Hornsea
Project Three
Offshore Wind
Farm

# Hornsea Project Three Offshore Wind Farm

## Environmental Impact Assessment: Scoping Report

Hornsea 3
Offshore Wind Farm

DONG energy

**Date:** October 2016

## Hornsea Project Three Offshore Wind Farm

# Environmental Impact Assessment
# Scoping Report

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This report has been prepared by RPS Group Plc (RPS), with all reasonable skill, care and diligence within the terms of their contracts with DONG Energy Wind Power A/S.

This report is also downloadable from the Hornsea Three offshore wind farm website at: www.dongenergy.co.uk/hornsea-project-three-development or a paper copy can be requested by writing to: contact@hornsea-project-three.co.uk. Paper copies will be charged based on printing, binding and postage copies at the time of request.



Front cover picture: Kite surfer near one of DONG Energy's UK offshore wind farms © DONG Energy Hornsea Project Three (UK) Ltd., 2016.

# Executive Summary

## Overview

This document supports Hornsea Three's request for a Scoping Opinion from the Planning Inspectorate (PINS) for the development of the Hornsea Project Three (hereafter referred to as Hornsea Three) offshore wind farm and associated infrastructure.

Hornsea Three will have a total capacity of up to 2,400 MW and will include all associated offshore (including up to 400 wind turbine generators) and onshore infrastructure. The Hornsea Three offshore export cable route (ECR) corridor search area extends from the Norfolk coast, offshore in a northeasterly direction to the western and southern boundary of the Hornsea Three array area. The offshore ECR corridor is approximately 120 km in length. From the North Norfolk coast, onshore cables will connect the offshore wind farm to the onshore HVAC substation/HVDC converter substation, which will in turn, connect to an existing National Grid substation. Hornsea Three will connect to the Norwich Main National Grid substation, located to the south of Norwich. The onshore ECR corridor search area is 55 km in length, at its fullest extent.

Hornsea Three comprises of an offshore generating station with a capacity of greater than 100 MW and therefore is a Nationally Significant Infrastructure Project (NSIP), as defined by Section 15(3) of the Planning Act 2008 (the 2008 Act). As such, there is a requirement to submit an application for Development Consent to PINS. The application for Development Consent will comprise full details of the development proposal and will be accompanied by an Environmental Statement (which will outline the full Environmental Impact Assessment (EIA)) prepared in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (the 'EIA Regulations') as amended.

This Scoping Report is intended to support engagement with PINS and relevant consultees in the EIA process, inviting them to provide relevant information and to comment on the proposed approach to the EIA, to ensure that a robust Environmental Statement is prepared and ultimately inform the development of Hornsea Three. In that regard, the main elements of the offshore and onshore, human, biological and physical environment likely to be significantly affected by the construction, operation and decommissioning of the proposed Hornsea Three have been identified. This document also outlines the extent of relevant environmental studies to be undertaken as part of the EIA.

A number of environmental impacts are considered within this Scoping Report. The identification of impacts within this Scoping Report has been based upon an understanding of the environmental conditions likely to be encountered within Hornsea Three, utilising information that has been gained within the former Hornsea Zone, the EIA for Hornsea Project One, the EIA for Hornsea Project Two and other publically available desktop data sources. For several identified potential impacts, further data collection and assessment will be required in order to determine the significance of the effect. These impacts have been scoped into the assessment. For other potential impacts it is proposed, based on an understanding of the nature of the development (including measures adopted as part of the project), that they be scoped out of the EIA (i.e. no further data collection or assessment is proposed).

The site selection for all elements of Hornsea Three infrastructure is ongoing; therefore exact locations of the offshore, landfall and onshore infrastructure are yet to be determined. Extensive consultation with relevant consultees (local authorities, statutory bodies, local community and interest groups) is required before an application for a Development Consent is submitted to PINS, and will help to inform the development of Hornsea Three.

## How to Get Involved

Consultees are invited to consider all of the information provided in this Scoping Report and to advise on whether they agree with the conclusions. Several broad questions are presented to encourage reflection of the key elements discussed in this Scoping Report:

- Are there any additional baseline data sources available that could be used to inform the EIA?
- Have all potential impacts resulting from Hornsea Three been identified for each the EIA topics within this Scoping Report?
- In light of the significant and relevant existing data and knowledge established through surveys and assessments undertaken for Hornsea Project One and Hornsea Project Two, as well as publically available desktop data sources, does the reader agree that the intended evidence-based approach is appropriate for the Hornsea Three EIA?
- Does the reader agree with the impacts to be scoped in, and out, of the assessment (including from Hornsea Three alone, cumulatively with other projects and on other European Economic Area interests (i.e. transboundary impacts))?
- For those impacts scoped in, does the reader agree that the methods described are sufficient to inform a robust impact assessment?

In parallel to the Scoping Report, Hornsea Three will hold a number of public community consultation events, at various locations in and around the onshore ECR corridor search area. Anyone who could potentially be affected by, or may have an active interest in Hornsea Three is encouraged to attend. The first series of these are to be held from 31 October to 9 November 2016, and their timings and locations are further detailed in the Statement of Community Consultation (SoCC) which was issued on 30 September 2016. Copies of the SoCC can be found on the project website via www.dongenergy.co.uk/hornseaproject3 under the 'Public Consultation' tab.

## Next Steps

Following receipt of the Scoping Opinion from PINS, a Preliminary Environmental Information Report (PEIR) will be produced and consulted on during the summer of 2017. The PEIR will provide an initial statement of the environmental information available for the Hornsea Three study area, including descriptions of the likely environmental effects and measures adopted as part of the Hornsea Three development (including enhancement, mitigation and monitoring commitments). The initial PEIR is intended to allow those taking part in the consultation to understand the nature, scale, location and likely significant environmental effects of Hornsea Three, such that they can make an informed contribution to the process of pre-application consultation under the Planning Act 2008 and to the EIA process. In parallel to the EIA process, the Habitats Regulation Assessment (HRA), including the HRA Screening Report and subsequent HRA, will be consulted upon as part of the pre-application consultation.

DONG Energy will further refine the Hornsea Three Project Description based upon the consultation responses received from the Preliminary Environmental Information (PEI) and HRA process. The final results of the EIA will be presented in an Environmental Statement and a summary of all the consultation responses received will be presented in a Consultation Report, both of which will accompany the Development Consent Order (DCO) application to be submitted in 2018.

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# Abbreviations and Glossary

## Glossary

| | |
|---|---|
| Bathymetry | The measurement of water depth in oceans, seas and lakes. |
| Cable Specification and Installation Plan | A document detailing the technical specification of the offshore electrical system, including a cable burial risk assessment, cable protection specification and installation risk mitigation measures. |
| Code of Construction Practice (CoCP) | A document detailing the overarching principles of construction, contractor protocols, construction-related environmental management measures, pollution prevention measures, the selection of appropriate construction techniques and monitoring processes' |
| Construction Traffic Management Plan | A document detailing the construction traffic routes for HGV and personnel travel, protocols for delivery of Abnormal Indivisible Loads to site, measures for road cleaning and sustainable site travel measures. |
| Cumulative effects | The combined effect of the assessed project in combination with the effects from a number of different projects, on the same single receptor/resource. |
| Cumulative impact | Impacts that result from changes caused by other past, present or reasonably foreseeable actions together with the project. |
| Decommissioning Plan | A document confirming the geographic scope/spatial extent of decommissioning activities, process for seeking approval for decommissioning, and standards/objectives for the decommissioning process. |
| Decommissioning Programme | In conjunction with the Decommissioning Plan, includes the proposed programme of decommissioning works, to include reporting intervals, and ongoing monitoring. |
| Design Envelope | A description of the range of possible elements which make up the project design options under consideration, as set out in detail in the project description. This envelope is used to define the project 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) | A legal order granting development consent for one or more nationally significant infrastructure projects. |
| DONG Energy Hornsea Project Three (UK) Ltd | The company promoting the development of Hornsea Three offshore wind farm. DONG Energy Hornsea Project Three (UK) Ltd is owned by DONG Energy Power (UK) Limited, who is owned by DONG Energy Vind A/S, who is owned by DONG Energy VE A/S, who is owned by DONG Energy Wind Power A/S, who is owned by DONG Energy Wind Power Holding A/S, and who is owned by DONG Energy A/S. |
| Ecological Management Plan | A document detailing the ecological surveys to be undertaken prior to and during construction, and during the operational phase of the project, where required. To include relevant survey and land/landscape reinstatement procedures and habitat mitigation/enhancement. |
| Effect | Term used to express the consequence of an impact. The significance of 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. |
| Emergency Response and Cooperation Plan (ERCoP) | A document detailing the emergency co-operation plans for the construction, operation and decommissioning phases. |
| Environmental Impact Assessment (EIA) | A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. Involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive, including the publication of an Environmental Statement. |
| 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 conservation site | A Special Area of Conservation (SAC) or candidate SAC, a Special Protection Area (SPA) or potential SPA, a site listed as a site of community importance or a Ramsar site. |
| Export cable route (ECR) corridor | The specific corridor of seabed (seaward of Mean High Water Springs (MHWS)) and land (landward of MHWS) from the Hornsea Three array area to the Norwich Main National Grid substation, within which the export cables will be located. The final ECR corridor will be located within the ECR corridor search area and will be defined via a site selection process considering technical, physical and environmental constraints. |
| Export cable route (ECR) corridor search area | The broad offshore corridor of seabed (seaward of MHWS) and land (landward of MHWS) from the Hornsea Three array area to the Norwich Main National Grid substation considered within this Scoping Report, within which the refined ECR corridor will be located. |
| Flood Risk Assessment (FRA) | An evaluation of the baseline onshore flood risk and effect as a result of Hornsea Three. The FRA will set out flood risk mitigation measures, as may be required. |
| Former Hornsea Zone | The Hornsea Zone was one of nine offshore wind generation zones around the UK coast identified by The Crown Estate (TCE) during its third round of offshore wind licensing. In March 2016, the Hornsea Zone Development Agreement was terminated and project specific agreements, Agreement for Leases (AfLs), were agreed with TCE for Hornsea Project One, Hornsea Project Two, Hornsea Project Three and Hornsea Project Four. The Hornsea Zone has therefore been dissolved and is referred to throughout the Hornsea Project Three Scoping Report as the former Hornsea Zone. |
| Habitats Regulations Assessment (HRA) | A process which helps determine likely significant effects and (where appropriate) assesses adverse impacts on the integrity of European conservation sites and Ramsar sites. The process consists of up to four stages: screening, appropriate assessment, assessment of alternative solutions and assessment of imperative reasons of over-riding public interest (IROPI). |
| 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 One | The first offshore wind farm project within the former Hornsea Zone. It has a maximum capacity of 1.2 gigawatts (GW) or 1,200 MW and includes all necessary offshore and onshore infrastructure required to connect to the existing National Grid substation located at North Killingholme, North Lincolnshire. |
| Hornsea Project Three | The third offshore wind farm project within the former Hornsea Zone. It has a maximum capacity of 2.4 GW (2,400 MW) and includes offshore and onshore infrastructure to connect to the existing National Grid substation located at Norwich Main, Norfolk. |
| Hornsea Project Two | The second offshore wind farm project within the former Hornsea Zone. It has a maximum capacity of 1.8 GW (1,800 MW) and includes offshore and onshore infrastructure to connect to the existing National Grid substation located at North Killingholme, North Lincolnshire. |
| Impact | Change that is caused by an action; for example, land clearing (action) during construction which results in habitat loss (impact). |
| Inter-related effects | Multiple effects on the same receptor arising from Hornsea Three. These occur either where a series of the same effect acts on a receptor over time to produce a potential additive effect or where a number of separate effects, such as noise and habitat loss, affect a single receptor, for example marine mammals. |
| Landfall Area | The area between MHWS and MLWS in which all of the export cables will be landed and is the transitional area between the offshore export cabling and the onshore export cabling. |
| Landscape Management Plan | A document detailing the proposed onshore landscape planting and landscape enhancement measures, with commitments for the ongoing maintenance of that planting through the operational phase of the project. |
| Magnitude | A combination of the extent, duration, frequency and reversibility of an impact. |

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| Marine Mammal Mitigation Protocol (MMMP) | A document detailing the protocol to be implemented in the event that driven or part-driven pile foundations are proposed to be used. The protocol identifies the methods for detection, potential mitigation and monitoring/reporting protocols for marine mammals. |
| Marine Pollution Contingency Plan (MPCP) | A document addressing the risks, methods and procedures to deal with spills and collusion incidents during the construction, and operation and maintenance phase. |
| Mean High Water Spring (MHWS) | The height of mean high water during spring tides in a year. |
| Mean Low Water Spring (MLWS) | The height of mean low water during spring tides in a year. |
| Measures adopted as part of the project | Enhancement, mitigation or monitoring commitment (which may include process or design measures) intended to avoid, reduce and where possible, remedy significant adverse impacts of a development. |
| National Policy Statement (NPS) | A document setting out national policy against which proposals for major infrastructure projects will be assessed and decided upon. |
| Nationally Significant Infrastructure Project (NSIP) | Large scale development including power generating stations which requires development consent under the Planning Act 2008. An offshore wind farm project with a capacity of more than 100 MW constitutes an NSIP. |
| Offshore Habitats Regulations | The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended) which applies to marine habitats extending beyond 12 nautical miles (NM). |
| Planning Inspectorate (PINS) | The executive agency of the Department for Communities and Local Government responsible for operating the planning process for NSIPs. |
| Project Description | A summary of the engineering design elements of Hornsea Three. |
| Project Environmental Management and Monitoring Plan (PEMMP) | In conjunction with the MPCP, this plan provides environmental risk analysis covering waste management, offshore maintenance plans, details of Archaeological Exclusion Zones (AEZ), seasonal and working restrictions, and protocol for the appointment of Fisheries and Environmental Liaison Officers. |
| Scour Protection Management Plan | A document detailing the need, type, sources, quantity, location and installation methods for scour protection and cable armouring. |
| Sensitivity | The extent to which a study subject can accept a change, of a particular type and scale, without unacceptable adverse effects. |
| Significance | The significance of an effect combines the evaluation of the magnitude of an impact and the sensitivity of the receptor. |
| Surface Water Management Plan | A document which identifies the surface water management/drainage strategy for the onshore HVAC booster station and HVAC/HVDC substation sites. |
| Suspended sediments | Particulates in suspension in the water column, often comprising fine material such as clays and silts. |
| Transboundary | Crossing into other European Economic Association (EEA) States. |
| Waste Management Plan | A plan setting out a framework for the management and mitigation of waste arisings from the Hornsea Three construction works, and protocols for the recording of waste arisings, waste minimisation measures and protocols that will be further developed and implemented by the construction teams. |

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| Written Scheme of Investigation (WSI) | A plan detailing the protocol for any archaeological investigation to be carried out prior to the construction of Hornsea Three, including procedures for field survey and watching briefs, as may be required. |
| Zone Appraisal and Planning (ZAP) | A framework intended to rationalise and balance the commercial aim of maximising development capacity aspirations with the practicalities of deliverability. |
| Zone Characterisation (ZoC) | A broad description of the physical, biological, socio-economic and cultural heritage characteristics of the former Hornsea Zone, at a resolution sufficient to support zonal layout and subsequent project identification. This does not take the form of a tangible output, but reflects the increase in understanding of the former Hornsea Zone over time. |

## Acronyms and Terms

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|---|---|
| AC | Alternating Current |
| ADR | Air Defence Radar |
| AfL | Agreement for Lease |
| AIS | Automatic identification System |
| ALC | Agricultural Land Classification |
| AONB | Area of Outstanding Natural Beauty |
| AQMA | Air Quality Management Area |
| ATC | Air Traffic Control |
| BAP | Biodiversity Action Plan |
| BEIS | Department of Business, Energy and Industrial Strategy |
| BERR | Department for Business, Enterprise and Regulatory Reform |
| BGS | British Geological Survey |
| BHCT | Broad Historic Character Types |
| BMAPA | British Marine Aggregate Producers Association |
| BTO | British Trust for Ornithology |
| CAA | Civil Aviation Authority |
| CCS | Carbon Capture and Storage |
| CEA | Cumulative Effect Assessment |
| CEH | Centre for Ecology and Hydrology |
| Cefas | Centre for Environment, Fisheries and Aquaculture Science |
| CoCP | Code of Construction Practice |
| COWRIE | Collaborative Offshore Wind Research into the Environment |
| CPA | Coast Protection Act |
| cSAC | Candidate Special Area of Conservation |
| CWS | County Wildlife Sites |

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| DC | Direct Current |
| DCO | Development Consent Order |
| DDV | Drop Down Video |
| DECC | Department of Energy and Climate Change |
| Defra | Department for Environment and Rural Affairs |
| DIO | Defence Infrastructure Organisation |
| DMRB | Design Manual for Roads and Bridges |
| DTLR | Department for Transport, Local Government and the Regions |
| ECR | Export Cable Route |
| EcIA | Ecological impact assessment |
| EEA | European Economic Area |
| EEZ | Exclusive Economic Zone |
| EIA | Environmental Impact Assessment |
| EMF | Electromagnetic fields |
| ERCoP | Emergency Response and Cooperation Plan |
| ESCA | European Subsea Cables UK Association |
| EU | European Union |
| EUNIS | European Nature Information System |
| FEPA | Food and Environment Protection Act |
| FL | Flight Level |
| FSA | Formal Safety Assessment |
| GBP | Great British Pound |
| GIS | Geographic Information Systems |
| HAT | Highest Astronomical Tide |
| HDD | Horizontal Directional Drilling |
| HDV | Heavy Duty Vehicle |
| HMR | Helicopter Main Routes |
| HRA | Habitat Regulations Assessment |
| HSC | Historic Seascape Character |
| HV | High Voltage |
| HVAC | High Voltage Alternating Current |
| HVDC | High Voltage Direct Current |
| IAQM | Institute of Air Quality Management |
| ICES | International Council of the Exploration of the Sea |

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| ICPC | International Cable Protection Committee |
| IFCA | Eastern Inshore Fisheries Conservation Authority |
| ILS | Instrument Landing Systems |
| IMO | International Maritime Organisation |
| JNCC | Joint Nature Conservation Committee |
| LAT | Lowest Astronomical Tide |
| LCA | Landscape Character Areas |
| LEP | Local Enterprise Partnership |
| LNR | Local Nature Reserve |
| LVIA | Landscape and Visual Impact Assessment |
| MCA | Maritime and Coastguard Agency |
| MCAA | Marine and Coastal Access Act |
| MCZ | Marine Conservation Zone |
| MGN | Marine Guidance Note |
| MHWS | Mean High Water Springs |
| MMO | Marine Management Organisation |
| MoD | Ministry of Defence |
| MV | Medium Voltage |
| NCA | National Character Areas |
| NM | Nautical Mile |
| NNR | National Nature Reserves |
| NO | Nitric Oxide |
| $NO_x$ | Nitrogen Oxides |
| $NO_2$ | Nitrogen Dioxide |
| NPS | National Policy Statement |
| NRA | Navigational Risk Assessment |
| NRHE | National Record of the Historic Environment |
| NSCA | National Seascape Character Areas |
| NSIP | Nationally Significant Infrastructure Project |
| OGA | Oil and Gas Authority |
| ONS | Office for National Statistics |
| OREI | Offshore Renewable Energy Installations |
| OS | Ordnance Survey |
| OSPAR | Oslo Paris Convention |

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| PEI | Preliminary Environmental Information |
| PEIR | Preliminary Environmental Information Report |
| PEMMP | Project Environmental Monitoring and Management Programme |
| PINS | Planning Inspectorate |
| PRoW | Public Rights of Way |
| PSA | Particle Size Analysis |
| pSAC | possible Special Area of Conservation |
| pSPA | potential Special Protection Area |
| PSR | Primary Surveillance Radar |
| RAG | Red, Amber, Green |
| REC | Regional Environmental Characterisation |
| REWS | Radar Early Warning Systems |
| rMCZ | Recommended Marine Conservation Zone (MCZ) |
| RYA | Royal Yachting Association |
| SAC | Special Area of Conservation |
| SAR | Search and Rescue |
| SCANS | Small Cetacean Abundance in the North Sea |
| SCI | Site of Community Importance |
| SCOS | Special Committee on Seals |
| SCUBA | Self-contained underwater breathing apparatus |
| SEA | Strategic Environmental Assessment |
| SMRU | Sea Mammal Research Unit |
| SNCB | Statutory Nature Conservation Body |
| SoCC | Statement of Community Consultation |
| SPA | Special Protection Area |
| SPZ | Source Protection Zones |
| SSSI | Sites of Special Scientific Interest |
| TCE | The Crown Estate |
| THLS | Trinity House Lighthouse Service |
| TJB | Transition Joint Bays |
| TP | Transition piece |
| UCG | Underground Coal Gasification |
| UK | United Kingdom |
| UKHO | United Kingdom Hydrographic Office |

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| UXO | Unexploded Ordnance |
| VER | Valued Ecological Receptors |
| VMS | Vessel Monitoring System |
| VOR | Valued Ornithological Receptors |
| WeBS | Wetland Bird Survey |
| WFD | Water Framework Directive |
| WMP | Waste Management Plan |
| WWT | Wildfowl and Wetlands Trust |
| ZAP | Zone Appraisal and Planning |
| ZoC | Zone Characterisation |
| ZTV | Zone of Theoretical Visibility |

# 1. Introduction

## 1.1 Background

1.1.1 DONG Energy Power (UK) Ltd. (hereafter referred to as DONG Energy), on behalf of DONG Energy Hornsea Project Three (UK) Ltd., is promoting the development of the Hornsea Project Three offshore wind farm (hereafter referred to as Hornsea Three). Hornsea Three is a proposed offshore wind farm located in the southern North Sea, with a total generating capacity of up to 2,400 MW.

1.1.2 The Hornsea Three array area (i.e. the area in which the offshore wind turbine generators (hereafter referred to as turbines) are located) is approximately 696 $km^2$, and is located approximately 120 km northeast of the Norfolk coast and 160 km east of the Yorkshire coast (Figure 1.1). The Hornsea Three array area lies to the east of Hornsea Project One (hereafter referred to as Project One) and Hornsea Project Two (hereafter referred to as Project Two) offshore wind farms, and is located within the former Hornsea Zone (as shown on Figure 1.1).

1.1.3 Hornsea Three comprises of an offshore generating station with a capacity of greater than 100 MW and therefore is a Nationally Significant Infrastructure Project (NSIP), as defined by Section 15(3) of the Planning Act 2008 (the 2008 Act). As such, there is a requirement to submit an application for Development Consent to the Planning Inspectorate (PINS).

1.1.4 The application for Development Consent will comprise full details of the development proposal and will be accompanied by an Environmental Statement prepared in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (the 'EIA Regulations') as amended.

1.1.5 This document represents the Hornsea Three Environmental Impact Assessment (EIA) Scoping Report (hereafter referred to as the Scoping Report) and has been prepared in support of a request for a Scoping Opinion from PINS in accordance with Regulation 8 of the EIA Regulations. To comply with Regulation 8, this Scoping Report provides:

- Plans sufficient to identify the area required for the construction, operation and decommissioning of Hornsea Three;
- A brief description of the nature and purpose of the proposed development and of its possible effects on the environment; and
- Other information on the characteristics of the proposed development and the environmental features likely to be affected by the proposed development, sufficient to define those potential characteristics, impacts and features to be considered further in the EIA and those which need not be considered further.

1.1.6 The Environmental Statement, which will outline the full EIA for Hornsea Three, will be informed by stakeholder responses to this Scoping Report. The Environmental Statement, which will accompany the application for Development Consent, will be submitted to PINS in Quarter 2 of 2018.

