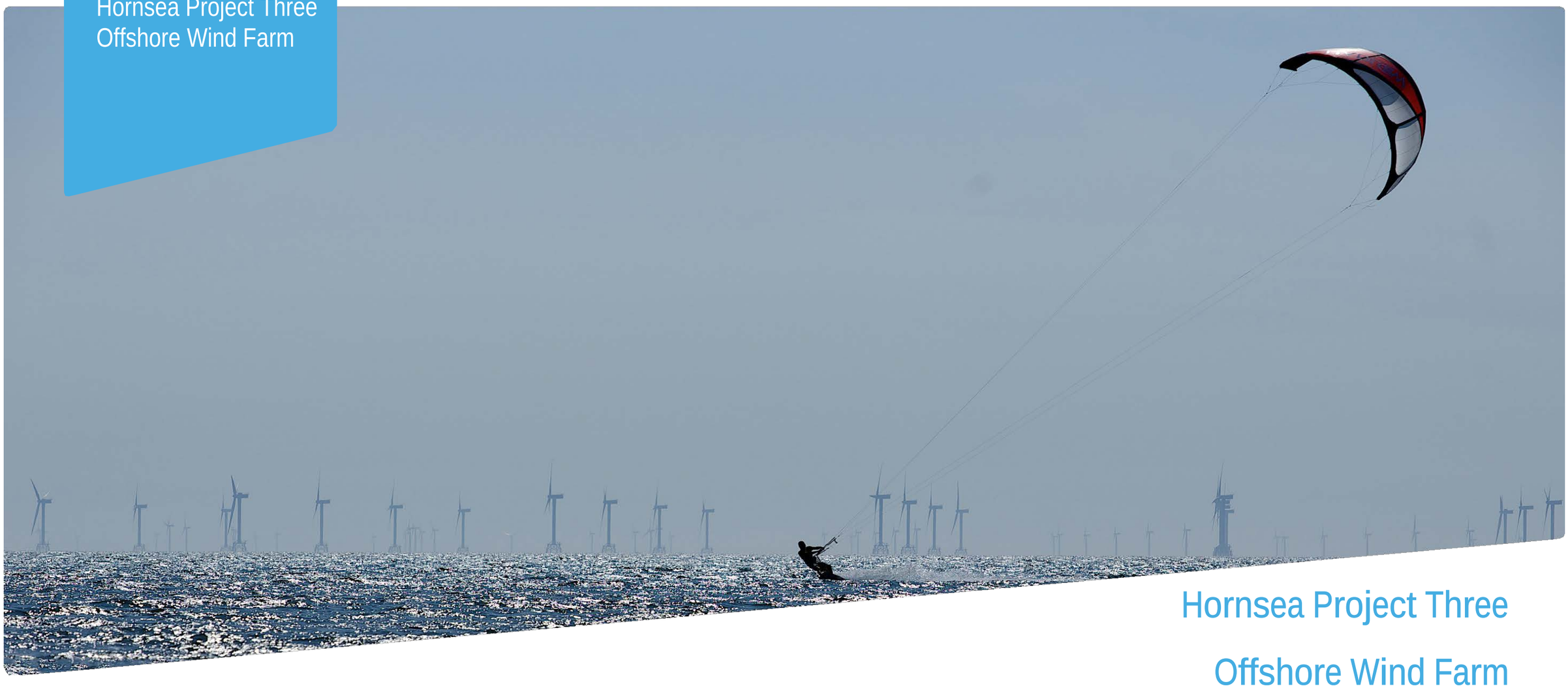
Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three

Offshore Wind Farm

Environmental Statement
Volume 2, Chapter 6 – Commercial Fisheries

PINS Document Reference: A6.2.6
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Date: May 2018

Hornsea 3
Offshore Wind Farm

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Environmental Impact Assessment

Environmental Statement

Volume 2

Chapter 6 – Commercial Fisheries

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Front cover picture: Kite surfer near a UK offshore wind farm © Orsted Hornsea Project Three (UK) Ltd., 2018.

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Glossary

Term	Definition
Beam trawlers	A method of bottom trawling with a net that is held open by a beam, which is generally a heavy steel tube supported by steel trawl heads at each end. Tickler chains or chain mats, attached between the beam and the ground rope of the net, are used to disturb fish and crustaceans that rise up and fall back into the attached net.
Bycatch	Catch which is retained and sold but is not the target species for the fishery.
CNPMEM	The French National Committee for Maritime Fisheries and Aquaculture, of which CRPMEM Nord, along with 13 other CRPMEMs are members.
Cooperative Maritime Etaploise (C.M.E.) Producer Organisation	A French producer organization representing 45% of French landings, representing 44 active vessels including their owners, skippers, crew and ancillary services.
CRPMEM Nord	One of 14 French regional committees for marine fisheries and marine farming which manages licensing of commercial fishing.
Danish Fisheries Directorate	Part of the Danish Ministry of Food, responsible for ensuring biologically, environmentally and socially sustainable Danish fisheries.
Danish Fishermen's Producer Organisation	A Danish producer organisation representing 95% of Danish vessels, equating to approximately 650 vessels including their owners, skippers, crew and ancillary services.
Demersal	Living on or near the seabed.
Demersal trawl	A fishing net used by towing the trawl along or close to the seabed.
Eastern Inshore Fisheries and Conservation Authority	A UK authority that license, regulate and plan commercial fisheries activities in the seas around England, with jurisdiction from 0 to 6 nm.
European Market Observatory for Fisheries and Aquaculture Products	An online database that enables direct monitoring of the weight, value and price of fishery and aquaculture products, from the first sale to retail stage, for EU countries, Norway and Iceland.
European Union Data Collection Framework	An EU framework for the collection and management of fisheries data.
First sale value	The value obtained for fish or shellfish when it is sold for the first time.
Fish stock	Any natural population of fish, which is an isolated and self-perpetuating group of the same species.
Fishery	A group of vessel voyages which target the same species or use the same gear.
Fishing ground	An area of water or seabed targeted by fishing activity.
Fishing mortality	Mortality due to fishing; death or removal of fish from a population due to fishing.
Fleet	A physical group of vessels sharing similar characteristics (e.g. nationality).
Fly shooting	A fishing net consisting of a conical net with two long wings with a bag where the fish collect. Drag lines extend from the wings, and are long so they can surround an area. A seine boat drags the net in a circle around the fish, the motion of the drag lines herds the fish into the central net.

Term	Definition
From Nord	A French non-cooperative producer organization, legally in the form of an association, representing 40% of all French quotas (on average across all species) and specifically 61% of sole *Solea solea* quota.
Gear type	The method/equipment used for fishing.
German Federal Ministry for Food, Agriculture and Consumer Protection (BMELV)	A cabinet-level ministry of the Federal Republic of Germany responsible for German fisheries.
Gill net	Fishing net set vertically in the water so that fish swimming into it are entangled by the gills in its mesh.
ICES statistical rectangles	Defined areas, 1 degree longitude x 0.5 degree latitude equalling approximately 30 x 30 nm used for fisheries statistics.
Industrial fishery	Highly mechanised commercial fishing operations whose ultimate products are principally fishmeal and fish oil.
L'Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER)	A French research institute for the exploitation of the sea.
Landings	Quantitative description of amount of fish returned to port for sale, in terms of value or weight.
Marine Management Organisation	A UK government department that license regulate and plan commercial fisheries activities in the seas around England, with jurisdiction from 0 to 12 nm.
Maximum sustainable yield	Maximum sustainable yield (MSY) is the largest yield (catch, in tonnes) that can be taken from a specific fish stock over an indefinite period under constant environmental conditions. Fishing at MSY levels should ensure the capacity of the stock to continue to produce this level in the long term.
Metier	A homogenous subdivision, either of a fishery by vessel type or a fleet by voyage type.
Minimum Landing Size	Is a technical measure that limits the size of fish or shellfish species that can be legally landed and sold. The MLS varies per species. With the implementation of the Landings Obligation, the existing MLS are changed into minimum conservation reference sizes (MCRS), but they will remain largely the same.
National Federation of Fishermen's Organisations	A UK organisation comprised of members from Producers' Organisations, fishermen's groups and individuals, representing fishermen in England, Wales, Northern Ireland and the Channel Islands.
Norwegian Directorate of Fisheries	A Norwegian government agency responsible for Norwegian fisheries.
Otter trawl	A net with large rectangular boards (otter boards) which are used to keep the mouth of the trawl net open. Otter boards are made of timber or steel and are positioned in such a way that the hydrodynamic forces, acting on them when the net is towed along the seabed, pushes them outwards and prevents the mouth of the net from closing.
Pelagic	Of or relating to the open sea.
Pelagic trawl	A net used to target fish species in the mid water column.
Rederscentrale	The only Belgian producer organization, an umbrella organization led by a Board of Directors, representing Belgian vessel owners and members.

Term	Definition
Scallop dredge	A method to catch scallop using steel dredges with a leading bar fitted with a set of spring loaded, downward pointing teeth. Behind this toothed bar (sword), a matt of steel rings is fitted. A heavy net cover (back) is laced to the frame, sides and after end of the mat to form a bag.
Shrimper	A vessel that predominantly targets shrimp.
Soak time	The duration of time that pots are left on the seabed in between hauls.
Spawning	The act of releasing or depositing eggs (fish).
Stock assessment	An assessment of the biological stock of a species and its status in relation to defined references points for biomass and fishing mortality.
String	A series of static fishing gear (pots) joined together to form a single deployable linear line of pots.
Swedish Fishermen's Producer Organisation	Swedish producer organization, representing Swedish vessel owners and members.
The Crown Estate	An independent commercial business, created by Act of Parliament that owns the UK seabed out to 200 nm.
Total Allowable Catches	Total Allowable Catches (TACs) are catch limits, expressed in tonnes or numbers that are set for some commercial fish stocks.
Vessel Monitoring System	A system used in commercial fishing to allow environmental and fisheries regulatory organizations to monitor, minimally, the position, time at a position, and course and speed of fishing vessels.
VisNed	(Cošperatie Kottervisserij Nederland u.a.) a Dutch umbrella organisation of producer organisations, representing 75% of the Dutch Demersal Fishing interest.
Vivier	A fishing vessel, normally targeting crab, which has a tank on board allowing the catch to be stored live in water.
Wageningen Economic Research	A Dutch independent research institute, part of the Wageningen University & Research.
Year class	The individual animals of a single species of fish or shellfish that were born in any one-year.

Acronyms

Acronym	Description
AfL	Agreement for Lease
AIS	Automatic Identification System
BMELV	German Federal Ministry for Food, Agriculture and Consumer Protection
CEA	Cumulative Effects Assessment
cSAC	Candidate Special Area of Conservation
DCF	Data Collection Framework
DFPO	Danish Fishermen's Producer Organisation
EC	European Council
EEC	European Economic Community
EEFPO	The East of England Fish Producers Organisation
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMF	Electromagnetic fields
EMS	European Marine Site
EU	European Union
EUMOFA	European Market Observatory for Fisheries and Aquaculture Products
FU	Functional Unit
ICES	International Council for the Exploration of the Sea
IFCA	Inshore Fisheries and Conservation Authorities
MCZ	Marine Conservation Zone
MMO	Marine Management Organisation
MPA	Marine Protected Area
MSAR	Monthly Shellfish Activity Returns
NFFO	National Federation of Fishermen's Organisations
rMCZ	Recommended Marine Conservation Zone
SAC	Special Area of Conservation
SPA	Special Protected Area
Spp.	Species
TAC	Total Allowable Catches
UK	United Kingdom
VMS	Vessel Monitoring System

Units

Unit	Description
€	Euro
£	Great British pounds
£/kg	Great British pounds per kilogram
hours	hours
kg	kilograms
km	kilometres
m	metres
mm	millimetres
nm	Nautical Mile

6. Commercial Fisheries

6.1 Introduction

6.1.1.1 This chapter of the Environmental Statement presents the Environmental Impact Assessment (EIA) for the potential impacts of the Hornsea Project Three offshore wind farm (hereafter referred to as Hornsea Three) on commercial fisheries. Specifically, this chapter considers the potential impact of Hornsea Three seaward of Mean High Water Springs (MHWS) during its construction, operation and maintenance, and decommissioning phases.

6.1.1.2 For the purpose of this chapter commercial fishing is defined as any form of fishing activity legally undertaken for taxable profit. Recreational fishing is addressed in volume 2, chapter 10: Infrastructure and Other Users. Navigational aspects related to fishing vessels are assessed in volume 2, chapter 7: Shipping and Navigation.

6.1.1.3 This chapter summarises information contained within a supporting technical report, which is included at volume 5, annex 6.1: Commercial Fisheries Technical Report.

6.2 Purpose of this chapter

6.2.1.1 The primary purpose of the Environmental Statement is to support the Development Consent Order (DCO) application for Hornsea Three under the Planning Act 2008 (the 2008 Act) and accompanies the application to the Secretary of State for Development Consent.

6.2.1.2 It is intended that the Environmental Statement will provide statutory and non-statutory consultees with sufficient information to complete the examination of Hornsea Three and will form the basis of agreement on the content of the DCO and/or Marine Licence conditions (as required).

6.2.1.3 In particular, this Environmental Statement chapter:

- Presents the existing environmental baseline established from desk studies, and consultation;
- Presents the potential environmental effects on commercial fisheries arising from Hornsea Three, based on the information gathered and the analysis and assessments undertaken;
- Identifies any assumptions and limitations encountered in compiling the environmental information; and
- Highlights any necessary monitoring and/or mitigation measures which could prevent, minimise, reduce or offset the possible environmental effects identified to date in the EIA process.

6.3 Study area

6.3.1.1 Hornsea Three is within the southwest portion of the International Council for the Exploration of the Sea (ICES) Division 4b (Central North Sea). Hornsea Three array area lies outside the 12 nautical miles (nm) territorial waters limit within the UK Exclusive Economic Zone (EEZ). For the purpose of recording fisheries landings, ICES Division 4b is divided into statistical rectangles, which are consistent across all Member States operating in the North Sea.

6.3.1.2 From a commercial fisheries perspective, the study areas are defined by the ICES statistical rectangles that Hornsea Three overlaps and is immediately adjacent to (Figure 6.1). Linking the study areas to ICES statistical rectangles supports analysis of landings data that is collated for each statistical rectangle. The commercial fisheries study areas are defined as follows:

- Hornsea Three array area commercial fisheries study area: ICES rectangle 36F2;
- Hornsea Three offshore cable corridor commercial fisheries study area: ICES rectangles 36F2, 36F1, 35F1 and 34F1;
- Hornsea Three commercial fisheries study area: ICES rectangles 36F2, 36F1, 35F1 and 34F1; and
- Regional commercial fisheries study area: ICES rectangles: 37F0 to F3, 36F0 to F3, 35F0 to F3 and 34F0 to F3.

6.3.1.3 An admiralty chart covering the regional commercial fisheries study area is presented in Figure 6.2, together with relevant ICES Divisions.

6.3.1.4 Given the range of commercial fisheries stakeholders considered in this chapter, and the scale of geographic coverage of their activities, the commercial fisheries study area for the cumulative effects assessment (CEA) is defined as the North Sea (ICES Divisions 4a, 4b and 4c).

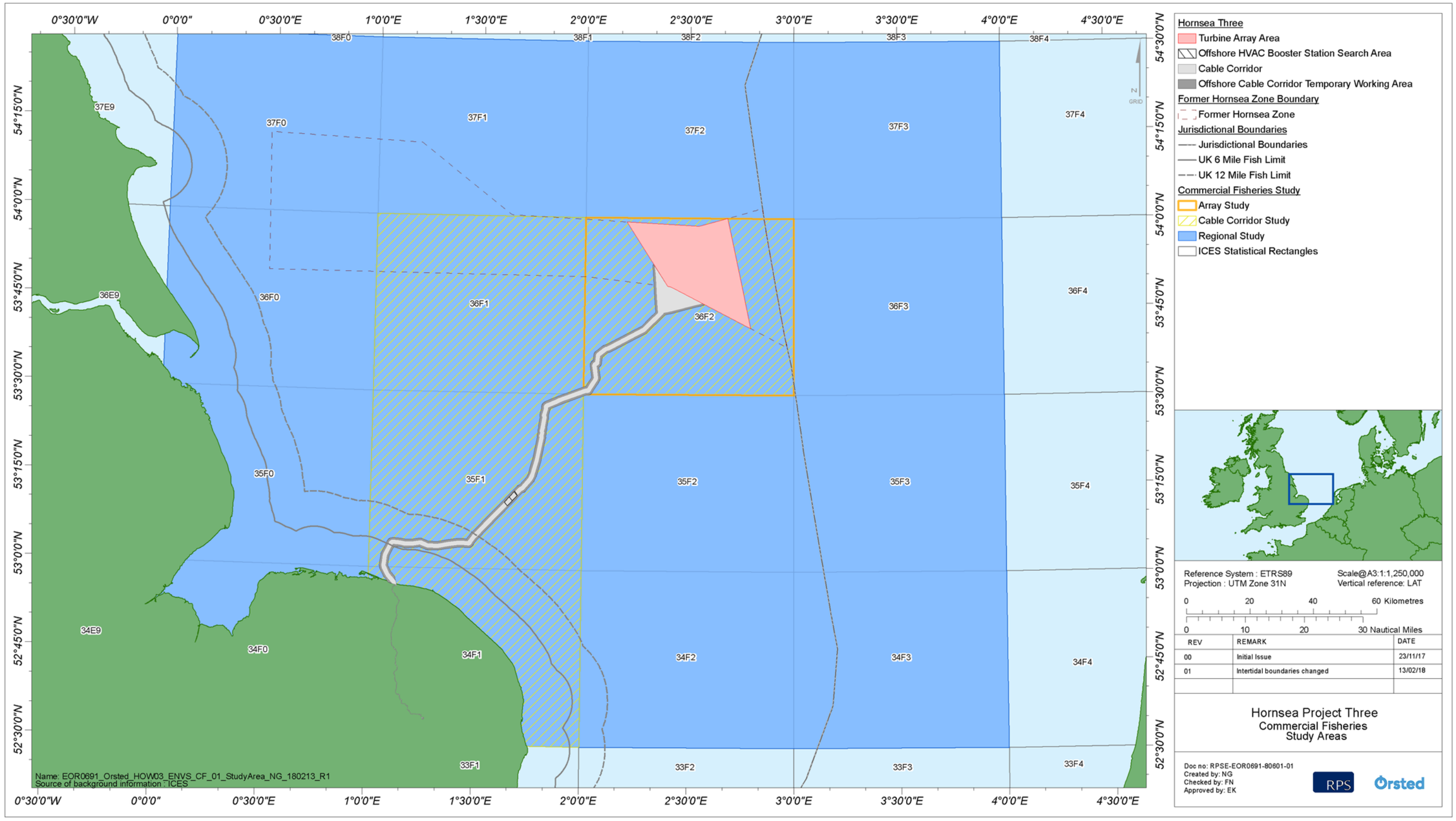

Figure 6.1: Commercial fisheries study areas for Hornsea Three.

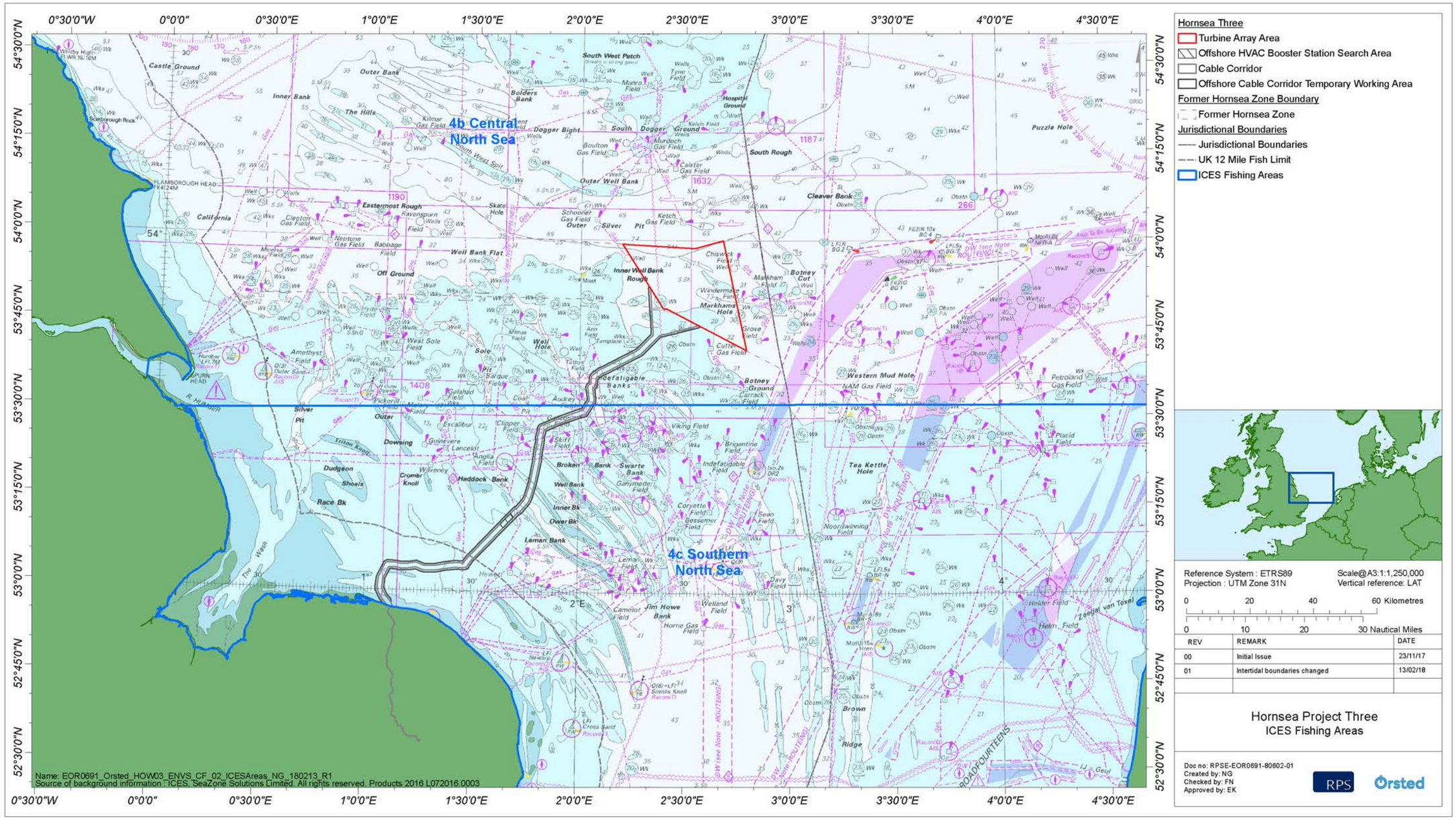

Figure 6.2: Admiralty chart indicating North Sea ICES Divisions.

6.4 Planning policy context

6.4.1 National Policy Statements

6.4.1.1 Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to commercial fisheries, is contained in the Overarching National Policy Statement (NPS) for Energy (EN-1; DECC, 2011a) and the NPS for Renewable Energy Infrastructure (EN-3, DECC, 2011b).

6.4.1.2 NPS EN-3 includes guidance on what matters are to be considered in the assessment. These are summarised in Table 6.1 below.

6.4.1.3 Specifically, the guidance provided within NPS EN-3 (DECC, 2011b) was considered, which highlights a number of factors relating to the determination of an application and in relation to mitigation. These are summarised in Table 6.2 below.

Table 6.1: Summary of NPS EN-3 provisions relevant to commercial fisheries.

Summary of NPS EN-3 provision	How and where considered in the Environmental Statement
Consultation	
Early consultation should be undertaken with statutory advisors and with representatives of the fishing industry which could include discussions of impact assessment methodologies. Where any part of a proposal involves a grid connection to shore, appropriate inshore fisheries groups should also be consulted (paragraph 2.6.127 of NPS EN-3).	Engagement with the local and regional industry over the period September 2010 to present (see section 6.5).
Where a number of offshore wind farms have been proposed within an identified zone, it may be beneficial to undertake such consultation at a zonal, rather than a site-specific, level (paragraph 2.6.128 of NPS EN-3).	Consultation has been undertaken both at a zonal and at a project-specific, level (see section 6.5).
The assessment by the applicant should include detailed surveys of the effects on fish stocks of commercial interest and any potential reduction in such stocks, as well as any likely constraints on fishing activity within the project's boundaries (paragraph 2.6.129 of NPS EN-3).	Site-specific otter trawl and epibenthic beam trawl surveys were undertaken to inform fish and shellfish ecology; details of which are presented in Table 6.6. In addition, consultation with the fishing industry has identified key concerns as well as available data and potential impacts, which have all been considered in the assessment (see section 6.5).
Baseline data	
Robust baseline data should have been collected and studies conducted as part of the assessment (paragraph 2.6.129 of NPS EN-3).	In addition to recent official landings and surveillance data, extensive consultation with the industry and Eastern Inshore Fisheries and Conservation Authority (IFCA), in addition to data from published reports, have been used to establish baseline data (see section 6.6).
Safety zones	
Where there is a possibility that safety zones will be sought around offshore infrastructure, potential effects should be included in the assessment on commercial fishing (paragraph 2.6.130 of NPS EN-3).	The need for safety zones has been considered by the navigational risk assessment (NRA) completed for Hornsea Three. The risk assessment results have been taken into account within the Commercial Fisheries assessment (see section 6.11). Consultation has also been undertaken with the Maritime and Coastguard Agency (MCA) (see volume 2, chapter 7: Shipping and Navigation). It is assumed there would be safety zones of 500 m around infrastructure under construction, decommissioning and major maintenance works; and 500 m safety zones around manned platforms during the operational period.
Where the precise extents of potential safety zones are unknown, a realistic worst case scenario should be assessed. Applicants should consult the MCA (paragraph 2.6.131 of NPS EN-3).	
Fish stocks	
The assessment by the applicant should include detailed surveys of the effects on fish stocks of commercial interest and the potential reduction or increase in such stocks that will result from the presence of the wind farm development and of any safety zones (paragraph 2.6.131 of NPS EN-3).	The Hornsea Three assessment has considered the effects on commercial fish stocks (see section 6.11, and volume 2, chapter 3: Fish and Shellfish Ecology).

Table 6.2: Summary of NPS EN-3 policy on decision making relevant to commercial fisheries.

Summary of NPS EN-3 policy on decision making (and mitigation)	How and where considered in the Environmental Statement
Commercial fisheries	
The Secretary of State should be satisfied that the site selection process has been undertaken in a way that reasonably minimises adverse effects on fish stocks, including during peak spawning periods and the activity of fishing itself (paragraph 2.6.132 of NPS EN-3).	The effects arising from the proposed development have been and will be discussed with statutory bodies during pre and post application consultation. Hornsea Three, is, and will continue to, take steps to minimise the effects upon the fishing industry in the area through appropriate mitigation where required. Designed-in measures related to commercial fisheries and adopted as part of Hornsea Three are provided in section 6.10.
The Secretary of State should consider the extent to which the proposed development occupies any recognised important fishing grounds and whether the project would prevent or significantly impede protection of sustainable Commercial Fisheries or fishing activities (paragraph 2.6.132 of NPS EN-3).	The extent to which Hornsea Three impacts on recognised fishing grounds has been considered and consultation with fishing stakeholders in order to fully understand any potential impacts has been undertaken (see section 6.5). The results of the commercial fisheries assessment are presented in section 6.11 below.
The Secretary of State should be satisfied that the applicant has sought to design the proposal having consulted representatives of the fishing industry with the intention of minimising the loss of fishing opportunity taking into account effects on other marine interests (paragraph 2.6.133 of NPS EN-3).	
Mitigation for commercial fisheries	
Any mitigation proposals should result from the applicant having detailed consultation with relevant representatives of the fishing industry (paragraph 2.6.134 of NPS EN-3).	Consultation is integral to the assessment of impact on commercial fisheries for Hornsea Three. Hornsea Three consultation with UK and overseas stakeholders from the fishing community is on-going (see section 6.5).
Mitigation should be designed to enhance where reasonably possible any potential medium and long-term positive benefits to the fishing industry and Commercial fish stocks (paragraph 2.6.135 of NPS EN-3).	A range of mitigation measures are presented within section 6.10.

6.4.2 Other relevant policies

6.4.2.1 The UK Marine Policy Statement (MPS; HM Government, 2011) explicitly expresses support for the fishing sector, and with regard to displacement, advocates “seeking solutions such as co-location of activity wherever possible”. Specifically paragraphs 3.8.1, 3.8.2, and 2.3.1.5 stipulate that the process of marine planning should “enable the co- existence of compatible activities wherever possible”, and supports the reduction of real and potential conflict as well as maximising compatibility and encouraging co-existence of activities (Defra, 2014).

6.4.2.2 The East Inshore and East Offshore Marine Plans (Defra, 2014) support maximising possibilities for the co-location of fisheries with other sectors (GOV2 under objective 10), together with a cross-sectoral policy on displacement (GOV3). A summary of East Inshore and East Offshore Marine Plans policies relevant to commercial fisheries is provided in Table 6.3.

Table 6.3: Summary of East Inshore and East Offshore Marine Plans policies relevant to commercial fisheries.

Summary of relevant East Inshore and East Offshore Marine Plans policies	How and where considered in the Environmental Statement
Commercial fisheries	
Policy FISH1: Within areas of fishing activity, proposals should demonstrate in order of preference: a) that they will not prevent fishing activities on, or access to, fishing grounds; b) how, if there are adverse impacts on the ability to undertake fishing activities or access to fishing grounds, they will minimise them; c) how, if the adverse impacts cannot be minimised, they will be mitigated; d) the case for proceeding with their proposal if it is not possible to minimise or mitigate the adverse impacts.	Hornsea Three, is, and will continue to, take steps to minimise the effects upon the fishing industry in the area through appropriate mitigation where required. Designed-in measures related to commercial fisheries and adopted as part of Hornsea Three are provided in section 6.10.
Policy FISH2: Proposals should demonstrate, in order of preference: a) that they will not have an adverse impact upon spawning and nursery areas and any associated habitat; b) how, if there are adverse impacts upon the spawning and nursery areas and any associated habitat, they will minimise them; c) how, if the adverse impacts cannot be minimised they will be mitigated; d) the case for proceeding with their proposals if it is not possible to minimise or mitigate the adverse impacts.	The Hornsea Three assessment has considered the effects on commercial fish stocks (see section 6.11, and volume 2, chapter 3: Fish and Shellfish Ecology).
Coexistence and displacement	
Policy GOV2: Opportunities for co-existence should be maximised wherever possible.	Hornsea Three, is, and will continue to, take steps to minimise the effects upon the fishing industry in the area through appropriate mitigation where required. Designed-in measures related to commercial fisheries and adopted as part of Hornsea Three are provided in section 6.10, and include commitment to developing a Fisheries Coexistence and Liaison Plan (document reference number A.8.10).
Policy GOV3: Proposals should demonstrate in order of preference: a) that they will avoid displacement of other existing or authorised (but yet to be implemented) activities; b) how, if there are adverse impacts resulting in displacement by the proposal, they will minimise them; c) how, if the adverse impacts resulting in displacement by the proposal, cannot be minimised, they will be mitigated against or; d) the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts of displacement.	

6.5 Consultation

6.5.1.1 A summary of the key issues raised during consultation specific to commercial fisheries is outlined below, together with how these issues have been considered in the production of this Environmental Statement chapter.

6.5.2 Hornsea Project One and Hornsea Project Two consultation

6.5.2.1 Hornsea Three has similarities, both in terms of the nature of the development and its location, to Hornsea Project One and Hornsea Project Two. The matters relevant to Hornsea Three, which were raised by consultees during the pre-application and examination phases of Hornsea Project One and Hornsea Project Two regarding commercial fisheries, are set out in volume 4, annex 1.1: Hornsea Project One and Hornsea Project Two Consultation of Relevance to Hornsea Three.

6.5.3 Hornsea Three consultation

6.5.3.1 Table 6.4 below summarises the issues raised relevant to commercial fisheries, which have been identified during consultation activities undertaken to date. Table 6.4 also indicates either how these issues have been addressed within this Environmental Statement or how the Applicant has had regard to them. Further information on the consultation activities undertaken for Hornsea Three can be found in the Consultation Report (document reference number A5.1) that accompanies the application for Development Consent.

Table 6.4: Summary of key consultation issues raised during consultation activities undertaken for Hornsea Three relevant to commercial fisheries.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
25 November 2016	MMO - Scoping Opinion	Commonly fished areas are around Markham's Hole and Silver Pit. The Hornsea Three array area is adjacent to a commercial fishing ground (Botney Gut/Silver Pit) where *Nephrops norvegicus* are targeted using Nephrops otter trawls. This will need to be given consideration in the EIA.	A range of commercial fisheries fleets are known to operate within and around Markham's Hole and Silber Pit, including UK and Dutch vessels. These, together with the *Nephrops* fleet are characterised as part of the UK demersal trawling fleet in the baseline assessment (section 6.7); the potential impacts of Hornsea Three during construction, operation and maintenance, and decommissioning are assessed specifically for the UK demersal trawl fleet (section 6.11); as is the cumulative impact of Hornsea Three with other projects in North Sea (section 6.13).
25 November 2016	MMO - Scoping Opinion	There are approximately 20 beach-launched commercial fishing vessels under 10 m working from Hornsea, Withernsea and Easington on the Holderness Coast. The main activity of these vessels is inshore potting for brown crab (*Cancer pagurus*) and lobster (*Homarus gammarus*). Fishing vessels from The Wash working out of King's Lynn and Boston target cockles (*Cerastoderma edule*) and brown shrimp (*Crangon crangon*) and although most are over 12m, they also typically work inshore.	This information has informed the baseline characterisation of the inshore fleets in operation within the vicinity of the project. The baseline section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report present landings data for the inshore UK fleets.
25 November 2016	MMO - Scoping Opinion	The inshore area of the Hornsea Three offshore cable corridor forms part of an important crab, lobster and whelk (Buccinum undatum) fishery. These species are targeted using baited pots which are left on the seabed to fish for up to several days. In recent years the landings of whelks have increased such that it now forms an important fishery, with peak catches occurring during the winter months. Conversely, peak catches for crab and lobster occur during spring-autumn, though catches occur all year around for all three species.	
25 November 2016	MMO - Scoping Opinion	The North Norfolk fishing fleet operate out of ports from The Wash estuary around the North Norfolk coast to beyond Lowestoft. The area extending offshore from Wells- Next-The-Sea to Cromer represents the most important area for this fishery. The majority of the fleet is made up of under 10 m vessels, with many of those being beach launch vessels which are only able to fish on the inshore grounds. It is important to note that the fishing distribution of this fleet will not be captured by a Vessel Monitoring System (VMS) as most, if not all vessels, are under 12 m in length and therefore do not have VMS installed (VMS has been required on vessels 12 m+ since 2013).	
25 November 2016	MMO - Scoping Opinion	The potential limitations of official landings statistics for <10 m fleet should be carefully considered as buyers and sellers notes are not produced. Many of the vessels will have limited ability to relocate their pots during surveys and cable laying works, due to heavily fished grounds in adjacent areas and the size of their vessels limiting the range they can travel.	Limitations of data have been considered within section 6.6. It is noted that in some instances landings by vessels under 10 m are not captured within buyers and sellers notes, due to the quantities being landed and/or fishermen selling directly to the public from their own local outlets. Other sources of data have been explored for the under 10 m fleet, including MSAR data.
25 November 2016	MMO - Scoping Opinion	The presence of vessels on site has the potential to create disruption to the commercial fishing activity. Some vessels may face longer steaming distances to alternative fishing grounds and more fishing pressure will be applied in areas outside of the exclusion zones. The impacts on commercial fishing activity can be reduced if the timings of works are well communicated with industry.	The designed in measures adopted as part of Hornsea Three, including communication with the industry, are presented in Table 6.13.
25 November 2016	MMO - Scoping Opinion	The MMO recommends the continued use of an Offshore Fisheries Liaison officer, a Company Fisheries Liaison Office and an Onshore Fishing Industry Representative to communicate with the fishing industry as outlined in FLOWW Best Practice Guidance (2014).	A company Fisheries Liaison Officer has been appointed. Regular ongoing updates have been and continue to be disseminated to the fishing industry via Notice to Mariners (NtMs), and Offshore Fishing Industry Representatives have been mobilised aboard survey vessels. Hornsea Three is also in the process of appointing a Fishing Industry Representative.
25 November 2016	Natural England - Scoping Opinion	We agree with the scoping in of impacts on commercial fisheries and the undertaking to liaise with fishing fleets as part of the project.	Noted.
28 November 2016	Norfolk County Council - Scoping Opinion	County Council welcomes reference for need to assess potential cumulative impacts on commercial fishing interests (Reference in paragraph 9.1.21). This should include those projects in the East Anglia Zone (Round 3), projects off the Norfolk coast consented under previous licencing Rounds and other operational, consented and proposed windfarms including Vanguard and the Boreas Windfarms. Commercial fishing contributes to the coastal economy of Norfolk and as such the impacts of this proposal alongside those already in operation, consented or planned needs to be carefully considered.	The cumulative effect of Hornsea Three with other projects in North Sea is presented in section 6.13. The CEA includes consideration of East Anglia One, East Anglia One North, East Anglia Two, East Anglia Three, Race Bank, Dudgeon, Triton Knoll, Norfolk Vanguard and Norfolk Boreas.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
6 December 2016	PINS - Scoping Opinion	The Secretary of State agrees that in principle effects during operation and decommissioning can be scoped out. However the Applicant is first advised to consult with commercial fishermen, the Eastern IFCA and the MMO. It should be noted that commercial fishermen and the IFCA have not been consulted as part of the Secretary of State' Scoping Opinion.	The potential impacts have been scoped in (section 6.11). Commercial fisheries stakeholders, the MMO and Eastern IFCA have been consulted prior to submission of the Environmental Statement.
6 December 2016	PINS - Scoping Opinion	Table 9.2 also proposes scoping out interference to fishing activity as a result of changes to shipping routes and construction vessel traffic leading to increased vessel traffic in fishing grounds for all phases of the development. The Secretary of State agrees that in principle these effects can be scoped out but as noted above, the Applicant should first consult with commercial fishermen, the Eastern IFCA and the MMO.	The potential impact of changes to shipping routes and construction vessel traffic leading to increased vessel traffic in fishing grounds during construction, operation and maintenance and decommissioning of the Hornsea Three array area have been scoped in to the impact assessment (section 6.11). Commercial fisheries stakeholders, the MMO and Eastern IFCA have been consulted prior to submission of the Environmental Statement.
6 December 2016	PINS - Scoping Opinion	The Secretary of State is content with the potential impacts scoped in to the assessment, as per Table 9.1, with the provision that the Applicant include the data sources and potential receptors identified in comments above. The Applicant should also consider whether the data collection (e.g. the type and nature of current fisheries in the area, including the vessel data) for decommissioning impacts will need to be updated prior to decommissioning. At present the decommissioning data is stated to be the same sources and dates as for construction and operation.	It is agreed that the data to inform decommissioning impacts will require further consideration within the Decommissioning Plan which will be produced prior to decommissioning.
2 February 2017	CRPMEM Nord and Copeche - email correspondence.	Acknowledgement of project and request to be kept informed.	The French fleet are characterised in the baseline assessment (section 6.7); the potential impacts of Hornsea Three during construction, operation, maintenance and decommissioning are assessed specifically for the French fleet (section 6.11); as is the cumulative impact of Hornsea Three with other projects in North Sea (section 6.13).
08 February 2017	NFFO – consultation meeting	Details of fisheries in operation across the Hornsea Three project are provided, including data sources and key stakeholders. Concerns related to the uncertainty surrounding the effects of floating turbines, their mooring systems and stability. Concerns related to potential for co-existence given floating turbines and uncertainty related to displacement. Emphasis placed on development of a fisheries coexistence plan.	Floating turbines have been removed from the design envelope. Gravity based structure foundations are considered the maximum design scenario, and the resumption of fishing activities following construction is assumed. The potential for co-existence is therefore considered throughout the assessment. Commitment has been made to the development of a Fisheries Coexistence and Liaison Plan (document reference number A.8.10). Further details are presented within the maximum design scenarios in Table 6.9. The potential for displacement is acknowledged within the gear conflict impact assessment which is presented in section 6.11 below. The minutes in full are provided in volume 5, annex 6.1: Commercial Fisheries Technical Report.
16 February 2017	Rederscentrale – Regulation 24 email correspondence.	Acknowledgement of project and request to be kept informed.	The Belgian fleet are characterised in the baseline assessment (section 6.7); the potential impacts of Hornsea Three during construction, operation and maintenance, and decommissioning are assessed specifically for the Belgian fleet (section 6.11); as is the cumulative impact of Hornsea Three with other projects in North Sea (section 6.13).
21 February 2017	Norfolk Independent Fishermen's Association – consultation meeting	Concerns related to the offshore cable corridor during the construction phase are highlighted, including direct exclusion from grounds and displacement of effort.	The potential for a reduction in access to grounds, displacement from grounds and gear conflict are considered in section 6.11 below.
21 February 2017	Wells and District Fishermen's Association – consultation meeting	Details of the local potting fleet are provided relating to whelk, crab and lobster. Concern raised regarding landings statistics, noting that Monthly Shellfish Activity Returns (MSARs) are likely to be more accurate.	Details on the fishing patterns, gear configurations and grounds targeted in the vicinity of the Hornsea Three offshore cable corridor commercial fisheries study area have informed the baseline section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report. MSAR data is presented in volume 5, annex 6.1: Commercial Fisheries Technical Report.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
22 February 2017	Eastern Inshore Fisheries Conservation Authority– consultation meeting	Details discussed on information sources, including inshore fisheries maps and MSAR data. Interest in any effects on nursery and spawning grounds. Details discussed on the Wash and North Norfolk Coast SAC and Cromer Shoal Chalk Beds MCZ.	Details on the fishing patterns, gear configurations and grounds targeted in the vicinity of the Hornsea Three offshore cable corridor commercial fisheries study area have informed the baseline section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report. MSAR data is presented in volume 5, annex 6.1: Commercial Fisheries Technical Report. The potential impacts on nursery and spawning grounds are considered in detail within volume 2, chapter 3: Fish and Shellfish Ecology. The cumulative effect of Hornsea Three, alongside MCZs and SACs, as well as other projects, plans and activities in the southern North Sea, are considered within the CEA presented in section 6.13 below.
22 February 2017	Jonas Seafood – consultation meeting	Details provided on prices, markets and landings points for shellfish fisheries. Concerns related to construction activities affecting crab resources in the short-medium term.	The potential impacts to crab and other shellfish resources are considered in detail within volume 2, chapter 3: Fish and Shellfish Ecology. This has informed the commercial fisheries EIA on the potential for displacement or disruption of commercially important fish and shellfish resources (section 6.11).
22 February 2017	North Norfolk Fishermen's Society – consultation meeting	Concerns related to the offshore cable corridor during the construction phase are highlighted. Notably construction methods and the potential that suspension of sediment and chalk plumes might affect crab resources. The potential cumulative impact of management measures related to the Cromer Shoal Chalk Bed Marine Conservation Zone (MCZ) was also noted.	A maximum design scenario for all phases of the development, including the construction phase, (see Table 6.9) has been used to inform the assessment of impacts from Hornsea Three. The potential impacts to the crab and other shellfish resource are considered in detail within volume 2, chapter 3: Fish and Shellfish Ecology. This has informed the commercial fisheries EIA on the potential for displacement or disruption of commercially important fish and shellfish resources (section 6.11). The cumulative effect of Hornsea Three, alongside MCZs and SACs, as well as other projects, plans and activities in the southern North Sea, are considered within the CEA presented in section 6.13 below.
23 February 2017	VisNed – consultation meeting and Regulation 24 email correspondence.	Details discussed on fishing patterns of UK and Dutch vessels in the area. Concern raised over floating turbines and reduced access to the array area due to mooring and anchor cables.	Floating turbines have been removed from the design envelope. Gravity based structure foundations are considered the maximum design scenario, and the resumption of fishing activities following construction is assumed. The potential for co-existence is therefore considered throughout the assessment. Commitment has been made to the development of a Fisheries Coexistence and Liaison Plan (document reference number A.8.10). Details on the fishing patterns, species mix, gear configurations and grounds targeted in the vicinity of the Hornsea Three array area commercial fisheries study area have informed the baseline section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report. The potential impact of Hornsea Three on access for commercial fisheries activities are considered in section 6.11.
30 March 2017	Norwegian Directorate of Fisheries - Regulation 24 email correspondence.	Acknowledgement of project and request to be kept informed.	The Norwegian fleet are characterised in the baseline assessment (section 6.7); the potential impacts of Hornsea Three during construction, operation and maintenance, and decommissioning are assessed specifically for the Norwegian fleet (section 6.11); as is the cumulative impact of Hornsea Three with other projects in North Sea (section 6.13).

