Hornsea Project Four: Environmental Statement (ES)

PINS Document Reference: A2.9

APFP Regulation: 5(2)(a)

Volume A2, Chapter 6: Commercial Fisheries

Prepared Poseidon Aquatic Resource Management. June 2021
Checked GoBe Consultants Ltd. June 2021
Accepted David King, Orsted. August 2021
Approved Julian Carolan, Orsted. September 2021

Doc. no. A2.6
Version B

Table of Contents

List of Tables

List of Figures

Annexes

Annex	Heading
A5.6.1	Commercial Fisheries Technical Report

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.
Commitment	A term used interchangeably with mitigation and enhancement measures. The purpose of Commitments is to reduce and/or eliminate Likely Significant Effects (LSEs), in EIA terms. Primary (Design) or Tertiary (Inherent) are both embedded within the assessment at the relevant point in the EIA (e.g. at Scoping, Preliminary Environmental Information Report (PEIR) or ES). Secondary commitments are incorporated to reduce LSE to environmentally acceptable levels following initial assessment i.e. so that residual effects are acceptable.
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.
Cumulative effects	The combined effect of Hornsea Four in combination with the effects from a number of different projects, on the same single receptor/resource. Cumulative impacts are those that result from changes caused by other past, present or reasonably foreseeable actions together with Hornsea Four.
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.
Design Envelope	A description of the range of possible elements that make up the Hornsea Four design options under consideration, as set out in detail in the project description. This envelope is used to define Hornsea Four for Environmental Impact Assessment (EIA) purposes when the exact engineering parameters are not yet known. This is also often referred to as the "Rochdale Envelope" approach.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Projects (NSIP).
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
EIA Regulations	The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended).
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Impact Assessment (EIA) Report.

Term	Definition
Environmental Statement	A document reporting the findings of the EIA and produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
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.
Export cable corridor (ECC)	The specific corridor of seabed (seaward of Mean High Water Springs (MHWS)) and land (landward of MHWS) from the Hornsea Four array area to the Creyke Beck National Grid substation, within which the export cables will be located.
First sales 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.
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.
High Voltage Alternating Current (HVAC)	High voltage alternating current is the bulk transmission of electricity by alternating current (AC), whereby the flow of electric charge periodically reverses direction.
High Voltage Direct Current (HVDC)	High voltage direct current is the bulk transmission of electricity by direct current (DC), whereby the flow of electric charge is in one direction.
Hornsea Project Four Offshore Wind Farm	The term covers all elements of the project (i.e. both the offshore and onshore). Hornsea Four infrastructure will include offshore generating stations (wind turbines), electrical export cables to landfall, and connection to the electricity transmission network. Hereafter referred to as Hornsea Four.
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.
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.

Term	Definition
Metier	A homogenous subdivision, either of a fishery by vessel type or a fleet by voyage type.
Mitigation	A term used interchangeably with Commitment(s) by Hornsea Four. Mitigation measures (Commitments) are embedded within the assessment at the relevant point in the EIA (e.g. at Scoping, PEIR or ES).
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.
North 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.
Norwegian Directorate of Fisheries	A Norwegian government agency responsible for Norwegian fisheries.
Orsted Hornsea Project Four Ltd.	The Applicant for the proposed Hornsea Project Four Offshore Wind Farm Development Consent Order (DCO).
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.
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.
Spawning	The act of releasing or depositing eggs (fish).
String	A series of static fishing gear (pots) joined together to form a single deployable linear line of pots.
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.

Acronyms

Acronym	Definition
AfL	Agreement for Lease
AIS	Automatic Identification System
BERR	Department for Business Enterprise & Regulatory Reform
CAA	Civil Aviation Authority
CBRAM	Cable Burial Risk Assessment Methodology
CEA	Cumulative Effects Assessment
C.M.E.	Cooperative Maritime Etaploise
COLREGS	The Convention on the International Regulations for Preventing Collisions at Sea
CPEMMP	Construction Project Environmental Management and Monitoring Plan
CRPMEM	Comité Régional des Pêches Maritimes et des Elevages Marins
DCO	Development Consent Order
DFPO	Danish Fishermen's Producer Organisation
DMRB	Design Manual for Roads and Bridges
ECC	Export Cable Corridor
EEA	European Economic Area
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ES	Environmental Statement
ESCA	European Subsea Cables Association
EU	European Union
EU DCF	European Union Data Collection Framework
EUMOFA	European Market Observatory for Fisheries and Aquaculture Products
FIM	Fishing Industry apping
FLO	Fisheries Liaison Officers
FLOWW	Fisheries Liaison with Offshore Wind and Wet Renewables
GBS	Gravity Base Structure
GPS	Global Positioning System
HFIG	Holderness Fishing Industry Group
HVAC	High Voltage Alternating Current
ICES	International Council for the Exploration of the Sea
IFCA	Inshore Fisheries and Conservation Authority
KIS-ORCA	Kingfisher Information Service – Offshore Renewable & Cable Awareness
LSE	Likely Significant Effect
MCA	Maritime and Coastguard Agency
MCZ	Marine Conservation Zone
MDS	Maximum Design Scenario
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
MPA	Marine Protected Area
MPS	Marine Policy Statement
NFFO	National Federation of Fishermen's Organisations
NPS	National Policy Statement
NRA	Navigational Risk Assessment
NSIP	Nationally Significant Infrastructure Project
OSS	Offshore Substations

Acronym	Definition
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
SAC	Special Area of Conservation
SCI	Site of Community Importance
SICG	Scallop Industry Consultation Group
SoS	Secretary of State
SPA	Special Protected Area
Spp.	Species
SSC	Suspended Sediment Concentration
TAC	Total Allowable Catches
TCA	Trade and Cooperation Agreement
TCE	The Crown Estate
UK	United Kingdom
VMS	Vessel Monitoring System
WTG	Wind Turbine Generator

Units

Unit	Definition
£	Great British pounds
£/kg	Great British pounds per kilogram
€	Euro
GW	Gigawatt
kg	kilograms
km	kilometres
m	metres
mm	millimetres
MW	Megawatt
NM	Nautical Mile

6.1 Introduction

6.1.1.1 Orsted Hornsea Project Four Limited (hereafter the 'Applicant') is proposing to develop the Hornsea Project Four Offshore Wind Farm, (hereafter 'Hornsea Four') which will be located approximately 69 km from East Riding of Yorkshire in the Southern North Sea and will be the fourth project to be developed in the former Hornsea Zone (please see **Volume A1, Chapter 1: Introduction** for further details on the former Hornsea Zone). Hornsea Four will include both offshore and onshore infrastructure including an offshore generating station (wind farm), export cables to landfall, and connection to the electricity transmission network (please see **Volume A1, Chapter 4: Project Description** for full details on the Project Design).

6.1.1.2 The Hornsea Four Agreement for Lease (AfL) area was 846 km^2 at the Scoping phase of project development. In the spirit of keeping with Hornsea Four's approach to Proportionate Environmental Impact Assessment (EIA), the project has due consideration to the size and location (within the existing AfL area) of the final project that is being taken forward to Development Consent Order (DCO) application. This consideration is captured internally as the "Developable Area Process", which includes Physical, Biological and Human constraints in refining the developable area, balancing consenting and commercial considerations with technical feasibility for construction.

6.1.1.3 The combination of Hornsea Four's Proportionality in EIA and Developable Area process has resulted in a marked reduction in the array area taken forward at the point of DCO application. Hornsea Four adopted a major site reduction from the array area presented at Scoping (846 km^2) to the Preliminary Environmental Information Report (PEIR) boundary (600 km^2), with a further reduction adopted for the Environmental Statement (ES) and DCO application (468 km^2) due to the results of the PEIR, technical considerations and stakeholder feedback. The evolution of the Hornsea Four Order Limits is detailed in **Volume A1, Chapter 3: Site Selection and Consideration of Alternatives** and **Volume A4, Annex 3.2: Selection and Refinement of the Offshore Infrastructure**.

6.1.1.4 This chapter of the ES presents the results of the EIA for the potential impacts of Hornsea Four on commercial fisheries. Specifically, this chapter considers the potential impact of Hornsea Four seaward of Mean High Water Springs (MHWS) during its construction, operation and maintenance, and decommissioning phases.

6.1.1.5 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 **Chapter 11: Infrastructure and Other Users**. Navigational aspects related to fishing vessels are assessed in **Chapter 7: Shipping and Navigation**. The ecology of fish and shellfish, including species of commercial interest, are assessed in **Chapter 3: Fish and Shellfish Ecology**.

6.1.1.6 This chapter summarises information contained within **Volume A5, Annex 6.1: Commercial Fisheries Technical Report**.

6.2 Purpose

6.2.1.1 The primary purpose of the ES is to support the DCO application for Hornsea Four under the Planning Act 2008 (the 2008 Act).

6.2.1.2 The ES has been finalised following completion of pre-application consultation (see **B1.1: Consultation Report** and **Table 6.4**) and the ES will accompany the application to the Planning Inspectorate (PINS) for Development Consent.

6.2.1.3 This ES chapter:

- Summarises the existing environmental baseline established from desk studies, and consultation;
- Presents the potential environmental effects on commercial fisheries arising from Hornsea Four, 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 mitigation measures which could, reduce or eliminate possible environmental effects identified in the EIA process.

6.3 Planning and Policy Context

6.3.1.1 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).

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

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

Summary of NPS EN-3 provisions	How and where considered in the ES
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 has taken place between September 2010 and the time of DCO Application (**Section 6.4**).
"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 (**Section 6.4**).
"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 surveys are detailed in **Chapter 3: Fish and Shellfish Ecology**. In addition, consultation with the fishing industry (**Section 6.4**) has identified key concerns as well as available data and potential impacts, which have been taken into account within the assessment (**Section 6.11**).

Summary of NPS EN-3 provisions	How and where considered in the ES
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)	Robust baseline datasets analysed include European Union (EU) and United Kingdom (UK) statistics and surveillance data, industry consultation and published reports (**Section 6.7.1**).
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 Four (see **Volume A5, Annex 7.1: Navigational Risk Assessment**). The risk assessment results have been taken into account within the Commercial Fisheries assessment (**Section 6.11**). Consultation has also been undertaken with the Maritime and Coastguard Agency (MCA) (see **Chapter 7: Shipping and Navigation**). It is assumed there would be safety zones of up to 500 m around infrastructure under construction, decommissioning and major maintenance works, which will be applied for separately if or when they are required (Co139).
"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 assessment has considered the effects on commercial fish stocks (**Section 6.11**, and **Chapter 3: Fish and Shellfish Ecology**).

6.3.1.3 NPS EN-3 also highlights several factors relating to the determination of an application and in relation to mitigation. These are summarised in **Table 6.2** below.

Table 6.2: Summary of 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 ES
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. The Applicant, is, and will continue to, take steps to minimise the effects upon the fishing industry in the area through appropriate mitigation where required. Commitments related to commercial fisheries and adopted as part of Hornsea Four are provided in **Section 6.8.2** and **Volume A4, Annex 5.2: Commitments Register**.
"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	The extent to which Hornsea Four impacts on recognised and important fishing grounds has been considered and consultation has been undertaken with fishing stakeholders in order to fully understand

Summary of NPS EN-3 policy on decision making (and mitigation)	How and where considered in the ES
commercial fisheries or fishing activities. Where the IPC [hereafter the Secretary of State (SoS)] considers the wind farm would significantly impede protection of sustainable fisheries or fishing activity at recognised important fishing grounds, this should be attributed correspondingly significant weight" (paragraph 2.6.132 of NPS EN-3)	any potential impacts (**Section 6.4**). The results of the commercial fisheries assessment are presented in **Section 6.11**.
"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. Guidance has been jointly agreed by the renewables and fishing industries on how they should liaise with the intention of allowing the two industries to successfully co-exist" (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)	Hornsea Four consultation with UK and overseas stakeholders from the fishing community is ongoing (**Section 6.4**).
"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 commitments are presented within **Section 6.8.2** and within **Volume A4, Annex 5.2: Commitments Register**. Opportunities for potential medium- and long-term positive benefits are being explored with the fishing industry.

6.3.2 Other relevant policies

6.3.2.1 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).

6.3.2.2 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 Plan policies	How and where considered in the ES
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."*	The Applicant, is, and will continue to take steps to minimise the effects upon the fishing industry in the area through appropriate mitigation where required. A range of commitments are presented within **Section 6.8.2** and within **Volume A4, Annex 5.2: Commitments Register**. The benefits of and case for proceeding with Hornsea Four are set out in **Volume A1, Chapter 2: Planning and Policy** and **F1.1: Planning Statement**.
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 Four assessment has considered the effects on commercial fish stocks (**Section 6.11**). Impacts to spawning stocks are considered in detail in **Chapter 3: Fish and Shellfish Ecology**.
Coexistence and displacement	
Policy GOV2: *"Opportunities for co-existence should be maximised wherever possible."*	The Applicant, is, and will continue to take steps to minimise the effects upon the fishing industry in the area through appropriate mitigation where required. A range of Commitments are presented within **Section 6.8.2**, within **F2.9: Outline Fisheries Coexistence and Liaison Plan** and within **Volume A4, Annex 5.2: Commitments Register** (Co95).
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."*	

6.4 Consultation

6.4.1.1 Consultation is a key part of the DCO application process. Consultation regarding commercial fisheries has been conducted through bilateral stakeholder meetings, the EIA scoping process (Orsted 2018) and formal consultation on the PEIR (Orsted 2019). An overview of the project consultation process is presented within **Volume A1, Chapter 6: Consultation**.

6.4.1.2 The key issues raised during consultation specific to commercial fisheries are outlined below in Table 6.4, together with how these issues have been considered in the production of this ES.

Table 6.4: Consultation Responses.

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
PINS	26 November 2018, Scoping Opinion	Displacement or disruption of commercially important fish and shellfish resources (during construction, operation and decommissioning). The primary justification provided in the Scoping Report for scoping this matter out is a cross-reference to the conclusions drawn in the Fish and Shellfish Ecology chapter regarding a similar matter. As the latter refers to the array area and the operational phase only, the justification is incomplete. In light of this the Inspectorate has insufficient information to enable this matter to be scoped out of the assessment and does not agree to do so.	This impact is scoped in (see Section 6.8 and Volume A4, Annex 5.1: Impact Register) and addressed within the impact assessment in Section 6.11.
PINS	26 November 2018, Scoping Opinion	Additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the array and export cable areas (during construction, operation and decommissioning). The Inspectorate agrees that this potential effect can be scoped out of the impact assessment having regard to the magnitude of the impact.	It is confirmed that this impact is scoped out of the impact assessment (see Section 6.8. and Volume A4, Annex 5.1: Impact Register).
PINS	26 November 2018, Scoping Opinion	Increased vessel traffic within fishing grounds leading to interference with fishing activity (during construction, operation and decommissioning). It is not evident how information on the anticipated number of vessel movements that will be associated with the construction, operation and decommissioning of the Proposed Development has been taken into account. Additionally, the datasets used in the Scoping Report do not capture the fishing activity undertaken in inshore areas by vessels smaller than 15 m, which are likely to be more vulnerable to interference with their fishing activity. Insufficient information is therefore provided to scope this matter out of the assessment, and the Inspectorate advises that it must be assessed in the ES where significant effects are likely to occur.	This impact is scoped in (see Section 6.8. and Volume A4, Annex 5.1: Impact Register) and addressed within the impact assessment in Section 6.11.
PINS	26 November 2018, Scoping Opinion	Baseline data: The Scoping Report states that baseline data "*may be supplemented by the results of vessel-based fishing activity reconnaissance survey work*". It is unclear on what basis this additional survey work would or would not be undertaken. The	Sources of commercial fisheries data is provided in Table 6.5 and a list site specific survey data is provided in Table 6.6.

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		ES should clearly explain what data has been used to inform the assessment and how it has been applied.	
National Federation of Fishermen's Organisations (NFFO) and Holderness Fishing Industry Group (HFIG)	10 July 2018, Meeting	Hornsea Project One Offshore Wind Farm (hereafter Hornsea Project One), Hornsea Project Two Offshore Wind Farm (hereafter Hornsea Project Two) & Hornsea Four project update meeting – Hornsea Four update meeting 1.	Details of fishing patterns and sensitivity of the fleet is considered within the impact assessment in Section 6.11.
NFFO and HFIG	19 September 2018, Meeting	Hornsea Project One, Hornsea Project Two & Hornsea Four project update meeting – Hornsea Four update meeting 2: Concern raised regarding cumulative impact of Hornsea Project One and Hornsea Project Two.	Assessed in the cumulative effects assessment in Section 6.12.
NFFO and HFIG	24 January 2019, Meeting	Hornsea Project One, Hornsea Project Two & Hornsea Four project update meeting – Hornsea Four update meeting 3: Discussion around construction timings and specific locations of construction activities for Hornsea One and Two and forthcoming Hornsea Four surveys.	Details of fishing patterns and sensitivity of the fleet is considered within the impact assessment in Section 6.11.
NFFO and HFIG	16 April 2019, meeting	Hornsea Four update meeting 4: Discussion around phasing of gear clearance to facilitate Hornsea Four surveys.	Details of fishing patterns and sensitivity of the fleet is considered within the impact assessment in Section 6.11.
NFFO and HFIG	02 May 2019, meeting	Hornsea Project One, Hornsea Project Two & Hornsea Four project update – Hornsea Four update 5: Discussion of timings of gear clearance and key areas of commercial fisheries activity.	Details of fishing patterns and sensitivity of the fleet is considered within the impact assessment in Section 6.11.
North East Inshore Fisheries and Conservation Authority (NE IFCA)	01 July 2019, email	Provision of surveillance data related to commercial fisheries.	Surveillance sightings data is provided within Volume A5, Annex 6.1: Commercial Fisheries Technical Report.
Rederscentrale	July 2019, email	Presentation on Hornsea Four and Belgian commercial fisheries activity.	Country specific characterisation of commercial fisheries activity is provided within Volume A5, Annex 6.1: Commercial Fisheries Technical Report. The baseline (Section 6.7) and impact assessment (Section 6.11) analyse and assess on a fleet by fleet / fishery by fishery basis.
From Nord	July 2019, email	Presentation on Hornsea Four and French commercial fisheries activity. Confirmation that French vessels are active across the area, as per baseline presented, and that further consultation should be directed via Comité Régional des Pêches Maritimes et des Elevages Marins (CRPMEM) Nord.	
Cooperative Maritime Etaploise	July 2019, email	Presentation on Hornsea Four and French commercial fisheries activity.	

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
(C.M.E.) Producer Organisation		Confirmation that French vessels are active across the area, as per baseline presented, and that further consultation should be directed via CRPMEM Nord.	
VisNed	July 2019, email and phone meeting	Presentation on Hornsea Four and Dutch commercial fisheries activity. Confirmation that baseline data is representative of the Dutch fleet; that vessels are likely to operate across the offshore export cable where appropriate burial is achieved.	
Danish Fishermen's Producer Organisation (DFPO)	July 2019, email	Presentation on Hornsea Four and Danish commercial fisheries activity.	
Swedish Pelagic Federation Producers Organisation	July 2019, email	Presentation on Hornsea Four and Swedish commercial fisheries activity.	
Danish Pelagic Producers Organisation	July 2019, email	Presentation on Hornsea Four and Danish commercial fisheries activity.	
Erzeugergemeinschaft der Nord- und Osteefischer GmbH	July 2019, email and phone meeting	Presentation on Hornsea Four and German commercial fisheries activity. Confirmation that baseline data is representative of the German fleet; and that pelagic vessels operating across the area will maintain the opportunity to catch pelagic shoaling species outside the array area.	
HFIG	20 September 2019, Section 42 response	Hornsea Four array area is in an area that the offshore fleet use to target predominantly edible crab with smaller catches of lobster. The offshore crab grounds act as feeder grounds for the whole crab fishery, whether via the seasonal migration patterns, offshore to inshore over the summer months and vice versa or as spawning grounds for larval release.	These details of brown crab (also known as edible crab) fishing patterns are considered within the baseline (Section 6.7) and impact assessments (Section 6.11).
		The pitfalls of using Vessel Monitoring System (VMS) data and NE IFCA sightings can lead to an underestimation of the fleet size and vessels working in the area. Of the 63 boats that are HFIG members, only 5 are > 15 m in length and subject to mandatory VMS. NE IFCA jurisdiction only extends to 6 nautical miles (NM); therefore their sightings will not consider most of the gear outside of this range, and some offshore vessels do not mark their gear on the surface.	Data limitations, including coverage of NE IFCA sightings data and VMS data for the potting fleet are considered in paragraph 6.7.4.5.

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
Marine Management Organisation (MMO)	23 September 2019, Section 42 response	Potting for lobster and crab predominantly takes place during summer and autumn seasons, however this can be extended in settled weather.	These details of fishing patterns are considered in the baseline assessment (Section 6.7).
NE IFCA	23 September 2019, Section 42 response	Noted that the minimum size for brown crab captured within Eastern IFCA district is 140 mm. Noted that Bridlington is the biggest port in the region and the intensity of effort south of Flamborough is likely higher than that occurring in North Yorkshire. Highlighted the limitations of sightings data based on patrol vessel effort.	The information provided has been updated within Volume A5, Annex 6.1: Commercial Fisheries Technical Report. Data limitations, including coverage of NE IFCA sightings data, are considered in paragraph 6.7.4.5.
NFFO	24 September 2019, Section 42 response	Applying Magnitude Criteria: noted that magnitude justification for CF-O-8 for trawl and dredge fisheries refers to the greater levels of activities taking place elsewhere.	The justification cited is of relevance to the sensitivity assessment. The magnitude assessment justification has been reviewed and updated in Section 6.11, and the cited text has been added to the sensitivity justification.
		Construction Phase: The assessment of impact CF-C-3 with reference to potting only considers the displacement of trawl activities on to potting grounds and not potting activities into remaining potting grounds. This latter effect does not appear to have been considered.	Further detail and justification on displacement of potting gear from within the array area into grounds already targeted by potters is provided in Section 6.11, specifically paragraphs 6.11.1.42 to 6.11.1.46.
		Operational and Maintenance Phase: It is considered that the current assumption for resumption of fishing within Hornsea Four does not reflect a worst case scenario for the purposes of completing the impact assessment and that in the case of mobile twined gear activities, the worst case scenario is that fishing will not take place within the wind farm array. We also note that 7.11.2.41 states that "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 infrastructure and cable protection within the Hornsea Four array area." Can the Applicant therefore clarify what is meant by the term "appropriate" with respect to the access to fishing activities within the site.	The maximum design scenario (MDS) (Table 6.9) describes turbine layout parameters (minimum spacing: 810 m) and scenarios for exclusion of commercial fisheries at each stage of the development. The Applicant acknowledges certain gear types including pelagic trawl, twin rigged trawls and demersal seine / fly shooting will not be practically deployed within the operational array. This has been clarified within the assessment (Section 6.11) in

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
			line with the Statement of Common Ground (SoCG) for Hornsea Three. The term "Appropriate" is interpreted as avoiding the indicated infrastructure and cable protection at the defined location.
		Can the Applicant clarify its position with respect to fishing in the vicinity of cables, and under what circumstances it would seek legal redress for damages to cables due to fishing operations under the Continental Shelf Act and whether or not it subscribes to the European Subsea Cables Association (ESCA) position statement? With reference to CF-O11 and CF-O-12, whilst we observe that these impacts could have an impact on fishing businesses due to damages to gears and associated costs, the more significant issue is related to safety. How does the impact assessment assess emergency response capability with respect to incidents occurring within the vicinity of the array?	The Applicant is a member of the Fisheries Liaison with Offshore Wind and Wet Renewables group (FLOWW) and has been involved in the development of the FLOWW cables document, which outlines both developers' and fishermen's position on fishing within the vicinity of cables and cable protection. Locations of cable protection, should it be required, will be communicated to the fishing industry. Impacts to emergency response capabilities are considered within **Chapter 7: Shipping and Navigation** and **Chapter 8: Aviation and Radar**.
		Cumulative Effects Assessment: The assessment does not currently include fisheries or spatial management measures such as associated with Marine Protected Areas. Concerned that prior completed projects may have impacts upon commercial fisheries that may be borne by the fleet but are assumed to have been accounted for in the baseline. This assumes that the fleet has perfected adapted to previous impacts. In addition, no guidance is provided in the methodology on how an assessor is able to judge when incremental losses of fishing ground become significant. Furthermore, it is not clear how magnitude of impact for other projects has been combined to inform the overall magnitude of impact in the CEA. In order to ensure transparency and allow stakeholders and decision-makers to verify the results of the CEA, presentations of fishing activity	The Applicant has amended the cumulative assessment to include marine protected areas. Cumulative effects assessments follow the standard methodology with respect to whether a project is considered within the baseline or not. The Applicant acknowledges that the fishing industry does not instantly adapt to a wind farm site once it becomes operational, however the Applicant will do their upmost to minimise impacts and assist the fishing industry to adapt to the 'new normal'

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		data and projects and proposals included the CEA should be included.	through data sharing and development of **F2.9: Outline Fisheries Coexistence and Liaison Plan**.
		Commercial Fisheries Commitments: We consider the following will help to address co-existence issues related to the proposal: • A fisheries co-existence and liaison plan should be prepared in outline as part of the planning consent application and included as part of the Deemed Marine Licence. • Layout principles for the array, inter array and inter connector cabling should take into account predominate fishing patterns as well as navigation patterns. • Consultation regarding the cable burial plan and design of cable protection. • Adherence to best practice when planning and laying cables via the use of the cable burial risk assessment methodology (CBRAM) or equivalent. • Communication of post construction survey results to the fishing industry. • An adequate monitoring programme to detecting changes in burial attenuation and safety risk and communication to the fishing industry. • Contingency protocols should be in place to report on dropped objects and cable exposures (secured via the Deemed Marine Licence) • Consider supporting the introduction of real-time "in the wheel-house" warning systems for safety hazards • Consider use of community support fund. • The development of protocols/arrangements for the removal/relocation of static gears associated with marine works and survey that require them. • A commitment to sourcing local vessels for work where practical to do so. • We take the view that there should be 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.	A Fisheries Coexistence and Liaison Plan has been prepared in outline form (**F2.9: Outline Fisheries Coexistence and Liaison Plan**) and submitted as part of the DCO application. This plan includes consideration of all the points raised in relation to commercial fisheries commitments. The Applicant will follow best practice guidelines wherever possible and will share the final cable specification and installation plan with the fishing industry. Post-construction survey data will be shared with the MMO, which can be requested by the fishing industry. Maintaining the integrity of the cable is a fundamental priority for the Applicant, and therefore known cable exposures will be shared with the fishing industry. The process for this is detailed within **F2.9: Outline Fisheries Coexistence and Liaison Plan**. In relation to Hornsea Four, the Applicant supports the East Coast Fisheries Research Sponsorship. The Applicant can confirm that the NFFO Services will be invited to competitive tender for relevant Hornsea Four works.
Rederscentrale	24 September	Presentation on Hornsea Four and Belgian activity assessment. Discussion on fisheries operation within a	Details of fishing patterns and sensitivity of the fleet is

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
	2019, phone meeting	wind farm and across buried subsea cables. Provision of Belgian VMS data across the Hornsea Four order limits. Discussion on cumulative effects across a range of offshore wind farms.	considered within the impact assessment Section 6.11. The information provided by Rederscentrale is presented within Volume A5, Annex 6.1: Commercial Fisheries Technical Report. The cumulative impact is assessed in Section 6.12.
NFFO and HFIG	20 November 2019, meeting	Presentation on updates on Hornsea Four since PEIR, and discussion around consultation response to Section 42 provided by NFFO and HFIG. Discussion on the displacement effects on potting vessels, based on past and present experience. Discussion on industry perception on importance of offshore areas to brown crab. Discussion around further clarity on safety zones, manned platforms and maintenance regime.	Details of fishing patterns and sensitivity of the fleet is considered within the impact assessment Section 6.11. The MDS is presented in Table 6.9. Further clarification on safety zones, manned platforms and maintenance regimes is provided in paragraph 6.9.1.3.
Copeche: Regional Fisheries Committee of France	05 February 2020, phone meeting	Presentation on updates on Hornsea Four since PEIR, and discussion around data specific to French vessels, specifically trawlers deploying demersal and pelagic trawl to target whiting and mackerel respectively.	Country specific characterisation of commercial fisheries activity is provided within Volume A5, Annex 6.1: Commercial Fisheries Technical Report. The baseline (Section 6.7) and impact assessment (Section 6.11) analyse and assess on a fleet by fleet / fishery by fishery basis.
Scallop Industry Consultation Group (SICG)	06 February 2020, email correspondence	Provision of details on Hornsea Four, including mapping for dredge VMS data. SICG provided confirmation that scallop tows are undertaken to the south extremity of the economic scallop fishing in the region, with the bulk of the activity approximately 2 miles north of the offshore Export Cable Corridor (ECC).	
NFFO	27 August 2020, email	Provision of details on the change to Order Limits from PEIR to DCO for Hornsea Four array area, including presentation of change to baseline characterisation and confirmation of no material change to impact assessment findings.	The Hornsea Four Order Limits are considered throughout this chapter, specifically within the baseline (Section 6.7) and impact assessments (Section 6.11).
HFIG			
SICG			
DFPO			
Erzeugergemeinschaft der Nord- und Osteefischer			
Copeche, FROM Nord and C.M.E			
VisNed			
Rederscentrale			

6.5 Study Area

6.5.1.1 Hornsea Four is within the southwest portion of the International Council for the Exploration of the Sea (ICES) Division 4b (Central North Sea). Hornsea Four array area lies outside the 12 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.

6.5.1.2 From a commercial fisheries perspective, the study areas are defined by the ICES statistical rectangles that Hornsea Four overlaps (**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:

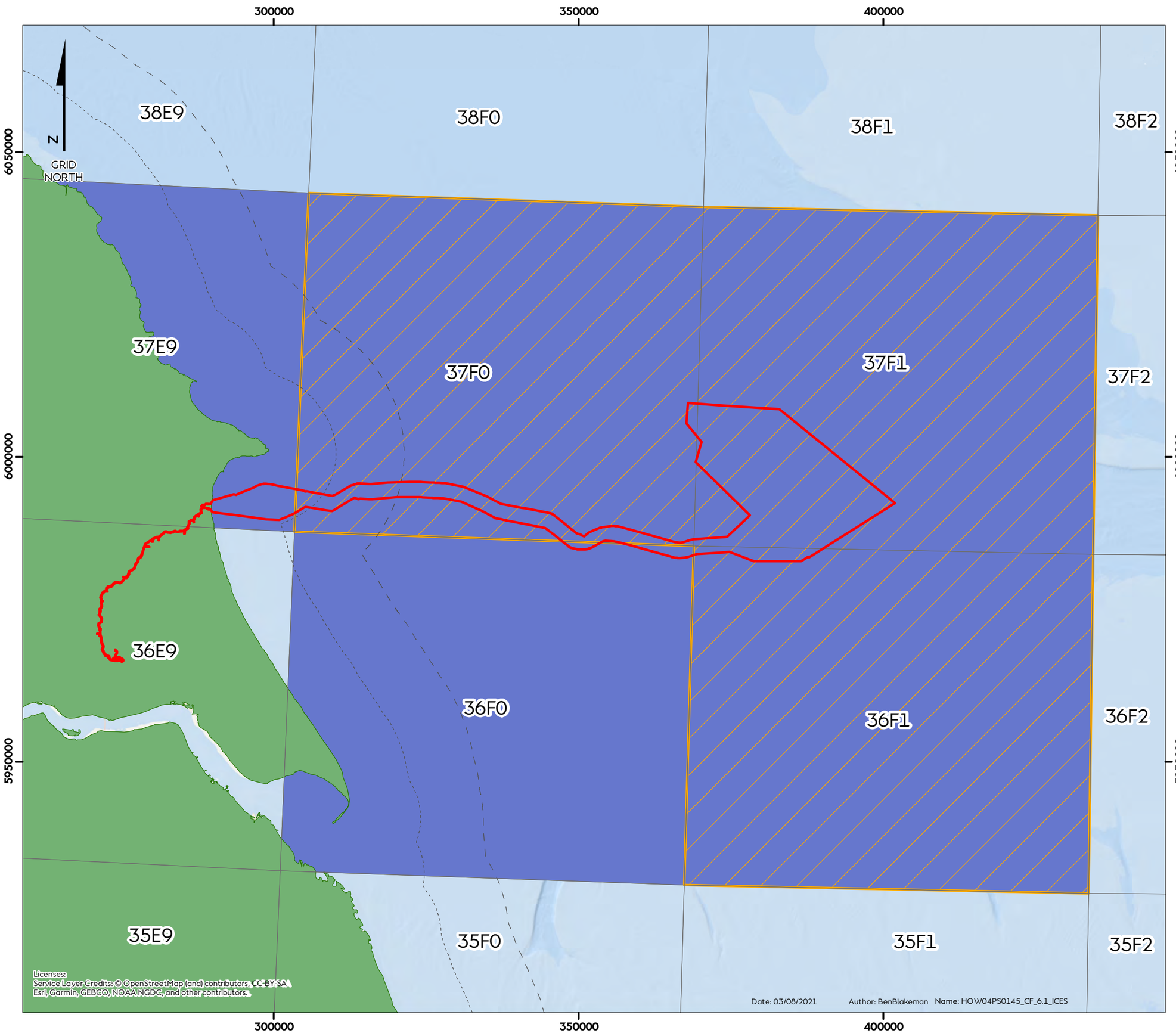
- Hornsea Four array commercial fisheries study area: ICES rectangles 37F0, 37F1, and 36F1;
- Hornsea Four offshore ECC commercial fisheries study area: ICES rectangles 37E9, 37F0, 37F1, 36F0 and 36F1; and
- Hornsea Four commercial fisheries study area: ICES rectangles 37E9, 37F0, 37F1, 36F0 and 36F1 i.e. covers all aspects of Hornsea Four (and mirrors the offshore ECC commercial fisheries study area). The Hornsea Four array area and offshore ECC occupy only a portion of these ICES rectangles (4.3%).