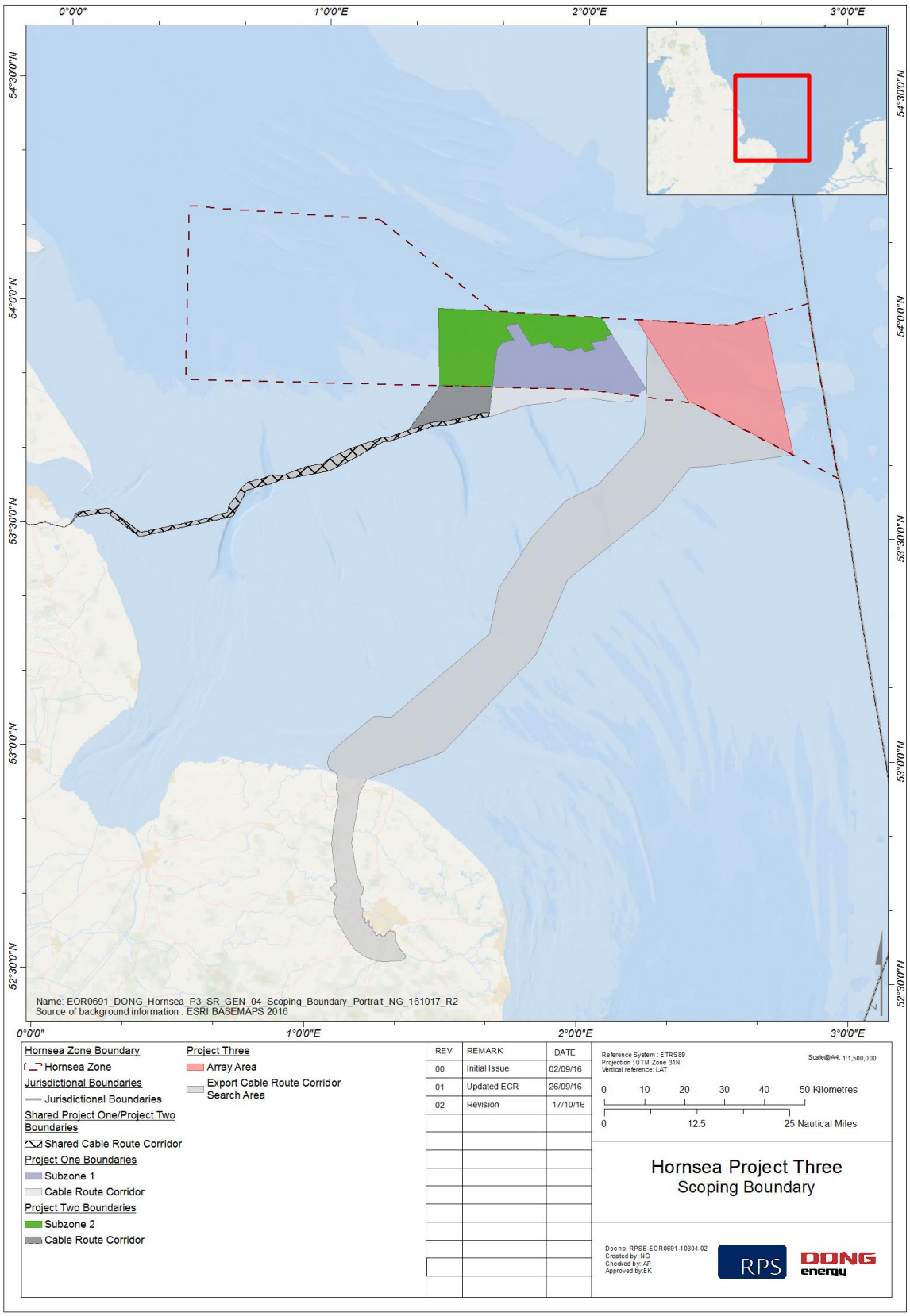



Figure 1.1 Location of the proposed Hornsea Three offshore wind farm and ECR corridor search area within the former Hornsea Zone.

## 1.2 DONG Energy and the Hornsea Three team

### DONG Energy A/S

1.2.1 DONG Energy A/S (owner of DONG Energy Hornsea Project Three (UK) Ltd) specialises in procuring, producing, distributing and trading energy and related products in Northern Europe. DONG Energy A/S is the world leader in the construction and operation of offshore wind farms and has pioneered the offshore wind farm industry through involvement in more than 50% of the current operating offshore wind farms worldwide.

1.2.2 DONG Energy A/S is involved in the consenting, construction and operation of a number of Round 1, Round 2, Round 2.5 and Round 3 offshore wind projects in the United Kingdom (UK), specifically:

- Barrow – operational (90 MW);
- Burbo Bank – operational (90 MW);
- Burbo Bank Extension – in construction (258 MW);
- Gunfleet Sands I, II and III (Demonstration) – operational (totalling 173 MW);
- Project One – in construction (1,200 MW);
- Project Two – consent granted in August 2016 (1,800 MW);
- Isle of Man – pre-application (approximately 700 MW);
- London Array – operational (630 MW);
- Race Bank – in construction (580 MW);
- Walney I and II – operational (367 MW);
- Walney Extension – in construction (660 MW);
- West of Duddon Sands – operational (389 MW); and
- Westermost Rough – operational (210 MW).

### The Hornsea Three team

1.2.3 RPS has been instructed by DONG Energy Wind Power A/S to undertake the EIA for Hornsea Three. This includes the initial review of the key environmental issues associated with the construction, operation and decommissioning of Hornsea Three as part of the Hornsea Three Scoping Report.

1.2.4 Pinsents Masons LLP has been instructed by DONG Energy to provide legal advice throughout the Development Consent application process.

## 1.3 Project overview

### Hornsea Zone

1.3.1 The Hornsea Zone was one of nine offshore wind generation zones around the UK coast identified by The Crown Estate (TCE) during its third round of offshore wind licensing. The Hornsea Zone was located in the southern North Sea, approximately 31 km east of the Yorkshire coast and 1 km from the median line between UK and Dutch waters (Figure 1.1).

1.3.2 As part of a competitive tender, SMart Wind Ltd. (a 50/50 joint venture between International Mainstream Renewable Power (Offshore) Limited and Siemens Project Ventures GmbH; hereafter referred to as SMart Wind) was awarded the rights to the development of the former Hornsea Zone by TCE in 2009. The subsequent development agreement between SMart Wind and TCE established a target capacity of 4,000 MW of generating capacity within the former Hornsea Zone, which was to be met through the development of several offshore wind farms.

1.3.3 DONG Energy Wind Power A/S acquired the development rights to Project One in February 2015 and, in August 2015, DONG Energy Power (UK) Ltd. acquired SMart Wind Ltd and the Hornsea Zone, together with the development rights for Project Two, Hornsea Three and Hornsea Project Four offshore wind farm (hereafter referred to as Hornsea Four). Subsequently in March 2016, the Hornsea Zone Development Agreement was terminated and project specific agreements, Agreement for Leases (AfLs), were agreed with TCE for Project One, Project Two, Hornsea Three and Hornsea Four. The Hornsea Zone has therefore been dissolved and is referred to throughout the Hornsea Three Scoping Report as the former Hornsea Zone.

1.3.4 The first project to be proposed within the former Hornsea Zone was Project One. Project One comprises up to three offshore wind farms with a maximum generating capacity of 1,200 MW. The Secretary of State granted development consent for Project One on 10 December 2014. The second project to be proposed within the former Hornsea Zone was Project Two. Project Two comprises up to two offshore wind farms with a maximum generating capacity of 1,800 MW. The Secretary of State granted development consent for Project Two on 16 August 2016.

1.3.5 The Hornsea Three array area is similar, both in terms of its nature and location, to the Project One and Project Two array areas. As such, where matters have been discussed and agreed during consultation on Project One and Project Two, and are applicable to the Hornsea Three EIA, they have been considered in the Hornsea Three Scoping Report.

### Hornsea Three

#### *Introduction*

1.3.6 Hornsea Three will have a total capacity of up to 2,400 MW (see paragraph 3.7.35) and will include all associated offshore (including up to 400 turbines) and onshore infrastructure. The Hornsea Three offshore Export Cable Route (ECR) corridor search area extends from the Norfolk coast, offshore in a northeasterly direction to the western and southern boundary of the Hornsea Three array area (Figure 1.1). The Hornsea Three offshore ECR corridor is approximately 120 km in length.

1.3.7 From the Norfolk coast, onshore cables will connect the offshore wind farm to an onshore High Voltage Alternating Current (HVAC) substation/High Voltage Direct Current (HVDC) converter substation, which will in turn, connect to an existing National Grid substation. Hornsea Three will connect to the Norwich Main National Grid substation, located to the south of Norwich. The onshore ECR corridor search area is approximately 55 km in length, at its fullest extent.

1.3.8 The Hornsea Three search area, including both onshore and offshore components, was selected following both engineering and environmental considerations. Further details regarding the site selection of Hornsea Three is provided in Chapter 4: Site Selection Methodology and Consideration of Alternatives.

### *Key project components*

1.3.9 Key project components of Hornsea Three include:

- Turbines;
- Turbine foundations;
- Array cables;
- Offshore substation(s), station(s) and platform(s);
- Offshore accommodation platform/s;
- Offshore export cable/s;
- Onshore cabling; and
- Onshore substation and onshore HVAC booster stations.

1.3.10 The electricity generated from Hornsea Three will be transmitted via buried High Voltage (HV) cables using either Direct Current (DC) or Alternating Current (AC), or a combination of the two. As a consequence, depending on the option selected prior to construction, Hornsea Three will have slightly different key components in addition to those listed above. Figure 1.2 shows a schematic drawing of the key components associated with the HVDC and HVAC electrical transmission options. Further details of the Hornsea Three design are provided in Chapter 3: Project Description.

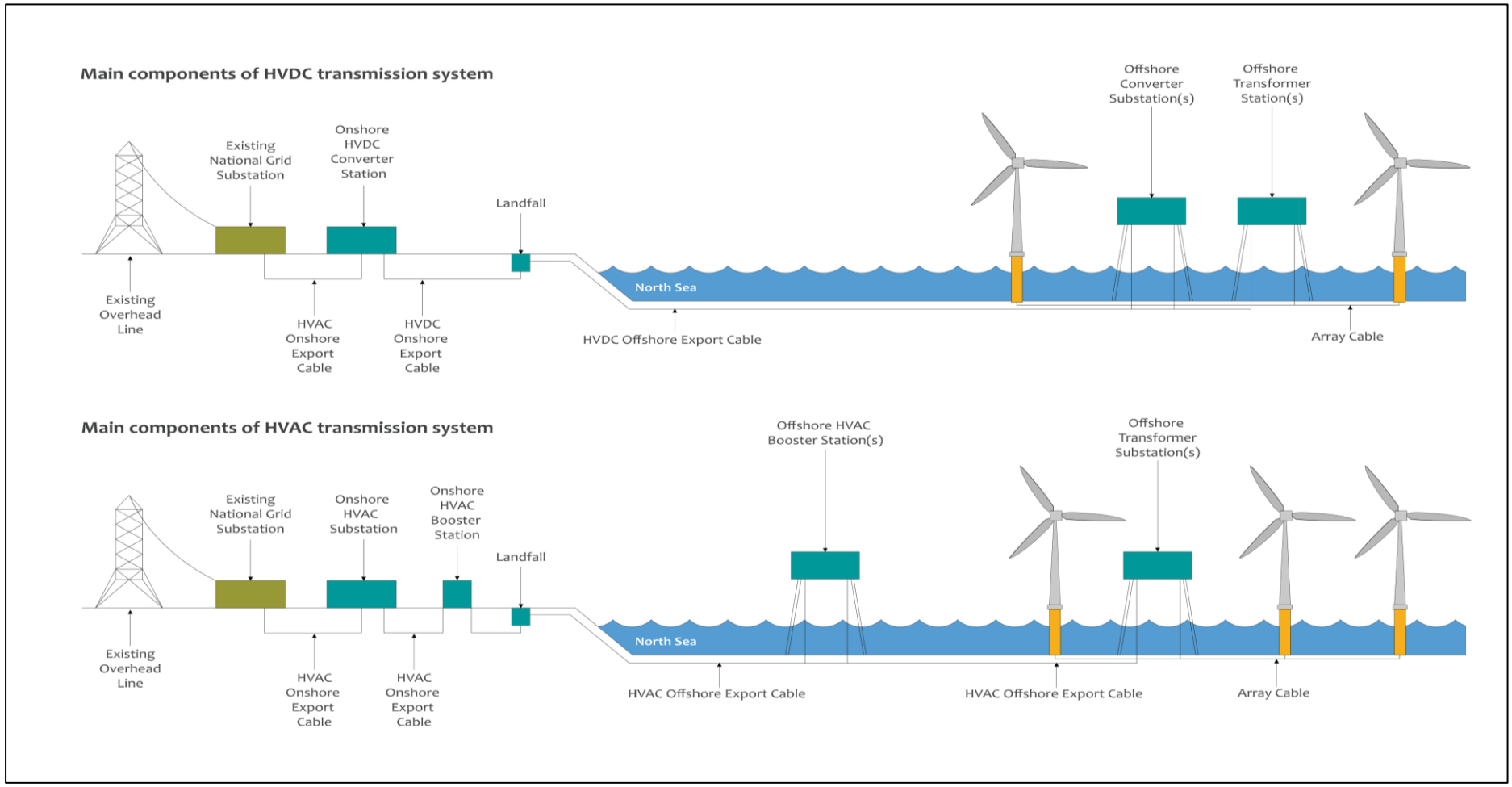



Figure 1.2 Main components of High Voltage Direct Current (HVDC) and High Voltage Alternating Current (HVAC) transmission options for Hornsea Three.

## 1.4 Purpose of the Scoping Report

1.4.1 The purpose of the Scoping Report is to engage with PINS and statutory consultees in the EIA process, inviting them to provide relevant information and to comment on the proposed approach to the EIA, to ensure that a robust EIA is undertaken. The Scoping Report therefore identifies:

i. The main aspects of the offshore and onshore, human, biological and physical environment likely to be significantly affected by the construction, operation and decommissioning of the proposed Hornsea Three; and

ii. The extent of relevant environmental studies to be undertaken as part of an EIA to be submitted alongside the application for Development Consent.

1.4.2 The identification and subsequent assessment of potentially significant impacts will be based upon an understanding of the environmental conditions likely to be encountered within Hornsea Three, utilising information that has been gained within the former Hornsea Zone, the EIA for Project One, the EIA for Project Two and other publically available desktop data sources.

1.4.3 A number of environmental impacts are considered in this Scoping Report. These include impacts which may not have a likely significant effect in EIA terms or effect-receptor pathways identified, and which will therefore be proposed to be scoped out of the EIA. Only once evidence is sufficiently advanced to be confident that there are no likely significant environmental effects will these topics finally be scoped out, in agreement with key stakeholders.

## 1.5 Offshore and onshore aspects of the Scoping Report

1.5.1 This Scoping Report and the subsequent Environmental Statement contain separate chapters for the offshore and onshore aspects of the EIA. For the purposes of the EIA, including this Scoping Report, 'offshore' generally refers to the receptors on the seaward side of Mean High Water Springs (MHWS) and 'onshore' refers to the receptors on the landward side of MHWS. Where particular onshore and offshore assessments overlap in the intertidal area, the extent of the study area is defined in Figure 1.3 below.

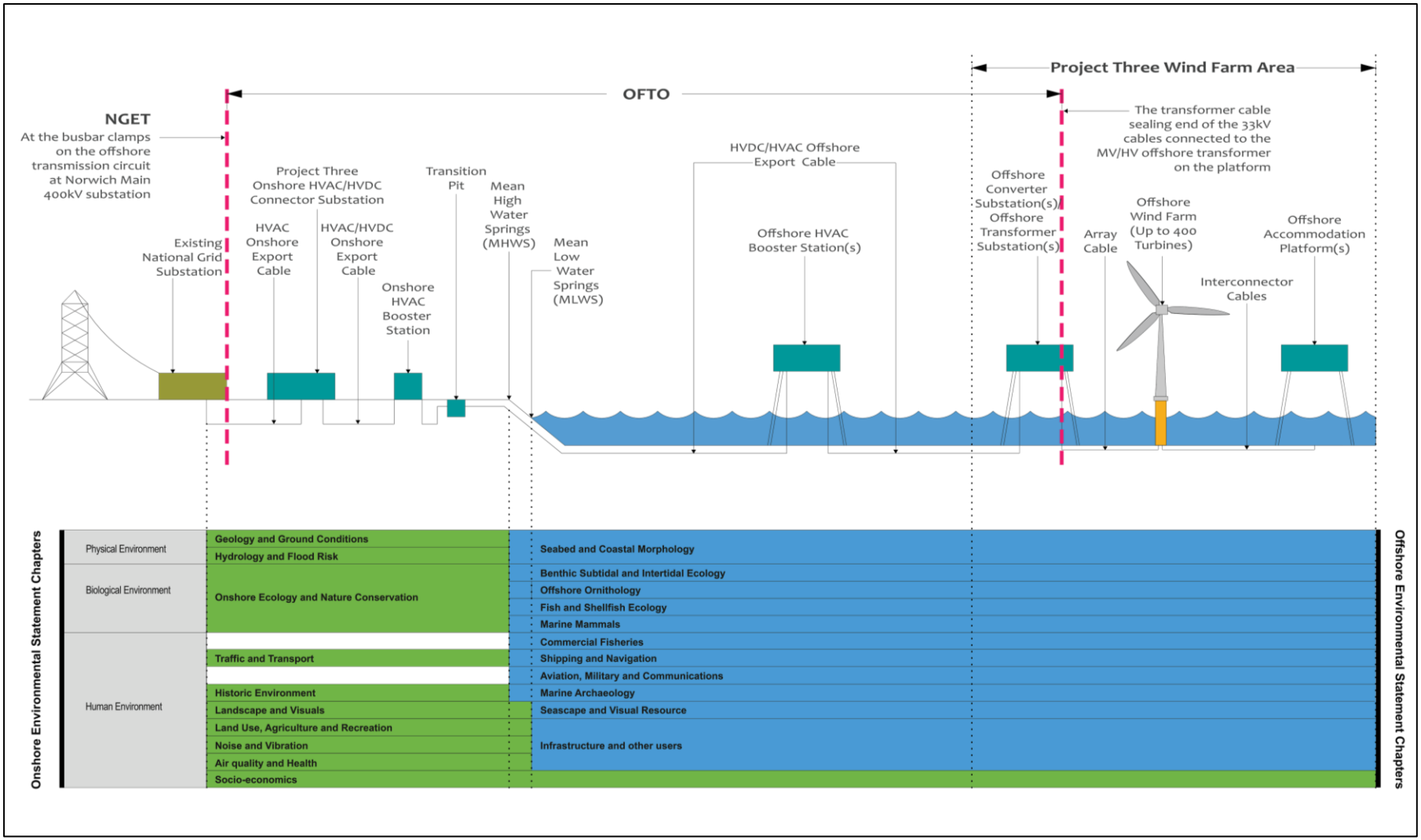



Figure 1.3 Extent of offshore and onshore assessments.

# 2. Policy and Legislative Context

## 2.1 The UK energy policy and the role of the renewable sources of energy

2.1.1 The 'Meeting the Energy Challenge white paper' (DTI, 2007) published by the former Department for Business, Enterprise and Regulatory Reform (BERR) – now the Department of Business, Energy and Industrial Strategy (BEIS), described two long-term challenges for the UK:

- Tackling climate change by reducing carbon dioxide emissions both within the UK and abroad; and
- Ensuring secure, clean and affordable energy.

2.1.2 At a European Union (EU) level the Renewables Directive (Directive 2009/28/EC) requires that by 2020, some 20% of the EU's energy consumption must come from renewable sources. Additional commitments were transposed into UK law by the Climate Change Act 2008, which places a duty on the Secretary of State to ensure that the net UK carbon account for the year 2050 is 80% lower than the 1990 baseline. As part of this process the 'UK Renewable Energy Strategy' (The Secretary of State for Energy and Climate Change, 2009) set the UK's commitment to source 15% of its energy from renewable sources by 2020.

2.1.3 The Energy Act 2013 provides further commitment from the UK to achieving a low carbon energy industry and incentivises investment in low carbon electricity generation. The Energy Act 2013 commits the Department of BEIS to Electricity Market Reform and the replacement of Renewables Obligations Certificates with Contracts for Difference in order to provide financial incentives to encourage investment in low carbon electricity generation such as offshore wind power.

## 2.2 Planning consents and Environmental Impact Assessment (EIA)

2.2.1 This section summarises the planning consents that will be required, under the Planning Act 2008 (as amended), in order to construct and operate Hornsea Three, as well as describing the UK and EU legal requirements for the Hornsea Three EIA.

### The Planning Act 2008

2.2.2 The Planning Act 2008 (as amended) is the primary piece of legislation that establishes the legal framework for the application, examination and determination of applications for NSIPs. It sets out the consenting system for all NSIPs, including those in the energy sector.

2.2.3 Part 2 of the Act specifies the provisions in relation to National Policy Statements (NPSs), which set the framework for decisions by PINS. The NPSs also identify relevant environmental considerations. To date there are 12 NPSs published, all relating to different types of infrastructure projects. There are six energy NPSs, three of which are relevant to offshore wind farm development, specifically, The Overarching NPS for Energy (NPS EN-1), The NPS for Renewable Energy Infrastructure (NPS EN-3) and The NPS for Electricity Networks Infrastructure (NPS EN-5) (DECC, 2011a; DECC, 2011b; DECC, 2011c).

2.2.4 Amendments have been made to the planning system that is applicable to the Planning Act 2008, through the Localism Act 2011. Under the Localism Act 2011, PINS became the executive agency responsible for the NSIP planning process. Any developer wishing to construct a project that is classified as an NSIP must apply for Development Consent. PINS will inspect the application submissions and make a recommendation to the Secretary of State for BEIS to grant or refuse consent.

### The Development Consent Order (DCO) and Environmental Statement

2.2.5 Section 31 of the Planning Act 2008 states that a Development Consent Order (DCO) is required for all NSIPs. The provisions of the Planning Act 2008 introduced the DCO to replace a number of consents that were normally required for an offshore wind farm development; namely, planning permission under the Town and Country Planning Act 1990, Section 36 or 37 of the Electricity Act 1989 (Section 32), Marine and Coastal Access Act (MCAA) 2009, listed building and conservation area consent under the Planning (Listed Buildings and Conservation Areas) Act 1990 and Scheduled Monument consent under the Ancient Monuments and Archaeological Areas Act 1979. The need for an EIA under the Marine Licence application process is also provided for through the EIA undertaken in support of the DCO application, with cross references made where necessary.

2.2.6 The DCO will provide for Hornsea Three in its entirety (i.e. both the offshore and the onshore aspects of Hornsea Three), with electrical grid connection works comprising (i.e. the offshore export cabling, offshore HVAC booster station(s), landfall works, onshore export cabling, onshore HVAC booster station and onshore substation including connection into the National Grid substation) and 'associated development'. In addition to the principal consents for Hornsea Three, any additional consents and licences will be identified during the development stage and through consultations with statutory bodies.

2.2.7 A formal EIA will be required as part of the application for a DCO. An Environmental Statement will be prepared, which is the formal report documenting the EIA process. The Environmental Statement will be prepared in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations (2009). These Regulations implement the EIA Directive for consent applications made under the Planning Act 2008. The aim of the EIA Directive is to ensure that when a relevant authority giving consent for a particular project makes its decision, it does so in the knowledge of any likely significant effects on the environment.

### Marine and Coastal Access Act (MCAA) 2009

2.2.8 As well as replacing consents under the Food and Environment Protection Agency (FEPA) 1985 and the Coast Protection Act (CPA) 1949, the MCAA 2009 also introduced a new planning system for marine environmental management and a requirement to obtain Marine Licences for works at sea.

2.2.9 The MCAA inserted a new section (Section 149A) into the Planning Act 2008 which enables an applicant for a DCO to apply for ‘deemed Marine Licences’ as part of the DCO process. The Marine Management Organisation (MMO) is the responsible authority and works with PINS to ensure that the deemed Marine Licences are transposed into the DCO. The MMO remains the monitoring and enforcement body in respect of the conditions and restrictions set out in the deemed Marine Licences.

## 2.3 The application and consenting process

### The Development Consent Order (DCO) process

2.3.1 The DCO will provide statutory consent for the development of Hornsea Three. The process for obtaining a DCO is split into the following phases: pre-application, acceptance, pre-examination, examination, decision and post decision.

2.3.2 During the pre-application phase, Part 5 of the Planning Act 2008 requires promoters of a DCO application to engage in pre-application consultation with local communities, local authorities and those who would be directly affected by the proposals. The Infrastructure Planning (Applications and Procedure) Regulations 2009 make provisions for various matters in connection with making an application for Development Consent, including publicising a proposed application and consulting with local and statutory stakeholders. Further details regarding the consultation process are included in Chapter 6: Consultation Process below.

2.3.3 The Hornsea Three application will be submitted to PINS with the prescribed forms and documents as required by the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009. Regulation 5(2)(a) requires that, where applicable, an application must be accompanied by "*the environmental statement required pursuant to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 and any scoping or screening opinions or directions*". A number of other supporting documents are also required to be submitted, including:

- A Consultation Report;
- A Draft DCO and Explanatory Memorandum; and
- A Habitat Regulations Assessment (HRA) Report.

### The Environmental Impact Assessment (EIA) process

2.3.4 The EC Directive 85/337/EEC, as amended by Directive 2011/92/E (known as the "EIA Directive"), requires an EIA to be completed in support of a DCO for certain types of projects. Offshore wind farms are listed in Annex II of the Directive, as "*installations for the harnessing of wind power for energy production (wind farms)*". These provisions have been transposed into UK legislation.

2.3.5 In the UK, the Directive is applied to offshore wind farm projects and associated onshore infrastructure through the Infrastructure Planning (Environmental Impact Assessment) Regulations (2009). These Regulations set out the statutory process and minimum requirements for the provision of adequate environmental information to enable the EIA process. The EIA, activities, surveys and studies will be reported in the Environmental Statement.