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
16 June 2017	Danish Fishermen's Producer Organisation (DFPO) – Regulation 24 email correspondence and consultation meeting	Details discussed on fishing patterns of Danish vessels in the area and wider North Sea. Concern raised over floating turbines and reduced access to the array area due to mooring and anchor cables, specifically across sandeel grounds that run from west to east across the northern half of the Hornsea Three array area.	Details on the fishing patterns, species mix, gear configurations and grounds targeted in the vicinity of the Hornsea Three array area commercial fisheries study area have informed the baseline section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report. Floating turbines have been removed from the design envelope. Gravity based structure foundations are considered the maximum design scenario, and the resumption of fishing activities following construction is assumed. The potential for co-existence is therefore considered throughout the assessment. Commitment has been made to the development of a Fisheries Coexistence and Liaison Plan (document reference number A.8.10). The potential impact of Hornsea Three on access for commercial fisheries activities are considered in section 6.11.
August to September 2017	NFFO, Visned, Danish Fishermen's Producer Organisation, Rederscentrale, From Nord,Cooperative Maritime Etaploise (C.M.E.) Producer Organisation, North Norfolk Independent Fishermen's Association, North Norfolk Fishermen's Society, Wells and District Fishermen's Association – email and telephone correspondence	Notification of Preliminary Environmental Information Report (PEIR) consultation period and provision of route to submit representations. Invitation for further discussion and meeting.	See Section 42 consultation responses (in below rows) for details.
28 August 2017	Denmark, specifically: Ministry of Foreign Affairs Denmark, Unit for EU and Fisheries Policy. Regulation 24 email correspondence	The Scoping Report only includes fisheries data regarding foreign vessels if the catches have been landed in the UK. UEF would like to draw attention to the considerable Danish fishery interests in the concerned areas and which are not reflected in the report since the catches are landed in Denmark. *In order to give a fair representation of the fisheries activities in the area, Danish and other countries' fishery data should be included in the Environmental Statement.*	Landings data has been collated for all EU Member States for all ICES statistical rectangles that overlap with the regional commercial fisheries study area (see section 6.7).
	Denmark, specifically: Danish Pelagic Producers Organisation (DPPO). Regulation 24 email correspondence	*DPPO is concerned about the future where fishing areas gradually are set aside for purposes that excludes fishing activities from the area, and destroys spawning and nursery habitats for species that are highly important to the ecosystem and the fisheries sector. We there recommend that a strategy be developed in order to ensure that fishery interests are not compromised as more and more areas are made exclusive for other purposes*	The cumulative impact of Hornsea Three, together with other projects and plans, is assessed in section 6.13.
	Denmark, specifically: Danish Fishermen's Association (DFPO). Regulation 24 email correspondence	Especially in 2005 and 2006, there was a great deal of sandeel fished by Danish vessels in the Hornsea Three array area. During the last ten years, the sandeel fishery has primarily taken place on the Dogger Bank but before this the banks in the southern parts of the North Sea were of great importance.	The impact of the construction, operation and maintenance, and decommissioning of Hornsea Three leading to displacement or disruption of commercially important fish and shellfish resources is considered in section 6.11.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
August 2017	Visned Section 42 - consultation	VisNed is strongly in favour of the largest type of turbines. This means spacing between turbines will be as wide as possible and shape the best possible conditions for fishing in an array. As long as cables are and stay sufficiently buried and will not be exposed, VisNed has no further comments on the Hornsea Three offshore cable corridor. We encourage a pragmatic approach during construction keeping as much of the area open and no unnecessary closures for parts of the area where no construction is taking place. Closure of the whole area has a much larger impact on certain vessels and fishing communities than the Dutch demersal fleet as a whole.	A maximum design scenario for all phases of the development, (see Table 6.9) has been used to inform the assessment; this assumes the maximum number of turbines will be located throughout the Hornsea Three array area. Furthermore, Table 6.9 describes design parameters for export cable laying and burial, subject to a detailed burial assessment which will be undertaken post-consent. Table 6.9 also describes the exclusion scenarios for commercial fisheries during all phases of the development, concluding that exclusion will be limited to construction/maintenance activities and associated safety zones.
14 August 2017	National Federation of Fishermen's Organisations Section 42 - consultation	The Commercial Fisheries PEIR makes reference to a consultation meeting held with the NFFO on 8 February 2017. The list of issues included in the PEIR do not, however fully reflect all of the issues discussed at that meeting. In particular, the NFFO consider that the assessment should explicitly assess the level of compatibility in the operation of fishing activities within the immediate footprint and vicinity of the project before going on assess wider impact significance taking account of available access to alternative fishing grounds.	Further details have been added to this table to reflect discussions during the 8 February 2017 consultation meeting. In addition, full meeting minutes are available in volume 5, annex 6.1: Commercial Fisheries Technical Report. The impact assessment (section 6.11) considers the level of impact to specific fisheries activities and fleets within the footprint of the impact (considered under magnitude criteria), prior to assessing availability of alternative grounds (considered under sensitivity of the fleet).
		The East Inshore and Offshore Marine Plan is aimed at maximising coexistence (policy GOV 2) so that mitigation is aimed directly at addressing this policy and mitigation responses are not just as a broader consideration according to impact significance as defined in the assessments use of DMRB methodology. This would be best informed by an assessment of the range of alternatives and not just the maximum design scenario.	Details of the policies within the East Inshore and East Offshore Marine Plans relevant to commercial fisheries are included within section 6.4. The removal of floating turbines from the project description results in the maximum design scenario assessing gravity based structure foundations (GBS) (see Table 6.9). Coexistence is therefore fundamental to the commercial fisheries impact assessment. Commitment has been made to the development of a Fisheries Coexistence and Liaison Plan (document reference number A.8.10).
		The maximum design scenario assumes that no fishing will take place within the Hornsea Three array area during the operation phase. Therefore it does not account for the possibility that other forms of turbine foundation, cable layout and array configuration will likely result in varying degrees of compatibility with different types of fishing activity.	The maximum design scenario (see Table 6.9) describes turbine layout parameters (minimum spacing: 1,000 m) and scenarios for exclusion of commercial fisheries at each stage of the development. The removal of floating turbines from the project description results in the maximum design scenario assessing GBS foundations. GBS foundations represent the largest seabed area in comparison to other foundation types within the design envelope. The principle of co-existence with GBS foundations and other foundation types included within the design envelope (monopiles, mono suction bucket, piled jacket or suction bucket jacket) is consistent i.e. resumption of fishing for all foundation types. Coexistence is therefore fundamental to the commercial fisheries impact assessment. Commitment has been made to the development of a Fisheries Coexistence and Liaison Plan (document reference number A.8.10).
		The sensitivity criteria combines whether the fisheries receptors are compatible with the project element being assessed and the degree to which they can relocate and operate elsewhere. These would benefit from being separated out. In addition, the embedded criteria of vulnerability and recoverability remain underdefined. In addition, the assessment of magnitude makes no reference to the spatial dimension of the magnitude of impact. It also combines fisheries resources as with fisheries access issues and period of impact. These would benefit by being separated out into their own analyses.	The criteria used for defining the sensitivity of the receptor and the magnitude of the impact has been updated (see impact assessment criteria in section 6.9.2).

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
		We disagree with the premise that should fishing activity no longer be able to take place within an area when it previously did take place, that a non-significant impact assessment outcome should require no further intervention to promote coexistence with that activity.	Given the updated maximum design scenario of GBS foundation, together with update criteria definitions for sensitivity of receptor and magnitude of impact, the justifications have been updated within the impact assessment (section 6.11). Furthermore, commitment is confirmed to developing a Fisheries Coexistence and Liaison Plan (document reference number A.8.10).
		Existing completed projects and other forms of marine management that has a bearing on fisheries should also be factored into the assessment, not just new and known future proposals.	Regulations pertaining to routine commercial fisheries management, including EU and UK fisheries legislation, including the Landing Obligation, are not considered plans or projects subject for assessment within the cumulative assessment (see volume 1, chapter 5: Environmental Impact Assessment Methodology for further methodology details). Projects completed before or during the time period assessed within the baseline assessment (up to 2016) are considered to form part of the baseline. Projects completed post 2016 are not reflected in the baseline and are included within the cumulative assessment.
		The commercial fisheries chapter details a number of measure that would assist in mitigating fisheries impacts. In addition, the following measures should be considered and/or combined into the proposed fisheries coexistence and liaison plan applying to both the Hornsea Three array area and offshore cable corridor: • Adherence to FLOWW best practice guidelines; • Consult with fisheries stakeholders on the production of cable burial plans/cable burial risk assessment and monitoring plans; • Where significant risk is identified with bottom towed fishing gears consider any protection and contingency remedial works; • Use post installation trawl surveys to verify clear seabed' • Communicate the results of post installation surveys to fisheries stakeholders; • Use of Kingfisher to provide hazard information and alert of emergent hazards; • Protect emergent hazards through appropriate means prior to remediation works being completed. • No in situ seabed hazards left in place following decommissioning and any infrastructure that remains buried in the seabed following an adequate assessment of the options should be subject to an ongoing monitoring regime with retained liability to address any emergent hazards. • Encourage the use of funding arrangements like the West of Morecombe Fisheries Fund as a mechanism to support fishing industry stakeholders affected by the project and provisioning of work opportunities (e.g. guard vessels or surveys for example) available to affected fisheries stakeholders as far as practically possible.	Designed-in measures adopted as part of Hornsea Three, that are considered as embedded mitigation for commercial fisheries, are detailed in Table 6.13. Commitment to follow FLOWW guidance where possible is confirmed. Commitment to develop a Fisheries Coexistence and Liaison Plan (document reference number A.8.10) is confirmed.
19 September 2017	Norfolk County Council Section 42 - consultation	It is felt that where there is likely to be a demonstrable impact on commercial fishing affecting communities in Norfolk that Hornsea Three should provide appropriate mitigation and compensation to those fishing communities affected.	Designed-in measures adopted as part of Hornsea Three, that are considered as embedded mitigation for commercial fisheries, are detailed in Table 6.13. Where significant impact has been identified, further measures related to mitigating disturbance as per FLOWW guidance have been proposed.
19 September 2017	Wells and District Fishermen's Association Section 42 - consultation	No comment on the Hornsea Three array area as it is beyond the usual area of fishing operations for our members.	Details on the fishing patterns, species mix, gear configurations and grounds targeted in the vicinity of the Hornsea Three array area and offshore cable corridor are presented in the baseline section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report. The potential impact to local fishing fleets are considered in detail within the commercial fisheries impact assessment (section 6.11).

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
		The Hornsea Three offshore cable corridor intersects through our fishing grounds. If not handled well, our members will be caused considerable disruption as well as loss of fishing opportunity leading to financial loss. Specifically, we are concerned about the pre-dredging along the Hornsea Three offshore cable corridor; the digging of jointing cable pits; the building of offshore HVAC booster stations along the Hornsea Three offshore cable corridor; the acquisition of land (Crown Commission); ploughing/trenching of cables into the seabed; and rock dumping. The above activities cause great upheaval to the seabed with sand and chalk fines being suspended in the water column for several miles. This can alter the topography of the seabed. In our experience, shellfish do not react well to this kind of disturbance and this can have long term consequences to the viability of the fishing grounds which we have to live with.	The Hornsea Three offshore cable corridor avoids known areas of chalk reef. Potential for fine chalk arising from routing across sub-cropping rock in the nearshore remains. The potential impacts to crab and other shellfish resources including suspension of particles are considered in detail within volume 2, chapter 3: Fish and Shellfish Ecology. This has informed the commercial fisheries EIA on the potential for displacement or disruption of commercially important fish and shellfish resources (section 6.11).
20 September 2017	Eastern Inshore Fisheries and Conservation Authority Section 42 - consultation	The Hornsea Three offshore cable corridor and surrounding areas lie within extremely important fishing grounds, particularly for the UK potting industry. In this area the use of passive gears is restricted within 3 nm and is dominated by potting activity, almost exclusively targeting crab and lobster. Whelks are also fished, but further offshore between 3 and 6 nm, and are mainly targeted in the winter, as opposed to crabs which are mainly targeted in the summer. The crab fishery represents a substantial contribution to both national and local economies (Welby, 2015). It is estimated that there are around 42 vessels operating out of ports on the north Norfolk coast between Sea Palling and Wells. Generally, fishers deploy between 200 and 1,300 pots per vessel at any one time. The majority of fishers operate within the 3 nm limit, as the fishery is generally exploited by single handed, small and open vessels. Other static gear fisheries occur, but on a much smaller scale. These include gill and trammel netting for bass, skate and cod and drift netting for herring (mainly in winter) and cod. A very low level of shrimp trawling occurs outside of the 3nm boundary on soft ground but this is generally impractical due to the concentration of pots in the area. Dredging for seed mussel has occurred in the past outside of the 3 nm boundary (Byelaw 15 restricted area) on an ephemeral mussel bed, previously forming a significant fishery of approximately 10,000 tonnes in 2011. Whilst the value of this fishery was not assessed, the current value of seed mussel is around £100 per tonne for sublittoral mussels and £250 per tonne for intertidal mussels. There is currently no dredge fishery here but there is potential for this to occur again in the future.	Details on the fishing patterns, species mix, gear configurations and grounds targeted in the vicinity of the Hornsea Three offshore cable corridor have informed the baseline section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report. The stock assessment undertaken by Welby (2015) has been of particular importance to the baseline characterisation and assessment of the crab and lobster fishery, including MSAR data. Information on the mussel seed fishery provided within the Section 42 consultation and during subsequent meetings with the Eastern IFCA has informed the baseline characterisation of inshore fisheries.
		Volume 2, chapter 6: Commercial Fisheries, paragraph.11.1.28 of the PEIR states that vessels will be temporarily excluded across a '3.1 km^2 area along the Hornsea Three offshore cable corridor' during the construction phase for a total period of 36 months (three 12 month periods over 11 years). This will lead to a reduction in access to, or exclusion from, established fishing grounds along the Hornsea Three offshore cable corridor and could lead to gear conflict and increased fishing pressure on adjacent grounds, additional steaming to alternate fishing grounds and a reduction in landings. In the environmental assessment, this was outlined as significant in EIA terms and Eastern IFCA agree with this.	The potential impact to local fishing fleets are considered in detail within section 6.11. The construction period and phasing has been updated since PEIR and is described in Table 6.9.
		The mitigation described in volume 2, chapter 6: Commercial Fisheries of the PEIR states that where required, justifiable disturbance payouts will be given and that they will follow the FLOWW guidance documents (2014 and 2015). The effects of construction activities will be highly dependent on the location of the fisheries exclusion zone. Further information is required on the proportion of the fleet that will be affected and the area that the fishery will be excluded from to assess the potential impacts and ensure appropriate action.	
20 September 2017	Natural England Section 42 - consultation	The list of UK offshore wind farms needs checking as a number of projects has been left off the list, for example, Lincs, and Lynn and Inner Dowsing offshore wind farm.	The cumulative effect assessment methodology is provided in section 6.12, with the assessment in section 6.13. Lincs and Lynn and Inner Dowsing were considered but were scoped out of the cumulative assessment on account of being considered part of the Hornsea Three commercial fisheries baseline (see volume 4, annex 5.3: Cumulative Effects Screening Matrix).
		It is reported for 'Electromagnetic fields, habitat alteration, noise and other ecological impacts due to operational and maintenance activities leading to displacement or disruption of commercially important fish and shellfish resources' that measures are adopted as part of the project are detailed in volume 2, chapter 3: Fish and Shellfish Ecology. However, with the exception of the PEMMP there are no other measures adopted by the project under the operational phase.	Table 6.18 has been corrected to state that designed-in measures adopted in relation to fish and shellfish resources are outlined within volume 2, chapter 3, Fish and Shellfish Ecology. These include a Project Environmental Management and Monitoring Plan (PEMMP).

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
14 November 2017	Eastern Inshore Fisheries Conservation Authority– consultation meeting	Details discussed on fishing patterns of inshore fisheries within Eastern IFCA remit. Data provided in the form of shape files for inshore fisheries mapping. Discussion on potential re-route of Hornsea Three offshore cable corridor.	Details of inshore fisheries, including shape files of fishing grounds, have informed the baseline; see section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report. The updated Hornsea Three offshore cable corridor is presented in figures in the baseline (section 6.7) and volume 5, annex 6.1: Commercial Fisheries Technical Report.
15 November 2017	National Federation of Fishermen's Organisations (NFFO) – consultation meeting	Details discussed on changes to project design envelope, including removal of floating turbines. Concern raised over coexistence being over-looked due to floating turbines. NFFO seek development of a commercial fisheries coexistence plan. Concern raised over the methodology of the impact assessment, specifically the ambiguous definitions for defining magnitude. Concern raised over detail provided within justifications for assessing impact significance.	The project design envelope specific to commercial fisheries impacts is provided as maximum design scenarios for all phases of the development in Table 6.9. Removal of floating turbines results in the assessment assuming fishing will resume within the Hornsea Three array area during operation. Hornsea Three are committed to the development of a fisheries coexistence plan, which will be produced in collaboration with the NFFO and other fisheries representatives. This is considered as part of the designed-in measures of Hornsea Three (see Table 6.13). The definitions for defining the level of magnitude have been updated and are presented in Table 6.11. Further justifications, including assessment based on GBS foundations, is provided in section 6.11.

6.6 Methodology to inform the baseline

6.6.1 Desktop study

6.6.1.1 Information on commercial fisheries within the commercial fisheries regional study area was collected through a detailed desktop review of existing studies and datasets. These are summarised at Table 6.5 below.

6.6.1.2 In addition, consultation with UK inshore and offshore fisheries and European offshore fisheries has been pertinent in both ground-truthing the data sources in Table 6.5 and understanding temporal and spatial patterns of fishing activity.

Landing statistics

6.6.1.3 Landings data for all species are collected via the European Union (EU) logbooks scheme and recorded by ICES statistical rectangle and stored in the EU Data Collection Framework (DCF) database, accessible through the EU Joint Research Committee. Landings data have been collated for all EU Member States for all ICES statistical rectangles that overlap the regional commercial fisheries study area, as shown in Figure 6.1.

6.6.1.4 Landing statistics were collated across five year (2012 to 2016) and ten year periods (2007 to 2016) to ensure reflection of long-term trends. Landing statistics include all landings by that country's nationally registered vessels into all ports. The following parameters were examined: year; season (quarter); gear type; ICES rectangle; species; effort (hours fished); and live weight (tonnes).

6.6.1.5 The EU DCF database does not provide first sales value or prices. The European Market Observatory for Fisheries and Aquaculture Products (EUMOFA) database was therefore assessed to provide first sale prices per country, species and year (i.e. an average price per year for each species and country from the EUMOFA database was correlated with the annual species landings per country in the EU DCF database in order to gain first sales values).

6.6.1.6 The EU DCF and EUMOFA databases included landings by UK, Belgian, Danish, Dutch, French, German and Swedish registered vessels. No landings statistics were obtained for Norwegian vessels, which are not included within the EU databases.

6.6.1.7 In addition to the EU DCF database, landing statistics for UK registered vessels were obtained from the Marine Management Organisation (MMO) with the following parameters: year; month; gear type; ICES rectangle; species; live weight (tonnes) and first sales value (£).

6.6.1.8 In addition, for the North Norfolk potting vessels, Monthly Shellfish Activity Returns data were analysed and are presented in volume 5, annex 6.1: Commercial Fisheries Technical Report.

Table 6.5: Summary of key desktop reports and datasets.

Title	Source	Year	Author
Landings statistics for Belgian, Danish, Dutch, French, German, Swedish and UK registered vessels for: landing year; quarter; ICES rectangle; vessel length; gear type; species and landed weight (tonnes).	European Union Data Collection Framework	2003 to 2016	N/A
Price data for species landed by Belgian, Danish, Dutch, French, German and Swedish registered vessels for: landing year; species; price (€per kg).	European Market Observatory for Fisheries and Aquaculture Products	2012 to 2016	N/A
Landing statistics data for UK registered vessels with data query attributes for: landing year; landing month; vessel length category; country code; ICES rectangle; vessel/gear type; port of landing; species; live weight (tonnes); and value.	Marine Management Organisation	2012 to 2016	N/A
Vessel Monitoring System data for UK registered vessels with attributes for time fishing and value of catch at a resolution of 200th of an ICES rectangle amalgamated for all mobile vessels and all static vessels. 2015 represents the latest data set available for this information, with 2016 data unavailable at the time of writing.	Marine Management Organisation	2011 to 2015	N/A
Surveillance data with data query attributes for: sighting date; ICES rectangle; ICES sub square; latitude; longitude; vessel/gear type; activity; nationality; course; speed; and number of sightings. 2015 represents the latest data set available for this information, with 2016 data unavailable at the time of writing.	Marine Management Organisation	2011 to 2015	N/A
Monthly Shellfish Activity Returns data for: UK vessels landing shellfish species caught within EIFCA jurisdiction. 2015 represents the latest data set available for this information, with 2016 data unavailable at the time of writing.	Eastern Inshore Fisheries and Conservation Authority	2006 to 2015	N/A
Vessel Monitoring System data for Belgian, Danish, Dutch, French, German, and Norwegian registered vessels with attributes for time fishing at a resolution of 1/200th of an ICES rectangle amalgamated for all mobile vessels. 2010 represents the latest data set available for this information.	Marine Management Organisation	2010	N/A
Commercial fishing activity density mapping across the former Hornsea Zone for beam trawl and demersal otter trawl.	The Crown Estate	1985 to 2010	N/A
Vessel Monitoring System data for Dutch registered vessels with data attributes presented graphically for: year; gear type; effort in hours fishing to a resolution of 1/200th ICES rectangle. 2015 represents the latest data set available for this information, with 2016 data unavailable at the time of writing.	Wageningen Economic Research	2011 to 2015	N/A
Mapping of effort (hours fishing) for demersal and combined demersal/pelagic otter trawling (French data provided in response to the consultation on The Crown Estate Round 3 UK offshore wind proposal). 2008 represents the latest data set available for this information.	French National Committee for Maritime Fisheries and Aquaculture (CNPMEM)	2008	N/A
Maps of key sandeel grounds based on vessel tracking plots from Danish registered vessels.	Danish Fishermen's Association and DTU Aqua	1985 to 2010	N/A

Vessel Monitoring System data

6.6.1.9 All EU fishing vessels (i.e. fishing vessels flying the flag of an EU Member State), and third party fishing vessels operating in EU waters, that are ≥ 12 m in length, are required to have a VMS on board. This reports the vessels' position to fisheries management authorities, in the case of EU fishing vessels, every two hours. Since 1 January 2012, this obligation has applied to vessels that are ≥ 12 m in length (before 1 January 2012 it applied to vessels ≥ 15 m in length, see Council Regulation (EC) No 1224/2009). However, the MMO does not yet include VMS data for vessels between 12 to 14.9 m within its datasets; therefore, all MMO VMS data (2011 to 2015) presented within this chapter and volume 5, annex 6.1: Commercial Fisheries Technical Report includes vessels that are ≥ 15 m in length.

6.6.1.10 A vessel's range varies due to weather conditions and skipper preferences as well as technical aspects such as power, but it is generally the case that vessels < 12 m in length fish within 20 nm offshore. Vessels ≥ 12 m in length can and do fish further afield, but in recent years many skippers have altered fishing patterns to favour fishing grounds closer to home ports due to increased fuel prices and time at sea restrictions (vessels being permitted a specific number of days at sea). This has particularly affected vessels operating mobile gears with high fuel demands, such as beam trawlers.

6.6.1.11 Although figures mapping VMS data may appear to show inshore areas as having lower (or no) fishing activity compared within offshore areas, this is not the case because VMS data do not include vessels typically operating in inshore area (i.e. typically vessels < 15 m in length). This is particularly important when assessing the activity across the Hornsea Three offshore cable corridor. Consultation has been key throughout the EIA process to determine extent and distribution of activity by the < 15 m fleet.

6.6.1.12 The MMO collate VMS data for UK registered vessels by aggregating the number of position plots by general gear type (mobile or static) in a grid of sub-rectangles approximately 5.3 nm^2 (i.e. at a resolution of 200th of an ICES rectangle). This has been integrated with landings values, thereby providing both effort (hours fished) and value (£) of each sub-rectangle for mobile and static gears. These data have been analysed across a five-year period from 2011 to 2015. Note that 2015 represents the latest data set available for this information, with 2016 data unavailable at the time of writing.

6.6.1.13 The MMO also provide effort (hours fished) for other Member States based on VMS recorded within the UK EEZ including, Belgian, Dutch, Danish, German, Swedish, and Norwegian registered vessels. These data are available for 2010.

Surveillance data

6.6.1.14 The UK has seven fisheries patrol vessels and four surveillance aircraft. Patrols are undertaken by IFCAs, Royal Navy Fisheries Patrol Vessels and patrol aircraft. UK surveillance aircraft are used to construct an on-going picture of fishing activity within the UK EEZ and to make effective use of patrol vessel activity by coordinated use of surveillance data. These data cannot be considered to give an accurate picture of the actual level of activity and have a number of limitations, as outlined in section 6.7.4. However, surveillance data include fishing vessels of all lengths, thereby allowing complete fleet coverage. In addition, individual gear types are identified, which can be cross-referenced with VMS data to identify fleet activity.

6.6.2 Site specific surveys

6.6.2.1 In order to inform the EIA, site-specific surveys were undertaken, as agreed with the statutory consultees. A summary of the surveys undertaken to inform the commercial fisheries EIA is outlined in Table 6.6 below.

Table 6.6: Summary of site-specific survey data.

Title	Extent of survey	Overview of survey	Survey contractor	Year	Reference to further information
Commercial Fisheries Scouting Surveys for Hornsea Project Three	A range of scouting surveys undertaken along the inshore section of the Hornsea Three offshore cable corridor.	Identify potting areas and any other relevant static gear areas along the Hornsea Three offshore cable corridor from shore to approximately 20 nm.	Brown and May Marine	2016 and 2017	N/A
Seasonal otter trawl sampling	41 trawls undertaken across the former Hornsea Zone with a 4 km buffer to the north and south. Twelve of these trawls were undertaken within or in the immediate vicinity to the Hornsea Three array area (see volume 2, chapter 3 Fish and Shellfish Ecology).	Seasonal otter trawl surveys undertaken in spring and autumn 2011 within the Hornsea Three fish and shellfish study area. The vessel used to conduct these surveys was a commercial fishing vessel fitted with a high-opening 5 m otter trawl and 40 mm cod-end allowing for both demersal and semi-pelagic species to be caught. A total of 41 trawls, of 30 minute duration, were completed (see volume 2, chapter 3 Fish and Shellfish Ecology).	EMU	2011	Volume 5, annex 3.1: Fish and Shellfish Ecology Technical Report
Epibenthic beam trawl sampling	102 beam trawl samples were collected across the former Hornsea Zone to support the zonal characterisation and baseline characterisations for Hornsea Projects One and Two. Nine of these were undertaken within the Hornsea Three array area (see volume 2, chapter 3 Fish and Shellfish Ecology).	Epibenthic beam trawl surveys between 2010 and 2012 within the Hornsea Three fish and shellfish study area. The beam trawls, each lasting 10 minutes, were carried out using a standard Cefas 2 m 'Jennings' beam trawl fitted with a 5 mm cod-end.	EMU	2010 and 2012	Volume 5, annex 3.1: Fish and Shellfish Ecology Technical Report Volume 5, annex 2.1: Benthic Ecology Technical Report
Epibenthic beam trawl sampling of Hornsea Three offshore cable corridor	Five epibenthic beam trawls undertaken across the Hornsea Three offshore cable corridor (see volume 2, chapter 3 Fish and Shellfish Ecology).	During the Evidence Plan process (see volume 2, chapter 3: Fish and Shellfish Ecology) it was agreed that further beam trawl samples would be collected to characterise the Hornsea Three offshore cable corridor. Hornsea Three proposed a further five locations, which were sampled in 2017 as part of the benthic ecology survey of the Hornsea Three offshore cable corridor.	Ocean Ecology	2017	Volume 5, annex 3.1: Fish and Shellfish Ecology Technical Report
Hornsea Three array area marine traffic survey (summer)	Hornsea Three array area shipping and navigation study area.	AIS, visual and Radar vessel survey determining existing shipping activity within and in the vicinity of the Hornsea Three array area in accordance with MGN 543.	Anatec	2016	Volume 5, annex 7.1: Hornsea Three Navigational Risk Assessment
Hornsea Three offshore HVAC booster station search area marine traffic survey (summer)	Hornsea Three offshore HVAC booster station search area shipping and navigation study area.	AIS, visual and Radar vessel survey determining existing shipping activity within and in the vicinity of the Hornsea Three offshore HVAC booster station search area in accordance with MGN 543.	Anatec	2016	Volume 5, annex 7.1: Hornsea Three Navigational Risk Assessment
Hornsea Three array area marine traffic survey (winter)	Hornsea Three array area	AIS, visual and Radar vessel survey determining existing shipping activity within and in the vicinity of the Hornsea Three array area in accordance with MGN 543.	Anatec	2016	Volume 5, annex 7.1: Hornsea Three Navigational Risk Assessment
Hornsea Three offshore HVAC booster station search area marine traffic survey (winter)	Hornsea Three offshore HVAC booster station search area shipping and navigation study area.	AIS, visual and Radar vessel survey determining existing shipping activity within and in the vicinity of the Hornsea Three offshore HVAC booster station search area in accordance with MGN 543.	Anatec	2016	Volume 5, annex 7.1: Hornsea Three Navigational Risk Assessment

6.7 Baseline environment

6.7.1 Total landings and activity across Hornsea Three

6.7.1.1 Hornsea Three (including array area and offshore cable corridor) overlaps with ICES rectangles 34F1, 35F1, 36F1 and 36F2, which form the Hornsea Three commercial fisheries study area. For context, the aerial overlap of Hornsea Three equates to 7% of the Hornsea Three commercial fisheries study area. Specifically, the Hornsea Three array area overlaps with 19% of 36F2 and the Hornsea Three offshore cable corridor overlaps with 2% of the total area covered by 34F1, 35F1, 36F1 and 36F2.

6.7.1.2 The average annual landings across the regional commercial fisheries study area (Figure 6.3) show the highest quantity of catch (tonnes) to be taken from ICES rectangles 37F0 to F3 and 35F3. The highest quantity of catch (tonnes) is taken by Danish registered vessels, followed by Dutch registered vessels, and UK registered vessels with smaller amounts by French, German, Swedish and Belgian vessels (negligible amounts are landed by Irish and Isle of Man registered vessels). Norwegian landing statistics are not available, but this fleet is understood to only sporadically target the regional commercial fisheries study area. Within the regional commercial fisheries study area, 37F0 is the most important ICES rectangle to the French and German registered vessels, with significantly smaller amounts taken from other ICES rectangles in this regional commercial fisheries study area.

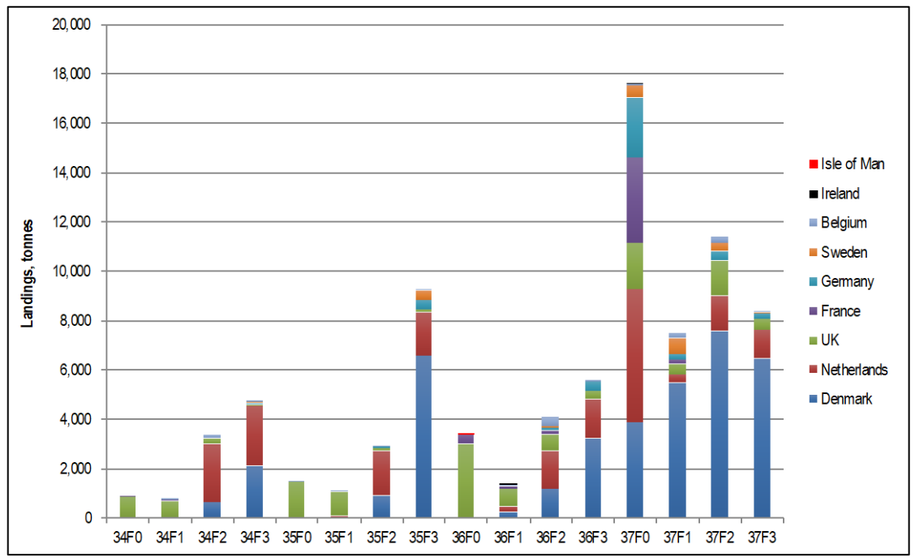

Figure 6.3: Average annual landed weight, tonnes, of all species landed by all EU member states from the regional commercial fisheries study area indicating ICES rectangles and vessel registered country (based on five-years' data from 2012 to 2016) (data source: EU DCF database, 2017).

6.7.1.3 Focusing into the Hornsea Three commercial fisheries study area (ICES rectangles 34F1, 35F1, 36F1 and 36F2), Figure 6.3 shows that landings by weight from 34F1, 35F1 and 36F1 are dominated by UK registered vessels, which is to be expected given the more inshore location of these F1 ICES rectangles; while landings weight from 36F2 is split across Danish, Dutch, UK, Belgian and to a smaller extent French and German vessels.

6.7.1.4 Landings from the Hornsea Three commercial fisheries study area had an average annual value of €10.6 million for all EU member states (based on five-years' data from 2012 to 2016; EU DCF database, 2017; EU MOFA, 2017). The proportion of value by ICES rectangle and species is shown in Figure 6.4.