6.5.1.3 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).

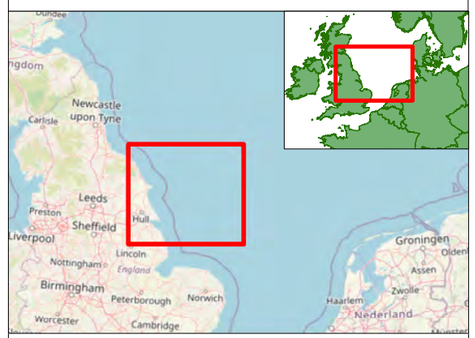
Hornsea Four

Figure 6.1

Commercial Fisheries ICES statistical rectangles and the Hornsea Four Order Limits



- Order Limits
- 12nm Territorial Sea Limit
- 6nm Fish Limit
- ICES Statistical Rectangles
- Hornsea Four Array Study Area
- Hornsea Four Offshore ECC Study Area



Coordinate system: ETRS 1989 UTM Zone 31N

Scale@A3: 1:600,000

0 10 20 Kilometres

0 5 10 Nautical Miles

REV	REMARK	DATE
...	First Issue	09/06/2019
A	Updated following PEIR consultation, for DCO	03/08/2021

Commercial Fisheries
ICES Rectangles
Document no: HOW04PS0145
Created by: FN
Checked by: SM
Approved by: LK

POSEIDON

Ørsted

6.6 Methodology to Inform Baseline

6.6.1 Desktop Study

6.6.1.1 A desk study was undertaken to obtain information on commercial fisheries through a review of existing studies and datasets. Data were acquired within the Hornsea Four commercial fisheries study area for the following time periods:

- 2015 to 2019 landing statistics for all UK vessels operating within the commercial fisheries study area.
- 2013 to 2017 VMS data amalgamated for all EU (including UK) Member State vessels.
- 2012 to 2016 landing statistics for all EU (including UK) Member State vessels operating within the commercial fisheries study area. Data for EU Member States is no longer publicly available by ICES rectangle for 2017 onwards. Data is available by wider region (e.g. North Sea), but this does not provide the spatial resolution to attribute landings to the study area. Data from 2012 to 2016 for EU Member States by ICES rectangle represents the best available landings statistics to assess international commercial fisheries activity.

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

Table 6.5: Key Sources of commercial fisheries data.

Source	Summary	Coverage of Hornsea Four development area
MMO	UK: Landings statistics data for UK-registered vessels, with data query attributes for: landing year; landing month; vessel length category; ICES rectangle; vessel/gear type; port of landing; species; live weight (tonnes); and, value for period 2015-2019.	Full coverage of the Hornsea Four array area and offshore ECC.
MMO	UK: VMS data for UK-registered vessels with data query attributes for time fishing and value of catch at a resolution of 200th of an ICES rectangle, amalgamated for all mobile gear vessels and all static gear vessels for period 2013-2017.	Full coverage of the Hornsea Four array area and offshore ECC.
European Union Data Collection Framework (EU DCF)	All Europe: Landings statistics for Belgian, Danish, Dutch, French, German, Swedish and UK registered vessels with data query attributes for: landing year; landing quarter; ICES rectangle; vessel length; gear type; species; and, landed weight (tonnes) for period 2012-2016.	Full coverage of the Hornsea Four array area and offshore ECC.
European Union Data Collection Framework (EU DCF)	Landings statistics for Belgian, Danish, Dutch, French, German, Swedish and UK registered vessels for the North Sea with data query attributes for: landing year; gear type; species; landed weight (tonnes); and value (euro) without ICES rectangle details) for period 2015-2018.	Coverage of the North Sea region.

Source	Summary	Coverage of Hornsea Four development area
European Market Observatory for Fisheries and Aquaculture Products (EUMOFA)	All Europe: Price data for species landed by Belgian, Danish, Dutch, French, German, and Swedish registered vessels with data query attributes for: landing year; species; and price (Euros per kilogram) for period 2012-2016.	Full coverage of the Hornsea Four array area and offshore ECC.
International Council for the Exploration of the Sea	All Europe: VMS data for Belgian, Danish, Dutch, French, German, and Norwegian registered vessels with data query attributes for time fishing at a resolution of 1/200th of an ICES rectangle amalgamated for all mobile vessels for period 2013-2017.	Full coverage of the Hornsea Four array area and offshore ECC.
The Crown Estate (TCE)	All Europe: Commercial fishing industry mapping (FIM) activity density mapping across the former Hornsea Zone for beam trawl and demersal otter trawl, collated in 2010 and covering a period of approximately 20 years.	Full coverage of the Hornsea Four array area.
North Eastern Inshore Fisheries Conservation Authority (NE IFCA)	UK: Commercial fisheries surveillance data for activity out to 6 NM, and out to 12 NM in some instances, for period 2011-2016, including mapping of sited fishing vessels deploying the following gears: potting, dredge, otter trawl, netting, lining.	Partial coverage of the offshore ECC.

Landing statistics

6.6.1.3 Landings data for all species are collected via the EU logbooks scheme and recorded by ICES statistical rectangle and stored in the EU 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 Hornsea Four commercial fisheries study area.

6.6.1.4 Landing statistics were collated across five years (2012 to 2016 or 2015 to 2019, dependant on availability). 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 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 an estimate of 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 MMO with the following parameters: year; month; gear type; ICES

rectangle; species; live weight (tonnes) and first sales value (£) across a five-year period (2014 to 2018).

Vessel Monitoring System data

6.6.1.8 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).

6.6.1.9 Through a European wide data call, ICES collated VMS data for vessels ≥ 12 m operating mobile gear that has contact with the seabed. This VMS data set includes vessel registered to the following countries: Belgium, Denmark, France, Germany, the Netherlands, Norway, Ireland, Sweden, and UK. Data is amalgamated for all countries and not available on a country-by-country basis; data has been analysed over a five-year period from 2013 to 2017.

6.6.1.10 Further annual VMS data are collated by the MMO for all vessels ≥ 15 m registered to the UK, including all gear types. VMS data for UK potting vessels has been analysed from 2016 to 2017.

6.6.2 Site Specific Surveys

6.6.2.1 To inform the EIA, site-specific surveys were undertaken. A summary of surveys is outlined in **Table 6.6**.

Table 6.6: Summary of site-specific survey data.

Title, year and reference	Summary	Coverage of Hornsea Four development area
Commercial Fisheries Scouting Surveys, 26 July to 01 August 2018.	Static gear survey and gear observations out to 12 NM across the offshore ECC, including location of gear and identification of gear marker type (drums, buoys, pellets and fenders).	Inshore section of the Hornsea Four offshore ECC
Seasonal otter trawl sampling, 2011. **Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report**.	41 trawls undertaken across the former Hornsea Zone with a 4 km buffer to the north and south. 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.	Partial coverage of the Hornsea Four array area.
Epibenthic beam trawl sampling, 2010 to 2012.	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. The beam trawls, each lasting 10 minutes, were carried out using a standard	Partial coverage of the Hornsea Four array area.

Title, year and reference	Summary	Coverage of Hornsea Four development area
Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report. Volume A5, Annex 2.1: Benthic Ecology Technical Report.	Cefas 2 m 'Jennings' beam trawl fitted with a 5 mm cod-end.	
Marine traffic surveys of Hornsea Four array area and High Voltage Alternating Current (HVAC) Booster Station Search Area (winter: January/February 2019 and February/March 2021; summer: July/August 2019 and June/July 2021). Volume A5, Annex 7.1: Navigational Risk Assessment.	Automatic Identification System (AIS), visual and Radar vessel survey determining existing shipping activity within and in the vicinity of the Hornsea Four array area and HVAC Booster Station Search Area in accordance with MGN 654.	Full coverage of the Hornsea Four array area and partial coverage of the offshore ECC.

6.7 Baseline Environment

6.7.1 Existing baseline

6.7.1.1 This section presents the existing baseline for commercial fisheries, using the most recent datasets available at the time of writing (2012-2016 for EU DCF data; 2014-2018 for MMO data; 2013-2017 for ICES VMS data and 2016-2017 for MMO VMS data).

6.7.1.2 This section provides an overview of all landings from the Hornsea Four commercial fisheries study area (i.e., ICES rectangles 37E9, 36F0, 37F0, 36F1, 37F1), followed by analysis on a fishery by fishery basis, where details on the nationality of vessels, species caught, and location of fishing activity is provided.

6.7.1.3 This section should be read in conjunction with Volume A5, Annex 6.1: Commercial Fisheries Technical Report, which provides further detail on vessel and gear characteristics and profiles fisheries activity on a country basis.

Total landings and activity across Hornsea Four

6.7.1.4 Landings from the Hornsea Four commercial fisheries study area had an average annual value of €33.1 million for all EU member states (based on five-years' data from 2012 to 2016; EU DCF database 2019; EUMOFA 2019). The proportion of value by ICES rectangle is shown in Figure 6.2 for vessel nationality and Figure 6.3 for species composition. As described in paragraph 6.7.4.5, the lack of more recent data for EU fleets is recognised as a data limitation. Data from 2017 to 2018 for EU fleets is not available by ICES rectangle

within the EU DCF database; however, more detailed nationally specific data for EU countries, including 2017 mapped VMS data, is provided in **Volume A5, Annex 6.1: Commercial Fisheries Technical Report.**

6.7.1.5 Landings from the inshore and southern ICES rectangles (37E9, 36F0 and 36F1) are dominated by UK vessels targeting shellfish, namely European lobster (*Homarus gammarus*), brown crab (*Cancer pagurus*), whelk (*Buccinum undatum*) and king scallops (*Pecten maximus*, and hereafter referred to as scallops). Landings from the remaining ICES rectangles (37F0 and 37F1) are fished by a mix of UK and other EU countries, mainly targeting pelagic (herring (*Clupea harengus*)) and demersal species including sandeel (*Ammodytes* spp.), sole (*Solea solea*), plaice (*Pleuronectes platessa*), Norway lobster (*Nephrops norvegicus* and hereafter referred to as *Nephrops*) and whiting (*Merlangius merlangus*).

6.7.1.6 The highest value (€11.2 million) and weight (17,300 tonnes) of landings is taken from 37F0 (**Figure 6.4**), where a range of fisheries occur (pelagic, demersal, shellfish), that are targeted by seven different countries. Other than UK vessels, landings by Dutch, Danish and French dominate, with smaller amounts landed by Belgian, German, and Swedish fleets.

6.7.1.7 Shellfish landings of lobster, brown crab, scallop, whelk and *Nephrops* are almost exclusively taken by UK vessels (**Figure 6.5**). For pelagic species, the majority of herring (58% by value) are caught by Dutch vessels, with the remainder taken by five other countries. While mackerel (*Scomber scombrus*) landings are almost exclusively taken by the French pelagic fleet, as are whiting landings by the French demersal fleet. The Danish dominate landings of sandeel, with a small proportion landed by Swedish vessels. Sole and plaice are landed by a mixture of Dutch, Belgian and UK vessels.

6.7.1.8 Lobster is one of the most economically important species in the Hornsea Four commercial fisheries study area, with an average annual value of €8.6 million, followed by herring (€6.6 million), brown crab (€6.3 million), scallop (€3.4 million) and sandeel (€2 million) (based on 2012-2016 EU wide data).

6.7.1.9 In more recent years, brown crab has become the most important species economically to the UK potting fleet operating in the Hornsea Four commercial fisheries study area, with an average annual value of £8.8 million (based on 2015-2019 landings). Lobster landings and price have also increased over this time, worth £8.5 million in first sales value to UK vessels.

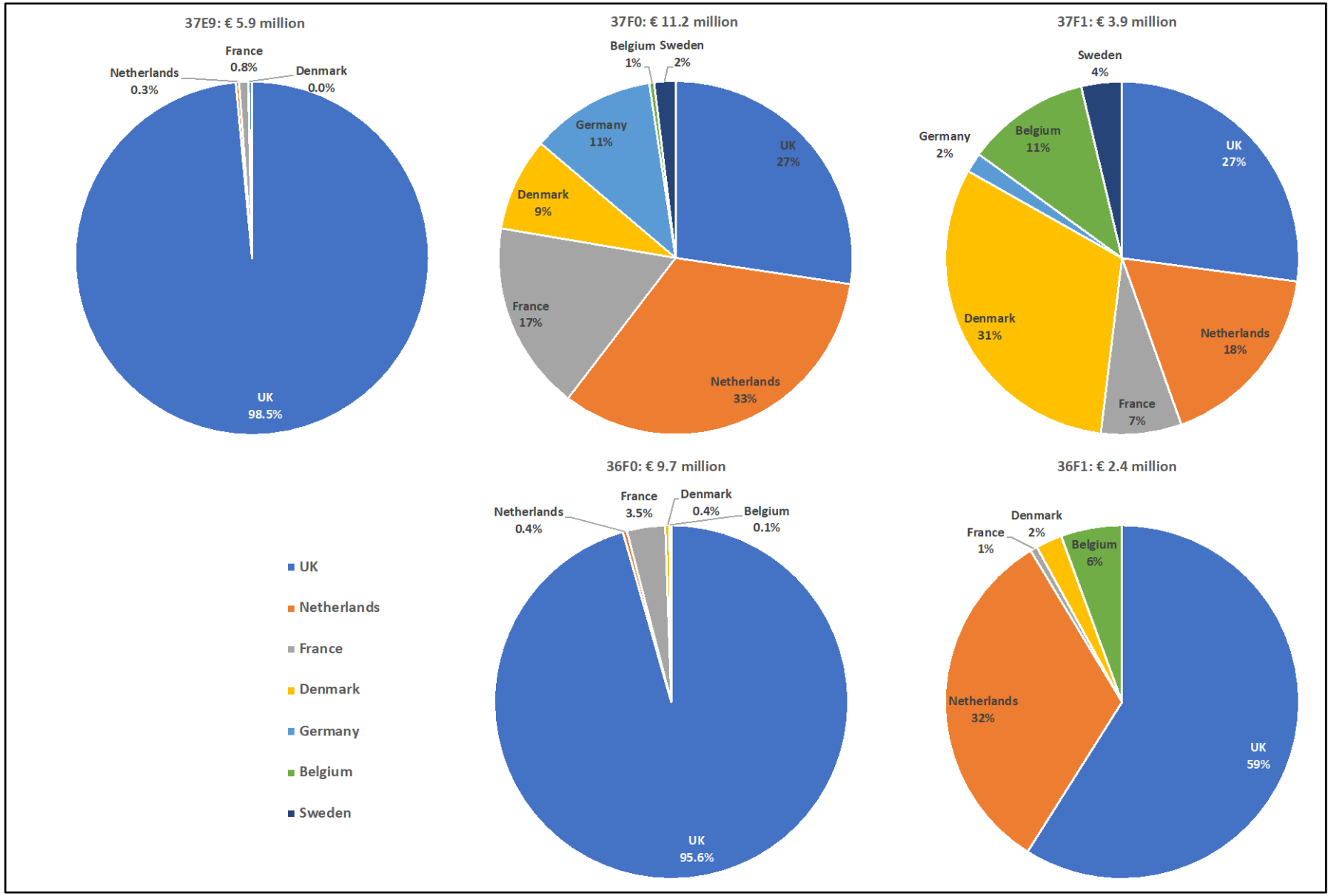


Figure 6.2: Average annual value by country and ICES rectangle (data 2012-2016, source: DCF 2019).

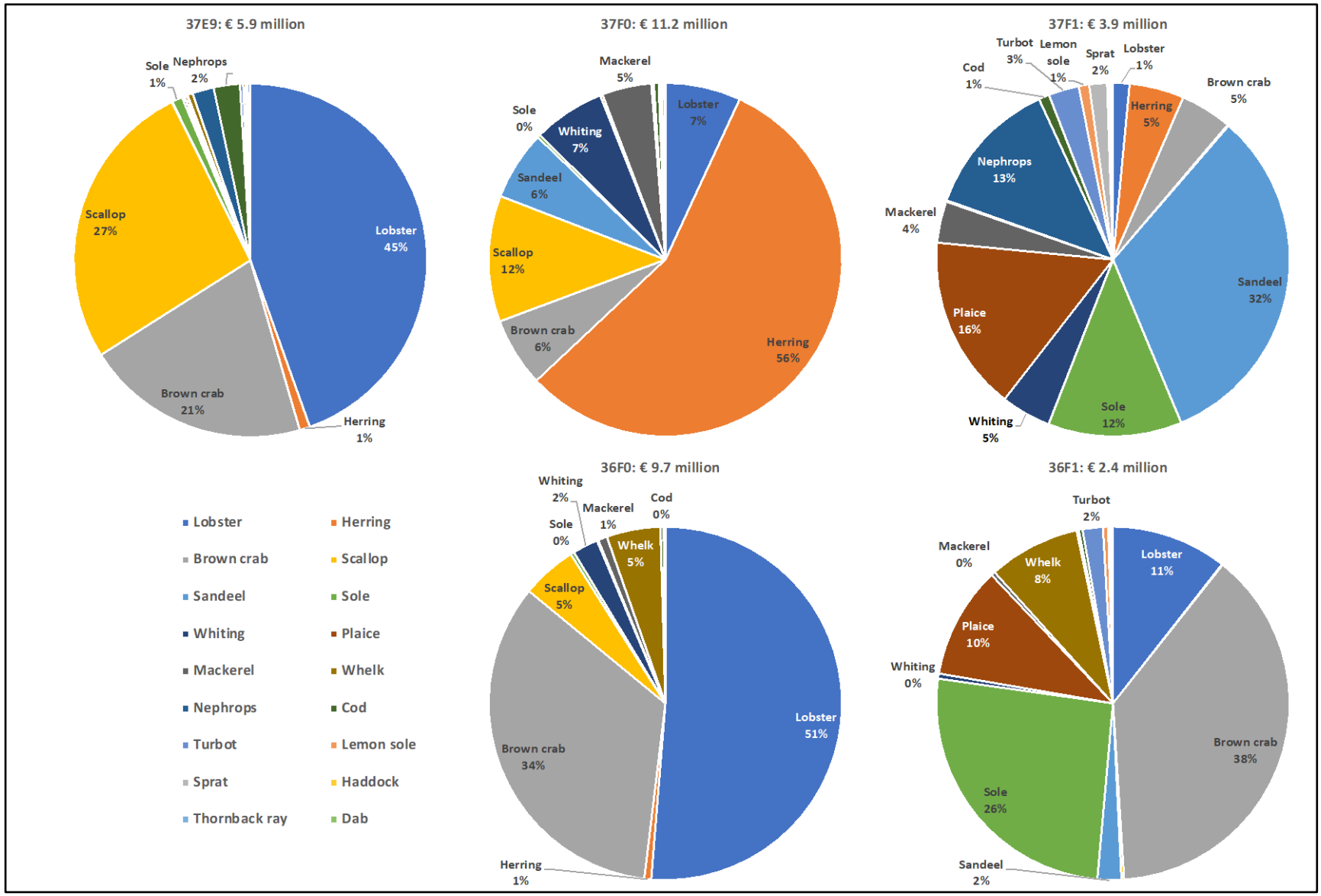


Figure 6.3: Average annual value by species and ICES rectangle (data 2012-2016, source: DCF 2019).

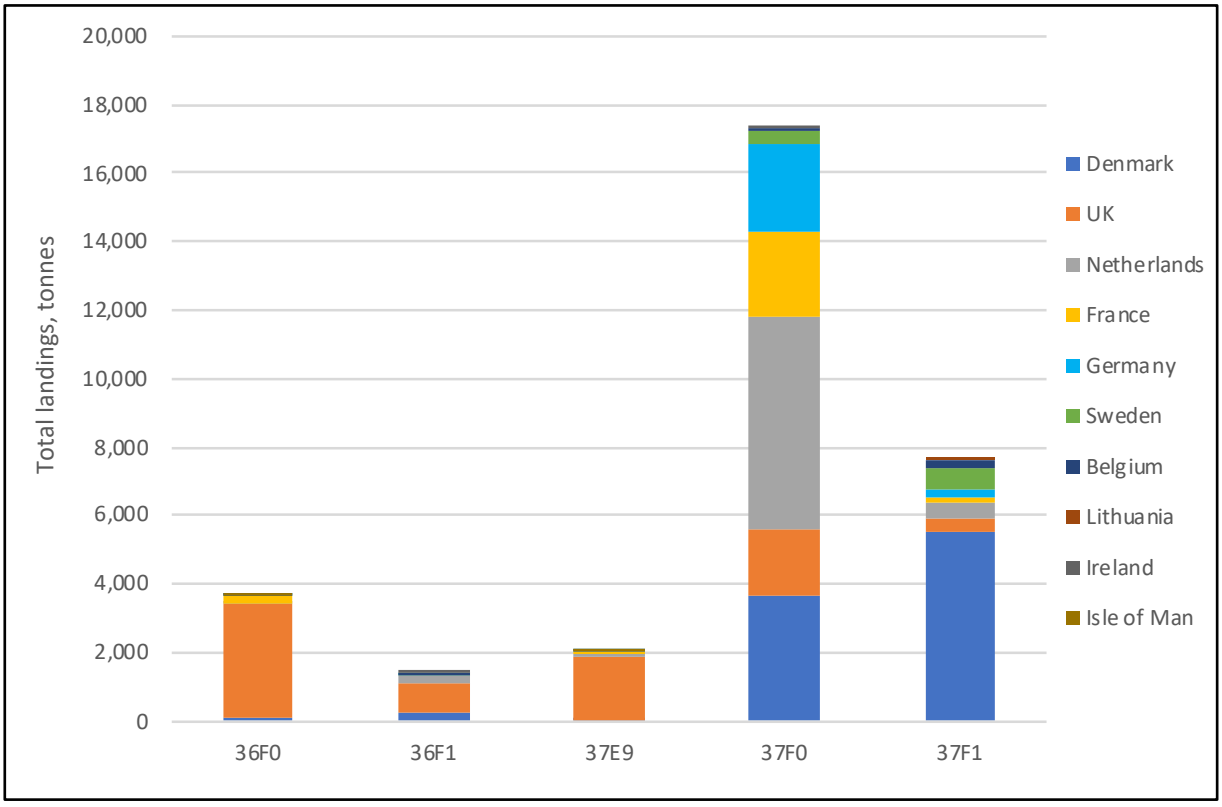


Figure 6.4: Average annual landings from Hornsea Four commercial fisheries study area by ICES rectangle and country (data 2012-2016, source: DCF 2019).

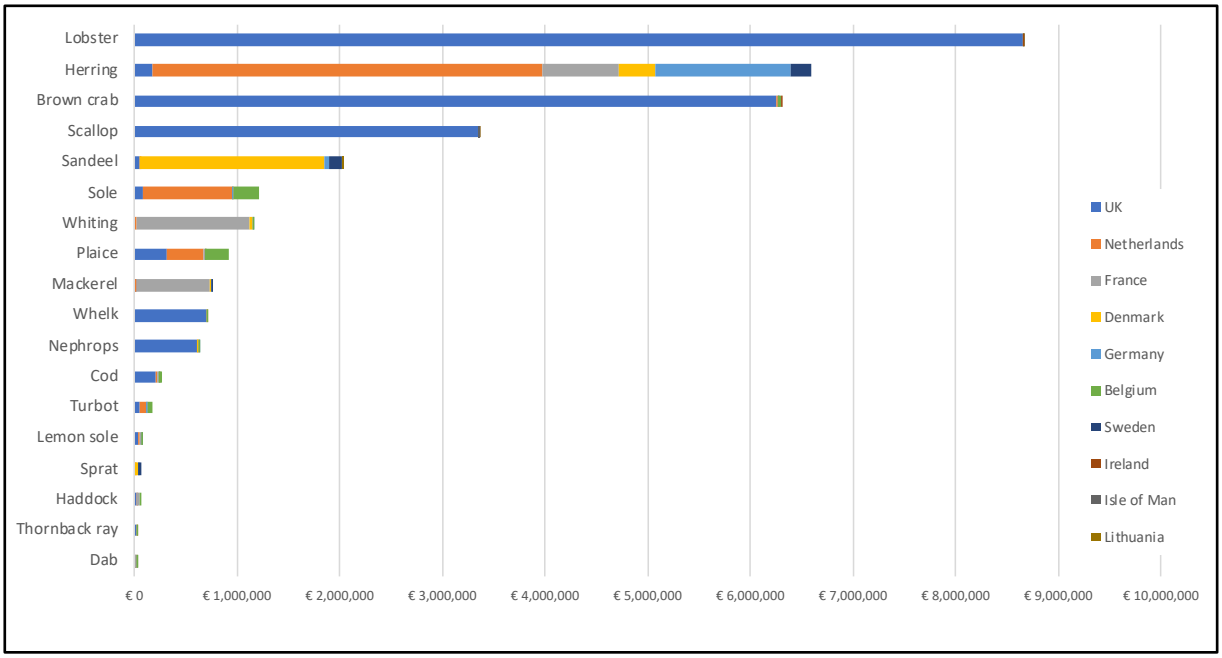


Figure 6.5: Average annual value from Hornsea Four commercial fisheries study area by species and country (data 2012-2016, source: DCF 2019).

Potting fishery

6.7.1.10 In the Hornsea Four commercial fisheries study area landings by vessels using pots are almost exclusively undertaken by the UK fleet (99.98%), with a negligible amount landed by Irish vessels (**Figure 6.6**). Lobster obtains a significantly higher market price than brown crab and while landed in smaller quantities (657 tonnes lobster annually, compared to 5,266 tonnes brown crab), have a similar annual first sales value (£8.5 million for lobster and £8.8 million for brown crab). While different grounds are targeted when fishing for brown crab or lobster or both, the potting fleet are dependent on both species. Increases in prices of brown crab and lobster have made the fisheries more profitable in recent years (see **Volume A5, Annex 6.1: Commercial Fisheries Technical Report**). A small whelk fishery also exists, using a different type of pot (normally a plastic container).

6.7.1.11 In terms of location, 37E9 and 36F0 are the most important ICES rectangles for potting, which is supported by VMS data showing the activity by those vessels ≥ 15 m in length (**Figure 6.7**). Total value of catches landed by the potting fleet have steadily increased over the time analysed, with a combined first sales value of £21 million of brown crab and lobster landed in 2019 from the commercial fisheries study area.

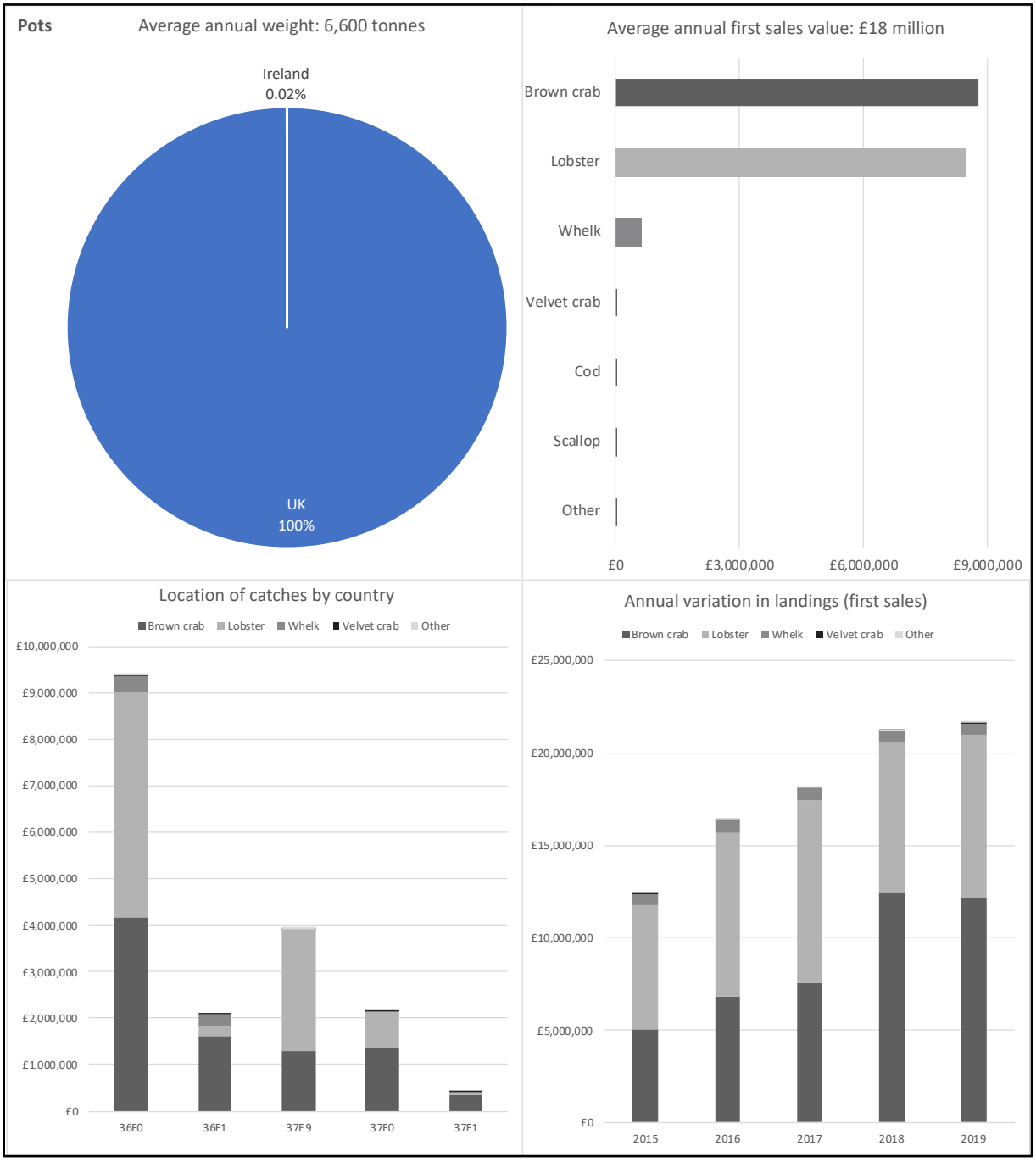
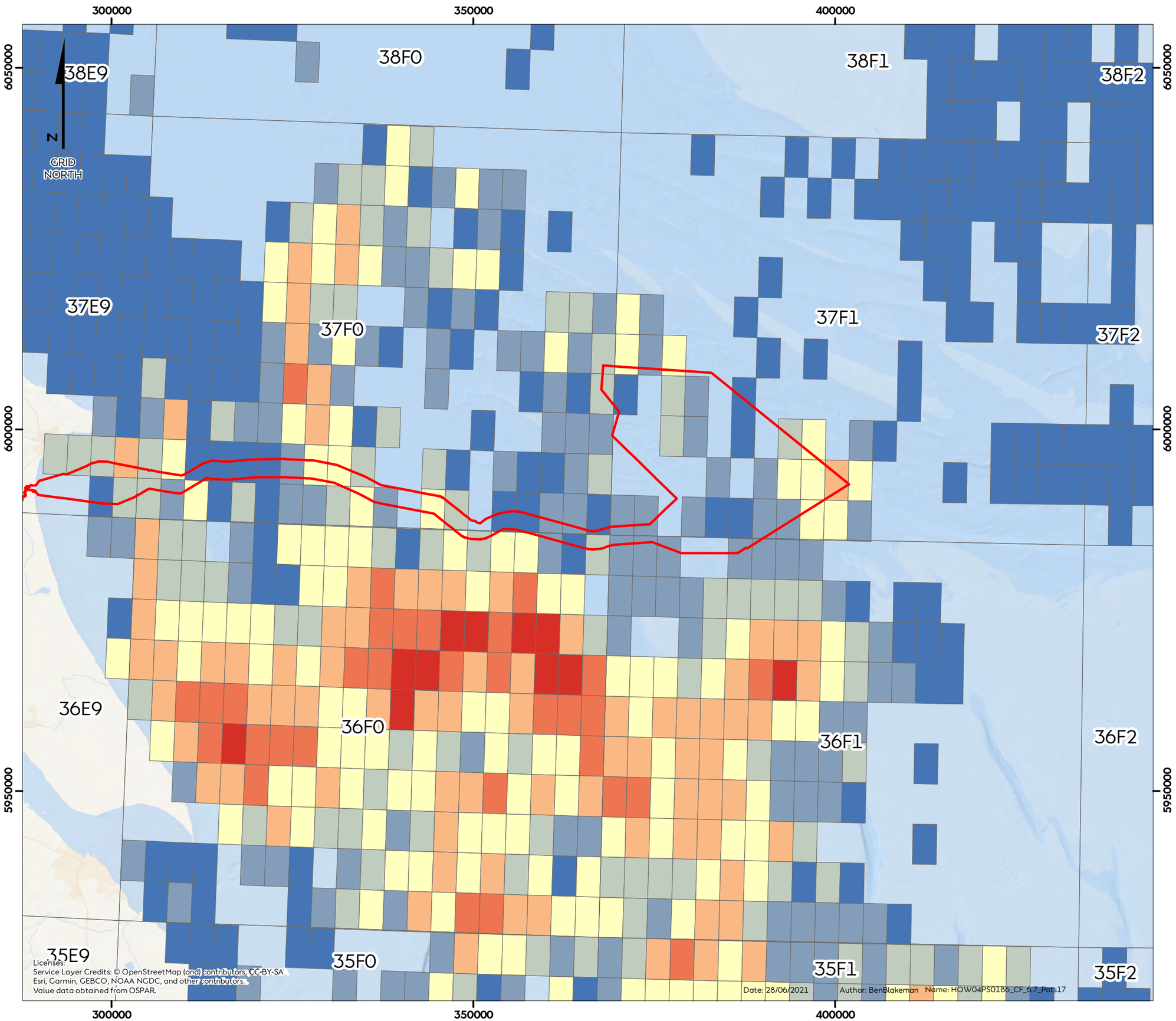


Figure 6.6: Pots landings profile from Hornsea Four commercial fisheries study area (data 2015-2019, source: MMO 2020).