2.3.6 The EIA process can be broadly summarised as consisting of three main elements that take place prior to the submission of the DCO and Environmental Statement:

- Scoping: Project promoters can request a formal Scoping Opinion from PINS;
- Consultation: The project promoter is required to conduct pre-application consultation in accordance with the Planning Act 2008 plus associated guidance and Regulations, which includes the above EIA Regulations. The Statement of Community Consultation (SoCC) identifies the proposed consultation activities (see Chapter 6: Consultation Process for further information); and

- Environmental Statement Preparation: The Environmental Statement is prepared taking into account the responses to the consultation process. An additional consultation process also takes place where consultation responses on the Preliminary Environmental Information Report (PEIR) are invited. The final Environmental Statement is then prepared taking into account comments on the PEIR.

### Habitats Regulation Assessment (HRA)

2.3.7 The Conservation of Habitats and Species Regulations 2010 (as amended) (Habitats Regulations) and the Offshore Marine Conservation (Natural Habitats, and c.) Regulations 2007 (as amended) (Offshore Habitat Regulations) require the assessment of any significant effects on qualifying features of internationally important nature conservation sites that are likely to arise as a result of a proposed project. These internationally important sites include Special Areas of Conservation (SACs), or candidate SACs (cSACs), Special Protection Areas (SPAs) or potential SPAs (pSPAs), sites of community importance (SCI) and Ramsar sites. These are often referred to as European Conservation Sites. This assessment is to be undertaken by the 'competent authority', which in the case of Hornsea Three is the Secretary of State for Business, Energy and Industrial Strategy.

2.3.8 In order to carry out the HRA the competent authority, under Regulation 5(2)(g) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, requires a report to be submitted alongside the Environmental Statement. As such, the HRA does not form part of the Environmental Statement, although the baseline presented contains some of the same information.

# 3. Project Description

## 3.1 Introduction

3.1.1 This chapter of the Scoping Report provides an outline description of the potential design of Hornsea Three, based on preliminary conceptual design information and current understanding of the environment from initial survey work. It sets out the Hornsea Three design and components for both the onshore and offshore infrastructure, as well as the activities associated with the construction, operation and maintenance, and decommissioning of the project.

3.1.2 At this early stage in Hornsea Three, the project description is indicative and the 'envelope' has been designed to include sufficient flexibility to accommodate further project refinement during detailed design. This chapter therefore sets out a series of options and parameters for which maximum values are shown. The maximum values constitute the realistic worst case scenario in relation to Hornsea Three. The final design will be refined later in the project development from the parameters stated here. Hornsea Three will also, throughout the EIA process, seek to refine the proposed values and to provide more detailed realistic worst case scenarios where required. A further refined and detailed project description will be provided in the Environmental Statement that will accompany the application for Development Consent.

## 3.2 Design Envelope approach

3.2.1 The use of the Design Envelope approach has been recognised in the Overarching NPS for Energy (NPS EN-1) (DECC, 2011a) and the NPS for Renewable Energy Infrastructure (NPS EN-3) (DECC, 2011b). This approach has been used in the majority of offshore wind farm applications.

3.2.2 In the case of offshore wind farms, NPS EN-3 (paragraph 2.6.42) recognises that: *"Owing to the complex nature of offshore wind farm development, many of the details of a proposed scheme may be unknown to the applicant at the time of the application, possibly including:*

- *Precise location and configuration of turbines and associated development;*
- *Foundation type;*
- *Exact turbine tip height;*
- *Cable type and cable route; and*
- *Exact locations of offshore and/or onshore substations."*

3.2.3 NPS EN-3 (paragraph 2.6.43) continues:

*"The Secretary of State should accept that wind farm operators are unlikely to know precisely which turbines will be procured for the site until sometime after any consent has been granted. Where some details have not been included in the application to the Secretary of State, the applicant should explain which elements of the scheme have yet to be finalised, and the reasons. Therefore, some flexibility may be required in the consent. Where this is sought and the precise details are not known, then the applicant should assess the effects the project could have to ensure that the project as it may be constructed has been properly assessed (the Rochdale [Design] Envelope)". (DECC, 2011b).*

3.2.4 NPS EN-3 also states that:

*"The 'Rochdale [Design] Envelope' is a series of maximum extents of a project for which the significant effects are established. The detailed design of the project can then vary within this 'envelope' without rendering the ES [Environmental Statement] inadequate".*

3.2.5 The Design Envelope approach is widely recognised and is consistent with PINS Advice Note Nine: Rochdale Envelope (PINS, 2012) which states that:

"*The 'Rochdale Envelope' is an acknowledged way of dealing with an application comprising EIA development where details of a project have not been resolved at the time when the application is submitted*".

3.2.6 Throughout the Scoping Report and subsequent EIA, the Design Envelope (otherwise known as the "Rochdale Envelope") Approach has been taken to allow meaningful assessments of Hornsea Three to proceed, whilst still allowing reasonable flexibility for future project design decisions.

## 3.3 Project Three boundary

3.3.1 The boundary of Hornsea Three can be seen in Figure 1.1 above. This area encompasses the:

- Hornsea Three Array area: This is where the offshore wind farm will be located, which will include the wind turbines, wind turbine foundations, array cables, and a range of offshore substations and offshore interconnector cables;
- Hornsea Three offshore ECR corridor search area: This is where the permanent offshore electrical infrastructure (offshore export cable(s), as well as the offshore HVAC booster station(s), if required), (see Table 3.12 below) will be located; and
- Hornsea Three onshore ECR corridor search area: This is where the permanent onshore electrical infrastructure (onshore export cable(s), as well as the onshore HVAC booster station, if required), onshore substation and connections to the National Grid will be located.

## 3.4 The Agreement for Lease (AfL) area

3.4.1 The AfL from TCE allows DONG Energy, as a tenant of the AfL, to carry out investigations, such as survey activities, to identify the potential design within the array area for the wind farm by understanding environmental sensitivities that may exist, in advance of submitting the consent application, whilst applying to TCE for a lease for the lifetime of the wind farm. As noted under NPS EN-3, the detailed design cannot be proposed at this stage, however further information on the site will inform the refinement of the Design Envelope.

3.4.2 The AfL area for Hornsea Three array area covers approximately 696 $km^2$ and is broadly a diamond shape with a length of approximately 29 km west to east and 35 km north to south. The AfL area is where the offshore infrastructure, such as the turbines, offshore substation(s) and array cables, will be located. This area is hereafter referred to as the array area throughout the Scoping Report (see Figure 1.1).

3.4.3 Hornsea Three does not yet have an AfL area for the offshore ECR corridor. This will be applied for once an offshore ECR has been defined following initial survey and design work. Detail of the Hornsea Three offshore ECR corridor AfL area will be published in the Environmental Statement.

## 3.5 Water depths and seabed within the Agreement for Lease (AfL) area

3.5.1 High level data for the Hornsea Three AfL identifies the water depth range from 26 m to 73 m below Lowest Astronomical Tide (LAT). Hornsea Three has recently completed a geophysical survey across the AfL array area, which provides greater accuracy of the water depths in this area. Geophysical and bathymetric data for the Hornsea Three AfL will be presented in the PEIR.

3.5.2 The tidal range is estimated at approximately 3.6 m from LAT to Highest Astronomical Tide (HAT). The estimated water level variation can be seen in Table 3.1 below.

Table 3.1 Estimated water level variation at Hornsea Three.

| Water level | Level [mMSL] | Level [mLAT] |
|---|---|---|
| HAT | 1.8 | 3.6 |
| MHWS | 1.2 | 3.0 |
| Mean Sea Level (MSL) | 0 | 1.8 |
| MLWS | -1.3 | 0.5 |
| LAT | -1.8 | 0.0 |

## 3.6 Project infrastructure overview

3.6.1 The key components of Hornsea Three are likely to include:

- Offshore Wind Turbines;
- Foundations (for offshore turbines, platforms, substations and stations);
- Scour protection;
- Offshore accommodation platform(s);
- Array cables linking the individual wind turbines to an offshore substation; and
- A HVAC or HVDC transmission system including either:
  - HVAC:
    - Offshore transformer substation(s);
    - Offshore interconnector cables(s);
    - Offshore export cable(s);
    - Offshore HVAC booster station(s);
    - Onshore export cable(s);
    - Onshore HVAC booster station;
    - Onshore substation; and
    - Grid connection export cable(s).
  - HVDC:
    - Offshore transformer substation(s);
    - Offshore interconnector cables(s);

- Offshore converter substation(s);
- Offshore export cables(s);
- Onshore export cables(s);
- Onshore substation; and
- Grid connection export cable(s).

3.6.2 It is likely that the Hornsea Three components will be fabricated at manufacturing sites across Europe. A construction base (port facility) may be used to stockpile some components, such as foundations and turbine blades, before delivery to the array area for installation. Other components, such as pre-fabricated offshore substation units, may be delivered directly to the array area when required. An operations and maintenance onshore base may be provided to support the operating wind farm after construction.

3.6.3 The offshore wind farm and associated grid connection components are briefly described in the following sections. Realistic worst case parameters (dimensions and numbers where appropriate) are provided to indicate the potential scale of the proposed offshore wind farm, however a further refined and detailed project description will be provided in the PEIR and final Environmental Statement.

## 3.7 Offshore infrastructure

### Wind turbines

3.7.1 Hornsea Three requires flexibility in wind turbine foundation choice to ensure that anticipated changes in available technology and project economics can be accommodated within the Hornsea Three design. The Design Envelope therefore sets maximum and minimum realistic worst case scenario parameters against which environmental effects can be assessed. It is possible that more than one turbine type may be selected.

3.7.2 Hornsea Three plans to construct up to 400 turbines. A range of turbine models will be considered; however, they are likely to all follow the traditional offshore wind turbine design with three blades and a horizontal rotor axis. An illustration of this design can be seen in Figure 3.1 below and a picture of a turbine at Walney offshore wind farm is shown in Figure 3.2.

3.7.3 Each turbine will have a maximum rotor diameter of 265 m and a maximum blade tip height of 325 m LAT (highest point of the structure). The minimum distance between the bottom of the blade and the water surface will be 34.97 m LAT. All turbines will be marked for aviation and navigation purposes.

3.7.4 The Design Envelope for the Hornsea Three wind turbines is shown in Table 3.2.

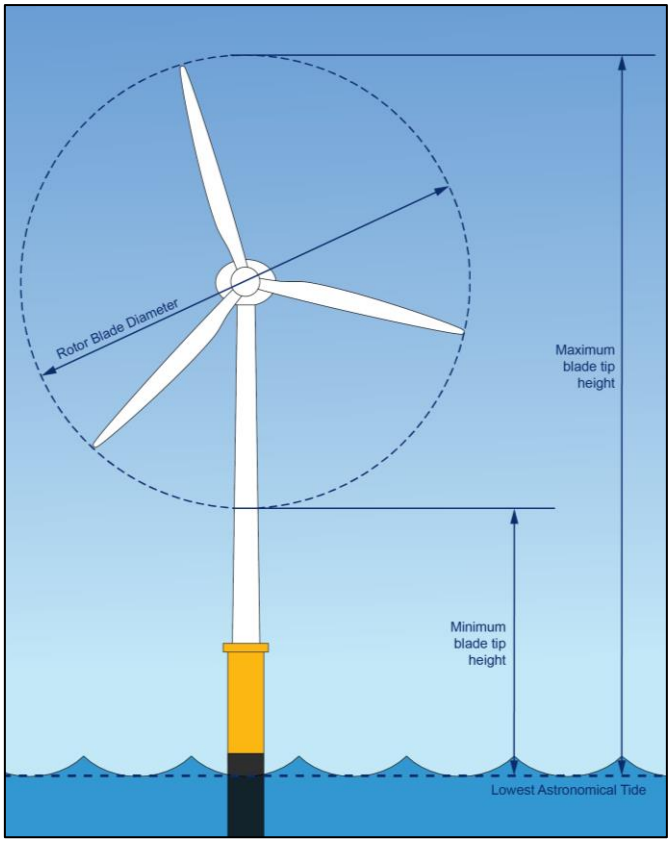



Figure 3.1 Schematic of an offshore wind turbine.

Figure 3.2 Wind turbines at Walney offshore wind farm.

Table 3.2 Design Envelope: wind turbines.

| Parameter | Maximum Design Envelope |
|---|---|
| Maximum number of turbines | 400 |
| Minimum height of lowest blade tip above LAT (m) | 34.97 |
| Maximum blade tip height above LAT (m) | 325 |
| Maximum rotor blade diameter (m) | 265 |

### Wind turbine, offshore substation and offshore accommodation platform foundations

3.7.5 There are a number of foundation types that are being considered for Hornsea Three. As with wind turbine type, Hornsea Three requires flexibility in foundation choice to ensure that anticipated changes in available technology and project economics can be accommodated within the Hornsea Three design. The final selection will depend on factors including turbine type, soil conditions, wave and tidal conditions, Project economics and procurement approach.

3.7.6 The wind turbines, offshore substation(s) and offshore accommodation platform(s) are fixed to the seabed by foundation structures. There are a number of foundation types that can be used and the types used will not be confirmed until the final design of the wind farm, post-consent. Consequently the EIA will consider a range of types, including monopiles, suction bucket jacket foundations, piled jacket foundations, mono suction buckets, gravity base structures and floating foundations. All foundation types and maximum parameters stated in the following sections include for wind turbines, offshore substation(s) and offshore accommodation platform(s).

3.7.7 Some form of seabed preparation may be required for each foundation type. Seabed preparations may include seabed levelling, and removing surface and subsurface debris such as (for example) boulders, fishing nets or lost anchors. If debris is present below the seabed surface then excavation may be required for access and removal. Following consultation with the MMO and Ministry of Defence (MoD), any unexploded ordnance (UXO) found with a potential to contain live ammunition may be detonated on site and any remaining debris removed. However, as the location and number of UXO detonations is currently unknown and will not be known until the final design of the wind farm, it is not possible to assess the detonation of UXO until after consent is granted and the exact ground conditions are known. This activity will therefore not be scoped as part of the EIA and a separate Marine Licence will be sought, if and as required.

3.7.8 The foundations will be fabricated offsite, stored at a suitable port facility and transported to site as needed. Specialist vessels will be needed to transport and install foundations. A filter layer and/or scour protection layer (typically rock) may be needed on the seabed and will be installed either before and/or after foundation installation.

3.7.9 Further details on the foundation types that will be considered in the EIA are described in the following sections.

#### *Monopile foundations*

3.7.10 Monopile foundations typically consist of a single steel tubular section and a transition piece (TP) which may include boat landing features, ladders, a crane, and other ancillary components as well as a flange for connection to the wind turbine tower (Figure 3.3). The TP is usually painted yellow and marked according to relevant regulatory guidance and may be installed separately following the monopile installation.

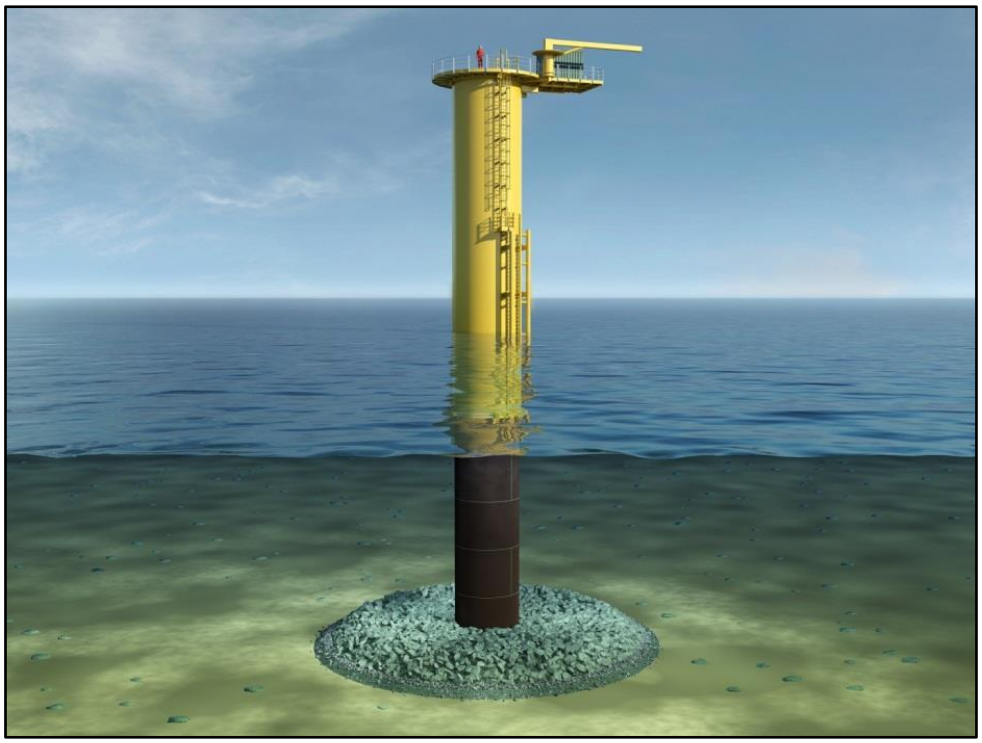


Figure 3.3 A monopile foundation.

3.7.11 Monopiles can be used to support wind turbines, offshore accommodation platforms or offshore substations. In most instances, monopiles are driven into the seabed from a jack-up barge using hydraulic hammers, which are available in various capacities for operation either above or under the water surface. In areas of hard soil or bedrock close to the seabed surface, where piling with a hammer is difficult or impossible, drilling may be used to assist piling. Drilling operations produce spoil which is typically disposed of at the drill site.

3.7.12 During the construction phase of Hornsea Three, up to four installation vessels may be in operation at any one time, operating over a 24 hour period, with up to two vessels piling simultaneously. The installation of a single monopile foundation may take up to three days allowing for vessel re-positioning and commissioning at each installation location, although continuous piling itself typically lasts only two to eight hours. Piling always commences with low hammer energies ('soft start') and maximum hammer energies (if required) are attained after a predefined 'ramp up' and typically only used where ground conditions require.

3.7.13 The Design Envelope for monopile foundations is shown in Table 3.3.

Table 3.3 Design Envelope: monopile foundations.

| Parameter | Maximum Design Envelope |
|---|---|
| Number of monopiles (includes wind turbines, offshore accommodation platforms and offshore substations) | 420 |
| Diameter (m) | 15 |
| Hammer energy (kJ) | 5,000 |
| Number of simultaneous piling events | 2 |
| Piling duration (per monopile) (hrs) | 8 |

### *Piled jacket foundations*

3.7.14 Piled jacket foundations are formed of a steel lattice construction (comprising tubular steel members and welded joints) secured to the seabed by driven pin piles attached to the jacket feet. Jacket structures can be used to support wind turbines, offshore accommodation platforms or offshore substations. Typically the hollow steel pin piles are driven, drilled or vibrated into the seabed relying on the frictional and end bearing properties of the seabed for support. Unlike monopiles, there is no separate TP. The TP and ancillary structure is fabricated as an integrated part of the jacket structure and is not installed separately offshore. Pin piles will typically be narrower than monopoles.

3.7.15 The Design Envelope for jacket foundations with pin piles is shown in Table 3.4.

Table 3.4 Design Envelope: jacket foundation with pin piles.

| Parameter | Maximum Design Envelope |
|---|---|
| Number of jackets (includes wind turbines, offshore accommodation platforms and offshore substations) | 420 |
| Number of legs | 4 |
| Height of platform above LAT (m) | 40 |
| Separation of adjacent legs at seabed level (m) | 40 |
| Separation of adjacent legs at LAT (m) | 25 |
| Leg diameter (m) | 4.6 |
| Pin pile diameter (m) | 4 |
| Hammer energy (kJ) | 2,500 |

### *Suction bucket jacket foundations*

3.7.16 Suction bucket jacket foundations are formed with a steel lattice construction (comprising tubular steel members and welded joints) fixed to the seabed by suction buckets installed below each leg of the jacket. The suction buckets are typically hollow steel cylinders, capped at the upper end, which are fitted in a horizontal position underneath the legs of the jacket structure. They do not require a hammer or drill for installation. Unlike monopiles, but similarly to piled jacket foundations, there is no separate TP. The TP and ancillary structure is fabricated as an integrated part of the jacket structure and is not installed separately offshore. An example of a suction bucket jacket provided in Figure 3.4.

3.7.17 Once at site, the jacket foundation will be lifted by the installation vessel using a crane, and lowered towards the seabed in a controlled manner (see Figure 3.4). When the steel caisson reaches the seabed, a pipe running up through the stem above each caisson will begin to suck water out of each bucket. The buckets are pressed down into the seabed by the resulting suction force. When the bucket has penetrated the seabed to the desired depth, the pump is turned off. A thin layer of grout is then injected under the bucket to fill the air gap and ensure contact between the soil within the bucket, and the top of the bucket itself.

3.7.18 The Design Envelope for jacket foundations with suction buckets is shown in Table 3.5.

Figure 3.4 A jacket foundation with suction buckets being installed at the Borkum Riffgrund One offshore wind farm.

Table 3.5 Design Envelope: jacket foundation with suction buckets.

| Parameter | Maximum Design Envelope |
|---|---|
| Number of jackets with suction buckets (includes wind turbines, offshore accommodation platforms and offshore substations) | 420 |
| Number of legs | 4 |
| Height of platform above LAT (m) | 40 |
| Separation of adjacent legs at seabed level (m) | 40 |
| Separation of adjacent legs at sea surface (m) | 25 |
| Bucket diameter (m) | 20 |

### *Mono suction bucket foundations*

3.7.19 A mono suction bucket consists of a single suction bucket supporting a single steel or concrete structure, which supports the wind turbine. The installation method is similar to that described for the suction bucket jacket, and as with the jacket structures and suction bucket foundations, this foundation type does not require a TP to be installed offshore. The Design Envelope for this foundation type can be seen in Table 3.6 below.

Table 3.6 Design Envelope: mono suction bucket.

| Parameter | Maximum Design Envelope |
|---|---|
| Number of jackets with mono suction buckets (includes wind turbines, offshore accommodation platforms and offshore substations) | 420 |
| Suction bucket diameter (m) | 40 |
| Suction bucket penetration depth (m) | 20 |
| Suction bucket height above seabed (m) | 10 |

### *Gravity base foundations*

3.7.20 Gravity base foundations are heavy steel, concrete, or steel and concrete structures sometimes including additional ballast that sit on the seabed to support the turbine tower (Figure 3.5). Gravity bases vary in shape and are placed in pre-prepared areas of seabed. Seabed preparation may involve levelling and dredging of the soft mobile sediments.

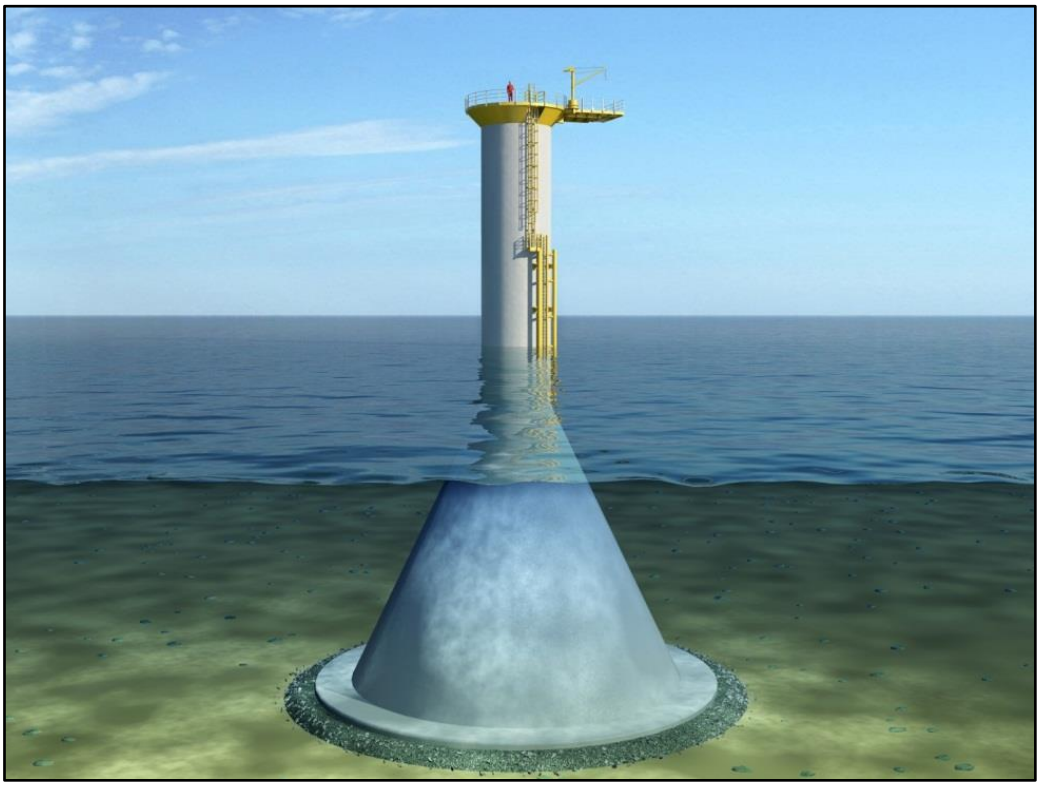


Figure 3.5 A gravity base foundation.