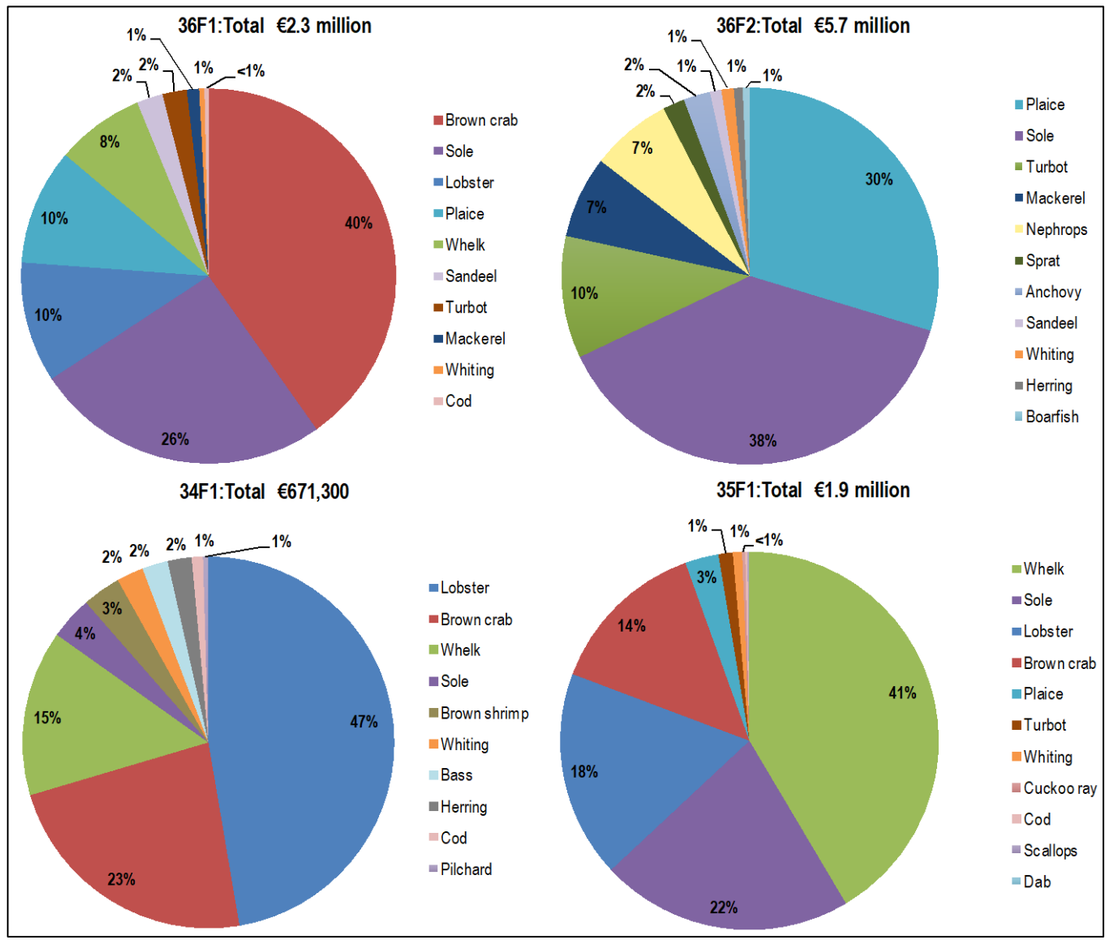

Figure 6.4: Average annual proportion of landings value by species and ICES rectangle for all EU member states combined (based on five-years' data from 2012 to 2016) (data source: EU DCF database, 2017; EU MOFA, 2017).

6.7.1.5 Plaice *Pleuronectes platessa* and sole *Solea solea* dominate the landings in 36F2, accounting for 68% of the annual value. Sole and plaice remain important for 36F1 and 35F1 (at 36% and 25% of the value respectively); but shellfish landings become increasingly dominant for these inshore ICES rectangles, with significant landings of brown crab *Cancer pagurus* from 36F1 (40% of value), whelk *Buccinum undatum* from 35F1 (41% of value), and lobster *Homarus gammarus* from 34F1 (47% of value). Together, lobster, brown crab and whelk account for 85% of the value from 34F1.

6.7.1.6 Surveillance data for UK and non-UK vessels of all sizes (which are presented in volume 5, annex 6.1: Commercial Fisheries Technical Report) indicate that the predominant gear types across the regional commercial fisheries study area include demersal otter trawlers and beam trawlers in the offshore areas (outside 12 nm) and potters/whelkers and shrimpers within inshore areas (inside 12 nm); clusters of other gears are also noted in a few locations including scallop dredgers.

6.7.1.7 Mapping undertaken as part of The Crown Estate UK Fishing Information Project (UKFIM) for beam trawling (Figure 6.7) indicates high to medium density of beam trawling activity throughout the Hornsea Three array area. This density mapping is presented together with the indicative Hornsea Three array area turbine layout in Figure 6.8. Significant hotspots of activity are illustrated to occur in the south-east, central and north-west portions of the Hornsea Three array area. Mapping for demersal otter trawling activity (which is presented in volume 5, annex 6.1: Commercial Fisheries Technical Report) indicates localised activity within distinct grounds within the Hornsea Three array area, across the Outer Silver Pit and Markhams Hole (which are illustrated in Figure 6.2).

6.7.2 Commercial fishing fleets operating across Hornsea Three

Hornsea Three array area

All EU member states vessels

6.7.2.1 The Hornsea Three array area commercial fisheries study area (ICES rectangle 36F2) is dominated by landings of sole and plaice targeted principally by the Dutch fleet, as well as Belgian, UK and German registered vessels (Figure 6.5). Other flatfish and roundfish species are taken in association with the sole and plaice targeted fishery including: turbot *Scopthalmus maximus*, cod *Gadus morhua*, brill *Scophthalmus rhombus*, whiting *Merlangius merlangus*, dab *Platichthys flesus* and lemon sole *Microstomus kitt*.

6.7.2.2 The average annual value of the sole, plaice and mixed demersal fishery from 36F2 is €4.9 million for all EU member states. Peaks in sole and plaice landings are noted in 2013 and 2014, with a significant drop in 2015, followed by a significant increase in 2016 (Figure 6.6). This is understood to be linked to changes in Total Allowable Catches (TACs) and quotas, with an increase in plaice TAC in 2015 resulting in fishermen targeting this species with more effort in grounds north of Hornsea Three (namely the Dogger Bank) (further details on this and TACs is provided in volume 5, annex 6.1: Commercial Fisheries Technical Report). Beam trawlers target sole and plaice.

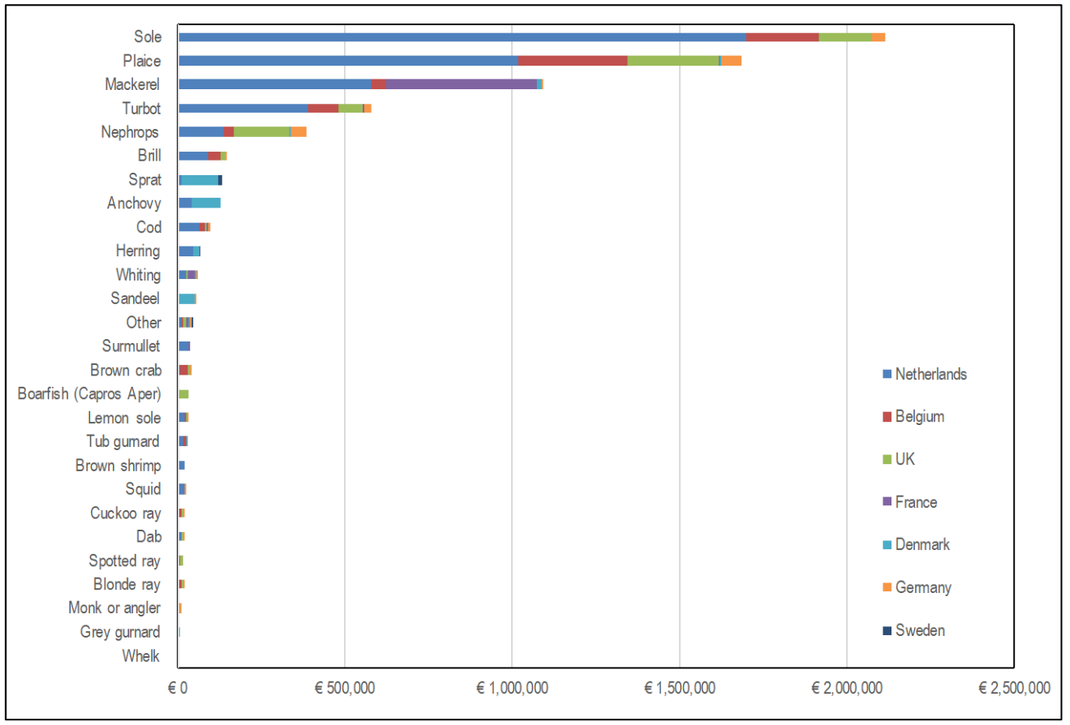

Figure 6.5: Average annual value landed from ICES rectangle 36F2 by all EU member states indicating species and vessel registered country (based on five-years' data from 2012 to 2016) (data sources: EU DCF database, 2017; EU MOFA, 2017).

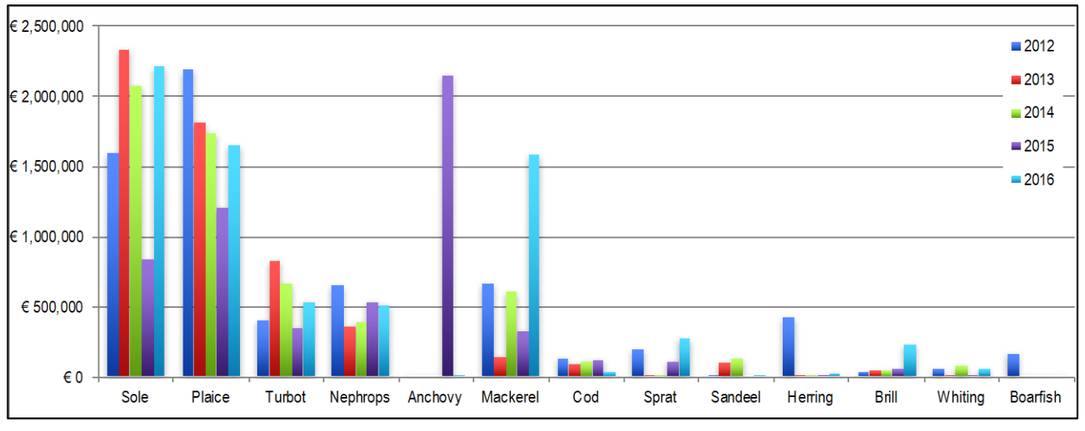

Figure 6.6: Annual value landed from ICES rectangle 36F2 by all EU member states indicating species from 2012 to 2016 (data sources: EU DCF database, 2017; EU MOFA, 2017).

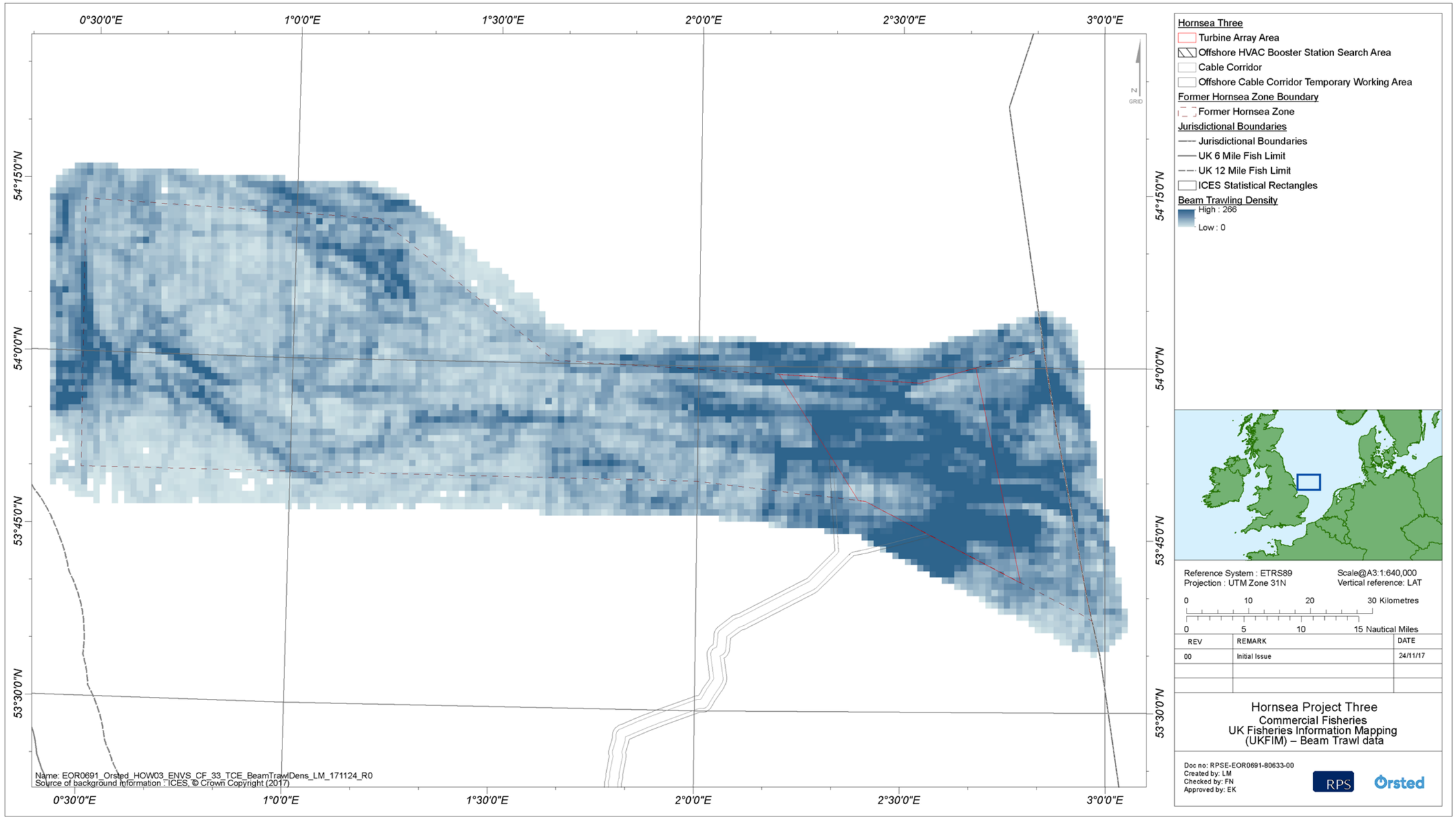

Figure 6.7: The Crown Estate UK Fisheries Information Project (UKFIM) beam trawl density mapping across Hornsea Three array area and the former Hornsea Zone.

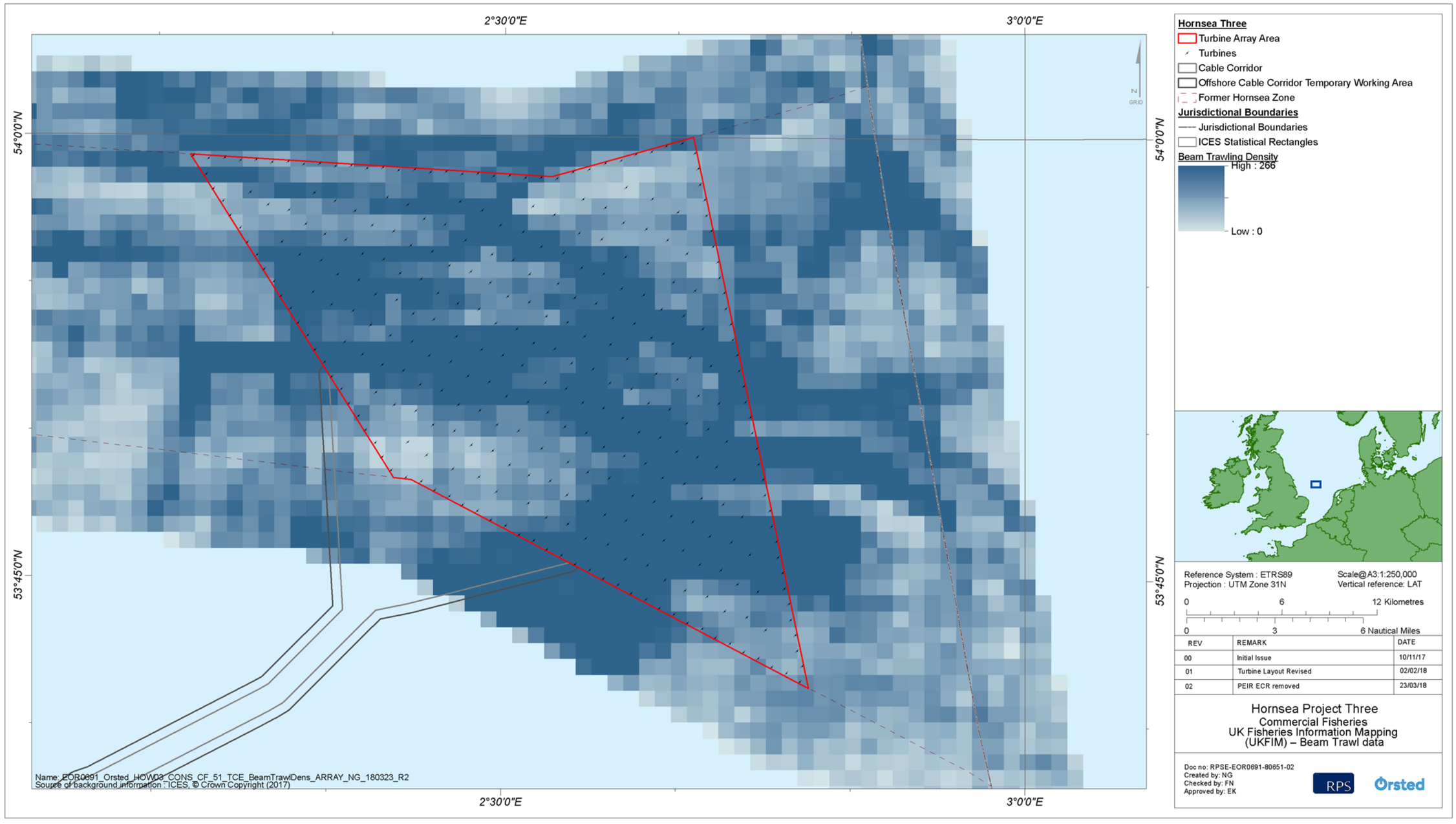

Figure 6.8: The Crown Estate UK Fisheries Information Project (UKFIM) beam trawl density mapping across Hornsea Three array area, together with the indicative Hornsea Three array area turbine layout.

6.7.2.3 *Nephrops norvegicus* (hereby referred to as *Nephrops*) are landed by Dutch, UK, Belgian and German demersal otter trawlers, with an average annual value of €385,000 from 36F2. Landings of *Nephrops* from 36F2 have remained fairly consistent across the five-year period from 2012 to 2016.

6.7.2.4 More sporadic landings of pelagic species are noted for anchovy *Engraulis encrasicolus* (by Dutch and Danish fleets), sprat *Sprattus sprattus* (by UK and Danish fleets), mackerel *Scomber scombrus* (by Dutch and French fleets), herring *Clupea harengus* (by Dutch fleet) and boarfish *Capros aper* (by UK fleet) (Figure 6.5 and Figure 6.6).

6.7.2.5 The Danish fleet has landed relatively small quantities of sandeel *Ammodytes* spp. from 36F2 in 2015, although higher quantities are noted from 2006 to 2011. This is discussed further in the following sections, which provide summaries of landings for each country (based on vessel registration).

UK registered vessels

6.7.2.6 A number of associations and organisations represent UK commercial fisheries stakeholders that currently operate across the Hornsea Three array area commercial fisheries study area (36F2), including the Eastern England Fish Producers Organisation (EEFPO), the Anglo-Dutch Fish PO, the Anglo-Dutch Fishermen's Association, the Lowestoft Fish PO and the National Federation of Fishermen's Organisations (NFFO). These organisations represent UK registered; UK owned vessels and UK registered, Dutch owned vessels.

6.7.2.7 On average, the UK annual landings from 36F2 have a first sale value of £647,000 (based on five-years data from 2012 to 2016). The fisheries predominately targeted are plaice, sole and mixed demersal species by beam trawlers, and *Nephrops* and mixed demersal species by demersal otter trawlers. Landings of boarfish are noted in 2012 (taken in November, by Scottish vessel(s)). Vessels targeting pelagic schooling fish species are not expected to typically or routinely target the Hornsea Three array area, which is supported by the sporadic nature of pelagic landings by UK and other nationalities from 36F2.

6.7.2.8 The Outer Silver Pit is an area of seabed routinely fished by UK demersal otter trawlers targeting *Nephrops* and mixed demersal species. It is located immediately north of the Hornsea Three array area (Figure 6.2), and overlaps across the northern portion of the array area.

6.7.2.9 Another significant fishing ground is Markhams Hole, which is located in the centre of the Hornsea Three array area, running southeast to the eastern edge of the array area and beyond (Figure 6.2). Markhams Hole is routinely fished by demersal otter trawlers targeting *Nephrops* and beam trawlers targeting sole and plaice. Figure 6.7 provides evidence for the extent of activity within Markhams Hole, in the central and southeast portions of the Hornsea Three array area.

6.7.2.10 Trends in landings by the UK fleet targeting sole and plaice have fluctuated significantly across the five-year period from 2012 to 2016 (Figure 6.9). Landings of plaice and sole were lower than average in 2012; and landings of sole were lower in 2014 and 2015.

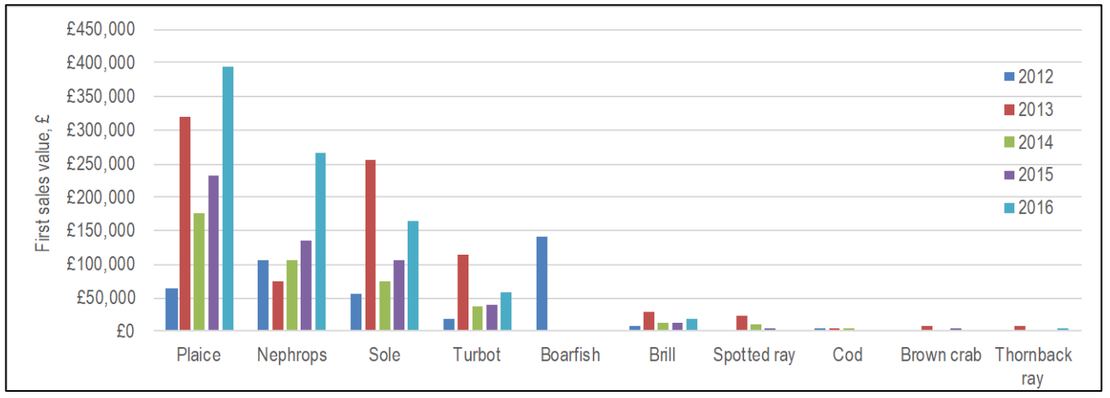

Figure 6.9: First sale value of species landed by UK registered vessels from ICES rectangle 36F2 from 2012 to 2016 (Data source: MMO, 2017).

6.7.2.11 Fisheries management restrictions (including days at sea and quotas) and operating costs (fuel prices/gear technology) can impact fishing patterns on a yearly basis resulting in vessels choosing to fish grounds that target a different fishery (or species mix) or grounds that are closer to home ports.

6.7.2.12 VMS data for UK vessels deploying mobile gear (including beam trawlers, demersal otter trawlers and pelagic trawlers etc.) indicating the value of catches in 2015 is presented in Figure 6.10 and in Figure 6.11 together with the indicative Hornsea Three array area turbine layout. VMS mapping for effort (hours fished) and value is presented in full for 2011 to 2015 in volume 5, annex 6.1: Commercial Fisheries Technical Report.

6.7.2.13 The resolution of UK VMS data allows the true value of landings and effort (hours fished) specifically from the Hornsea Three array area to be calculated for UK vessels. This is presented in Table 6.7 for UK vessels deploying mobile gear. No landings or effort is recorded for UK vessels deploying passive gear within the Hornsea Three array area.

6.7.2.14 On average, the first sale value of fish landed by UK vessels specifically from within the Hornsea Three array area is worth £278,000 per annum (based on five-years VMS data from 2011 to 2015) (Table 6.7). Peak landings were recorded in 2013 when a value of £766,000 was landed from the Hornsea Three array area; this is reflected in the peak in plaice and sole landings seen in Figure 6.9 for 36F2.

6.7.2.15 On average, 19,000 hours of fishing occurs per annum within the Hornsea Three array area (based on five-years from 2011 to 2015), with a peak of approximately 29,000 hours in 2013.

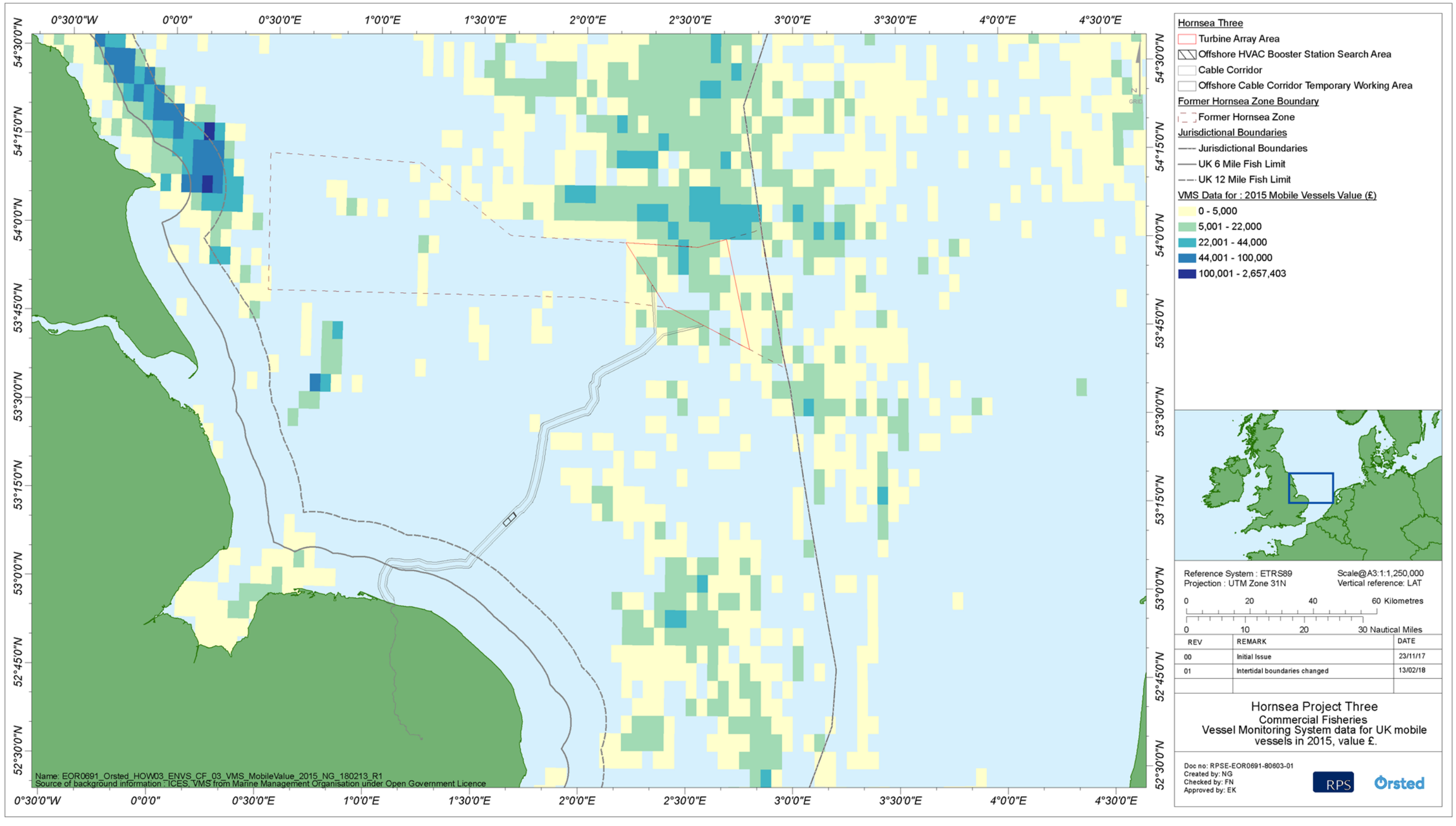

Figure 6.10: Vessel Monitoring System data for UK mobile **vessels (≥** 15 m) actively fishing within regional commercial fisheries study area in 2015 indicating value of catch.

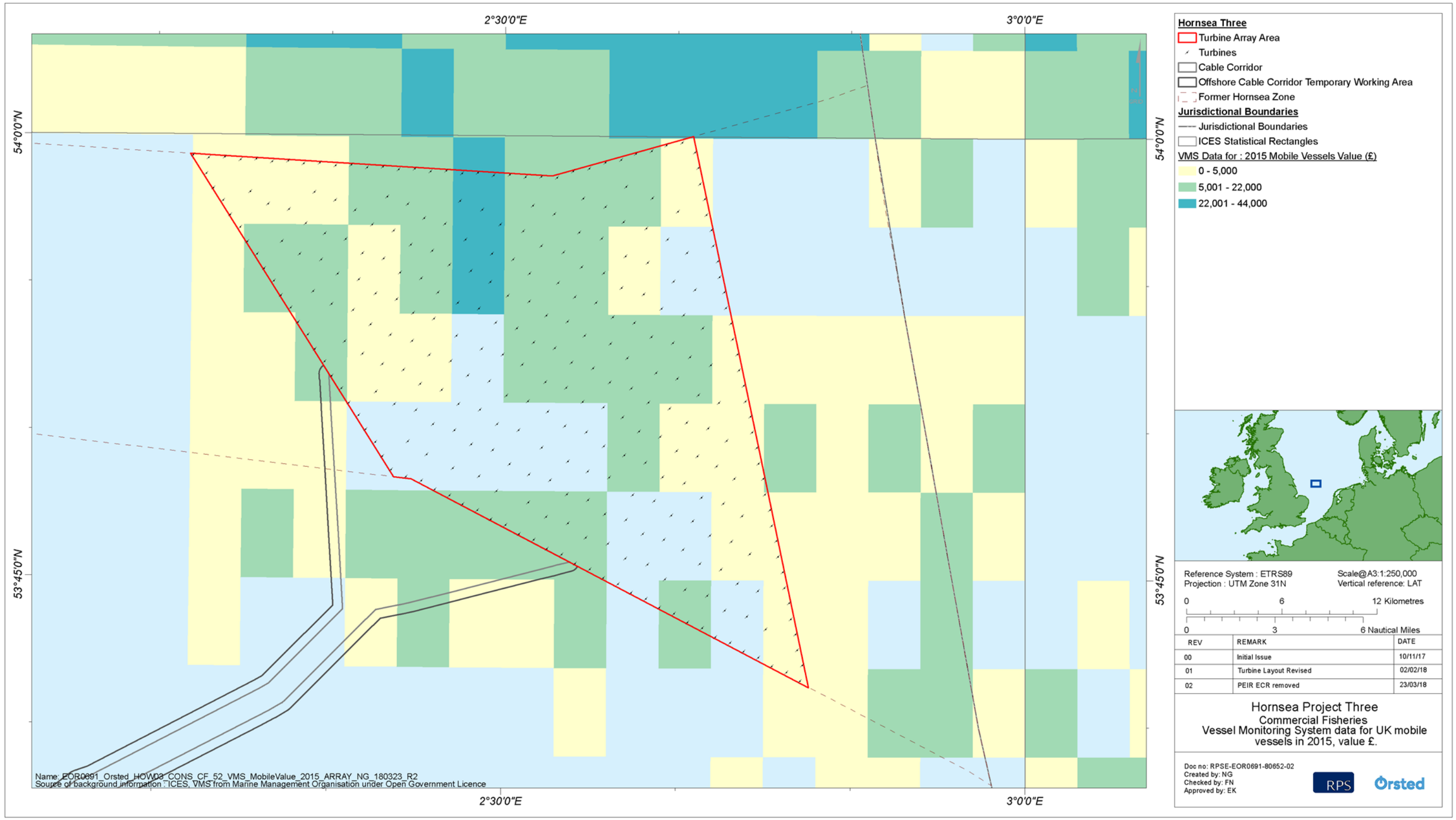

Figure 6.11: Vessel Monitoring System data for UK mobile **vessels (≥** 15 m) actively fishing within regional commercial fisheries study area in 2015 indicating value of catch, together with the indicative Hornsea Three array area turbine layout.

Table 6.7: Hours and value of catch landed from Hornsea Three array area by UK vessels using mobile gear based on VMS data, 2011 to 2015 (Source: MMO, 2017).

Year	Mobile hours fished	Mobile value
2011	19,363.93	£229,866
2012	14,479.08	£124,418
2013	29,169.12	£766,285
2014	11,658.41	£81,823
2015	20,075.42	£187,627
Average	18,949.19	£278,004

6.7.2.16 Consultation with the local Norfolk and Bridlington UK potting fleets indicates that vessels are unlikely to operate within the Hornsea Three array area. This is corroborated with VMS data for ≥ 15 m passive vessels and surveillance data for UK potters (see volume 5, annex 6.1: Commercial Fisheries Technical Report), which show no activity for potters within the Hornsea Three array area.

6.7.2.17 UK scallop dredgers are not recorded as being active within the Hornsea Three array area, but target areas to the west and inshore of the former Hornsea Zone.

Dutch registered vessels

6.7.2.18 Dutch vessels fish within the Hornsea Three array area targeting sole and plaice together with mixed demersal species of turbot, *Nephrops* and cod, with an average annual first sale value of €3.2 million (based on five-years data from 2012 to 2016), with peaks of €3.9 million in both 2013 and 2014 and an uncharacteristic low of €1.6 million in 2015. The Dutch fleet predominately use pulse trawl (an adaptation of beam trawl), or fly shooting, which is becoming increasingly popular due to the lower fuel consumption. Vessels are greater than 25 m in length.

6.7.2.19 Sole and plaice are the key target species, followed by turbot. Landings dropped significantly from 2014 to 2015 (Figure 6.12) due to changing fishing patterns, as discussed for UK vessels, but increased again in 2016. A sporadic landing of anchovy was noted in 2015, but anchovies are not expected to be routinely targeted in the Hornsea Three array area.

6.7.2.20 VMS data collated by Wageningen Economic Research for Dutch vessels indicating value of catch (see volume 5, annex 6.1: Commercial Fisheries Technical Report), show that the Hornsea Three array area is an important fishing ground within ICES rectangle 36F2. VMS data for beam trawling vessels indicating the value of catches in 2015, together with the indicative Hornsea Three array area turbine layout is presented in Figure 6.13.

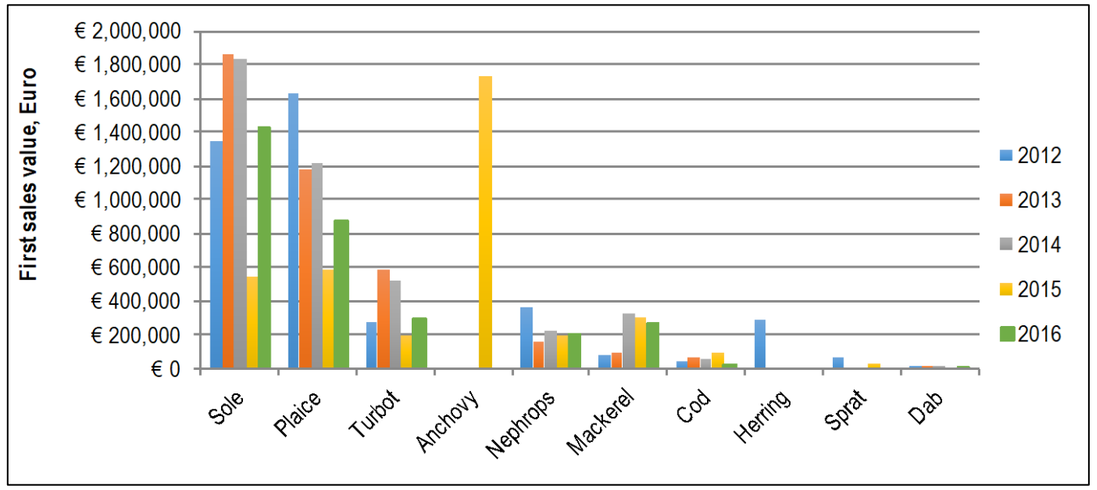

Figure 6.12: First sale value of species landed by Dutch registered vessels from ICES rectangle 36F2 from 2012 to 2016 (Data sources: EU DCF, 2017; EU MOFA, 2017).

6.7.2.21 In total, Dutch vessels spent approximately 120 days annually fishing within the Hornsea Three array area (based on five-years data from 2011-2015). Approximately 40% of the landings from 36F2 were taken from within the Hornsea Three array area, with an average annual value of €1 million specifically from within the Hornsea Three array area.

6.7.2.22 A progression from beam trawl gear (including traditional beam trawl and pulse trawl) to fly shooting is noted from 2011 to 2015, which is corroborated by consultation with the industry (see volume 5, annex 6.1: Commercial Fisheries Technical Report Appendix C for further data analysis and Appendix D for meeting minutes). The Hornsea Three array area is considered to be a productive and valuable fishing ground for the Dutch fleet (Oostenbrugge and Hamon, 2017).

6.7.2.23 Other gears including pelagic trawls and gill nets were rarely noted to be operated in the area.

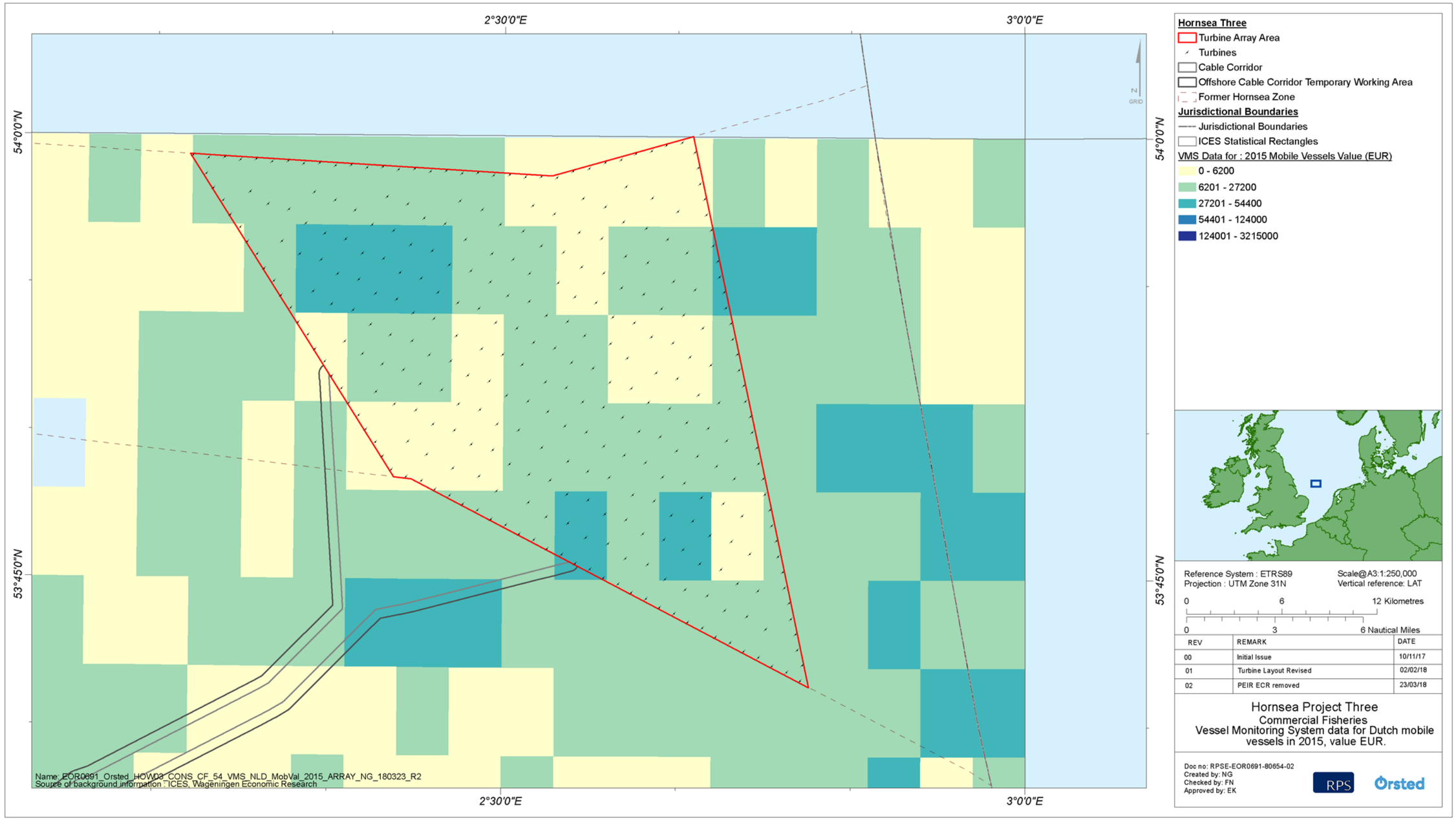

Figure 6.13: Vessel Monitoring System data for Dutch beam trawlers (≥ 15 m) actively fishing within regional commercial fisheries study area in 2015 indicating value of catch, together with the indicative Hornsea Three array area turbine layout.