Hornsea Four

Figure 6.7

Value of catches made in 2017 by all UK potting vessels ≥15m in length (MMO, 2019)



Coordinate system: ETRS 1989 UTM Zone 31N

Scale@A3: 1:500,000

0 10 20 Kilometres

0 5 10 Nautical Miles

REV	REMARK	DATE
....	First Issue, for DCO	28/06/2021

Commercial Fisheries
Annual value, >15m vessels
Document no: HOW04PS0186
Created by: FN
Checked by: SM
Approved by: LK

POSEIDON

Ørsted

Hornsea Four array area

6.7.1.12 The majority of the Hornsea Four array area is in ICES rectangle 37F1, which has the lowest level of landings by potting vessels within the study area, corroborated by statistics and VMS data. Activity by UK potting vessels within the array area is limited. However, consultation indicates that displacement related to other projects (including Hornsea Project One and Hornsea Project Two, as well as oil and gas exploration activity) has resulted in a higher proportion of potting in the Hornsea Four area during 2019. The Hornsea Four array area is an area targeted primarily for brown crab by the offshore potting fleet, with smaller catches of lobster. Industry consider this offshore area to act as 'feeder grounds' for the regional crab fishery, including as spawning grounds for larval release and supporting seasonal migrations of brown crab from offshore to inshore over the summer months (HFIG, pers. comm. 20 November 2019). **Section 3.5** of **Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report** provides further details on brown crab migrations and spawning habitat. Specifically, that post-larvae are known to settle inshore and juvenile crabs are more common in shallow waters, with adult female crabs understood to undertake extensive migrations, which may be associated with the reproductive cycle. Berried female brown crabs exhibit a largely sedentary lifestyle during the overwintering period whilst brooding eggs. During this time, they typically bury themselves in soft mud and sand substrates. Information on crab spawning habitats were collected through crab larvae surveys in 1976, 1993 and 1999 (Eaton et al. 2003); two areas of spawning habitat were identified in the fish and shellfish study area, with one spawning ground directly overlapping the ECC, and another interacting with the north west corner of the array area (Eaton et al. 2003).

Hornsea Four offshore ECC

6.7.1.13 It is understood that extensive potting occurs in the inshore region of the Holderness coast, and along the entirety of the offshore ECC. VMS data indicates hot spots of activity in the north eastern portion of 36F0, with less activity overlapping the offshore ECC. However, this is due to the dataset representing ≥15 m vessels, which does not reflect the majority of vessels based in the Bridlington area, which are under 15 m. It is noted that other ICES VMS datasets presented within the report are for ≥12 m vessels; due to data availability, it is not possible to present MMO VMS to the same level of detail for potting vessels. With VMS data representing ≥15 m potting vessels, the VMS figure very likely underestimates the fleet size and vessels working in the area. Of the 63 potting vessels that are members of HFIG, only five are ≥15 m.

6.7.1.14 Extensive potting activity across the offshore ECC is evidenced by landings statistics and consultation with fisheries representatives (NFFO and HFIG) and directly with the fishing industry, based on one-to-one discussions related to survey work to inform the EIA. Seasonal landings for brown crab and lobster are presented within **Volume A5, Annex 6.1: Commercial Fisheries Technical Report**; potting predominately occurs in the summer and autumn months, extending into winter in settled weather. Bridlington is the region's largest port, with landings into this port characterised within **Volume A5, Annex 6.1: Commercial Fisheries Technical Report** for landing statistics up to and including 2019.

6.7.1.15 Surveillance data provided by the NE IFCA and mapped within **Volume A5, Annex 6.1: Commercial Fisheries Technical Report** corroborates that potting activity occurs across the inshore waters of the Holderness Coast, including across the inshore parts of the offshore ECC. Activity appears greatest to the north of the offshore ECC, but this may be a factor of surveillance coverage across the NE IFCA area. Limitations of surveillance data

are detailed in Section 6.7.4, specifically noting that the level of patrol effort at any particular location is not factored into the data interpretation.

Dredge fishery

6.7.1.16 In the Hornsea Four commercial fisheries study area, landings by vessels using mechanical dredge are almost exclusively undertaken by the UK fleet (99.9%), with a negligible amount landed by Isle of Man vessels (Figure 6.8).

6.7.1.17 The dredge fishery targets scallops, with minimal landings of other commercial species. The fishery is predominately undertaken in ICES rectangles 37E9 and 37F0, as well as 36F0 to a lesser extent. There is no fishery in the most offshore ICES rectangles 36F1 and 37F1, which is corroborated by VMS data for all EU and UK vessels ≥12 m in length (Figure 6.8).

6.7.1.18 Annual landings by the dredge scallop fishery are highly variable, with lower catches from the study area in 2014 and 2016, compared with 2015, 2017 & 2018 when first sales value ranged from £5 million to £5.4 million. The annual average first sales value from 2014 to 2018 is £4.2 million. This reflects the somewhat cyclable nature of scallop fisheries, where certain grounds are more productive in certain years and are therefore targeted on a cyclable basis.

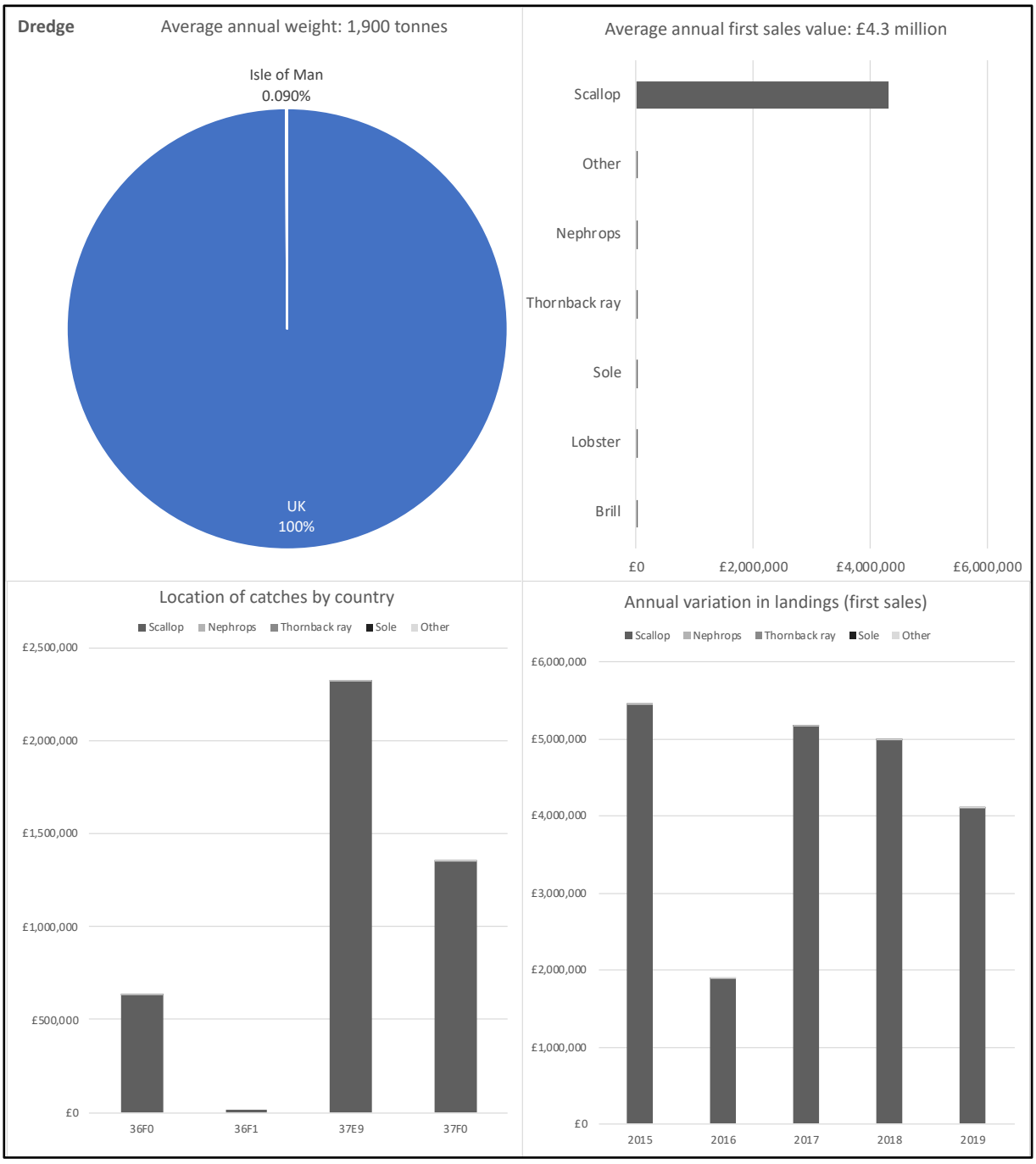
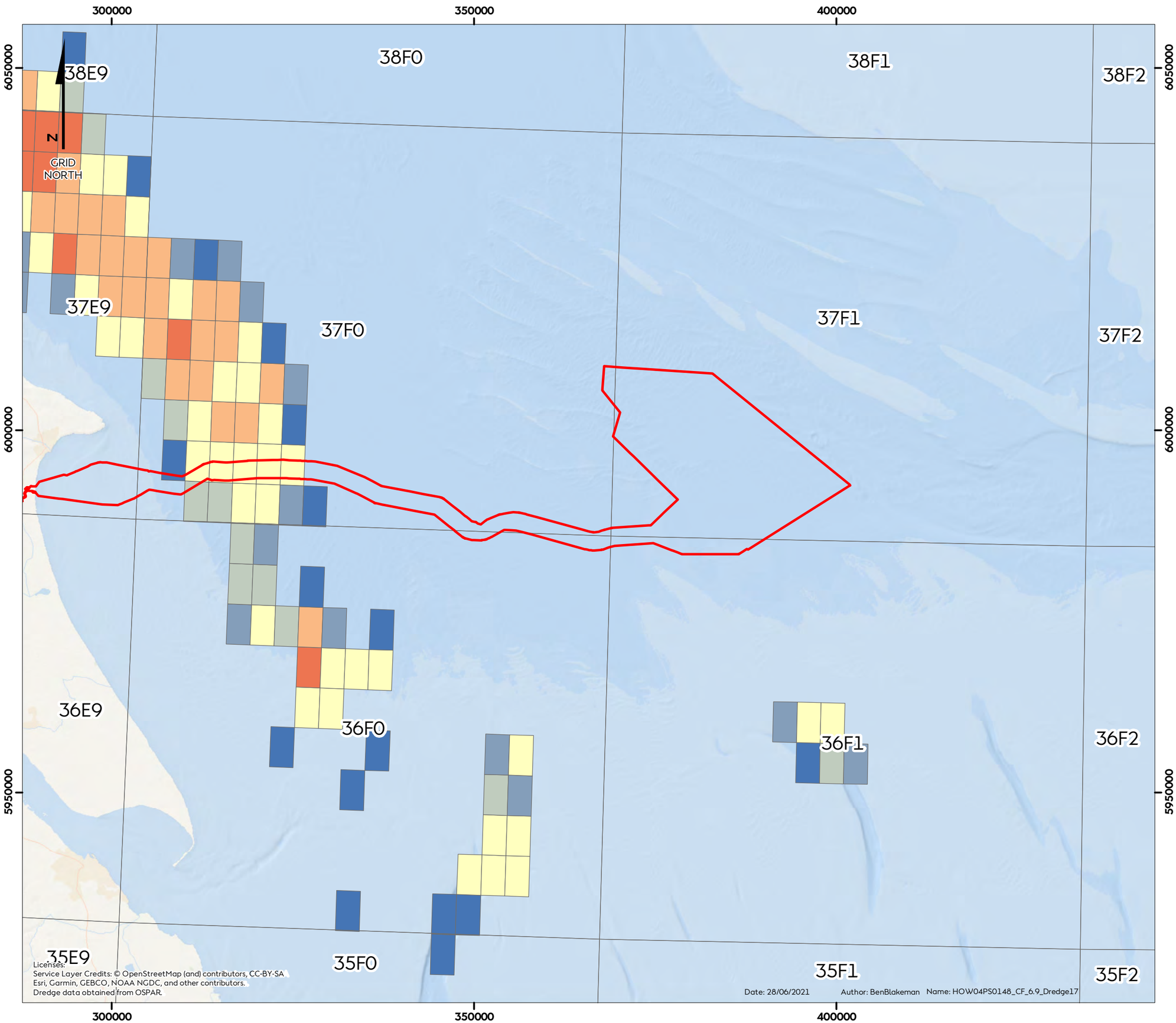


Figure 6.8: Dredge landings profile from Hornsea Four commercial fisheries study area (data 2015-2019, source: MMO 2020).

Hornsea Four

Figure 6.9

Value of catches made in 2017 by all EU (including UK) dredge vessels ≥12m in length (ICES, 2019)



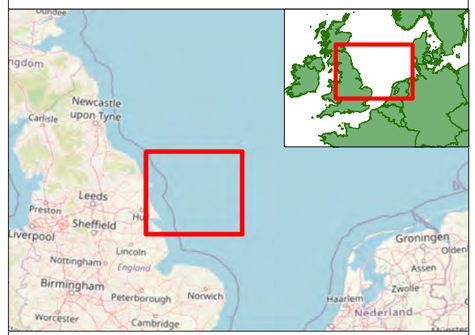
Order Limits

ICES Statistical Rectangles

Dredge, 2017

Total value, Euro

- 0 - 1000
- 1001 - 5000
- 5001 - 10000
- 10001 - 50000
- 50001 - 100000
- 100001 - 500000
- 500001 - 8760000



Coordinate system: ETRS 1989 UTM Zone 31N

Scale@A3: 1:500,000

0 10 20 Kilometres

0 5 10 Nautical Miles

REV	REMARK	DATE
....	First Issue	09/06/2019
A	Updated following PEIR consultation, for DCO	28/06/2021

Commercial Fisheries
Annual value, >12m vessels
Document no: HOW04PS0148
Created by: FN
Checked by: SM
Approved by: LK

POSEIDON

Ørsted

Date: 28/06/2021 Author: BenBlakeman Name: HOW04PS0148_CF_6.9_Dredge17

Hornsea Four array area

6.7.1.19 There is no scallop dredge activity within the Hornsea Four array area, as evidenced by landing statistics and VMS data.

Hornsea Four offshore ECC

6.7.1.20 The scallop dredge fishery targets grounds between 6 to 12 NM, running parallel to Holderness Coast. The fishery is principally undertaken north of the offshore ECC, but also runs through the section of offshore ECC between 6 to 12 NM.

Pelagic fishery

6.7.1.21 In the Hornsea Four commercial fisheries study area, landings by vessels using pelagic trawl are taken by Dutch (45% by value), German (18%) and French and Danish (15% each) fleets.

6.7.1.22 The main target species is herring, worth an estimated €7.6 million in average annual first sales value, with additional small quantities of mackerel, sandeel and whiting associated with the catch. Almost all pelagic catches are taken from 37F0 and are highly variable year on year.

6.7.1.23 Pelagic trawls target highly mobile pelagic species that move in shoals and are not associated with specific seabed habitats. Herring shoal and migrate across long distances to and from spawning grounds and are therefore available to catch across large areas. VMS data is not available for analysis of activity by individual EU member states. The fishery is characterised by short, highly seasonal fishing events, with each trip landing between 1,000 – 1,500 tonnes, which can be taken in a single haul.

Hornsea Four array area

6.7.1.24 The majority of pelagic landings are consistently taken from 37F0. A small portion of Hornsea Four array area overlaps with 37F0. All pelagic trawl fleets are assumed to occasionally fish within the array area, but do not routinely target this area.

Hornsea Four offshore ECC

6.7.1.25 The Hornsea Four offshore ECC runs across the southern part of 37F0. All pelagic trawl fleets are assumed to occasionally fish within the offshore ECC, but do not routinely target this area.

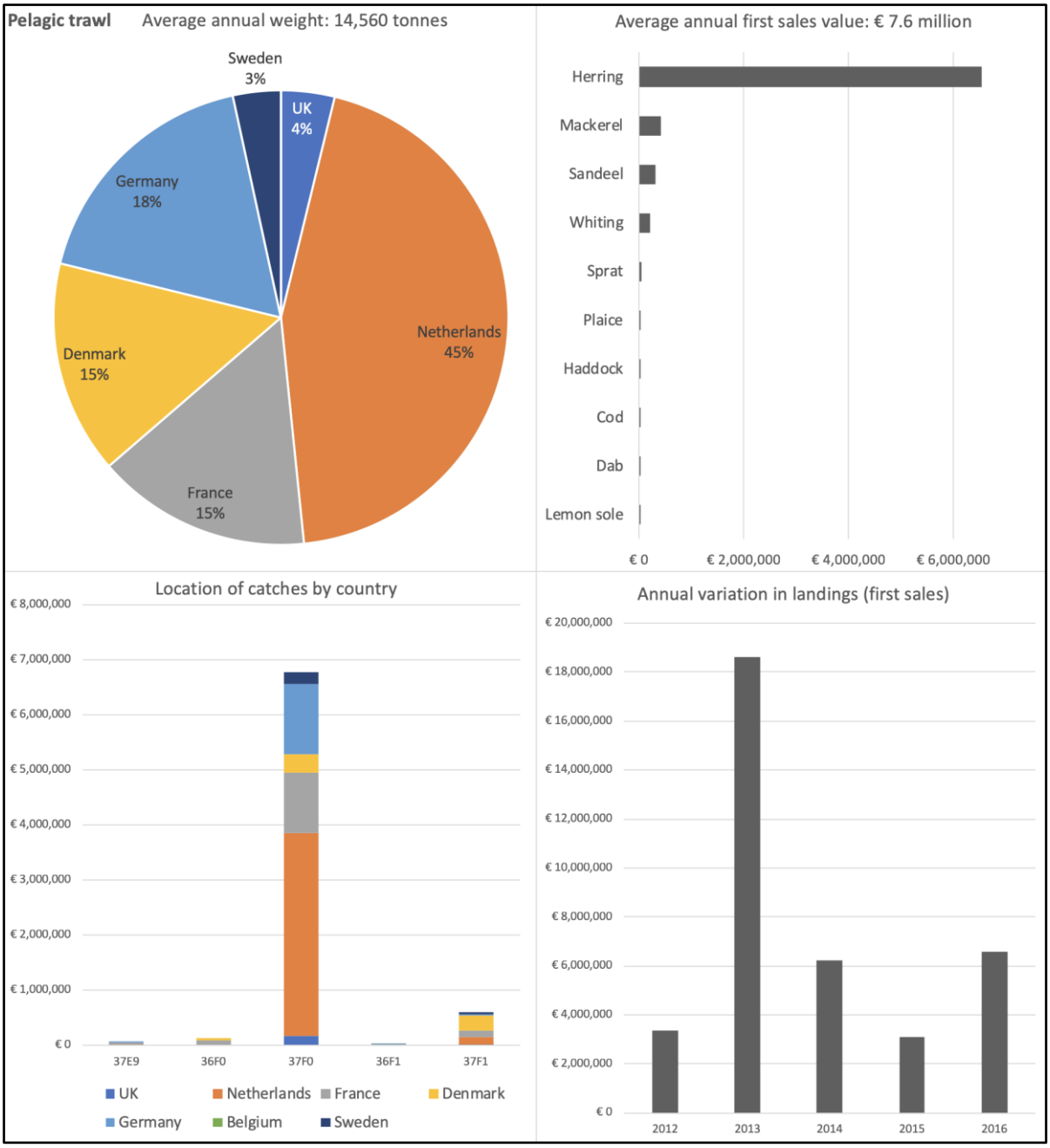


Figure 6.10: Pelagic trawl landings profile from Hornsea Four commercial fisheries study area (data 2012-2016, source: DCF 2019).

Demersal fishery – beam trawl

6.7.1.26 In the Hornsea Four commercial fisheries study area, landings by vessels using beam trawl are principally taken by Dutch (56% by value) and Belgian (40%) fleets (Figure 6.11). The target species are sole and plaice, worth an estimated €2 million in average annual first sales value. Landings are predominately taken from the offshore ICES rectangles 36F1 and 37F1, with 36F1 principally targeted by Dutch vessels.

6.7.1.27 The total landings value by beam trawl has dropped consistently across the years analysed and by 46% across the full five-year time series. This is likely to be due to changes in gear, with the Dutch fleet citing a move towards demersal seine over beam trawl, as

well as fluctuations related to trends in Total Allowable Catches (TACs) and prices for the key species.

6.7.1.28 VMS data (**Figure 6.12**) corroborates landings from 36F1 and 37F1, noting that the adjacent ICES rectangle (37F2) is more important to the beam trawl fleet, in terms of value landed.

Hornsea Four array area

6.7.1.29 Some activity by beam trawl vessels is noted within Hornsea Four array area, notably in the southern portion of the array (**Figure 6.12**). The south east corner of 37F1 (outside the array area boundary) and adjacent ICES rectangle (37F2) are considerably more important in terms of value landed by beam trawl vessels. This finding is consistent with the trends identified for the previous years analysed (2013 to 2016), as presented in **Volume A5, Annex 6.1: Commercial Fisheries Technical Report**.

Hornsea Four offshore ECC

6.7.1.30 There is limited effort by beam trawl vessels across the offshore ECC. However, a pocket of activity is noted, approximately 10 NM east of Flamborough Head, which extends south and overlaps with a small section of the offshore ECC.

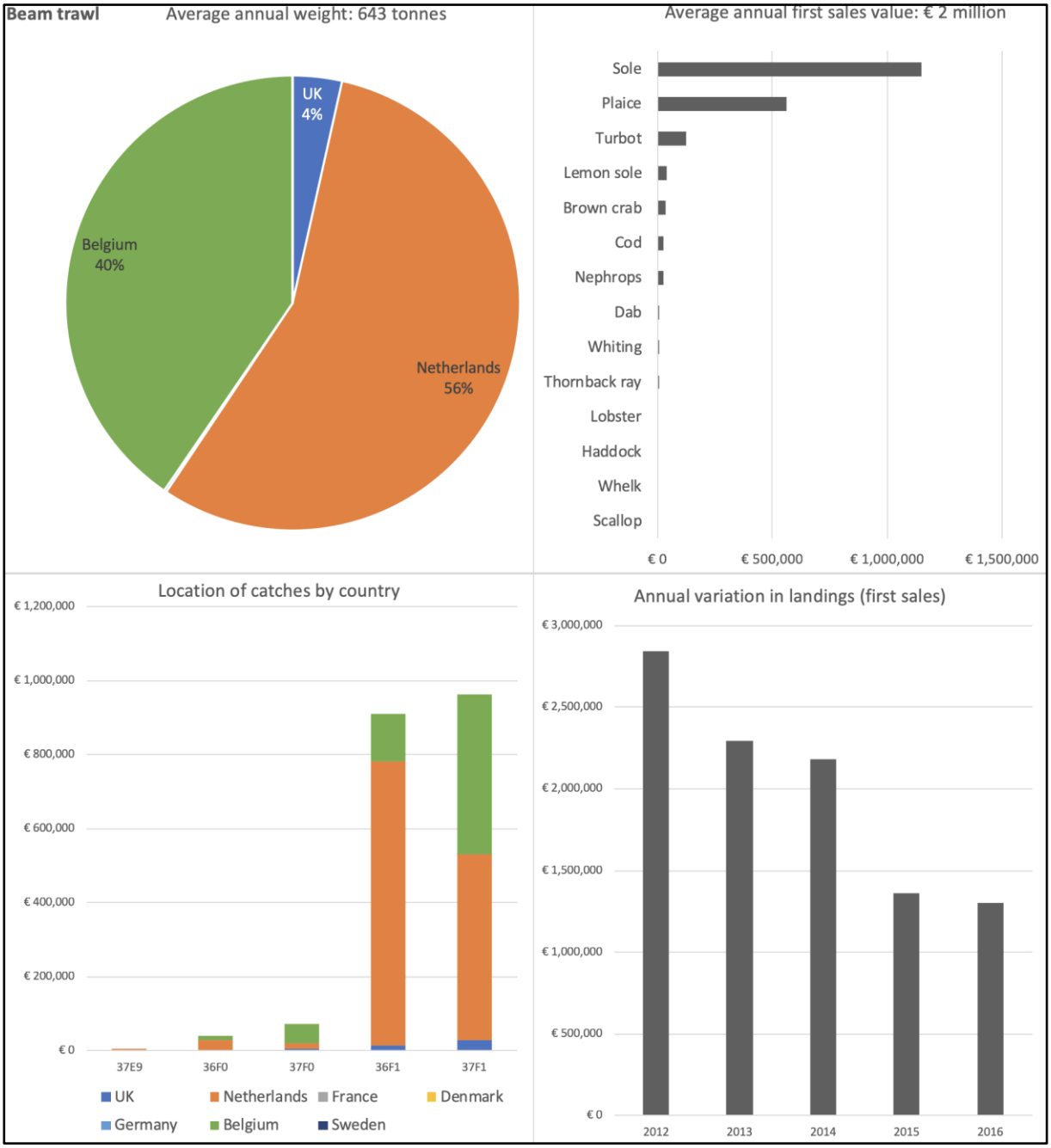
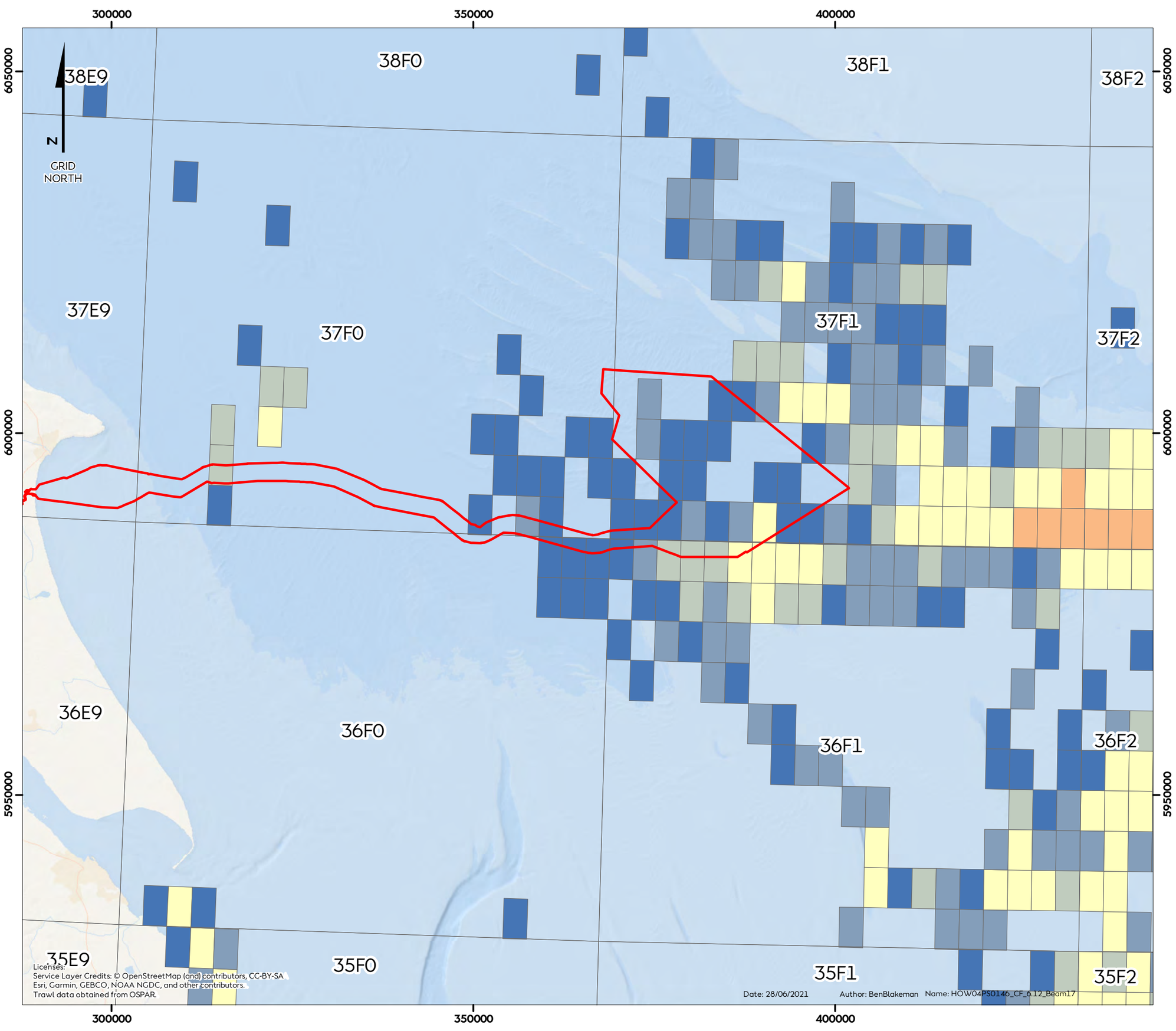


Figure 6.11: Beam trawl landings profile from Hornsea Four commercial fisheries study area (data 2012-2016, source: DCF 2019).

Hornsea Four

Figure 6.12

Value of catches made in 2017 by all EU (including UK) beam trawl vessels ≥12m in length (ICES, 2019)



Order Limits

ICES Statistical Rectangles

Beam trawl, 2017

Total value, Euro

- 0 - 1000
- 1001 - 5000
- 5001 - 10000
- 10001 - 50000
- 50001 - 100000
- 100001 - 500000
- 500001 - 1820000

Coordinate system: ETRS 1989 UTM Zone 31N

Scale@A3: 1:500,000

0 10 20 Kilometres

0 5 10 Nautical Miles

REV	REMARK	DATE
....	First Issue	09/06/2019
A	Updated following PEIR consultation, for DCO	28/06/2021

Commercial Fisheries
Annual value, >12m vessels
Document no: HOW04PS0146
Created by: FN
Checked by: SM
Approved by: LK

POSEIDON

Ørsted

Date: 28/06/2021 Author: BenBlakeman Name: HOW04PS0146_CF_6.12_Beam17

Demersal fishery – otter trawl and demersal seine

6.7.1.31 In the Hornsea Four commercial fisheries study area, landings by vessels using otter trawl are principally taken by Danish (75% by value), French (9%), UK (8%) and Swedish (6%) vessels. The Danish and Swedish demersal trawl vessels are large industrial trawlers targeting sandeel in 37F0 and 37F1. The French demersal fleet are targeting whiting in 36F0 and 37F0, and the UK are targeting a *Nephrops* and mixed demersal fishery.

6.7.1.32 Landings have significantly dropped from 2015 to 2016, likely to be linked to the limitations in TAC for sandeel.

6.7.1.33 Small quantities of landings by demersal seine are recorded across the Hornsea Four commercial fisheries study area, worth an estimated €54,000 in average annual first sales value. Landings are principally by UK (60% by value), Dutch (29%) and French (9%) vessels, targeting plaice, whiting and mixed demersal. The majority of landings are from 37F1, with smaller quantities from 36F0 and 37F0.