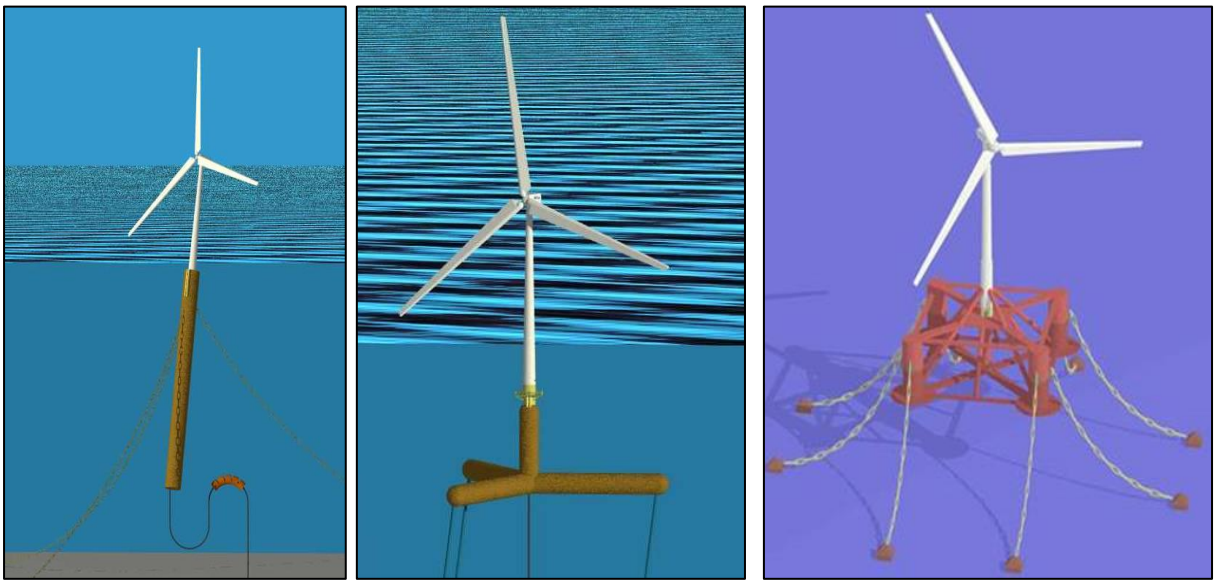
3.7.21 A gravity base does not require piling or drilling to remain in place. Scour protection is usually required to avoid the structure being undermined. The amount of ballast and scour protection will depend on structure design and location. The Design Envelope for gravity base foundations is shown in Table 3.7.

Table 3.7 Design Envelope: gravity base foundation.

| Parameter | Maximum Design Envelope |
|---|---|
| External diameter (excluding scour protection) (m) | 53 |
| Number of gravity base foundations (includes wind turbines, offshore accommodation platforms and offshore substations) | 420 |
| Seabed preparation diameter (m) | 61 |
| Scour protection width (m) | 93 |

### *Floating foundations*

3.7.22 Floating foundations can consist of a range of structure types, typically classed as spar buoys, tensioned-leg platforms or semi-submersibles (see Figure 3.6). The classification of floating foundations depends on how stability is achieved; by ballast at the base of the spar, by tension in the mooring lines or by a wide structure at the water surface. Typically the structure will consist of either a single slender vertical cylindrical structure, called a spar buoy, or a shallower and more complex structure consisting of various tubular and plate elements, called a tensioned-leg platforms or semi-submersible platform.



**Spar class**
(Ballast stabilised)

**Tensioned-leg platform class**
(Moorings stabilised)

**Semi-submersible class**
(Buoyancy and moorings stabilised)

Figure 3.6 Examples of floating foundations.

3.7.23 The foundations are typically fabricated from steel and/or concrete and are held in place by mooring lines connected to anchors in the seabed. The anchors could be piles, suction buckets, gravity structures or drag anchors. The structures will either be floated into place from harbour or brought to site on suitable installation vessels and lifted into the water. The anchors will be installed using a range of methods dependent on the anchor type, including piling, drilling, suction, and placement. The installation of the anchors is likely to be carried out by a separate vessel.

3.7.24 The Design Envelope for floating foundations is shown in Table 3.8.

Table 3.8 Design Envelope: floating foundation.

| Parameter | Maximum Design Envelope |
|---|---|
| Foundation surface dimension (m) | 70 |
| Depth of structure (m) | 50 |
| Number of mooring lines and anchors (per turbine) | 12 |
| Mooring cable radius (m) | 1,000 |
| Number of floating foundations (includes wind turbines, offshore accommodation platforms and offshore substations) | 420 |

### *Scour protection for foundations*

3.7.25 Scour protection is designed to prevent foundation structures for turbines, substations and offshore accommodation platforms, being undermined by hydrodynamic and sedimentary processes, resulting in seabed erosion and subsequent scour hole formation. The shape of the foundation structure is an important parameter influencing the potential depth of scour hole formation. Scour around foundations is typically mitigated by the use of scour protection measures. Several types of scour protection exist, including mattress protection, sand bags, stone bags and artificial seaweeds. However, the placement of large quantities of crushed rock around the base of the foundation structure is the most frequently used solution ('rock placement').

3.7.26 The preferred scour protection solution may comprise a rock armour layer resting on a filter layer. The filter layer can either be installed before the foundation is installed ('pre-installed') or afterwards ('post-installed'). Alternatively, by using heavier rock material with a wider gradation, it is possible to avoid using a filter layer and pre-install a single layer of scour protection.

3.7.27 The amount of scour protection required will vary for the different foundation types being considered for Hornsea Three. Flexibility in scour protection choice (rock armouring and use of mattresses) is required to ensure that anticipated changes in available technology and project economics can be accommodated within the Hornsea Three design. The final choice and detailed design of a scour protection solution for the wind farm will be made after detailed design of the foundation structure, taking into account a range of aspects including geotechnical data, meteorological and oceanographical data, water depth, foundation type, maintenance strategy and cost.

3.7.28 The Design Envelope for scour protection is shown in Table 3.9.

Table 3.9 Design Envelope: scour protection.

| Parameter | Maximum Design Envelope* |
|---|---|
| Total wind farm scour protection material volume (includes wind turbines, offshore accommodation platforms and offshore substations) ($m^3$) | 3,390,000 |
| Total wind farm scour protection seabed area (includes wind turbines, offshore accommodation platforms and offshore substations) ($km^2$) | 1.7 |

* Note - Worst case derived from the use of GBS foundations for all relevant infrastructure.

### Array cables

3.7.29 Cables carrying the electrical current produced by the turbines will link the wind turbines to an offshore substation. A small number of turbines will typically be grouped together on the same cable 'string' connecting those turbines to the substation, and multiple cable 'strings' will connect back to each offshore substation.

3.7.30 The cables will be buried below the seabed wherever possible. It may be necessary in places, where crossing pre-existing cables, pipelines or exposed bedrock for example, to cover the cables with a hard protective layer (such as rock or concrete mattresses) to ensure that the cable remains secure, is not a hazard to other sea users and does not risk becoming exposed and damaged by tidal currents. Figure 3.7 shows an array cable being installed.

3.7.31 The Design Envelope for array cables is shown in Table 3.10.


Figure 3.7 Array cable installation at the Gode Wind offshore wind farm.

Table 3.10 Design Envelope: array cables.

| Parameter | Maximum Design Envelope |
|---|---|
| Cable diameter (mm) | 200 |
| Burial depth | To be determined via a cable burial assessment |
| Installation methodology | Trenching, dredging, jetting, ploughing, vertical injection, rock cutting |
| Total length of cable (km) | 850 |
| Width of seabed affected by installation per cable (m) | 10 |
| Total seabed disturbed ($km^2$) | 8.5 |

### Offshore accommodation platforms

3.7.32 Hornsea Three may construct up to three offshore accommodation platforms to allow operations staff to be housed at the wind farm site for a number of weeks at a time, and to allow spares and tools to be stored at the wind farm site. This aims to reduce trips to the wind farm and time spent in transit, in order to decrease down time for faults and repairs. The offshore accommodation platforms would be accessed by vessel and/or helicopter, and may have associated captive vessels to access the turbines and substations. The offshore accommodation platforms may also be co-sited with offshore substations, including bridge access between the two platforms. The offshore accommodation platforms would use the same substructure and foundation concepts as the turbines and offshore substations. An example of an offshore accommodation platform can be seen in Figure 3.8.


Figure 3.8 Offshore accommodation platform (right) at the Horns Rev 2 offshore wind farm, sited next to an offshore substation (left)*.

*Note - the offshore accommodation platform is supported by a monopile foundation, and the offshore substation by a jacket foundation.

3.7.33 The Design Envelope for the offshore accommodation platforms can be seen Table 3.11 below. The foundation types will be similar to those proposed for the offshore wind turbines and the substations. Hornsea Three requires flexibility in location and foundation choice to ensure that anticipated changes in available technology and project economics can be accommodated within the Hornsea Three design.

Table 3.11 Design Envelope for offshore accommodation platforms.

| Parameter | Maximum Design Envelope |
|---|---|
| Number | 3 |
| Length and width (m) | 60 |
| Main structure height above LAT (m) | 60 |
| Structure height max above LAT (m) | 64 |

### Transmission system

3.7.34 The wind farm transmission system is used to transport the power produced at the wind turbines and delivered by the array cables, to the UK National Grid. The system transforms the Medium Voltage (MV) power produced at the wind turbines to HV at the offshore transformer substations (located in the array area), and transports this via export cables and a number of other offshore and onshore components (see paragraph 3.7.37). The transmission system is paid for and constructed by the wind farm developer (DONG Energy in the case of Hornsea Three), but must be purchased by an Offshore Transmission Operator (OFTO) after the wind farm is constructed in a transaction overseen by the Office of Gas and Electricity Markets (Ofgem).

#### *Project capacity*

3.7.35 The point at which the energy produced by the wind farm is metered is at the offshore substation (currently MV side of the Transformer), therefore all wind farm capacities defined through the consenting process will be in reference to the capacity at the offshore substation. Hornsea Three has a planned maximum capacity of 2.4 GW. This may be split into multiple phases, developed and constructed either separately or together (see Section 3.9 for further details).

#### *HVAC/HVDC transmission systems*

3.7.36 There are a range of transmission system designs that can be used to transport the power from the wind farm to the UK National Grid. These fall under two primary transmission types defined by how the current is delivered to the export cables; HVAC or HVDC. Both transmission types have a range of relative benefits and drawbacks depending on an individual perspective. Offshore wind farms have traditionally used HVAC connections; however HVDC connections become more viable at far from shore projects and are used on a number of projects in Germany. Hornsea Three requires flexibility in transmission system choice to ensure that anticipated changes in available technology and project economics can be accommodated within the Hornsea Three design, and will make a decision on which transmission type to use during the detailed design phase (likely post consent).

3.7.37 An overview of the differences between the component requirements between two technologies are outlined in Table 3.12.

Table 3.12 Infrastructure required for High Voltage Alternating Current (HVAC) and High Voltage Direct Current (HVDC) systems.

| Component | HVAC | HVDC | Comment |
|---|---|---|---|
| Offshore transformer substation | Y | M | HVDC: may be combined with converter substation |
| Offshore interconnector cable | M | M | Interconnector cables may be required between offshore substations. |
| Offshore converter substation | N | Y | - |
| Offshore export cable | Y | Y | - |
| Offshore HVAC booster station(s) | M | N | HVAC: onshore and/or offshore HVAC booster station. |
| Onshore HVAC booster station | M | N | |
| Onshore export cable | Y | Y | - |
| Onshore substation | Y | Y | HVDC systems require larger onshore converter substations for conversion to HVAC. |
| Grid connection export cable | Y | Y | - |
| *Table Key* | *Required (Y)* | *May be required (M)* | *Not required (N)* |

### *Circuit description*

3.7.38 A circuit is an electrical system that allows the flow of electrons from one location to another. Typical HVAC transmission systems are three phase designs and require three conductors per electrical circuit to transport the power. Offshore these three conductors are usually combined into a single cable. Onshore these three conductors are usually housed within one cable per conductor (so three cables per circuit) (Table 3.13).

3.7.39 Typical HVDC transmission systems are Bi-Pole designs and require two conductors per circuit to transport the power. Offshore these are generally housed in separate cables but these cables may be installed together. Onshore these conductors are housed in separate cables (Table 3.13).

Table 3.13 Cables required per circuit.[1]

| | HVAC | HVDC |
|---|---|---|
| Offshore Cables/Circuit | 1 | 2 |
| Onshore Cables/Circuit | 3 | 2 |

### Offshore substations

3.7.40 All offshore substations will be marked, as with the wind turbines, for aviation and navigation purposes. The exact substation locations will be determined during the wind farm design phase (typically post consent), taking account of ground conditions and the most efficient cable routing amongst other considerations. Offshore substations will not be manned but once functional will be subject to periodic operational and maintenance visits by staff by helicopter or crew boat.

[1] Irrespective of the electrical system chosen (AC or DC) the total number of export cables will not exceed 6 offshore and 18 onshore.

3.7.41 Hornsea Three requires flexibility in location and foundation choice of offshore transformer substation to ensure that anticipated changes in available technology and project economics can be accommodated within the Hornsea Three design.

3.7.42 A description of the offshore substations is detailed below.

### *Offshore transformer substations*

3.7.43 Offshore transformer substations are required in HVAC transmission systems and may be required in HVDC transmission systems, dependent on the system design.

3.7.44 One or more offshore transformer substations will collect the electricity generated by the operational wind turbines via the array cables. The voltage will be "stepped up" by transformers on the substation before transmission to the onshore substation by export power cables; this will be via the offshore converter substation in the case of HVDC, or the offshore and/or onshore HVAC booster station(s) in the case of HVAC. For some HVDC transmission system designs, the equipment required in the offshore transformer substation will be incorporated into the offshore converter substation. It may also be beneficial to co-locate the offshore transformer substations with wind turbines so that a substation and a turbine may share a single foundation structure.

3.7.45 The HV equipment on the offshore transformer substations is expected to be rated between 220 kV and 400 kV. The substation unit is pre-fabricated in the form of a multi-layered cube and will be mounted on a foundation (Figure 3.9) some distance above the sea surface.

3.7.46 Up to 12 separate offshore transformer substations are required. All offshore transformer substations will be located within the final array area.

3.7.47 The Design Envelope for this can be seen in Table 3.14 below and a schematic can be seen in Figure 3.10.

Figure 3.9 Offshore substations at Gode Wind offshore wind farm.

Table 3.14 Design Envelope for offshore transformer substations.

| Parameter | Maximum Design Envelope |
|---|---|
| Number of offshore transformer substations | 12 |
| Topside – main structure length and width (m) | 90 |
| Topside – ancillary structure length and width (m) | 100 |
| Topside – height (excluding helideck or lightning protection) (LAT) (m) | 70 |
| Height of lightning protection above topside (LAT) (m) | 90 |

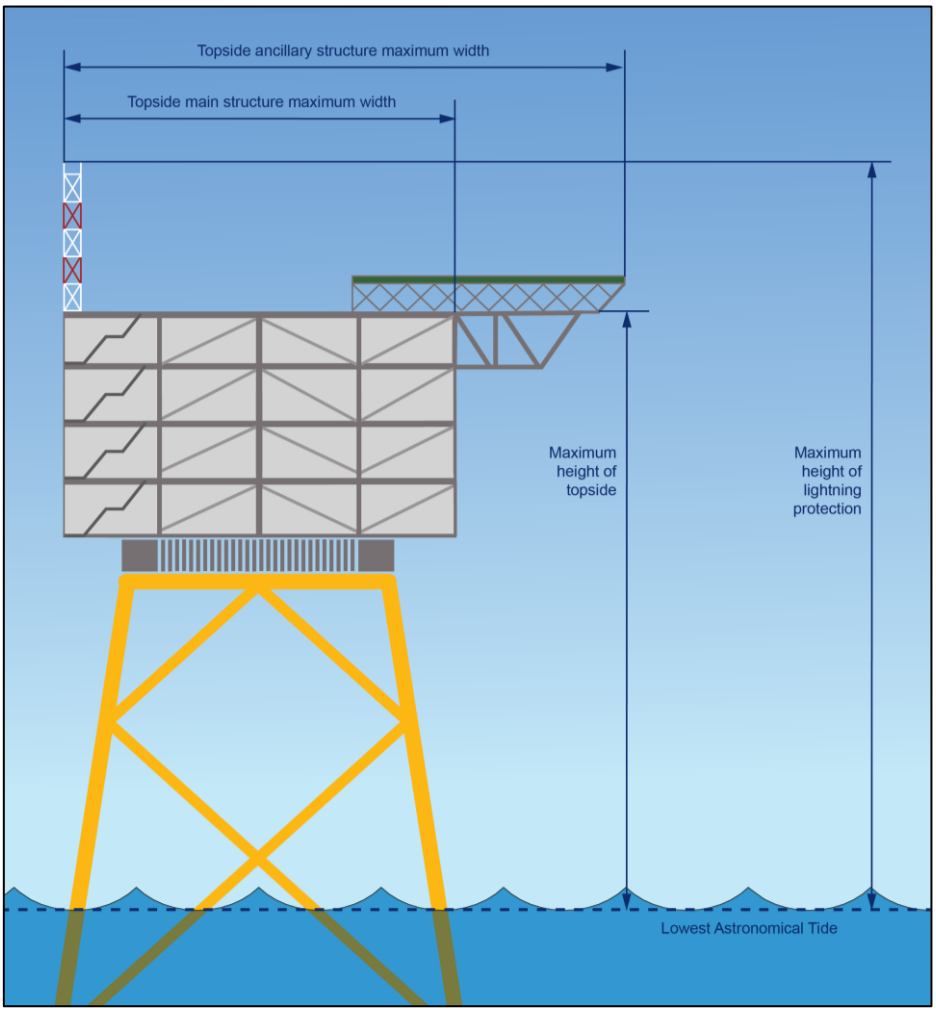



Figure 3.10 Schematic of an offshore transformer substation.

### *Offshore converter substations*

3.7.48 Offshore converter substations are required in HVDC transmission systems only; they are not required in HVAC transmission systems.

3.7.49 Offshore converter substations convert the three-phase AC power generated at the turbines into DC power. This is then transmitted to the onshore substation via the export cables.

3.7.50 As for the offshore transformer substations, the offshore converter substation unit is pre-fabricated in the form of a multi-layered cube. The offshore converter substation is expected to be larger than the offshore transformer substations. The structure will most likely be mounted on a jacket or gravity base foundation some distance above the sea surface. Up to four separate offshore converter substations will be required. The Design Envelope for this can be seen in Table 3.15 below.

3.7.51 Hornsea Three requires flexibility in location and foundation choice of the offshore convertor substations to ensure that anticipated changes in available technology and project economics can be accommodated within the Hornsea Three design.

3.7.52 It is possible that the design approach for offshore converter substations will move towards multiple smaller units, rather than fewer large units. In this case the Design Envelope for the smaller offshore transformer substations (as in Table 3.14) should be used, however the total number of offshore transformer substations would be up to 12 and up to four offshore converter substations, not exceeding 16 in total.

Table 3.15 Design envelope for offshore converter substations.

| Parameter | Maximum Design Envelope |
|---|---|
| Number of offshore converter substations | 4 |
| Length of Topside (m) | 180 |
| Width of Topside (m) | 90 |
| Topside - height (excluding helideck or lightning protection) (LAT) | 100 |
| Height of lightning protection above topside (LAT) | 110 |

### *Offshore HVAC booster station(s)*

3.7.53 Offshore HVAC booster station(s) are required in HVAC transmission systems only; they are not required in HVDC transmission systems.

3.7.54 Long distance, large capacity HVAC transmission systems require reactive compensation equipment along the Hornsea Three offshore ECR to reduce the reactive power generated by the capacitance of the export cable in order to allow the power delivered to the National Grid to be useable. The electrical equipment required to provide the reactive compensation, in the form of an HVAC booster station, can be located onshore, on an offshore platform or within a subsea structure. If required, this infrastructure would be located in the Hornsea Three offshore ECR corridor, at a location approximately 40% to 60% of the total cable route length, and/or onshore (see Table 3.12 and paragraphs 3.8.9 to 3.8.10), rather than in the array area.

3.7.55 Hornsea Three requires flexibility in location, type and foundation choice for offshore HVAC booster station(s) to ensure that anticipated changes in available technology and project economics can be accommodated within the Hornsea Three design.

### *Surface*

3.7.56 The design of a surface offshore HVAC booster station will be very similar to the offshore transformer substations described in paragraphs 3.7.43 to 3.7.46. The Design Envelope is set out in Table 3.16.

Table 3.16 Design Envelope for surface offshore HVAC booster station(s).

| Parameter | Maximum Design Envelope |
|---|---|
| Number of surface offshore HVAC booster stations | 4 |
| Topside – main structure length and width (m) | 90 |
| Topside – ancillary structure length and width (m) | 100 |
| Topside - height (excluding helideck or lightning protection) (LAT) (m) | 70 |
| Height of lightning protection above topside (LAT) (m) | 90 |

### *Subsea*

3.7.57 At the time of writing no subsea offshore HVAC booster station(s) have been constructed for HV power transfer, therefore the details of this type of structure are primarily based on knowledge of surface designs as well as an understanding of subsea structures used in the offshore oil and gas industry. The structure would likely be a sealed steel or concrete structure fixed to the seabed with piles. It is not expected that this structure would be regularly accessed for operation and maintenance during Hornsea Three's lifetime. The Design Envelope can be seen in Table 3.17.

3.7.58 The lighting and marking of the structure (as well as all other Hornsea Three structures) will be specified by Trinity House Lighthouse Services (THLS), as having a statutory duty as a General Lighthouse Authority, upon the receipt of project information and the navigation risk assessment. This information will be necessary for THLS to specify the exact navigational marking that will be required to mitigate the risk to shipping that will be presented by a subsea offshore HVAC booster station(s). The marking will be based on the recommendations of the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA, 2013). The positions of the structure and export cable will be conveyed to the UK Hydrographic Office so that they can be incorporated into Admiralty Charts and the Notice to Mariners procedures.

Table 3.17 Design Envelope for subsea offshore HVAC booster station(s).

| Parameter | Maximum Design Envelope |
|---|---|
| Number of subsea offshore HVAC booster stations | 6 |
| Subsea structure: length (m) | 30 |
| Subsea structure: width (m) | 30 |
| Subsea structure: height above seabed (m) | 15 |
| Subsea structure: number of piles | 12 |
| Piles: penetration depth (m) | 40 |
| Piles: diameter (m) | 2 |

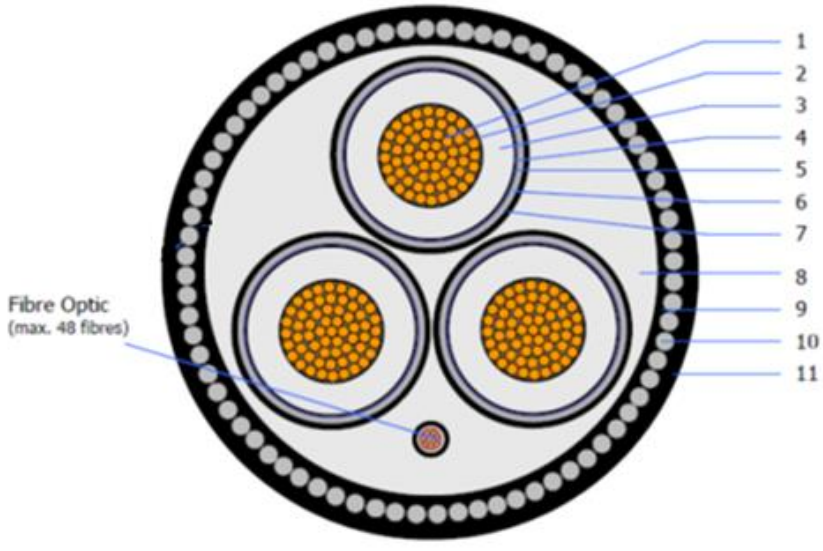
### Offshore export cables

3.7.59 Offshore export cables are used for the transfer of power from the offshore substations to the landfall point. For HVAC transmission systems offshore export cables will carry electricity from the offshore transformer substations to the offshore HVAC booster station(s) and then on to the landfall. For HVDC transmission systems offshore export cables will carry electricity from the offshore transformer substations to the offshore converter substations and then to the landfall. Up to six offshore export cables, with a voltage of up to 600 kV will be required for Hornsea Three. If possible the cables will be buried below the seabed through to landfall. As with the array cables, but with a greater likelihood due to their longer length, the export cables will need to be made secure where the route crosses obstacles such as exposed bedrock, pre-existing cables or pipelines that mean the cable cannot be buried. This is typically achieved through some form of armouring (rock or mattress) to maintain the integrity of the cable.

3.7.60 The length and orientation of the Hornsea Three offshore ECR corridor will be determined once the landfall location is confirmed. The EIA will consider an ECR corridor to allow the final cable route to be microsited around seabed conditions that would make cable installation challenging (including extensive debris, steep gradients, highly mobile sediments, hard bedrock, and protected sites). Detailed geophysical and geotechnical surveys will be needed to confirm the exact route within the Hornsea Three offshore ECR corridor post-consent.