French registered vessels

6.7.2.24 French registered vessels target mackerel in a mid-water trawl fishery and whiting in a demersal otter trawl fishery from ICES rectangle 36F2 (Figure 6.14). Landings fluctuate, with an average first sales value of €271,000 per annum (ranging from €614,000 in 2012 to €33,000 in 2015).

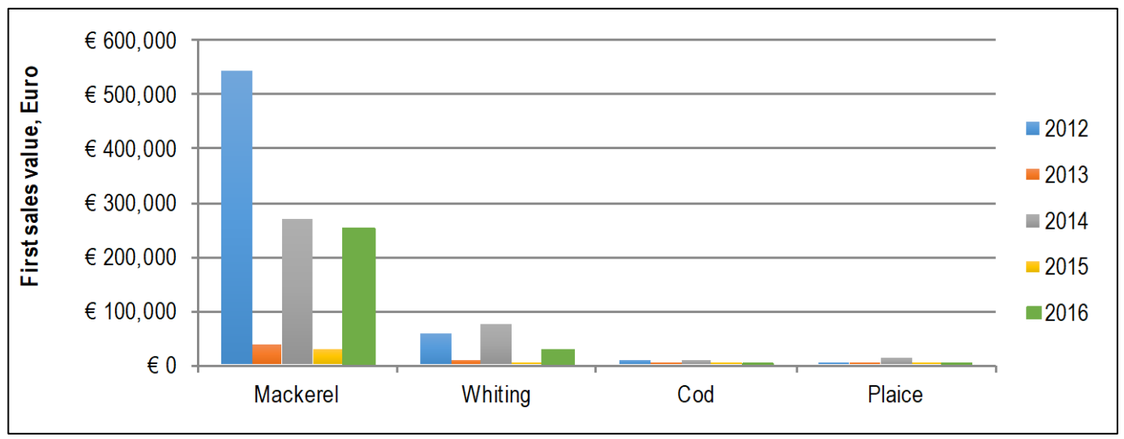

Figure 6.14: First sale value of species landed by French registered vessels from ICES rectangle 36F2 from 2012 to 2016 (Data sources: EU DCF, 2017; EU MOFA, 2017).

6.7.2.25 The limited VMS data available for French vessels shows activity within the former Hornsea Zone to be focused across the Hornsea Three array area. A 2008 report calculated the average dependence of French demersal trawlers and combined demersal/pelagic trawlers on the former Hornsea Zone to be 2.3% (CNPMEM, 2009), based upon the proportion of total fishing effort by these vessels that fished within the former Hornsea Zone.

Belgian registered vessels

6.7.2.26 Belgian beam trawl and demersal otter trawl vessels operate within the Hornsea Three array area commercial fisheries study area (36F2) targeting plaice, sole, turbot, Nephrops, brill and cod (Figure 6.15), with an average first sale value of €744,000 per annum (ranging from €1.1 million in 2016 to €518,000 in 2013).

6.7.2.27 VMS data for the Belgian fleet (see volume 5, annex 6.1: Commercial Fisheries Technical Report) indicate that the majority of effort within 36F2 is located within the Hornsea Three array area.

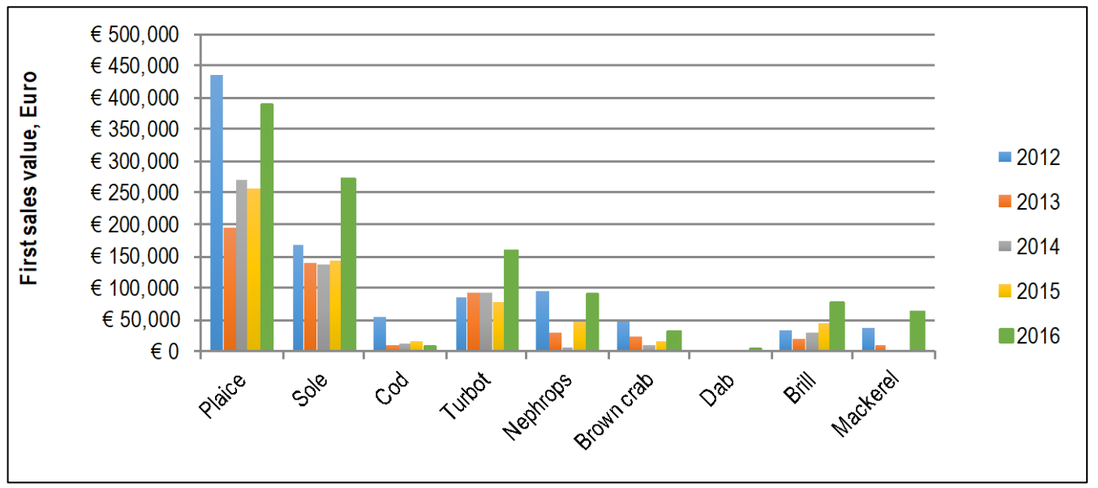

Figure 6.15: First sale value of species landed by Belgian registered vessels from ICES rectangle 36F2 from 2012 to 2016 (Data sources: EU DCF, 2017; EU MOFA, 2017).

Danish registered vessels

6.7.2.28 Danish registered vessels principally target sandeel using demersal otter trawl gear across the former Hornsea Zone, as well as herring and sprat that are also occasionally targeted by Danish vessels using pelagic trawl gear.

6.7.2.29 There are three distinct sandeel grounds in the former Hornsea Zone that could be targeted by the Danish trawling fleet, which includes up to 25 to 30 Danish trawl vessels (using demersal otter trawl and semi-pelagic otter trawl gear). A significant sandeel ground is located within the Hornsea Three array area, running horizontally from the west to east of the array boundary, in the northern half of the array area (Figure 6.16). The indicative Hornsea Three array area turbine layout across these sandeel grounds is presented in Figure 6.17.

6.7.2.30 The sandeel fishing season runs from 1 April to 31 July each year. At the start of the season, sandeel fishermen will sample different grounds and then fish where the catch rates are highest. This means they may focus on one area, or move about, dependent on catch rates. The majority of effort by vessels targeting sandeel has been focused on other North Sea sandeel grounds (namely Dogger Bank) for the past ten years. Sandeel grounds are highly dependent on habitats and upwelling dynamics that support food source. Grounds are therefore distinct and the opportunity to fish for sandeel is defined to specific grounds that do not change over time. Over the past ten-years the productive nature of the grounds across the Dogger Bank has resulted in Danish effort being focused to these grounds throughout the relatively short seasonal fishery. However, it is expected that the grounds within Hornsea Three array area will be more productive again, depending upon sandeel recruitment patterns, and thereby targeted in the future.

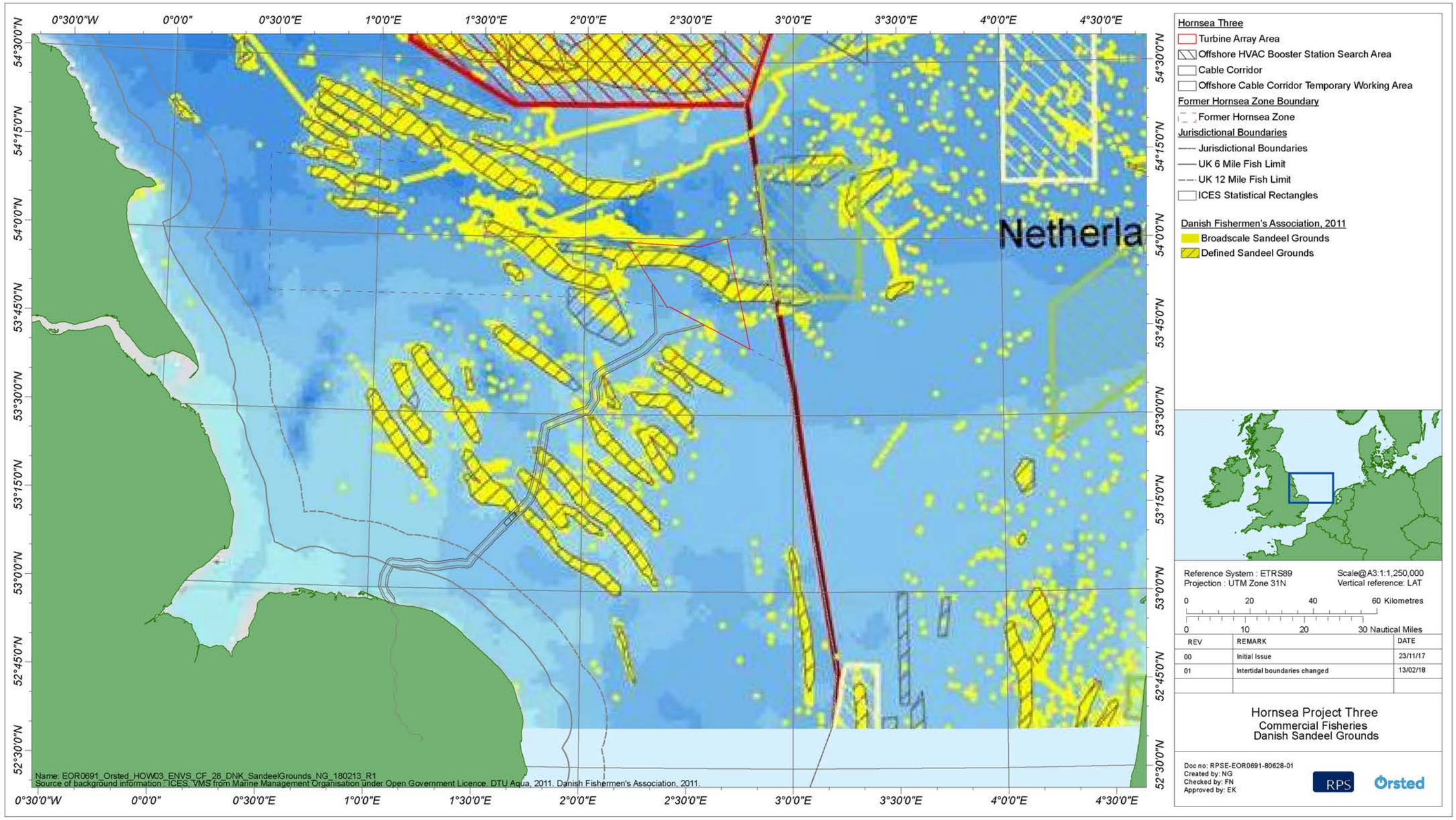

Figure 6.16: Map of key sandeel fishing grounds (yellow) for Danish fleet based on Vessel Monitoring System data.

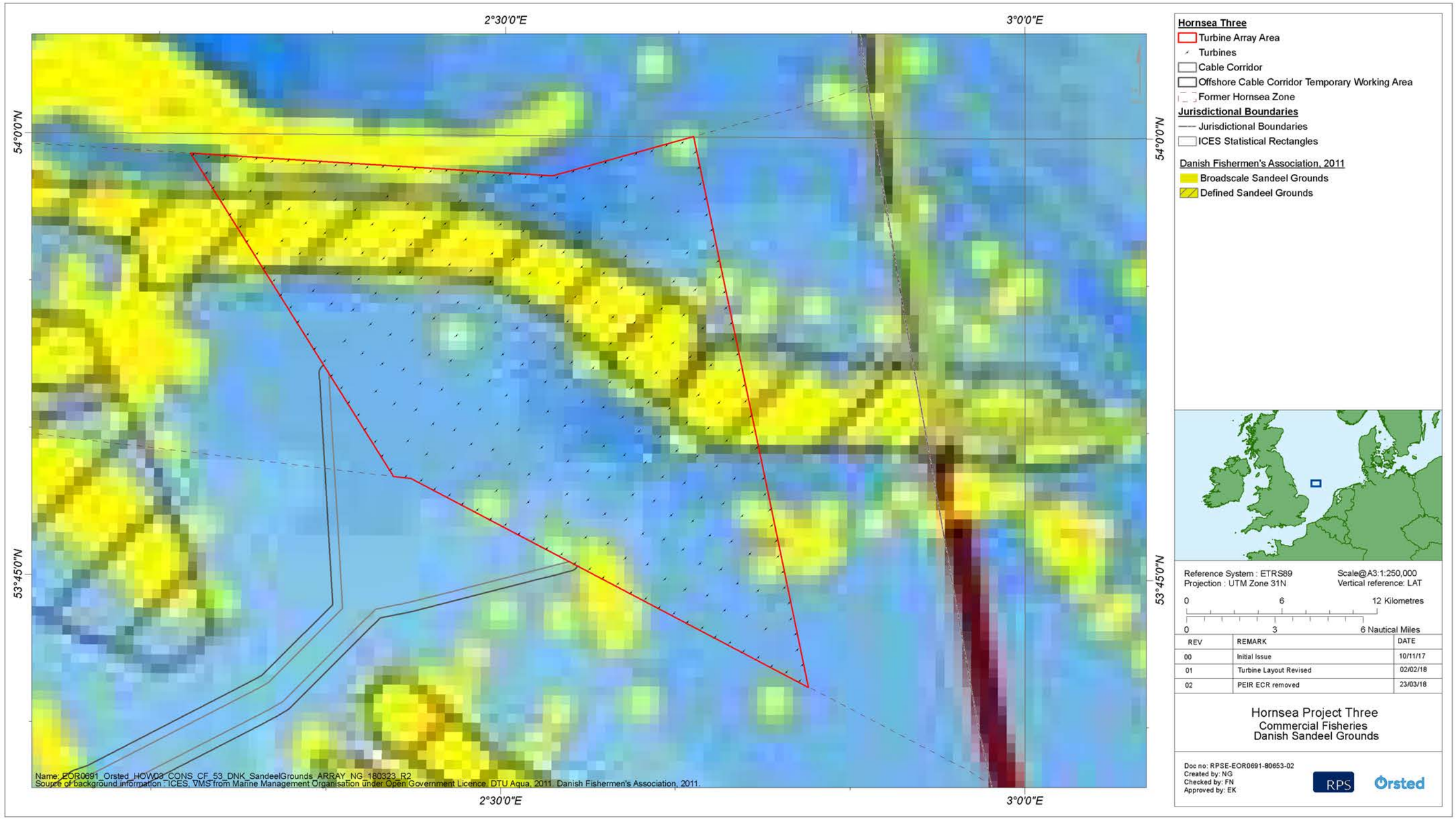

Figure 6.17: Map of key sandeel fishing grounds (yellow) for Danish fleet based on Vessel Monitoring System data, together with the indicative Hornsea Three array area turbine layout.

6.7.2.31 Over the past five years (2012 to 2016) Danish vessels landed sandeel from 36F2 in 2013 and 2014 with an average annual first sales value of €121,000 over these two years (Figure 6.18).

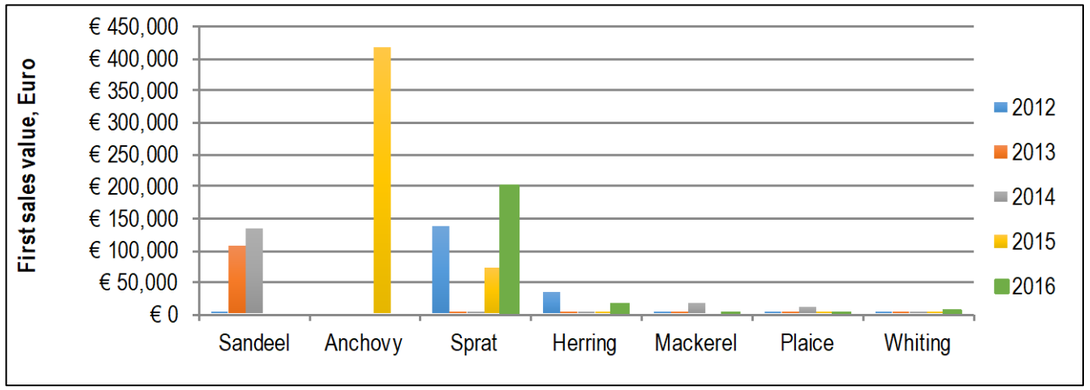

Figure 6.18: First sale value of species landed by Danish registered vessels from ICES rectangle 36F2 from 2012 to 2016 (Data sources: EU DCF, 2017; EU MOFA, 2017).

German registered vessels

6.7.2.32 German registered vessels principally target *Nephrops*, plaice and mixed demersal species using demersal otter trawl gear, with an average first sale value of €154,000 per annum (ranging from €194,000 in 2013 to €88,000 in 2014). It is noted that sole landings have been relatively low from 2012 onwards (Figure 6.19).

Swedish registered vessels

6.7.2.33 Swedish registered vessels landed an average first sale value of €14,000 per annum from 36F2, related to sporadic landings of sprat and herring. Swedish vessels are understood to target sandeel grounds throughout the North Sea and to occasionally target the regional commercial fisheries study area. Swedish vessels targeting sandeel are not known to have fished within Hornsea Three array area over the past five years, based on the location of sandeel grounds inferred from the Danish activity and VMS data provided by the MMO (see volume 5, annex 6.1: Commercial Fisheries Technical Report).

Norwegian registered vessels

6.7.2.34 Norwegian registered vessels are understood to sporadically fish within the Hornsea Three array area targeting pelagic species. No landings data has been made available to corroborate the scale of this effort, but it is expected to be low based on VMS data and consultation (see volume 5, annex 6.1: Commercial Fisheries Technical Report). Norwegian landing statistics are not included within EU databases analysed, and data requests to Norwegian fisheries departments have not yet been forthcoming.

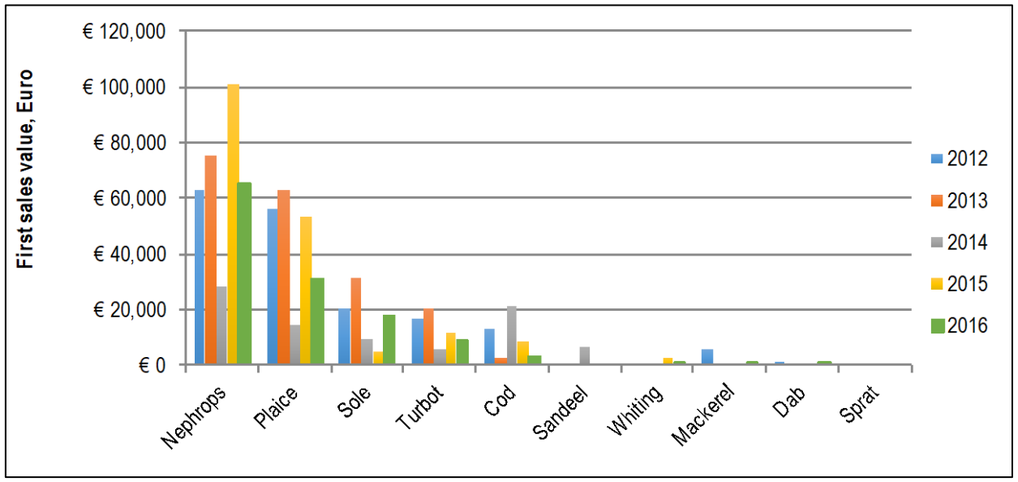

Figure 6.19: First sale value of species landed by German registered vessels from ICES rectangle 36F2 from 2012 to 2016 (Data sources: EU DCF, 2017; EU MOFA, 2017).

Hornsea Three offshore cable corridor

All EU member state vessels

6.7.2.35 The Hornsea Three offshore cable corridor commercial fisheries study area is the same as that described for Hornsea Three (i.e. ICES rectangles 34F1, 35F1, 36F1 and 36F2) in section 6.7.1. The proportion of landings from 36F2 and 34F1, 35F1 and 36F1 is illustrated by country in Figure 6.20.

6.7.2.36 The sections below focus on landings from ICES rectangles 34F1, 35F1 and 36F1, as 36F2 has been characterised in detail in the previous section.

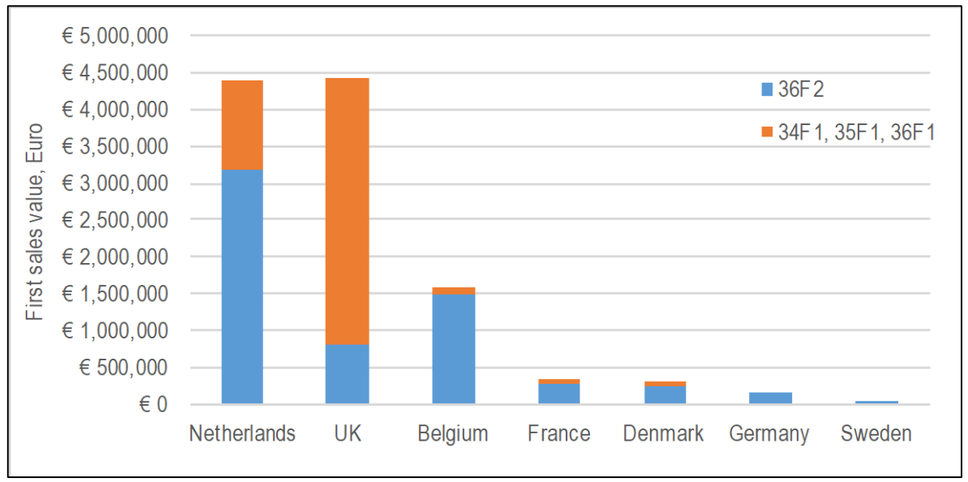

Figure 6.20: Average annual first sales value of landings by EU member states by ICES rectangle (based on five-years' data from 2012 to 2016) (data sources: EU DCF database, 2017; EU MOFA, 2017).

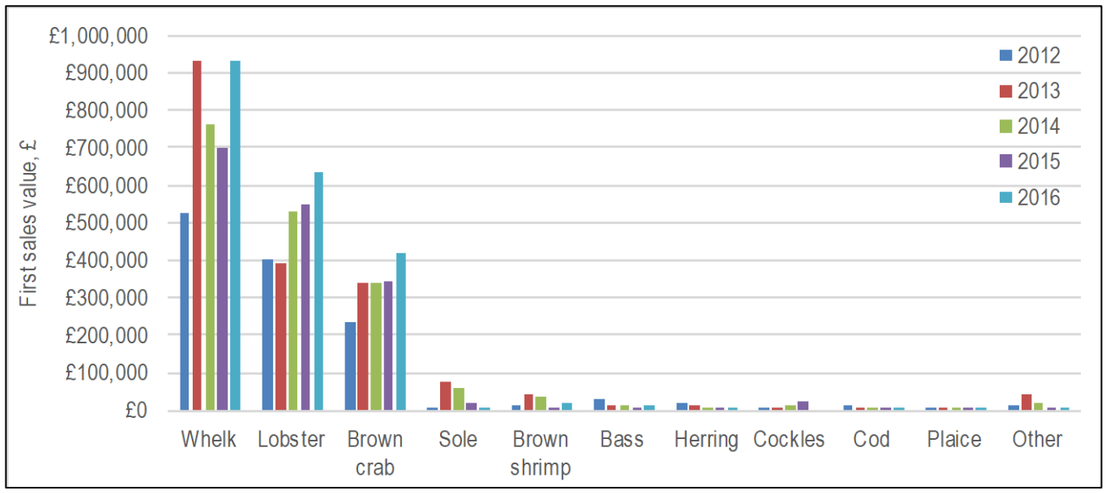

Figure 6.21: First sale value of species landed by UK registered vessels from ICES rectangle 34F1 and 35F1 from 2012 to 2016 (Data sources: MMO, 2017).

UK registered vessels

6.7.2.37 UK registered vessels are responsible for the large majority of landings from 34F1, 35F1 and 36F1, which is to be expected given the proximity to UK coastline. The average annual first sales value of UK landings from 34F1, 35F1 and 36F1 is £2.9 million (approximately €3.6 million).

6.7.2.38 It is important to note that the Hornsea Three offshore cable corridor overlaps with a very small portion of the southeast corner of ICES rectangle 36F1. Significant crab and lobster grounds are known to exist within 36F1, targeted by the Bridlington fleet, but these are located in the northern and western halves of 36F1 and do not coincide with the small area of cable corridor that overlaps this ICES rectangle. Data from 36F1 has not been scoped out of the baseline characterisation to ensure a comprehensive assessment that allows all potential impacts to be assessed (e.g. displacement). Further data on 36F1 is provided in volume 5, annex 6.1: Commercial Fisheries Technical Report.

6.7.2.39 UK landings from 34F1 and 35F1 are dominated by whelk, lobster and brown crab (Figure 6.21), with an average annual first sales value of £1.6 million.

6.7.2.40 On average, the first sale value of fish landed by UK vessels specifically from within the Hornsea Three offshore cable corridor is worth £22,884 per annum (based on five-years VMS data from 2011 to 2015) (Table 6.8). Peak landings were recorded in 2015 when a value of approximately £37,000 was landed from the Hornsea Three offshore cable corridor. VMS data indicate that the majority of effort is consistently focused within the area of the Hornsea Three offshore cable corridor that is adjacent to the Hornsea Three array area.

Table 6.8: Hours and value of catch landed from Hornsea Three offshore cable corridor by UK vessels using mobile gear based on VMS data, 2011 to 2015 (Source: MMO, 2017).

Year	Mobile hours fished	Mobile value
2011	2,690.23	£30,644.94
2012	0.00	£0.00
2013	2,931.55	£33,268.19
2014	1,471.08	£13,436.61
2015	2,627.40	£37,074.81
Average	1,944.05	£22,884.91

6.7.2.41 On average, 1,944 hours of fishing occurs per annum within the Hornsea Three offshore cable corridor (based on five-years from 2011 to 2015), with a peak of approximately 2,930 hours in 2013.

6.7.2.42 Further characterisation of the North Norfolk potting fleet, together with analysis of MSAR data is provided in volume 5, annex 6.1: Commercial Fisheries Technical Report.

Other EU member states and Norwegian registered vessels

6.7.2.43 As indicated in Figure 6.20, other EU nationalities have relatively low levels of landings from ICES rectangles 34F1 and 35F1, with the exception of the Netherlands.

6.7.2.44 The average annual first sales value of Dutch landings from 34F1 and 35F1 is €467,000. Sole dominate the landings and are predominately taken from 35F1 (Figure 6.22), with small amounts of plaice and turbot also taken. The Dutch sole landings have significantly dropped from €484,000 in 2012 to €232,000 in 2015, although have increase to €310,000 in 2016.

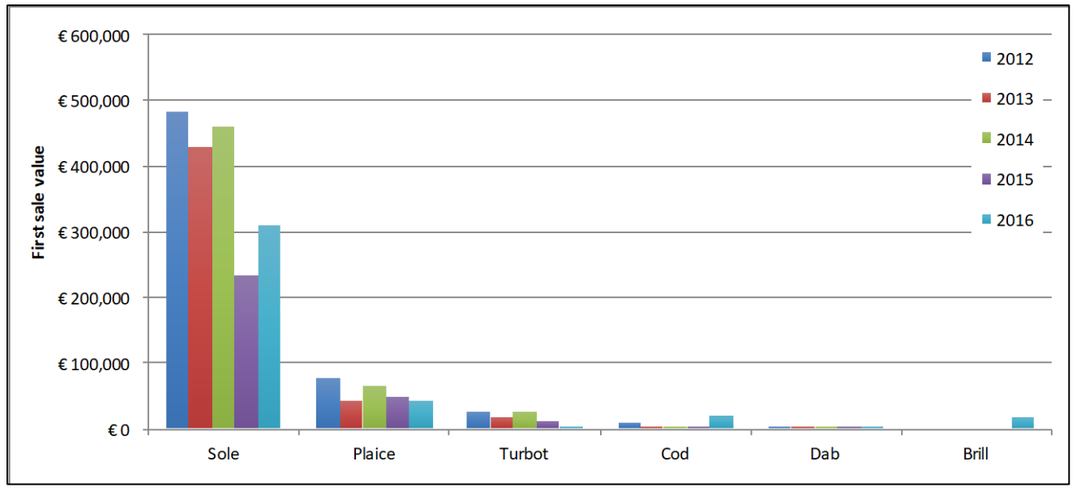

Figure 6.22: First sale value of species landed by Dutch registered vessels from ICES rectangle 34F1 and 35F1 from 2012 to 2016 (Data sources: EU DCF, 2017; EU MOFA, 2017).

6.7.2.45 As shown in Figure 6.16 the Hornsea Three offshore cable corridor overlaps five defined sandeel grounds, including three within the offshore HVAC booster station search area. For four of these defined sandeel grounds, it is important to note that the overlap occurs at the outermost ends of the grounds. Landing statistics for 35F1 and 36F2 indicate that sandeels have not been targeted in this area from 2011 to 2015. However, as described in paragraph 6.7.2.30, it is expected that the grounds within the Hornsea Three offshore cable corridor will be targeted in the future, depending upon sandeel recruitment patterns.

6.7.3 Future baseline scenario

6.7.3.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 requires that "*an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge*" is included within the Environmental Statement.

6.7.3.2 In the event that Hornsea Three does not come forward, an assessment of the future baseline conditions has been carried out and is described within this section.

6.7.3.3 Commercial fisheries patterns change and fluctuate based on a range of natural and management controlled factors. This includes the following:

- Stock abundance: fluctuation in the biomass of individual species stocks in response to status of the stock, recruitment, natural disturbances (e.g. due to storms, sea temperature etc.), changes in fishing pressure etc.;
- Fisheries management: including changes in TACs leading to the relocation of effort, and/or an overall increase/decrease of effort;
- Environmental management: including the potential restriction of certain fisheries within protected areas;
- Improved efficiency and gear technology: with fishing fleets constantly evolving to reduce operational costs e.g. by moving from beam trawl to pulse trawl;
- Sustainability: with seafood buyers more frequently requesting certification of the sustainably of fish and shellfish products, such as the Marine Stewardship Council certification, industry is adapting to improve fisheries management and wider environmental impacts; and
- Markets: commercial fishing fleets respond to market prices by focusing effort on higher value target species when prices are high and markets in demand.

6.7.3.4 The variations and trends in commercial fisheries activity is an important aspect of the baseline assessment, and forms the principle reason for assessing five years of baseline data. For certain fisheries, and/or upon the request of fisheries stakeholders, it is appropriate to analyse a longer time period to ensure long-term trends inform the assessment, this may be due to natural biological cycles of the target species or other management control factors (e.g. Dutch and Danish fleets, see volume 5, annex 6.1: Commercial Fisheries Technical Report).

6.7.3.5 Overall, given that five-year time periods have been assessed for all commercial fisheries and ten-year periods where appropriate, the future baseline scenario is expected to be reflected within the current baseline assessment undertaken, which is presented in section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report.

6.7.4 Data limitations

6.7.4.1 Limitations of landings data include the spatial size of ICES rectangles (e.g. the surface-area of the Hornsea Three array area is 19% of the surface area of ICES rectangle 36F2). This can misrepresent actual activity across Hornsea Three and care is therefore required when interpreting these data. A further limitation of landings data is the potential under-reporting of landings associated with potting vessels, which may occur as a result of estimating catches (as opposed to accurate weighing) and not reporting catches that fall below the acceptable limit as defined within the UK Registration of Buyers and Sellers (i.e. when purchases of first sale fish direct from a fishing vessel are wholly for private consumption, and less than 30 kg is bought per day).

6.7.4.2 Lack of Norwegian landing statistics, as they are not included within EU databases, is also recognised as a data limitation.

6.7.4.3 Limitations of VMS data are primarily focused on the coverage being limited to vessels ≥15 m (noting that while vessels ≥12 m require VMS, data is not available for under 15 m vessels). It is important to be aware that where mapped VMS data may appear to show inshore areas as having lower (or no) fishing activity compared within offshore areas, this is not the case because VMS data do not include vessels typically operating in inshore area (i.e. which typically comprises of vessels <15 m in length). This is particularly important when assessing the activity across the offshore cable corridor. Consultation has been key throughout the EIA process to determine extent and distribution of activity by the <15 m fleet.

6.7.4.4 Limitations of surveillance data are primarily focused on the frequency and aerial coverage of patrols. UK surveillance aircraft are used to construct an on-going picture of fishing activity within the UK EEZ and to make effective use of patrol vessel activity by coordinated use of surveillance data. These data cannot be considered to give a complete picture of the actual level of activity and have a number of limitations, including the following key aspects:

- Patrol effort by IFCAs, Royal Navy Fisheries Patrol Vessels and patrol aircraft are optimised for enforcement purposes and not collection of sightings data. Areas with fewer fisheries enforcement issues are therefore likely to be visited less often and result in lower data confidence;
- Surveillance data are only indicative of areas where fishing activities occur, as there is no continuous monitoring of activities;
- Surveillance data present a snapshot of activity in an area and it cannot be assumed that if no vessels have been sighted then no fishing takes place; and
- Vessels fishing at night would likely remain undetected.

6.7.4.5 Data limitations were managed by ensuring accurate interpretation of the data and clear understanding of its scope (i.e. VMS data provided by MMO includes vessels ≥15 m in length, omitting those from 12 m to <15 m). Consultation was fundamental in understanding the validity of data, enabling appropriate interpretation and ground-truthing of data, particularly for the UK potting fleet. This also allowed specific requests to be accommodated (e.g. assessing ten-year trends for Dutch and Danish fleets to ensure a more accurate reflection of historic fishing patterns).

6.7.4.6 As data form only part of the evidence base, the limitations identified are not considered to significantly affect the certainty or reliability of the impact assessments in section 6.11.

6.8 Key parameters for assessment

6.8.1 Maximum design scenario

6.8.1.1 The maximum design scenarios identified in Table 6.9 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the details provided in the project description (volume 1, chapter 3: Project Description). Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the project Design Envelope (e.g. different turbine layout), to that assessed here be taken forward in the final design scheme.

6.8.1.2 The commercial fisheries impact assessment of reduced access to fishing grounds will be used to inform volume 2, chapter 3: Fish and Shellfish Ecology. Both volume 2, chapter 3: Fish and Shellfish Ecology and volume 2, chapter 7: Shipping and Navigation have been used to inform the commercial fisheries EIA.

6.8.2 Impacts scoped out of the assessment

6.8.2.1 On the basis of the baseline environment and the project description outlined in volume 1, chapter 3: Project Description, no impacts are scoped out of the assessment for commercial fisheries.

Table 6.9: Maximum design scenario considered for the assessment of potential impacts on commercial fisheries.

Potential impact	Maximum design scenario	Justification
Construction phase		

Hornsea Three array area construction activities and physical presence of constructed wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds.	All of the infrastructure described below located within the Agreement for Lease (AfL) area of 696 km^2.
	
	Turbines
	
	• Construction of up to 300 turbines utilising the entire AfL area of 696 km^2;
	• Minimum spacing between turbines of 1,000 m;
	• Construction of turbines with gravity based structure (GBS) foundations, of conical flask design, tapering in a straight line from the seabed to the sea-surface, with a diameter at seabed of 53 m and at sea-surface of 15 m;
	• Up to a total of 1,623,182 m^2 across the entire Hornsea Three array from GBFs (including scour protection) for up to 300 turbines, each affecting up to 5,411 m^2 of seabed (1,452 m^2 from the foundation and 3,958 m^2 from the scour protection); and
	• Duration of construction would entail seabed preparation of up to six days per GBS (including dredging and scour protection) and up to 3.5 days installation per GBS, with total duration of GBS construction of up to 913 days (2.5 years).
	
	Offshore platforms
	
	Construction of up to 19 offshore platforms within the Hornsea Three array area including:
	
	• Up to a total of 158,700 m^2 from box GBFs (including scour protection) for up to 12 offshore transformer substations, each affecting up to 13,225 m^2 of seabed (5,625 m^2 from the foundation and 7,600 m^2 from the scour protection);
	• Up to a total of 28,628 m^2 from suction caisson jacket foundations (including scour protection) for up to three offshore accommodation platforms, each affecting up to 9,543 m^2 of seabed (2,945 m^2 from the foundation and 6,597 m^2 from the scour protection); and
	• Up to 109,200 m^2 from pontoon GBFs (including scour protection) for up to four offshore HVDC converter substations, each affecting up to 27,300 m^2 of seabed (17,850 m^2 from the foundation and 9,450 m^2 from the scour protection).
	
	Cables
	
	Construction of cables within the Hornsea Three array area as follows:
	• Up to a total of 19,920,000 m^2 from burial of up to 830 km of array cables as follows:
	
	Up to a total of 14,490,000 m^2 due to 498 km of the array cable requiring sandwave clearance (up to 30 m wide corridor); and
	
	Up to a total of 4,980,000 m^2 due to boulder clearance and laying of up to 332 km of array cables by trenching, mechanical cutting, jetting, mass flow excavator, ploughing or vertical injection and similar tools currently under development augmented by cable protection installation (up to 15 m wide corridor).
	
	• Up to a total of 6,300,000 m^2 from burial of up to 225 km of interconnector cables as follows:
	
	  • Up to a total of 4,050,000 m^2 due to 135 km of the interconnector cable requiring sandwave clearance (up to 30 m wide corridor); and
	  • Up to a total of 2,250,000 m^2 due to boulder clearance and laying of up to 90 km of interconnector cables by trenching, mechanical cutting, jetting, mass flow excavator, ploughing or vertical injection and similar tools currently under development augmented by cable protection installation (up to 25 m wide corridor).
	
	• Up to a total of 4,704,000 m^2 from burial of up to 168 km of export cables (up to six trenches of 28 km length) within the array as follows:
	
	  • Up to a total of 3,024,000 m^2 due to 100.8 km of the export cables within the array requiring sandwave clearance (up to 30 m wide corridor); and
	  • Up to a total of 1,680,000 m^2 due to boulder clearance and laying of up to 67.2 km of interconnector cables by trenching, mechanical cutting, jetting, mass flow excavator, ploughing or vertical injection and similar tools currently under development augmented by cable protection installation (up to 25 m wide corridor).
	
	• Cables will have a maximum diameter of 200 mm.
	• Cables will typically be buried between 1 and 2 m below the seabed surface. A Cable Burial Risk Assessment will inform the actual cable burial depth which will depend upon ground conditions. This assessment will be undertaken post-consent.
	• Installation of cable protection and crossings as follows:
		The two-phase construction scenario has a maximum gap of three years during the Hornsea Three array area construction period of eight years, resulting in the longest duration of construction activity.
		
		Total seabed disturbance of 32.84 km^2 plus advisory safety distances.
		
		GBS foundations in conical flask design represent the largest area of seabed that would prevent fishing activity during construction.
		
		The HVDC scenario results in more infrastructure within the Hornsea Three array area (compared to the HVAC scenario).
		
		Offshore transformer substations with box gravity base foundations represent the largest area of seabed.
		
		Offshore HVDC substation foundations pontoon gravity base -Type I represent the largest area of seabed.
		
		Three accommodation platforms represent the largest topsides footprint.
		
		Array, interconnector and export cable assumptions represent largest area of remedial cable protection and rock berms associated with crossings.

Potential impact	Maximum design scenario	Justification

	• Up to a total of 581,000 m² based on installation of cable protection for 10% of the up to 830 km of array cables (i.e. 83 km and 7 m wide cable corridor);
	• Up to a total of 157,500 m² based on the installation of cable protection for 10% of the up to 225 km of interconnector cables (i.e. 22.5 km and 7 m wide cable corridor);
	• Up to a total of 117,600 m² based on the installation of cable protection for 10% of the up to 168 km of export cables within the Hornsea Three array area (i.e. up to six trenches of 28 km length and 7 m wide corridor); and
	• Up to a total of 87,500 m² for cable/pipeline crossings, with up to 35 crossings within the Hornsea Three array area, each with long term loss of seabed (i.e. through placement of rock berms) of up to 2,500 m².
	
	Total area of seabed disturbance that will exclude commercial fisheries during construction
	
	• 32,843,828 m² (32.84 km²) (assuming cable protection will occur within the footprint of disturbance and not including safety distances). This equates to 4.72 % of the total Hornsea Three array area.
	