Hornsea Four array area

6.7.1.34 Very little activity is noted by demersal otter trawlers within the Hornsea Four array area, in 2017 (**Figure 6.15**). Higher levels of activity are seen in 2014 and 2016 (**Volume A5, Annex 6.1: Commercial Fisheries Technical Report**), but this remains relatively limited compared to the areas outside the array boundaries (notably to the east and north east of the array).

6.7.1.35 Two small areas of key sandeel grounds overlap with the array area, in the north west and south east corners of the array (**Figure 6.16**).

Hornsea Four offshore ECC

6.7.1.36 Some activity is noted by demersal otter trawlers in the middle section of the offshore ECC (**Figure 6.15**). Key sandeel grounds are not mapped within the offshore ECC, and so this activity is likely to be French vessels targeting whiting and/or UK vessels targeting *Nephrops* and mixed demersal species.

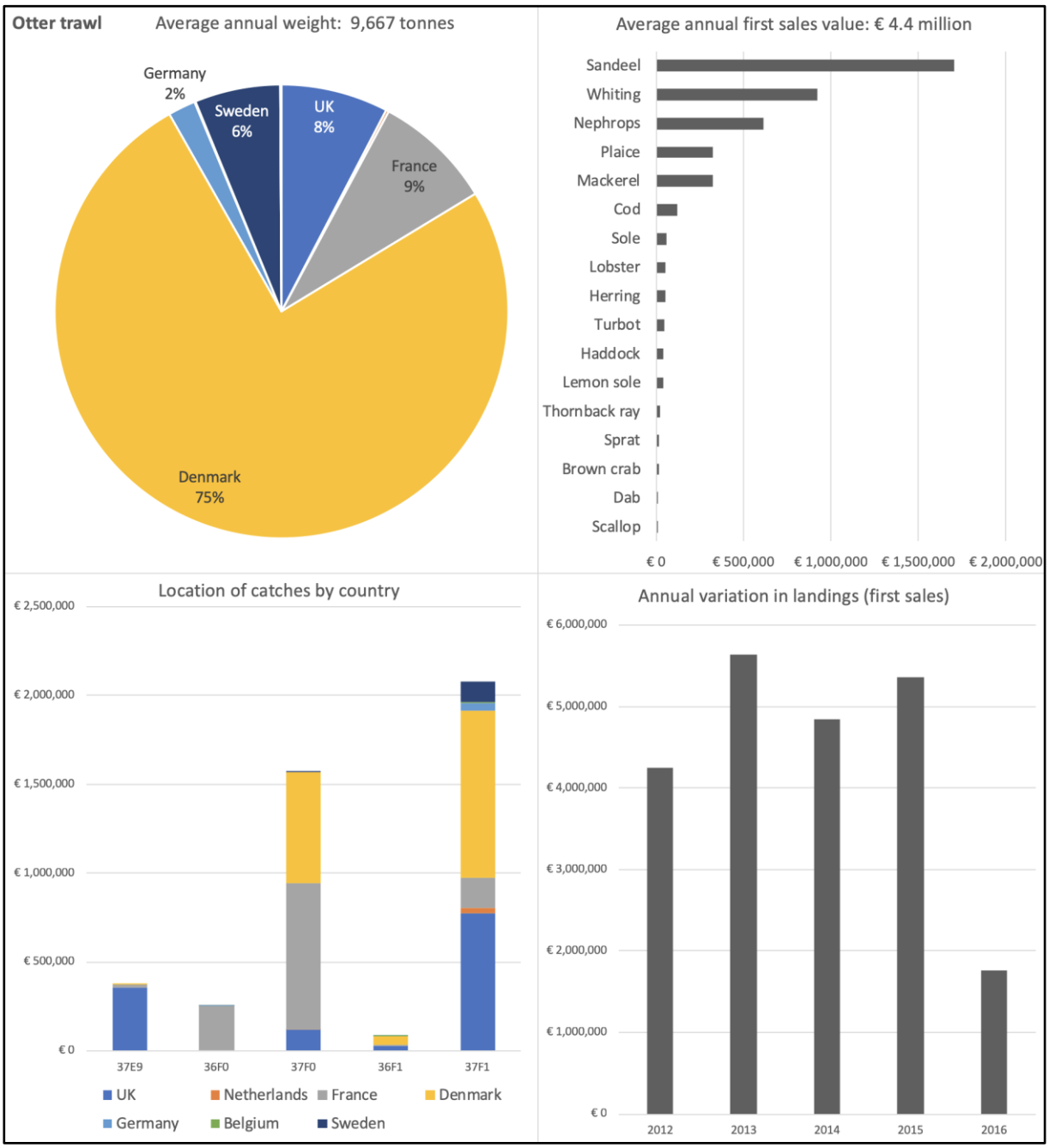


Figure 6.13: Demersal trawl landings profile from Hornsea Four commercial fisheries study area (data 2012-2016, source: DCF 2019).

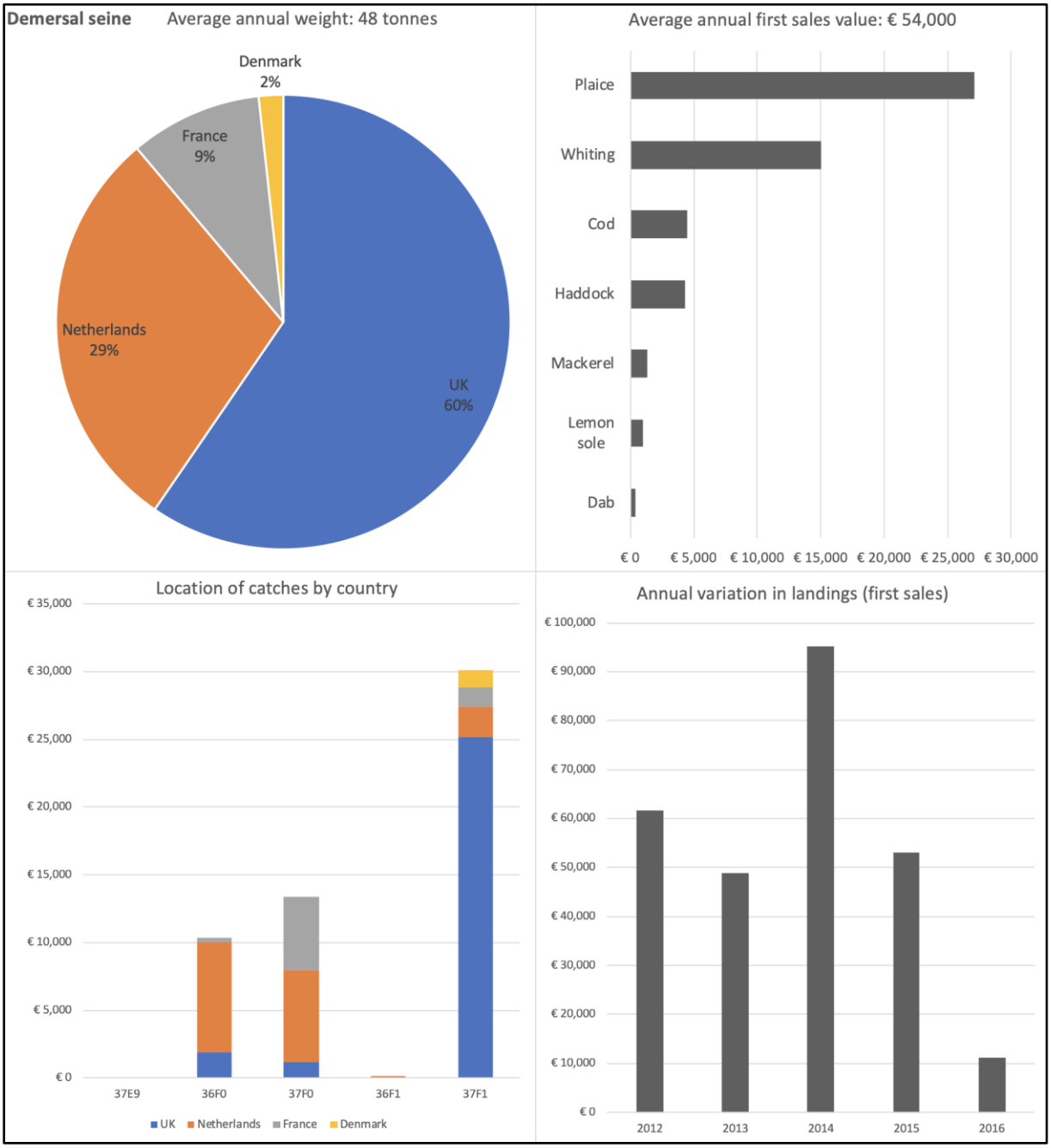


Figure 6.14: Demersal seine landings profile from Hornsea Four commercial fisheries study area (data 2012-2016, source: DCF 2019).

Hornsea Four

Figure 6.15

Value of catches made in 2017 by all EU (including UK) otter trawl vessels ≥12m in length (ICES, 2019)

300000 350000 400000

6050000 6000000 5950000

38E9 38F0 38F1 38F2

37E9 37F0 37F1 37F2

36E9 36F0 36F1 36F2

35E9 35F0 35F1 35F2

N GRID NORTH

Order Limits

ICES Statistical Rectangles

Otter trawl, 2017

Total value, Euro

- 0 - 1000
- 1001 - 5000
- 5001 - 10000
- 10001 - 50000
- 50001 - 100000
- 100001 - 500000
- 500001 - 2505000

Coordinate system: ETRS 1989 UTM Zone 31N

Scale@A3: 1:500,000

0 10 20 Kilometres

0 5 10 Nautical Miles

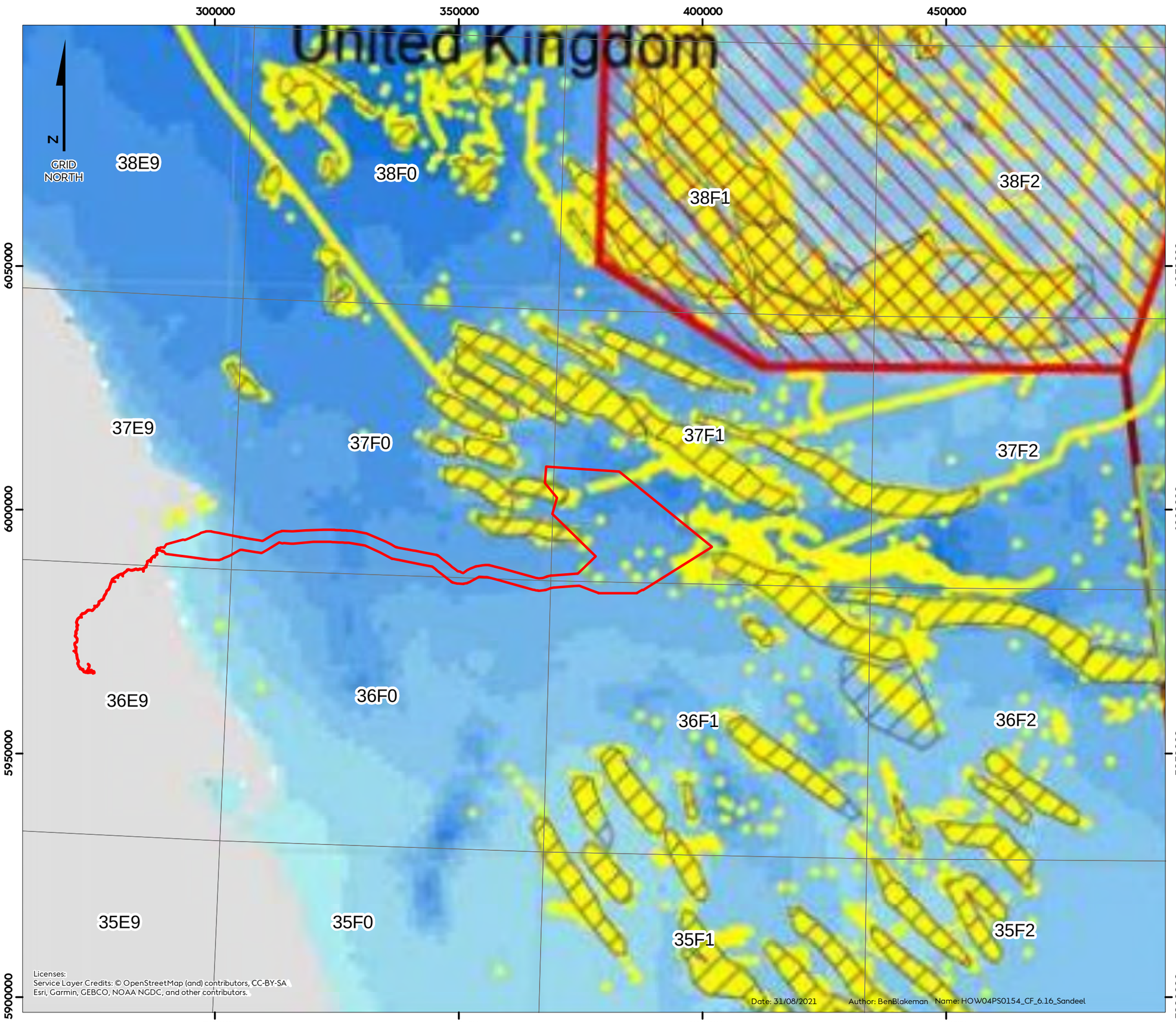
REV	REMARK	DATE
....	First Issue	09/06/2019
A	Updated following PEIR consultation, for DCO	28/06/2021

Commercial Fisheries
Annual value, >12m vessels
Document no: HOW04PS0150
Created by: FN
Checked by: SM
Approved by: LK

POSEIDON

Ørsted

Date: 28/06/2021 Author: BenBlakeman Name: HOW04PS0150_CF_6.15_Otter17

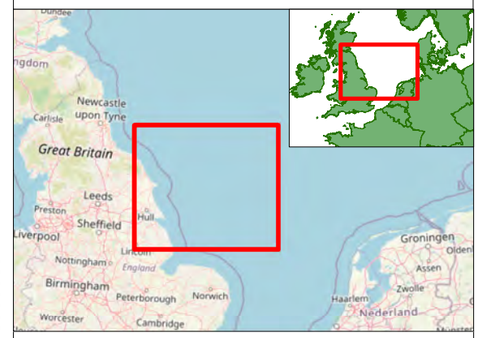


Hornsea Four

Figure 6.16

Key North Sea sandeel fishing grounds targeted by EU Member States (including UK) and Norway (DTU Aqua, 2010)

- Order Limits
- ICES Statistical Rectangles
- Key Sandeel Grounds



Coordinate system: ETRS 1989 UTM Zone 31N

Scale@A3: 1:750,000

0 10 20 Kilometres

0 10 20 Nautical Miles

REV	REMARK	DATE
---	First Issue	09/06/2019
A	Updated following PEIR consultation, for DCO	31/08/2021

Commercial Fisheries
Sandeel Grounds
Document no: HOW04PS0154
Created by: FN
Checked by: SM
Approved by: LK

POSEIDON

Ørsted

6.7.2 Baseline at point of impact

6.7.2.1 The baseline description above provides an accurate reflection of the current state of the existing environment. The earliest possible date for the start of construction is August 2026, with an expected operational life of 35 years, and therefore there exists the potential for the baseline to evolve between the time of assessment and point of impact. Changes to the baseline in relation to commercial fisheries can occur over the long-term (considered in **Section 6.7.3**) or short to medium-term. The current baseline described above gives an accurate portrayal of the existing environment based on the most recent available data, and the baseline at the point of impact is expected to be broadly similar to this in most respects. However, it is reasonably foreseeable that the baseline will evolve over the next six years in terms of the following aspects.

6.7.2.2 There is uncertainty surrounding the conditions of the withdrawal of the UK from the EU, with the UK becoming an independent coastal state and in control of waters out to 200 NM. Following the exit of the UK from the EU on 31 January 2020, the Common Fisheries Policy applied during the transition period which ran until the end of 2020. Following the withdrawal, the UK and the EU have agreed to a Trade and Cooperation Agreement (TCA), applicable on a provisional basis from 1 January 2021. The TCA sets out fisheries rights and confirms that from 1 January 2021 and during a transition period until 30 June 2026, UK and EU vessels will continue to access respective Excusive Economic Zones (EEZs, 12-200 NM) to fish. In this period, EU vessels will also be able to fish in specified parts of UK waters between 6-12 NM.

6.7.2.3 Twenty-five percent of the EU's fisheries quota in UK waters will be transferred to the UK over the five-year transition period. Overall, the biggest gains are for Western and North Sea stocks and associated fisheries, including mackerel, sole and herring. There have been increases in the UK share of TACs for the following species relevant to the study area:

- Sole (13% increase in quota for North Sea);
- Cod (10% increase in quota for North Sea);
- Saithe (9% increase in quota for North Sea);
- Herring (8% increase in quota for North Sea); and
- Whiting (7% increase for North Sea).

6.7.3 Evolution of the Baseline

6.7.3.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 require 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 ES (EIA Regulations, Schedule 4, Paragraph 3). From the point of assessment, over the course of the development and operational lifetime of Hornsea Four (operational lifetime anticipated to be 35 years), long-term trends mean that the condition of the baseline environment is expected to evolve. This section provides a qualitative description of the evolution of the baseline environment, on the assumption that Hornsea Four is not constructed, using available information and scientific knowledge of commercial fisheries.

6.7.3.2 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 and catches from specific areas;
- 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 demersal seine;
- 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.

6.7.3.3 The variations and trends in commercial fisheries activity are an important aspect of the baseline assessment and form the principal reason for assessing five years of baseline data. Overall, given the time periods assessed, the anticipated evolution of the baseline without Hornsea Four is expected to be reflected within the current baseline assessment undertaken and is expected to remain consistent, subject to the implementation of the TCA described above.

6.7.4 Data Limitations

6.7.4.1 Limitations of landings data include the spatial size of ICES rectangles which can misrepresent actual activity across Hornsea Four 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 recent landings statistics for EU (non-UK) fleets is also recognised as a data limitation; based on the most recent European Commission data call, more recent landings data (2017-2018) is no longer available by ICES rectangle. Lack of Norwegian landing statistics, as they are not included within EU databases, is also recognised as a data limitation.

6.7.4.3 Lack of first sales data for EU (non-UK) landings statistics is also noted as a data limitation, with first sales values estimated by combining average annual sales prices per species, with landed weight.

6.7.4.4 Limitations of VMS data are primarily focused on the coverage being limited to vessels ≥15 m (for MMO data on potting gear) and ≥12 m (for ICES data on bottom-contact mobile gear). 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 with offshore areas, this is not necessarily 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 ECC for the potting fleet.

6.7.4.5 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.

6.7.4.6 Data limitations were managed by ensuring accurate interpretation of the data and clear understanding of its scope, together with cross-referencing between data sources and consultation with the fishing industry. 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 Project Basis for Assessment

6.8.1 Impact register and impacts not considered in detail in this ES

6.8.1.1 Upon consideration of the baseline environment, the project description outlined in **Volume A1, Chapter 4: Project Description**, the Hornsea Four Commitments detailed within **Volume A4, Annex 5.2: Commitments Register**), and in response to formal consultation on the PEIR, a number of impacts are "not considered in detail in the ES". All impacts assessed within the PEIR for commercial fisheries have been further considered in the ES, with no impacts falling into the category "not considered in detail in the ES". **Table 6.7** details impacts that were agreed to be scoped out during the Scoping phase. Further detail is provided in **Volume A4, Annex 5.1: Impacts Register**.

6.8.1.2 In July 2019, Highways England issued an update to the Design Manual for Roads and Bridges (DMRB) significance matrix (see **Volume A1, Chapter 5: Environmental Impact Assessment Methodology**). Impacts resulting in effects on the commercial fishing industry that were formerly assessed within the category medium sensitivity and minor magnitude, as Minor (Not Significant), under the new guidance are now within the significance range of Slight or Moderate and therefore require professional judgement. Following a review of the relevant potential impacts, it was considered that the changes do not alter the overall

significance of the effects assessed at Scoping and in the PEIR (see **Volume A4, Annex 5.1: Impacts Register**).

Table 6.7: Impacts scoped out of assessment and justification.

Project activity and impact	Likely significance of effect	Approach to assessment	Justification
Hornsea Four array area and Hornsea Four offshore ECC construction activities leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the array and offshore ECC areas (CF-C-6).	No likely significant effect	Scoped Out	Scoped out based on PINS Scoping Opinion (PINS Scoping Opinion, November 2018, ID: 4.8.2). Effects are expected to be highly localised and temporary during construction; limited deviations to existing steaming routes are expected. Given adequate notification it is expected that these vessels, which have an operational range beyond that of the development, will be in a position to avoid construction areas with no or minimal effect upon steaming times.
Physical presence of the Hornsea Four array area and export cable leading to additional steaming to alternative fishing grounds for vessels that would otherwise be fishing within the Hornsea Four array area and offshore cable corridor (CF-O-14).	No likely significant effect	Scoped Out	Scoped out based on PINS Scoping Opinion (PINS Scoping Opinion, November 2018, ID: 4.8.2). No additional steaming is expected to be required. Fleets can transit through the development area; magnitude and sensitivity is negligible/low for all fleets.
Decommissioning activities leading to longer steaming distances to alternative fishing grounds (CF-D-22).	No likely significant effect	Scoped Out	Scoped out based on PINS Scoping Opinion (PINS Scoping Opinion, November 2018, ID: 4.8.2). As per justification provided for construction impact.

Notes:
Grey – Potential impact is scoped out at EIA Scoping and both PINS and Hornsea Four agree.

6.8.1.3 Please note that the term "scoped out" in **Table 6.7** relates to the Likely Significant Effect (LSE) in EIA terms and not "scoped out" of the EIA process *per se*. All impacts "scoped out" of LSE are assessed for magnitude, sensitivity of the receiving receptor and conclude an EIA significance in the Impacts Register (see **Volume A4, Annex 5.1: Impacts Register**). This approach is aligned with the Hornsea Four Proportionate approach to EIA (see **Volume A1, Chapter 5: EIA Methodology**).

6.8.2 Commitments

6.8.2.1 Hornsea Four has adopted commitments (primary design principles inherent as part of Hornsea Four, installation techniques and engineering designs/modifications) as part of the pre-application phase, to eliminate and/or reduce the LSE arising from a number of impacts. These are outlined in **Volume A4, Annex 5.2 Commitments Register**. Further commitments (adoption of best practice guidance), referred to as tertiary commitments are embedded as an inherent aspect of the EIA process. Secondary commitments are incorporated to reduce LSE to environmentally acceptable levels following initial assessment i.e. so that residual effects are reduced to environmentally acceptable levels.

6.8.2.2 The commitments adopted by Hornsea Four in relation to commercial fisheries are presented in **Table 6.8**. The full list of Commitments can be found in **Volume A4, Annex 5.2: Commitments Register.**

Table 6.8: Relevant commercial fisheries commitments.

Commitment ID	Measure Proposed	How the measure will be secured
Co2	Primary: A range of sensitive historical, cultural and ecological conservation areas (including statutory and non-statutory designations) have been directly avoided by the permanent Hornsea Four footprint, at the point of Development Consent Order Submission (DCO). These include, but are not restricted to: Listed Buildings (564 sites); Scheduled Monuments (30 sites); Registered Parks and Gardens (Thwaite Hall and Risby Hall); Onshore Conservation Areas (18 sites); Onshore National Site Network (one site); Offshore National Site Network (three sites); Offshore Marine Conservation Zones (two sites); Sites of Special Scientific Interest (two sites); Local Nature Reserves (none have been identified); Local Wildlife sites (33 sites); Yorkshire Wildlife Trust Reserves (none have been identified); Royal Society for the Protection of Birds (RSPB) Reserves (none have been identified); Heritage Coast; National Trust land; Ancient Woodland (10 sites and known Tree Preservation Orders (TPOs)); non-designated built heritage assets (334 sites); and historic landfill (none have been identified). Where possible, unprotected areas of woodland, mature and protected trees (i.e. veteran trees) have and will also be avoided.	DCO Works Plan - Onshore; and DCO Works Plan - Offshore
Co81	Tertiary: Where scour protection is required, MGN 654 (or latest relevant available guidance) will be adhered to with respect to changes greater than 5% to the under keel clearance in consultation with the MCA.	DCO Schedule 11, Part 2 – Condition 15 and; DCO Schedule 12, Part 2 – Condition 15 Offshore Safety Management
Co83	Primary: Where possible, cable burial will be the preferred option for cable protection.	DCO Schedule 11, Part 2 – Condition 13(1)(h) and; DCO Schedule 12, Part 2 – Condition 13(1)(h)

Commitment ID	Measure Proposed	How the measure will be secured
		Cable Specification and Installation Plan
Co85	Primary: No more than a maximum of two foundations to be installed simultaneously.	DCO Schedule 11, Part 2 – Condition 13(1)(g) and; DCO Schedule 12, Part 2 – Condition 13(1)(g) Marine Mammal Mitigation Protocol DCO Schedule 11, Part 2 - Condition 13(1)(c) and; DCO Schedule 12, Part 2 - Condition 13(1)(c) Construction Method Statement
Co89	Tertiary: Advance warning and accurate location details of construction, maintenance and decommissioning operations, associated Safety Zones and advisory passing distances will be given via Notices to Mariners and Kingfisher Bulletins.	DCO Schedule 11, Part 2 – Condition 7 and; DCO Schedule 12, Part 2 – Condition 7 Notifications and Inspections
Co90	Tertiary: Ongoing liaison with fishing fleets will be maintained during construction, maintenance and decommissioning operations via an appointed Fisheries Liaison Officer and Fishing Industry Representative.	DCO Schedule 11, Part 2 – Condition 13(1)(d)(vi) and; DCO Schedule 12, Part 2 – Condition 13(1)(d)(vi) Construction Project Environmental Management and Monitoring Plan
Co93	Tertiary: Aids to navigation (marking and lighting) will be deployed in accordance with the latest relevant available standard industry guidance and as advised by Trinity House, MCA and Civil Aviation Authority (CAA) and MoD as appropriate. This will include a buoyed construction area around the array area and the HVAC booster station in consultation with Trinity House.	DCO Schedule 11, Part 2 – Condition 8 and; DCO Schedule 12, Part 2 – Condition 8 Aids to Navigation DCO Schedule 11, Part 2 – Condition 13(1)(j) and; DCO Schedule 12, Part 2 – Condition 13(1)(j) Aid to Navigation Management Plan
Co94	Tertiary: The United Kingdom Hydrographic Office will be notified of both the commencement (within two weeks), progress and completion of offshore construction works (within two weeks) to allow marking of all installed infrastructure on nautical charts.	DCO Schedule 11, Part 2 – Condition 7(10) and; DCO Schedule 12, Part 2 – Condition 7(10) Notifications and Inspections

Commitment ID	Measure Proposed	How the measure will be secured
Co95	Tertiary: A Fisheries Coexistence and Liaison Plan will be developed in accordance with the Outline Fisheries Coexistence and Liaison Plan prior to the commencement of construction.	N/A
Co99	Tertiary: Hornsea Four will ensure compliance with MGN654 where appropriate.	DCO Schedule 11, Part 2 – Condition 15 and; DCO Schedule 12, Part 2 – Condition 15 Offshore Safety Management
Co111	Tertiary: A Construction Project Environmental Management and Monitoring Plan (CPEMMP) will be developed and will include details of: • a marine pollution contingency plan to address the risks, methods and procedures to deal with any spills and collision incidents of the authorised project in relation to all activities carried out below MHWS; • a chemical risk review to include information regarding how and when chemicals are to be used, stored and transported in accordance with recognised best practice guidance; • a marine biosecurity plan detailing how the risk of introduction and spread of invasive non-native species will be minimised; • waste management and disposal arrangements; • a vessel management plan, to determine vessel routing to and from construction sites and ports, to include a code of conduct for vessel operators; and • - the appointment and responsibilities of a company fisheries liaison officer.	DCO Schedule 11, Part 2 - Condition 13(1)(d) and; DCO Schedule 12, Part 2 - Condition 13(1)(d) Construction Project Environmental Management and Monitoring Plan
Co139	Secondary: Safety zones of up to 500 m will be applied during construction, maintenance and decommissioning phases. Where defined by risk assessment, guard vessels will also be used to ensure adherence with Safety Zones or advisory passing distances to mitigate impacts which pose a risk to surface navigation during construction, maintenance and decommissioning phases.	Application for safety zones to be made post consent under 'The Electricity (Offshore Generating Stations) (Safety Zones) (Applications Procedures and Control of Access) Regulations 2007 (SI No 2007/1948)'. Safety zones required are also detailed within **Volume A1, Chapter 4: Project Description**.
Co180	Tertiary: The following guidance will be followed where appropriate; 'Recommendations For Fisheries Liaison: Best Practice' guidance for offshore renewable developers (FLOWW 2014 and 2015; Department for Business Enterprise & Regulatory Reform (BERR) 2008).	N/A

Commitment ID	Measure Proposed	How the measure will be secured
Co181	Tertiary: An Offshore Decommissioning Plan will be developed prior to decommissioning.	DCO Schedule 11, Part 1(6) and; DCO Schedule 12, Part 1(6) General Provisions
Co201	Primary: Gravity Base Structure (GBS) foundations (WTG type) will be utilised at a maximum of 110 of the 180 WTG foundation locations. The location of GBS foundations, if used for WTG, will be confirmed through a construction method statement which will include details of foundation installation methodology.	DCO Schedule 11, Part 2 - Condition 13(1(c) Construction Method Statement

6.9 Maximum Design Scenario

6.9.1.1 This section describes the MDS parameters on which the commercial fisheries assessment has been based. These are the parameters which are judged to give rise to the maximum levels of effect for the assessment undertaken, as set out in **Volume A1, Chapter 4: Project Description**. Should Hornsea Four be constructed to different parameters within the design envelope, then impacts would not be any greater than those set out in this ES using the MDS presented in **Table 6.9**.

6.9.1.2 During the operation and maintenance phase, Hornsea Four will apply for a safety zone of up to 500 m around manned infrastructure (such as offshore accommodation platform) in order to ensure the safety of the individuals aboard. Hornsea Four will also apply for safety zones of up to 500 m for infrastructure undergoing major maintenance (for example a blade replacement). Further information regarding the Safety Zones which Hornsea Four intends to apply for post consent will be outlined in the Safety Zone Statement as described in **F1.2: Safety Zone Statement**.

6.9.1.3 A description of the reasonably foreseeable maintenance activities at Hornsea Four, including frequency of events, is provided in **Volume A1, Chapter 4: Project Description**.

Table 6.9: Maximum design scenario for impacts on commercial fisheries.