3.7.61 Cable burial will be undertaken by specialist vessels and the burial technique and burial depth will be subject to a detailed assessment.

3.7.62 An example of offshore export cable (HVAC 220 kV) is shown in Figure 3.11.




(Diagrammatic only – not to scale)

| | |
|---|---|
| 1. Plain Cu conductor | 2. Conductor screen |
| 3. XLPE Insulation | 4. Insulation screen |
| 5. Longitudinal water barrier | 6. Lead sheath |
| 7. PE semi conductive sheath | 8. Fillers |
| 9. Binder tape and string bedding | 10. Galvanised wire armour |
| 11. String serving in double layer | |

Figure 3.11 Cross section through a typical offshore Alternating Current (AC) (220 kV) export cable (Courtesy of Prysmian).

3.7.63 Hornsea Three requires flexibility in type, location, depth of burial and protection measures for export cable to ensure that anticipated physical and technical constraints and changes in available technology and project economics can be accommodated within the Hornsea Three design.

3.7.64 The Design Envelope for offshore export cables is shown in Table 3.18.

Table 3.18 Design Envelope: offshore export cables.

| Parameter | Maximum Design Envelope |
|---|---|
| Number of cables | 6 |
| Cable diameter (mm) | 300 |
| Burial depth | To be determined via a cable burial assessment |
| Installation methodology | Trenching, dredging, jetting, ploughing, vertical injection, rock cutting |
| Total length of cable (km) | 1,038* |
| Width of seabed affected by installation per cable (m) | 10 |
| Total seabed disturbed ($km^2$) | 10.38 |

* Note: The total length of export cables includes ~120 km of offshore ECR corridor from the North Norfolk coast to the Hornsea Three array area boundary. The remaining length (up to 53 km per cable) is required to connect the six cables to the, as yet unconfirmed, location of the offshore substation(s).

### Offshore interconnector cables

3.7.65 Hornsea Three may require power cables to interconnect the offshore substations in order to provide redundancy in the case of cable failure elsewhere, or to connect to the offshore accommodation platforms in order to provide power for operation. The cables will have a similar design to either the offshore export cables or array cables depending on the final wind farm design.

## 3.8 Onshore infrastructure

### Onshore export cables

3.8.1 Onshore export cables will be buried and connect to the offshore export cables at the landfall point (which has yet to be selected along the North Norfolk coast) and transfer the power onwards to the onshore substation (potentially via an onshore HVAC booster station in the case of HVAC, see 3.8.9 to 3.8.10).

3.8.2 Onshore export cables differ in design to offshore export cables due to the differing conditions they operate in (i.e. marine and terrestrial) as well as the differing installation methods employed. Whereas offshore export cables usually include multiple conductors within a single cable, onshore cables usually contain only a single conductor, and therefore there are more cables.

3.8.3 The offshore and onshore export cables will be jointed together at a location very close to the landfall on the landward side. Site investigations at the landfall (consisting of a borehole and resistivity survey) is due to be undertaken between Quarter 4 2016 and Quarter 1 2017 and will confirm the exact approach to installing export cables at the landfall. At the present time, horizontal directional drilling (HDD), trenching, dredging, jetting, ploughing, rock cutting or vertical injection are being considered as options for laying the cables at the landfall.

3.8.4 Up to six export cable circuits will be required. The cables will be buried either in multiple separate trenches (up to six trenches, each containing one circuit), or with some circuits combined in a single larger trench. The cables may be installed directly into open trenches, or pulled through pre-installed ducting. The cables will be installed within an onshore ECR corridor, with an expected width of 80 m (this includes both the permanent installation area and temporary working area). The width of the permanent and/or temporary areas may change where obstacles are encountered.

3.8.5 Transition Joint Bays (TJB) will be required for the jointing between the offshore and onshore cables. This is a subsurface concrete box that will be accessed via a manhole. There will be up to eight TJBs with an area of approximately 250 $m^2$ each. Those TJBs will be located above MHWS and will likely be completely buried, hence the need for manholes for access.

3.8.6 Joint Bays will be required along the onshore route in order to join sections of onshore cable together. They will be similar to the TJB, but with smaller dimensions of approximately 150 $m^2$. They will be located approximately every 1 to 2.5 km along the onshore ECR. As with the TJBs, these will likely be completely buried, with manholes for access.

3.8.7 The exact onshore ECR corridor will be finalised prior to the EIA being completed once the landfall location is known. The cable routing will consider a wide range of human, biological and physical constraints as well as technical and commercial considerations.

3.8.8 The onshore export cable may need to cross infrastructure and obstacles such as roads, railways and rivers. The detail of how this will be carried out will be explored further when more is known about the onshore ECR corridor, however it is likely that a various methods will be used, including open cut trenching, and HDD, depending on the nature and complexity of each crossing. Hornsea Three will aim to undertake all major crossings, such as major roads, rivers and rail crossings using HDD.

### Onshore HVAC booster station

3.8.9 An onshore HVAC booster station is required for the HVAC transmission only; it is not required for HVDC transmission.

3.8.10 The onshore HVAC booster station would have the same purpose as an offshore HVAC booster station(s) and contain similar equipment. The equipment will either be housed within a single or multiple buildings, in an open yard or a combination of the above. The exact location, as well as requirements for landscaping, would be determined based upon a wide range of human, biological and physical constraints as well as technical and commercial considerations. The site selection methodology for the onshore HVAC booster station is described in Chapter 4: Site Selection Methodology and Consideration of Alternatives. The Design Envelope for the onshore HVAC booster station can be seen in Table 3.19 below.

Table 3.19 Design Envelope: onshore HVAC booster station.

| Parameter | Maximum Design Envelope |
|---|---|
| Permanent area of site for all infrastructure* ($m^2$) | 25,000 |
| Single building: length (m) | 150 |
| Single building: width (m) | 30 |
| Building: height (m) | 12.5 |
| Maximum lightning protection height (m) | 17.5 |

* Note – the onshore HVAC booster station may comprise of a single building or multiple buildings on the same site.

### Onshore substation

3.8.11 The onshore substation contains the electrical components for transforming the power supplied from the offshore wind farm to 400 kV and to adjust the power quality and power factor, as required to meet the UK Grid Code for supply to the National Grid. If a HVDC system is used it will also house equipment to convert the power from HVDC to HVAC. The equipment will either be housed within a single or multiple buildings, in an open yard or a combination of the above.

3.8.12 The Design Envelope for the onshore substation for both HVAC and HVDC options can be seen in Table 3.20 below. Hornsea Three will connect to the National Grid at the Norwich Main 400 kV substation, located between Swardeston and Stoke Holy Cross in South Norfolk.

Table 3.20 Design Envelope for onshore substation.

| Parameter | Maximum Design Envelope |
|---|---|
| Area of site ($m^2$) | 100,000 |
| Number of main buildings within the substation site | 5 |
| Width of main building (m) | 75 |
| Length of main building (m) | 150 |
| Height of main building(m) | 25 |

### Grid connection export cable

3.8.13 A further section of buried onshore export cabling is required to connect the Hornsea Three onshore substation with the National Grid substation. This section of cabling will be similar in design to the onshore export cabling, but must be HVAC at 400 kV.

### Construction compounds

3.8.14 The onshore works at the landfall, the onshore HVAC booster station (if required) and onshore substation will require the establishment of temporary construction compounds for the storage of materials and plant, as well as space for small temporary offices, welfare facilities, security and parking.

3.8.15 Construction compounds of various sizes will also be required along the onshore ECR corridor, for laydown and storage of materials, plant and staff, as well as operations such as out drilling works, where there are crossings of other infrastructure.

3.8.16 The construction compounds, if deemed necessary, will be removed and sites restored to their original condition when construction has been completed. The exact number, location and size of the compounds required will be confirmed once a substation location and onshore ECR have been developed. New temporary roads or access tracks for construction traffic are likely to be required at various points along the route, connecting compounds and construction sites to existing nearby roads. All compounds will be reinstated to their former condition following the construction phase, unless it is considered necessary to retain the use of a compound for a longer period post-construction.

## 3.9 Construction programme

3.9.1 A high-level indicative construction programme is presented in Figure 3.12 below. The programme illustrates the likely duration of the major installation elements, and how they may relate to one another if built out in a single construction campaign. It covers installation of the major components and does not include elements such as preliminary site preparation, and commissioning of the wind farm post-construction. Onshore construction is currently planned to commence in 2021.

3.9.2 Hornsea Three may also be split into two or more phases, including the potential for an overlap or a gap between the completion of construction of one phase and the start of construction of another.

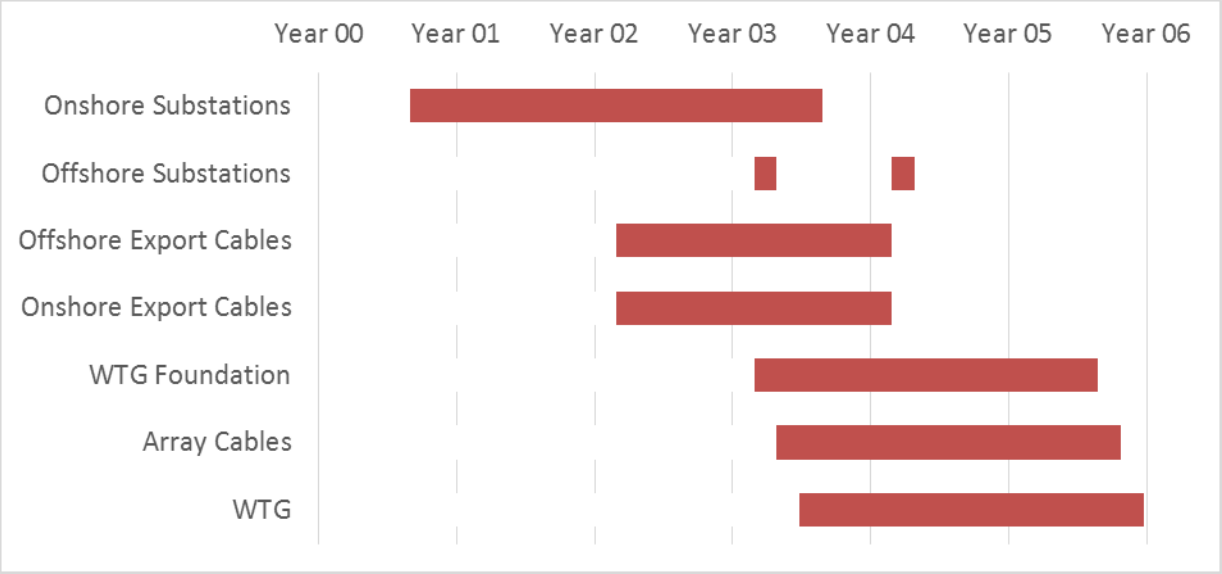



Figure 3.12 Indicative construction programme.

## 3.10 Operation and maintenance, and decommissioning phases

3.10.1 The indicative project programme outlined in Figure 3.12 above shows that the operation and maintenance phase will not commence until 2025, based on an onshore construction start date of 2021, with the decommissioning phase following the cessation of Hornsea Three. At this stage the exact activities undertaken during these phases are not known, however they will be further explored as part of the EIA and reported in the final Environmental Statement.

3.10.2 The overall operation and maintenance strategy will be finalised once the operation and maintenance onshore base location and technical specification of Hornsea Three are known, including turbine type, electrical export option and final project layout. The operation and maintenance strategy could include either an onshore operation and maintenance base, or an offshore operation and maintenance base (offshore accommodation platforms), or both. The general operation and maintenance strategy will rely primarily on crew vessels, offshore accommodation, supply vessels, and helicopters for the operation and maintenance services that will be performed at the wind farm.

3.10.3 Maintenance activities can be categorised into two levels: preventive and corrective maintenance. Preventive maintenance is according to scheduled services whereas corrective maintenance covers unexpected repairs, component replacements, retrofit campaigns and breakdowns. Onshore the operation and maintenance requirements will be largely corrective, accompanied by infrequent on-site inspections of the onshore transmission infrastructure. However the onshore infrastructure will be consistently monitored remotely, and there may be operation and maintenance staff visiting the onshore substation to undertake works on a regular basis.

3.10.4 At the end of the operational lifetime of the offshore wind farm, it is anticipated that all structures above the seabed or ground level will be completely removed. The decommissioning sequence will take approximately three years and will generally be the reverse of the construction sequence and involve similar types and numbers of vessels and equipment. The Crown Estate (TCE) Agreement for Lease (AfL) for Hornsea Three requires that the project is decommissioned at the end of its lifetime. Additionally, the Energy Act (2004) requires that a decommissioning plan must be submitted to the Secretary of State for Business, Energy and Industrial Strategy prior to the construction of Hornsea Three. The decommissioning plan and programme will be updated during Hornsea Three's lifespan to take account of changing best practice and new technologies.

3.10.5 This Scoping Report considers the potential likely significant environmental effects during both of these project phases for each receptor.

# 4. Site Selection Methodology and Consideration of Alternatives

## 4.1 Introduction

4.1.1 A summary of the considerations for site selection and alternatives of the major Hornsea Three components, onshore and offshore, is outlined below. The PEIR and resulting Environmental Statement will outline the stages of site selection that have been carried out in order to establish the offshore array, offshore export cables, landfall and onshore works. Furthermore, the Environmental Statement will set out any refinements to Hornsea Three that have taken place as a result of the EIA process and in response to consultation and stakeholder feedback and describe the main alternatives that have been considered as part of the process.

4.1.2 Factors influencing site selection for electricity transmission networks are summarised in Section 2.2 of NPS EN-5 (DECC, 2011c). In particular, NPS EN-5 states that "*the general location of an electricity network project is determined by the location of a particular generating station and the existing network infrastructure available to take electricity to centres of energy use*" (NPS EN-5, paragraph 2.2.2).

4.1.3 Accordingly, the starting point for site selection work is considered to be the two 'end points' of a project. In this case, the Hornsea Three array area, and the National Grid connection point. The following sections outline the process behind the identification of the Hornsea Three array area and the onshore grid connection point. It then goes on to discuss the site selection approach for the transmission infrastructure that will connect those two points.

## 4.2 Site selection methodology and consideration of alternatives

### Hornsea Three array area

4.2.1 The Hornsea Zone was originally identified by TCE using their Marine Resource System Geographic Information System (GIS) tool to identify suitable areas for offshore wind farm development as part of a Strategic Environmental Assessment (SEA) of the Round 3 offshore wind zone tendering process (DECC, 2009a).

4.2.2 TCE awarded SMart Wind Ltd the right to develop 4 GW of wind capacity in Zone 4 (the former Hornsea Zone), under the Round 3 Offshore Wind Licensing Arrangements. In August 2015, DONG Energy Power (UK) Ltd. acquired the Hornsea Round 3 Offshore Wind Zone from SMart Wind (including the SMart Wind Company itself) and the rights to develop within the former Hornsea Zone.

4.2.3 In 2016 DONG Energy reached an agreement with TCE for amended plans for the former Hornsea Zone. The changes increased the target capacity of the Hornsea Zone to 6 GW, as well as the termination of the Zone Development Agreement and the agreement of project specific agreements (AfLs) for Project One, Project Two, Hornsea Three and Hornsea Four.

4.2.4 Hornsea Three was identified via the Zone Appraisal and Planning (ZAP) process. ZAP is a term advocated by TCE to describe the non-statutory strategic approach to Zone design, project identification and consent for Round 3. The ZAP process allows developers to have greater control over the way a zone is developed and encourages a high-level strategic approach to planning and stakeholder engagement of the zone in terms of environmental, social and economic effects (particularly cumulative effects).

4.2.5 Hornsea Three has been identified via the ZAP process, whereby constraints (those considered to preclude offshore wind farm development) were mapped. The constraints used for project identification built upon the ones used by TCE, Marine Resource System and SEA.

4.2.6 Overlaying all constraints in the former Hornsea Zone enabled the location of Hornsea Three to be identified when considered in parallel with environmental and consenting constraints, such as known:

- Volume and routes of shipping;
- Civil and military aviation radar interference;
- Military air defence radar (ADR) interference;
- Ministry of Defence (MoD) training and practise and exercise areas;
- Commercial fishing interactions;
- Helicopter main routes (HMRs);
- Oil and gas surface installations with 9 NM consultation buffers;
- Active cables and pipelines and their buffers of 500 m according to a nominal 500 m proximity agreement requirement;
- Protected wrecks and their buffers according to the Protection of Military Remains Act 1986;
- Waste disposal sites and dredging sites;
- Other marine infrastructure including renewable developments (offshore wind farm developments), oil and gas activities, gas storage etc.;
- Recreational users;
- Nature conservation designations and other protected habitats;
- Fish spawning and nursery areas;
- Geological information;
- Geotechnical design parameters;
- Metocean considerations; and
- Foundation type suitability.

4.2.7 Following the site selection for the array area, the AfL to DONG Energy was granted by TCE in March 2016.

4.2.8 The Environmental Statement will further describe the background to the former Hornsea Zone and the evolution of Hornsea Three within this boundary. In addition, the Environmental Statement will outline the process that DONG Energy has followed to identify potential turbine layouts within the Hornsea Three array area, the main alternatives that were considered and the rationale for the selection of the final layout taking into account any modifications identified during consultation.

### Onshore grid connection: HVAC/HVDC substation

4.2.9 A number of potential connection locations were originally discussed with National Grid based on the capacity sought for the Project when connection to the grid would take place. A grid connection has consequently been offered by National Grid in relation to one grid connection location. A number of potential connection locations were originally discussed with National Grid based on the capacity sought for the Project when connection to the grid would take place. A grid connection has consequently been offered by National Grid in relation to one grid connection location. In July 2016, following initial site identification activities, DONG Energy was offered a grid connection by National Grid to connect Hornsea Three into the 400kV Norwich Main substation, located to the south of the City, 1.5 km beyond the ring road. That offer was accepted by DONG Energy in October 2016.

4.2.10 In order to connect Hornsea Three to the National Grid it will be necessary to construct a new HVAC/HVDC substation. The final location of the new onshore HVAC/HVDC substation is still to be determined but will be constructed within the onshore ECR corridor search area. In order to minimise the potential landscape and visual impact of the new onshore HVAC/HVDC substation it will be located as close as practicable to the existing 400 kV Norwich Main Substation site.

4.2.11 The selection of candidate onshore HVAC/HVDC substation sites within the onshore ECR search area will evolve using detailed constraints mapping, and preliminary surveys, technical feasibility studies and consultation feedback, considering a number of criteria, including:

- Site size and suitability in terms of the existing landscape context;
- Appropriate access opportunities for construction and ongoing operation and maintenance activities;
- Relationships with existing residential development;
- Relationship to other (known) planned development;
- Flood risk;
- Minimising interfaces with existing infrastructure;
- Proximity to Public Rights of Way;
- Minimising interface with sites designated at international and national level (SAC, SPA, Ramsar, SSSI); and
- Minimising interface with sites affected by heritage designations (Scheduled Ancient Monuments, Registered Parks and Gardens, listed buildings, known archaeological assets).

4.2.12 The selection of candidate onshore HVAC/HVDC substation sites will evolve further and be refined as Hornsea Three matures, building on the detailed constraints mapping, and using data collected through surveys, further analysis, and stakeholder feedback in the form of formal consultation, informal consultation and comments channelled through community consultation events.

4.2.13 The Environmental Statement will provide further detail on the process that DONG Energy has followed to identify potential sites for the development of the new infrastructure, including modifications identified during consultation, the main alternatives that were considered, and the rationale for the selection of the final option that is taken forwards.

### Transmission cables and associated infrastructure

4.2.14 In order to connect Hornsea Three to the National Grid Electricity Transmission (NGET) System, DONG Energy must install export cables between the Hornsea Three array area and the onshore grid connection point. The policy framework for projects requiring the installation of marine and terrestrial electricity transmission cables is provided in the Overarching NPS for Energy (EN-1) (DECC, 2011a), the NPS for Renewable Energy Infrastructure (EN-3) (DECC, 2011b) and the NPS Electricity Networks Infrastructure (EN-5) (DECC, 2011c).

4.2.15 As stated above, factors influencing site selection for electricity transmission networks are summarised in Section 2.2 of NPS EN-5 (DECC, 2011c). In particular, NPS EN-5 states that *"the general location of an electricity network project is determined by the location of a particular generating station and the existing network infrastructure available to take electricity to centres of energy use"* (NPS EN-5, paragraph 2.2.2). NPS EN-5 goes on to explain that *"it is not necessarily the case that a new connection should be via the most direct route, and this will be influenced by a number of factors, including environmental and engineering aspects".*

4.2.16 A range of different cabling connection options to transfer the electricity generated by the offshore wind turbines to the National Grid transmission system are currently under consideration. As set out in Chapter 3: Project Description, DONG Energy is proposing to transmit the electricity generated via buried HV cables using either DC or AC, or a combination of the two. As a result, the alternatives that have been considered for Hornsea Three consider both technology options. The final decisions will be reliant on the final wind turbine and electrical design, as well as a detailed analysis of the costs, technical aspects and available technology of the various options.

#### *Offshore export cable route (ECR) corridor*

4.2.17 The Hornsea Three offshore ECR corridor search area is formed by a wide corridor between the 'fixed' locations of the Hornsea Three array area and the 'landfall area' (see Section 4.2.21). A wide Hornsea Three offshore ECR corridor search area has been defined to allow for a number of refined offshore ECR corridor options within it to be further investigated.

4.2.18 The selection of the Hornsea Three final refined offshore ECR corridor will be determined following an engineering and environmental appraisal, as follows:

- Identify the shortest technically feasible ECR corridor;
- Identify flexible route options;
- Consistent staged approach to route planning supported by GIS-based Heat Mapping;
- Multi-disciplinary (site and land rights, legal, commercial, engineering, technical and consents) input to all workshops and deliverables; and

- All decisions and route changes documented and justified.

4.2.19 As Hornsea Three progresses, and as part of the EIA process, the Hornsea Three offshore ECR corridor options will be further refined as a result of environmental and technical studies, surveys and consultation in order to reflect and incorporate the information gathered at each stage.

4.2.20 By the time the application for Development Consent is submitted, Hornsea Three will have defined an offshore ECR corridor, which is anticipated to be approximately 1.5 km wide and run from the AfL to landfall on the North Norfolk coast. The Environmental Statement will further describe the process that DONG Energy has followed to identify the array area, including any material considerations identified during consultation, the main alternatives that were considered, and the rationale for the selection of the final option that is taken forwards.

### *Landfall*

4.2.21 A preliminary detailed cable landfall study has been carried out in order to select the most appropriate cable landfall areas for Hornsea Three. A single broad landfall area was identified and this is referred to as the landfall area throughout this Scoping Report.

4.2.22 The selection of the landfall area has evolved using detailed constraints mapping, which considered:

- Avoiding:
  - Land internationally designated for nature conservation (i.e. SPA, SAC);
  - Land used for defence purposes;
  - Common land;
  - High (>20 m) and geomorphically active coastal cliffs;
  - Excessive take of Grade 1 agricultural land;
  - Areas adjacent to railway lines;
  - Underground or subsea rock/solid substrates;
  - Steep gradients/banked verges;
  - Residential areas and industrial sites;
  - Areas of standing water; and
  - Areas of ancient woodland habitats or other areas of woodland likely to have nature conservation interest.
- Ensuring:
  - Suitable foreshore access for vehicles during construction;
  - Minimal length of HDD (or similar technology) to cross any sea defences;
  - Suitable working area to allow for drilling operations (if required);
  - Feasible installation of jointing bays and cable pull-in;
  - Suitable access for inspection and maintenance; and
  - Minimal crossings of linear natural features and infrastructure (e.g. rail, road, water and utilities);

4.2.23 To aid the site selection of the landfall area, a Red, Amber, Green (RAG) assessment methodology was applied (see Table 4.1). It should be noted that the RAG assessment reviewed existing constraint databases and this will evolve as further information becomes known of the landfall area.

Table 4.1 Red, Amber, Green (RAG) assessment methodology.

| Parameter | Proposed action | Score | Rank |
|---|---|---|---|
| High | Avoid at route selection | 3 | |
| Medium | Avoid if possible/mitigate | 2 | |
| Low | Mitigate/no action | 1 | |

4.2.24 'High' ranked constraints are critical in determining coastal landfall locations that should be avoided wherever possible to avoid consenting risk and reduce EIA complexity. 'Medium' and 'Low' rank constraints relate to areas that may be more readily minimised or managed by employing appropriate mitigation measures.

4.2.25 As Hornsea Three progresses, and throughout the EIA process, the landfall area will be further refined as a result of environmental and technical studies, surveys and consultation in order to reflect and incorporate the information gathered at each stage.

4.2.26 The Environmental Statement will further describe the process that DONG Energy has followed to identify potential cable landfall areas, including modifications identified during consultation and the rationale for the selection of shortlisted landfall areas and in turn the final landfall site location within the landfall area that is taken forwards.