	Advisory safety distances
	
	• 500 m safety zones around infrastructure under construction;
	• 50 m safety zones around incomplete structures at which construction activity may be temporarily paused (and therefore the 500 m safety zone has lapsed); and
	• 1,000 m advisory safety distances around vessels undertaking construction activities.
	
	Construction duration
	
	• Hornsea Three array area construction duration: up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of construction. Pre-construction activities will occur one to two years prior to the start of the eight year construction. The construction activities will occur over the following durations within the eight year construction period:
	  • Foundation installation: up to 2.5 years;
	  • Cable installation: up to 2.5 years; and
	  • Substations and platforms: up to 38 months (two months per structure).
	• Exclusion scenario: two phased construction within Hornsea Three array area leading to localised exclusion around construction activities within the AfL of 696 km² plus advisory distances around construction works.	

Potential impact	Maximum design scenario	Justification

Hornsea Three offshore cable corridor construction activities leading to reduction in access to, or exclusion from, established fishing grounds.	*Cables*
	
	Construction of cables within the Hornsea Three offshore cable corridor as follows:
	• Up to a total of 27,492,030 m² from burial of up to 978 km of export cable (up to six trenches of 163 km length) as follows:
	  • Up to a total of 18,396,180 m² due to 613.2 km of the export cable requiring sandwave clearance (up to 30 m wide corridor); and
	  • Up to a total of 9,095,850 m² due to boulder clearance and cable laying of up to 363.8 km of export cable by trenching, mechanical cutting, jetting, mass flow excavator, ploughing or vertical injection and similar tools currently under development augmented by cable protection installation (up to 25 m wide corridor for boulder clearance and 15 m wide corridor for cable installation).
	• Cables will have a maximum diameter of 200 mm.
	• Cables will typically be buried between 1 and 2 m below the seabed surface. A Cable Burial Risk Assessment will inform the actual cable burial depth which will depend upon ground conditions. This assessment will be undertaken post-consent.
	• Installation of cable protection and crossings as follows:
	  • Up to a total of 684,600 m² based on the installation of cable protection for 10% of the up to 978 km of export cable. Assumes up to six cables, and up to 7 m width of cable protection per cable;
	  • Up to a total of 660,000 m² for cable/pipeline crossings, with up to 44 crossings, assuming up to six cables, with each crossing having a long term loss of seabed (i.e. through placement of rock berms) of up to 2,500 m²;
	
	Offshore platforms
	
	Construction of up to four offshore HVAC booster stations within the Hornsea Three offshore cable corridor including:
	• Up to a total of 52,900 m² from box GBFs (including scour protection) for up to four above surface offshore HVAC booster stations, each affecting up to 13,225 m² of seabed (5,625 m² from the foundation and 7,600 m² from the scour protection).
	
	Total area of seabed disturbance that will exclude commercial fisheries during construction
	• 27,544,930 m² (27.54 km²) (assuming cable protection will occur within the footprint of disturbance and not including safety distances).
	
	Advisory safety distances
	• 500 m safety zones around infrastructure under construction;
	• 50 m safety zones around incomplete structures at which construction activity may be temporarily paused (and therefore the 500 m safety zone has lapsed); and
	• 1,000 m advisory safety distances around vessels undertaking construction activities.
	
	Construction duration
	• Hornsea Three offshore cable corridor construction duration: up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of construction. Pre-construction activities will occur one to two years prior to the start of the eight year construction. The construction activities will occur over the following durations within the eight year construction period:
	  • Cable installation: up to three years; and
	  • Substations: up to eight months (two months per substation).
	• Exclusion scenario: 1,000 m advisory safety distance around vessel construction activities along the Hornsea Three offshore cable corridor (i.e. a roaming 3.1 km² exclusion along the 163 km Hornsea Three offshore cable route).
		The two-phase construction scenario has a maximum gap of three years during the Hornsea Three offshore cable coridor construction period of eight years, resulting in the longest duration of construction activity.
		
		The assessment assumes fishing activity would be prevented from the Hornsea Three offshore cable route corridor within advisory safety distances around construction vessels, with a maximum duration of three years over a period of eight years. The assessment assumes fishing will resume during the gap of up to three years between construction phases.
		
		HVAC transmission option represents the greatest number of infrastructure in the Hornsea Three offshore cable corridor (compared with HVDC transmission option).
		
		Four offshore above surface HVAC booster stations with box gravity base foundations represent the largest area (topsides) (compared to six subsurface HVAC booster stations with pile foundations).

Displacement from Hornsea Three array area leading to gear conflict and increased fishing pressure on adjacent grounds.	As per maximum design scenario for "*Hornsea Three array area construction activities and physical presence of wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds*".	As per construction description for "*Hornsea Three array area construction activities and physical presence of wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds*".
Displacement from the Hornsea Three offshore cable corridor leading to gear conflict	As per maximum design scenario for "*Hornsea Three offshore cable corridor construction activities leading to reduction in access to, or exclusion from established fishing grounds*".	As per construction description for "*Hornsea Three offshore cable corridor construction activities leading to reduction in access to, or exclusion from established fishing grounds*".

Potential impact	Maximum design scenario	Justification
and increased fishing pressure on adjacent grounds.		
Hornsea Three array area and Hornsea Three offshore cable corridor construction activities leading to displacement or disruption of commercially important fish and shellfish resources.	The maximum design scenarios for impacts on fish and shellfish species during the construction activities are presented in volume 2, chapter 3: Fish and Shellfish Ecology.	The scenarios presented in volume 2, chapter 3: Fish and Shellfish Ecology provide for the greatest disturbance to fish and shellfish species and therefore the greatest knock on effect to Commercial Fisheries.
Hornsea Three array area and Hornsea Three offshore cable corridor construction activities leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the array and export cable areas.	As per maximum design scenario for "*Hornsea Three array area construction activities and physical presence of wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds*" and "*Hornsea Three offshore cable corridor construction activities leading to reduction in access to, or exclusion from established fishing grounds*".	As per construction description for "*Hornsea Three array area construction activities and physical presence of wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds*" and "*Hornsea Three offshore cable corridor construction activities leading to reduction in access to, or exclusion from established fishing grounds*".

Increased vessel traffic within fishing grounds as a result of changes to shipping routes and construction vessel traffic from Hornsea Three array area and Hornsea Three offshore cable corridor leading to interference with fishing activity.	As per maximum design scenario for "*Hornsea Three array area construction activities and physical presence of wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds*" with the exception of gravity base foundations for the turbines (as opposed to floating turbine foundations).
	• Up to 10,774 vessel round trips during the construction phase:
	  • Up to four installation vessels (300 round trips), up to 24 support vessels (1,800 round trips) and up to 12 transport vessels (900 round trips) for wind turbine installation;
	  • Up to three installation vessels (300 round trips), up to 13 support vessels (1,500 round trips), up to 12 dredging vessels (1,200 round trips) and up to four transport vessels (tugs) (1,200 round trips) for wind turbine GBF installation;
	  • Up to two installation vessels (38 round trips), up to 12 support vessels (228 round trips) and up to four transport vessels (38 round trips) for offshore substation foundations installation; and
	  • Up to three main cable laying vessels (315 round trips), up to three main cable burial vessels (315 round trips), support vessels comprising up to four crew boats or SOVs, up to two service vessels, up to two diver vessels, up to two PLGR vessels, and up to two dredging vessels (1,890 round tripsfor support vessels) for array cable installation; and
	  • Up to four main laying vessels comprising up to one barge and three associated tugs (180 return trips), up to four main jointing vessels comprising up to one barge and three associated tugs (120 return trips), up to four main burial vessels comprising up to one barge and three associated tugs (180 return trips) and support vessels comprising up to two crew boats or SOVs, up to one service vessel, up to one diver vessel, up to one PLGR vessel, and up to one dredging vessel (270 return trips for support vessels) for export cable installation.
		The maximum number of turbines and associated infrastructure will lead to the highest level of construction activities and therefore highest level of construction vessel round trips.
		The construction of gravity base foundations have the highest support, dredging and tug vessel round trips related to the self-installing concept compared with other foundation designs.

Operation phase		
Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds.	*Operation and maintenance duration* The anticipated design life of Hornsea Three is 35 years. It may be desirable to 'repower' Hornsea Three at or near the end of the design life of Hornsea Three, to the end of the 50 year Crown Lease period. If the specifications and designs of the new turbines and/or foundations fell outside of the Maximum design scenario or the impacts of constructing, operation and maintenance, and decommissioning them were to fall outside those considered by this EIA, repowering would require further consent (and EIA) and is therefore outside of the scope of this document. *Infrastructure* All of the infrastructure described below located within the entire AfL area of 696 km^2. The assessment assumes that commercial fisheries will be prevented from actively fishing within a total area of 9.69 km^2 due to infrastructure within the Hornsea Three array area, together with associated safety zones and assumed operating distances, as a result of: *Turbines* • Up to 300 turbines located within the entire AfL area of 696 km^2; • Minimum spacing between turbines of 1,000 m;	GBS foundations in conical flask design represent the largest area of seabed that would prevent fishing activity during construction. The HVDC scenario results in more infrastructure within the Hornsea Three array area (compared to the HVAC scenario). Offshore transformer substations with box gravity base foundations represent the largest area of seabed. Offshore HVDC substation foundations pontoon gravity base -Type I represent the largest area of seabed. Three accommodation platforms represent the largest topsides footprint. Array and interconnector cables assumptions represent largest area of remedial cable protection and rock berms associated with crossings. Outwith the area of 9.69 km^2, the assessment assumes that fishing will resume within the Hornsea Three array area, with the exception of safety

Potential impact	Maximum design scenario	Justification

	• Turbines with GBS foundations, of conical flask design, tapering in a straight line from the seabed to the sea-surface, with a diameter at seabed of 53 m and at sea-surface of 15 m;
	• Assumed operating distance of 50 m from turbine and GBS foundation;
	• Commercial fisheries exclusion based on radius of 26.5 m from GBS, plus 50 m operating distance = 76.5 m radius. Equating to a circular area of 0.018 km^2 per turbine, totalling 5.52 km^2 for 300 turbines.
	
	Offshore platforms
	
	Up to 19 offshore platforms within the Hornsea Three array area including:
	
	• Up to 12 offshore transformer substations with box GBFs, each with topsides footprint of 8,100 m^2; and dimensions of 90 m by 90 m. Assumed operating distance of 50 m. Commercial fisheries exclusion based on radius of 45 m (i.e. 90 m / 2), plus 50 m operating distance = 95 m radius. Equating to a circular area of 0.028 km^2 per substation, totalling 0.34 km^2 for 12 substations.
	• Up to three offshore accommodation platforms of dimensions 60 m by 60 m and 500 m safety zone as manned platform. Commercial fisheries exclusion based on radius of 30 m (i.e. 60 m / 2), plus 500 m safety zone distance = 530 m radius. Equating to a circular area of 0.88 km^2 per platform, totalling 2.65 km^2 for 3 platforms.
	• Up to four offshore HVDC converter substations with pontoon GBFs each of dimensions 180 x 90 m (i.e. each with 16,200 m^2 topsides footprint). Assumed operating distance of 50 m. Commercial fisheries exclusion based on radius of 90 m (i.e. 180 m / 2), plus 50 m operating distance = 140 m radius. Equating to a circular area of 0.062 km^2 per substation, totalling 0.25 km^2 for 4 substations.
	
	Cables
	
	Cables within the Hornsea Three array area as follows:
	• Cables will have a maximum diameter of 200 mm.
	• Cables will typically be buried between 1 and 2 m below the seabed surface. A Cable Burial Risk Assessment will inform the actual cable burial depth which will depend upon ground conditions. This assessment will be undertaken post-consent.
	• Cable protection and crossings as follows:
	  • Up to a total of 581,000 m^2 based on installation of cable protection for 10% of the up to 830 km of array cables (i.e. 83 km and 7 m wide cable corridor);
	  • Up to a total of 157,500 m^2 based on the installation of cable protection for 10% of the up to 225 km of interconnector cables (i.e. 22.5 km and 7 m wide cable corridor);
	  • Up to a total of 117,600 m^2 based on the installation of cable protection for 10% of the up to 168 km of export cables within the Hornsea Three array area (i.e. up to six trenches of 28 km length and 7 m wide corridor); and
	  • Up to a total of 87,500 m^2 for cable/pipeline crossings, with up to 35 crossings within the Hornsea Three array area, each with long term loss of seabed (i.e. through placement of rock berms) of up to 2,500 m^2.
	  • Total commercial fisheries exclusion from cable protection and cable/pipeline crossings = 943,600 m^2 = 0.94 km^2.
	
	Maintenance activities
	
	• Maintenance activities within the Hornsea Three array area, consisting of:
	  • Offshore substation component exchange, painting and removal of organic build-up;
	  • Wind turbine component exchange, painting, organic waste removal, ladder replacement and anode replacement;
	  • Array, interconnector and export cable with the Hornsea Three array area remedial burial and repairs.
	
	Advisory safety distances
	
	• 500 m safety zones will be applied for around manned offshore platforms;
	• 500 m safety zones will be applied for around wind turbines and offshore platforms undergoing major maintenance;
	• Advisory safety distances of 1,000 m will be recommended around vessels undertaking major maintenance activities.
		zones around infrastructure undergoing major maintenance and advisory safety distances around vessels undertaking major maintenance activities.

Potential impact	Maximum design scenario	Justification

Physical presence of offshore export cable and infrastructure within the Hornsea Three offshore cable corridor leading to reduction in access to, or exclusion from established fishing grounds.	*Operation and maintenance duration*
	The anticipated design life of Hornsea Three is 35 years. It may be desirable to 'repower' Hornsea Three at or near the end of the design life of Hornsea Three to the end of the 50 year Crown Lease period. If the specifications and designs of the new turbines and/or foundations fell outside of the Maximum design scenario or the impacts of constructing, operation and maintenance, and decommissioning them were to fall outside those considered by this EIA, repowering would require further consent (and EIA) and is therefore outside of the scope of this document.
	Infrastructure
	All of the infrastructure set out in the maximum design scenario for "*Hornsea Three offshore cable corridor construction activities leading to reduction in access to, or exclusion from established fishing grounds*".
	Total affected seabed area = 1,344,600 m^2 (from export cable protection and crossings) and 0.25 km^2 (90 m radius plus 50 m operating area around substations) x 4 = 246,300 m^2).
	Maintenance activities
	• Maintenance activities within the Hornsea Three offshore cable corridor, consisting of:
	  • Offshore substation component exchange, painting, removal of organic build-up, replacement of anodes and j-tube replacement; and
	  • Export cable with the Hornsea Three offshore cable corridor remedial burial and repairs.
	Advisory safety distances
	• 500 m safety zones will be applied for around manned offshore platforms;
	• 500 m safety zones will be applied for around offshore platforms undergoing major maintenance; and
	• 1,000 m advisory safety distances around vessels undertaking major maintenance activities (i.e. roaming 3.1 km^2 exclusion along the 1,038 km of offshore export cable).
		Assessment assumes that fishing will resume along the Hornsea Three offshore cable corridor, with the exception of areas of cable protection and safety zones around infrastructure undergoing major maintenance.

Displacement from Hornsea Three array area and Hornsea Three offshore cable corridor leading to gear conflict and increased fishing pressure on adjacent grounds.	As per maximum design scenario for "*Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds*" and "*Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds*".	As per operation description for "*Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds*" and "*Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds*".
Physical presence of Hornsea Three array area leading to gear snagging.	As per maximum design scenario for "*Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds*".	Assessment assumes that fishing might resume within areas of the Hornsea Three array area and thereby floating turbines and associated mooring and anchor cables represent the highest level of risk for snagging.
Physical presence of the export cable and infrastructure within the Hornsea Three offshore cable corridor leading to gear snagging.	As per maximum design scenario for "*Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds*".	As per operation description for "*Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds*".
Electromagnetic fields, habitat alteration, noise and other ecological impacts due to operational and maintenance activities leading to displacement or disruption of commercially important fish and shellfish resources.	The maximum design scenario for impacts on fish and shellfish species during the operational phase are presented in volume 2, chapter 3: Fish and Shellfish Ecology.	The scenarios presented in volume 2, chapter 3: Fish and Shellfish Ecology provide for the greatest disturbance to fish and shellfish species and therefore the greatest knock on effect to Commercial Fisheries.

Potential impact	Maximum design scenario	Justification
Physical presence of Hornsea Three array, interconnector and offshore export cable leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the Hornsea Three array area and offshore cable corridor.	As per maximum design scenario for "*Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds*" and "*Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds*".	As per operation description for "*Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds*" and "*Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds*". Assessment assumes fishing will not resume within the Hornsea Three array and that vessels will not transit through the array, leading to the greatest potential for longer steaming distances to alternative grounds.

Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic from Hornsea Three array area and Hornsea Three offshore cable corridor infrastructure leading to interference with fishing activity.	As per maximum design scenario for "*Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds*" and "*Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds*".
	• Operation and maintenance vessels making up to 2,885 return trips per year (includes those vessels undertaking the maintenance activities listed above), comprised of:
	  • Up to 140 returns trips for jack-up vessels;
	  • Up to 2,433 returns trips for crew-transfer vessels; and
	  • Up to 312 returns trips for supply vessels.
		As per operation description for "*Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds*" and "*Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds*".
		Assessment assumes the highest level of maintenance activities and therefore highest level of vessel round trips

Potential impact	Maximum design scenario	Justification
Decommissioning phase		

Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds.	*Turbines*
	• Decommissioning of up to 300 turbines utilising the entire AfL area of 696 km²;
	• Minimum spacing between turbines of 1,000 m;
	• Decommissioning of turbines with gravity based structure (GBS) foundations.
	• Scour protection will be left in situ following decommissioning.
	Offshore platforms
	• Decommissioning of up to 19 offshore platforms within the Hornsea Three array area including:
	  • Up to 12 offshore transformer substations with box GBFs;
	  • Up to three offshore accommodation platforms with suction caisson jacket foundations; and
	  • Up to four offshore HVDC converter substations with pontoon GBFs.
	• Scour protection will be left in situ following decommissioning.
	Cables
	Decommissioning of cables within the Hornsea Three array area as follows:
	• Up to 830 km of array cables;
	• Up to 225 km of interconnector cables;
	• Up to 168 km of export cables; and
	• Cable protection will be left in situ following decommissioning.
	Advisory safety distances
	• 500 m safety zones around infrastructure being decommissioned;
	• 50 m safety zones around incomplete structures at which decommissioning activity may be temporarily paused (and therefore the 500 m safety zone has lapsed); and
	• 1,000 m advisory safety distances around vessels undertaking decommissioning activities.
	Decommissioning duration
	• Hornsea Three array area decommissioning duration: up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of decommissioning; and
	• Exclusion scenario: two phased decommissioning within Hornsea Three array area leading to localised exclusion around decommissioning activities within the AfL of 696 km2 plus advisory distances around decommissioning works.
		GBS foundations in conical flask design represent the largest area of seabed that would prevent fishing activity during construction.
		The HVDC scenario results in more infrastructure to be decommissioned within the Hornsea Three array area (compared to the HVAC scenario).
		Offshore transformer substations with Box GBS foundations represent the largest area of seabed.
		Offshore HVDC substation foundations Pontoon GBS-Type I represent the largest area of seabed.
		Three accommodation platforms represent the largest topsides footprint.
		Array and interconnector cables represent largest area of cable protection and post-lay rock berm.

Potential impact	Maximum design scenario	Justification
Hornsea Three offshore cable corridor decommissioning activities within the Hornsea Three offshore cable corridor leading to reduction in access to, or exclusion from, potential and/or established fishing grounds.	*Cables* Decommissioning of cables within the Hornsea Three offshore cable corridor as follows: • Up to 978 km of export cable (up to six trenches of 163 km length). • Cable protection will be left in situ following decommissioning. *Offshore platforms* • Decommissioning of up to four offshore HVAC booster stations within the Hornsea Three offshore cable corridor; and • Scour protection will be left in situ following decommissioning. *Advisory safety distances* • 500 m safety zones around infrastructure being decommissioned; • 50 m safety zones around incomplete structures at which decommissioning activity may be temporarily paused (and therefore the 500 m safety zone has lapsed); and • 1,000 m advisory safety distances around vessels undertaking decommissioning activities. *Decommissioning duration* • Hornsea Three offshore cable corridor decommissioning duration: up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of decommissioning; and • Exclusion scenario: 1,000 m advisory safety distance around vessel decommissioning activities along the Hornsea Three offshore cable corridor (i.e. a roaming 3.1 km^2 exclusion along the 163 km Hornsea Three offshore cable corridor).	The assessment assumes exclusion from the offshore cable route corridor and advisory distances around decommissioning activities for a maximum duration of 3.5 years over a period of 8 years. The assessment assumes fishing will resume, to the extent possible, during the 4-year gap between decommissioning phases 2 and 3. Four offshore above surface HVAC booster stations with Box GBS foundations represent the largest area (topsides) (compared to six subsurface HVAC booster stations with pile foundations).
Displacement from Hornsea Three array area leading to gear conflict and increased fishing pressure on adjacent grounds.	As per maximum design scenario for "*Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds*".	As per decommissioning description for "*Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds"*.
Displacement from the Hornsea Three offshore cable corridor leading to gear conflict and increased fishing pressure on adjacent grounds.	As per maximum design scenario for "*Offshore export cable decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds*".	As per decommissioning description for "*Offshore export cable decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds*".
Decommissioning activities leading to displacement or disruption of commercially important fish and shellfish resources.	The maximum design scenario for impacts on fish and shellfish species during the operational phase are presented in volume 2, chapter 3: Fish and Shellfish Ecology	The scenarios presented in volume 2, chapter 3: Fish and Shellfish Ecology provide for the greatest disturbance to fish and shellfish species and therefore the greatest knock on effect to Commercial Fisheries.
Decommissioning activities leading to longer steaming distances to alternative fishing grounds.	As per maximum design scenario for "*Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds*" and "*Offshore export cable decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds*".	As per decommissioning description for "*Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds*" and "*Offshore export cable decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds*".
Increased vessel traffic, including Hornsea Three array area related and changes in shipping routes, leading to interference with fishing activity	As per maximum design scenario for "*Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds*".	As per decommissioning description for "*Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds*".
Physical presence of cable and scour protection leading to gear snagging.	As per maximum design scenario for "*Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds*" and "*Offshore export cable decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds*". Cable protection and scour protection to be left in situ following decommissioning.	As per decommissioning description for "*Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds*" and "*Offshore export cable decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds*".

6.9 Impact assessment criteria

6.9.1 Overview

6.9.1.1 The commercial fisheries EIA has followed the methodology set out in volume 1, chapter 5: Environmental Impact Assessment Methodology. Specific to the commercial fisheries EIA, the following guidance documents have also been considered:

- Best Practice Guidance for Fishing Industry Financial and Economic Impact Assessments (UKFEN, 2013);
- Fisheries Liaison with Offshore Wind and Wet Renewables group (FLOWW) Recommendations For Fisheries Liaison: Best Practice guidance for offshore renewable developers (BERR, 2008 and FLOWW, 2014);
- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds (FLOWW, 2015);
- Options and opportunities for marine fisheries mitigation associated with wind farms (Blyth-Skyrme, 2010a); and
- Developing guidance on fisheries CIA for wind farm developers (Blyth-Skyrme, 2010b).

6.9.1.2 The legislative framework from which commercial fisheries operate under is accounted for within the baseline assessment, as management defines the level of catch (e.g. through TACs and quotas) and operating distribution (e.g. through Eastern IFCA Byelaws) of commercial fisheries. This legislative framework is defined by the EU Common Fisheries Policy, the UK Blue Book (which provides a single collection of UK and EU legislation applicable to UK fisheries) and Eastern IFCA Byelaws (which are applicable from 0 to 6 nm).

6.9.2 Impact assessment criteria

6.9.2.1 The criteria for determining the significance of effects is a two-stage process that involves defining the sensitivity of the receptors and the magnitude of the potential impacts. This section describes the criteria applied in this chapter to assign values to the sensitivity of receptors and the magnitude of potential impacts. The terms used to define sensitivity and magnitude are based on those used in the DMRB methodology, which is described in further detail in volume 1, chapter 5: Environmental Impact Assessment Methodology.

6.9.2.2 The criteria for defining sensitivity in this chapter are outlined in Table 6.10 below.

Table 6.10: Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition used in this chapter
Very High	Receptor is highly vulnerable to impacts that may arise from the project and recoverability is long term or not possible. And/or: No alternative fishing grounds are available.
High	Receptor is generally vulnerable to impacts that may arise from the project and recoverability is slow and/or costly. And/or: Low levels of alternative fishing grounds are available and/or fishing fleet has low operational range.
Medium	Receptor is somewhat vulnerable to impacts that may arise from the project and has moderate levels of recoverability. And/or: Moderate levels of alternative fishing grounds are available and/or fishing fleet has moderate operational range.
Low (or lower)	Receptor is not generally vulnerable to impacts that may arise from the project and/or has high recoverability. And/or: High levels of alternative fishing grounds are available and/or fishing fleet has large to extensive operational range; fishing fleet is adaptive and resilient to change.
Negligible	Receptor is not vulnerable to impacts that may arise from the project and/or has high recoverability. And/or: Extensive alternative fishing grounds available and/or fishing fleet is highly adaptive and resilient to change.

6.9.2.3 The criteria for defining magnitude in this chapter are outlined in Table 6.11 below.

6.9.2.4 In assessing the magnitude of the impact the value and vulnerability of the receptor, i.e. the fishing fleet under assessment, together with the reversibility of the impact are also considered. Due to the range in scale, value (in terms of both landings and income/profit) and operational practises, within the commercial fishing fleets assessed, specific economic criteria were not set for defining value within the categories of high, medium or low. Instead, these classifications were based on judgement informed from the baseline characterisation and consultation with the industry.

Table 6.11: Definition of terms relating to the magnitude of an impact.

Magnitude of impact	Definition used in this chapter
Major	Impact is of long-term duration (e.g. greater than 12 years duration) and/or is of extended physical extent; And: Impact is expected to result in one or more of the following: • Substantial loss of target fish or shellfish biological resource (e.g. loss of substantial proportion of resource within project area); and • Substantial loss of ability to carry on fishing activities (e.g. substantial proportion of effort within project area). (Adverse)
	Impact is expected to result in one or more of the following: • Large scale or major improvement of resource quality, measurable against biomass reference points; and • Extensive restoration or enhancement of habitats supporting commercial fisheries resources. (Beneficial)
Moderate	Impact is of medium term duration (e.g. less than 12 years) and/or is of moderate physical extent; And: Impact is expected to result in one or more of the following: • Partial loss of target fish or shellfish biological resource (e.g. moderate loss of resource within project area); and • Partial loss of ability to carry on fishing activities (e.g. moderate reduction of fishing effort within project area). (Adverse)
	Impact is expected to result in one or more of the following: • Moderate improvement of resource quality; and • moderate restoration or enhancement of habitats supporting commercial fisheries resources. (Beneficial)
Minor	Impact is of short-term duration (e.g. less than 5 years) and/or is of limited physical extent; And: Impact is expected to result in one or more of the following: • Minor loss of target fish or shellfish biological resource (e.g. minor loss of resource within project area); and • Minor loss of ability to carry on fishing activities (e.g. minor reduction of fishing effort within project area). (Adverse)
	Impact is expected to result in one or more of the following: • Minor benefit to or minor improvement of resource quality; and • Minor restoration or enhancement of habitats supporting commercial fisheries resources. (Beneficial)
Negligible	Impact is of very short-term duration (e.g. less than 2 years) and/or physical extent of impact is negligible; And: Impact is expected to result in one or more of the following: • Slight loss of target fish or shellfish biological resource (e.g. slight loss of resource within project area); and • Slight loss of ability to carry on fishing activities (e.g. slight loss of fishing effort within project area). (Adverse)
	Impact is expected to result in one or more of the following: • Very minor benefit to or very minor improvement of resource quality; and • Very minor restoration or enhancement of habitats supporting commercial fisheries resources. (Beneficial)
No change	No change from baseline conditions.

6.9.2.5 The significance of the effect upon commercial fisheries is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 6.12. Where a range of significance of effect is presented in Table 6.12, the final assessment for each effect is based upon expert judgement.

6.9.2.6 For the purposes of this assessment, any effects with a significance level of minor or less have been concluded to be not significant in terms of the EIA Regulations.

Table 6.12: Matrix used for the assessment of the significance of the effect.

		Magnitude of impact				
Sensitivity		*No change*	*Negligible*	*Minor*	*Moderate*	*Major*
	Negligible	Negligible	Negligible	Negligible or minor	Negligible or minor	Minor
	Low	Negligible	Negligible or minor	Negligible or minor	Minor	Minor or moderate
	Medium	Negligible	Negligible or minor	Minor	Moderate	Moderate or major
	High	Negligible	Minor	Minor or moderate	Moderate or major	Major or substantial
	Very high	Negligible	Minor	Moderate or major	Major or substantial	Substantial

6.10 Measures adopted as part of Hornsea Three

6.10.1.1 As part of the project design process, a number of designed-in measures have been proposed to reduce the potential for impacts on commercial fisheries (see Table 6.13). As there is a commitment to implementing these measures, they are considered inherently part of the design of Hornsea Three and have, therefore, been considered in the assessment presented in section 6.11 below (i.e. the determination of magnitude and therefore significance assumes implementation of these measures). These measures are considered standard industry practice for this type of development.

Table 6.13: Designed-in measures adopted as part of Hornsea Three.

Measures adopted as part of Hornsea Three	Justification
Advance warning and accurate location details of phased construction operations and associated advisory distances.	Ensure sufficient notice for either gear removal and/or avoidance of construction areas.
On-going liaison with all fishing fleets (including regular Notice to Mariners).	Ensure appropriate and proactive communication.
Appropriate marine coordination to ensure risks associated with construction vessels are minimised.	Ensure navigational safety.
Use of guard vessels, where appropriate.	Protect construction activities, provide assistance and communicate information to passing vessels.
Regular Notice to Mariners used to request mariners maintain an advisory safe distance (up to 1,000 m) from construction vessels and its attendant anchor spread and/or anchor handling tugs.	Ensure navigational safety.
Ensure that partially constructed turbines are marked correctly with temporary Aids to Navigation.	Ensure navigational safety.
Extensive promulgation of information to ensure vessels do not pass in close proximity to construction activities by taking them into consideration during their passage planning.	Ensure navigational safety.
A post construction survey to detect any construction debris and subsequent removal where necessary and/or possible.	To determine and remove presence of any construction related debris materials.
Application for and use of the following safety zones: • 500 m safety zones around infrastructure under construction or decommissioning activities or undergoing major maintenance; • 50 m safety zones around incomplete structures at which construction/decommissioning activity may be temporarily paused (and therefore the 500 m safety zone has lapsed); and • 500 m safety zones around manned platforms during operational phase.	Ensure navigational safety.
1,000 m advisory safety distances around vessels undertaking under construction or decommissioning activities or undertaking major maintenance activities.	Ensure navigational safety.
Advance warning and accurate location details of maintenance operations and associated advisory safety zones.	Ensure sufficient notice for either gear removal and/or avoidance of maintenance area.
Adequate navigational markers including lighting, as directed by Trinity House Lighthouse Service (THLS).	Ensure navigational safety.
Notification of all offshore and seabed structures (locations of cables to be disseminated via Kingfisher Information Service - Cable Awareness (KISCA) Charts).	Minimise risk of gear snagging.
Early communication of any incidents to the fishing sector.	Ensure navigational safety.
Location of cable protection provided via Notice to Mariners.	Minimise risk of gear snagging.
Removal of floating turbines from design envelope	Maximise opportunity for co-existence with commercial fisheries.
Develop a fisheries co-existence and liaison plan, which would be produced in collaboration with the NFFO and other fisheries representatives.	Ensure opportunities to fish are maintained where possible.
Prepare a Decommissioning Programme.	Ensure that any in situ hazards to fishing activities are identified and either removed or marked on charts.

6.11 Assessment of significance

6.11.1 Construction phase

6.11.1.1 The impacts of the offshore construction of Hornsea Three have been assessed on commercial fisheries. The potential impacts arising from the construction of Hornsea Three are listed in Table 6.9 along with the maximum design scenario against which each construction phase impact has been assessed.

6.11.1.2 A description of the potential effect on commercial fisheries receptors caused by each identified impact is given below.

Hornsea Three array area construction activities and physical presence of constructed wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds.

6.11.1.3 During construction of the Hornsea Three array area, associated infrastructure and cabling, commercial fisheries will be prevented from fishing where construction activities are taking place (plus 1 km advisory distance around construction work vessels) across an eight year period built in two phases, with a maximum indicative gap between the same component of Hornsea Three in different phases of three years. The total construction duration for the turbines will be 36 months (three years), with a number/range of construction activities being undertaken simultaneously. For example, each turbine with gravity base structure (GBS) foundation would entail up to six days for seabed preparation and up to 3.5 days for installation; with total duration of wind farm turbine installation including GBS foundations of 2.5 years; meaning theoretically, that three to four turbines may be in the process of construction at any one time, as well as other infrastructure and cabling.

Magnitude of impact

6.11.1.4 This impact will lead to a localised loss of access to fishing grounds and the fish resources within these grounds for a range of fishing opportunities during 913 days of construction within the eight year construction period, which will directly affect fleets over a medium-term duration. The impact is predicted to be intermittent with localised exclusion during the two phases of construction i.e., the phased construction results in partial localised loss of grounds over the 913 days of construction within the eight year period; limited to localised exclusion surrounding construction activities.

6.11.1.5 In terms of the area impacted by construction activities, in total a maximum of 32.84 km^2 of seabed will be disturbed during construction, which equates to 4.72 % of the total Hornsea Three array area. In addition, there will be 500 m safety distance around infrastructure under construction (equating to 0.79 km^2 per structure) and 1 km advisory distance around construction vessels (equating to 3.14 km^2 per vessel).

6.11.1.6 The impact is of relevance to international fishing fleets and is described below on a fleet-by-fleet basis.

6.11.1.7 UK demersal trawlers, including otter trawl, beam trawl, pulse trawl and fly shooting (including UK registered/Dutch owned vessels): The Hornsea Three array area overlaps with sole, plaice and *Nephrops* grounds that are routinely targeted by UK demersal trawling vessels. An average annual first sales value of £278,004 landings is taken specifically within Hornsea Three array area by UK vessels (informed from VMS data providing detailed catch value by area).

6.11.1.8 Dutch demersal trawlers, including otter trawl, beam trawl, pulse trawl and fly shooting: The Hornsea Three array area overlaps with sole, plaice and *Nephrops* grounds that are routinely targeted by Dutch demersal trawling vessels. An average annual first sales value of €1 million landings is taken specifically within Hornsea Three array area by Dutch vessels (informed from VMS data providing detailed catch value by area).

6.11.1.9 Belgian demersal trawlers, including otter trawl and beam trawl: The Hornsea Three array area overlaps with sole and plaice grounds that are routinely targeted by Belgian demersal trawling vessels. An average annual first sales value of €300,500 landings is estimated to be taken specifically within the Hornsea Three array area by Belgian vessels (based on the assumption that 41% of effort from within 36F2 to be attributable to Hornsea Three array area).

6.11.1.10 German and French demersal otter trawlers: landing statistics and VMS data indicate that grounds within Hornsea Three array area are occasional targeted, with an estimated annual first sales value of €77,000 for German vessels and €24,600 for French vessels taken specifically within the Hornsea Three array area.

6.11.1.11 Danish sandeel industrial otter trawlers: industry mapping of sandeel grounds within the North Sea indicate a substantial ground located within the Hornsea Three array area (Figure 6.16). However, landing statistics indicate that the Hornsea Three array area study area (36F2) has not been heavily targeted for sandeel for the past five years in comparison to the regional commercial fisheries study area and the wider North Sea. It is understood that effort has been recently focused on the Dogger Bank. The sandeel fishery is highly dependent on recruitment on a year-to-year basis; it is noted that a zero TAC was in place for 2015 due to low stock abundance (ICES, 2015). Sandeel grounds are well established and understood throughout the North Sea and it is reasonable to assume that the sandeel grounds overlapping the Hornsea Three array area could be productive in the future including within the eight year construction period.

6.11.1.12 Danish, UK, French, Swedish and Norwegian vessels deploying pelagic gear, including pelagic (mid-water) otter trawl and purse seine: Hornsea Three array area is understood to be sporadically targeted for pelagic species including: mackerel, herring, sprat, anchovy and boarfish. Highly mobile pelagic species, that move in shoals and are not associated with specific seabed habitats, are assumed to be available to catch across large areas i.e., if a shoal of herring cannot be caught within Hornsea Three array area, this shoal is expected to move to an area where they can be caught. Thereby, while the access to the water column within the Hornsea Three array area may be affected; the opportunity to catch pelagic fish is not lost.

6.11.1.13 UK potters: potting vessels are understood not to operate within Hornsea Three array area, which is supported by landing statistics, VMS data and by virtue of the mobile effort across the array area (which makes co-existence of these gear types challenging).

6.11.1.14 All other EU and Norwegian fleets: VMS and/or landing statistics indicate negligible levels of effort and landings by any other fleets not included above.

6.11.1.15 The impact is predicted to be of regional spatial extent, intermittent, reversible and will affect the receptors directly. It is predicted that the construction impact will be short term (total time for construction is 2.5 years), phased across a medium term duration (eight year period). Fishing may be prevented from up to 4.72% of seabed disturbed during construction of Hornsea Three array area, and from safety zones around localised construction activities.

6.11.1.16 The landings by the UK, Dutch and Belgian demersal trawlers from the Hornsea Three array area are considered important and valuable. However, due to the maximum potential area of loss, short term duration of localised construction activities, two-phased construction program together with the Hornsea Three array area being fishable immediately post-construction, the magnitude is assessed to be minor for UK, Dutch and Belgian demersal trawlers.

6.11.1.17 The magnitude for other fleets is assessed as follows; minor for German, French and Swedish demersal trawlers, due to lower levels of landings; moderate for Danish industrial demersal trawlers, due to significant potential for the sandeel fishery to become productive within the eight year construction period together with the impact of sandwave clearance occurring across sandbanks constituting sandeel grounds; minor for UK, Danish, Norwegian, Swedish and French pelagic trawlers due to the opportunity to catch the same shoaling pelagic fish outside the Hornsea Three array area; negligible for UK potters due to minimal effort in the Hornsea Three array area and negligible for all other fleets.

Sensitivity of the receptor

6.11.1.18 The EU and Norwegian mobile vessels targeting Hornsea are typically > 25 m in length and operate across large areas over the North Sea. Given adequate notification it is expected that these vessels will be in a position to avoid construction areas. All mobile fleets are considered to have a large operational range.

6.11.1.19 The UK, Dutch and Belgian demersal trawling fleets are considered to have moderate levels of alternative fishing grounds; while the French, German and Swedish demersal trawling fleets are considered to have moderate-high levels of alternative grounds, based on their lower dependence on the Hornsea Three array area. The UK, Dutch and Belgian demersal trawling fleets are deemed to be of medium vulnerability, high recoverability and medium value. The sensitivity of the receptor is therefore, considered to be medium. The French, German and Swedish demersal trawling fleets are deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be low.

6.11.1.20 The Danish sandeel industrial otter trawlers are considered to have substantial alternative fishing grounds and be resilient and adaptable to change (e.g. given large fluctuations in TACs). The Danish sandeel industrial otter trawlers are deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be low.

6.11.1.21 All pelagic gear fleets are considered to have an extensive operational range, be highly adaptive and resilient to change. The Danish, UK, French, Swedish and Norwegian fleets deploying pelagic gear are deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be low.

6.11.1.22 The UK potting fleet are typically < 15 m in length and operate across more distinct areas of ground, typically 0 to 6 nm from shore, but also extending from 6 nm. The UK potting fleet are deemed to be of low vulnerability, medium recoverability and low value. The sensitivity of the receptor is therefore, considered to be low.