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
Construction			
Hornsea Four array area construction activities and physical presence of constructed wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds (CF-C-1).	Primary: Co83 Co85 Co201 Tertiary: Co81 Co89 Co90 Co95 Co99	**Total temporary reduction** **Wind Turbine Generators (WTGs) and platforms:** • Seabed preparation for 110 GBS (Wind Turbine Generator (WTG) type) foundations for WTGs = 411,321 m^2; • Seabed preparation for 70 suction caisson jacket (WTG type) foundations for WTGs = 198,870 m^2. • Seabed preparation for offshore substations (OSS) within the array (three large OSS on GBS (large OSS) foundations and six small OSS on suction caisson jacket (small OSS)) = 156,594 m^2; • Seabed preparation for one accommodation platform on a suction caisson jacket (small OSS) foundation = 12,321 m^2; •500 m exclusion zones around construction activities = 790,000 m^2 per structure under construction at any one time; and • 50 m exclusion zones around incomplete structures = 7,854 m^2 per partially constructed structure at any one time. **Offshore cables:** • Boulder and sandwave clearance for array cables (600 km length, 40 m width) = 24,000,000 m^2; • Burial of array cables (600 km length, 15 m width) = 9,000,000 m^2; • Boulder and sandwave clearance for interconnector cables (90 km length, 40 m width) = 3,600,000 m^2; • Burial of interconnector cables (90 km length, 15 m width) = 1,350,000 m^2; and • Roaming 500 m safe passing distance for mobile installation vessels, which may, in exceptional circumstances, be increased to 1,000 m dependant on the nature of the installation works.	This represents the maximum duration and extent of fishing exclusion throughout the construction phase and hence the greatest potential to restrict access to fishing grounds. The construction footprint comprises the full permanent seabed area of structures, scour protection, cable crossings and cable protection (also assessed in CF-O-8) plus the temporary footprint of preparatory works including seabed preparation, sandwave clearance and boulder clearance. The impact also incorporates exclusion zones around major activities. It is important to note that the temporal aspect of temporary works will not apply in full throughout the approximately three-year construction phase, as activities will be completed sequentially. As described in **Volume A4, Annex 4.8: Pro-Rata Annex**, maximum parameters will be delivered on a *pro rata* basis. For example, the maximum seabed

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
		Construction Duration: • Offshore construction over approximately a three-year period. **<u>Total permanent reduction</u>** **WTGs and platforms:** • Turbine footprint with scour protection, based on 110 GBS (WTG-type) foundations = 504,540 m^2; • Turbine footprint with scour protection, based on 70 suction caisson jacket (WTG type) foundations = 296,881 m^2. **Offshore platforms:** • Total seabed area for OSS in the array (three large OSS on GBS (large OSS) foundations and six small OSS on GBS (Box-type) foundations, including associated scour protection = 371,250 m^2; and • Total seabed area for one offshore accommodation platform within the array on a small OSS foundation (GBS (Box-type)), including associated scour protection = 30,625 m^2. **Offshore cables:** • Cable protection for array cables = 624,000 m^2; • Cable protection for interconnector cables = 94,000 m^2; and • Pre- and post-lay rock berm area for 32 cables crossings within the array area = 204,000 m^2.	preparation area for WTGs is described for 180 structures, but this would be scaled down to an equivalent value should only 100 structures be built out. It is important to note that three HVDC converter substations in the array area are mutually exclusive with three HVAC booster stations along the ECC in a single transmission system. As secured by **C1.1 Draft DCO including Draft DML**, a maximum of ten OSS and platforms will be constructed within the Hornsea Four Order Limits, however in order to assess the MDS for both the array and the ECC, the presence of the maximum numbers of OSS and platforms in each area has been considered (ten and three, respectively). As a result, the outcome of the assessment is therefore inherently precautionary.
Hornsea Four offshore ECC construction activities leading to reduction in access to, or exclusion from established fishing grounds (CF-C-2).	<u>Primary:</u> Co83 <u>Tertiary:</u> Co89 Co90 Co93	**<u>Total temporary reduction</u>** **Offshore platforms:** • Seabed preparation for three HVAC booster stations on suction caisson jacket (small OSS) foundations within the HVAC Booster Station Search Area = 36,963 m^2; • 500 m exclusion zones around construction activities = 790,000 m^2 per structure under construction at any one time; and	This represents the maximum duration and extent of fishing exclusion throughout the construction phase and hence the greatest potential to restrict access to fishing grounds. The construction footprint comprises the full permanent seabed area of structures, scour protection, cable

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
	Co94 Co95 Co99	• 50 m exclusion zones around incomplete structures = 7,854 m^2 per partially constructed structure at any one time. **Offshore cables:** • Boulder and sandwave clearance for export cables (654 km length, 40 m width) = 26,160,000 m^2; • Burial of export cables (654 km length, 15 m width) = 9,810,000 m^2; Cable jointing (four joints per cables, six cables and 3,500 m^2 per joint) = 84,000 m^2; and • Roaming 500 m safe passing distance for mobile installation vessels, which may, in exceptional circumstances, be increased to 1,000 m dependant on the nature of the installation works. **Construction Duration:** • Construction over approximately a 4-5 year period, including: • Site preparation works = 28 months; • Platform installation = two months per platform; and • Cable installation = 24 months. **<u>Total permanent reduction</u>** **Offshore platforms:** • Total seabed area for three HVAC booster stations on small OSS GBS (Box-type) foundations within the HVAC Booster Station Search Area, including associated scour protection = 91,875 m^2. **Offshore cables:** • Cable protection for export cables = 792,000 m^2; • Pre- and post-lay rock berm area for 54 cable crossings within the offshore ECC = 344,000 m^2.	crossings and cable protection (also assessed in CF-O-9) plus the temporary footprint of preparatory works including seabed preparation, sandwave clearance and boulder clearance. The impact also incorporates exclusion zones around major activities. It is important to note that the temporal aspect of temporary works will not apply in full throughout the approximately 4.5-year construction phase, as activities will be completed sequentially. As described in **Volume A4, Annex 4.8: Pro-Rata Annex**, maximum parameters will be delivered on a *pro rata* basis. For example, the maximum seabed preparation area for WTGs is described for 180 structures, but this would be scaled down to an equivalent value should only 100 structures be built out. It is important to note that three HVDC converter substations in the array area are mutually exclusive with three HVAC booster stations along the ECC in a single transmission system. As secured by **C1.1 Draft DCO including Draft DML**, a maximum of ten OSS and platforms

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
			will be constructed within the Hornsea Four Order Limits, however in order to assess the MDS for both the array and the ECC, the presence of the maximum numbers of OSS and platforms in each area has been considered (ten and three, respectively). As a result, the outcome of the assessment is therefore inherently precautionary.
Displacement from Hornsea Four array area leading to gear conflict and increased fishing pressure on adjacent grounds (CF-C-3).	Primary: Co83 Co85 Co201 Tertiary: Co89 Co90 Co93 Co94 Co95 Co99	As per MDS for "Hornsea Four array area construction activities and physical presence of wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds (CF-C-1)".	This represents the maximum duration and extent of fishing exclusion throughout the construction phase and hence the greatest potential for displacement.
Displacement from the Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CF-C-4).	Primary: Co83 Tertiary: Co89 Co90 Co93 Co94 Co95 Co99	As per MDS for "Hornsea Four offshore cable corridor construction activities leading to reduction in access to, or exclusion from established fishing grounds (CF-C-2)".	This represents the maximum duration and extent of fishing exclusion throughout the construction phase and hence the greatest potential for displacement.

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
Hornsea Four array area and offshore ECC construction activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-C-5).	None	See Fish and Shellfish Ecology MDS' presented in Section 3.9 of **Chapter 3: Fish and Shellfish Ecology** (FSE-C-1, FSE-C-2, FSE-C-3, and FSE-C-4).	The scenarios presented in **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. Importantly, this considers the impacts as a whole on commercially important species as considered in the MDS' in **Chapter 3: Fish and Shellfish Ecology**, rather than any one impact in particular.
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and transiting construction vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC leading to interference with fishing activity (CF-C-7).	Tertiary: Co89 Co90 Co93 Co94 Co95 Co99	**Wind Turbine Foundation Installation:** • Up to 2,880 return trips over a 12-month period. **Wind Turbine Installation:** • Up to 900 return trips over a 24-month period. **OSS Installation (all OSSs and the accommodation platform):** • Up to 270 return trips over a two-month period. **OSS Foundation Installation (all OSSs and the accommodation platform):** • Up to 180 return trips over a two-month period. **Inter-Array and Interconnector Cable Installation:** • Up to 1,488 return trips over a 24-month period. **Offshore Export Cable Installation:** • Up to 408 return trips over a 24-month period. **Total:** • Up to 8 vessels in any given 5 km^2 at any one time.	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 maximum number of vessels transits and the maximum duration of the construction would result in the greatest potential for interference.

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
Operation and maintenance			
Physical presence of Hornsea Four array area infrastructure and maintenance activities leading to reduction in access to, or exclusion from established fishing grounds (CF-O-8).	Primary: Co83 Co201 Tertiary: Co81 Co89 Co90 Co93 Co94 Co95 Co99	**Total permanent reduction** **WTGs and platforms:** • Total seabed area for 110 GBS (WTG-type) foundations = 504,540 m^2; • Total seabed area for 70 suction caisson jacket (WTG type) foundations = 296,881 m^2; and • Minimum turbine spacing of 810 m. **Offshore platforms:** • Total seabed area for OSS in the array (three large OSS on GBS (large OSS) foundations and six small OSS on GBS (Box-type) foundations, including associated scour protection = 371,250 m^2; and • Total seabed area for one offshore accommodation platform within the array on a small OSS foundation (GBS (Box-type)), including associated scour protection = 30,625 m^2. **Offshore cables:** • Cable protection for array cables = 624,000 m^2; • Cable protection for interconnector cables = 94,000 m^2; and • Pre- and post-lay rock berm area for 32 cables crossings within the array area = 204,000 m^2. **Temporary reduction from maintenance activities** **WTG O&M Activities:** • Component replacement = 378,000 m^2; • Access ladder replacement = 378,000 m^2; • Foundation anode replacement = 378,000 m^2; and • J-Tube repair/ replacement = 108,000 m^2. **Offshore substation and accommodation activities:** • Offshore substation component replacement = 6,000 m^2;	This represents the maximum duration and extent of fishing exclusion throughout the operation and maintenance phase and hence the greatest potential to restrict access to fishing grounds. It comprises the maximum footprint of infrastructure on the seabed plus maintenance activities throughout the O&M phase and associated temporary safety zones. The smaller the spacing between turbines the greatest the potential for vessels to have restricted access to the site. The assessment assumes that fishing will resume around and between infrastructure within the Hornsea Four array area where possible, with the exception of an assumed 50 m operating distance from infrastructure, areas of cable protection, and safety zones around infrastructure undergoing major maintenance or replacement. Furthermore, 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 Four array area. Inclement weather will be a significant contributor to this risk

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
		• Access ladder replacement = 21,000 m^2; • Foundation anode replacement = 21,000 m^2; and • J-Tube repair/ replacement = 6,000 m^2. **Array cable activities:** • Remedial burial of array cables (42 km total length reburied) = 4,200,000 m^2; • Array cable repairs = 363,736 m^2; • Cable protection replacement = 156,000 m^2; • Ten array cable repair events over lifetime; and • Duration of each cable repair event: approximately three months. **Interconnector cable activities:** • Remedial burial of interconnector cables (7 km total length reburied) = 700,000 m^2; • Interconnector cable repairs = 20,028 m^2; • Cable protection replacement = 23,500 m^2; • Three interconnector cable repair events over lifetime; and • Duration of each cable repair event approximately three months. **Safety Zones:** • 500 m safety zones around manned offshore platforms and temporary 500 m safety zones around turbines and offshore platforms undergoing major maintenance. **Duration: Operational design life of 35 years.**	perception. In addition, certain gear types including pelagic trawl, twin rigged trawls and demersal seine / fly shooting will not be practically deployed within the operational array. It is important to note that three HVDC converter substations in the array area are mutually exclusive with three HVAC booster stations along the ECC in a single transmission system. As secured by **C1.1 Draft DCO including Draft DML**, a maximum of ten OSS and platforms will be constructed within the Hornsea Four Order Limits, however in order to assess the MDS for both the array and the ECC, the presence of the maximum numbers of OSS and platforms in each area has been considered (ten and three, respectively). As a result, the outcome of the assessment is therefore inherently precautionary.
Physical presence of offshore export cable and infrastructure and maintenance activities within the Hornsea Four offshore ECC leading to reduction in	Primary: Co83 Tertiary: Co81	**Total permanent reduction** **Offshore platforms:** • HVAC booster station foundations footprint and scour protection, based on three small OSS foundations (GBS (Box-type)) = 91,875 m^2; and • Minimum spacing of 100 m.	This represents the maximum duration and extent of fishing exclusion throughout the operation and maintenance phase and hence the greatest potential to restrict access to fishing grounds. It comprises the

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
access to, or exclusion from established fishing grounds (CF-O-9).	Co89 Co90 Co93 Co94 Co95 Co99	**Offshore cables:** • Cable protection for export cables = 792,000 m^2; • Pre- and post-lay rock berm area for 54 cable crossings within the offshore ECC = 344,000 m^2. **<u>Total temporary reduction from maintenance activities</u>** **ECC activities:** • Remedial burial of export cables (14 km total length reburied) = 1,400,000 m^2; • Export cable repairs = 153,548 m^2; • Cable protection replacement = 198,000 m^2; and • Duration of each cable repair event: approximately three months. **HVAC booster station activities:** • Offshore substation component replacement = 1,800 m^2; • Access ladder replacement = 6,300 m^2; • Foundation anode replacement = 6,300 m^2; and • J-Tube repair/ replacement = 1,800 m^2. **Safety Zones:** • 500 m safety zones around manned offshore platforms; and • Temporary 500 m safety zones around offshore platforms undergoing major maintenance. **<u>Duration: Operational design life of 35 years.</u>**	maximum footprint of infrastructure on the seabed plus maintenance activities throughout the O&M phase and associated temporary safety zones. The smaller the spacing between turbines the greatest the potential for vessels to have restricted access to the site. The assessment assumes that fishing will resume along the Hornsea Four offshore cable corridor, with the exception of an assumed 50 m operating distance from infrastructure (i.e. three HVAC booster stations), areas of cable protection and safety zones around infrastructure undergoing major maintenance. It is important to note that three HVDC converter substations in the array area are mutually exclusive with three HVAC booster stations along the ECC in a single transmission system. As secured by **C1.1 Draft DCO including Draft DML**, a maximum of ten OSS and platforms will be constructed within the Hornsea Four Order Limits, however in order to assess the MDS for both the array and the ECC, the presence of the maximum numbers of OSS and platforms in each area has been considered (ten and three, respectively). As a result, the outcome of

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
			the assessment is therefore inherently precautionary.
Displacement from Hornsea Four array area and Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CF-O-10).	Primary: Co83 Co201 Tertiary: Co81 Co89 Co90 Co93 Co94 Co95 Co99	As per MDS for "Physical presence of Hornsea Four array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds (CF-O-8)" and "Physical presence of offshore export cable and infrastructure within the Hornsea Four offshore cable corridor leading to reduction in access to, or exclusion from established fishing grounds (CF-O-9)".	As per the justification for "Physical presence of Hornsea Four array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds" and "Physical presence of offshore export cable and infrastructure within the Hornsea Four offshore cable corridor leading to reduction in access to, or exclusion from established fishing grounds".
Physical presence of Hornsea Four array area leading to gear snagging (CF-O-11).	Primary: Co83 Co201 Tertiary: Co81 Co89 Co90 Co93 Co94 Co95 Co99	As per MDS for "Physical presence of Hornsea Four array area infrastructure leading to reduction in access to, or exclusion from established fishing grounds (CF-O-8)".	This represents the maximum potential for interactions between infrastructure and fishing gear. Assessment assumes that fishing will resume around and between infrastructure within the Hornsea Four array area, with the exception of an assumed 50 m operating distance from infrastructure, areas of cable protection, and safety zones around infrastructure undergoing major maintenance.
Physical presence of the export cable and associated infrastructure leading to gear snagging (CF-O-12).	Primary: Co83 Tertiary: Co81	As per MDS for "Physical presence of offshore export cable and infrastructure within the Hornsea Four offshore cable corridor leading to reduction in access to, or exclusion from established fishing grounds (CF-O-9)".	This represents the maximum potential for interactions between infrastructure and fishing gear.

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
	Co89 Co90 Co93 Co94 Co95 Co99		Assessment assumes that fishing will resume along the Hornsea Four offshore cable corridor, with the exception of an assumed 50 m operating distance from infrastructure, areas of cable protection and safety zones around infrastructure undergoing major maintenance.
Hornsea Four operation and maintenance activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-O-13).	Primary: Co83 Tertiary: Co81 Co94	See Fish and Shellfish Ecology MDS presented in **Section 3.9** of **Chapter 3: Fish and Shellfish Ecology** (FSE-O-18, FSE-O-6, FSE-O-7, FSE-O-10, FSE-O-8).	The scenarios presented in Fish and Shellfish Ecology provide for the greatest disturbance to fish and shellfish species and therefore the greatest knock on effect to Commercial Fisheries. Importantly, this considers the impacts as a whole on commercially important species as considered in the MDS for Fish and Shellfish chapter, rather than any one impact in particular.
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC infrastructure leading to interference with fishing activity (CF-O-15).	Tertiary: Co89 Co90 Co93 Co95 Co99	**Total of 1,433 return vessel trips per year:** • 124 jack-up vessel return trips; • 1,205 crew vessel return trips; and • 104 supply vessel return trips. **Duration:** • Anticipated design life for Hornsea Four of 35 years.	The maximum number of turbines and associated infrastructure will lead to the highest level of operation and maintenance activities and therefore highest level of operation and maintenance vessel round trips.
Decommissioning			
Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from,	Tertiary: Co89 Co90 Co93	In the absence of detailed methodologies and schedules, decommissioning works and associated implications for commercial fisheries are considered analogous with those assessed for the construction phase.	The scenario which represents the potential for the maximum level of infrastructure to be decommissioned.

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
potential and/or established fishing grounds (CF-D-16).	Co94 Co95 Co99 Co111		Decommissioning is likely to include removal of all of the wind turbine components and part of the foundations (those above seabed level) and removal of all other surface infrastructure. Some or all of the array cables, interconnector cables, and offshore export cables may be removed. Scour and cable protection would likely be left in situ. The removal of cables and rock protection is considered the MDS, however the necessity to remove cables and rock protection will be reviewed at the time of decommissioning.
Hornsea Four offshore ECC decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds (CF-D-17).	Tertiary: Co89 Co90 Co93 Co94 Co95 Co99 Co111	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds (CF-D-16)".	The scenario which represents the potential for the maximum level of infrastructure to be decommissioned.
Displacement from Hornsea Four array area leading to gear conflict and increased fishing pressure on adjacent grounds (CF-D-18).	Tertiary: Co89 Co90 Co93 Co94 Co95 Co99 Co111	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds (CF-D-16)".	The scenario which represents the potential for the maximum level of infrastructure to be decommissioned.

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
Displacement from the Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CF-D-19).	Tertiary: Co89 Co90 Co93 Co94 Co95 Co99 Co111	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds (CF-D-16)".	The scenario which represents the potential for the maximum level of infrastructure to be decommissioned.
Physical presence of any infrastructure left in situ leading to gear snagging (CF-D-20).	Primary: Co83 Tertiary: Co81 Co89 Co90 Co93 Co94 Co95 Co99 Co111	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds (CF-D-16)".	The scenario which represents the potential for the maximum level of infrastructure to be decommissioned.
Decommissioning activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-D-21).	None	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds (CF-D-16)".	The scenario which represents the potential for the maximum level of infrastructure to be decommissioned.
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and transiting decommissioning vessel traffic from Hornsea Four	Tertiary: Co89 Co90 Co93 Co94 Co95	As per MDS for "Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds (CF-D-16)".	The scenario which represents the potential for the maximum level of infrastructure to be decommissioned.

Impact and Phase	Embedded Mitigation Measures	Maximum Design Scenario	Justification
array area and Hornsea Four offshore ECC leading to interference with fishing activity (CF-D-23).	Co99 Co111		

6.10 Assessment Methodology

6.10.1.1 The assessment methodology for commercial fisheries is consistent with that presented in **Volume A1, Chapter 5: Environmental Impact Assessment Methodology**.

6.10.2 Impact assessment criteria

6.10.2.1 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 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 A1, Chapter 5: Environmental Impact Assessment Methodology**.

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

Table 6.10: Definition of terms relating to receptor sensitivity.

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	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.

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

6.10.2.4 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 by the baseline characterisation and consultation with the industry.

Table 6.11: Definition of terms relating to 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)

6.10.2.5 The significance of the effect upon commercial fisheries is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The 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.

6.10.2.6 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 (degree of change)			
		Negligible	*Minor*	*Moderate*	*Major*
Environmental value (sensitivity)	*Low*	Neutral or Slight (Not Significant)	Neutral or Slight (Not Significant)	Slight (Not Significant)	Slight (Not Significant) or Moderate (Significant)
	Medium	Neutral or Slight (Not Significant)	Slight (Not Significant) or Moderate (Significant)	Moderate or Large (Significant)	Moderate or Large (Significant)
	High	Slight (Not Significant)	Slight (Not Significant) or Moderate (Significant)	Moderate or Large (Significant)	Large or Very Large (Significant)
	Very High	Slight (Not Significant)	Moderate or Large (Significant)	Large or Very Large (Significant)	Very Large (Significant)

6.11 Impact Assessment

6.11.1 Construction

6.11.1.1 The impacts of the offshore construction of Hornsea Four have been assessed on commercial fisheries. The environmental impacts arising from the construction of Hornsea Four are listed in **Table 6.9** along with the MDS against which each construction phase impact has been assessed.

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

Hornsea Four array area construction activities and physical presence of constructed wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds (CF-C-1)

6.11.1.3 During construction of the Hornsea Four array area, associated infrastructure and cabling, commercial fisheries will be prevented from fishing where construction activities are taking place, plus up to 500 m safety zones around infrastructure under construction or up to 500 m safe passing distance for mobile installation vessels. The total construction duration for the turbines will be 36 months (three years), with a number/range of construction activities being undertaken simultaneously across the site.

Magnitude of impact

6.11.1.4 This impact will lead to a localised loss of access to fishing grounds and the fish and shellfish resources within these grounds for a range of fishing opportunities during the period of construction, which will directly affect fleets over a short-term duration (i.e., less than five years, as per definition in **Table 6.11**). The impact is predicted to be intermittent with localised exclusion surrounding construction activities.

6.11.1.5 In terms of the area impacted by construction activities, in total a maximum of 38.73 km^2 of seabed will be temporarily disturbed during construction, which equates to 8.28 % of the total Hornsea Four array area; with a permanent reduction of 2.13 km^2 of seabed (equating to 0.45% of Hornsea Four array area). In addition, there will be 500 m safety distance around infrastructure under construction (equating to 0.79 km^2 per structure) and 500 m safe passing distance for mobile installation vessels (equating to 0.79 km^2 per vessel).

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

6.11.1.7 Potting: the UK potting fleet targets lobster and crab across a wide area, from inshore grounds, extending out to the array area. An average annual first sales value of £88,000 landings is taken specifically within the Hornsea Four array area by UK potting vessels ≥ 15 m (informed from 2017 VMS data providing detailed catch value by area). Consultation indicates that offshore areas are becoming increasingly important to the fleet, as other activities from renewable energy and oil and gas sector displace effort which becomes increasingly concentrated further offshore, including into the Hornsea Four array area. This is corroborated by landing statistics with landed weight of brown crab from the offshore ICES rectangle 37F1 which overlaps with the Hornsea Four array area, increased 2-fold from 2015 to 2019 (i.e. from 111 tonnes in 2015 to 247 tonnes in 2019). The total value in 2019 taken by all sized vessels deploying pots from the Hornsea Four array study area is £6.2 million; noting that the array area overlaps with approximately 4.3% of this study area, this equates to a pro-rata value of £266,000 (assuming uniform landings across the entire study area). While such a simplistic calculation brings higher level of uncertainty to the resulting figure, it does demonstrate the importance of the potting industry and the potential opportunity within the array area. During construction, potting vessels would be required to remove pots from areas under construction and relocate them. Potting fishermen will therefore experience loss of earnings for the time taken to relocate gear and (potentially) a loss of earnings associated with not being able to fish the specific grounds under construction (e.g. if alternative grounds are either not available, or not as productive). Potting typically involves a number of fleets of pots being deployed across a range of areas, and it is therefore unlikely that all pots deployed by a single vessel will be impacted at any one time.

6.11.1.8 Dredge: the UK dredging fleet targets scallops but does not operate across the Hornsea Four array area (evidenced by VMS and landings statistics). Scallops are found on clean firm sand and fine gravel and in currents which provide good feeding conditions. The targeted scallop grounds that run parallel to Holderness Coast are well established and do not extend into the Hornsea Four array area.

6.11.1.9 Pelagic: the Dutch, German, Danish, French, and Swedish pelagic trawling fleets are large vessels (typically > 25 m in length), targeting highly mobile species (herring and/or mackerel) that consistently move/shoal during spawning migrations. Any activity by

pelagic vessels within the array area is highly likely to be a sporadic, transitory event. 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 Four array area, this shoal is expected to move to an area where they can be caught. Therefore, while the access to the water column within the Hornsea Four array area may be affected; the opportunity to catch pelagic fish is not lost. Moreover, the landings statistics indicate that very limited landings are taken by pelagic vessels from within the study area for the Hornsea Four array area.

6.11.1.10 Demersal sandeel: Danish, and to a lesser extent Swedish industrial otter trawlers, target sandeel throughout the North Sea. Industry mapping of sandeel grounds within the North Sea indicate two small areas of key sandeel grounds that overlap with the array area, in the north west and (to a lesser extent) south east corners of the array (**Figure 6.16**). Both these areas represent the end (or beginning) of a sandeel fishing ground i.e., from which a vessel would start or finish a tow, and therefore do not fully restrict access to each of the defined grounds. Large areas of significant sandeel grounds are located north and west of the array area (i.e. outside the array area). It is expected that landings statistics for sandeel within ICES rectangle 37F1 and 37F0 relate to these grounds, outside the array area.

6.11.1.11 The sandeel fishery is highly dependent on recruitment on a year-to-year basis; it is noted that a zero TAC has been in place for 2018 and 2019 due to low stock abundance (ICES 2019). Sandeel grounds are well established and understood throughout the North Sea and it is reasonable to assume that the small areas of sandeel grounds overlapping the Hornsea Four array area could be productive in the future including within the approximately three-year construction period.

6.11.1.12 Demersal mixed fisheries: Dutch and Belgian beam trawlers target sole and plaice; French otter trawlers target whiting and UK otter trawlers target *Nephrops* and mixed demersal species. An average annual first sales value of £438,400 landings is taken specifically within the Hornsea Four array area by these fleets, split evenly across beam trawl and otter trawl vessels (informed from 2017 VMS data providing detailed catch value by area). VMS data indicates that in the surrounding area, fishing grounds north, north-east and east of the array area are significantly more important to these fleets.

6.11.1.13 The impact is predicted to be of regional spatial extent, short term duration, intermittent and medium reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **moderate** for potting fisheries, **minor** for pelagic and demersal fisheries, and **negligible** for dredge fisheries.

Sensitivity of the receptor

6.11.1.14 The mobile fleets targeting pelagic, dredge and demersal fisheries across the Hornsea Four array area are typically >25 m in length and operate 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. All mobile fleets are considered to have a large operational range. All pelagic gear fleets are considered to have an extensive operational range, be highly adaptive and resilient to change.

6.11.1.15 The mobile fleets targeting pelagic, dredge and demersal fisheries are considered to have moderate-high levels of alternative fishing grounds; are deemed to be of low

vulnerability, high recoverability and low-medium value. The sensitivity of these receptors is therefore, considered to be **low**.

6.11.1.16 The UK potting fleet are typically <15 m in length and operate across more distinct areas of ground, typically 0 to 12 NM from shore, but also extending beyond 12 NM, in areas that are already heavily exploited and are therefore more sensitive to disruption. The UK potting fleet are deemed to be of medium vulnerability, medium recoverability and medium value across the Hornsea Four array area. The sensitivity of the receptor is therefore, considered to be **medium**.

Significance of the effect

6.11.1.17 Pelagic and demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms.

6.11.1.18 Dredge fishery: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **negligible**. The effect is **neutral**, which is not significant in EIA terms.

6.11.1.19 Potting fishery: overall, it is predicted that the sensitivity of the receptor is **medium** and the magnitude is **moderate**. The effect is of **moderate adverse** significance, which is significant in EIA terms. The justification for this moderate adverse significance is based on the dependence of the potting fleet not being solely associated to the array area.

Further mitigation

6.11.1.20 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 (Co180). 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 Global Positioning System (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; and
- 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.

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

Hornsea Four offshore ECC construction activities leading to reduction in access to, or exclusion from established fishing grounds (CF-C-2)

6.11.1.22 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).

6.11.1.23 The construction scenario assumes 36 months of offshore construction. In terms of the area impacted by construction activities, in total 36.09 km^2 of seabed will be temporarily disturbed during construction, with a permanent reduction of seabed of 1.27 km^2 (due to foundations of HVAC booster stations, cable protection and rock berm area for cable crossings). In addition, an advisory safe passing distance of 500 m radius around cable installation vessels active along the offshore ECC, is recommended i.e. a roaming 0.79 km^2 area along the 109 km offshore ECC.

Magnitude of impact

6.11.1.24 This impact will lead to a loss of access to fishing grounds and the fish and shellfish resources within these grounds for a range of fishing opportunities during the construction activities, which will directly affect various fishing fleets over a short-term duration. The impact is predicted to be intermittent and of relevance to international fishing fleets and is described below on a fishery basis.

6.11.1.25 Potting: the Hornsea Four offshore ECC overlaps with fishing ground routinely targeted by UK potting vessels targeting brown crab and lobster using creels and whelk using pots. Lobster and brown crab are the most valuable species in this area, with approximately 655 tonnes of lobster and 5,260 tonnes of brown crab landed annually with a combined first sales value of £17.3 million from the offshore ECC study area (based on five-year average from 2015-2019). The lobster fishery is estimated to generate £35m a year to the region's economy and support 250 fishermen and 200 onshore jobs (Oliver 2018). The market for lobster has recently seen improved prices, with a sharp increase from 2015 to 2016 and continued growth in 2017 and 2018. VMS data for potting across the offshore ECC is not representative of the Bridlington and Holderness Coast potting fleet, due to the omission of vessels <15 m in length within the dataset.

6.11.1.26 During the construction process, vessels with pots set along the Hornsea Four offshore ECC will need to move these pots and cease fishing activities at particular construction locations. The provision of sufficient notice (Co89), together with the support of an offshore Fisheries Liaison Officers (FLOs) where appropriate (Co90), will facilitate this process.

6.11.1.27 Dredge: the UK dredging fleet targets scallops, including from established grounds that run parallel to Holderness Coast between 6 to 12 NM from the coast, including across the ECC. Based on VMS data, the most productive scallop grounds are targeted north of the offshore ECC and north of Flamborough Head, between 6 and 12 NM offshore. The southern end of the scallop grounds runs across the portion of offshore ECC between 6 to 12 NM (see **Figure 6.9**). Approximately 1,900 tonnes of scallop are landed annually from the offshore ECC study area, with a first sales value of £4.3 million (based on five-year average from 2015-2019). Based on 2017 VMS data, the actual value of the dredge fishery specifically within the offshore ECC is approximately £154,000 in annual first sales.

Consultation with the UK scallop fishing industry corroborates that the key economic area targeted for scallops in the region is a few miles north of the offshore ECC.

6.11.1.28 Pelagic: the Dutch, German, Danish, French, and Swedish pelagic trawling fleets target herring across a wide area, including a limited amount taken from ICES rectangle 37F0, which overlaps with the offshore ECC. As described in **paragraph 6.11.1.9**, activity from the pelagic fleet is understood to be sporadic and based on the shoaling behaviour of the fish, which are available to be caught over a wide area. Therefore, while the access to the water column within the Hornsea Four offshore ECC may be affected; the opportunity to catch pelagic fish will not be lost.

6.11.1.29 Demersal sandeel: no established sandeel grounds overlap with the offshore ECC (**Figure 6.16**).

6.11.1.30 Demersal mixed fisheries: there is a very low level of beam trawl activity across the offshore ECC (based on VMS data from 2013 to 2017). An area of ground 12 to 20 NM from shore is routinely targeted by otter trawl vessels, catching whiting, and mixed demersal species. This has a relatively low value compared to adjacent areas, outside the offshore ECC, with an average annual first sales value of approximately €95,000 (based on VMS data).

6.11.1.31 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 receptor directly. The magnitude is therefore, considered to be **minor** for dredge, pelagic and demersal fisheries, and **moderate** for potting fisheries.

Sensitivity of the receptor

6.11.1.32 The sensitivity of receptors is as described in **paragraphs 6.11.1.14** and **6.11.1.16**. The mobile fleets targeting pelagic and demersal fisheries are considered to have high levels of alternative fishing grounds; are deemed to be of low vulnerability, high recoverability and low-medium value. The sensitivity of these receptors is therefore, considered to be **low**. 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**.

6.11.1.33 For the mobile dredge fishery targeting scallops it is recognised that while there are moderate levels of alternative fishing grounds, scallops are strongly associated with specific benthos and grounds running parallel to the Holderness Coast are well established and routinely fished. The dredge fleet are therefore deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of these receptors is therefore, considered to be **medium**.

Significance of the effect

6.11.1.34 Pelagic and demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low** and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms.

6.11.1.35 Dredge fishery: overall, it is predicted that the sensitivity of the receptor is **medium**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms. The justification for this slight adverse assessment is based on the key scallop

grounds being located further north and predominantly outside of the offshore ECC (see Figure 6.9), a fact which has been corroborated by industry consultation (SICG, 06 February 2020, see Table 6.4), as well as VMS data.

6.11.1.36 Potting fishery: overall, it is predicted that the sensitivity of the receptor is **medium**, and the magnitude is **moderate**. The effect is of **moderate adverse** significance, which is significant in EIA terms. The justification for this moderate adverse significance is based on the dependence of the potting fleet not being solely associated to the offshore ECC area.

Further mitigation

6.11.1.37 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 (Co180). 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; and
- 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.

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

Displacement from Hornsea Four array area leading to gear conflict and increased fishing pressure on adjacent grounds (CF-C-3)

6.11.1.39 Localised exclusion from fishing grounds during phased construction of Hornsea Four 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.

6.11.1.40 In terms of the area impacted by construction activities within the Hornsea Four array area, in total a maximum of 38.73 km^2 of seabed will be temporarily disturbed during construction, with a permanent reduction of 2.13 km^2 of seabed during construction. In addition, there will be 500 m safety distance around infrastructure under construction (equating to 0.79 km^2 per structure) and 500 m safe passing distance around construction vessels (equating to 0.79 km^2 per vessel).