### *Onshore export cable route (ECR) corridor site selection methodology*

4.2.27 A detailed onshore ECR study is being carried out in order to select the most appropriate onshore ECR corridor for Hornsea Three. The selection of candidate onshore ECR corridors and the final landfall area will evolve using detailed constraints mapping, considering a number of criteria, including:

- Minimising the number and complexity of major crossings of watercourses, roads, rail lines and existing infrastructure;
- Avoiding, where possible, residential development and existing settlements;
- Minimising interfaces with sites designated at international and national level (SAC, SPA, Ramsar, SSSI); and
- Minimising interfaces with sites affected by heritage designations (Scheduled Monuments, Registered Parks and Gardens, listed buildings, known archaeological assets).

4.2.28 The Environmental Statement will present the onshore ECR corridor work that is being undertaken including the main alternative options which were considered, and the rationale for the selection of the final option that is taken forward.

### *Onshore HVAC booster station site selection methodology*

4.2.29 If Hornsea Three is developed with the HVAC transmission, it may be necessary to develop an onshore HVAC booster station (or offshore HVAC booster station(s), see Table 3.12). This would be developed at a location along the onshore ECR corridor. Further information about this is provided in Chapter 3: Project Description, paragraphs 3.8.9 to 3.8.10.

4.2.30 The selection of candidate onshore HVAC booster station sites will evolve using detailed constraints mapping, and preliminary surveys, technical feasibility studies and consultation feedback, considering a number of criteria, including:

- Site size and suitability in terms of the existing landscape context;
- Appropriate access opportunities for construction and ongoing operation and maintenance activities;
- Relationships with existing residential development;
- Relationship to other (known) planning development;
- Flood risk;
- Minimising interfaces with existing infrastructure;
- Proximity to Public Rights of Way;
- Minimising interface with sites designated at international and national level (SAC, SPA, Ramsar, SSSI); and
- Minimising interface with sites affected by heritage designations (Scheduled Monuments, Registered Parks and Gardens, listed buildings, known archaeological assets).

4.2.31 The Environmental Statement will describe the process that DONG Energy has followed to identify potential sites for the development of the onshore HVAC booster station, the main alternatives that were considered and the rationale for the selection of the final option that is taken forward.

# 5. Environmental Impact Assessment (EIA) Methodology

## 5.1 Introduction

5.1.1 This section presents an outline of the EIA methodology to be employed for Hornsea Three. It outlines the methodology for the identification and evaluation of potential likely significant environmental effects and also presents the methodology for the identification and evaluation of potential cumulative and inter-related impacts, which includes due consideration of potential transboundary effects.

5.1.2 A systematic and auditable evidence based approach is proposed to evaluate and interpret potential effects on physical, biological and human receptors.

## 5.2 Basis of the assessment

### Regulations and guidance

5.2.1 The impact assessment methodology draws upon a number of EIA principles, regulations and guidance documents, including:

- The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009,
- Overarching NPS for Energy (NPS EN-1) (DECC, 2011a);
- NPS for Renewable Energy Infrastructure (NPS EN-3) (DECC, 2011b);
- NPS for Electricity Networks Infrastructure (NPS EN-5) (DECC, 2011c);
- The Planning Act 2008 (as amended);
- Guidelines for EIA (IEMA, 2004);
- Guidelines for Ecological Impact Assessment (EcIA) in the UK (IEEM, 2006); and
- Guidelines for EcIA in Britain and Ireland – Marine and Coastal (IEEM, 2010).

5.2.2 A revised EIA Directive was published in the European Union's Official Journal in April 2014. The UK Government is in the process of revising the various EIA Regulations that apply in the UK in order to reflect the requirements of the new directive. The European Commission has set a deadline of 16 May 2017 for these revised regulations to be published.

5.2.3 As work on Hornsea Three has already commenced, it is likely to be able to benefit from transitional arrangements meaning that the current regulations will still apply even if the new regulations are issued before the completion of the Hornsea Three Environmental Statement. However, dependent upon the date when the new regulations come into force, Hornsea Three will, where applicable, incorporate the new requirements from the regulations within the EIA work that leads to the preparation of the Hornsea Three PEIR and Environmental Statement.

5.2.4 A full account of applicable legislation and guidance taken into account within the EIA methodology will be documented within the Environmental Statement.

### The Design Envelope approach

5.2.5 The Hornsea Three EIA will utilise the Design Envelope approach, also known as the Rochdale Envelope approach. This approach allows for a project to be assessed on the basis of project design parameters that are not specific at the time of writing, but are indicated with a range of potential values. It is not possible to provide precise final details of the Project, or the way it will be built, a number of years ahead of the time it will be constructed. Additionally, the Project has yet to receive a significant amount of feedback from statutory and non-statutory stakeholders as part of the consultation process, and fully understand any potential significant impacts that need to be mitigated/managed, which will aid the refinement of the final application. As a relatively new industry, improvements in technology and construction methodologies occur frequently and information provided as part of the consent application could become rapidly outdated, resulting in an uneconomical and potentially unbuildable Project.

5.2.6 For each impact assessment the maximum adverse scenario from within the range of potential options for each development parameter will be identified, and the assessment will be undertaken on this basis. The Design Envelope approach employed for Hornsea Three is consistent with the Planning Inspectorate's (PINS) Advice Note Nine: Rochdale Envelope (PINS, 2012)[2].

5.2.7 Chapter 3: Project Description sets out the Hornsea Three Design Envelope parameters and identifies the range of potential project design values for all relevant components of the development. For each of the topic chapters (Chapters 7 to 12 below) within the Hornsea Three Environmental Statement and for each of the impacts assessed, the Design Envelope considered will be the scenario which would give rise to the greatest potential impact. For example, if several turbine types remain possible, then the assessment of the project will be based on the turbine type known to have the greatest impact. This may be the turbine type with the largest footprint, the greatest tip height or the largest area of seabed required during construction, depending upon the topic under consideration. If, after undertaking the impact assessment it is shown that no significant effect is anticipated, it can be assumed that any project parameters equal to or less than those assessed in this 'Design Envelope' will have environmental effects of the same level or less and will therefore also have no significant effect upon the receptors for the topic under consideration.

5.2.8 By employing the Design Envelope approach the developer retains flexibility in design of the offshore wind farm and associated offshore and onshore infrastructure within certain maximum extents and ranges, all of which are fully assessed in the Environmental Statement.

5.2.9 It is Hornsea Three's intention to refine the Design Envelope throughout the EIA process as further technical, environmental and design information becomes available.

5.2.10 Chapter 3, Section 3.2: Design Envelope Approach provides further detail on the Rochdale Envelope methodology employed for Hornsea Three.

[2] https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/05/Advice-note-9.-Rochdale-envelope-web.pdf

### The iterative approach and measures adopted as part of the project

5.2.11 The Hornsea Three EIA will utilise an iterative approach. This approach will be employed in order to demonstrate commitment to appropriate mitigation of project-related impacts by including them in the Hornsea Three project description (i.e. these will be measures adopted as part of the project).

5.2.12 The proposed methodology involves what is known as a "feedback loop" as illustrated in Figure 5.1. Impacts are initially assessed for significance of potential environmental effects. If the effect is significantly adverse, changes are made where practicable to the Hornsea Three design to reduce or offset the impact magnitude through measures adopted as part of the project. This process is repeated (as per Figure 5.1) until the EIA practitioner is satisfied that:

- The effect is reduced to a level that is not significant in EIA terms; or
- No further changes can be made to the project description to reduce the impact magnitude though measures adopted as part of the project (and hence the significance of the effect). In these cases, an overall effect that is still significant in EIA terms may be presented.

5.2.13 By employing this iterative approach, the significance of effect presented for each identified impact may be presumed to be representative of the maximum residual effect the development will have. Any agreed mitigation will ultimately form part of the requirements included in the DCO or the conditions within the deemed Marine Licences.

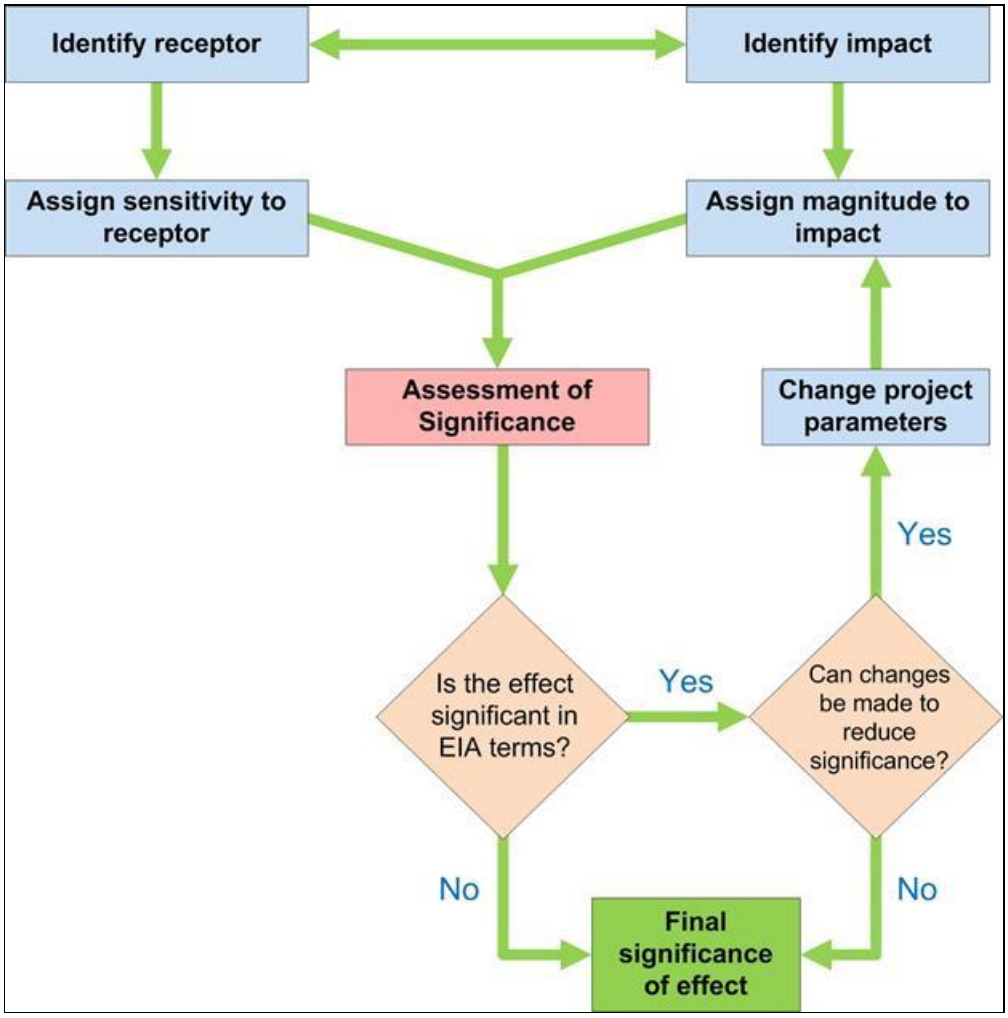



Figure 5.1 Proposed iterative approach to mitigation within the Hornsea Three Environmental Impact Assessment (EIA).

### Evidence based approach

5.2.14 Hornsea Three is located within the former Hornsea Zone, for which significant existing data and knowledge regarding the baseline environment is already available. This data/knowledge has been acquired through zonal studies and from the surveys and assessments undertaken for Project One and Project Two. There is also significant pre-existing technical work (including modelling and comprehensive assessments) to determine the likely potential environmental effects associated with Hornsea Three. It is therefore Hornsea Three's intention to maximise, where possible, the use of this data and assessments, in order to:

- Characterise the baseline environment to inform the EIA where data is sufficient and appropriate to do so;
- Scope out impacts where there is a clear evidence basis; and
- Where impacts are scoped in, to draw upon the pre-existing evidence base and previous impact assessment work where appropriate.

5.2.15 It is also important to maximise the use of this existing relevant data and assessments to the extent possible in the context of the offshore wind industry responding to strong government drivers to reduce the cost of offshore wind.

5.2.16 The topic chapters of this Scoping Report (Chapters 7 to 12) identify where the evidence base is being drawn upon to inform the EIA. In particular, where relevant, each topic chapter of this Scoping Report sets out:

- The data that has been obtained and the role of the current Project One, Project Two and zonal datasets, as well as publically available desktop data sources, in defining the baseline environment for Hornsea Three (see the following sections within each topic chapter: 'Baseline data' and 'Baseline environment');
- The role of the Project One, Project Two and zonal datasets, as well as publically available desktop data sources (including whether this data is sufficient, appropriate and contemporaneous) in the Hornsea Three impact assessments (see the following sections within each topic chapter: 'Potential project impacts'); and
- Where it is required necessary, a description of additional data that will be collected in order to inform the Hornsea Three impact assessment (see the following sections within each topic chapter: 'Potential project impacts').

5.2.17 As part of the pre-application consultation process, the nature of the existing baseline data, its sufficiency for the undertaking of the Hornsea Three assessment and any requirements for further data collection are currently being discussed with the relevant consultees (see Chapter 6: Consultation Process).

5.2.18 The Environmental Statement will also provide full justification for the use of the evidence base where applicable.

## 5.3 Impacts and effects

### Identification of impacts and assessment of significant effects

5.3.1 Hornsea Three has the potential to create a range of impacts and effects with regard to the physical, biological and human environment. For the purposes of the EIA, 'impact' is used to define a change that is caused by an action. For example, the piling of turbine foundations (action) will result in increased levels of underwater noise (impact). Impacts can be defined as direct, indirect, secondary, cumulative and inter-related. They can also be either positive or negative, although the relationship between them is not always straightforward. In addition, for certain impacts, the reversibility of an impact is relevant to its overall effect. An irreversible (permanent) impact may occur when recovery is not possible, or not possible within a reasonable timescale. In contrast, a reversible (temporary) impact is one where natural recovery is possible over a short time period, or where mitigation measures can be effective at reversing the impact.

5.3.2 The term 'effect' will be used in the EIA to express the consequence of an impact. Using the foundation piling example again, the piling of turbine foundations (action) results in increased levels of subsea noise (impact), with the potential to disturb marine mammals (effect).

### Defining magnitude of impact

5.3.3 The magnitude of an impact is the combination of extent, duration, frequency and reversibility of an impact. For each impact assessed within the EIA, a magnitude will be assigned. For each topic, the magnitude of impact will be categorised into the below scale:

- No Change;
- Negligible;
- Low;
- Medium; or
- High.

5.3.4 Scales of magnitude will be defined for each subject area within the EIA that is relevant to the particular receptor being assessed. Design of such topic-specific scales will draw upon relevant external guidance and specialist knowledge relevant to each topic.

### Defining sensitivity of receptor

5.3.5 Receptors will be defined as the physical or biological resource or user group that would be affected by the potential Hornsea Three impacts. Potential receptors will be informed by baseline studies.

5.3.6 In defining the sensitivity for each topic, the vulnerability, recoverability and value/importance will be taken into account.

5.3.7 The sensitivity of each receptor will then be defined for each topic according to the below scale:

- Negligible;
- Low;
- Medium;
- High; or
- Very High.

### Evaluation of significance of effect

5.3.8 Effect is the term used to express the consequence of an impact (expressed as the 'significance of effect'). The significance of an effect will be determined by the consideration of the magnitude of impact alongside the sensitivity of receptor. In order to ensure consistency, a matrix approach will be adopted for the EIA. An example of such an EIA matrix is given below in Table 5.1.

Table 5.1 Matrix used for assessment of significance, showing the combinations of receptor sensitivity and the magnitude of effect.

| Sensitivity of Receptor | Magnitude of Impact | | | | |
|---|---|---|---|---|---|
| | ***No Change*** | ***Negligible*** | ***Low*** | ***Medium*** | ***High*** |
| ***Negligible*** | Negligible | Negligible | Negligible or Minor | Negligible or Minor | Minor |
| ***Low*** | Negligible | Negligible or Minor | Negligible or Minor | Minor | Minor or Moderate |
| ***Medium*** | Negligible | Negligible or Minor | Minor | Moderate | Moderate or Major |
| ***High*** | Negligible | Minor | Minor or Moderate | Moderate or Major | Major or Substantial |
| ***Very High*** | Negligible | Minor | Moderate or Major | Major or Substantial | Substantial |

5.3.9 By cross-referencing the expected magnitude of impact with the sensitivity of receptor, a significance of effect may be assigned for all project impacts, as per Table 5.1. The significance of effect may be one, or a range of:

- Negligible;
- Minor;
- Moderate;
- Major; or
- Substantial.

5.3.10 These significance levels are defined in Table 5.2.

Table 5.2 Definition of significance levels.

| Term | Definition |
|---|---|
| Negligible | No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error. |
| Minor | These beneficial or adverse effects are generally, but not exclusively, raised as local factors. They are unlikely to be critical in the decision making process, but are important in enhancing the subsequent design of Hornsea Three. |
| Moderate | These beneficial or adverse effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse or beneficial effect on a particular resource or receptor. |
| Major | These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process. |
| Substantial | Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category. Effects upon human receptors may also be attributed this level of significance. |

5.3.11 A significance of an effect being moderate or greater, is generally considered significant in EIA terms unless otherwise stated, and will thus trigger additional analysis and potential consultation where deemed necessary. In cases where a range is suggested for the significance of effect, there remains the possibility that this may span the significance threshold (for example, the range is given as minor to moderate). In such cases the final significance is based upon expert opinion as to which outcome within the range is likely to be closer to the actual significance.

## 5.4 Cumulative Effects Assessment (CEA)

5.4.1 This section describes the proposed approach to the Cumulative Effect Assessment (CEA) for Hornsea Three[3]. Cumulative impacts are defined as those that result from incremental changes caused by other reasonably foreseeable actions or other major developments alongside Hornsea Three. Cumulative effects are therefore the combined effect of the assessed project in combination with the effects from a number of different projects, on the same single receptor/resource. A fundamental requirement of undertaking the CEA is to identify those foreseeable developments or activities with which Hornsea Three may interact to produce a cumulative impact. Interactions have the potential to arise during the construction, operation and maintenance, and decommissioning phases.

5.4.2 For the Hornsea Three CEA, other proposed major developments in the area will be taken into account within the CEA, including Project One and Project Two. PINS Advice Note Seventeen: Cumulative Effects Assessment Relevant to Nationally Significant Infrastructure Projects (PINS, 2015) recommends that, through consultation with Local Authorities and other relevant consenting bodies, other major developments (both onshore and offshore) in the area should be taken into account when conducting CEA, including those which are:

- Under construction;
- Permitted application(s), but not yet implemented;
- Submitted application(s) not yet determined;
- Projects on the National Infrastructure Planning Portal's Programme of Projects;
- Projects identified in relevant development plans; and
- Projects identified in other plans and programmes as may be relevant.

5.4.3 The CEA process is therefore divided into a screening stage and an assessment stage. The proposed process is broadly illustrated in Figure 5.2.

[3] For the purposes of the Hornsea Three EIA, cumulative effects are defined as the combined effect of the assessed project, in combination with the effects from a number of different projects, on the same single receptor/resource. In-combination effects are defined as the combined efffect of the project, in combination with the effects from a number of different projects, on European Conservation Site integrity. In-combination effects will be presented within the HRA.

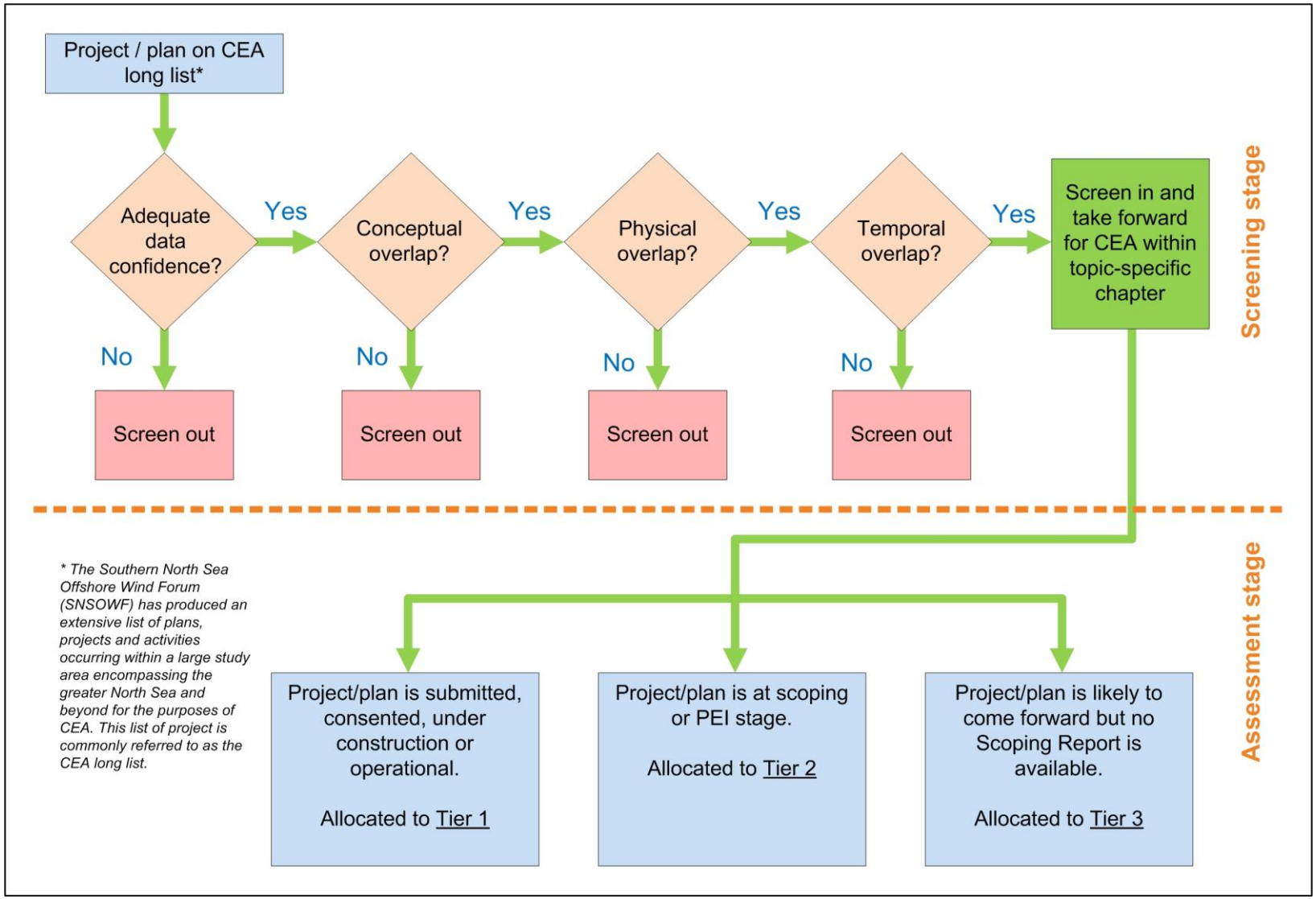



Figure 5.2 Proposed methodology for Hornsea Three for the screening of potential projects/plans to provide cumulative impacts.

### Screening stage

5.4.4 In order to provide a comprehensive CEA of all relevant projects, the Southern North Sea Offshore Wind Forum has produced an extensive list of plans, projects and activities occurring within a large study area encompassing the greater North Sea area and beyond. This list of projects is commonly referred to as the CEA long list. The CEA long list will act as one of the key information sources to identify projects that could potentially have a cumulative impact with Hornsea Three.

5.4.5 A specialised process will be developed and implemented within the EIA to methodically and transparently screen the large number of project and plans that may be considered cumulatively alongside Hornsea Three. This involves a stepwise process that considers the level of detail available for projects/plans, as well as the potential for interactions to occur on the following basis:

- Conceptual overlap - For a conceptual overlap to occur it must be established that such an impact has the potential to directly or indirectly affect the receptor(s) in question. In EIA terms this is described as an impact-receptor pathway and is defined here as a conceptual overlap;
- Physical overlap - A physical overlap refers to the ability for impacts arising from Hornsea Three to overlap with those from other projects/plans on a receptor basis. This means that, in most examples, an overlap of the physical extents of the impacts arising from the two (or more) projects/plans must be established for a cumulative impact to arise. Exceptions to this exist for certain mobile receptors that may move between, and be subject to, two or more separate physical extents of impact from two or more projects; or
- Temporal overlap - In order for a cumulative impact to arise from two or more projects, a temporal overlap of impacts arising from each must be established. It should be noted that some impacts are active only during certain phases of development, such as piling noise during construction. In these cases it is important to establish the extent to which an overlap may occur between the specific phase of Hornsea Three and other projects/plans. The absence of a strict overlap however may not necessarily preclude a cumulative impact, as receptors may become further affected by additional, non-temporally overlapping projects.

### Assessment stage

5.4.6 Once a project has been taken forward to the assessment stage, a tiered approach is proposed for the CEA. The tiered approach provides a framework to assist the decision maker in placing relative weight upon the potential for each project/plan assessed cumulatively to ultimately be realised, based upon the project/plan's current stage of maturity. The allocation of projects/plans into tiers is not affected by the screening process, but is merely a categorisation applied to all projects/plans that have been screened in for assessment.