6.11.1.23 All other EU and Norwegian fleets are deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

6.11.1.24 UK, Dutch and Belgian demersal trawling fleets: overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.25 French, German and Swedish demersal trawling fleets: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.26 The Danish sandeel industrial otter trawling fleet: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be moderate. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.27 Danish, UK, French, Swedish and Norwegian fleets deploying pelagic gear: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.28 UK potting fleet: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be negligible. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.29 All other EU and Norwegian fleets: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be negligible. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

Hornsea Three offshore cable corridor construction activities leading to reduction in access to, or exclusion from established fishing grounds.

6.11.1.30 Fishing activity will be locally and temporarily excluded at the location of construction owing to the presence of construction vessels, construction operations and the need to observe The Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGS).

6.11.1.31 The construction scenario assumes 36 months of construction over a period of eight years, built in two phases. In terms of the area impacted by construction activities, in total 27.54 km^2 of seabed will be disturbed during construction. In addition, an advisory safety distance up to 1 km radius around cable installation vessels active along the Hornsea Three offshore cable corridor, is recommended i.e., a roaming 3.1 km^2 area along the 163 km Hornsea Three offshore cable corridor.

Magnitude of impact

6.11.1.32 This impact will lead to a loss of access to fishing grounds and the fish resources within these grounds for a range of fishing opportunities during the construction activities, which will directly affect fleets over a short-term duration. The impact is predicted to be intermittent with potential resumption of activities between phases of construction. The impact is of relevance to international fishing fleets and is described below on a fleet-by-fleet basis.

6.11.1.33 UK potters: Consultation with North Norfolk fishermen's associations and societies, and the Eastern IFCA indicates the Hornsea Three offshore cable corridor overlaps with fishing ground routinely targeted by potting vessels targeting brown crab and lobster using creels and whelk using pots. Consultation indicates that beach launched vessels tend to target areas from 0 to 3 nm, while harbour based vessels predominately target areas from 3 to 6 nm and further offshore. During the construction process vessels with pots set along the Hornsea Three offshore cable corridor will be required to move these pots and cease fishing activities at particular construction locations. Sufficient notice, together with the support of a guard vessel where appropriate, will be provided to facilitate this process (see Table 6.13).

6.11.1.34 UK and Dutch demersal trawlers, including otter trawl, beam trawl, pulse trawl and fly shooting: VMS and landing statistics indicate low levels of activity by mobile vessels along the offshore cable corridor, with the exception of the funnel shaped area where the offshore cable corridor meets the Hornsea Three array area. This area is routinely fished with an effort proportional to that seen within the Hornsea Three array area.

6.11.1.35 UK beam trawlers targeting shrimp: The Wash is a nationally significant area for the UK brown shrimp fishery, however activity is predominately within ICES rectangles 34F0 and 35F0 (which the Hornsea Three offshore cable corridor does not overlap). Brown shrimp landings from 34F1 have an average annual value of £20,500 (from 2012 to 2016), with minimal landings from 35F1 and none from 36F1 and 36F2. A notable reduction in landings was seen in 2015 when only £650 were landed from 34F1, this is linked to Eastern IFCA management of closed areas to protect designated sites within their jurisdiction.

6.11.1.36 German and French demersal otter trawlers: VMS and landing statistics indicate that grounds within Hornsea Three offshore cable corridor are very occasional fished.

6.11.1.37 Danish sandeel industrial otter trawlers: industry mapping of sandeel grounds within the North Sea indicate an overlap across the offshore cable corridor with four distinct grounds that run in a northwest to southeast orientation (Figure 6.16). As per the description in paragraph 6.11.1.11, sandeel landings have been low over the last five-year period, but could be productive in the future and within the eight year construction period.

6.11.1.38 Danish, UK, French, Swedish and Norwegian vessels deploying pelagic gear, including pelagic (mid-water) otter trawl and purse seine: landing statistics indicate minimal landings of pelagic species from ICES rectangles 34F1, 35F1 and 36F1 (that overlap Hornsea Three offshore cable corridor). As described in paragraph 6.11.1.12, 36F2 is understood to be sporadically targeted for pelagic species including: mackerel, herring, sprat, anchovy and boarfish.

6.11.1.39 All other EU and Norwegian fleets: VMS and landing statistics indicate negligible levels of effort and landings by any other fleets not included above.

6.11.1.40 If the impact is predicted to be of regional spatial extent, short term duration, intermittent and reversible. It is predicted that the impact will affect the receptors directly. The magnitude is therefore, considered to be minor for UK, Dutch and Belgian demersal trawlers; minor for German and French demersal trawlers; minor for Danish industrial demersal trawlers; negligible for UK, Danish, Norwegian, Swedish and French pelagic trawlers; moderate for UK potters and negligible for all other fleets.

Sensitivity of the receptor

6.11.1.41 The EU and Norwegian mobile vessels targeting Hornsea are typically > 25 m in length and operate across large areas over the North Sea. Given adequate notification it is expected that these vessels will be in a position to avoid construction areas. All mobile fleets are considered to have a large operational range.

6.11.1.42 The UK, Dutch, Belgian, French, German and Swedish demersal trawling fleets are considered to have moderate-high levels of alternative grounds, based on their lower dependence on the Hornsea Three offshore cable corridor. The UK, Dutch, Belgian French, German and Swedish demersal trawling fleets are deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be low.

6.11.1.43 The Danish sandeel industrial otter trawlers are considered to have substantial alternative fishing grounds and be resilient and adaptable to change (e.g. given large fluctuations in TACs). The Danish sandeel industrial otter trawlers are deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be low.

6.11.1.44 All pelagic gear fleets are considered to have an extensive operational range, be highly adaptive and resilient to change. The Danish, UK, French, Swedish and Norwegian fleets deploying pelagic gear are deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be low.

6.11.1.45 The UK potting fleet are typically < 15 m in length and operate across more distinct areas of ground, typically 0 to 6 nm from shore, but also extending from 6 nm. The UK potting fleet are deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be medium.

6.11.1.46 The UK beam trawl fleet targeting brown shrimp are typically < 18 m in length and operate across more distinct areas of ground, typically 0 to 6 nm from shore, and predominately in ICES rectangles 34F0 and 35F0, but sometimes extending into 34F1. The UK beam trawl fleet targeting brown shrimp are deemed to be of medium vulnerability, medium recoverability and low value. The sensitivity of the receptor is therefore, considered to be medium.

6.11.1.47 All other EU and Norwegian fleets are deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

6.11.1.48 UK, Dutch, Belgian, French, German and Swedish demersal trawling fleets: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.49 Danish sandeel industrial otter trawling fleet: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.50 Danish, UK, French, Swedish and Norwegian fleets deploying pelagic gear: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be negligible. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

6.11.1.51 UK potting fleet: overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be moderate. The effect will, therefore, be of **moderate** adverse significance, which is significant in EIA terms.

6.11.1.52 UK beam trawling fleet targeting brown shrimp: overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.53 All other EU and Norwegian fleets: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be negligible. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

Further mitigation

6.11.1.54 UK potting fleet: with respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance documents (2014 and 2015), will be followed. Specifically, this will consist of the provision of evidence and data, examples of which include (FLOWW, 2015):

- Copy of certificate of registry for each vessel for which a claim is being made;
- Copy of a valid MCA certification or equivalent;
- Copy of the relevant vessel fishing licenses and entitlements for each vessel for which a claim is being made;
- Sight of vessels fishing charts and GPS plotter records to provide clear historic evidence of potential disruption in the area of the operations;
- Evidence of sales notes where available for an agreed time period;
- Fishing accounts of the vessels concerned for an agreed time period;
- Fishing vessel or and/or fisheries landings data held by fisheries authorities. Due to the requirements of the Data Protection Act, for access to individual records a declaration will need to be completed in order for records to be released.
- It may be appropriate to validate sources of evidence not obtained directly from claimants in order to verify accuracy (for example, transcription errors may exist in official landings data). Similarly, corroboration/validation of evidence provided by claimants may be possible via independent sources such as fishery officers, for example.

6.11.1.55 Through the application of justifiable disturbance payments, the residual effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Displacement from Hornsea Three array area leading to gear conflict and increased fishing pressure on adjacent grounds.

6.11.1.56 Localised exclusion from fishing grounds during phased construction of Hornsea Three array area may lead to temporary increases in fishing effort in other areas that may already be exploited thereby leading to gear conflict and increased fishing pressure on adjacent grounds.

6.11.1.57 In terms of the area impacted by construction activities within the Hornsea Three array area, in total 32.84 km^2 of seabed will be disturbed during construction. In addition, there will be 500 m safety distance around infrastructure under construction (equating to 0.79 km^2 per structure) and 1 km advisory distance around construction vessels (equating to 3.14 km^2 per vessel).

Magnitude of impact

6.11.1.58 The impact is predicted to be of regional spatial extent, medium-term duration, intermittent and with medium reversibility. It is predicted that the impact will affect the receptor directly. The impact is of relevance to international fishing fleets as described below.

6.11.1.59 VMS and surveillance data indicate that there are numerous areas surrounding Hornsea Three array area that are targeted by the same gear types used within Hornsea Three array area (including beam trawl, pulse trawl, demersal otter trawl and fly shooting). Notably a distinct *Nephrops* and mixed demersal fishing ground extends from within the northern border of the Hornsea Three array area to 20 km north of the Hornsea Three array area. Whether or not displaced vessels are likely to disperse into these areas depends on the normal fishing patterns of the fleets targeting the area.

6.11.1.60 The UK and Dutch VMS data show the vast areas targeted by the demersal trawl, beam trawl, pulse trawl and fly shooting fleets, as do the maps of Danish sandeel grounds throughout the North Sea. The beam trawlers, demersal, semi-pelagic and pelagic otter trawlers from all nationalities that operate within the regional commercial fisheries study area, fish throughout the North Sea across a range of established fishing grounds.

6.11.1.61 Conflict over diminished grounds is also likely to be of concern to the UK potting vessels, if displaced vessels operating mobile gear explore grounds traditionally fished by potters. Displacement of mobile gear may therefore increase the risk of interaction with potting grounds and gear. However, potting activity is most prominent in inshore areas (within 12 nm), with little effort in waters adjacent to the Hornsea Three array area.

6.11.1.62 The magnitude of potential increased conflict over alternative fishing grounds during the construction process is considered to be minor for all demersal trawling fishing fleets and UK potting vessels, and negligible for fleets deploying pelagic gear.

Sensitivity of the receptor

6.11.1.63 All mobile commercial fisheries fleets operating within the Hornsea Three array area are considered to have high availability of alternative fishing grounds (including current focus of effort), and an operational range that is not limited to the Hornsea Three array area. All mobile fleets are deemed to be of low vulnerability, high recoverability and medium value. The sensitivity of all mobile fleets is therefore, considered to be low.

6.11.1.64 The UK potting fleet operates across large areas inshore from Hornsea Three array area and across the offshore cable corridor. This form of static fishing gear is considered to be of high vulnerability to gear conflict interactions since it is left unattended on the seabed. It is expected that any displacement from mobile vessels may lead to exploring other fishing grounds outside the Hornsea Three array area, which includes areas currently targeted by potters. The UK potting fleet are deemed to be of high vulnerability, medium recoverability and medium value. The sensitivity of the UK potting fleet is therefore, considered to be medium.

Significance of the effect

6.11.1.65 All mobile fleets deploying demersal trawl gear: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.66 All mobile fleets deploying pelagic gear: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be negligible. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

6.11.1.67 UK potting fleet: overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The effect of mobile gears being displaced into potting ground will, therefore, be of **minor** adverse significance to UK potters, which is not significant in EIA terms.

Displacement from the Hornsea Three offshore cable corridor leading to gear conflict and increased fishing pressure on adjacent grounds.

6.11.1.68 Exclusion from fishing grounds during construction of the offshore cable corridor may lead to temporary increases in fishing effort in other areas that may already be exploited thereby leading to gear conflict.

6.11.1.69 In terms of the area impacted by construction activities, in total 27.54 km^2 of seabed will be disturbed during construction within the Hornsea Three offshore cable corridor. In addition, an advisory safety distance up to 1 km radius around cable installation vessels active along the Hornsea Three offshore cable corridor, is recommended i.e., a roaming 3.1 km^2 area along the 163 km Hornsea Three offshore cable corridor.

Magnitude of impact

6.11.1.70 The impact is predicted to be of regional spatial extent, medium-term duration, intermittent and with medium reversibility. It is predicted that the impact will affect the receptor directly. The impact is of relevance to international fishing fleets as described below.

6.11.1.71 UK potters: The vessels deploying creels and pots across the Hornsea Three offshore cable corridor will be required to temporarily relocate gear to other grounds during the construction process. The density of creels and pots varies significantly along the length of the export cable, increasing from low at the Hornsea Three array area to high in inshore waters, within 1.5 to 3 nm from shore. Vessels deploy between approximately 300 and 3,500 pots. However, it is not likely that all fleets (or creels/pots from one vessel) will overlap the Hornsea Three offshore cable corridor given that a number of fleets of pots and a range of grounds are targeted at any given time. Vessels deploying pots in the North Norfolk area tend to leave their pots on the ground (i.e. do not bring pots back to shore in between fishing trips, with the exception of carrying out gear maintenance on specific pots/stings).

6.11.1.72 Therefore, when considering the impact of potters being displaced into grounds already targeted by potters two scenarios are feasible:

- Alternative fishing grounds are available to relocate gear, in which case gear conflict and displacement effects will be low; or
- Alternative fishing grounds are not available as adjacent areas are already being fished by potters, in which case the gear already on the ground limits the level of displacement. While there remains potential for gear conflicts and increased fishing pressure to arise, appropriately mitigated exclusion impacts will limit this (see paragraph 6.11.1.54).

6.11.1.73 On balance, the displacement effect to UK potters targeting the Hornsea Three offshore cable corridor is considered to have a lower magnitude of impact than the exclusion impact causing the displacement. Taking all of these aspects into consideration, the magnitude of the displacement impact is assessed to be minor for UK potters.

6.11.1.74 For all mobile fleets deploying demersal trawl gear, due to the lower level of activity across the Hornsea Three offshore cable corridor, together with the range of alternative grounds, the magnitude is considered to be minor.

6.11.1.75 For all mobile fleets deploying pelagic trawl gear, the magnitude is considered to be negligible.

Sensitivity of the receptor

6.11.1.76 The sensitivity is as assessed in paragraphs 6.11.1.63 and 6.11.1.64 and considered to be low for all mobile fleets and medium for the UK potting fleet.

Significance of the effect

6.11.1.77 All mobile fleets deploying demersal trawl gear: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.78 All mobile fleets deploying pelagic gear: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be negligible. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

6.11.1.79 UK potting fleet: overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Hornsea Three array area and Hornsea Three offshore cable corridor construction activities leading to displacement or disruption of commercially important fish and shellfish resources.

6.11.1.80 Temporary displacement due to noise and disruption of habitats during construction activities may decrease or displace commercially important fish and shellfish populations from the area. This section assesses the potential temporary knock-on impact for the owners of fishing vessels, where commercially important stocks may be disturbed or displaced to a point where normal fishing practices would be affected.

Magnitude of impact

6.11.1.81 Detailed assessments of the following potential construction impacts have been undertaken in volume 2, chapter 3: Fish and Shellfish Ecology for key commercial species (including brown crab, lobster, *Nephrops*, sandeel and 'other' fish and finfish species such as sole, plaice and whiting):

- Temporary habitat loss/disturbance from construction operations including foundation installation and cable laying operations;
- Increased suspended sediment concentrations as a result of foundation installation, cable installation and seabed preparation resulting in potential effects on fish and shellfish receptors;
- Sediment deposition as a result of foundation installation, cable installation and seabed preparation resulting in potential effects on fish and shellfish receptors; and
- Underwater noise as a result of foundation installation (i.e., piling) and other construction activities (e.g. cable installation) resulting in potential effects on fish and shellfish receptors.

6.11.1.82 With respect to the magnitude of this impact on commercial fisheries, the overall significance of the effect on fish and shellfish species is considered (i.e. both the magnitude and sensitivity of fish and shellfish species are considered to assess the magnitude on commercial fishing fleets). For instance, where an effect of negligible significance is assessed for a species, a negligible magnitude is assessed for commercial fishing; where an effect of minor adverse significance is assessed for a species, a minor magnitude is assessed for commercial fishing, and so on.

6.11.1.83 Details of the fish and shellfish ecology assessment are summarised in Table 6.14 justifications for this assessment will not be repeated in this chapter. Evidence, modelling and justifications for these assessments are provided in volume 2, chapter 3: Fish and Shellfish Ecology.

6.11.1.84 The impact is predicted to be of regional spatial extent, of relevance to international fishing fleets, and of medium-term duration. It is predicted that the impact will affect the receptor directly through loss of resources. The magnitude is therefore considered to be minor for all species and all potential impacts.

Table 6.14: Significance of effects of construction impacts on fish and shellfish ecology.

Potential impact	Species	Significance of effect
Habitat loss/ disturbance	Brown crab and lobster	Minor
	Sandeel and herring	Minor
	All other fish and shellfish species	Minor
Increased suspended sediment concentrations	Brown crab and lobster	Minor
	Nephrops	Minor
	Brown shrimp	Minor
	All other fish and shellfish species	Minor
Sediment deposition	Brown crab and lobster	Minor
	Nephrops	Minor
	Brown shrimp	Minor
	All other fish and shellfish species	Minor
Underwater noise	Shellfish	Minor
	Demersal finfish	Minor
	Pelagic finfish	Minor

Sensitivity of the receptor

6.11.1.85 Exposure to the impact is likely and commercial fleets targeting key species will be affected, including sole, plaice, sandeel, *Nephrops*, brown crab, lobster, whelk and brown shrimp.

6.11.1.86 Due to the locality of the impact on brown crab and lobster, the sensitivity of the UK potting fleet is considered to be medium. This is based on the potential for grounds beyond the immediate construction activities to be affected by increased suspended sediment and sediment deposition, impacting the wider potting fleet.

6.11.1.87 Suspended sediment concentration modelling related to installation of the export cable is presented within volume 2, chapter 3: Fish and Shellfish Ecology, which states that "*finer material will be advected away from the release location by the prevailing tidal current. High initial concentrations (similar to sands and gravels) are to be expected but will be subject to rapid dispersion, both laterally and vertically, to near-background levels (tens of mg/l) within hundreds to a few thousands of metres of the point of release*". Brown shrimp are primarily targeted in the Wash, and also along the North Norfolk coast adjacent to the Wash. Brown shrimp fishing grounds are understood not to overlap with the Hornsea Three offshore cable corridor. Based on these fishing locations, and the rate of dispersion predicted by modelling, it is expected that elevated suspended sediment concentrations and sediment deposition will not impact brown shrimp grounds and therefore the sensitivity of beam trawlers targeting this species is considered to be low.

6.11.1.88 Due to the importance of the *Nephrops* grounds located within the northern border of Hornsea Three array area and extending north, the sensitivity of demersal otter trawlers targeting *Nephrops* is considered to be medium.

6.11.1.89 Due to the range of alternative areas targeted and the distribution of key commercial species throughout the central and southern North Sea the sensitivity of all other fleets is considered to be low.

Significance of the effect

6.11.1.90 Danish sandeel industrial otter trawling fleet: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.91 All mobile demersal otter trawling fleets targeting *Nephrops*: overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.92 All other mobile fleets deploying demersal trawl gear: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.93 All mobile fleets deploying pelagic gear: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.94 UK potting fleet: overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Hornsea Three array area and Hornsea Three offshore cable corridor construction activities leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the array and export cable areas.

6.11.1.95 A detailed Navigational Risk Assessment has been undertaken within volume 2, chapter 7: Shipping and Navigation, which includes full consideration of commercial fishing vessels while transiting (e.g. from a collision and allision perspective). This assessment focuses on the potential impact of longer steaming distances to alternative fishing grounds while construction processes are ongoing.

Magnitude of impact

6.11.1.96 The impact is predicted to be of regional spatial extent, of relevance to international fishing fleets, and of medium-term duration. It is predicted that the impact will affect the receptor directly.

6.11.1.97 The construction programme for the Hornsea Three array area and the offshore cable corridor will be communicated through Notice to Mariners and Kingfisher Bulletins with ample warning provided. A shipping corridor will be maintained (immediately west of the Hornsea Three array area) to allow steaming to grounds north of Hornsea Three (namely to Dogger Bank). Although, it should be noted that commercial fisheries will not be restricted to these lanes. In addition, construction works will only necessitate minor deviations for fishing vessels transiting along the Hornsea Three offshore cable corridor during the construction phase. Localised impacts are anticipated but will be limited to the immediate area of construction activity and associated construction vessels. The magnitude is therefore, considered to be minor for all fishing fleets.

Sensitivity of the receptor

6.11.1.98 The mobile fleets targeting the Hornsea Three array area and the offshore cable corridor are typically > 25 m, operating across large areas of the North Sea. Given adequate notification it is expected that these vessels will be in a position to avoid construction areas with no or minimal impact upon steaming times.

6.11.1.99 The potting fleet targeting the Hornsea Three offshore cable corridor operate across a range of grounds to haul and re-set different fleets of creels/pots on a daily basis. Their normal operating range is expected to extend well beyond the roaming advisory safety distance of 500 m radius that will be requested around large cable installation vessels. Given adequate notification it is expected that these vessels will be in a position to avoid construction areas with no or minimal impact upon steaming times.

6.11.1.100 All commercial fisheries fleets are considered to have high availability of alternative fishing grounds (including the grounds where fishing effort is currently focused throughout the North Sea area), and an operational range that is not limited to the Hornsea Three area. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

6.11.1.101 All commercial fishing fleets: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Increased vessel traffic within fishing grounds as a result of changes to shipping routes and transiting construction vessel traffic from Hornsea Three array area and Hornsea Three offshore cable corridor leading to interference with fishing activity.

6.11.1.102 This assessment focuses on the potential impact of Hornsea Three related vessel traffic and changes to shipping patterns as a result of navigational channels leading to interference with fishing activity (i.e. reduced access) during construction.

Magnitude of impact

6.11.1.103 Vessel movements (i.e. construction vessels transiting to and from areas undergoing construction works) related to the construction of Hornsea Three, the offshore cable corridor and all associated infrastructure will add to the existing level of shipping activity in the area (see volume 2, chapter 7: Shipping and Navigation for a full assessment of additional vessel movements).

6.11.1.104 Based on the extent of fishing currently within the proposed navigation corridor to the west of Hornsea Three array area (based on VMS data from 2011 to 2015) a moderate magnitude of impact is considered for UK, Dutch and Belgian demersal trawlers and Danish sandeel industrial trawlers.

6.11.1.105 The magnitude for fleets deploying pelagic gear is considered negligible, based on the operational range of such large vessels that typically fish for distinct time periods (e.g. a number of weeks) throughout the year. For all other fishing fleets is considered minor due to low levels of activity within the navigation corridor.

Sensitivity of the receptor

6.11.1.106 Construction traffic is likely to constrain most potting activity across established construction supply routes due to the vulnerability of the marker buoys to the propellers of passing construction vessels. The sensitivity of potting is therefore considered to be medium.

6.11.1.107 All other fleets are expected to be in a position to avoid the Hornsea Three area during construction and the sensitivity of all other fleets is considered to be low or negligible.

Significance of the effect

6.11.1.108 UK, Dutch and Belgian demersal trawling fleets: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be moderate. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.109 Danish sandeel industrial otter trawling fleet: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be moderate. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.110 All fleets deploying pelagic gear: overall, the sensitivity of the receptor is considered to be negligible and the magnitude is deemed to be negligible. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

6.11.1.111 UK potting fleet: overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.1.112 All other mobile fleets: overall, the sensitivity of the receptor is considered to be negligible and the magnitude is deemed to be minor. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

6.11.2 Operational and maintenance phase

6.11.2.1 The impacts of the offshore operation and maintenance of Hornsea Three have been assessed on commercial fisheries. The environmental impacts arising from the operation and maintenance of Hornsea Three are listed in Table 6.9 along with the maximum design scenario against which each operation and maintenance phase impact has been assessed.

6.11.2.2 A description of the potential effect on commercial fisheries receptors caused by each identified impact is given below.

Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds.

6.11.2.3 The assessment assumes that commercial fisheries will be prevented from actively fishing within a total area of 9.69 km^2 due to infrastructure within the Hornsea Three array area, including 300 turbines with gravity based structure foundations, together with associated safety zones for manned platforms and maintenance activities and assumed operating distances (full details of the area breakdowns are provided in Table 6.9). Minimum turbine spacing is 1,000 m, including between turbines and all other infrastructure.

6.11.2.4 Out with the area of 9.69 km^2, the assessment assumes that fishing will resume within the Hornsea Three array area where productive grounds can be targeted, with the exception of safety zones around infrastructure undergoing major maintenance and advisory safety distances around vessels undertaking major maintenance activities. In addition, the individual decisions made by skippers with their own perception of risk will determine the likelihood of whether their fishing will resume within the Hornsea Three array area. Inclement weather will be a significant contributor to this risk perception.

Magnitude of impact

6.11.2.5 This impact will lead to localised loss of access to fishing grounds and the fish resources within these grounds for a range of fishing opportunities during the operational and maintenance phase, which will directly affect fleets over a long-term duration. The impact is predicted to be continuous with low reversibility and is of relevance to international fishing fleets.

6.11.2.6 Evidence on the value and importance of the Hornsea Three array area to commercial fishing fleets is the same as that presented for construction in paragraphs 6.11.1.7 to 6.11.1.14.

6.11.2.7 Localised loss of access to fishing grounds from within the Hornsea Three array area amounts to an area of 9.69 km^2 due to infrastructure, safety zones and assumed operational distances (equating to 1.4% of the total Hornsea Three array area), with additional safety zones for infrastructure undergoing major maintenance. Based on the assumption that fishing will resume within the Hornsea Three array area, the magnitude of impact is considered minor for UK, Dutch and Belgian demersal trawlers; minor for German, French and Swedish demersal trawlers; minor for Danish industrial demersal trawlers; minor for UK, Danish, Norwegian, Swedish and French pelagic trawlers; negligible for UK potters and negligible for all other fleets.

Sensitivity of the receptor

6.11.2.8 The sensitivity of the commercial fisheries receptors is the same as that presented for construction in paragraphs 6.11.1.19 to 6.11.1.23, summarised as medium for UK, Dutch and Belgian demersal trawlers (including otter trawl, beam trawl, pulse trawl and fly shooters), and low for all other fleets.

Significance of the effect

6.11.2.9 UK, Dutch and Belgian demersal trawling fleets: overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.2.10 French, German and Swedish demersal trawling fleets: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.2.11 The Danish sandeel industrial otter trawling fleet: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.2.12 Danish, UK, French, Swedish and Norwegian fleets deploying pelagic gear: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.2.13 UK potting fleet: overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be negligible. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.2.14 All other EU and Norwegian fleets: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be negligible. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

Physical presence of offshore export cable and infrastructure within the Hornsea Three offshore cable corridor leading to reduction in access to, or exclusion from established fishing grounds.

6.11.2.15 Temporary 500 m safety zones, that may be established around the HVAC booster stations if major works are required, and advisory safety distances requested around vessels engaged in export cable repair works, could limit fishing opportunities within localised areas.

Magnitude of impact

6.11.2.16 The assessment assumes that fishing will resume within the vicinity of the export cables. Minimum burial depth of the offshore cable is unknown and subject to burial assessment, but it is assumed that where areas of cable protection are not necessary, the cable will be buried to a depth that allows demersal trawling gear to operate.

6.11.2.17 Notices to Mariners will be issued in advance of any maintenance works. Potting vessels may be required to temporarily relocate pots during maintenance works, although such works are likely to be infrequent.

6.11.2.18 The impact is predicted to be of local spatial extent and of short-term duration for the HVAC booster stations and short-term duration for maintenance works that may be required along the Hornsea Three offshore cable corridor. It is predicted that the impact will affect the receptor directly. Given that fishing can resume across the majority of the Hornsea Three offshore cable corridor, the magnitude is considered to be minor for all fishing fleets.

Sensitivity of the receptor

6.11.2.19 The UK potting fleet are typically < 15 m in length and operate across more distinct areas of ground, typically 0 to 6 nm from shore, but also extending from 6 nm. The UK potting fleet are deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be medium.

6.11.2.20 All mobile commercial fisheries fleets are considered to have high availability of alternative fishing grounds (including current focus of effort), and an operational range that is not limited to the Hornsea Three offshore corridor. All commercial fisheries fleets deploying mobile gear are deemed to be of low vulnerability, high recoverability and medium to low value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

6.11.2.21 UK potting fleet: overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.2.22 All other EU and Norwegian fleets: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Displacement from Hornsea Three array area and Hornsea Three offshore cable corridor leading to gear conflict and increased fishing pressure on adjacent grounds.

6.11.2.23 Exclusion from a fishing grounds during operation and maintenance of Hornsea Three may lead to increases in fishing effort in other areas that may already be exploited thereby leading to gear conflict.

Magnitude of impact

6.11.2.24 The magnitude of impact of displacement during the operational and maintenance phase is expected to be the same or similar to that during construction for all commercial fishing fleets deploying mobile demersal or pelagic gear (see paragraphs 6.11.1.58 to 6.11.1.62 and 6.11.1.70 to 6.11.1.75), summarised as minor for all demersal trawlers and negligible for vessels deploying pelagic gear.

6.11.2.25 Given that potting can resume across the Hornsea Three offshore cable corridor, the magnitude for UK potters is considered to be minor.

Sensitivity of the receptor

6.11.2.26 The sensitivity of the commercial fisheries receptors is the same as that presented for construction in paragraphs 6.11.1.63 to 6.11.1.64, summarised as low for all fleets deploying mobile gear and medium for UK potters.

Significance of the effect

6.11.2.27 All mobile fleets deploying demersal trawl gear: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.2.28 All mobile fleets deploying pelagic gear: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be negligible. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

6.11.2.29 UK potting fleet: overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Physical presence of Hornsea Three array area leading to gear snagging.

6.11.2.30 The array cables, interconnector cables, export cables and associated cable protection, together with any structures on the seabed represent potential snagging points for fishing gear and could lead to damage to, or loss of, fishing gear. The safety aspects including potential loss of life as a result of snagging risk are assessed within volume 2, chapter 7: Shipping and Navigation.

Magnitude of impact

6.11.2.31 In the instance that snagging does occur, the developer would work to the protocols laid out within the guidance by the FLOWW group and 'Recommendations For Fisheries Liaison: Best Practice' guidance for offshore renewable developers, in particular section 9: Dealing with claims for loss or damage of gear (FLOWW, 2006 and 2014; BERR, 2008).

6.11.2.32 Snagging poses a risk to fishing equipment and in extreme cases may potentially lead to capsize of vessel and crew fatalities, as well as damage to subsea infrastructure. Three phases of interaction are possible: initial impact of gear and subsea infrastructure; pullover of gear across subsea infrastructure; and snagging or hooking of gear on the subsea infrastructure. The snagging or hooking of fishing gear with infrastructure/cables on the seabed is the most hazardous to the vessel and crew due to the possibility of capsize.

6.11.2.33 It is considered likely that fishermen would operate appropriately given adequate notification of the locations of any snagging hazards; and are highly likely to avoid the Hornsea Three array area infrastructure and cable protection. For this reason, the magnitude of gear snagging is considered to be minor.

6.11.2.34 The UK potting fleet has minimal effort within the Hornsea Three array area and therefore the magnitude to this fleet is considered negligible.

Sensitivity of the receptor

6.11.2.35 Due to the nature and operation of mobile trawling gear (i.e., it is actively towed and demersal gear directly penetrates the seabed with near continuous contact) there is increased vulnerability to this impact and the sensitivity is therefore considered to be medium for demersal and pelagic fleets.

6.11.2.36 UK potters show a low vulnerability as the gear is placed, not towed and is less likely to penetrate the seabed. The sensitivity of UK potters is considered to be low.

Significance of the effect

6.11.2.37 All mobile fleets deploying pelagic and demersal gear: overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.2.38 UK potting fleet: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be negligible. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

Physical presence of the export cable and associated infrastructure leading to gear snagging.

Magnitude of impact

6.11.2.39 Based on the measures that will be implemented as part of the project and the commitment to follow standard protocols should snagging occur (see Table 6.13), the magnitude is considered to be negligible for fleets deploying pelagic gear and minor for all other fishing fleets.

Sensitivity of the receptor

6.11.2.40 Due to the nature and operation of mobile demersal trawling gear (i.e. it is actively towed and directly penetrates with near continuous contact with the seabed) there is high vulnerability to this impact and the sensitivity is therefore considered to be medium.

6.11.2.41 Fleets deploying pelagic gear have a low vulnerability, as the gear does not normally touch the seabed, as fishing takes place in the water column. The sensitivity of pelagic fleets is considered to be low.

6.11.2.42 UK potters show a low vulnerability as the gear is placed, not towed and is less likely to penetrate the seabed. The sensitivity of UK potters is considered to be low.

Significance of the effect

6.11.2.43 All mobile fleets deploying demersal gear: overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.11.2.44 All mobile fleets deploying pelagic gear: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be negligible. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

6.11.2.45 UK potting fleet: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Electromagnetic fields, habitat alteration, noise and other ecological impacts due to operational and maintenance activities leading to displacement or disruption of commercially important fish and shellfish resources.

6.11.2.46 Displacement or disturbance of commercially important fish and shellfish resources may occur during the operational phase due to a range of impacts brought on by the physical presence and operation of the project, including long-term habitat alterations and potential EMF effects.

6.11.2.47 Long-term changes to benthic habitat due to rock protection at certain locations along the Hornsea Three offshore cable corridor, cables within the Hornsea Three array area and turbine foundations may affect spawning and nursery grounds, most notably for demersal spawners.

6.11.2.48 Other ecological effects, such as the creation of artificial habitat and the potential for the Hornsea Three array area to act as a refuge for commercially important fish and shellfish species, are considered within the assessment carried out in volume 2, chapter 3: Fish and Shellfish Ecology.

Magnitude of impact

6.11.2.49 A detailed assessment of EMF interactions with fish and shellfish is presented within volume 2, chapter 3: Fish and Shellfish Ecology.

6.11.2.50 As described in volume 2, chapter 3: Fish and Shellfish Ecology, EMF during operation would be mitigated by use of armoured cable for array, interconnector cables and export cables buried at a sufficient depth to reduce the potential impact of EMF on fish and shellfish.

6.11.2.51 With the exception of elasmobranchs, no experiments have highlighted significant concerns and the magnitude of impact of EMFs is generally considered to be low for most marine organisms (Switzer and Meggitt, 2010; Polagye, *et al*., 2011). Evidence from post construction surveys of Round 1 wind farms (Kentish Flats, Lynn and Inner Dowsing, Burbo Bank and Barrow) show no significant effects to fish populations as a result of EMF.

6.11.2.52 Elasmobranchs do not form a targeted fishery in this area, and are not taken in significant quantities as retained species by the fleets in operation across the Hornsea Three offshore cable corridor or Hornsea Three array area.

6.11.2.53 Another industry concern raised was the potential for an increase in ray abundance due to attraction to EMF leading to increased predation on juvenile crab and lobster. Volume 2, chapter 3: Fish and Shellfish Ecology reviews research into responses of some ray individuals, which suggest greater searching effort when cables are switched on, although responses were not predictable and did not always occur (Gill *et al.*, 2009).

6.11.2.54 The permanent habitat loss due to the installation of foundations, scour protection and cable protection leads to the loss of seabed habitats during the operation of Hornsea Three array area will result in a reduction of potential spawning habitat available to a number of commercial species including, sole, plaice, sandeel, mackerel and cod. The breakdown of potential habitat lost per species is presented in volume 2, chapter 3: Fish and Shellfish Ecology, together with a full assessment of this impact.

6.11.2.55 The magnitude of disruption or displacement of commercially important species during operation is considered to be minor.

Sensitivity of the receptor

6.11.2.56 For UK potters the sensitivity is considered to be medium, based on their reliance on grounds across the offshore cable corridor. The sensitivity of all other fleets to the displacement of resources is considered low, based on the range of alternative areas available and the distribution of key commercial species throughout the central and southern North Sea.

Significance of the effect

6.11.2.57 All mobile fleets: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be negligible. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

6.11.2.58 UK potting fleet: overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Physical presence of the Hornsea Three array area and export cable leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the Hornsea Three array area and offshore cable corridor.

6.11.2.59 A detailed Navigational Risk Assessment has been undertaken within volume 2, chapter 7: Shipping and Navigation, which includes full consideration of commercial fishing vessels while transiting (e.g. from a collision and allision perspective). This assessment focuses on the potential impact of longer steaming distances to alternative fishing grounds during operation and maintenance.

Magnitude of impact

6.11.2.60 The impact is predicted to be of regional spatial extent, of relevance to international fishing fleets, and of long-term duration. It is predicted that the impact will affect the receptor directly.

6.11.2.61 During the operation and maintenance phase, it is expected that fishing will resume across the Hornsea Three array area and offshore cable corridor and, as such, additional steaming will not be necessary. A shipping corridor will be maintained (immediately west of Hornsea Three array area) to allow steaming to grounds north of Hornsea Three (namely to Dogger Bank). Although, it should be noted that commercial fisheries will not be restricted to these lanes. The magnitude is therefore, considered to be negligible for all fishing fleets.

Sensitivity of the receptor

6.11.2.62 The sensitivity of commercial fishing fleets to this impact is expected to be the same or similar to that for construction (see paragraph 6.11.1.98 to 6.11.1.100) and is low for all fleets.

Significance of the effect

6.11.2.63 All commercial fishing fleets: overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be negligible. The effect will, therefore, be **negligible**, which is not significant in EIA terms.

Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic from Hornsea Three array area and Hornsea Three offshore cable corridor infrastructure leading to interference with fishing activity.

6.11.2.64 The effects of the operational and maintenance phase are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor** adverse for the following fleets: UK, Dutch and Belgian, demersal trawl fleets, UK potting fleet and Danish sandeel trawling fleet, which is not significant in EIA terms, and **negligible** for pelagic fleets and for all other commercial fishing fleets (see paragraph 6.11.1.102 to 6.11.1.112), which is not significant in EIA terms.

6.11.3 Decommissioning phase

6.11.3.1 The impacts of the offshore decommissioning of Hornsea Three have been assessed on commercial fisheries. The environmental effects arising from the decommissioning of Hornsea Three are listed in Table 6.9 along with the maximum design scenario against which each decommissioning phase impact has been assessed.

6.11.3.2 A description of the potential effect on commercial fisheries receptors caused by each identified impact is given below.

Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds.

6.11.3.3 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor** adverse for the following fleets: UK, Dutch, Belgian, French, German and Swedish demersal trawl fleets, UK, Danish, Norwegian, Swedish and French pelagic fleets, UK potting fleet and Danish sandeel trawling fleet, which is not significant in EIA terms, and **negligible** for all other commercial fishing fleets (see paragraph 6.11.1.3 to 6.11.1.29), which is not significant in EIA terms.

Hornsea Three offshore export cable decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds.

6.11.3.4 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **moderate** adverse for the UK potting fleet, which is significant in EIA terms, **minor** adverse for the following fleets: UK, Dutch, Belgian, French, German and Swedish demersal trawl fleets, UK beam trawling fleet and Danish sandeel trawling fleet, which is not significant in EIA terms, and **negligible** for pelagic fleets and for all other commercial fishing fleets (see paragraph 6.11.1.30 to 6.11.1.53), which is not significant in EIA terms.

Further mitigation

6.11.3.5 UK potting fleet: with respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance documents (2014 and 2015), will be followed as described in paragraph 6.11.1.54. The residual effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Displacement from Hornsea Three array area leading to gear conflict and increased fishing pressure on adjacent grounds.

6.11.3.6 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor** adverse for the UK potting fleet, negligible for pelagic fleets and minor for all other commercial fishing fleets (see paragraph 6.11.1.56 to 6.11.1.67), which is not significant in EIA terms.