Magnitude of impact

6.11.1.41 The impact is predicted to be of regional spatial extent, short-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.

6.11.1.42 Potting: conflict over diminished grounds may occur if displaced vessels operating mobile gear explore grounds traditionally fished by potters; and/or displaced potting gear is relocated into actively fished potting grounds. While potting activity is most prominent in areas inshore from the array area, the offshore potting fleet is understood to operate within the array area, and deploys large numbers of pots (HFIG, pers. comm. 20 November 2019). Displacement of mobile gear may therefore increase the risk of interaction with potting gear. For mobile gear, displacement could be expected to be focused on alternative established grounds both in the vicinity of Hornsea Four array area and throughout the North Sea, thereby reducing displacement onto potting grounds. However, consultation indicates that gear conflict between mobile and potting gear occurs often, and the industry is concerned that spatial restrictions due to the construction of the Hornsea Four array area will increase such interaction (HFIG, pers. comm. 20 November 2019).

6.11.1.43 When considering the impact of potters being displaced from the array area 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 6.11.1.20**).

6.11.1.44 Notwithstanding the above, concern has been raised by the HFIG potting fleet and NFFO regarding displacement of potting gear into ground already targeted by potters. This can lead to the entanglement of potting lines, which is time consuming to separate and can create operational difficulties (for example, the lines have to be cut and re-tied at each pot to disentangle and reassemble the string of pots).

6.11.1.45 The Applicant commits to ensuring that exclusion impacts are appropriately mitigated to minimise the displacement effect (see **paragraph 6.11.1.20** and Co180) e.g. such that displaced pots are not actively deployed during the period of mitigation (e.g. left open, or stored on land), or if deployed, they are done so in a matter that avoids or minimises gear interaction.

6.11.1.46 On balance, the displacement effect to potters targeting the Hornsea Four array area 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.

6.11.1.47 Dredge: displacement from Hornsea Four array area is not expected to affect the dredge fishery operating between 6 to 12 NM from the coast based on the distance from the array area to these grounds, together with the established dredge fishery in this area.

6.11.1.48 Pelagic: pelagic otter trawlers from all nationalities that may occasionally operate within the Hornsea Four array area, fish throughout the North Sea across a range of established fishing grounds. Displacement is not expected to affect pelagic fleets.

6.11.1.49 Demersal: VMS data indicate that there are numerous areas surrounding Hornsea Four array area that are targeted by the same demersal gear types used within the 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. The ICES VMS data shows vast areas targeted by demersal otter trawl, demersal seine and beam trawl fleets, as do the maps of Danish sandeel grounds throughout the North Sea.

6.11.1.50 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 receptor directly. The magnitude is therefore, considered to be **minor** for potting, dredge, and demersal fisheries, and **negligible** for pelagic fisheries.

Sensitivity of the receptor

6.11.1.51 All mobile commercial fisheries fleets operating within the Hornsea Four 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 Four 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**.

6.11.1.52 The UK potting fleet operates across large areas inshore from the Hornsea Four array area. This form of static fishing gear is considered to have a 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 Four array area, which includes areas currently targeted by potters. The UK potting fleet are, therefore, deemed to be of high vulnerability, with medium recoverability and medium value. The sensitivity of the UK potting fleet is therefore, considered to be **medium**.

Significance of the effect

6.11.1.53 Dredge and demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms.

6.11.1.54 Pelagic fishery: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **negligible**. The effect is **neutral**, which is not significant in EIA terms.

6.11.1.55 Potting fishery: overall, it is predicted that the sensitivity of the receptor is **medium**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms. The justification for this slight adverse assessment is on the adoption of effective mitigation (Co180) of reduced access to fishing grounds within the Hornsea Four array area, which will subsequently limit the level of displacement experienced.

Displacement from the Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CF-C-4)

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

6.11.1.57 In terms of the area impacted by construction activities, in total 36.09 km^2 of seabed will be temporarily disturbed during construction, with a permanent reduction of seabed of 1.27 km^2 within the offshore ECC. In addition, a 500 m safe passing distance radius around cable installation vessels active along the offshore ECC, is recommended i.e., a roaming 0.79 km^2 area along the 109 km offshore ECC.

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 Potting: vessels deploying creels and pots across the Hornsea Four offshore ECC will be required to temporarily relocate gear to other grounds during the construction phase. Each individual vessel deploys between approximately 300 and 3,500 pots. However, it is not likely that all fleets (or creels/pots from one vessel) will overlap the offshore ECC given that a number of fleets of pots and a range of grounds are targeted at any given time. Due to the volumes of gear, vessels 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/strings).

6.11.1.60 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 6.11.1.37**).

6.11.1.61 Notwithstanding the above, concern has been raised by the HFIG potting fleet and NFFO regarding displacement of potting vessels into ground already targeted by potters. The Applicant commits to ensuring that exclusion impacts are appropriately mitigated to minimise the displacement effect (see **paragraph 6.11.1.37**) e.g. such that displaced pots are not actively deployed during the period of mitigation (e.g. left open, or stored on land), or if deployed, they are done so in a matter that avoids or minimises gear interaction.

6.11.1.62 On balance, the displacement effect to potters targeting the Hornsea Four offshore ECC 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.

6.11.1.63 For all mobile fleets deploying demersal trawl, beam trawl and dredge gear, due to the lower level of activity across the Hornsea Four offshore ECC, together with the range of alternative grounds with higher rates of effort, the magnitude is considered to be **minor**.

6.11.1.64 For all mobile fleets deploying pelagic trawl gear, due to the ability to catch the same shoaling pelagic fish as they move outside the offshore ECC area, together with the limited level of effort recorded in the baseline assessment, the magnitude is considered to be **negligible.**

Sensitivity of the receptor

6.11.1.65 The sensitivity is as assessed in **paragraphs 6.11.1.51** and **6.11.1.52** and considered to be low for all mobile fleets and medium for the UK potting fleet.

Significance of the effect

6.11.1.66 Dredge and demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms.

6.11.1.67 Pelagic fishery: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **negligible**. The effect is **neutral**, which is not significant in EIA terms.

6.11.1.68 Potting fishery: overall, it is predicted that the sensitivity of the receptor is **medium**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms. The justification for this slight adverse assessment is the adoption of effective mitigation of reduced access to fishing grounds across the offshore ECC, which will subsequently limit the level of displacement experienced.

Hornsea Four array area and offshore ECC construction activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-C-5)

6.11.1.69 Temporary displacement due to noise and seabed disturbances during construction activities may decrease or displace commercially important fish and shellfish populations from the area. This section assesses the potential temporary subsequent 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

6.11.1.70 Detailed assessments of the following potential construction impacts have been undertaken in **Chapter 3: Fish and Shellfish Ecology**:

- Direct damage (e.g. crushing) and disturbance to mobile demersal and pelagic fish and shellfish species arising from construction activities (FSE-C-1);
- Temporary localised increases in Suspended Sediment Concentration (SSC) and smothering (FSE-C-2);
- Direct and indirect seabed disturbances leading to the release of sediment contaminants (FSE-C-3); and
- Mortality, injury, behavioural changes and auditory masking arising from noise and vibration (FSE-C-4).

6.11.1.71 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). This is because the overall effect on the fish and/or shellfish species relates directly to the availability and amount of exploitable resource. 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.

6.11.1.72 Details of the fish and shellfish ecology assessment are summarised in **Table 6.13** justifications for this assessment will not be repeated in this chapter. Evidence, modelling and justifications for these assessments are provided in **Chapter 3: Fish and Shellfish Ecology**.

6.11.1.73 The impact is predicted to be of regional spatial extent, of relevance to international fishing fleets, and of short-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 6.13: Significance of effects of construction impacts on fish and shellfish ecology.

Potential impact	Species	Significance of effect
Direct damage (e.g. crushing) and disturbance to mobile demersal and pelagic fish and shellfish species arising from construction activities (FSE-C-1)	Herring	**Slight**
	Sandeel	**Slight**
	Brown crab	**Slight**
	European lobster	**Slight**
	Scallop	**Slight**
	Nephrops	**Slight**
	Common whelk	**Slight**
	All other fish and shellfish	**Not significant**
Temporary localised increases in SSC and smothering (FSE-C-2).	Herring	**Slight**
	Sandeel	**Neutral**
	Brown crab	**Slight**
	European lobster	**Slight**
	Scallop	**Slight**
	Nephrops	**Neutral**
	Common whelk	**Neutral**
	All other fish and shellfish	**Neutral**
Direct and indirect seabed disturbances leading to the release of sediment contaminants (FSE-C-3).	All fish and shellfish	**Not significant**
Mortality, injury, behavioural changes and auditory masking arising from noise and vibration (FSE-C-4).	Herring	**Slight**
	Sandeel	**Slight**
	All other fish and shellfish	**Slight**

Sensitivity of the receptor

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

6.11.1.75 Due to the locality of the impact on brown crab and lobster, there is potential for grounds beyond the immediate construction activities to be affected by increased suspended sediment and sediment deposition, impacting the wider potting fleet. The potting fleet is deemed to be of medium vulnerability, medium recoverability and medium-high value. The sensitivity of the receptor is therefore, considered to be **medium**.

6.11.1.76 Due to the locality of the impact on scallops there is potential for grounds beyond the immediate construction activities to be affected by increased suspended sediment and sediment deposition, impacting the wider area targeted by scallop dredge vessels. The dredge fishery is deemed to be of medium vulnerability, high recoverability and medium value. The sensitivity of the receptor is therefore, considered to be **medium**.

6.11.1.77 Due to the range of alternative areas targeted and the distribution of key commercial species throughout the central and southern North Sea, all other fleets are deemed to be of low vulnerability, high recoverability and medium-low value. The sensitivity of the receptor for pelagic and demersal fisheries is therefore, considered to be **low**.

Significance of the effect

6.11.1.78 Pelagic and demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms.

6.11.1.79 Potting and dredge fisheries: overall, it is predicted that the sensitivity of the receptor is **medium**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms. The justification for this slight adverse significance is based on the highly localised effects on resources.

Increased vessel traffic within fishing grounds as a result of changes to shipping routes and transiting construction vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC leading to interference with fishing activity (CF-C-7)

6.11.1.80 This assessment focuses on the potential impact of Hornsea Four 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

6.11.1.81 Vessel movements (i.e. construction vessels transiting to and from areas undergoing construction works) related to the construction of Hornsea Four, the offshore ECC and all associated infrastructure will add to the existing level of shipping activity in the area (see **Chapter 7: Shipping and Navigation** for a full assessment of additional vessel movements).

6.11.1.82 It is noted that continuous liaison with the fishing industry will be undertaken including location and duration of construction activities; further details are provided in **F2.9:**

Outline Fisheries Coexistence and Liaison Plan (Co95) which is included as part of the DCO Application.

6.11.1.83 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. All other fishing fleets are considered to be able to avoid vessel movements related to construction of the array area and offshore ECC.

6.11.1.84 The impact is predicted to be of regional spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **minor** for all fisheries.

Sensitivity of the receptor

6.11.1.85 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. It is noted that established shipping routes do currently cross the offshore ECC and array area, and that the construction vessels are likely to follow these routes where possible. The UK potting fishery is deemed to be of high vulnerability, high recoverability and medium-high value. The sensitivity of the receptor is therefore, considered to be **medium**.

6.11.1.86 All other fishery fleets are expected to be in a position to avoid the Hornsea Four construction areas. Demersal trawl fisheries (including beam trawl, otter trawl and demersal seine) are deemed to be of low vulnerability, high recoverability and medium-high value. The sensitivity of the receptor is therefore, considered to be **low**.

6.11.1.87 The pelagic and dredge fisheries are deemed to be of very low vulnerability, very high recoverability and medium-high value. The sensitivity of these receptors is therefore, considered to be **low**.

Significance of the effect

6.11.1.88 Pelagic and demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms.

6.11.1.89 Potting and dredge fisheries: overall, it is predicted that the sensitivity of the receptor is **medium**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms. The justification for this slight adverse significance is based on the designed in commitments provided in **Table 6.8**, specifically a vessel management plan which will determine vessel routing to and from construction sites and ports (see commitment Co111).

6.11.2 Operation and Maintenance

6.11.2.1 The impacts of the offshore operation and maintenance phase of Hornsea Four have been assessed on commercial fisheries. The environmental impacts arising from the operation and maintenance of Hornsea Four are listed in **Table 6.9** along with the MDS 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 Four array area infrastructure and maintenance activities leading to reduction in access to, or exclusion from established fishing grounds (CF-O-8)

6.11.2.3 The assessment assumes that commercial fisheries will be prevented from actively fishing within a total area of 2.13 km^2 due to infrastructure within the Hornsea Four array area, including 110 turbines with GBS (WTG-type) foundations and 70 WTGs with suction caisson jacket (WTG-type) foundations, ten platforms for accommodation and substations, together with associated safety zones for maintenance activities and assumed operating distances (full details of the area breakdowns are provided in **Table 6.9**). Minimum turbine spacing is 810 m, including between turbines and all other infrastructure. In addition, during the lifetime of the project, routine and major maintenance may be undertaken, including component replacement and remedial cable burial, and as such there may be some temporary displacement to fishing activities over a total area of 6.76 km^2.

6.11.2.4 Outwith this area of 2.13 km^2, the assessment assumes that fishing will be possible within the Hornsea Four array area where turbine spacing and turbine layout allow productive grounds to 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 the skippers of fishing vessels with their own perception of risk will determine the likelihood of whether their fishing will resume within the Hornsea Four array area. Inclement weather will be a significant contributor to this risk perception. The type and dimension of fishing gear also influences the potential opportunities within the array area. For example, pelagic trawl, multi-rig otter trawl and demersal seine / fly shooting gear require a greater distance for safe operation and these gears are unlikely to target grounds in the vicinity of infrastructure.

Magnitude of impact

6.11.2.5 This impact will lead to localised loss of access to fishing grounds and the fish and shellfish 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 Four array area to commercial fishing fleets is the same as that presented for construction in **paragraphs 6.11.1.4** to **6.11.1.12**.

6.11.2.7 Demersal fisheries: the degree to which demersal mobile gear can resume within Hornsea Four offshore array is uncertain and dependant on a number of factors including gear type, width of gear spread when in seabed contact and the vessel skipper's risk perception. A study by Gray et al. (2016) explored changes to fishing practices as a result of the development of offshore wind farms in the Irish Sea. Through industry interviews with mobile demersal otter trawlers targeting *Nephrops* grounds, it was found that for those fishermen who claimed to have operated on fishing grounds now occupied by wind turbines, the majority stated they had not returned or had reduced their fishing effort within the wind farm area two or more years after construction. The main reason for the

reduction in effort was increased actual risk associated with the presence of wind farm infrastructure and overall heightened perceived risk (Gray et al. 2016). The study did find a small number of fishermen operating inside the wind farm areas.

6.11.2.8 While demersal trawl fisheries (including targeting sandeel, sole, plaice, *Nephrops* and mixed demersal) are expected to experience reduced access to the Hornsea Four array area, the evidence indicates that the Hornsea Four array area is not routinely targeted, especially in comparison to areas outside the array area, notably to the north, north east and east of the array area, as well as other grounds throughout the North Sea (such as Dogger Bank). Overall, the presence of Hornsea Four array area is unlikely to lead to an overall decline in landings for these fisheries.

6.11.2.9 Pelagic fisheries: midwater trawls are designed to catch species living anywhere in the water column above the seafloor, including at the surface. Acoustic technology is used to locate the position and depth of the target fish shoal and the path of the boat and depth of the net are adjusted accordingly. Based on the gear width and operational method that requires space to set the trawl net and move into the path of the fish shoal, it is unlikely that pelagic gear would be operated within the array area. However, given the infrequent nature of pelagic fisheries, together with the opportunity to catch the target, highly mobile species when it moves outside the area, the presence of Hornsea Four array area is not expected to restrict the baseline operation of pelagic fisheries throughout the North Sea.

6.11.2.10 Dredge fishery: no established scallop grounds are present within the Hornsea Four array area (**Figure 6.9**). The presence of Hornsea Four array area is not expected to restrict the baseline operation of scallop dredge fisheries.

6.11.2.11 Potting fisheries: a recent study by Roach et al. (2018) investigated the effect of the construction and operation of the Westermost Rough offshore wind farm on established lobster fishing grounds (noting that this site lies approximately 8 km off the Holderness coast and is targeted by the same fishing fleets also exploiting the Hornsea Four array area and ECC). The study concluded that:

- The temporary closure during the construction period offered some respite from fishing pressure for adult lobsters and lead to an increase in abundance and size of lobster in the wind farm area;
- Reopening of the site to fishing exploitation saw a decrease in catch rates and size structure, but this did not reach levels below that of the surrounding area;
- Opening the site to exploitation allowed the fishery to recuperate some of the economic loss during the closure; and
- Finally, the authors conclude that temporary closures of selected areas may be beneficial to lobster fisheries and should be considered as a management option for lobster fisheries.

6.11.2.12 It is therefore expected that potting activity will resume within the Hornsea Four array area during the operation and maintenance phase and that catch rates will, most likely, initially be higher than comparable grounds outside the array area, before returning to similar baseline levels.

6.11.2.13 The impact is predicted to be of regional spatial extent, long term duration, continuous and with low reversibility. It is predicted that the impact will affect the receptor directly.

Based on the justifications above, the magnitude is therefore, considered to be **minor** for potting, pelagic and demersal fisheries, and **negligible** for pelagic fisheries.

Sensitivity of the receptor

6.11.2.14 The sensitivity of the commercial fisheries receptors is the same as that presented for construction in **paragraphs 6.11.1.14** to **6.11.1.16**, summarised as **low** for mobile pelagic, demersal and dredge fisheries and **medium** for potting fishery.

Significance of the effect

6.11.2.15 Pelagic and demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms.

6.11.2.16 Dredge fisheries: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **negligible**. The effect is **neutral**, which is not significant in EIA terms.

6.11.2.17 Potting fisheries: overall, it is predicted that the sensitivity of the receptor is **medium**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms. The justification for this slight adverse significance is based on the higher likelihood of potting vessels being able to resume fishing within the array area.

Physical presence of offshore export cable and infrastructure and maintenance activities within the Hornsea Four offshore ECC leading to reduction in access to, or exclusion from established fishing grounds (CF-O-9)

6.11.2.18 The assessment assumes that commercial fisheries will be prevented from actively fishing within a total area of 1.27 km^2 within the Hornsea Four offshore ECC, including infrastructure (HVAC booster stations) and cable protection. 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. In addition to 1.27 km^2 that is permanently unavailable (due to infrastructure), an estimated additional area of up to 1.76 km^2 will be temporarily unavailable throughout the lifetime of the project due to remedial cable burial and cable repairs.

6.11.2.19 The European Subsea Cables Association notes that cables are potentially subsea hazards, and that while great effort is made to bury and protect them, mariners should never assume that cables are completely buried. Furthermore, the Mariners Handbook advises that: *"every care should be taken to avoid anchoring, trawling, fishing, dredging, drilling or carrying out any other activity in the vicinity of cables which might damage them"*.

6.11.2.20 Notwithstanding this, subsea cables are widespread throughout the waters of Europe, providing power and telecommunications links, and it is understood that fishing does take place in the vicinity of subsea cables (Kingfisher Information Service – Offshore Renewable & Cable Awareness (KIS-ORCA) 2019). The Applicant is a member of FLOWW and is actively working with fishing industry representatives to facilitate coexistence in relation to fishing and cables.

6.11.2.21 The assessment is undertaken on the understanding that it is illegal to wilfully, or negligently, break or damage any submarine cable and that burial, or other forms of protection, and routine burial surveys or other activities undertaken by the cable owner do not indemnify other seabed users should their activities result in damage to it.

Magnitude of impact

6.11.2.22 For the purposes of this assessment, it is assumed that fishermen will be well informed of the location and integrity of the offshore ECC i.e., locations of protection, details of routine cable integrity surveys and location and schedule for any maintenance works, and that based on this knowledge will seek to exploit grounds across the offshore ECC with caution (see commitments provided in **Table 6.8**). The assessment therefore assumes that fishing will resume within the vicinity of the export cables.

6.11.2.23 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.

6.11.2.24 Pelagic gear does not come into contact with the seabed and therefore the presence of the offshore ECC will not affect potential fishing opportunities.

6.11.2.25 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 Four offshore ECC. It is predicted that the impact will affect the receptor directly. Given that fishing is likely to resume across the majority of the Hornsea Four offshore ECC, the magnitude is considered to be **negligible** for pelagic fisheries and **minor** for all other fishing fleets.

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 6.11.1.32** *et seq.*, summarised as **low** for pelagic and demersal trawl fisheries and **medium** for potting and dredge fisheries.

Significance of the effect

6.11.2.27 Pelagic fisheries: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **negligible**. The effect is **neutral**, which is not significant in EIA terms.

6.11.2.28 Demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms.

6.11.2.29 Dredge fishery: overall, it is predicted that the sensitivity of the receptor is **medium**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms. The justification of this slight adverse significance is based on the key scallop grounds being located north and outside of the offshore ECC, which has been corroborated by industry consultation (see further detail in **Table 6.4**).

6.11.2.30 Potting fishery: overall, it is predicted that the sensitivity of the receptor is **medium**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is significant in

EIA terms. The justification of this slight adverse significance is based on the very high likelihood of resumption of fishing by potting vessels across the offshore ECC.

Displacement from Hornsea Four array area and Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CF-O-10)

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

Magnitude of impact

6.11.2.32 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 6.11.1.41** to **6.11.1.50,** and **6.11.1.58** to **6.11.1.64**), summarised as **minor** for all demersal trawlers and negligible for vessels deploying pelagic gear.

6.11.2.33 Given that potting can resume across the Hornsea Four offshore cable corridor and within the array area, the magnitude for UK potters is considered to be **minor**.

6.11.2.34 The impact is predicted to be of regional spatial extent, short term duration, intermittent and with high reversibility. It is predicted that the impact will affect the receptor directly. Based on the justifications above, the magnitude is therefore, considered to be **minor** for potting and demersal fisheries, and **negligible** for pelagic fisheries.

Sensitivity of the receptor

6.11.2.35 The sensitivity of the commercial fisheries receptors is the same as that presented for construction in **paragraphs 6.11.1.51** to **6.11.1.52**, summarised as **low** for mobile pelagic and demersal fisheries and **medium** for potting and dredge fisheries.

Significance of the effect

6.11.2.36 Demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms.

6.11.2.37 Pelagic fisheries: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **negligible**. The effect is **neutral**, which is not significant in EIA terms.

6.11.2.38 Dredge fishery: overall, it is predicted that the sensitivity of the receptor is **medium**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms. The justification of this slight adverse significance is based on the key scallop grounds being located north and outside of the offshore ECC, which has been corroborated by industry consultation (see further detail in **Table 6.4**).

6.11.2.39 Potting fisheries: overall, it is predicted that the sensitivity of the receptor is **medium**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms. The justification of this slight adverse significance is based on the very high likelihood of resumption of fishing by potting vessels across the offshore ECC.

Physical presence of Hornsea Four array area leading to gear snagging (CF-O-11)

6.11.2.40 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 **Chapter 7: Shipping and Navigation**.

Magnitude of impact

6.11.2.41 In the instance that snagging does occur, the developer would work to the protocols laid out within the guidance produced by the FLOWW group and 'Recommendations for Fisheries Liaison: Best Practice' guidance for offshore renewable developers (Co180), in particular 'Section 9: Dealing with claims for loss or damage of gear' (FLOWW 2014 and 2015; BERR 2008).

6.11.2.42 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 capsizing.

6.11.2.43 It is considered likely that fishermen would operate appropriately (i.e., avoiding the indicated infrastructure and cable protection at the defined location) given adequate notification of the locations of any snagging hazards; and are highly likely to avoid the infrastructure and cable protection within the Hornsea Four array area.

6.11.2.44 The Applicant is a member of FLOWW and has been involved in the development of the FLOWW cables document, (in draft) which outlines both developers and fishermen's positions on fishing within the vicinity of cables and cable protection. Locations of cable protection will be communicated to the fishing industry.

6.11.2.45 The impact is predicted to be of regional spatial extent, long term duration, continuous and with low reversibility. It is predicted that the impact will affect the receptor directly. Based on the justifications above, the magnitude is therefore, considered to be **minor** for potting and demersal fisheries, and **negligible** for pelagic and dredge fisheries.

Sensitivity of the receptor

6.11.2.46 Due to the nature and operation of mobile trawling gear (i.e., it is actively towed and demersal trawl and dredge 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 trawl and dredge fisheries.

6.11.2.47 Pelagic trawl gear is designed to catch fish in the water column and does not normally come into contact with the seabed, sensitivity is considered to be **low**.

6.11.2.48 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

6.11.2.49 Demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **medium**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms. The justification for this slight adverse significance is based on the designed in commitments provided in Table 6.8, specifically that cable burial will be the preferred option for cable protection.

6.11.2.50 Dredge fisheries: overall, it is predicted that the sensitivity of the receptor is **medium**, and the magnitude is **negligible**. The effect is of **slight adverse** significance, which is not significant in EIA terms.

6.11.2.51 Pelagic fisheries: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **negligible**. The effect is **neutral**, which is not significant in EIA terms.

6.11.2.52 Potting fisheries: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms.

Physical presence of the export cable and associated infrastructure leading to gear snagging (CF-O-12)

Magnitude of impact

6.11.2.53 Based on the measures that will be implemented as part of the project and the commitment to follow standard protocols should snagging occur (see Section 6.8.2 and Table 6.8), the magnitude is considered to be **negligible** for fleets deploying pelagic gear and **minor** for all other fishing fleets.

Sensitivity of the receptor

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

6.11.2.55 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**.

6.11.2.56 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

6.11.2.57 Demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **medium**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms. The justification for this slight adverse significance is based on the designed in commitments provided in Table 6.8, specifically that cable burial will be the preferred option for cable protection.

6.11.2.58 Dredge fisheries: overall, it is predicted that the sensitivity of the receptor is **medium**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms. The justification for this slight adverse significance is based on the designed in commitments provided in Table 6.8, specifically that cable burial will be the preferred option for cable protection, with up to 10% of the cable protected.

6.11.2.59 Pelagic fisheries: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **negligible**. The effect is **neutral**, which is not significant in EIA terms.

6.11.2.60 Potting fisheries: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms.

Hornsea Four operation and maintenance activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-O-13)

Magnitude of impact

6.11.2.61 Assessments of the following potential operation and maintenance impacts have been undertaken in Chapter 3: Fish and Shellfish Ecology:

- Temporary localised increases in SSC and smothering (FSE-O-18);
- Long term loss of habitat due to the presence of turbine foundations, scour protection and cable protection (FSE-O-6);Increased hard substrate and structural complexity as a result of the introduction of turbine foundations, scour protection and cable protection (FSE-O-7);
- Direct disturbance resulting from maintenance during operation (FSE-O-10); and
- Underwater noise as a result of operational turbines (FSE-O-8) - Assessed as part of the EIA, as set out in the PEIR and confirmed in Volume A4, Annex 5.1 Impacts & Effects Register, with no likely significant effect identified.

6.11.2.62 The approach to this assessment follows that outlines for construction, with details of the fish and shellfish ecology assessment summarised in Table 6.14.

6.11.2.63 The impact is predicted to be of regional spatial extent, of relevance to international fishing fleets, and of short-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.

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

Potential impact	Species	Significance of effect
Temporary localised increases in SSC and smothering (FSE-O-18).	Herring	**Slight**
	Sandeel	**Neutral**
	Brown crab	**Slight**
	European lobster	**Slight**
	Scallop	**Slight**
	Nephrops	**Neutral**
	Common whelk	**Neutral**
	All other fish and shellfish	**Neutral**
Long-term loss of habitat due to the presence of turbine foundations, scour protection and cable protection (FSE-O-6).	Herring	**Slight**
	Sandeel	**Slight**
	Brown crab	**Slight**
	European lobster	**Neutral**
	Scallop	**Slight**
	Nephrops	**Slight**
	Common whelk	**Neutral**
	All other fish and shellfish	**Neutral**
Increased hard substrate and structural complexity as a result of the introduction of turbine foundations, scour protection and cable protection (FSE-O-7).	Herring	**Slight**
	Sandeel	**Slight**
	Brown crab	**Neutral**
	European lobster	**Neutral**
	Scallop	**Neutral**
	Nephrops	**Neutral**
	Common whelk	**Neutral**
	All other fish and shellfish	**Not significant**
Direct disturbance resulting from maintenance during operation (FSE-O-10).	Herring	**Slight**
	Sandeel	**Slight**
	Brown crab	**Slight**
	European lobster	**Neutral**
	Scallop	**Slight**
	Nephrops	**Slight**
	Common whelk	**Slight**
	All other fish and shellfish	**Not significant**
Underwater noise as a result of operational turbines (FSE-O-8).	Herring	**Not significant.** Assessed as part of the EIA, as set out in the PEIR and confirmed in Volume A4, Annex 5.1 Impacts & Effects Register, with no likely significant effect identified.
	Sandeel	
	All other fish/shellfish	

Sensitivity of the receptor

6.11.2.64 The sensitivity of the commercial fisheries receptors is the same as that presented for construction in paragraphs 6.11.1.74 to 6.11.1.77, summarised as **low** for mobile pelagic and demersal fisheries and **medium** for potting and dredge fisheries.

Significance of the effect

6.11.2.65 Pelagic and demersal fisheries: overall, it is predicted that the sensitivity of the receptor is **low**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms.

6.11.2.66 Potting and dredge fisheries: overall, it is predicted that the sensitivity of the receptor is **medium**, and the magnitude is **minor**. The effect is of **slight adverse** significance, which is not significant in EIA terms. The justification for this slight adverse significance is based on the highly localised effects on resources.

Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC infrastructure leading to interference with fishing activity (CF-O-15)

6.11.2.67 The effects of the operational and maintenance phase are expected to be the same or similar to the effects from construction (see **paragraphs 6.11.1.80** to **6.11.1.89**). The significance of effect is therefore neutral for pelagic and dredge fisheries, which **not significant** in EIA terms, and **slight adverse** for potting and demersal fisheries, which is also not significant in EIA terms.

Future monitoring

6.11.2.68 Continuous liaison with the fishing industry will be undertaken throughout the lifetime of the project, including issuing Notice to Mariners with details on upcoming maintenance activities. Further details of communication roles and responsibilities is provided in **F2.9: Outline Fisheries Coexistence and Liaison Plan** (Co95).

6.11.3 Decommissioning

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

Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds (CF-D-16)

6.11.3.2 The effects of decommissioning activities are expected to be the same or similar to the effects from construction (see **paragraphs 6.11.1.3** to **6.11.1.19**). The significance of effect is therefore **slight adverse** for pelagic and demersal trawl fisheries, which is not significant in EIA terms, **neutral** for the dredge fishery, which is not significant in EIA terms, and **moderate adverse** for potting fisheries, which is significant in EIA terms.

Further mitigation

6.11.3.3 Potting fisheries: with respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance documents (2014 and 2015), will be followed (Co180) as described in **paragraph 6.11.1.20**. The residual effect will, therefore, be of **slight adverse** significance, which is not significant in EIA terms.

Hornsea Four offshore ECC decommissioning activities leading to reduction in access to, or exclusion from established fishing grounds (CF-D-17)

6.11.3.4 The effects of decommissioning activities are expected to be the same or similar to the effects from construction (see **paragraphs 6.11.1.22** to **6.11.1.36**). The significance of effect is therefore **slight adverse** for pelagic, dredge and demersal trawl fisheries, which is not significant in EIA terms, and **moderate adverse** for potting fisheries, which is significant in EIA terms.

Further mitigation

6.11.3.5 Potting fisheries: with respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance documents (2014 and 2015), will be followed (Co180) as described in **paragraph 6.11.1.37**. The residual effect will, therefore, be of **slight adverse** significance, which is not significant in EIA terms.

Displacement from Hornsea Four array area leading to gear conflict and increased fishing pressure on adjacent grounds (CF-D-18)

6.11.3.6 The effects of decommissioning activities are expected to be the same or similar to the effects from construction (see **paragraphs 6.11.1.39** to **6.11.1.55**). The significance of effect is therefore **slight adverse** for potting, dredge, and demersal trawl fisheries, which is not significant in EIA terms, and **neutral** for pelagic fisheries, which is also not significant in EIA terms.

Displacement from the Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CF-D-19)

6.11.3.7 The effects of decommissioning activities are expected to be the same or similar to the effects from construction (see **paragraphs 6.11.1.56** to **6.11.1.68**). The significance of effect is therefore **slight adverse** for potting, dredge and demersal trawl fisheries, which is not significant in EIA terms, and **neutral** for pelagic fisheries, which is also not significant in EIA terms.