5.4.7 The tiered approach uses the following categories:

- Tier 1: Hornsea Three considered alongside other project/plans currently under construction and/or those consented but not yet implemented, and/or those submitted but not yet determined and/or those currently operational that were not operational when baseline data was collected, and/or those that are operational but have an on-going impact;

- Tier 2: All projects/plans considered in Tier 1, as well as those on relevant plans and programmes likely to come forward but have not yet submitted an application for consent (the PINS programme of projects is the most relevant source of information). Specifically, this Tier includes all projects where the developer has submitted a Scoping Report; and
- Tier 3: All projects/plans considered in Tier 2, as well as those on relevant plans and programmes likely to come forward but have not yet submitted an application for consent (the PINS programme of projects is the most relevant source of information). Specifically, this Tier includes all projects where the developer has advised PINS in writing that they intend to submit an application in the future but have not submitted a Scoping Report.

5.4.8 The tiered approach is consistent with PINS Advice Note Seventeen: (PINS, 2015a) and the Renewable UK CIA Guidelines, specifically Guiding Principle 4 and Guiding Principle 7 (Renewable UK, 2013).

5.4.9 All projects/plans that have been screened into the CEA via the screening process will be allocated into one of the above Tiers and assessed for cumulative impact. Where practicable, the CEA methodology then follows the outline of the stand-alone assessment methodology as described above in Section 5.3. This approach allows consistency throughout the EIA and enables comparisons to be made.

## 5.5 Transboundary effects

### Legislation and guidance

5.5.1 Transboundary effects arise when impacts from the development within one European Economic Area (EEA) state affects the environment of another EEA state(s). The need to consider such transboundary effects has been embodied by the United Nations Economic Commission for Europe Convention on EIA in a Transboundary Context (commonly referred to as the 'Espoo Convention'). The Convention requires that assessments are extended across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary impacts.

5.5.2 The Espoo Convention has been implemented in the UK by the Infrastructure Planning (EIA) Regulations 2009 (as amended) in the UK. Regulation 24 sets out a prescribed process of consultation and notification. In addition, PINS Advice Note Twelve: Transboundary Impacts (PINS, 2015b) sets out the procedures for a consultation in association with an application for a DCO where such a development may have significant transboundary impacts.

5.5.3 The PINS Advice Note Twelve (PINS, 2015b) also sets out the procedure for screening, consulting and assessing transboundary issues. This procedure involves the following broad steps which are split into two stages:

- Stage 1:
  - Developer carries out pre-application consultation with EEA State(s);
  - Developer Notifies PINS of EIA potentially requiring transboundary assessment;
  - Developer prepares initial matrix to identify potential significant impacts on other EEA State(s) and provides to PINS;
  - The Secretary of State undertakes transboundary screening for potential significant impacts;

- Secretary of State notifies other relevant EEA State(s), including London Gazette notice; and
- Other EEA State(s) notify PINS of their wish to participate in the consultation.

- Stage 2:
  - Developer submits DCO application, including translated Non-technical Summary and a consultation report summarising pre-submission transboundary consultation that took place;
  - Secretary of State undertakes consultation with other relevant EEA State(s);
  - Other EEA State(s) consult with their public and provide comments to the Secretary of State; and
  - Consultation responses are taken account of by the Secretary of State in decision making process.

5.5.4 Hornsea Three will follow this broad process with regard to transboundary EIA, including any other guidance that may prevail at the time of undertaking the assessment.

### Screening

5.5.5 Identification and screening of transboundary impacts has been undertaken and is presented in Appendix A: Transboundary Impacts Screening. The screening exercise identified that the following receptors may experience transboundary impacts from the proposed Hornsea Three:

- Fish and shellfish ecology (Chapter 8, Section 8.2);
- Marine mammals (Chapter 8, Section 8.3);
- Ornithology (Chapter 8, Section 8.4);
- Commercial fisheries (Chapter 9, Section 9.1);
- Shipping and navigation (Chapter 9, Section 9.2): and
- Socio-economics (Chapter 12, Section 12.7).

## 5.6 Inter-related effects

5.6.1 Schedule 4, Part I of The Infrastructure Planning (EIA) Regulations 2009 (as amended) require a consideration of the inter-relationships between EIA topics that may lead to environmental effects. To serve as an example, the separate impacts of noise and habitat loss may in combination have an effect upon a single receptor, such as marine mammals. Such consideration of inter-related effects should also include cumulative impacts.

5.6.2 Guidance on inter-related effects is provided within PINS Advice Note Nine: Rochdale Envelope (PINS, 2012), which states that *"Inter-relationships consider impacts of the proposals on the same receptor. These occur where a number of separate impacts, (e.g. noise and air quality), affect a single receptor such as fauna*". The approach to inter-related effects will take into account this Advice Note, along with any other guidance that may prevail at the time.

5.6.3 The approach to the assessment of inter-related effects will consider two levels of potential effect:

- Project Lifetime Effects: Effects that occur throughout more than one phase of Hornsea Three; and
- Receptor-led Effects: Effects that interact spatially and/or temporally resulting in inter-related effects upon a single receptor.

5.6.4 The assessment of inter-related effects will be undertaken with specific reference to the potential for such effects to arise in relation to receptor groups. The term 'receptor group' is used to highlight the fact that the proposed approach to inter-relationships assessment will, in the main, not assess every individual receptor assessed at the EIA stage, but rather, potentially sensitive groups of receptors.

5.6.5 The broad approach to inter-related effects assessment will follow the below key steps:

- Review of effects for individual EIA topic areas;
- Review of the assessment carried out for each EIA topic area, to identify "receptor groups" requiring assessment;
- Potential inter-related effects on these receptor groups identified via review of the assessment carried out across a range of topics;
- Development of tables that list all potential effects on the selected receptor in construction, operational and decommissioning phases (project lifetime effects);
- Development of lists for all potential receptor-led effects; and
- Qualitative assessment on how individual effects may combine to create inter-related effects.

5.6.6 It is important to note that the inter-relationships assessment will consider only effects produced by the Hornsea Three development, and not those from other projects (these will be considered within the CEA).

# 6. Consultation Process

## 6.1 Background

6.1.1 Before an application for a DCO is submitted to PINS, extensive informal and formal statutory consultation with key stakeholders (local authorities, statutory bodies, the local community and interest groups) is required. This consultation is undertaken during the preparation of consultation material (including a draft DCO and PEIR), before the DCO application is made.

## 6.2 Pre-application consultation

6.2.1 With regards to the pre-application consultation, in brief, the Planning Act 2008 requires the Applicant to (DCLG, 2009):

- Consult with the relevant local authorities on what should be contained within the promoter's Statement of Community Consultation (SoCC), which will describe how the promoter proposes to consult the local community about the proposal;
- Have regard to the local authorities response to that consultation in preparing the SoCC;
- Publish the SoCC in a locally circulating newspaper, as required by secondary legislation, and carry out consultation in accordance with the SoCC (this Scoping Report will help to inform that consultation exercise);
- Consult a range of statutory consultees as identified by PINS (this Scoping Report will help inform that consultation exercise);
- Set a deadline of at least 28 days by which responses to consultation must be received;
- Notify PINS of the proposed DCO application;
- Publicise the proposed application in accordance with regulations in secondary legislation;
- Have due regard to relevant responses to publicity and consultation within the DCO application; and
- Prepare a Consultation Report and submit it to PINS with the DCO application and Environmental Statement.

6.2.2 The broad consultation process, together with the associated timeframes, are summarised in Figure 6.1 below.

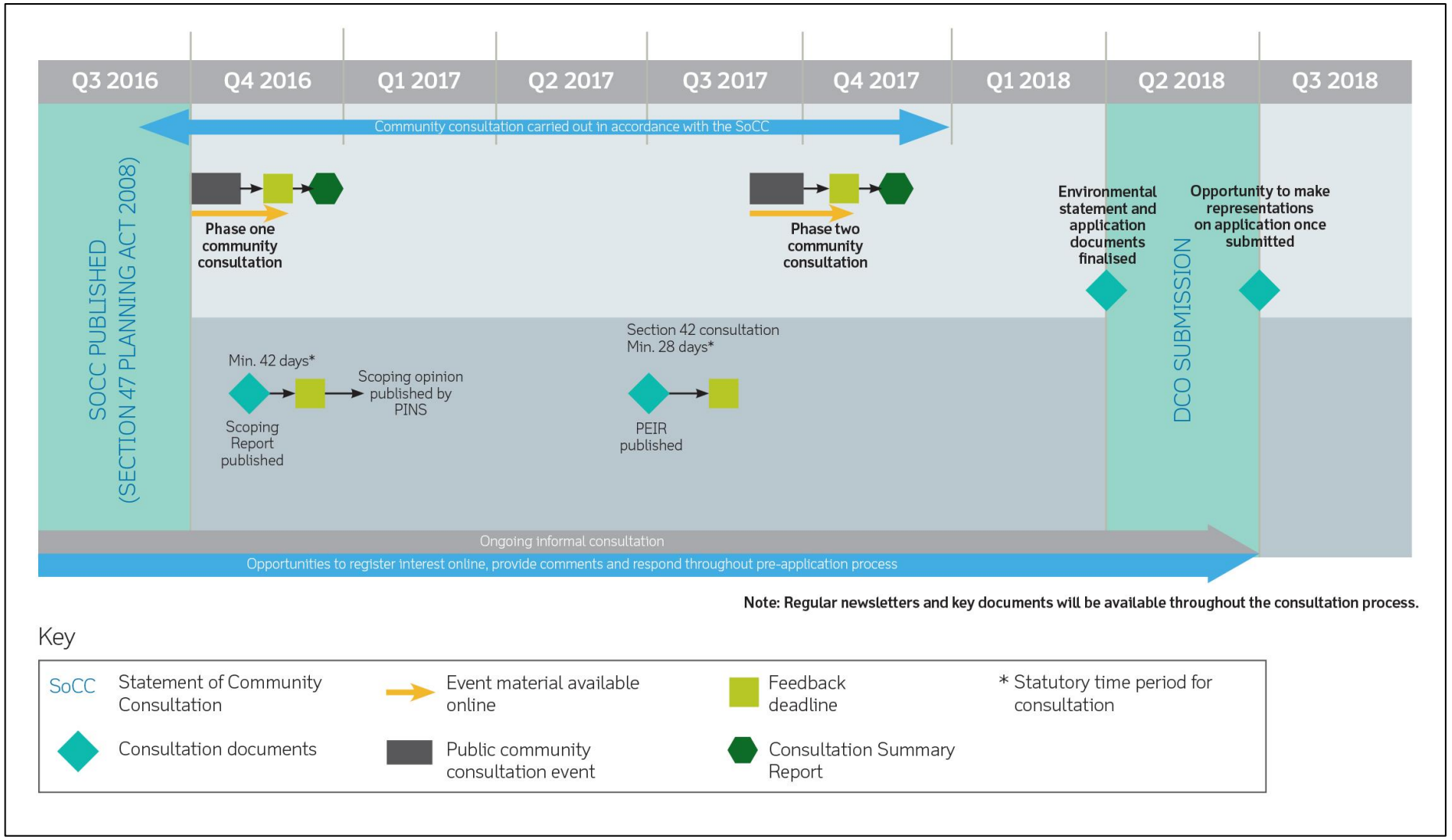



Figure 6.1 Summary of the Hornsea Three consultation process.

## 6.3 Statement of Community Consultation (SoCC)

6.3.1 Under Section 47 of the Planning Act (2008), the applicant has a duty to prepare a SoCC, which sets out how it plans to consult local communities on the proposed development, and must conduct its consultation in line with this statement. The applicant must consult on and agree the contents of the SoCC with each of the local authority, in whose area the proposed development is situated (as prescribed in section 43(1)).

6.3.2 In the case of Hornsea Three, land directly affected by the onshore works may come under the local authority jurisdiction of the following organisations:

- North Norfolk District Council;
- Broadlands District Council;
- South Norfolk District Council; and
- Norfolk County Council.

6.3.3 The above organisations were consulted on the contents of a draft SoCC in July 2016.

6.3.4 In addition to those organisations listed above, a number of local authorities in close proximity to the onshore works associated with Hornsea Three were consulted on the draft SoCC. Specifically this included:

- Norwich City Council;
- Breckland District Council;
- Broads Authority; and
- Great Yarmouth Borough Council.

6.3.5 The SoCC in its final format was published on 30th September 2016 and copies issued in local newspapers the following week. A copy can also be found on the Project Three website under the 'Public Consultation' tab (www.dongenergy.co.uk/hornseaproject3).

## 6.4 Consultation

### Consultation undertaken to date

6.4.1 In preparing this Scoping Report, consultation with a number of stakeholders has been undertaken. This early engagement is outlined in Table 6.1 below. This summarises consultation to date only and does not include all stakeholders and topics that will be discussed as Hornsea Three progresses.

6.4.2 In order to progress the Hornsea Three EIA, it is the Applicant's intention to build upon this initial consultation undertaken to date and to actively engage with all key stakeholders throughout the pre-application process. An overview of the key consultation phases are provided below.

Table 6.1 Consultation undertaken to date to inform the Hornsea Three Scoping Report and subsequent Environmental Impact Assessment.

| Topic chapters | Stakeholders | Areas of discussions to date | Key areas of agreement between the parties |
|---|---|---|---|
| ***Offshore*** | | | |
| Marine, processes, benthic subtidal and intertidal ecology, and fish and shellfish ecology. | Natural England, Cefas, MMO and The Wildlife Trust. | Present the existing baseline data sources for both the Hornsea Three array area and offshore ECR corridor, and to discuss the requirement for the collection of additional baseline data. | It was agreed that existing metocean data is sufficient and appropriate top inform the EIA. All other discussions are ongoing. |
| Marine mammals | Natural England, MMO and The Wildlife Trust. | Present the existing baseline data sources for both the Hornsea Three array area and offshore ECR corridor, and to discuss the requirement for the collection of additional baseline data. | It was agreed that one year of aerial surveys will be undertaken to inform the marine mammal EIA. |
| Offshore ornithology | Natural England, MMO and the Royal Society for the Protection of Birds (RSPB). | Present the existing baseline data sources for both the Hornsea Three array area and offshore ECR corridor, and to discuss the requirement for the collection of additional baseline data. | It was agreed that one year of aerial surveys will be undertaken to inform the offshore ornithology EIA. |
| Shipping and navigation | Maritime and Coastguard Agency (MCA) and Trinity House Lighthouse Service (THLS) | To introduce the Project and to discuss the approach to the corridor between Hornsea Three and the other former Hornsea Zone wind farm developments; Project One and Project Two. | Discussions are ongoing. |
| Aviation, military and communications | Joint Radio Company (JRC) | To request an assessment of the potential for Hornsea Three to interfere with radio systems operated by utility companies in support of their regulatory operational requirements. | JRC confirmed that, based on the current project description, they do not foresee any potential interference with radio systems. |
| | National Air Traffic Services (NATS) | To request an assessment of the potential for Hornsea Three to affect any radar or communication systems operated or controlled by NATS. | NATS confirmed that, based on the current project description, they have no objections to Hornsea Three. |
| | The Office of Communications (Ofcom) | Email request for microwave fixed links within search area of Hornsea Three array. | Ofcom identified three fixed links within range of Hornsea Three array, operated by Centrica and ConocoPhillips. |
| Marine archaeology | Historic England | Present the existing baseline data sources for both the Hornsea Three array area and offshore ECR corridor, and to discuss the requirement for the collection of additional baseline data. | It was agreed that the geophysical survey of the Hornsea Three array area and offshore ECR corridor was sufficient and appropriate to inform the marine archaeology EIA. |
| Seascape and visual resources | Natural England | To present the baseline environment and to agree the approach to the assessment. | It was agreed that the sea to land present day visual impact of Hornsea Three could be scoped out of the EIA due to the distance from shore. |

| Topic chapters | Stakeholders | Areas of discussions to date | Key areas of agreement between the parties |
|---|---|---|---|
| Infrastructure and other users | A number of other offshore wind farms, including Project One, Project Two and Norfolk Vanguard Offshore Wind Farm. | To provide an overview of Hornsea Three and to obtain an understanding of current and proposed activities in the vicinity of Hornsea Three. | Discussions are ongoing. |
| | Oil and Gas Authority (OGA) | To obtain an understanding of new or pending legislation requirements and an understanding of current and proposed oil and gas activities in the southern North Sea. | Discussions are ongoing. |
| | A number of oil and gas stakeholders, including Centrica, ConocoPhillips, INEOS and Wintershall. | To provide an overview of Hornsea Three and to obtain an understanding of current and proposed activities in the vicinity of Hornsea Three. | Discussions are ongoing. |
| | Coal Authority | To request information on any coal licence area that are within the Hornsea Three array area or offshore ECR corridor or that may be affected by the offshore elements of the project. | At the present time, there are no licences or other access agreements in place and there are no applications being processed. |
| ***Onshore*** | | | |
| General (multiple topics) | Norfolk County Council, North Norfolk District Council, Broadlands District Council, South Norfolk District Council, Environment Agency, Natural England | Introduction to Hornsea Three, including an overview of the key elements of the project. | Discussions are ongoing. |
| General (multiple topics) | Norfolk County Council | To discuss the location and status of safeguarded mineral sites in the vicinity of Hornsea Three. | Discussions are ongoing. |
| Ecology and Nature Conservation | Natural England | Present the initial findings of the desktop study and extended Phase 1 habitat survey. | Discussions are ongoing. |
| Landscape and Visual Resources | South Norfolk District Council | To discuss the draft Zone of Theoretical Visibility and location of viewpoints for the landscape and visual impact assessment. | Discussions are ongoing. |
| Onshore Historic Environment | Norfolk County Council | To provide an overview of the approach to, and results of, the historic desk based assessment and to discuss the need for a geophysical survey of the onshore ECR corridor prior to the application for Development Consent. | Discussions are ongoing. |

## Phase One Consultation

### *Overview and Scoping*

6.4.3 DONG Energy has prepared this Scoping Report during the Phase One Consultation. PINS, having received this Scoping Report, will consult with the relevant authorities and key statutory consultees to seek their comments on the scope of the proposed studies. In addition to the bodies that PINS will formally consult, Hornsea Three will make the Scoping Report available to other consultees (stakeholders) via the Project website (www.dongenergy.co.uk/hornseaproject3), however will not consult on this directly – this being the role of PINS. Following consultation with statutory consultees on the scoping of the EIA, the Secretary of State will provide a Scoping Opinion.

6.4.4 In parallel to feedback in the form of the Scoping Opinion, DONG Energy will also hold a number of public consultation events (a minimum of two separate phases of events), at various locations in and around the onshore ECR corridor search area. Anyone who could potentially be affected by, or may have an active interest in Hornsea Three is encouraged to attend.

### *How to get involved in the Phase One Consultation - Community consultation events*

6.4.5 The first round of community consultation events will be held from 31st October - 9th November 2016, at various locations in local authorities across the consultation zone (details can be found in the SoCC via the Project Three website; www.dongenergy.co.uk/hornseaproject3). At these events, members of the public will be able to view up-to-date Hornsea Three information, including maps of Hornsea Three and diagrams illustrating the proposed infrastructure. They will be able to speak directly with members of the Hornsea Three team and ask any questions or raise any concerns they may have with regards to the proposal. Attendees will have the opportunity to complete a feedback form either on the day or online, and a Consultation Summary Report will be produced and made available online. The Consultation Summary Report will capture all of the views expressed during the Phase One Consultation events (a similar report will also be produced following Phase Two Consultation). Information from the Consultation Summary report will be fed back to stakeholders, however this will not replace the Consultation Report which will be submitted with the final DCO application (information from it will feed into the final Consultation report however).

## Phase Two Consultation

### *Overview*

6.4.6 Phase Two Consultation is marked by the beginning of formal consultation (Section 42 of the Planning Act (2008)) on the PEIR. This document will build upon and utilise the Scoping Report and Scoping Opinion, and comments received from the consultation process.

6.4.7 In parallel to this formal consultation with statutory consultees, DONG Energy will hold a second round of public consultation events, in local authorities across the consultation zone. At this stage, DONG Energy will specifically consult stakeholders and the local community on the contents of the PEIR and following this additional Community Consultation events are envisaged to be held in Quarter 3 of 2017[4].

### *Preliminary Environmental Information Report (PEIR)*

6.4.8 The EIA Regulations require preliminary environmental information (PEI) to be provided for public consultation by those seeking a DCO for NSIPs. The level of detail required in the PEI is not defined by the EIA regulations; however it must cover those areas being assessed by the Environmental Statement, which will accompany the application for Development Consent. The PEIR will incorporate the findings of the surveys and initial assessments and will enable consultees to develop an informed view of the potential environmental effects of Hornsea Three. DONG Energy will be seeking feedback on this from statutory consultees, local communities and interested parties.

6.4.9 DONG Energy plans to submit and consult upon an initial PEIR for Hornsea Three as part of Phase Two consultation during the summer of 2017. The initial PEIR is intended to allow those taking part in the consultation to understand the nature, scale, location and likely significant environmental effects of Hornsea Three, such that they can make an informed contribution to the process of pre-application consultation under the Planning Act 2008 and to the EIA process.

6.4.10 DONG Energy plan to further refine the Hornsea Three Project proposal, in terms of the detailed consent application to be submitted, based upon the consultation responses received from the PEI process. The final results of the EIA will be presented in an Environmental Statement and a summary of all the consultation responses received will be presented in a final Consultation Report, both of which will accompany the DCO application.

### *Community consultation events*

6.4.11 A second round of community consultation events will be held in Quarter 3 of 2017 following the publication of the PEIR. The dates, venues and times will be confirmed nearer to the time and advertised online and in local media.

6.4.12 During these consultation events, Hornsea Three will be able to present a more refined scheme for development, on which members of the public can comment. As with the first round of events, attendees will be asked to complete a feedback form and a summary of responses will be circulated afterwards in the form of another Consultation Summary Report (again, not the final Consultation Report).

## 6.5 Application for Development Consent

6.5.1 The application for Development Consent will be submitted in Quarter 2 of 2018. The Environmental Statement that will be submitted to accompany the application for Development Consent will be prepared taking into account the responses to the Phase One and Phase Two Consultation, which will be captured in the Consultation Report that will accompany the application.

[4] Final dates to be confirmed at a later date – project website will show these next year (www.dongenergy.co.uk/hornseaproject3)

# 7. Offshore Physical Environment

## 7.1 Marine processes

### Introduction

7.1.1 This section of the Scoping Report identifies the elements of the offshore physical environment of relevance to Hornsea Three and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (up to the MHWS mark) of Hornsea Three on the offshore physical environment.

7.1.2 For the purposes of this Scoping Report and subsequent EIA, the offshore physical environment is defined as encompassing the following elements:

- Tidal elevations and currents;
- Waves;
- Bathymetry;
- Geology and seabed sediments;
- Suspended sediments; and
- Sediment transport.

7.1.3 The parameters listed above are collectively referred to as 'marine processes' through the remainder of this Scoping Report.

### Study area

7.1.4 The marine processes study area for Hornsea Three is defined as:

- The Hornsea Three array area;
- The Hornsea Three offshore ECR corridor search area;
- The Hornsea Three landfall area; and
- The seabed and coastal areas surrounding these areas that may be influenced by changes to marine processes due to Hornsea Three.

### Baseline data

7.1.5 An initial desk based review of literature and data sources to support this Scoping Report has identified a number of baseline datasets in the form of both pre-existing, non-project specific and project specific datasets. Non-project specific datasets are listed in Table 7.1 below (this list is not exhaustive and identifies key datasets only).

7.1.6 Datasets collected as part of the Hornsea Three development and datasets available within the former Hornsea Zone (for example via Zonal Characterisation (ZoC) surveys) are described in the sections below.