Displacement from the Hornsea Three offshore cable corridor leading to gear conflict and increased fishing pressure on adjacent grounds.

6.11.3.7 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor** adverse for the UK potting fleet, which is not significant in EIA terms, and **negligible** for pelagic fleets and **minor** adverse for all other commercial fishing fleets (see paragraph 6.11.1.68 to 6.11.1.79), which is not significant in EIA terms.

Decommissioning activities leading to displacement or disruption of commercially important fish and shellfish resources.

6.11.3.8 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is **minor** adverse for all commercial fishing fleets (see paragraph 6.11.1.80 to 6.11.1.94), which is not significant in EIA terms.

Decommissioning activities leading to longer steaming distances to alternative fishing grounds.

6.11.3.9 The effects of the decommissioning phase are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor** adverse for all commercial fishing fleets (see paragraph 6.11.1.95 to 6.11.1.101), which is not significant in EIA terms.

Increased vessel traffic, including Hornsea Three array area related and changes in shipping routes, leading to interference with fishing activity.

6.11.3.10 The effects of the operational and maintenance phase are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor** adverse for the following fleets: UK, Dutch and Belgian, demersal trawl fleets, UK potting fleet and Danish sandeel trawling fleet, which is not significant in EIA terms, and **negligible** for pelagic fleets and for all other commercial fishing fleets (see paragraph 6.11.1.102 to 6.11.1.112), which is not significant in EIA terms.

Physical presence of any infrastructure left in situ leading to gear snagging.

6.11.3.11 The effects of decommissioning activities are expected to be the same or similar to the effects from operation phase of the offshore cable corridor. The significance of effect is **negligible** for pelagic fleets and **minor** adverse for all other commercial fishing fleets (see paragraph 6.11.2.39 to 6.11.2.45), which is not significant in EIA terms.

6.12 Cumulative Effect Assessment methodology

6.12.1 Screening of other projects and plans into the Cumulative Effect Assessment

6.12.1.1 The CEA takes into account the impact associated with Hornsea Three together with other projects and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise undertaken as part of the 'CEA long list' of projects (see volume 4, annex 5.3: Cumulative Effects Screening Matrix). Each project on the CEA long list has been considered on a case-by-case basis for scoping in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

6.12.1.2 In undertaking the CEA for Hornsea Three, it is important to bear in mind that other projects and plans under consideration will have differing potential for proceeding to an operational stage and hence a differing potential to ultimately contribute to a cumulative impact alongside Hornsea Three. For example, relevant projects and plans that are already under construction are likely to contribute to cumulative impact with Hornsea Three (providing effect or spatial pathways exist), whereas projects and plans not yet approved or not yet submitted are less certain to contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors. For this reason, all relevant projects and plans considered cumulatively alongside Hornsea Three have been allocated into 'Tiers', reflecting their current stage within the planning and development process. This allows the CEA to present several future development scenarios, each with a differing potential for being ultimately built out. Appropriate weight may therefore be given to each Tier in the decision making process when considering the potential cumulative impact associated with Hornsea Three (e.g. it may be considered that greater weight can be placed on the Tier 1 assessment relative to Tier 2). An explanation of each tier is included below:

- Tier 1: Hornsea Three considered alongside:
    - Other project/plans currently under construction; and/or
    - Those with consent, and, where applicable (i.e. for low carbon electricity generation projects), that have been awarded a Contract for Difference (CfD) but have not yet been implemented; and/or
    - Those currently operational that were not operational when baseline data was collected, and/or those that are operational but have an on-going impact.
- Tier 2: All projects/plans considered in Tier 1, as well as:
    - Those project/plans that have consent but, where relevant (i.e. for low carbon electricity generation projects) have no CfD; and/or
    - Submitted but not yet determined.

- Tier 3: All projects/plans considered in Tier 2, as well as those on relevant plans and programmes likely to come forward but have not yet submitted an application for consent (the PINS programme of projects and the adopted development plan including supplementary planning documents are the most relevant sources of information, along with information from the relevant planning authorities regarding planned major works being consulted upon, but not yet the subject of a consent application). Specifically, this Tier includes all projects where the developer has advised PINS in writing that they intend to submit an application in the future, those projects where a Scoping Report is available and/or those projects which have published a PEIR.

6.12.1.3 It is noted that offshore wind farms seek consent for a maximum design scenario and the 'as built' offshore wind farm will be selected from the range of consented scenarios. In addition, the maximum design scenario quoted in the application (and the associated Environmental Statement) are often refined during the determination period of the application. For example, it is noted that the Applicant for Hornsea Project One considered a maximum of turbines 332 turbines within the Environmental Statement, but has gained consent for 240 turbines. In addition, it is now known that Hornsea Project One 'as built' will consist of 174 turbines. Similarly, Hornsea Project Two has gained consent for an overall maximum number of turbines of 300, as opposed to 360 considered in the Environmental Statement and the as built number of turbines is likely to be less than this. A similar pattern of reduction in the project envelope from that assessed in the Environmental Statement, to the consented envelope and the 'as built' project is also seen across other offshore wind farms of relevance to this CEA. This process of refinement can result in a reduction to associated project parameters, for example the number and length of cable to be installed and the number of offshore substations. The CEA presented in this chapter has been undertaken on the basis of information presented in the Environmental Statements for the other projects, plans and activities. Given that this broadly represents a maximum design scenario, the level of cumulative impact on commercial fisheries would highly likely be reduced from those presented here.

6.12.1.4 The specific projects scoped into this CEA and the tiers into which they have been allocated, are outlined in Table 6.15. The projects included as operational in this assessment have been commissioned since the baseline studies for Hornsea Three were undertaken and as such were excluded from the baseline assessment. The projects included in Tiers 1, 2 and 3 are depicted graphically in Figure 6.23 to Figure 6.26.

6.12.1.5 As described in paragraph 6.9.1.2, the framework of legislation that commercial fisheries operate under shapes the baseline activity that is presented in section 6.7 and volume 5, annex 6.1: Commercial Fisheries Technical Report.

6.12.1.6 Other new legislation being introduced could form a cumulative effect to commercial fisheries. This is the reason that designated sites are considered a project or plan in the context of commercial fisheries i.e., because management implemented to protect designated features may lead to reduced access for commercial fisheries, amongst other impacts.

6.12.1.7 A key element of the 2013 reformed Common Fisheries Policy is the progressive elimination of discards in EU fisheries through the introduction of a landing obligation. The landing obligation requires all catches of regulated commercial species on-board to be landed and counted against TACs and quota.

6.12.1.8 Pelagic species were subject to the landing objective from January 2015. Phased implementation for demersal species occurred from January 2016, with statutory guidance provided to fishers from October 2015. Sole, plaice, *Nephrops*, and haddock (as well as other species) landed from the North Sea by demersal trawl, seine and beam trawl were included in the landing obligation in 2016. It is therefore considered that the effects of the landing objective for the fisheries included in this assessment are captured within the baseline characterisation and the landing objective is therefore not included as a plan or project within the CEA.

6.12.2 Maximum design scenario

6.12.2.1 The maximum design scenarios identified in Table 6.16 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. The cumulative impacts presented and assessed in this section have been selected from the details provided in the Hornsea Three project description (volume 1, chapter 3: Project Description), as well as the information available on other projects and plans, in order to inform a 'maximum design scenario'. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the project Design Envelope (e.g. different turbine size), to that assessed here be taken forward in the final design scheme.

Table 6.15: List of other projects and plans considered within the CEA.

Tier	Phase	Project/Plan	Distance from Hornsea Three array area	Distance from Hornsea Three offshore cable corridor	Details	Date of Construction (if applicable)	Overlap of construction phase with Hornsea Three construction phase	Overlap of operation phase with Hornsea Three operation phase
1	*Offshore wind farms*							
	Approved, Consented (with a Contract for Difference (CfD)), or being Constructed or in Operation and Maintenance phase or being Decommissioned	Belgium: Norther, Rentel Area A, Seastar Denmark: Horns Rev 3, Vesterhavet Nord, Vesterhavet Syd Germany: Albatros, Borkum Riffgrund 2, Demonstrationsprojekt Albatros 1, Deutsche Bucht Offshore Wind Farm, Kaikas, MEG Offshore I (now Merkur Offshore Wind Farm), Noerdlicher Grund, Nordergruende, OWP Delta Nordsee 1, OWP Delta Nordsee 2, OWP West, Petrel, Sandbank 24, Trianel Windpark Borkum (Borkum West II) Phase 2 Netherlands: Borssele 1 and 2, Borssele 3 and 4, Irene Vorrink I, Irene Vorrink II, Leeghwater - Turbine Demonstration Facility. UK: European Offshore Wind Deployment Centre, Blyth Demo, Dudgeon, East Anglia ONE, Galloper, Hornsea Project One, Hornsea Project Two, Hywind Scotland Pilot Park, Inch Cape, Neart na Gaoithe, Race Bank, Rampion Wind Farm, Scroby Sands, SeaGreen Alpha, SeaGreen Bravo, Triton Knoll.	7 to 448 km	7 to 472 km	Capacity up to 15.4 GW	-	Yes	No: for Irene Vorrink I & II, Scroby Sands Yes: for all others
	Oil and gas infrastructure							
	Decommissioning (currently active or abandoned, with decommissioning planned)	UK: Viking Charlie Drilling, Viking Delta Drilling, Leman Bh, Thames Ar, Viking Echo Drilling, Viking Golf Drilling, Viking Hotel Drilling, Viking Ed	33 to 79 km	11 to 56 km	Gas and oil fields where decommissioning is planned	-	Yes	No
	Pipelines							
	Decommissioning (currently active, with decommissioning planned)	UK: PL370 - Bacton to Thames, PL496, PL497, PL723, PL724, PL575 and PL576.	13 to 70 km	8 to 56 km	Pipelines where decommissioning is planned	-	Yes	No
	Marine designations and protected areas							
	Designated	60 UK designated MCZs of total area 20,450 km^2 7 UK Sites of Community Importance (SCIs) with marine components, of total area 16,032 km^2 25 UK SACs with marine components, of total area 10,736 km^2 51 SPAs with marine components, of total area 6,803 km^2	12 km	0 km	Nature designated areas within the North Sea and English Channel	-	Yes	Yes
	Coastal developments							
	Approved	UK: Aggregate Dredging in North Sea, Maintenance Dredged Material Disposal, Aggregate Dredging in North Sea	144 to 287 km	63 to 193 km	Approved dredging applications	-	Yes	Yes

Tier	Phase	Project/Plan	Distance from Hornsea Three array area	Distance from Hornsea Three offshore cable corridor	Details	Date of Construction (if applicable)	Overlap of construction phase with Hornsea Three construction phase	Overlap of operation phase with Hornsea Three operation phase
2	*Offshore wind farms*							
	Consented (but with no CfD) or application submitted	UK: Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A, Dogger Bank Teesside B (now known as Sofia Offshore Wind Farm), East Anglia Three Germany: Aiolos, AreaC I, AreaC II, AreaC III, Austerngrund, Bight Power I, Kaskasi II, PNE Atlantis I, Sandbank Extension Netherlands: Windpark Fryslan	76 to 331 km	87 to 345 km	Capacity up to 10.4 GW	-	Yes	Yes
	Marine designations and protected areas							
	Recommended, potential or candidate designations	58 UK recommended MCZs of total area 18,394 km^2 1 English candidate SAC of total area 36,950 km^2 8 English potential SPAs of total area 5,771 km^2	0 km	0 km	Recommended, potential or candidate designations within the North Sea and English Channel	-	Yes	Yes
3	*Offshore wind farms*							
	Planned, pre-scoping and/or pre-planning.	Belgium: Northwester 2 Denmark: Nissum Bredning France: Le Treport Germany: Borkum-Riffgrund West II, Concordia I, Concordia II, Diamant, Horizont I, Horizont II, Horizont III, Horizont IV, Meerwind West, Nautilus I, Nemo, Neptune III, Nord-Ost Passat I, Nord-Ost Passat II, Nord-Ost Passat III, PNE Atlantis II, PNE Atlantis III, Prowind I, Seagull, SeaStorm I, SeaStorm II, SeaWind III, SeaWind IV, Skua, Witte Bank Netherlands: Zeeuws Offshore Wind Project UK: East Anglia One North, East Anglia TWO, Hornsea Project Four, Kincardine Offshore Wind Farm, Methil Demonstration Project - 2B Energy, Norfolk Boreas, Norfolk Vanguard, Seagreen Charlie, Seagreen Delta, Seagreen Echo, Seagreen Foxtrot, Seagreen Golf, Thanet Extension	36 to 461 km	47 to 485 km	Capacity up to 24 GW	-	Yes	Yes
	Pipelines and/or interconnectors							
	Proposed	Viking Link Interconnector	13 km	18 km	High voltage (up to 500 kV) Direct Current (DC) electricity interconnector	2019 to 2022	Yes	Yes
	Coastal developments							
	Application	Maintenance dredgings from the ports of Harwich and Felixstowe and associated navigation channels, Harwich Haven Outer Channel The Quay Harwich Essex	230 km	113 km	Renewed consent to dispose of maintenance dredgings	-	Yes	No

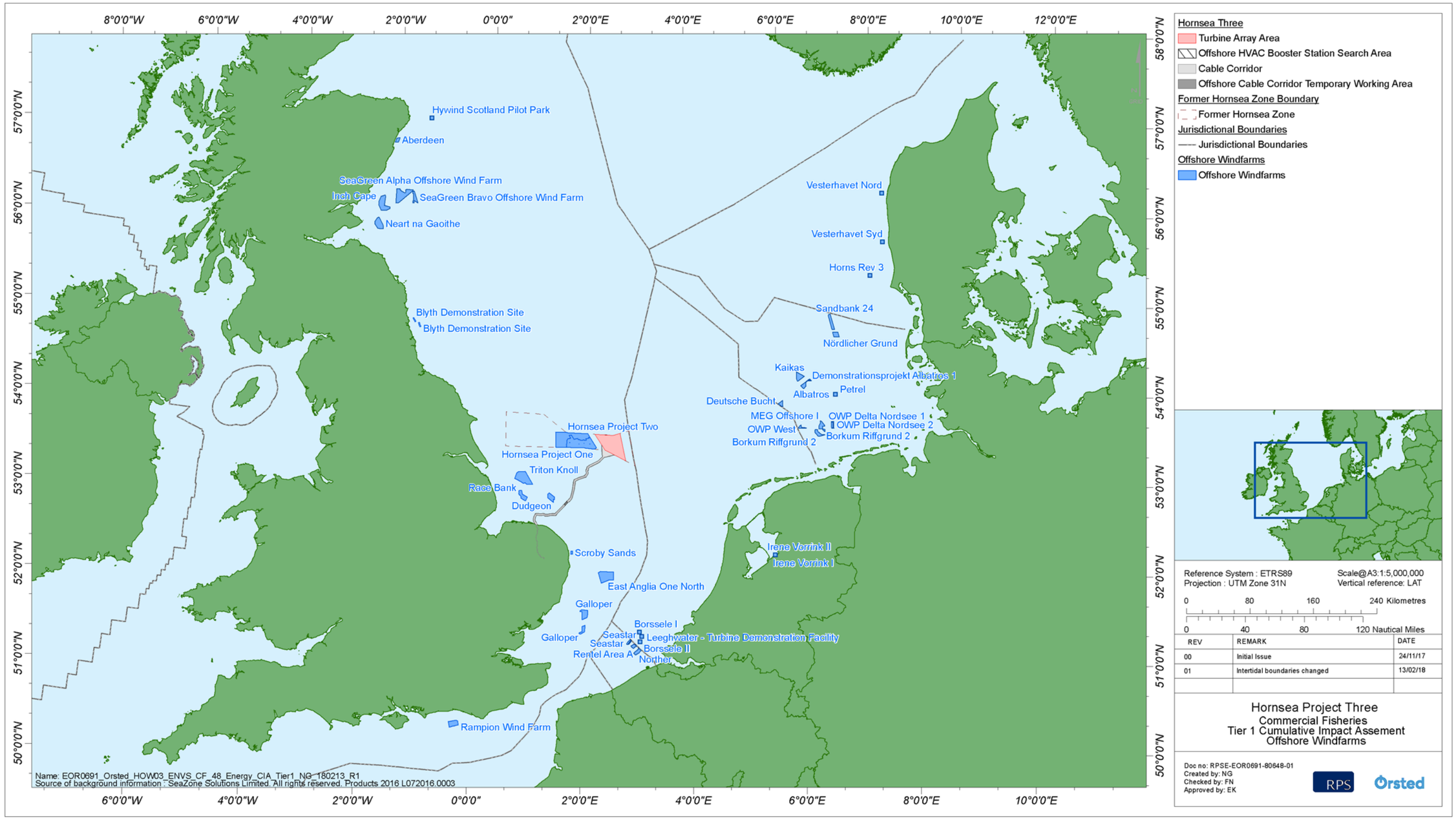

Figure 6.23: Offshore renewable energy projects included in the Tier 1 cumulative effects assessment.

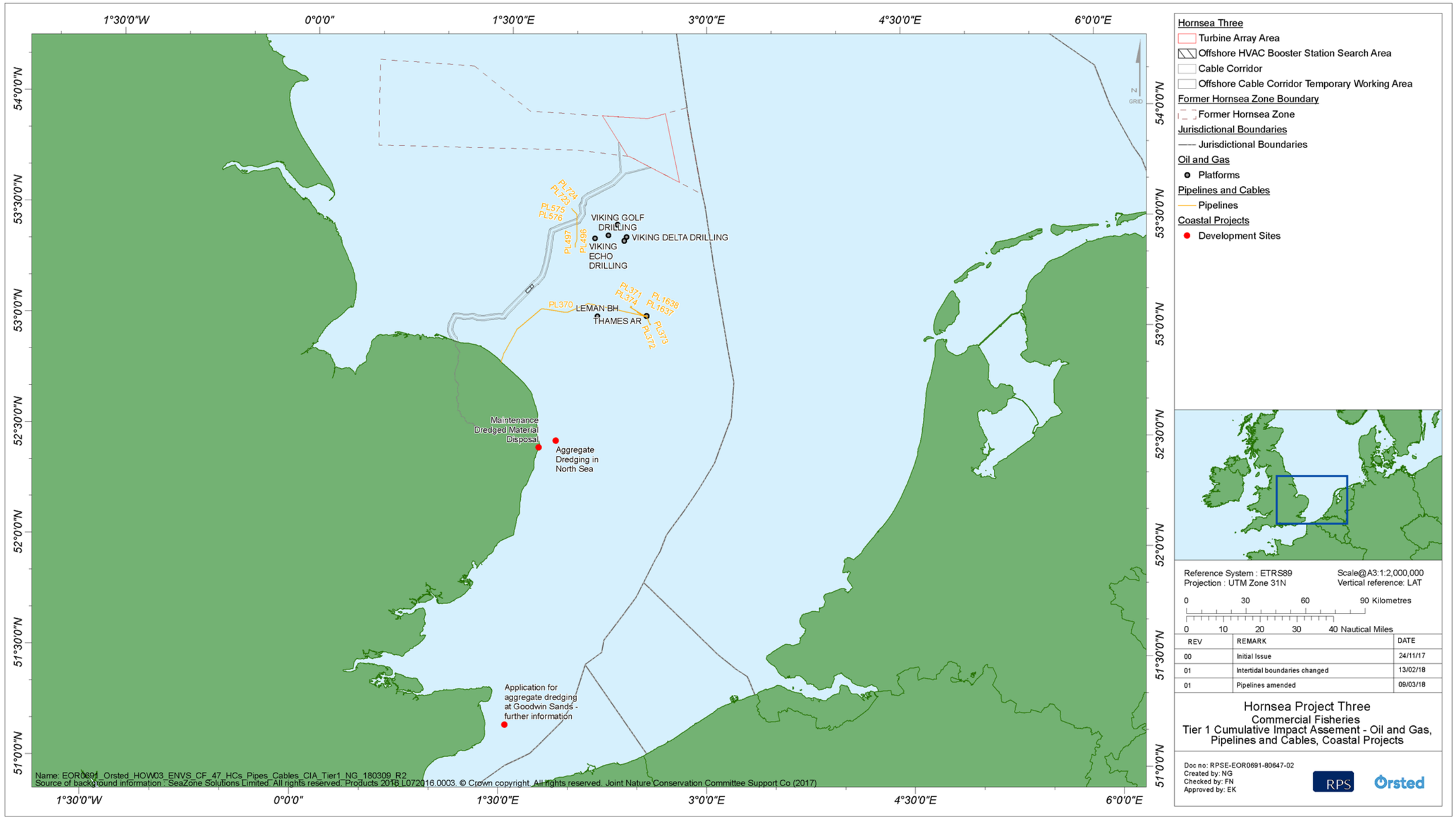

Figure 6.24: Oil and gas, cables and pipeline projects included in the Tier 1 cumulative effects assessment.

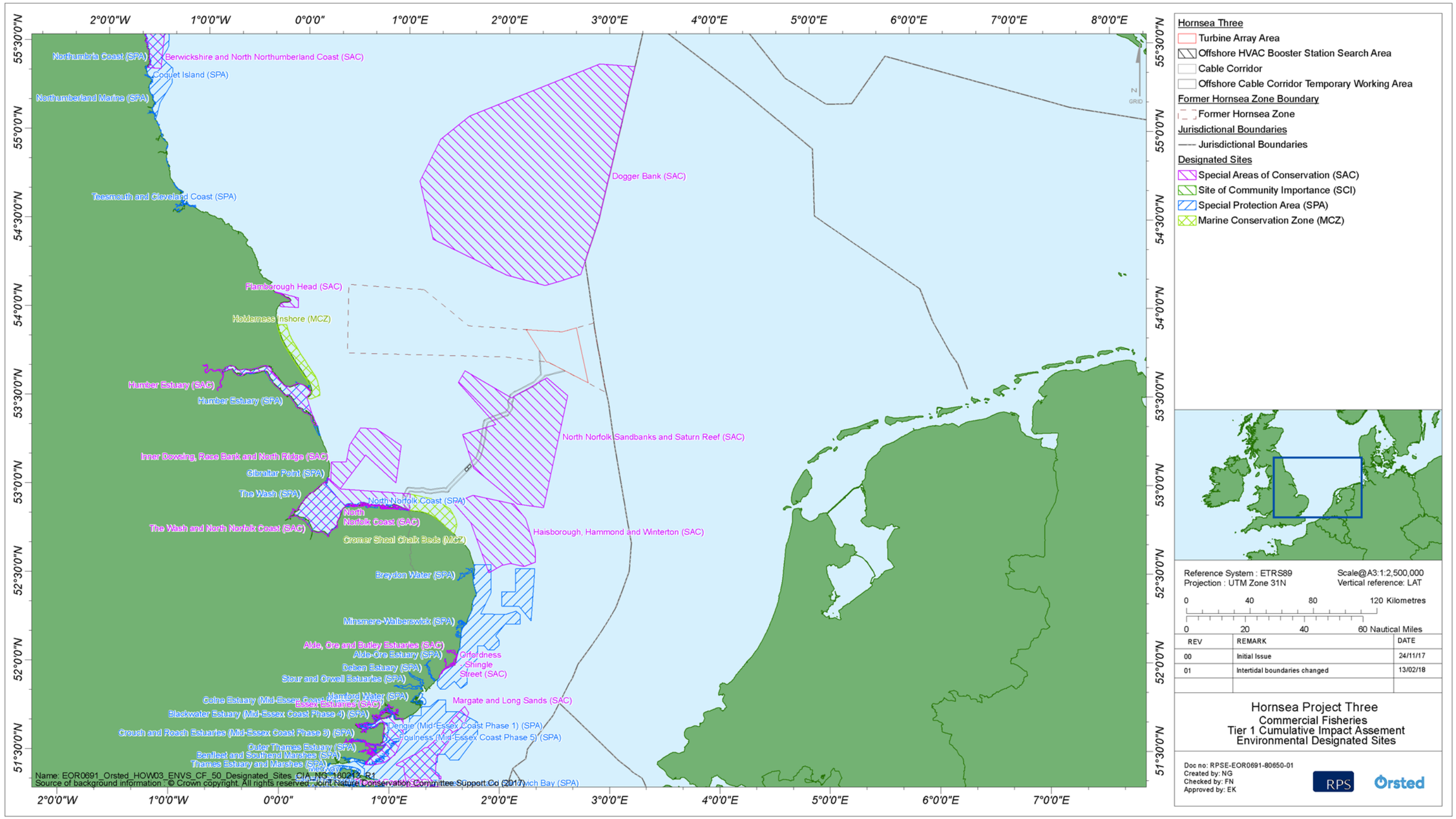

Figure 6.25: Marine designations included in the Tier 1 cumulative effects assessment.

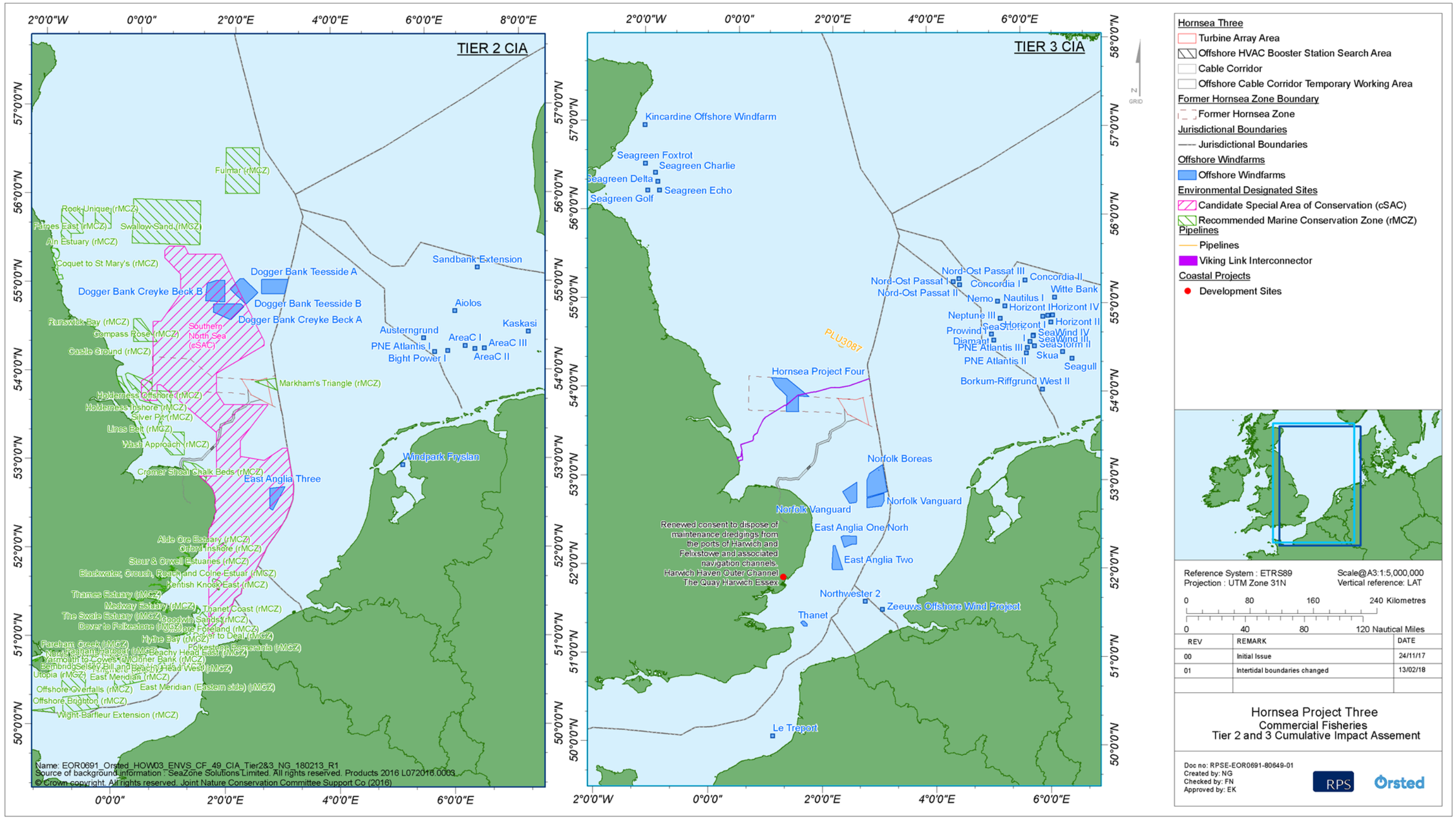

Figure 6.26: Projects included in the Tier 2 and Tier 3 cumulative effects assessments.

Table 6.16: Maximum design scenario considered for the assessment of potential cumulative impacts on commercial fisheries.

Potential impact	Maximum design scenario	Justification
Construction phase		
Cumulative effects of reduction in access to, or exclusion from, potential and/or established fishing grounds. Cumulative effects of displacement leading to gear conflict and increased fishing pressure on alternative grounds. Cumulative effects of longer steaming distances to alternative fishing grounds. Cumulative effects of changes in shipping routes, leading to interference with fishing activity.	Tier 1 • 45 offshore wind farm developments of potential combined capacity of 26 GW within the following EEZs: UK: 18, Germany: 14, Netherlands: seven, Denmark:three, Belgium: three. • Eight oil and gas platforms with decommissioning activities expected. • Nine pipelines in UK EEZ, currently active with decommissioning planned. • 60 UK designated MCZs of total area 20,450 km^2 • Seven UK SCIs with marine components, of total area 16,032 km^2 • 25 UK SACs with marine components, of total area 10,736 km^2 • 51 SPAs with marine components, of total area 6,803 km^2 • Four UK aggregate dredging developments. Tier 2 • 15 offshore wind farm developments of potential combined capacity of 10.4 GW within the following EEZs: UK: five, Germany: nine, Netherlands: one. • 58 UK recommended MCZs of total area 18,394 km^2 • One English candidate SAC of total area 36,950 km^2 • Eight English potential SPAs of total area 5,771 km^2 Tier 3 • 42 offshore wind farm developments of potential combined capacity of 24 GW within the following EEZs: UK: 13, Germany: 25, Netherlands: one, Denmark: one, Belgium: one, France: one. • One UK aggregate dredging development • One interconnector in UK EEZ.	Outcome of the CEA will be greatest when the greatest number of other schemes, present or planned, are considered.
Operation phase		
Cumulative effects of reduction in access to, or exclusion from, potential and/or established fishing grounds. Cumulative effects of displacement leading to gear conflict and increased fishing pressure on alternative grounds. Cumulative effects of longer steaming distances to alternative fishing grounds. Cumulative effects of changes in shipping routes, leading to interference with fishing activity.	Tier 1 • 42 offshore wind farm developments of potential combined capacity of 25.9 GW within the following EEZs: UK: 17, Germany: 14, Netherlands: five, Denmark:three, Belgium: three. • 60 UK designated MCZs of total area 20,450 km^2 • Seven UK SCIs with marine components, of total area 16,032 km^2 • 25 UK SACs with marine components, of total area 10,736 km^2 • 51 SPAs with marine components, of total area 6,803 km^2 • Four UK aggregate dredging developments. Tier 2 • 15 offshore wind farm developments of potential combined capacity of 10.4 GW within the following EEZs: UK: five, Germany: nine, Netherlands: one. • 58 UK recommended MCZs of total area 18,394 km^2 • One English candidate SAC of total area 36,950 km^2 • Eight English potential SPAs of total area 5,771 km^2 Tier 3 • 42 offshore wind farm developments of potential combined capacity of 24 GW within the following EEZs: UK: 13, Germany: 25, Netherlands: one, Denmark: one, Belgium: one, France: one. • One interconnector in UK EEZ.	Outcome of the CEA will be greatest when the greatest number of other schemes, present or planned, are considered.

Potential impact	Maximum design scenario	Justification
Decommissioning phase		
Cumulative effects of reduction in access to, or exclusion from, potential and/or established fishing grounds. Cumulative effects of displacement leading to gear conflict and increased fishing pressure on alternative grounds. Cumulative effects of longer steaming distances to alternative fishing grounds. Cumulative effects of changes in shipping routes, leading to interference with fishing activity.	Tier 1 • 23 offshore wind farm developments of potential combined capacity of 19.4 GW within the following EEZs: UK: six, Germany: nine, Netherlands: five, Denmark: three. • 60 UK designated MCZs of total area 20,450 km^2 • Seven UK SCIs with marine components, of total area 16,032 km^2 • 25 UK SACs with marine components, of total area 10,736 km^2 • 51 SPAs with marine components, of total area 6,803 km^2 • Four UK aggregate dredging developments. Tier 2 • 14 offshore wind farm developments of potential combined capacity of 9.2 GW within the following EEZs: UK: four, Germany: nine, Netherlands: one. • 58 UK recommended MCZs of total area 18,394 km^2 • One English candidate SAC of total area 36,950 km^2 • Eight English potential SPAs of total area 5,771 km^2 Tier 3 • 37 offshore wind farm developments of potential combined capacity of 21.6 GW within the following EEZs: UK: ten, Germany: 24, Netherlands: one, Denmark: one, France: one. • One interconnector in UK EEZ.	Outcome of the CEA will be greatest when the greatest number of other schemes, present or planned, are considered.

6.13 Cumulative Effect Assessment

6.13.1.1 A description of the significance of cumulative effects upon commercial fisheries receptors arising from each identified impact is given below.

6.13.1.2 The CEA for commercial fisheries assesses cumulative effects for all fishing fleets considered within the EIA for Hornsea Three. The majority of the impacts identified within the EIA are taken forward for assessment at a cumulative level, with the exception of gear snagging and increased vessel traffic which are not considered to be cumulative effects, but specific to individual projects.

6.13.2 Construction phase

Cumulative effects of reduction in access to, or exclusion from, potential and/or established fishing grounds.

Tier 1

Magnitude of impact

6.13.2.1 The impacts of reduced access or exclusion from fishing grounds assessed within individual commercial fisheries assessments for key offshore wind farms are presented in Table 6.17.

6.13.2.2 Due to the proximity of Dudgeon and Race Bank, these offshore wind farms have the most potential to result in a cumulative impact for the North Norfolk UK potting fleet due to the grounds targeted by these potting fleets, while all other wind farms are expected to have a negligible to minor magnitude of impact to this fleet.

6.13.2.3 Dudgeon is located 11 km and Race Bank is located 28 km from Hornsea Three offshore cable corridor. The Environmental Statements for Dudgeon and Race Bank confirm activity by North Norfolk potting fleets across their array areas and offshore cable corridors. However, the impacts are assessed as minor during the construction and decommissioning of Race Bank and Dudgeon and negligible during operation on account of the opportunity for co-existence of potting fisheries.

6.13.2.4 It is noted that a moderate/minor impact to potters was assessed for Rampion Offshore Wind Farm during its construction (which is will be completed prior to construction of Hornsea Three), and negligible during Rampion's operation. Rampion is 266 km from Hornsea Three offshore cable corridor, and therefore it is highly unlikely that the North Norfolk potting fleet would operate across this area in the Eastern English Channel.

6.13.2.5 Overall, for all wind farms included in Tier 1, the magnitude of the cumulative impact is assessed as being minor to UK potters.

6.13.2.6 In relation to all other fleets (including UK, Dutch, Danish, French, Belgian, Norwegian, Swedish and German demersal and/or pelagic otter trawlers, fly shooters and/or beam trawlers) the following wind farms have the most potential to result in a cumulative impact due to the location of the wind farms and the grounds targeted and/or operational range of the fishing fleets: (from south to north) Galloper, East Anglia One, Triton Knoll, Race Bank, Dudgeon, Hornsea Project One and Hornsea Project Two. Based on the available evidence, including VMS data provided by the MMO, all other wind farms are expected to have a low to negligible magnitude of impact for these fleets.

6.13.2.7 Based on available Environmental Statements (DONG Energy, 2014; RWE npower renewables, 2003; Scottish Power Renewables and Vattenfall, 2012; SMart Wind, 2013; SMart Wind, 2015), it is understood that these offshore wind farms are considered to represent effects within a range of negligible to minor adverse significance to demersal trawl commercial fisheries and negligible to minor for pelagic fleets. This is due to fishing not being excluded within the operational wind farms, together with commitment to follow FLOWW guidance (2008 and 2014). As such a minor magnitude is assessed for these fleets.

6.13.2.8 The magnitude of impact of gas and oil fields that have ceased production is considered to be minor to all fishing fleets based on the expected time-frame for decommissioning activities and the potential for fishing grounds to be gained based on the cessation of any related safety zones.

6.13.2.9 The magnitude of impact of pipelines and aggregate dredging activities is considered to be minor to all fishing fleets based on the expected time-frame for pipeline decommissioning activities and the limited aerial overlap of dredging activities.

6.13.2.10 As presented in Figure 6.25 a network of MCZs, SACs and SPAs are included within the Tier 1 assessment. Of specific note based on proximity to Hornsea Three and activity of the commercial fishing fleets under assessment are:

- North Norfolk Sandbanks and Saturn Reef SAC;
- North Norfolk Coast SPA and SAC;
- Cromer Shoal Chalk Beds MCZ; and
- Dogger Bank SAC.

6.13.2.11 The impact of the designated Cromer Shoal MCZ on the UK potting fleet has been considered. It is understood that the current level of effort by the potting fleet is unlikely to cause detrimental effects to the status of this MCZ. This does not eliminate the possibility of management measures being introduced in the future to limit effort to current levels. As such a minor magnitude is assessed for this fleet.

6.13.2.12 At present, additional management for any gear interaction with SACs, SPAs or MCZs has not yet been implemented. Given that the MCZs and SACs cover a range of habitat features, based on a maximum design scenario for commercial fisheries; it is assumed that all mobile trawling gear with seabed contact will be subject to some form of restrictions.

Table 6.17: Summary of commercial fisheries impact assessment findings for key offshore wind farms included in the cumulative assessment.

Project	Source	Consented Capacity/ scale	Status of Development	Tier	Overlap with Hornsea Three phases			Impact assessment results as assessed for individual offshore wind farms	
					Construction	Operation	Decommissioning	Exclusion or reduction in access to fishing grounds	Displacement into alternative grounds.
Hornsea Project One	SMart Wind (2013)	Up to 240 5-8 MW turbines (DCO)	Under construction	1	n	y	y	Minor for all fleets during all phases of the development	Minor for all fleets during all phases of the development
Hornsea Project Two	SMart Wind (2015)	Up to 300 6-15 MW turbines (DCO)	Under construction	1	y	y	y	Minor for all fleets during all phases of the development	Minor for all fleets during all phases of the development
Race Bank	DONG Energy (2014)	Up to 580 MW	Operational	1	n	y	n	Minor to negligible for all fleets during construction and decommissioning; and negligible during operation.	Minor to negligible for all fleets during construction and decommissioning; and negligible during operation.
Rampion Wind Farm	E.ON Climate and Renewables (2012)	400 MW (116x3.45 MW)	Under construction	1	y	y	n	Moderate/minor for UK potters and UK pair trawl during construction of site and export cable. Negligible during operation. Minor to negligible for all other fleets.	Interfered access to grounds: negligible for all fleets
East Anglia One	Scottish Power Renewables and Vattenfall (2012)	714 MW (102x7 MW)	Consented	1	y	y	n	Minor to negligible for all fleets	Minor to negligible for all fleets
Triton Knoll	RWE npower renewables (2003)	750-900 MW (113-288x8 MW turbines)	Consented	1	y	y	n	Negligible for all fleets	Negligible for all fleets
Dudgeon	Warwick Energy (2009)	402 MW and 67 turbines	Operational	1	n	y	y	Minor for all fleets during construction and negligible during operations	Minor for all fleets during construction and negligible during operations
Dogger Bank Creyke Beck A	Forewind (2013a)	Up to 1.2 GW (Up to 200 turbines of up to 10 MW capacity)	Consented	2	y	y	y	Minor for all fleets during all phases, except: moderate for potters targeting crab & lobster across export cable route during construction.	Minor for all fleets during all phases, except: moderate for potters targeting crab & lobster across export cable route during construction
Dogger Bank Creyke Beck B	Forewind (2013a)	Up to 1.2 GW (Up to 200 turbines of up to 10 MW turbines)	Consented	2	y	y	y	Minor for all fleets during all phases, except: moderate for potters targeting crab & lobster across export cable route during construction	Minor for all fleets during all phases, except: moderate for potters targeting crab & lobster across export cable route during construction
Dogger Bank Teesside A	Forewind (2013b)	Up to 1.2 GW	Consented	2	y	y	y	Minor for all fleets during all phases, except: moderate for seine nets across wind farm site during construction & operation.	Minor for all fleets during all phases, except: moderate for seine nets across wind farm site during construction & operation.
Dogger Bank Teesside B (now Sofia offshore wind farm)	Forewind (2013b)	Up to 1.2 GW	Consented	2	y	y	y	Minor for all fleets during all phases, except: moderate for seine nets across wind farm site during construction & operation.	Minor for all fleets during all phases, except: moderate for seine nets across wind farm site during construction & operation.
East Anglia Three	ScottishPower Renewables and Vattenfall (2015)	Up to 1200 MW (up to 172 turbines of up to 7 – 12 MW capacity)	Submitted	2	y	y	n	Minor to Negligible for all fleets during construction and operations; except moderate (reduced to minor with mitigation) for UK static fleet during construction of offshore cable corridor.	Minor to negligible for all fleets

6.13.2.13 The magnitude of the impact for all mobile demersal trawling fleets is therefore considered to be moderate. This assessment takes into consideration high uncertainty related to the scale of management measures to be implemented within designated sites. The magnitude of impact for pelagic trawlers and UK potting fleets is considered to be minor, on account of the low habitat interaction of these gears, making them unlikely to be managed within designated sites.