Physical presence of any infrastructure left in situ leading to gear snagging (CF-D-20)

6.11.3.8 The effects of decommissioning activities are expected to be the same or similar to the effects from operation phase of the offshore ECC for any infrastructure that is left in situ (see **paragraph 6.11.2.40** to **6.11.2.60**). The significance of effect is **neutral** for pelagic fisheries, which is not significant in EIA terms and **slight adverse** for all other commercial fishing fleets, which is also not significant in EIA terms.

Decommissioning activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-D-21)

6.11.3.9 The effects of decommissioning activities are expected to be the same or similar to the effects from construction (noting that the MDS subsea noise emissions are likely to substantially less than those arising from the construction MDS) (see **paragraphs 6.11.1.69** to **6.11.1.79**). The significance of effect is therefore **slight adverse** for all fisheries, which is not significant in EIA terms.

Increased vessel traffic within fishing grounds as a result of changes to shipping routes and transiting decommissioning vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC leading to interference with fishing activity (CF-D-23)

6.11.3.10 The effects of decommissioning activities are expected to be the same or similar to the effects from construction (see **paragraphs 6.11.1.81** to **6.11.1.89**). The significance of effect is therefore **slight adverse** for potting and demersal trawl fisheries, which is not significant in EIA terms, and **neutral** for pelagic and dredge fisheries, which is not significant in EIA terms.

Future monitoring

6.11.3.11 Prior to decommissioning, and subject to the requirements of the final decommissioning programme and the prevailing regulatory framework in place at that time, the baseline for commercial fisheries will be reviewed to ensure appropriate assessment of fisheries and fleets in operation at the time of decommissioning.

6.12 Cumulative Effect Assessment (CEA)

6.12.1.1 Cumulative effects can be defined as effects upon a single receptor from Hornsea Four when considered alongside other proposed and reasonably foreseeable projects and developments. This includes all projects that result in a comparative effect that is not intrinsically considered as part of the existing baseline environment and is not limited to offshore wind projects.

6.12.1.2 A screening process has identified a number of reasonably foreseeable projects and developments which may act cumulatively with Hornsea Four. The full list of such projects that have been identified in relation to the offshore environment are set out in **Volume A4, Annex 5.3: Offshore Cumulative Effects** and are presented in a series of maps within **Volume A4, Annex 5.4: Location of Offshore Cumulative Schemes**.

6.12.1.3 In assessing the potential cumulative impacts for Hornsea Four, it is important to bear in mind that some projects, predominantly those 'proposed' or identified in development plans, may not actually be taken forward, or fully built out as described within their MDS. There is therefore a need to build in some consideration of certainty (or uncertainty) with respect to the potential impacts which might arise from such proposals. For example, those projects under construction are likely to contribute to cumulative impacts (providing effect or spatial pathways exist), whereas those proposals not yet approved are less likely to contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors.

6.12.1.4 With this in mind, all projects and plans considered alongside Hornsea Four have been allocated into 'tiers' reflecting their current stage within the planning and development process. This allows the cumulative impact assessment to present several future development scenarios, each with a differing potential for being ultimately built out. This approach also allows appropriate weight to be given to each scenario (tier) when considering the potential cumulative impact. The proposed tier structure that is intended to ensure that there is a clear understanding of the level of confidence in the cumulative assessments provided in the Hornsea Four ES. An explanation of each tier is included in **Table 6.15**.

Table 6.15: Description of tiers of other developments considered for CEA (adapted from PINS Advice Note 17).

Tier 1	Project under construction.
	Permitted applications, whether under the Planning Act 2008 or other regimes, but not yet implemented.
	Submitted applications, whether under the Planning Act 2008 or other regimes, but not yet determined.
Tier 2	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has been submitted.
Tier 3	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has not been submitted.
	Identified in the relevant Development Plan (and emerging Development Plans with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited.
	Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.

6.12.1.5 The plans and projects selected as relevant to the CEA of impacts to commercial fisheries are based on an initial screening exercise undertaken on a long list (see **Volume 4, Annex 5.3: Offshore Cumulative Effects**). A consideration of effect-receptor pathways, data confidence and temporal and spatial scales has been given to select projects for a topic-specific short-list. For the majority of potential effects for commercial fisheries, planned projects were screened into the assessment based on a study area of the North Sea, to provide appropriate coverage of relevant fishing grounds.

6.12.1.6 The specific projects scoped into the CEA for commercial fisheries, as well as the tiers into which they have been allocated are presented in **Table 6.16** below and shown in **Volume A4, Annex 5.4: Location of Offshore Cumulative Schemes**. The operational projects included within the table are included due to their completion/ commissioning subsequent to the data collection process for Hornsea Four and as such not included within the baseline characterisation. Note that this table only includes the projects screened into the assessment for commercial fisheries based on the criteria outlined above. For the full list of projects considered, including those screened out, please see **Volume A4, Annex 5.3: Offshore Cumulative Effects**.

6.12.1.7 The CEA includes designated sites as a project or plan in the context of commercial fisheries, as management measures implemented to protect designated features in these sites may lead to reduced access for commercial fisheries, amongst other impacts. The Marine Protected Areas (MPAs) considered in the assessment include all Special Areas of Conservation (SACs), Marine Conservation Zones (MCZs), Special Protected Areas (SPAs) and non-UK Sites of Community Importance (SCI) within 200 km of Hornsea Four, as presented in **Figure 6.17**. As all sites are designated, they are considered in the Tier 1 CEA.

6.12.1.8 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.

6.12.1.9 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.

Table 6.16: Projects screened into the commercial fisheries cumulative assessment.

Tier	Project/plan	Details/ relevant dates	Distance to Hornsea Four Array	Distance to Hornsea Four ECC	Distance to Hornsea Four HVAC Booster Station Search Area	Reason for inclusion in CEA
1	Hornsea Project One Offshore Wind Farm Export Cables	Active	21.80	27.15	54.22	Construction period from 2019 onwards, so not included within baseline assessment, and temporal overlap of operation phase.
1	Hornsea Project One Offshore Wind Farm	Active	16.84	26.56	83.33	
1	Beatrice Offshore Wind Farm	Under Construction in 2019	503.16	490.44	498.32	
1	THV Mermaid Offshore Wind Farm	Authorised: Operation expected 2020	268.65	269.03	301.27	
1	Deutsche Bucht Pilot Offshore Wind Farm	Planned: Operation expected 2020	269.73	289.19	347.44	
1	Hundale Potash Mine Offshore Minerals Lease operated by York Potash	Open: Construction expected 2019-2021	68.09	19.06	30.75	Construction period from 2019 onwards, so not included within baseline assessment, and temporal overlap of operation phase.
1	Triton Knoll Offshore Wind Farm	Under Construction from 2019-2021	56.99	50.20	61.89	
1	Borkum Riffgrund II Offshore Wind Farm	Authorised: Construction expected 2019-2020	322.48	337.29	393.34	
1	East Anglia One Offshore Wind Farm	Under Construction from 2019-2020	201.96	202.40	237.68	
1	Moray East Offshore Wind Farm	Under Construction	489.27	479.28	486.11	
1	Borssele II Offshore Wind Farm	Under Construction from 2019-2020	280.89	281.37	316.55	
1	Viking Link Interconnector	Consented: Construction expected 2020-2023	1.98	4.04	42.23	Construction period after 2019, so not included within baseline assessment, and temporal overlap of operation phase.
1	Dogger Bank A Offshore Wind Farm Export Cables	Consented: Construction expected 2021-2024	28.88	0.00	9.16	
1	Dogger Bank B Offshore Wind Farm Export Cables	Consented: Construction expected 2021-2024	28.88	0.00	9.16	
1	Hornsea Project Two Offshore Wind Farm Export Cables	Consented: Construction from 2020-2021	9.3	13.67	54.14	

Tier	Project/plan	Details/ relevant dates	Distance to Hornsea Four Array	Distance to Hornsea Four ECC	Distance to Hornsea Four HVAC Booster Station Search Area	Reason for inclusion in CEA
1	Hornsea Project Two Offshore Wind Farm	Consented: Construction from 2020-2023	3.46	10.61	67.23	
1	Hornsea Three Offshore Wind Farm	Consented: Construction expected 2024-2031+	46.47	60.28	116.91	
1	Dogger Bank A Offshore Wind Farm	Consented: Construction expected 2021-2024	65.86	83.83	108.33	
1	Dudgeon Offshore Wind Farm	Active	74.89	74.81	102.70	
1	Dogger Bank B Offshore Wind Farm	Consented: Construction expected 2021-2024	76.14	94.43	112.01	
1	Sofia Offshore Wind Farm	Pre-Construction: Construction expected 2023-2026	97.75	114.01	144.05	
1	Dogger Bank C Offshore Wind Farm	Consented: Construction expected 2023-2026	120.86	136.85	171.02	
1	Norfolk Boreas Offshore Wind Farm	Pre-planning Application: Construction expected 2022-2025	134.88	138.68	188.41	
1	Norfolk Vanguard Offshore Wind Farm	Pre-planning Application: Construction expected 2024-2028	134.40	135.41	176.99	
1	East Anglia Three Offshore Wind Farm	Consented: Construction expected 2020-2023	168.48	169.31	212.86	
1	East Anglia One North Offshore Wind Farm	Pre-planning Application: Construction expected 2025-2028	186.20	186.60	220.74	
1	East Anglia Two Offshore Wind Farm	Pre-planning Application: Construction expected 2026-2029	194.20	194.48	225.13	
1	Neart na Gaoithe (NnG) Offshore Wind Farm	Authorised: Construction expected 2020-2022	296.10	272.19	285.06	
1	Inch Cape Offshore Wind Farm	Authorised: Construction expected 2020-2022	311.84	292.35	303.64	
1	Seagreen Alpha Offshore Wind Farm	Authorised: Construction expected 2020-2022	314.53	296.10	305.51	
1	Seagreen Bravo Offshore Wind Farm	Authorised: Construction	301.98	289.15	296.25	

Tier	Project/plan	Details/ relevant dates	Distance to Hornsea Four Array	Distance to Hornsea Four ECC	Distance to Hornsea Four HVAC Booster Station Search Area	Reason for inclusion in CEA
		expected 2020-2022				
1	Moray West Offshore Wind Farm	Planned	492.64	479.44	487.49	
1	Dudgeon Extension	Pre-planning Application: Construction expected from 2024	69.49	69.48	92.80	Construction period expected from 2025, so not included within baseline assessment, and temporal overlap of construction and operation phases.
1	Sheringham Shoal Extension	Pre-planning Application: Construction expected from 2024	83.60	82.32	100.68	
1	Blyth Offshore Wind Farm	Active: Decommissioning expected 2026-2027	189.08	147.34	165.41	Temporal overlap of decommissioning phase with construction phase of Hornsea Four.
1	Johnston WHPS	Operational: decommissioning expected in 2022	0.00	2.83	57.79	Decommissioning period after 2019, so not included within baseline assessment.
1	Johnston template/manifold	Operational: decommissioning expected in 2022	0.00	2.86	51.65	
1	Tolmount Platform	Operational	35.36	1.46	3.98	Construction period after 2019, so not included within baseline assessment.
1	Dana Petroleum Platypus	In planning, operation expected from 2021	17.01	0.00	20.56	Construction period expected during 2020 to 2022, so not included within baseline assessment, and temporal overlap of operation phase.
1	Bridlington A (HU015) disposal site	Operational	72.14	2.69	28.59	Operational since 1980s and intermittent use. Considered part of the existing baseline but has an ongoing impact and is therefore considered relevant.
1	Aln Estuary	MCZ	212.00	174.80	190.95	Designated and therefore management measures
1	Cumbria Coast	MCZ	283.47	213.00	246.53	
1	Swallow Sand	MCZ	143.80	158.35	158.35	

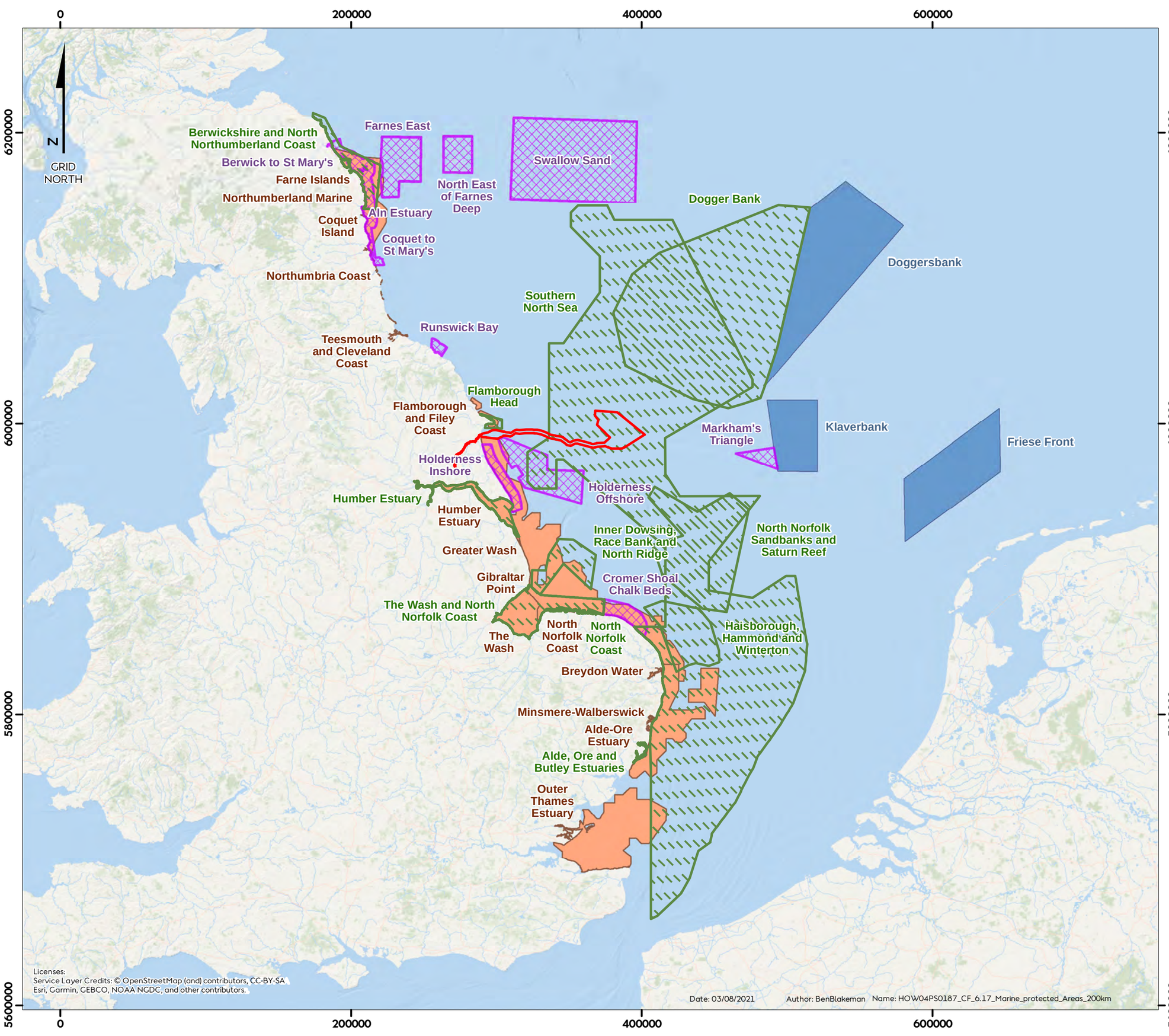
Tier	Project/plan	Details/ relevant dates	Distance to Hornsea Four Array	Distance to Hornsea Four ECC	Distance to Hornsea Four HVAC Booster Station Search Area	Reason for inclusion in CEA
1	Farnes East	MCZ	200.20	173.47	184.90	anticipated for implementation after 2019.
1	North East of Farnes Deep	MCZ	184.40	177.89	181.51	
1	Holderness Inshore	MCZ	70.71	4.90	29.23	
1	Cromer Shoal Chalk Beds	MCZ	105.38	104.49	121.91	
1	Runswick Bay	MCZ	111.40	61.03	80.62	
1	Coquet to St Mary's	MCZ	176.50	134.50	152.34	
1	Fylde	MCZ	267.24	191.79	226.87	
1	West of Walney	MCZ	282.03	208.84	243.41	
1	Markham's Triangle	MCZ	63.85	77.46	134.24	
1	Holderness Offshore	MCZ	29.34	1.28	10.41	
1	Cumbria Coast	MCZ	283.47	213.00	246.53	
1	Ribble Estuary	MCZ	236.91	160.86	195.89	
1	Berwick to St Mary's	MCZ	176.50	134.50	152.34	
1	Wyre-Lune	MCZ	242.74	168.96	203.64	
1	Shell Flat and Lune Deep	SAC	264.09	189.44	224.41	Designated and therefore management measures anticipated for implementation after 2019.
1	Morecambe Bay	SAC	241.15	168.23	202.61	
1	North Norfolk Coast	SAC	113.96	111.91	120.09	
1	Drigg Coast	SAC	279.27	209.01	242.45	
1	Humber Estuary	SAC	79.76	32.21	49.20	
1	Berwickshire and North Northumberland Coast	SAC	204.70	171.08	185.79	
1	The Wash and North Norfolk Coast	SAC	105.38	100.09	104.13	
1	Dee Estuary/ Aber Dyfrdwy	SAC	273.99	197.63	232.04	
1	Dogger Bank	SAC	31.17	49.05	72.99	
1	Haisborough, Hammond and Winterton	SAC	108.62	108.85	138.99	
1	Inner Dowsing, Race Bank and North Ridge	SAC	72.10	64.97	73.26	
1	North Norfolk Sandbanks and Saturn Reef	SAC	33.94	34.80	85.71	
1	Southern North Sea	SAC	0.00	0.00	5.18	
1	Flamborough Head	SAC	63.90	1.45	20.81	
1	Outer Thames Estuary	SPA	151.28	151.41	178.93	Designated and therefore management measures anticipated for implementation after 2019.
1	Liverpool Bay / Bae Lerpwl	SPA	261.75	187.48	222.38	
1	Morecambe Bay and Duddon Estuary	SPA	241.15	168.22	202.60	
1	Northumbria Coast	SPA	156.20	102.64	125.07	
1	The Wash	SPA	117.47	103.31	107.12	
1	Minsmere-Walberswick	SPA	184.91	184.93	207.41	

Tier	Project/plan	Details/ relevant dates	Distance to Hornsea Four Array	Distance to Hornsea Four ECC	Distance to Hornsea Four HVAC Booster Station Search Area	Reason for inclusion in CEA
1	The Dee Estuary	SPA	281.56	205.66	239.33	
1	Breydon Water	SPA	154.71	154.82	180.22	
1	Teesmouth and Cleveland Coast	SPA	138.80	84.46	106.94	
1	Humber Estuary	SPA	78.00	32.21	48.06	
1	Coquet Island	SPA	204.30	167.75	183.76	
1	Farne Islands	SPA	228.20	198.25	211.74	
1	Ribble and Alt Estuaries	SPA	249.92	173.86	208.89	
1	Mersey Narrows and North Wirral Foreshore	SPA	272.44	196.06	230.55	
1	Gibraltar Point	SPA	114.00	100.09	104.09	
1	Mersey Estuary	SPA	259.38	183.43	217.17	
1	North Norfolk Coast	SPA	113.72	110.81	119.84	
1	Northumberland Marine	SPA	187.30	144.20	162.81	
1	Greater Wash	SPA	63.38	0.35	21.80	
1	Flamborough and Filey Coast	SPA	66.80	2.50	23.96	
1	Klaverbank	Natura2000 - SAC/SCI	86.47	102.35	156.25	Designated and therefore management measures anticipated for implementation after 2019.
1	Friese Front	Natura2000 - SPA	180.67	194.15	251.09	
1	Doggersbank	Natura2000 - SAC/SCI	89.15	106.13	156.59	
3	Carbon Capture and Storage project (Endurance)	No planning application has been submitted, early stages of the development with only high-level information available.	0.00	2.15	18.78	Potential temporal overlap of construction and operation phases.
1	Scotland England Green Link 2 (SEGL2)	No planning application has been submitted, early stages of the development with only high-level information available. Construction expected 2025-2030	53.33	0.15	16.12	Potential temporal overlap of construction and operation phases.

Hornsea Four

Figure 6.17

Marine Protected Areas within 200km of Hornsea Four Offshore Wind Farm



- Order Limits
- Marine Conservation Zones
- Special Areas of Conservation
- Special Protection Areas
- Non-UK Sites (Natura2000)

Coordinate system: ETRS 1989 UTM Zone 31N

Scale@A3: 1:2,500,000

0 50 100 Kilometres

0 25 50 Nautical Miles

REV	REMARK	DATE
....	First Issue, for DCO	03/08/2021

Marine Protected Areas
200km
Document no: HOW04PS0187
Created by: FN
Checked by: SM
Approved by: LK

POSEIDON

Ørsted

6.12.1.10 Certain impacts assessed for the project alone are not considered in the cumulative assessment due to:

- The highly localised nature of the impacts (i.e. they occur entirely within the Hornsea Four Order Limits only);
- Management measures in place for Hornsea Four (**Table 6.8**) will also be in place on other projects reducing their risk of occurring; and/or
- Where the potential significance of the impact from Hornsea Four alone has been assessed as neutral.

6.12.1.11 The impacts excluded from the CEA for the above reasons are:

- Increased risk of gear snagging;
- Displacement or disruption of commercially important fish and shellfish resources; and
- Increased vessel traffic within fishing grounds as a result of changes to shipping routes and project related vessel traffic leading to interference with fishing activity.

6.12.1.12 Therefore, the impacts that are considered in the CEA during construction and operation and maintenance are as follows:

- Reduction in access to, or exclusion from established fishing grounds; and
- Displacement leading to gear conflict and increased fishing pressure on established fishing grounds.

6.12.1.13 The cumulative MDS described in **Table 6.17** have been selected as those having the potential to result in the greatest cumulative effect on an identified receptor group. The cumulative impacts presented and assessed in this section have been selected from the details provided in the project description for Hornsea Four (summarised for commercial fisheries in **Table 6.9**) as well as the information available on other projects and plans in order to inform a cumulative 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 to that assessed here, be taken forward in the final design scheme.

Table 6.17: Cumulative MDS for commercial fisheries.

Project Phase	Potential Impact	Maximum Design Scenario	Justification
Construction and Operation	Reduction in access to, or exclusion from established fishing grounds And Displacement leading to gear conflict and increased fishing pressure on established fishing grounds	Maximum design scenario for Hornsea Four plus the cumulative full development of the following projects within the North Sea: **Tier 1:** - Active aggregate extraction (Hundale Potash Mine); - Active aggregate disposal (Bridlington A HU015); - Consented cable and pipeline projects (Viking Link, Dogger Bank A Export Cables, Dogger Bank B Export Cables, Hornsea Project Two Export Cables); - Planned cables and pipelines (Dana Petroleum Platypus); - Active offshore wind farms, with construction or decommissioning activities (Dudgeon, Blyth, Hornsea Project One); - Offshore wind farms under construction (Hornsea Project Two, East Anglia One, Beatrice, Triton Knoll, Moray East); - Consented / planned / authorised wind farm projects (NnG, Inch Cape, Seagreen Alpha, Seagreen Bravo, Moray West, Borssele II, THV Mermaid, Borkum Riffgrund, Deutsche Buch Pilot, Dogger Bank A, Dogger Bank B, Sofia, Dogger Bank C, East Anglia Three, Hornsea Three); and - Submitted wind farm project applications not yet determined (Norfolk Boreas, Norfolk Vanguard, East Anglia One North, East Anglia Two); - Submitted wind farm project PEIR pre-planning applications (Dudgeon Extension, Sheringham Shoal Extension); - Designated MPAs, including 17 UK MCZs, 14 UK SACs, 20 UK SPAs, and three non-UK SCI/SAC/SPAs; - Planned oil and gas infrastructure (Tolmount Platform); and - Planned decommissioning of oil and gas infrastructure (Johnston). **Tier 2:** - No Tier 2 projects identified. **Tier 3:** - Carbon capture and storage project (Endurance); and - Cable and pipelines applications not yet submitted (Scotland England Green Link 2).	Outcome of the CEA will be greatest when the greatest number of other schemes, present or planned, are considered.

6.12.1.14 A description of the significance of cumulative effects upon commercial fisheries arising from each identified impact is given below. The cumulative effects assessment has been based on information available in Environmental Statements and it is noted that the project parameters quoted within Environmental Statements are often refined during the determination period and in the post-consent phase. The assessment presented here is therefore considered to be conservative, with the level of impacts expected to be reduced compared to those considered here.

6.12.2 Construction Phase

Cumulative effect of reduction in access to, or exclusion from established fishing grounds

Tier 1

6.12.2.1 There is potential for cumulative reduction in access to or exclusion from established fishing grounds as a result of construction activities associated with Hornsea Four and other projects (Table 6.16). For the purposes of this ES, this additive impact has been assessed within the North Sea, which is considered to be representative of the fishing grounds exploited by the fleets active across Hornsea Four. The projects identified under Tier 1 are provided in Table 6.16.

6.12.2.2 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 6.18. This ranges from negligible to moderate impacts across different commercial fishing fleets assessed. Where moderate impacts are defined, these either remain unmitigated as residual moderate impacts (e.g. Moray East) or are mitigated through evidence based disruption and cooperation agreements (Hornsea Three, NnG, Dudgeon Extension and Sheringham Shoal Extension).

6.12.2.3 Due to the proximity of Hornsea Project One and Hornsea Project Two, these offshore wind farms have the most potential to result in a cumulative impact for the Holderness Coast 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. It is noted that the Dudgeon Extension and Sheringham Shoal Extension are highly likely to be out with the normal activity range for the Holderness Coast potting fleet.

6.12.2.4 Of particular note, Hornsea Project Two export cable is located 8.5 km from Hornsea Four offshore cable corridor and likely to impact the same potting fleet. However, the impacts are assessed as minor during the construction and operation phases on account of the opportunity for co-existence of potting fisheries within array sites and the localised impacts during construction. There is expected to be five years between the completion of Hornsea Project Two construction and commencement of Hornsea Four construction. This temporal difference in construction programme is expected to limit the scale of cumulative impact on the potting fleet.

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

Table 6.18: Summary of commercial fisheries impact assessment findings for key offshore wind farms included in the cumulative assessment.

Project	Source	Consented Capacity/ scale	Residual Impact assessment results as assessed for individual offshore wind farms	
			Exclusion or reduction in access to fishing grounds	Displacement into alternative grounds.
Hornsea Project One	SMart Wind (2013)	Up to 240 5-8 Megawatt (MW) turbines (DCO)	**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)	**Minor** for all fleets during all phases of the development	**Minor** for all fleets during all phases of the development
East Anglia One	Scottish Power Renewables and Vattenfall (2012)	714 MW (102x7 MW)	**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)	**Negligible** for all fleets	**Negligible** for all fleets
Dudgeon	Warwick Energy (2009)	402 MW and 67 turbines	**Minor** for all fleets during construction and negligible during operations	**Minor** for all fleets during construction and negligible during operations
Dogger Bank A	Forewind (2013a)	Up to 1.2 Gigawatt (GW) (Up to 200 turbines of up to 10 MW capacity)	**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 B	Forewind (2013a)	Up to 1.2 GW (Up to 200 turbines of up to 10 MW turbines)	**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 C	Forewind (2013b)	Up to 1.2 GW	**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.
Sofia	Forewind (2013b)	Up to 1.2 GW	**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)	**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
Beatrice	Beatrice Offshore Wind Farm (2012)	588 MW (84 turbines)	**Minor** for all fleets during all phases	**Minor** for all fleets during all phases

Project	Source	Consented Capacity/ scale	Residual Impact assessment results as assessed for individual offshore wind farms	
			Exclusion or reduction in access to fishing grounds	Displacement into alternative grounds.
NnG	NnG Offshore Wind Farm(2017)	588 MW (54 turbines)	**Minor** to **negligible** for all fleets during construction and operations; except **moderate** (reduced to **minor** with mitigation) for UK potting fleet during construction of wind farm and moderate (reduced to **minor** with mitigation) for UK demersal trawl fleet during construction of offshore cable corridor.	**Minor** for all fleets during all phases, except **moderate** for potting across offshore export cable during construction
Inch Cape	Inch Cape Offshore Limited (2018)	72 turbines	**Moderate** for scallop dredge and creel fisheries during construction and operation; **minor** to negligible for all other fleets.	**Minor/Moderate** for all fleets during construction, and operation.
Seagreen Alpha	SSE (2018)	Up to 70 turbines in each project, with maximum of 120 turbines across both sites.	**Moderate** for scallop dredgers during construction (reduced to **minor** with mitigation), **minor** for all other fleets.	**Moderate** for scallop dredgers (reduced to **minor** with mitigation), **minor** for all other fleets.
Seagreen Bravo	SSE (2018)			
Moray East	Moray Offshore Renewables Limited (2016)	950 MW	**Moderate** for scallop dredgers and squid fishery during construction and operation.	**Moderate** for scallop dredgers and squid fishery during construction and operation.
Hornsea Three	Orsted (2018)	231 turbines	**Minor** to **negligible** for all fleets during construction and operation; except moderate (reduced to **minor** with mitigation) for UK potting fleet during construction of offshore cable corridor.	**Minor** to **negligible** for all fleets during construction and operation.
Norfolk Boreas	Norfolk Boreas Limited (2019)	180 x 10MW turbines	**Minor** to **negligible** for all fleets during construction and operation.	**Minor** to **negligible** for all fleets during construction and operation.
Norfolk Vanguard	Norfolk Vanguard Limited (2019)	200 x 9MW turbines	**Minor** to **negligible** for all fleets during construction and operation.	**Minor** to **negligible** for all fleets during construction and operation.
Dudgeon Extension	Equinor (2021)	32 turbines	**Moderate** for potters during construction (reduced to **minor** with mitigation), **minor** to **negligible** for all other fleets during all phases.	**Moderate** for potters during construction (reduced to **minor** with mitigation), **minor** to **negligible** for all other fleets during all phases.
Sheringham Shoal Extension	Equinor (2021)	24 turbines	**Moderate** for potters during construction (reduced to **minor** with mitigation), **minor** to **negligible** for all other fleets during all phases.	**Moderate** for potters during construction (reduced to **minor** with mitigation), **minor** to **negligible** for all other fleets during all phases.

6.12.2.6 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) East Anglia One, East Anglia Three, Triton Knoll, Dudgeon, Hornsea Project One, Hornsea Project Two, Dogger Bank A, Dogger Bank B, Dogger Bank Teesside A, and Sofia. Based on the available evidence, including VMS data, all other wind farms are expected to have a **low** to **negligible** magnitude of impact for these fleets.

6.12.2.7 Based on available ES' (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) (Co180). As such a **minor** magnitude is assessed for these fleets.

6.12.2.8 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.

6.12.2.9 Bridlington A (HU015) disposal site is located approximately 2.7 km to the north of the offshore ECC, mostly within the boundary of Flamborough Head SAC. This spoil site is used for disposal of maintenance dredgings from Bridlington Harbour and has been in use intermittently since the 1980's. It was found in **Chapter 1: Marine Geology, Oceanography and Physical Processes** that during the offshore ECC construction, the sediment plume resulting from nearshore trenching activity across the ebb channel could extend to Bridlington A in spring tides only. Conditions are highly dispersive for muds and silts in this Bridlington A location, with fast flows and therefore no expectation for material to settle.

6.12.2.10 The cumulative impact is considered to be **minor** due to the short-term impact of material that will quickly disperse and the intermittent use of Bridlington A disposal site leading to low likelihood of simultaneous occurrence. This is consistent with assessments undertaken for cumulative impacts within **Chapter 1: Marine Geology, Oceanography and Physical Processes** which found the impact to be negligible and **Chapter 3: Fish and Shellfish Ecology** which found the impact of increased suspended sediment concentration to be minor.

6.12.2.11 The Platypus development is located in the north west corner of ICES rectangle 36F1, south of Hornsea Four Order Limits and the proposed pipeline is located across the north east corner of ICES rectangle 36F0. The Platypus Development ES (Dana Petroleum 2018) confirms that "no permanent safety exclusion zone will be in place along the pipeline and, as such, once the installation and support vessels have moved out of the area, there will be no statutory restrictions on fishing in the vicinity". Sea users will be excluded from an area of 0.79 km^2 around the Platypus drill centre during drilling, and then from a 0.79 km^2 area around the new Platypus manifold throughout the life of the development (Dana Petroleum 2018).

6.12.2.12 Overall, the Platypus Development ES considers the consequence on other sea users to be negligible, and residual risk to be minor. The cumulative impact is considered to be **minor** due to the relatively small area of localised exclusion and expectation that fishing will resume across the Platypus pipeline.