6.13.2.14 Combining all Tier 1 projects, the magnitude of impact to all demersal trawling fleets is therefore considered to be moderate. Combined with the minor magnitude of impact assessed for demersal trawlers in relation to Hornsea Three, the overall magnitude of impact is moderate.

Sensitivity of receptor

6.13.2.15 UK, Dutch, Danish, French, German and Belgian demersal trawlers (including otter trawl, beam trawl, pulse trawl and fly shooting) are known to fish within areas overlapping Round 2 and 3 developments. It is noted that these fleets also operate across most of the North Sea ICES Divisions 4b and 4c. Overall these fleets are considered to be vulnerable to cumulative impacts of exclusion from developed areas as the opportunities and options for fishing current and future alternative grounds are reduced. Demersal fisheries fleets are deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be medium.

6.13.2.16 The Danish and Norwegian pelagic trawlers target wide areas throughout the North Sea when fishing for pelagic, water-column dwelling species including herring and sprat, and are not known to specifically target the Hornsea Three area. Pelagic fisheries fleets are deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be low.

6.13.2.17 The operating range of UK potters is more limited than the UK and European trawling fleets due to the size and power of the vessels. The UK potters may therefore be more sensitive to reduced access to Round 2 sites. The UK potting fleet is deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of the receptor is therefore, considered to be medium.

6.13.2.18 All other commercial fisheries fleets are deemed to be of low vulnerability, high recoverability and medium value. The sensitivity of all other commercial fisheries receptors is therefore, considered to be low.

Significance of Effect

6.13.2.19 For all demersal trawlers, overall, the sensitivity of the receptor is considered to be medium and the combined cumulative magnitude is deemed to be moderate. The cumulative effect will, therefore, be of **moderate** adverse significance, which is significant in EIA terms.

6.13.2.20 For all pelagic trawlers, overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.13.2.21 For all potting vessels, overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

Magnitude of impact

6.13.2.22 Based on available Environmental Statements (Forewind, 2013a; Foewind, 2013b), it is understood that Dogger Bank Creyke Beck A and B, Dogger Bank Teesside A, and Dogger Bank Teesside B (now known as Sofia Offshore Wind Farm) are considered to represent effects within a range of no discernible impact to minor adverse significance for demersal trawl commercial fisheries, moderate adverse to seine net commercial fisheries and negligible to minor for pelagic fleets. These projects, together with the nine German and one Dutch offshore wind farms are not expected to increase the magnitude of the cumulative impact assessed for Tier 1, based on the locations of these wind farms and the assumption that fishing will resume during the operational phase.

6.13.2.23 Two designations are of particular importance to commercial fisheries under the Tier 2 cumulative assessment: the recommended Markham's Triangle MCZ and the candidate Southern North Sea SAC.

6.13.2.24 Markham's Triangle rMCZ covers an area of 200 km^2, and overlaps with the Hornsea Three array area. The proposed features of the Markham's Triangle rMCZ relate to the broad-scale habitats of subtidal coarse sediment and subtidal sand (Green and Cooper, 2014).

6.13.2.25 The Southern North Sea cSAC is located 2 km from the Hornsea Three array area and overlaps the Hornsea Three offshore cable corridor; it covers an area of 36,951 km^2 and is the largest cSAC in UK and European waters. It is identified as an area of importance for harbour porpoise *Phocoena phocoena*, including key winter and summer habitat for this species (JNCC, 2017). The conservation objective is to avoid deterioration of the habitats of the harbour porpoise or significant disturbance to the harbour porpoise.

6.13.2.26 The objective for these proposed/recommended designations is to maintain the integrity of the sites and identified features. There is uncertainty as to whether management measures would be implemented in relation to commercial fisheries operating within these sites. Where management measures are required, it is Defra's policy that:

- Both regulatory and non-regulatory mechanisms should be investigated (e.g. voluntary agreements);
- Management measures with the least social and economic impact should be implemented where effective in meeting conservation objectives (e.g. gear adaptations or seasonal closures rather than area closures); and
- Management measures should be proportionate to the conservation objectives of the feature (e.g. permit schemes rather than area closures).

6.13.2.27 However, given the uncertainty of the scale of any management measure implemented to maintain the status of the rMCZ and cSAC, a moderate magnitude for demersal trawlers is assessed. This combined with the Tier 1 assessment and the EIA for Hornsea Three is therefore, considered to be **moderate** for all demersal trawling fleets targeting flatfish and mixed demersal species.

6.13.2.28 The assessment for UK potters, pelagic gear and all other fleets is consistent with Tier 1.

Sensitivity of receptor

6.13.2.29 The sensitivity of receptors is consistent with the Tier 1 assessment for all fishing fleets.

Significance of Effect

6.13.2.30 For all demersal trawlers, overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be moderate. The cumulative effect will, therefore, be of **moderate** adverse significance, which is significant in EIA terms. This assessment takes account of a high degree of uncertainty.

6.13.2.31 For all pelagic trawlers, overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.13.2.32 For all potting vessels, overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

6.13.2.33 The plans and projects included in Tier 3 are not considered to raise the cumulative effect beyond that assessed for the Tier 2 assessment for all fishing fleets. The significance of effect is therefore **moderate** adverse for demersal trawling fleets, which is significant in EIA terms and **minor** for all other fleets, which is not significant in EIA terms (see paragraph 6.13.2.30 to 6.13.2.32).

Cumulative effects of displacement leading to gear conflict and increased fishing pressure on alternative grounds.

Tier 1

Magnitude of impact

6.13.2.34 The effect of displacement leading to gear conflict and increased fishing pressure is directly correlated to the previous impact of reduced access to fishing grounds (i.e. if there is no reduction in access, then there will be no displacement). There is a moderate magnitude of impact for reduced access to fishing grounds and therefore displacement is expected. As such the magnitude of impact of displacement is assessed as moderate for all demersal trawling fleets; minor for pelagic fleets; minor for potting fleets and **minor** for all other commercial fisheries fleets.

Sensitivity of receptor

6.13.2.35 The sensitivity of the receptors is consistent with the assessment of reduced access to fishing grounds (see paragraphs 6.13.2.15 to 6.13.2.18, and 6.13.3.3). The sensitivity is therefore medium for demersal trawling fleets and potting fleets and low for pelagic and all other commercial fishing fleets.

Significance of Effect

6.13.2.36 For all demersal trawlers, overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be moderate. The cumulative effect will, therefore, be of **moderate** adverse significance, which is significant in EIA terms. This assessment takes account of a high degree of uncertainty.

6.13.2.37 For all pelagic trawlers, overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.13.2.38 For all potting vessels, overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

Magnitude of impact

6.13.2.39 Following the logic for the Tier 1 assessment, the effect of displacement leading to gear conflict and increased fishing pressure is directly correlated to the previous Tier 2 impact of reduced access to fishing grounds (i.e. if there is no reduction in access, then there will be no displacement). There is a moderate magnitude of impact for reduced access to fishing grounds on account of two designations (rMCZ and cSAC), and therefore displacement is expected. As such the magnitude of impact of displacement is assessed as **moderate** for all demersal trawling fleets; minor for pelagic fleets; **minor** for potting fleets and **minor** for all other commercial fisheries fleets.

Sensitivity of receptor

6.13.2.40 The sensitivity of the receptors is consistent with the assessment of reduced access to fishing grounds (see paragraphs 6.13.2.15 to 6.13.2.18, and 6.13.3.3). The sensitivity is therefore medium for demersal trawling fleets and potting fleets and **low** for pelagic and all other commercial fishing fleets.

Significance of Effect

6.13.2.41 For all demersal trawlers, overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be moderate. The cumulative effect will, therefore, be of **moderate** adverse significance, which is significant in EIA terms. This assessment takes account of a high degree of uncertainty.

6.13.2.42 For all pelagic trawlers, overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.13.2.43 For all potting vessels, overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

6.13.2.44 The plans and projects included in Tier 3 are not considered to raise the cumulative effect beyond that assessed for the Tier 2 assessment for all fishing fleets. The significance of effect is therefore **moderate** adverse for demersal trawling fleets, which is significant in EIA terms and **minor** for all other fleets, which is not significant in EIA terms (see paragraph 6.13.3.26 to 6.13.3.28).

Cumulative effects of longer steaming distances to alternative fishing grounds.

Tier 1

Magnitude of impact

6.13.2.45 A shipping corridor has been identified through the former Hornsea Zone which will aid navigational safety around and through the zone.

6.13.2.46 Based on the fact that vessels will not be prohibited from transiting through operational offshore wind farms, designated areas, or any other plans or projects included in Tier 1, the magnitude of longer steaming distances is considered to be minor for all fishing fleets.

Sensitivity of receptor

6.13.2.47 All commercial fisheries fleets are considered to have high availability of alternative fishing grounds (including current focus of effort), and an operational range that is not limited to the proposed development areas. The sensitivity of the receptor is therefore, considered to be low.

Significance of Effect

6.13.2.48 Overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

6.13.2.49 The cumulative effect is consistent with the Tier 1 assessment for all fishing fleets, which is of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

6.13.2.50 The cumulative effect is consistent with the Tier 1 assessment for all fishing fleets, which is of **minor** adverse significance, which is not significant in EIA terms.

Cumulative effects of changes in shipping routes, leading to interference with fishing activity.

Tier 1

Magnitude of impact

6.13.2.51 A shipping corridor has been identified through the former Hornsea Zone which will aid navigational safety around and through the zone.

6.13.2.52 Based on the fact that vessels will not be prohibited from transiting through operational offshore wind farms, designated areas, or any other plans or projects included in Tier 1, magnitude of changes in shipping routes, leading to interference with fishing activity is considered to be low for all fishing fleets.

Sensitivity of receptor

6.13.2.53 All commercial fisheries fleets are considered to have high availability of alternative fishing grounds (including current focus of effort), and an operational range that is not limited to proposed development areas. The sensitivity of the receptor is therefore, considered to be low.

Significance of Effect

6.13.2.54 Overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

6.13.2.55 The cumulative effect is consistent with the Tier 1 assessment for all fishing fleets, which is of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

6.13.2.56 The cumulative effect is consistent with the Tier 1 assessment for all fishing fleets, which is of **minor** adverse significance, which is not significant in EIA terms.

6.13.3 Operation and maintenance phase

Cumulative effects of reduction in access to, or exclusion from, potential and/or established fishing grounds.

Tier 1

Magnitude of impact

6.13.3.1 The cumulative effect during operation and maintenance of other offshore wind farms on reduction in access to or exclusion from fishing grounds is consistent with that presented during construction, see paragraphs 6.13.2.1 to 6.13.2.7. As such a minor magnitude is assessed for all fleets.

6.13.3.2 The impact is predicted to be of international spatial extent, medium to long-term duration, continuous and medium reversibility. It is predicted that the impact will affect the receptor directly. The magnitude, combined with the EIA for Hornsea Three is therefore, considered to be moderate for all demersal trawling fleets and minor for all pelagic trawling fleets and the UK potting fleet.

Sensitivity of receptor

6.13.3.3 The sensitivity of receptors is considered to be consistent with that assessed during construction, see paragraphs 6.13.2.15 to 6.13.2.18 and is medium for all demersal trawlers, medium for UK potters, low for pelagic trawlers and low for all other fleets.

Significance of Effect

6.13.3.4 For all demersal trawlers, overall, the sensitivity of the receptor is considered to be medium and the combined cumulative magnitude is deemed to be moderate. The cumulative effect will, therefore, be of **moderate** adverse significance, which is significant in EIA terms.

6.13.3.5 For all pelagic trawlers, overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.13.3.6 For all potting vessels, overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

Magnitude of impact

6.13.3.7 Based on available Environmental Statements (Forewind, 2013a; Forewind, 2013b), it is understood that Dogger Bank Creyke Beck A and B, Dogger Bank Teesside A, and Dogger Bank Teesside B (now known as Sofia Offshore Wind Farm) are considered to represent effects within a range of no discernible impact to minor adverse significance for demersal trawl commercial fisheries, moderate adverse to seine net commercial fisheries and negligible to minor for pelagic fleets. These projects, together with the nine German and one Dutch offshore wind farms are not expected to increase the magnitude of the cumulative impact assessed for Tier 1, based on the locations of these wind farms and the assumption that fishing will resume during the operational phase.

6.13.3.8 Two designations are of particular importance to commercial fisheries under the Tier 2 cumulative assessment: the recommended Markham's Triangle MCZ and the candidate Southern North Sea SAC.

6.13.3.9 Markham's Triangle rMCZ covers an area of 200 km^2, and overlaps with the Hornsea Three array area. The proposed features of the Markham's Triangle rMCZ relate to the broad-scale habitats of subtidal coarse sediment and subtidal sand (Green and Cooper, 2014).

6.13.3.10 The Southern North Sea cSAC is located 2 km from the Hornsea Three array area and overlaps the offshore cable corridor; it covers an area of 36,951 km^2 and is the largest cSAC in UK and European waters. It is identified as an area of importance for harbour porpoise *Phocoena phocoena*, including key winter and summer habitat for this species (JNCC, 2017). The conservation objective is to avoid deterioration of the habitats of the harbour porpoise or significant disturbance to the harbour porpoise.

6.13.3.11 The objective for these proposed/recommended designations is to maintain the integrity of the sites and identified features. There is uncertainty as to whether management measures would be implemented in relation to commercial fisheries operating within these sites. Where management measures are required, it is Defra's policy that:

- Both regulatory and non-regulatory mechanisms should be investigated (e.g. voluntary agreements);
- Management measures with the least social and economic impact should be implemented where effective in meeting conservation objectives (e.g. gear adaptations or seasonal closures rather than area closures); and
- Management measures should be proportionate to the conservation objectives of the feature (e.g. permit schemes rather than area closures).

6.13.3.12 However, given the uncertainty of the scale of any management measure implemented to maintain the status of the rMCZ and cSAC, a moderate magnitude for demersal trawlers is assessed. This combined with the EIA for Hornsea Three is therefore, considered to be **moderate** for all demersal trawling fleets targeting flatfish and mixed demersal species.

6.13.3.13 The assessment for UK potters, pelagic gear and all other fleets is consistent with Tier 1.

Sensitivity of receptor

6.13.3.14 The sensitivity of receptors is consistent with the Tier 1 assessment for all fishing fleets.

Significance of Effect

6.13.3.15 For all demersal trawlers, overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be moderate. The cumulative effect will, therefore, be of **moderate** adverse significance, which is significant in EIA terms. This assessment takes account of a high degree of uncertainty.

6.13.3.16 For all pelagic trawlers, overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.13.3.17 For all potting vessels, overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

6.13.3.18 The plans and projects included in Tier 3 are not considered to raise the cumulative effect beyond that assessed for the Tier 2 assessment for all fishing fleets. The significance of effect is therefore **moderate** adverse for demersal trawling fleets, which is significant in EIA terms and **minor** adverse for all other fleets, which is not significant in EIA terms (see paragraph 6.13.3.15 to 6.13.3.17).

Cumulative effects of displacement leading to gear conflict and increased fishing pressure on alternative grounds.

Tier 1

Magnitude of impact

6.13.3.19 The effect of displacement leading to gear conflict and increased fishing pressure is directly correlated to the previous impact of reduced access to fishing grounds (i.e. if there is no reduction in access, then there will be no displacement). There is a moderate magnitude of impact for reduced access to fishing grounds and therefore displacement is expected. As such the magnitude of impact of displacement is assessed as moderate for all demersal trawling fleets; minor for pelagic fleets; minor for potting fleets and minor for all other commercial fisheries fleets.

Sensitivity of receptor

6.13.3.20 The sensitivity of the receptors is consistent with the assessment of reduced access to fishing grounds (see paragraphs 6.13.2.15 to 6.13.2.18, and 6.13.3.3). The sensitivity is therefore medium for demersal trawling fleets and potting fleets and low for pelagic and all other commercial fishing fleets.

Significance of Effect

6.13.3.21 For all demersal trawlers, overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be moderate. The cumulative effect will, therefore, be of **moderate** adverse significance, which is significant in EIA terms. This assessment takes account of a high degree of uncertainty.

6.13.3.22 For all pelagic trawlers, overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.13.3.23 For all potting vessels, overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

Magnitude of impact

6.13.3.24 Following the logic for the Tier 1 assessment, the effect of displacement leading to gear conflict and increased fishing pressure is directly correlated to the previous Tier 2 impact of reduced access to fishing grounds (i.e. if there is no reduction in access, then there will be no displacement). There is a moderate magnitude of impact for reduced access to fishing grounds on account of two designations (rMCZ and cSAC), and therefore displacement is expected. As such the magnitude of impact of displacement is assessed as moderate for all demersal trawling fleets; minor for pelagic fleets; minor for potting fleets and minor for all other commercial fisheries fleets.

Sensitivity of receptor

6.13.3.25 The sensitivity of the receptors is consistent with the assessment of reduced access to fishing grounds (see paragraphs 6.13.2.15 to 6.13.2.18, and 6.13.3.3). The sensitivity is therefore medium for demersal trawling fleets and potting fleets and low for pelagic and all other commercial fishing fleets.

Significance of Effect

6.13.3.26 For all demersal trawlers, overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be moderate. The cumulative effect will, therefore, be of **moderate** adverse significance, which is significant in EIA terms. This assessment takes account of a high degree of uncertainty.

6.13.3.27 For all pelagic trawlers, overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

6.13.3.28 For all potting vessels, overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be minor. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 3

6.13.3.29 The plans and projects included in Tier 3 are not considered to raise the cumulative effect beyond that assessed for the Tier 2 assessment for all fishing fleets. The significance of effect is therefore **moderate** adverse for demersal trawling fleets, which is significant in EIA terms and **minor** adverse for all other fleets, which is not significant in EIA terms (see paragraph 6.13.3.26 to 6.13.3.28).

Cumulative effects of longer steaming distances to alternative fishing grounds.

6.13.3.30 The CEA for operation and maintenance phase is consistent with the construction assessment. The cumulative effect across Tiers 1, 2 and 3 for all commercial fishing fleets will, therefore, be of minor adverse significance, which is not significant in EIA terms.

Cumulative effects of changes in shipping routes, leading to interference with fishing activity.

6.13.3.31 The CEA for operation and maintenance phase is consistent with the construction assessment. The cumulative effect across Tiers 1, 2 and 3 for all commercial fishing fleets will, therefore, be of minor adverse significance, which is not significant in EIA terms.

6.13.4 Decommissioning phase

6.13.4.1 The CEA for the decommissioning phase is consistent with the construction assessment.

6.14 Transboundary effects

6.14.1.1 Transboundary effects relate to impacts that may occur from an activity within one European Economic Area (EEA) state on the environment or interests of another.

6.14.1.2 A screening of transboundary impacts has been carried out and is presented in volume 5, annex 5.4: Transboundary Impacts Screening Note. This screening exercise identified that there was potential for significant transboundary effects with regard to commercial fisheries from Hornsea Three upon the interests of other EEA States.

6.14.1.3 This commercial fisheries chapter has assessed the potential impacts incurred by non-UK registered vessels operating within UK waters. This includes the potential effects on Belgian, Danish, Dutch, French, German, Norwegian and Swedish commercial fishing fleets across all impact categories assessed, including exclusion from Hornsea Three and displacement effects. Transboundary impacts within UK waters have therefore been intrinsically considered throughout the commercial fisheries EIA process and are consistent to those presented in sections 6.11 and 6.12.

6.14.1.4 Transboundary impacts outside UK waters are limited to potential displacement of fishing effort from Hornsea Three into non-UK EEZs, namely the Dutch EEZ. Based on the established fishing grounds targeted by the fleets under assessment it is not anticipated that displacement effects into the Dutch EEZ would be significant (see paragraphs 6.11.1.56 to 6.11.1.67 and 6.11.2.23 to 6.11.2.29).

6.15 Inter-related effects

6.15.1.1 Inter-relationships are considered to be the impacts and associated effects of different aspects of the proposal on the same receptor. These are considered to be:

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the project (construction, operational and maintenance, and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three key project stages (e.g. displacement during construction and decommissioning activities and reduction in access to ground due to floating turbine mooring and cable systems during operation); and
- Receptor led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on commercial fisheries, such as changes to fisheries resources, loss of ground, longer steaming times and displacement leading to gear conflict may interact to produce a different, or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

6.15.1.2 A description of the likely inter-related effects arising from Hornsea Three on commercial fisheries is provided in volume 2, chapter 12: Inter-Related Effects (Offshore).

6.16 Conclusion and summary

6.16.1.1 Commercial fisheries baseline activity data has been assessed for the following countries: UK, Netherlands, France, Belgium, Denmark, Germany, Sweden and Norway. Based on quota allocations and landing statistics for the regional commercial fisheries study area it is understood that vessels registered to other countries do not operate across the Hornsea Three array area, the offshore cable corridor and the wider former Hornsea Zone. The key fleets operating across the Hornsea Three array area and Hornsea Three offshore cable corridor include (in no particular order):

- UK potters targeting brown crab, lobster and whelk (vessels typically 10-12 m and under in length), operating across the Hornsea Three offshore cable corridor;
- UK (Dutch owned), Dutch and Belgian beam trawlers targeting sole and plaice, and/or *Nephrops* and mixed demersal species (vessels >25 m in length), operating across the Hornsea Three array area;
- UK demersal otter trawlers targeting *Nephrops* and mixed demersal species (vessels 12 m in length), operating within the Hornsea Three array area;
- Dutch and Belgian fly shooting vessels targeting sole, plaice, *Nephrops* and mixed demersal species (vessels >25 m in length), operating across the regional commercial fisheries study area;
- Danish demersal trawlers targeting sandeel (vessels >25 m in length), including specific fishing grounds within the Hornsea Three array area; and
- French, Danish and Norwegian pelagic trawlers targeting mackerel (vessels 15 to 25 m in length), operating across the regional commercial fisheries study area (but not regularly in the Hornsea Three array area), targeting highly mobile species that consistently move/shoal throughout the wider southern North Sea.

6.16.1.2 A summary of the potential environmental effects on Commercial Fisheries is provided in Table 6.18. During construction the potential effects of reduced access and localised exclusion from Hornsea Three array area are of **minor** adverse significance, which is not significant in EIA terms, for UK, Dutch and Belgian demersal trawling fleets targeting flatfish, *Nephrops* and mixed demersal species; and of **minor** adverse significance for all other fleets.

6.16.1.3 During construction the potential effects of reduced access and localised exclusion from Hornsea Three offshore cable route are of **moderate** adverse significance, which is significant in EIA terms, for UK potters targeting brown crab, lobster and whelk; and of **minor** adverse significance for all other fleets.

6.16.1.4 The moderate effects related to reduction in access or exclusion from fishing grounds have been mitigated by committing to following, wherever possible, the procedures as outlined in the FLOWW guidance documents (2014 and 2015) with respect to any justifiable disturbance payment. As such, the residual effects are of **minor** adverse significance, which is not significant in EIA terms.

6.16.1.5 During construction the potential effects of displacement leading to gear conflict and displacement or disruption of fish and shellfish resources are of **minor** adverse significance, which is not significant in EIA terms, for UK potters targeting brown crab, lobster and whelk; and also of **minor** adverse significance for all other fleets.

6.16.1.6 During the operational and maintenance phase of the Hornsea Three array area, the assessment assumes that fishing will resume within the site, which will be supported by a Fisheries Coexistence and Liaison Plan (document reference number A.8.10). The potential effects of localised exclusion from the Hornsea Three array area are of **minor** adverse significance, which is not significant in EIA terms, for UK, Dutch and Belgian demersal trawling fleets targeting flatfish, *Nephrops* and mixed demersal species; and of **minor** adverse significance for all other fleets.

6.16.1.7 During the operational and maintenance phase the potential effects associated with the Hornsea Three array area leading to gear snagging are of **minor** adverse significance, which is not significant in EIA terms, for all demersal and pelagic trawling fleets, and of **minor** adverse significance for UK potters.

6.16.1.8 All other potential effects during operational and maintenance phase are of **minor** adverse or **negligible** significance for all fleets.

6.16.1.9 Potential effects during decommissioning are consistent with the assessment for the construction phase.

6.16.1.10 The cumulative effects of reduction in access to, or exclusion from, potential and/or established fishing grounds and displacement leading to gear conflict and increased fishing pressure on alternative grounds are considered to be **moderate** adverse for demersal trawling fleets and **minor** adverse for all other fleets. The moderate adverse cumulative effect remains consistent for Tiers 1, 2 and 3 of the assessment which considers a range of developments and plans including offshore wind farms and marine protected areas. All other cumulative effects are considered to be of minor adverse significance for all fleets.

6.16.1.11 Transboundary impacts to non-UK vessels fishing within UK waters have been intrinsically considered throughout the commercial fisheries impact assessment. Transboundary impacts outside UK waters are limited to potential displacement of effort from Hornsea Three into non-UK EEZs, namely the Dutch EEZ. Based on the established fishing grounds targeted by the fleets under assessment it is anticipated that displacement effects into the Dutch EEZ would not be significant.

Table 6.18: Summary of potential environment effects, mitigation and monitoring.

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Construction phase							
Hornsea Three array area construction activities and physical presence of wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds.	Advance warning and accurate location details of construction operations and associated Safety Zones and advisory safety distances. On-going liaison with all fishing fleets (including regular Notice to Mariners).	UK, Dutch, Belgian, French, German and Swedish demersal trawl fleets: Minor Danish sandeel fleet: Moderate UK potting fleet: Negligible UK, Danish, Norwegian, Swedish and French pelagic fleets: Minor All other fleets: Negligible	UK, Dutch & Belgian demersal trawl fleets: Medium All other fleets: Low	UK, Dutch, Belgian, French, German and Swedish demersal trawl fleets: **Minor** adverse (not significant in EIA terms). Danish sandeel fleet: **Minor** adverse (not significant in EIA terms). Danish UK, French, Swedish and Norwegian fleets pelagic fleets: **Minor** adverse (not significant in EIA terms). UK potting fleet: **Minor** adverse (not significant in EIA terms). All other fleets: **Negligible** (not significant in EIA terms).	None proposed	N/A	None
Hornsea Three offshore cable corridor construction activities leading to reduction in access to, or exclusion from established fishing grounds.		UK, Dutch, Belgian, French, German and Swedish demersal trawl fleets: Minor Danish sandeel fleet: Minor UK potting fleet: Moderate Pelagic fleet: Negligible All other fleets: Negligible	UK potting fleet: Medium UK shrimp beam trawlers: Medium All other fleets: Low	UK potting fleet: **Moderate** adverse (significant in EIA terms). UK, Dutch, Belgian, French, German and Swedish demersal trawl fleets: **Minor** adverse (not significant in EIA terms). UK beam trawling fleet: **Minor** adverse (not significant in EIA terms). Danish sandeel fleet: **Minor** adverse (not significant in EIA terms). Pelagic fleets: **Negligible** (not significant in EIA terms). All other fleets: **Negligible** (not significant in EIA terms).	With respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance (2014 and 2015), will be followed.	UK potting fleet: **Minor** adverse (not significant in EIA terms).	None
Displacement from Hornsea Three array area leading to gear conflict and increased fishing pressure on adjacent grounds.		UK potting fleet: Minor Pelagic fleets: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low	UK potting fleet: **Minor** adverse (not significant in EIA terms). Pelagic fleets: **Negligible** (not significant in EIA terms). All other fleets: **Minor** adverse (not significant in EIA terms).	None proposed	N/A	None
Displacement from the Hornsea Three offshore cable corridor leading to gear conflict and increased fishing pressure on adjacent grounds.		UK potting fleet: Minor Pelagic fleets: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low	UK potting fleet: **Minor** adverse (not significant in EIA terms). Pelagic fleets: **Negligible** (not significant in EIA terms) All other fleets: **Minor** adverse (not significant in EIA terms).	None proposed	N/A	None

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Hornsea Three array area and Hornsea Three offshore cable corridor construction activities leading to displacement or disruption of commercially important fish and shellfish resources.	Measures adopted as part of the project are detailed within volume 2, chapter 3: Fish and Shellfish Ecology.	All fleets: Minor	UK potting fleet: Medium UK, Dutch, Belgian *Nephrops* demersal trawl fleets: Medium UK, Dutch, Belgian demersal trawl fleets (targeting otter species): Low All other fleets: Low	All fleets: **Minor** adverse (not significant in EIA terms).	None proposed	N/A	None
Hornsea Three array area and Hornsea Three offshore cable corridor construction activities leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the array and export cable areas.	Appropriate marine coordination to ensure construction vessels do not present an additional risk. Use of guard vessels, where appropriate. Advance warning and accurate location details of construction operations and associated phased Safety Zones and advisory safety distances. On-going liaison with all fishing fleets (including regular Notice to Mariners).	All fleets: Minor	All fleets: Low	All fleets: **Minor** adverse (not significant in EIA terms).	None proposed	N/A	None
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and construction vessel traffic from Hornsea Three array area leading to interference with fishing activity.		UK, Dutch and Belgian demersal trawl fleets: Moderate Danish sandeel fleet: Moderate Pelagic fleets: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low or negligible	UK, Dutch and Belgian demersal trawl fleets: **Minor** adverse (not significant in EIA terms). Danish sandeel fleet: **Minor** adverse (not significant in EIA terms). UK potting fleet: **Minor** adverse (not significant in EIA terms). Pelagic fleets: **Negligible** (not significant in EIA terms). All other fleets: **Negligible** (not significant in EIA terms).	None proposed	N/A	None
Operation and maintenance phase							
Physical presence of Hornsea Three array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds.	Advance warning and accurate location details of maintenance operations and associated advisory safety zones. 500 m safety zones around manned platforms. 500 m safety zones around infrastructure undergoing major maintenance. 1000 m advisory safety distances around vessels undertaking major maintenance activities.	UK, Dutch, Belgian, French, German and Swedish demersal trawl fleets: Minor Danish sandeel fleet: Minor Pelagic fleets: Minor UK potting fleet: Negligible All other fleets: Negligible	UK, Dutch & Belgian demersal trawl fleets: Medium All other fleets: Low	UK, Dutch, Belgian, French, German and Swedish demersal trawl fleets: **Minor** adverse (not significant in EIA terms). Danish UK, French, Swedish and Norwegian pelagic fleets: **Minor** adverse (not significant in EIA terms). Danish sandeel fleet: **Minor** adverse (not significant in EIA terms). UK potting fleet: **Minor** adverse (not significant in EIA terms). All other fleets: **Negligible** (not significant in EIA terms).	None proposed	N/A	None
Physical presence of offshore export cable and infrastructure leading to reduction in access to, or exclusion from established fishing grounds.		All fleets: Minor	UK potting fleet: Medium All other fleets: Low	All fleets: **Minor** adverse (not significant in EIA terms).	None proposed	N/A	None

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Displacement from Hornsea Three array area and Hornsea Three offshore cable corridor leading to gear conflict and increased fishing pressure on adjacent grounds.	On-going liaison with all fishing fleets (including regular Notice to Mariners). No floating foundations.	Pelagic fleets: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low	Pelagic fleets: **Negligible** (not significant in EIA terms). All other fleets: **Minor** adverse (not significant in EIA terms).	None proposed	N/A	None
Physical presence of Hornsea Three array area leading to gear snagging.	Location of any cable protection will be provided via Notices to Mariners. In the instance that snagging does occur, protocols are laid out within the guidance by FLOWW and 'Recommendations For Fisheries Liaison: Best Practice' guidance for offshore renewable developers, in particular Section 9: Dealing with claims for loss or damage of gear (BERR, 2008). 500 m safety zones around manned platforms. 500 m safety zones around infrastructure undergoing major maintenance. 1000 m advisory safety distances around vessels undertaking major maintenance activities.	UK potting fleet: Negligible All other fleets: Minor	UK potting fleet: Low All other fleets: Medium	UK potting fleet: **Negligible** (not significant in EIA terms). All other fleets: **Minor** adverse (not significant in EIA terms).	None proposed	N/A	None
Physical presence of the offshore export cable leading to gear snagging.		Pelagic fleets: Negligible All other fleets: Minor	Demersal trawl fleets: Medium All other fleets: Low	Pelagic fleets: **Negligible** (not significant in EIA terms). All other fleets: **Minor** adverse (not significant in EIA terms).	None proposed	N/A	None
Electromagnetic fields, habitat alteration, noise and other ecological impacts due to operational and maintenance activities leading to displacement or disruption of commercially important fish and shellfish resources.	Measures adopted as part of the project are within volume 2, chapter 3: Fish and Shellfish Ecology.	All fleets: Minor	UK potting fleet: Medium All other fleets: Low	UK potting fleet: **Minor** adverse (not significant in EIA terms). All other fleets: **Negligible** (not significant in EIA terms).	None proposed	N/A	None
Physical presence of Hornsea Three array and offshore export cable leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the Hornsea Three array area and offshore cable corridor.	Adequate navigational markers including lighting, as directed by THLS. Notification of all offshore and seabed structures (locations	All fleets: Negligible	All fleets: Low	All fleets: **Negligible** (not significant in EIA terms).	None proposed	N/A	None

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic from Hornsea Three array area and Hornsea Three offshore cable corridor infrastructure leading to interference with fishing activity.	of cables) to be disseminated via KIS-ORCA Charts. Early communication of any incidents to the fishing sector. 500 m safety zones around manned platforms. 500 m safety zones around infrastructure undergoing major maintenance. 1000 m advisory safety distances around vessels undertaking major maintenance activities.	UK, Dutch and Belgian demersal trawl fleets: Moderate Danish sandeel fleet: Moderate Pelagic fleets: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low or negligible	UK, Dutch and Belgian demersal trawl fleets: **Minor** adverse (not significant in EIA terms). Danish sandeel fleet: **Minor** adverse (not significant in EIA terms). UK potting fleet: **Minor** adverse (not significant in EIA terms). Pelagic fleets: **Negligible** (not significant in EIA terms). All other fleets: **Negligible** (not significant in EIA terms).	None proposed	N/A	None
Decommissioning phase							
Hornsea Three array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds.	As detailed within measures adopted during construction.	UK, Dutch, Belgian, French, German and Swedish demersal trawl fleets: Minor Danish sandeel fleet: Moderate UK, Danish, Norwegian, Swedish and French pelagic fleets: Minor UK potting fleet: Negligible All other fleets: Negligible	UK, Dutch & Belgian demersal trawl fleets: Medium All other fleets: Low	UK, Dutch, Belgian, French, German and Swedish demersal trawl fleets: **Minor** adverse (not significant in EIA terms). Danish sandeel fleet: **Minor** adverse (not significant in EIA terms). Danish UK, French, Swedish and Norwegian pelagic fleets: **Minor** adverse (not significant in EIA terms). UK potting fleet: **Minor** adverse (not significant in EIA terms). All other fleets: **Negligible** (not significant in EIA terms).	None proposed	N/A	None
Hornsea Three offshore cable corridor decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds.		UK, Dutch, Belgian, French, German and Swedish demersal trawl fleets: Minor Danish sandeel fleet: Minor UK potting fleet: Moderate Pelagic fleets: Negligible All other fleets: Negligible	UK potting fleet: Medium UK shrimp beam trawlers: Medium All other fleets: Low	UK potting fleet: **Moderate** adverse (significant in EIA terms). UK, Dutch, Belgian, French, German and Swedish demersal trawl fleets: **Minor** adverse (not significant in EIA terms). UK beam trawling fleet: **Minor** adverse (not significant in EIA terms). Danish sandeel fleet: **Minor** adverse (not significant in EIA terms). Pelagic fleets: **Negligible** (not significant in EIA terms). All other fleets: **Negligible** (not significant in EIA terms).	With respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance (2014 and 2015), will be followed.	UK potting fleet: **Minor** adverse (not significant in EIA terms).	None

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Displacement from Hornsea Three array area leading to gear conflict and increased fishing pressure on adjacent grounds.		UK potting fleet: Minor Pelagic fleets: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low	UK potting fleet: **Minor** adverse (not significant in EIA terms). Pelagic fleets: **Negligible** (not significant in EIA terms). All other fleets: **Minor** adverse (not significant in EIA terms).	None proposed	N/A	None
Displacement from the Hornsea Three offshore cable corridor leading to gear conflict and increased fishing pressure on adjacent grounds.		UK potting fleet: Minor Pelagic fleets: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low	UK potting fleet: **Minor** adverse (not significant in EIA terms). Pelagic fleets: **Negligible** (not significant in EIA terms) All other fleets: **Minor** adverse (not significant in EIA terms).	None proposed	N/A	None
Decommissioning activities leading to displacement or disruption of commercially important fish and shellfish resources.		All fleets: Minor	UK potting fleet: Medium UK, Dutch, Belgian *Nephrops* demersal trawl fleets: Medium UK, Dutch, Belgian demersal trawl fleets (targeting otter species): Low All other fleets: Low	All fleets: **Minor** adverse (not significant in EIA terms).	None proposed	N/A	None
Decommissioning activities leading to longer steaming distances to alternative fishing grounds.		All fleets: Minor	All fleets: Low	All fleets: **Minor** adverse (not significant in EIA terms).	None proposed	N/A	None
Increased vessel traffic, including Hornsea Three array area related and changes in shipping routes, leading to interference with fishing activity.		UK, Dutch and Belgian demersal trawl fleets: Moderate Danish sandeel fleet: Moderate Pelagic fleets: Negligible All other fleets: Minor	UK potting fleet: Medium All other fleets: Low or negligible	UK, Dutch and Belgian demersal trawl fleets: **Minor** adverse (not significant in EIA terms). Danish sandeel fleet: **Minor** adverse (not significant in EIA terms). UK potting fleet: **Minor** adverse (not significant in EIA terms). Pelagic fleets: **Negligible** (not significant in EIA terms). All other fleets: **Negligible** (not significant in EIA terms).	None proposed	N/A	None
Physical presence of cable and scour protection leading to gear snagging.		Pelagic fleet: Negligible All other fleets: Minor	Demersal trawl fleets: Medium All other fleets: Low	Pelagic fleets: **Negligible** (not significant in EIA terms). All other fleets: **Minor** adverse (not significant in EIA terms).	None proposed	N/A	None

a Demersal trawl includes demersal otter trawl, beam trawl, pulse trawl and fly shooting fleets targeting sole, plaice, *Nephrops* and mixed demersal fisheries.

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