6.12.2.13 Overall, the magnitude of impact of pipelines, aggregate dredging and disposal activities is considered to be **minor** to all fishing fleets based on the expected time-frame for pipeline decommissioning activities and the limited spatial overlap of dredging activities.

6.12.2.14 As presented in **Figure 6.17**, a network of MCZs, SACs and SPAs are included within the Tier 1 CEA assessment. Of specific note based on the activity of the commercial fishing fleets under assessment are:

- Holderness Inshore MCZ (309 km^2) protected for a range of subtidal habitats and moderate-high energy circalittoral rock;
- Holderness Offshore MCZ (1,176 km^2) protected for a range of subtidal habitats, Glacial Tunnel valleys and ocean quahog *Arctica islandica*.
- Greater Wash SPA (3,536 km^2) protected for breeding and non-breeding seabirds;
- Flamborough and Filey Coast SPA (79 km^2) protected for breeding seabirds;
- Flamborough Head SAC (64 km^2) protected for reefs and sea caves;
- Southern North Sea SAC (36,951 km^2) protected for harbour porpoise;
- Dogger Bank SAC (12,331 km^2) protected for sandbanks;
- Markham's Triangle MCZ (200 km^2) protected for a range of subtidal habitats;
- North Norfolk Sandbanks and Saturn Reef SAC (3,603 km^2) protected for sandbanks and reefs; and
- Inner Dowsing, Race Bank and North Ridge SAC (845 km^2) protected for sandbanks and reefs.

6.12.2.15 Management in MPAs can take several different forms, including introducing voluntary measures, use of the existing planning and licensing framework, specific byelaws and orders.

6.12.2.16 The NE IFCA has implemented two Byelaws specific to the Flamborough Head SAC including the Flamborough Head No Take Zone and the Flamborough Head Fishing Byelaw, which includes a permit scheme and a no trawl zone.

6.12.2.17 At present, it is not known whether additional management measures for any gear interaction with the other aforementioned SACs, SPAs or MCZs have been implemented. At the time of writing, the MMO are consulting on a prohibition of bottom contact gears within the entirety of the Dogger Bank SAC. Given that the MCZs and SACs cover a range of habitat features and 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 in relation to MCZ and SAC sites protected for habitat features. Management measures for mobile gear in sites protected for mobile species, such as birds (SPA) or harbour porpoise (SAC) are considered less likely based on the limited risk these gears present to the feature species; this is applicable to all mobile gears, except those targeting key prey items of the protected species (e.g. sandeel).

6.12.2.18 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.

6.12.2.19 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**.

6.12.2.20 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 Four 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**.

6.12.2.21 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**.

6.12.2.22 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**.

6.12.2.23 The maximum sensitivity of receptors in the area is **medium** and the magnitude has been assessed as **moderate** for mobile demersal trawling fleets and **minor** for all other fleets. Therefore, the significance of effect from the reduced access, or exclusion from established grounds from the installation of Hornsea Four cumulatively with the Tier 1 projects is **moderate adverse** for mobile demersal trawling fleets, which is significant in EIA terms, and **slight adverse** for all other fleets, which is not significant in EIA terms. The limited activity of demersal trawling fleets across Hornsea Four resulted in slight adverse effects to these metiers for Hornsea Four in isolation; the inclusion of MPAs into the cumulative assessment has led to this moderate adverse assessment for demersal trawling fleets. The effect of the MPAs is unmitigable by the project and this impact would remain significant without the *de minimis* cumulative contribution from Hornsea Four.

Tier 2

6.12.2.24 No Tier 2 projects have been identified.

Tier 3

6.12.2.25 Endurance is a carbon capture and storage project proposed for an area adjacent to and overlapping the north west corner of Hornsea Four array area. Two subsea pipelines are proposed to transport compressed CO^2 from the coast to be injected into the Endurance reservoir through a series of wells. One of these pipelines crosses the Hornsea Four offshore ECC.

6.12.2.26 At the time of the application, the impact to commercial fisheries has not been assessed by the Endurance project. Given the location of the southern subsea cable and reservoir, it is expected that there will be a level of disruption and exclusion to commercial fisheries during construction and operation of the Endurance project, specifically the Holderness potting fleet. Given the close proximity of the southern subsea pipeline and Endurance reservoir to Hornsea

Four, together with the likelihood of simultaneous construction phases, the magnitude of the impact is considered to be **moderate** for the UK potting fleet.

6.12.2.27 At the time of the application the impact to commercial fisheries has not been assessed by the Scotland England Green Link 2 (SEGL2) Cable. Survey works have commenced, and a planning application is expected to be submitted in 2022, with potential construction commencing in 2025. The cable crosses and partially overlaps the temporary works area within the Hornsea Four offshore ECC in the nearshore area. Given the close proximity, together with the likelihood of simultaneous construction phases, the magnitude of the impact is considered to be **moderate** for the UK potting fleet.

6.12.2.28 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**.

6.12.2.29 For the Endurance project and SEGL2, the magnitude of impact for UK demersal trawlers, pelagic trawlers and all other mobile fleets is considered to be **minor**, on account of the operational range and fishing intensity of these fleets. All mobile 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**.

6.12.2.30 The maximum sensitivity of receptors in the area is **medium** and the magnitude has been assessed as **moderate** for potting fleets and **minor** for all other fleets. Therefore, the significance of effect from the reduced access, or exclusion from established grounds from the installation of Hornsea Four cumulatively with the Tier 3 projects is **moderate adverse** for the potting fleet, which is significant in EIA terms, and **slight adverse** for all other fleets, which is not significant in EIA terms.

6.12.2.31 The activity of the UK potting fleet across Hornsea Four resulted in moderate adverse effects during construction of Hornsea Four in isolation, which, with further mitigation, is reduced to slight adverse**.** The inclusion of these Tier 3 projects into the cumulative assessment has led to a **moderate adverse** cumulative effect for UK potting. This takes account of high uncertainty related to the impact to commercial fisheries and Tier 3 projects, which have not yet been assessed by the Endurance or SEGL2 projects. The Applicant is committed to ongoing communication and discussion with the Endurance and SEGL2 project developers. The Applicant will seek to collaborate with these projects in order to develop a consistent approach in fisheries liaison, coexistence and mitigation.

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

Tier 1

6.12.2.32 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 for mobile demersal gear and therefore potential for displacement affecting the static potting fleet is expected. As such the magnitude of impact of displacement is assessed as **moderate** for the UK potting fleet and **minor** for all other fleets and fisheries.

6.12.2.33 The sensitivity of the receptors is consistent with the assessment of reduced access to fishing grounds and is therefore **medium** for demersal trawling fleets and potting fleets and **low** for pelagic and all other commercial fishing fleets.

6.12.2.34 The maximum sensitivity of receptors in the area is **medium** and the magnitude has been assessed as **moderate** for potting fleets and **minor** for all other fleets. Therefore, the significance of effect from the displacement of commercial fisheries leading to gear conflict and increase pressure from the installation of Hornsea Four cumulatively with the Tier 1 projects is **moderate adverse** for the UK potting fleet, which is significant in EIA terms, and **slight adverse** for all other fleets, which is not significant in EIA terms.

6.12.2.35 The inclusion of MPAs into the cumulative assessment led to the moderate adverse assessment for reduced access for demersal trawling fleets, which has influenced the moderate adverse assessment for displacement of the UK potting fleet. The effect of the MPAs in reduced access and subsequent displacement is unmitigable by the project and this impact would remain significant without the *de minimis* cumulative contribution from Hornsea Four.

Tier 2

6.12.2.36 No Tier 2 projects have been identified.

Tier 3

6.12.2.37 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 for UK potting gear and therefore potential for displacement. Cumulatively, this adds additional potential for displacement from these Tier 3 projects (Endurance and SEGL2), in addition to displacement from Hornsea Four project during construction. While the displacement from Hornsea Four in isolation is considered to have a minor magnitude, the cumulative effect of overlapping construction periods of all three projects is expected to further affect the level of displacement on the static potting fleet to a level of **moderate** magnitude. Cumulative displacement is considered to be **minor** for all other mobile fleets and fisheries.

6.12.2.38 The sensitivity of the receptors is consistent with the assessment of reduced access to fishing grounds and is therefore **medium** for UK potting fleets and **low** for all other commercial fishing fleets.

6.12.2.39 The maximum sensitivity of receptors in the area is **medium** and the magnitude has been assessed as **moderate** for potting fleets and **minor** for all other fleets . Therefore, the significance of effect from the displacement of commercial fisheries leading to gear conflict and increase pressure from the installation of Hornsea Four cumulatively with the Tier 3 projects is **moderate adverse** for the UK potting fleet, which is significant in EIA terms, and **slight adverse** for all other fleets, which is not significant in EIA terms.

6.12.2.40 As per the Tier 1 justification, the inclusion of MPAs into the cumulative assessment led to the moderate adverse assessment for reduced access for demersal trawling fleets, which has influenced the moderate adverse assessment for displacement of the UK potting fleet. The effect of the MPAs in reduced access and subsequent displacement is unmitigable by the project and this impact would remain significant without the *de minimis* cumulative contribution from Hornsea Four.

6.12.3 Operation and Maintenance Phase

Cumulative effect of reduction in access to, or exclusion from established fishing grounds.

Tier 1

6.12.3.1 The cumulative effect during operation and maintenance of Tier 1 projects on reduction in access to or exclusion from fishing grounds is expected to be lower than that presented during construction, see **paragraphs 6.12.2.1** to **6.12.2.23.** As such a **minor** magnitude is assessed for all fleets, due to:

- Effects of reduced access are lower during the operation and maintenance phase, as many fishing practices can resume access across the offshore ECC, array area and other constructed offshore wind farms (to an extent limited by physical presence of infrastructure); and
- Management measures for MPAs will have been established and adjusted to during the construction phase.

6.12.3.2 The sensitivity of receptors is considered to be consistent with that assessed during construction, see **paragraph 6.12.2.24** *et seq.* and is **medium** for all demersal trawlers and UK potters, and **low** for pelagic trawlers and all other fleets.

6.12.3.3 The maximum sensitivity of receptors in the area is **medium** and the magnitude has been assessed as **minor**. Therefore, the significance of effect from the reduced access, or exclusion from established grounds from the operation of Hornsea Four cumulatively with the Tier 1 projects is **moderate adverse** for mobile demersal trawling fleets, which is significant in EIA terms, and **slight adverse** for all other fleets, which is not significant in EIA terms. The limited activity of demersal trawling fleets across Hornsea Four resulted in slight adverse effects to these metiers for Hornsea Four in isolation; the inclusion of MPAs into the cumulative assessment has led to this moderate adverse assessment for demersal trawling fleets. The effect of the MPAs is unmitigable by the project and this impact would remain significant without the *de minimis* cumulative contribution from Hornsea Four.

Tier 2

6.12.3.4 No Tier 2 projects have been identified.

Tier 3

6.12.3.5 It is assumed that during the operation and maintenance phase, fishing will be able to resume across the Endurance project, including subsea pipelines, and within the reservoir, except for areas of infrastructure. It is assumed that during the operation and maintenance phase, fishing will be able to resume across the SEGL2.

6.12.3.6 The Tier 3 assessment is not considered to raise the cumulative effect beyond that assessed for the Tier 1 assessment for all fishing fleets.

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

Tier 1

6.12.3.7 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 **minor** magnitude of impact for reduced access to fishing grounds and therefore no significant displacement effect is expected. As such the magnitude of impact of displacement is assessed as **minor** for all other fleets and fisheries.

6.12.3.8 The sensitivity of the receptors is consistent with the assessment of reduced access to fishing grounds and is therefore **medium** for demersal trawling fleets and potting fleets and **low** for pelagic and all other commercial fishing fleets.

6.12.3.9 The maximum sensitivity of receptors in the area is **medium** and the magnitude has been assessed as **minor**. Therefore, the significance of effect on displacement leading to gear conflict and increase fishing pressure from the operation of Hornsea Four cumulatively with the Tier 1 projects is **slight adverse**, which is not significant in EIA terms.

Tier 2

6.12.3.10 No Tier 2 projects have been identified.

Tier 3

6.12.3.11 It is assumed that during the operation and maintenance phase, fishing will be able to resume across the Endurance project, including subsea pipelines, and within the reservoir, except for areas of infrastructure. The magnitude of displacement is therefore expected to be **minor** for all fleets. It is assumed that during the operation and maintenance phase, fishing will be able to resume across the SEGL2.

6.12.3.12 The Tier 3 assessment is not considered to raise the cumulative effect beyond that assessed for the Tier 1 assessment for all fishing fleets.

6.13 Transboundary Effects

6.13.1.1 Transboundary effects are defined as those effects upon the receiving environment of other European Economic Area (EEA) states, whether occurring from Hornsea Four alone, or cumulatively with other projects in the wider area. A transboundary screening exercise was undertaken at Scoping (Annex L of the Scoping Report (Orsted 2018)), which identified that there was the potential for transboundary effects to occur in relation to commercial fisheries. The potential transboundary impacts screened into the assessment for commercial fisheries were:

- Effects on commercial fishing fleets as a result of impacts from Hornsea Four on commercial fish stocks in the waters of other EEA States; and
- Effects on commercial fishing fleets from all EEA countries as a result of constraints on foreign commercial fishing activities operating in Hornsea Four, including demersal trawling, beam trawling, demersal seining and other gears. These effects may include reduction in access to fishing grounds and potential displacement of fishing effort from

Hornsea Four to alternative fishing grounds in other EEA States, which will have direct implications to that fishing ground.

6.13.1.2 Effects on biological resources could occur over a range of 10s of kilometres from Hornsea Four and could therefore interact with the following EEA states: the Netherlands. Based on the neutral to slight significance of disruption to commercial species during all phases of the project, it is expected that the impact on stocks in the Dutch EEZ will be **slight**. Therefore, the potential transboundary impact of effects on commercial fish stocks in the waters of other EEA States on commercial fisheries is concluded to be **not significant** in EIA terms.

6.13.1.3 Effects on commercial fishing fleets could occur over a range of 100s of kilometres from Hornsea Four (i.e. affecting fleets from other states that operate in the vicinity of Hornsea Four) and could therefore interact with the following EEA states: the Netherlands, Germany, Belgium, Denmark, Norway, France, and Ireland. Effects on these foreign commercial fishing fleets from EEA states, in terms of reduction in access to fishing grounds and displacement into alternative grounds including other EEZs, have therefore been intrinsically considered throughout the commercial fisheries EIA process and are consistent to those presented in the impact assessment (Section 6.11) and CEA (Section 6.12).

6.14 Inter-Related Effects

6.14.1.1 Inter-related effects consider impacts from the construction, operation or decommissioning of Hornsea Four on the same receptor (or group). The potential inter-related effects that could arise in relation to commercial fisheries are presented in Table 6.19. Such inter-related effects include both:

- Project lifetime effects: i.e. those arising throughout more than one phase of the project (construction, operation, and decommissioning) to interact to potentially create a more significant effect on a receptor than if just one phase were assessed in isolation; and
- Receptor led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor (or group). Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

6.14.1.2 A description of the process to identify and assess these effects is presented in Section 5.8 of Volume A1 Chapter 5: EIA Methodology.

6.14.1.3

Table 6.19: Inter-related effects assessment for commercial fisheries.

Project phase(s)	Nature of inter-related effect	Assessment alone	Inter-related effects assessment
Project-lifetime effects			
Construction, operation and, decommissioning	Reduction in access to, or exclusion from, potential and/or established fishing grounds within the Hornsea Four array area	**Neutral** to **moderate adverse** during construction and decommissioning phases and **neutral** to **slight adverse** during O&M phase.	During construction and decommissioning phases of project, safety zones, and therefore the areas from which commercial fishing will be excluded, will be highly localised. While there will be a small incremental increase in the area in which fishing may be disrupted as the project is built out, as fishing activity is likely to be able to continue elsewhere during the operational and maintenance phase, effects on commercial fisheries across the phases are not anticipated to interact in such a way as to result in combined

Project phase(s)	Nature of inter-related effect	Assessment alone	Inter-related effects assessment
			effects of greater significance than the assessments presented for each individual phase.
Construction, operation and, decommissioning	Reduction in access to, or exclusion from, potential and/or established fishing grounds within the Hornsea Four offshore ECC	**Slight** to **moderate adverse** during construction and decommissioning phases and **neutral** to **slight adverse** during O&M phase.	During all phases of the project, safety zones, and therefore the areas from which commercial fishing will be excluded, will be highly localised. During construction, for example, fishing will be excluded from temporary 500 m roaming safety zones around cable installation activities. During operation, there will be no formal exclusion of fishing activity except for within temporary 500 m roaming safety zones implemented during major maintenance activities. In addition, disruption to UK potters along the offshore ECC during construction will reduce during the operational and maintenance phase. Therefore, although there will be a small incremental increase in the area in which fishing may be disrupted as the project is built out, as fishing activity is likely to be able to continue, effects on commercial fisheries across the phases are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.
Construction, operation and, decommissioning	Displacement from Hornsea Four leading to gear conflict and increased fishing pressure on adjacent grounds	**Slight** to **moderate adverse** during construction and decommissioning phases and **neutral** to **slight adverse** during O&M phase.	Fishing may be disrupted, and partial exclusion may occur during the construction and decommissioning phases of Hornsea Four. However it is anticipated that fishing will resume where productive grounds can be targeted, with the exception of safety zones around infrastructure undergoing major maintenance and advisory safe distances around vessels undertaking major maintenance activities. Also, alternate fishing grounds will be available for the fleets that operate across the Hornsea Four array and offshore ECC. Therefore, effects on commercial fisheries are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.
Construction, operation and, decommissioning	Displacement or disruption of commercially important fish and shellfish resources	**Neutral** to **slight adverse** during all phases.	Project lifetime inter-related effects are unlikely as the majority of disturbance (resulting in highest SSC/deposition) will be during the construction and decommissioning phases with minimal disturbance likely during the operation and maintenance phase. Impacts to prey species (i.e. fish and shellfish) will be at their maximum during the construction phase as a result of effects associated with underwater noise from piling, increased suspended sediments and habitat loss. Across the project lifetime, the effects on

Project phase(s)	Nature of inter-related effect	Assessment alone	Inter-related effects assessment
			commercial fisheries are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.
Construction, operation and, decommissioning	Increased vessel traffic within fishing grounds as a result of changes to shipping routes and construction vessel traffic leading to interference with fishing activity	**Neutral** to **slight adverse** during all phases.	With the successful implementation of measures adopted for this development (i.e. issue of Notices to Mariners (NTMs), preparation of a fisheries co-existence and liaison plan, close liaison with the local vessels), no significant effects are predicted for the construction, operation and maintenance, and decommissioning phases of the project. The majority of vessel traffic (resulting in interference with fishing) is predicted to peak during construction and decommissioning with reduced potential for interference during the operation and maintenance phase. Therefore, across the project lifetime, the effects on commercial fisheries are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.
Operation	Gear snagging and obstruction due to seabed objects within the Hornsea Four array area	**Neutral** to **slight adverse**	This effect will only arise during the operation and maintenance phase and as such there will be no inter-related effects across the project phases.
Operation and decommissioning	Gear snagging and obstruction due to seabed within the offshore ECC	**Neutral** to **slight adverse** during all phases.	Impacts due to gear snagging will occur during the operation phase due to the presence of cable protection on the seabed and the presence of the export cable. During decommissioning this infrastructure will be removed although cable and scour protection may be left in situ following decommissioning. However, across the project lifetime, the effects on commercial fisheries are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.

Receptor-led effects

Project phase(s)	Nature of inter-related effect	Assessment alone	Inter-related effects assessment
Inter-related effect from the combination of the reduction in access to fishing grounds and the subsequent increased pressure on adjacent grounds.		During the construction and decommissioning phases, both effects will be temporary and short lived, with access to fishing grounds being prevented where construction and decommissioning activity is taking place. During operation the effects will be different depending on the receptors affected. Mobile fishing fleets may access specific grounds within the array area or move to other fishing areas in the North Sea, which could put them into conflict with static gear (i.e. potting) fleets operating closer to shore and along the offshore ECC. As a result, the static fleets will be subjected to potential increases in pressure on their grounds. While the two effects may act together, it is considered that appropriately mitigated loss of access, will limit the impact of displacement and that therefore, overall, any inter-related effect will not be of any greater significance than those already assessed in isolation (i.e. **neutral** to **moderate adverse** significance).	

6.15 Conclusion and Summary

6.15.1.1 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 commercial fisheries study area it is understood that vessels registered to other countries do not operate across the Hornsea Four array area, the offshore ECC and the wider former Hornsea Zone.

6.15.1.2 The key fleets operating across the Hornsea Four include (in no particular order):

- UK potters targeting lobster, brown crab, and whelk;
- UK demersal otter trawlers targeting *Nephrops* and mixed demersal species;
- French demersal trawlers targeting whiting;
- UK, Belgian, and Dutch beam trawlers targeting sole, plaice, *Nephrops* and mixed demersal species;
- Dutch, German, Danish, French, and Swedish pelagic trawlers, targeting herring that consistently move/shoal throughout the wider southern North Sea; and
- Danish, Swedish and Norwegian demersal trawlers targeting sandeel throughout the North Sea with occasional effort within the array area.

6.15.1.3 Table 6.20 presents a summary of the impacts assessed within this ES, any mitigation, and the residual effects.

6.15.1.4 A summary of the cumulative and transboundary effects assessed for commercial fisheries is provided in **Chapter 12: Cumulative and Transboundary Effects Summary.**

Table 6.20: Summary of potential impacts assessed for commercial fisheries.

Impact and Phase	Receptor and value/sensitivity	Magnitude and significance	Mitigation	Residual impact
Construction				
Hornsea Four array area construction activities and physical presence of constructed wind farm infrastructure leading to reduction in access to, or exclusion from established fishing grounds (CF-C-1).	Potting fisheries Medium	Moderate Moderate adverse	With respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance (2014 and 2015), will be followed.	Slight adverse
	Dredge fishery Low	Negligible Neutral	None proposed beyond existing Commitments	Neutral
	Pelagic fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Demersal trawl and seine fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Hornsea Four offshore ECC construction activities leading to reduction in access to, or exclusion from established fishing grounds (CF-C-2).	Potting fisheries Medium	Moderate Moderate adverse	With respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance (2014 and 2015), will be followed.	Slight adverse
	Dredge fishery Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Pelagic fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Demersal trawl and seine fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Displacement from Hornsea Four array area leading to gear conflict and increased fishing pressure on adjacent grounds (CF-C-3).	Potting fisheries Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Dredge fishery Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Pelagic fisheries Low	Negligible Neutral	None proposed beyond existing Commitments	Neutral
	Demersal trawl and seine fisheries	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse

Impact and Phase	Receptor and value/sensitivity	Magnitude and significance	Mitigation	Residual impact
	Low			
Displacement from the Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CF-C-4).	Potting fisheries Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Dredge fishery Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Pelagic fisheries Low	Negligible Neutral	None proposed beyond existing Commitments	Neutral
	Demersal trawl/seine fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Hornsea Four array area and offshore ECC construction activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-C-5).	Potting fisheries Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Dredge fishery Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Pelagic fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Demersal trawl and seine fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and transiting construction vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC leading to interference with fishing activity (CF-C-7).	Potting fisheries Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Dredge fishery Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Pelagic fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Demersal trawl and seine fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Operation				
Physical presence of Hornsea Four array area infrastructure	Potting fisheries Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse

Impact and Phase	Receptor and value/sensitivity	Magnitude and significance	Mitigation	Residual impact
and maintenance leading to reduction in access to, or exclusion from established fishing grounds (CF-O-8).	Dredge fishery Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Pelagic fisheries Low	Negligible Neutral	None proposed beyond existing Commitments	Neutral
	Demersal trawl and seine fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Physical presence of offshore export cable and infrastructure and maintenance within the Hornsea Four offshore ECC leading to reduction in access to, or exclusion from established fishing grounds (CF-0-9).	Potting fisheries Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Dredge fishery Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Pelagic fisheries Low	Negligible Neutral	None proposed beyond existing Commitments	Neutral
	Demersal trawl and seine fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Displacement from Hornsea Four array area and Hornsea Four offshore ECC leading to gear conflict and increased fishing pressure on adjacent grounds (CF-O-10).	Potting fisheries Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Dredge fishery Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Pelagic fisheries Low	Negligible Neutral	None proposed beyond existing Commitments	Neutral
	Demersal trawl and seine fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Physical presence of Hornsea Four array area leading to gear snagging (CF-O-11).	Potting fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Dredge fishery Medium	Negligible Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Pelagic fisheries Low	Negligible Neutral	None proposed beyond existing Commitments	Neutral

Impact and Phase	Receptor and value/sensitivity	Magnitude and significance	Mitigation	Residual impact
	Demersal trawl and seine fisheries Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Physical presence of the export cable and associated infrastructure leading to gear snagging (CF-O-12).	Potting fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Dredge fishery Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Pelagic fisheries Low	Negligible Neutral	None proposed beyond existing Commitments	Neutral
	Demersal trawl and seine fisheries Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Hornsea Four operation and maintenance activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-O-13).	Potting fisheries Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Dredge fishery Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Pelagic fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Demersal trawl and seine fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic from Hornsea Four array area and Hornsea Four offshore ECC infrastructure leading to interference with fishing activity (CF-O-15).	Potting fisheries Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Dredge fishery Low	Minor Neutral	None proposed beyond existing Commitments	Neutral
	Pelagic fisheries Low	Minor Neutral	None proposed beyond existing Commitments	Neutral
	Demersal trawl and seine fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Decommissioning				

Impact and Phase	Receptor and value/sensitivity	Magnitude and significance	Mitigation	Residual impact
Hornsea Four array area decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds (CF-D-16).	Potting fisheries Medium	Moderate Moderate adverse	None proposed beyond existing Commitments	Slight adverse
	Dredge fishery Low	Negligible Neutral	None proposed beyond existing Commitments	Neutral
	Pelagic fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Demersal trawl and seine fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Hornsea Four offshore ECC decommissioning activities leading to reduction in access to, or exclusion from, potential and/or established fishing grounds (CF-D-17).	Potting fisheries Medium	Moderate Moderate adverse	With respect to any justifiable disturbance payment, the procedures as outlined in the FLOWW guidance (2014 and 2015), will be followed.	Slight adverse
	Dredge fishery Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Pelagic fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Demersal trawl and seine fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Displacement from Hornsea Four array area leading to gear conflict and increased fishing pressure on adjacent grounds (CF-D-18).	Potting fisheries Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Dredge fishery Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Pelagic fisheries Low	Negligible Neutral	None proposed beyond existing Commitments	Neutral
	Demersal trawl and seine fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Displacement from the Hornsea Four offshore ECC leading to gear conflict and increased	Potting fisheries Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Dredge fishery	Minor	None proposed beyond existing Commitments	Slight adverse

Impact and Phase	Receptor and value/sensitivity	Magnitude and significance	Mitigation	Residual impact
fishing pressure on adjacent grounds (CF-D-19).	Low	Slight adverse		
	Pelagic fisheries Low	Negligible Neutral	None proposed beyond existing Commitments	Neutral
	Demersal trawl and seine fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Physical presence of any infrastructure left in situ leading to gear snagging (CF-D-20).	Potting fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Dredge fishery Medium	Negligible Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Pelagic fisheries Low	Negligible Neutral	None proposed beyond existing Commitments	Neutral
	Demersal trawl and seine fisheries Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Decommissioning activities leading to displacement or disruption of commercially important fish and shellfish resources (CF-D-21).	Potting fisheries Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Dredge fishery Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Pelagic fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Demersal trawl and seine fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
Increased vessel traffic within fishing grounds as a result of changes to shipping routes and transiting decommissioning vessel traffic from Hornsea Four array area and Hornsea Four	Potting fisheries Medium	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse
	Dredge fishery Low	Minor Neutral	None proposed beyond existing Commitments	Neutral
	Pelagic fisheries Low	Minor Neutral	None proposed beyond existing Commitments	Neutral

Impact and Phase	Receptor and value/sensitivity	Magnitude and significance	Mitigation	Residual impact
offshore ECC leading to interference with fishing activity (CF-D-23).	Demersal trawl and seine fisheries Low	Minor Slight adverse	None proposed beyond existing Commitments	Slight adverse

6.16 References

Beatrice Offshore Windfarm Limited (2012). Environmental Statement Beatrice Offshore Wind Farm: Commercial Fisheries Chapter.

BERR (Department for Business, Enterprise, and Regulatory Reform) (2008) Fisheries Liaison with Offshore Wind and Wet Renewables Group (FLOWW) Recommendations For Fisheries Liaison: Best Practice guidance for offshore renewable developers.

Blyth-Skyrme, R.E. (2010a) Options and opportunities for marine fisheries mitigation associated with wind farms. Final report for Collaborative Offshore Wind Research Into the Environment contract FISHMITIG09. COWRIE Ltd, London.

Blyth-Skyrme, R.E. (2010b) Options and opportunities for marine fisheries mitigation associated with windfarms: Summary report for COWRIE contract FISHMITIG09. COWRIE Ltd, c/o Nature Bureau, Newbury, UK. 8pp.

Dana Petroleum (2018) Platypus Development Environmental Statement https://www.dana-petroleum.com/files/pdfs/public-notices/Platypus-Development-Environmental-Statement.pdf

Defra (2014) East Inshore and East Offshore Marine Plans.

Eaton D.R., Brown J., Addison J.T., Milligan S.P. and Fernand L.J. (2003) Edible crab (*Cancer pagurus*) larvae surveys off the east coast of England: Implications for stock structure. Fisheries research (65), 191-199.

European Union Data Collection Framework (EU DCF) (2019). Data by quarter-rectangle: Tables and maps of effort and landings by ICES statistical rectangles.

European Union Market Observatory for Fisheries and Aquaculture products (EUMOFA) (2019). Yearly comparison between member states.

Fisheries Liaison with Offshore Wind and Wet Renewables group FLOWW (2015) FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds (FLOWW 2015).

FLOWW (2014) FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison. January 2014.

FOREWIND (2013a) Dogger Bank Creyke Beck A & B, Environmental Statement.

FOREWIND (2013b) Dogger Bank Teesside A & B, Environmental Statement.

Gray, M., Stromberg, P-L., Rodmell, D. 2016. 'Changes to fishing practices around the UK as a result of the development of offshore windfarms – Phase 1 (Revised).' The Crown Estate, 121 pages. ISBN: 978-1-906410-64-3

HM Government (2011) UK Marine Policy Statement. HM Government Northern Ireland Executive Scottish Government Welsh Assembly Government. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69322/pb3654-marine-policy-statement-110316.pdf

KIS-ORCA 2019. Safety of fishermen - reducing risks whilst fishing. http://www.kis-orca.eu/safety/reducing-risks-whilst-fishing#.XRdPSy2ZOjq.

Marine Management Organisation (MMO) (2019) IFISH database with landing statistics data for UK registered vessels for 2013 to 2017 with attributes for: landing year; landing month; vessel length category; country code; ICES rectangle; vessel/gear type; species; live weight (tonnes); and value; and landing year; landing month; vessel length category; country code; vessel/gear type; port of landing; species; live weight (tonnes); and value.

NnG Offshore Wind Limited (2017). Environmental Statement NnG Offshore Wind Farm: Commercial Fisheries Chapter.

Roach, M., Cohen, M., Forster, R., Revill, A. S., and Johnson, M. The effects of temporary exclusion of activity due to wind farm construction on a lobster (*Homarus gammarus*) fishery suggests a potential management approach. ICES Journal of Marine Science, doi:10.1093/icesjms/fsy006.

RWE npower renewables (2003) Triton Knoll Offshore Wind Farm Ltd Environmental Statement ES Volume 3 (Annex I) Commercial Fisheries.

Scottish Power Renewables and Vattenfall (2012) East Anglia ONE Offshore Windfarm Environmental Statement Volume 2 Offshore Chapter 13 – Commercial Fisheries. Prepared by Environmental Resource Management (ERM).

Scottish Power Renewables and Vattenfall (2015) East Anglia THREE Chapter 14 Commercial Fisheries Environmental Statement Volume 1 Document Reference – 6.1.14. Report prepared by Brown and May Limited.

SMart Wind (2013) Hornsea Offshore Wind Farm Project One – Environmental Statement Volume 2 Chapter 7 – Commercial Fisheries.

SMart Wind (2015) Hornsea Offshore Wind Farm Project Two – Environmental Statement Volume 2 Chapter 6 – Commercial Fisheries.

Technical University of Denmark National Institute of Aquatic Resources (DTU Aqua) (2011) Maps of key sandeel fishing grounds detailing locations of fishing grounds that have been targeted by Danish registered vessels.

The Crown Estate (2012) UK Fisheries Information Project (UKFIM) beam trawl mapping across Hornsea Zone.

UKFEN (2013) Best Practice Guidance for Fishing Industry Financial and Economic Impact Assessments.

Warwick Energy (2009) Dudgeon Offshore Wind Farm Environmental Statement Non-Technical Summary June 2009. Report prepared by Royal Haskoning.