Table 7.1 Primary non project specific data sources for marine processes.

| Topic | Data source |
|---|---|
| Tidal Elevations and Currents | Admiralty Tide tables; Water level data from the National Tide and Sea Level Facility (NTSLF) (http://www.ntslf.org/) (NTSLF, 2016); Co-tidal and Co-range charts (UKHO, 1996); the Atlas of UK Marine Renewable Energy Resources (ABPmer, *et al.,* 2008); British Oceanographic Data Centre (BODC) current records (http://www.bodc.ac.uk/) (BODC, 2016); and UK Hydrographic Office (UKHO) TotalTide records. |
| Waves | Cefas WaveNet wave data (https://www.cefas.co.uk/cefas-data-hub/wavenet/); and ABPmer Seastates hindcast wave data (www.seastates.net) (ABPmer, 2013). |
| Bathymetry | Bathymetry data from (a) the UK Hydrographic Office INSPIRE portal (http://aws2.caris.com/ukho/mapViewer/map.action) (UKHO, 2016) and (b) harmonised Digital Terrain Model (DTM) for the European sea regions generated by the EMODnet Bathymetry partnership (http://www.emodnet-hydrography.eu/) (EMODnet, 2016). |
| Geology and Seabed Sediments | North Sea Geology. Strategic Environmental Assessment - SEA2 and SEA3 (BGS, 2002a); Various British Geological Survey (and Rijks Geologische Dienst) Solid Geology, Quaternary Geology and Seabed Sediments mapping; and The Humber Regional Environmental Characterisation (Tappin *et al*., 2011). |
| Suspended Sediments | Satellite derived surface Suspended Particulate Matter (SPM) observations. Dolphin *et al*. (2011); and data from the Land-Ocean Interaction: Measuring and Modelling Fluxes from River Basins to Coastal Seas (Huntly *et al*., 2000). |
| Sediment Transport | A synthesis of current knowledge on the genesis of the Great Yarmouth and Norfolk Bank Systems. Cooper *et al*. (2008); Southern North Sea Sediment Transport Study 2 (SNS2). HR Wallingford *et al*., (2002); and Sandbanks, sand transport and offshore wind farms. Kenyon and Cooper, (2005). |
| Landfall Area | Coastal monitoring data collected by the Anglia Regional Coastal Monitoring Programme (available through http://www.channelcoast.org/) (Channel Coastal Observatory, 2016); National Coastal Erosion Mapping (NCERM), http://maps.environment-agency.gov.uk (Environment Agency, 2016); Shoreline Management Plans; Sheringham Shoal Offshore Wind Farm Environmental Statement (Scira Offshore Energy, 2006); Dudgeon Offshore Wind Farm Environmental Statement. |

### *Project specific data sources*

#### *Hornsea Three array area and Hornsea Three offshore ECR corridor search area*

7.1.7 Details are provided below of both planned and existing project specific data sources of relevance to marine processes. More specifically a description is provided below of the availability of the following: metocean data, seabed sediments data and geophysical data.

7.1.8 A metocean baseline data collection programme has been carried out within the former Hornsea Zone between June 2010 and March 2012. The collected data has been used within the marine processes assessments presented in the Project One and Project Two EIAs. This included processing and analysis of the datasets and the use of the collected data in the setup and calibration of numerical models.

7.1.9 Monitoring has been carried out of tidal heights, currents, waves, suspended sediment concentrations (SSC) and meteorological parameters at six locations (referred to as L1 to L6) in addition to telemetered wave data at one location north of the development zone (L7, later moving to L7a). A summary of the equipment and deployment locations is provided in Table 7.2, and the locations are also shown on Figure 7.1. Data was collected in two phases, with phase 1 deployments commencing in June 2010 and phase 2 deployments commencing in September 2010 (see Table 7.2 for individual recovery dates).

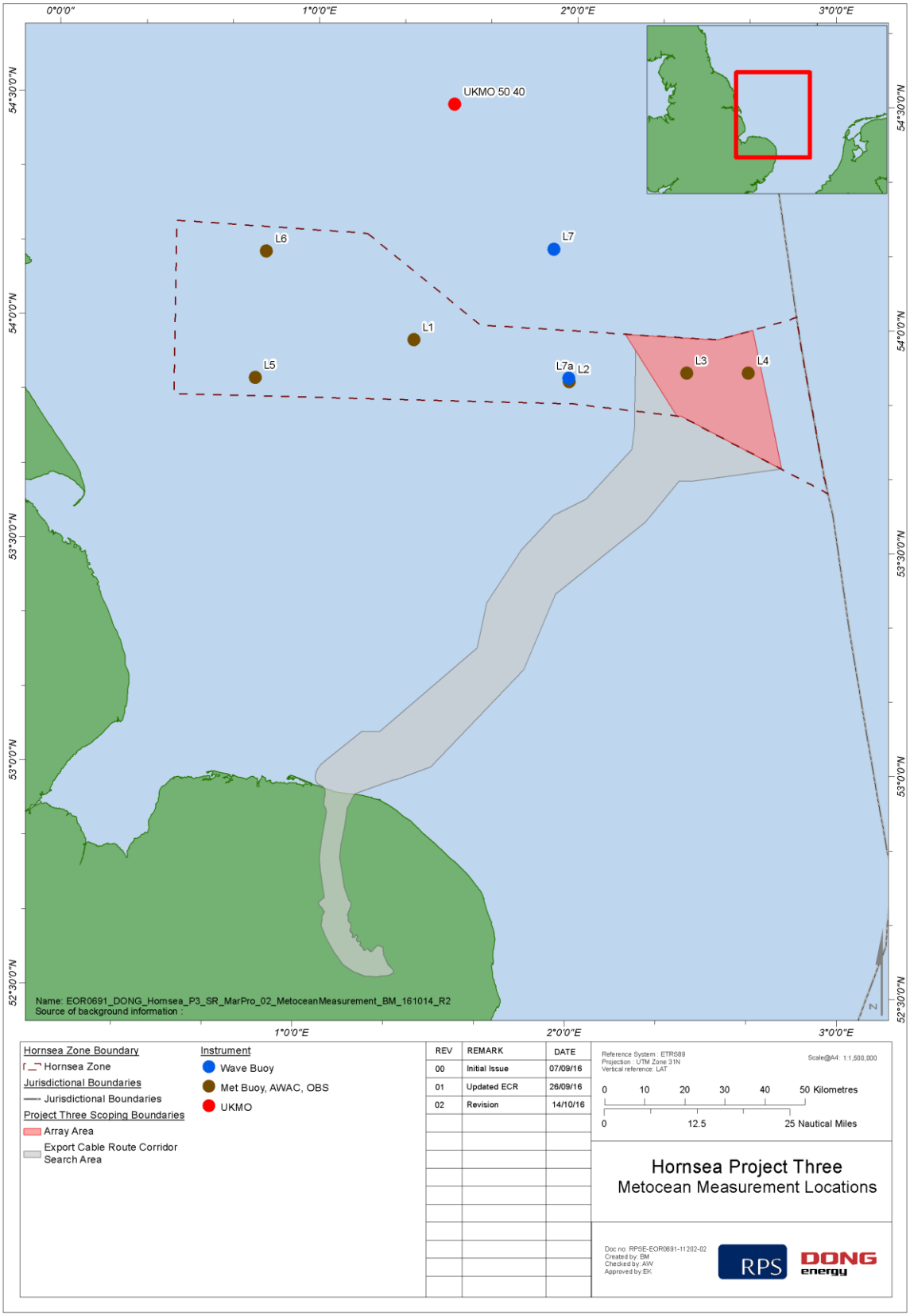



Figure 7.1 Marine processes metocean data measurement locations across Project One, Project Two, Hornsea Three and the wider former Hornsea Zone.

7.1.10 At Well Bank Flat (L1) to Ravenspurn Field (L6) seabed mounted Acoustic Wave And Current (AWAC) profilers were deployed with an associated Optical Back Scatter (OBS) and temperature sensor. The AWAC profiler was capable of recording current profiles, tidal heights, directional wave data and acoustic backscatter (ABS) profiles. In addition, a meteorological data buoy was deployed at each of the locations in order to characterise the meteorological conditions across the zone.

7.1.11 In terms of geophysical data, as part of the development of Hornsea Three, a geophysical survey of the Hornsea Three array area was completed in summer 2016. The outputs of this survey will feed in to the marine processes assessment and more specifically will provide information regarding seabed topography and morphology, and sub-bottom geology across the array area. A similar geophysical survey within the Hornsea Three offshore ECR corridor search area was completed in Quart 3 of 2016 providing a further input of information to the marine processes assessment.

7.1.12 Data characterising seabed sediments across the Hornsea Three array area and offshore ECR corridor search area are available from grab samples collected as part of site specific subtidal benthic ecology surveys. These datasets provide particle size data to inform the marine processes assessment. Details of the number and location of samples available is presented in Chapter 8, Section 8.1: Benthic Subtidal and Intertidal Ecology.

7.1.13 In addition, as part of the Hornsea Three development, a geophysical and geotechnical survey at the Hornsea Three landfall area has also taken place. This will provide additional characterisation of the surface and subsurface conditions at the landfall to support the marine processes assessment (see Table 7.4).

Table 7.2 Summary of metocean equipment and deployment locations.

| Location name | Location ID | Instrument | Latitude | Longitude | Deployment date | Recovery date |
|---|---|---|---|---|---|---|
| Well Bank Flat | L1 | Meteorological data buoy, AWAC profiler and OBS sensor. | 53°58.200'N | 001°23.580'E | 29/06/2010 | 04/07/2011 |
| Inner Well Bank Rough | L2 | Meteorological data buoy, AWAC profiler and OBS sensor. | 53°52.950'N | 001°59.190'E | 29/06/2010 | 04/09/2011 |
| Chiswick Field | L3 | Meteorological data buoy, AWAC profiler and OBS sensor. | 53°54.250'N | 002°25.900'E | 29/06/2010 | 04/09/2011 |
| Windermere Field | L4 | Meteorological data buoy, AWAC profiler and OBS sensor. | 53°54.277'N | 002°39.993'E | 24/09/2010 | 03/09/2011 |
| Off Ground | L5 | Meteorological data buoy, AWAC profiler and OBS sensor. | 53°52.539'N | 000°47.683'E | 23/09/2010 | 28/07/2011 |
| Ravenspurn Field | L6 | Meteorological data buoy, AWAC profiler and OBS sensor. | 54°09.584'N | 000°49.345'E | 23/09/2010 | 28/07/2011 |
| Outer Well Bank | L7 | Directional Waverider (DWR) buoy. | 54°10.710'N | 001°55.249'E | 20/11/2010 | 28/07/2011 |
| Schooner Field | L7a | DWR buoy. | 53°53.370'N | 001°59.100'E | 03/09/2011 | 26/03/2012 |

## Baseline environment

### *Tidal elevations and currents*

#### *Hornsea Three array area*

7.1.14 The Hornsea Three array area is situated in a semi-diurnal tidal setting with a meso-tidal range. In this area, the tidal wave propagates from north to south (i.e. high tide occurs earlier in the north and moves southwards) and tidal range is found to increase in an east to west direction.

7.1.15 Ebb tidal currents are to the northwest; flood tidal currents are to the southeast. Tidal current speeds increase with an east to west gradient. At metocean deployment location L4 (the eastern margin of Hornsea Three array area), maximum (metonic) tidal current speeds are 0.67 $ms^{-1}$; at L3 (the western margin of Hornsea Three array area), maximum tidal current speeds are 0.71 $ms^{-1}$. More generally, mean spring tidal current velocities within the site are ~0.5 $ms^{-1}$, with equivalent neap velocities of ~0.25 $ms^{-1}$ (Emu, 2011a).

7.1.16 The region is affected by storm surges with the 50-year return period positive storm surge elevation approximately 2 m within the Hornsea Three array area (Flather, 1987; HSE, 2002).

#### *Hornsea Three offshore ECR corridor search area*

7.1.17 Along the Hornsea Three offshore ECR corridor search area the tidal range increases with greater proximity to the Norfolk coast.

7.1.18 Similar to tidal range, mean spring peak currents increase with proximity to the Norfolk coast. Peak current speeds on a mean spring tide are around 0.5 $ms^{-1}$ at the offshore terminus of the Hornsea Three offshore ECR corridor search area, increasing up to approximately 1.0 $ms^{-1}$ in nearshore areas (ABPmer *et al*., 2008).

### *Waves*

#### *Hornsea Three array area*

7.1.19 In the vicinity of the Hornsea Three array area, during summer and autumn the prevailing winds come from the southwesterly quadrant (Emu, 2011a). During the winter and spring, winds from northerly sectors are more common and often these are associated with longer period swell waves propagating into the North Sea from the North Atlantic.

7.1.20 Based on Met Office hindcast wave data available close to the former Hornsea Zone, the estimated average wave heights for summer and winter are 1.2 m and 1.8 m, respectively, and associated periods increase from 7.8 to 8.0 seconds during the summer, to 8.2 to 8.5 seconds in the winter (SMart Wind, 2012b).

#### *Hornsea Three offshore ECR corridor search area*

7.1.21 In the deeper offshore areas of the ECR corridor, waves will travel across the sea surface without major modification and the wave regime will have similar characteristics to that described above for the Hornsea Three array area. However, as the waves move into shallower water, refraction, shoaling (wave steepening) and potentially wave breaking will occur. As a consequence of the above processes, the wave regime within inshore and nearshore areas will be of a generally similar or smaller wave height and period than offshore areas, but may also exhibit a degree of spatial variability owing to the sheltering effect of the banks further offshore.

### Bathymetry

#### Hornsea Three array area

7.1.22 Within the Hornsea Three array area, the shallowest depths (approximately 25 mLAT) are found in the central and eastern parts, and the deepest depths are found along the northern boundary (associated with Outer Silver Pit; approximately 60 mLAT) and in central areas (associated with Markham's Hole; approximately 70 mLAT). These glacial tunnel valleys formed during Quaternary glacial episodes and are a characteristic feature of the regional-scale bathymetry (Praeg, 2003; Graham *et al*., 2011). Across the remaining Hornsea Three array area, the water depths typically vary between 30 mLAT and 40 mLAT.

#### Hornsea Three offshore ECR corridor search area

7.1.23 The Hornsea Three offshore ECR corridor is fairly shallow throughout, with water depths typically less than 30 mLAT. In offshore areas, the shallowest water depths are associated with the crests of the Norfolk sandbanks which shallow to approximately 5 mLAT. The greatest water depths, approximately 60 mLAT, are encountered where the Hornsea Three offshore ECR corridor crosses the southern margins of Well Hole and Cole Pit, both glacial tunnel valleys (Praeg, 2003; Graham *et al*., 2011).

### Geology and seabed sediments

#### Hornsea Three array area

7.1.24 The majority of seabed sediment within Hornsea Three array area consists of sand and gravelly sand, with slightly gravelly sand and sandy gravel (Figure 7.2). The borehole and Cone Penetration Test (CPT) records collected during the zonal surveys are consistent with existing BGS mapping which suggests the surficial sediments are of variable thickness across the site (BGS and Rijks Geologische Dienst, 1987; Fugro GeoConsulting Limited, 2012).

7.1.25 In the former Hornsea Zone, the Quaternary deposits consist of the Botney Cut Formation, Bolders Bank Formation, Eem Formation, Egmond Ground Formation, Swarte Bank Formation, and Yarmouth Roads Formation. The majority of the Quaternary deposits lying close to the seabed consist of Bolders Bank and Botney Cut Formation. The Quaternary deposits generally increase in thickness in an easterly direction and may be 200+ m thick in the east of the former Hornsea Zone (SMart Wind, 2012a).

7.1.26 The available information from BGS mapping and the existing Zonal surveys suggests that bedrock is not exposed anywhere within the Hornsea Three array area and is instead overlain by varying thicknesses of Quaternary sediments (EMU, 2011b).

#### Hornsea Three offshore ECR corridor search area

7.1.27 The seabed along the Hornsea Three offshore ECR corridor dominantly comprises coarse grained sand and gravel sediments (Figure 7.2). The relative proportion of sands and gravels varies along the offshore ECR corridor search area route. More sandy sediments are associated with the flanks and crests of sandbanks, with more gravelly sediments encountered in the sand wave troughs and elsewhere. Isolated pockets of fine grained muddy material are also present in inshore areas which may relate to sampling of the underlying Quaternary units (BGS, 2002a).

7.1.28 The thickness of the surficial Holocene sediments along the ECR corridor is highly variable. In the vicinity of the bank systems, the thickness may locally exceed 20 m. Conversely, across much of the inshore area only a thin veneer of surficial material is present, with hard substrate within 0.5 m below the seabed (Gafeira *et al*., 2010).

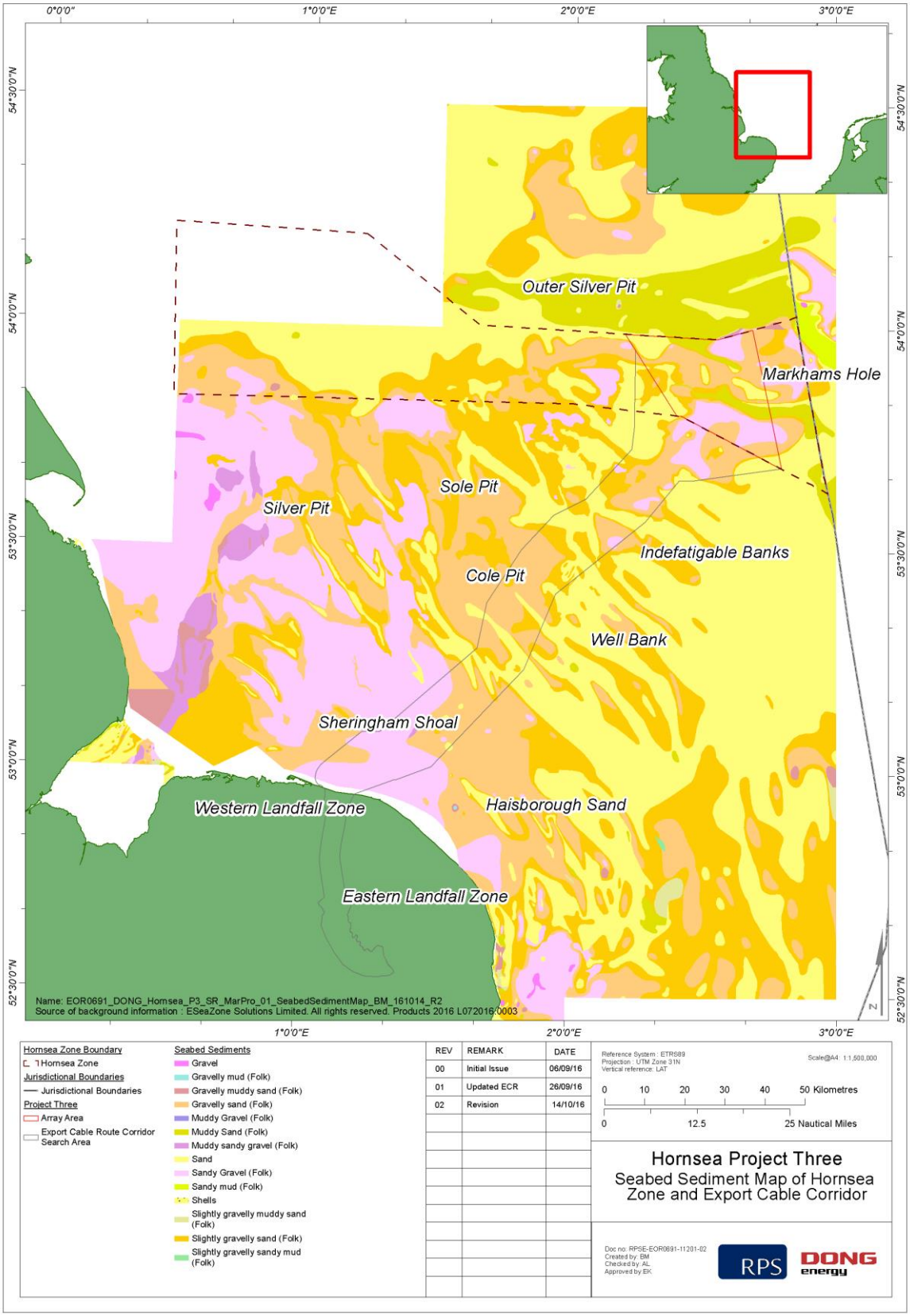



Figure 7.2 Seabed sediment map.

### *Suspended sediments*

#### *Hornsea Three array area*

7.1.29 SSC in the Hornsea Three array area was typically found, via the metocean surveys, to be in the range 3 to 30 mg/l. Slightly higher values (up to ~35 mg/l) were experienced during spring tides and storm conditions (EMU, 2011a).

7.1.30 These relatively low turbidity levels are consistent with the synoptic sea surface turbidity maps of the North Sea available from Dolphin *et al*. (2011), which are based on satellite observations. According to Dolphin *et al*. during the winter months, mean surface SPM concentrations are typically around 5 mg/l in the vicinity of the Hornsea Three array area, reducing to approximately 0 to 5 mg/l during summer months.

#### *Hornsea Three offshore ECR corridor search area*

7.1.31 Based on the turbidity maps presented in Dolphin *et al*. (2011), during the winter months, mean surface SPM concentrations are typically around 5 mg/l in the vicinity of the Hornsea Three array area, increasing to around 50 mg/l within inshore areas of the Hornsea Three offshore ECR corridor search area. During summer months, mean SPM is usually in the range 0 to 5 mg/l, with values increasing with greater proximity to the coast. However, within inshore and (especially) nearshore areas where water depths are very shallow, strong tidal currents combined with wave stirring of the bed will result in high turbidity levels. These high turbidity levels will be greatest closer to the seabed, in nearshore areas (i.e. <5 mLAT), in areas exposed to larger waves and may be in the order of 100's to 1000's mg/l during storm conditions.

### *Sediment transport*

#### *Hornsea Three array area*

7.1.32 Within the vicinity of the Hornsea Three array area, tidal currents are the main influence on offshore sediment transport, rather than the wave climate. Existing regional-scale mapping suggests that bedload sediment transport is broadly to the northwest in the vicinity of the Hornsea Three array area (e.g. Keyon and Cooper, 2005). This understanding will be refined through consideration of bedform morphologies mapped during the Hornsea Three array area geophysical survey.

7.1.33 Suspended sediment transport is more diffuse and ephemeral. However, a general northeasterly flux of suspended sediment occurs during winter months as part of the East Anglia Plume (Dyer and Moffat, 1998).

#### *Hornsea Three offshore ECR corridor search area*

7.1.34 At the offshore terminus of the Hornsea Three offshore ECR corridor, bedload sediment transport is broadly to the northwest and towards the south/southeast within inshore/ nearshore areas. These regions of sediment transport are separated by a bedload parting zone, which runs in an approximately shore parallel direction, at a distance of approximately 15 km from the coast (Kenyon and Cooper, 2005). This bedload parting has been identified on the basis of bedform morphology, especially the asymmetry of sand waves mapped on the seabed. Although these broad regional-scale transport pathways may be recognised, more complex localised patterns are also present. This is particularly the case in the vicinity of the sandbank systems where circulatory patterns of transport may occur.

7.1.35 Both relict (inactive) and active bedforms are present along the offshore ECR corridor search area. The most prominent relict features include some of the further offshore Norfolk sandbanks located close to Hornsea Three array area (e.g. Indefatigable Banks) that formed during the mid-Holocene post-glacial transgression (Kenyon *et al*., 1981; Cooper *et al*., 2008). These contrast with sandbanks located closer to shore (e.g. Sheringham Shoal and Haisborough Sand) which are typically associated with actively migrating fields of sand waves (Kenyon and Cooper, 2005). Rates of bedform migration are expected to be highly variable along the Hornsea Three offshore ECR corridor, although in general terms, larger bedforms will tend to migrate more slowly than smaller ones. With regards to the Norfolk offshore banks, migration rates in the literature vary from 1-16 m/yr (Houbolt, 1968; Caston, 1972; Stride, 1988) although the more recent research of Cooper *et al*. (2008) suggests an average rate of between 1-3 m/yr (i.e. at the lower end of observations). Direct observations of sand wave migration are limited although rates in excess of 10 m/yr may occur on the flanks of some sand banks.

### *Hornsea Three landfall area*

7.1.36 Much of the shoreline in the area of the proposed landfall is formed of a steep shingle beach, fronting eroding cliffs of glacial till over a chalk base. However, areas of lower ground are also present at Weybourne Hope, the location of the Sheringham Shoal and Dudgeon offshore wind farm export cable landfalls. Where the backshore is low, the shingle beach forms a barrier ridge and is the main defence against backshore flooding (Scira Offshore Energy Ltd, 2006).

7.1.37 HR Wallingford *et al*. (2002) provides a summary of past studies into longshore sediment transport rates in this region and suggests high net westerly drift to the west of Weybourne and easterly drift at Sheringham. The later work of HR Wallingford (2004) highlights the high potential for annual variability in drift rates, which are anticipated to reverse between years, depending on the prevailing wave conditions.

### *Designated sites*

7.1.38 The identification of designated sites for inclusion in the marine processes EIA was carried out as follows:

- Sites, with relevant qualifying features, which overlap with Hornsea Three were screened in for further assessment; and
- Sites, with relevant qualifying features, which are located within the likely zone of influence of effects associated with Hornsea Three were screened in for further assessment. The likely zone of influence has been determined through a review of the modelled zone of effects associated with increased suspended sediment concentrations during construction for Project Two. On this basis, a 16 km buffer around the Hornsea Three array area has been included, based on the evidence base from Project Two which predicted suspended sediment dispersal of up to 2 mg/l extending out to 16 km during seabed preparation works. A buffer of one tidal excursion (approximately 12 km) from the Hornsea Three marine ECR corridor has also been included to capture the zone of likely impacts from cable installation works. This ensures that all sites potentially affected by changes in water quality (e.g. increased suspended sediment concentrations) and potential changes to the hydrodynamic regime are included in the assessment.

7.1.39 Further details on these designated sites are provided in Table 7.3.

Table 7.3 Marine nature conservation designations with relevance to marine processes and the Hornsea Three EIA.

| Site | Closest distance to Hornsea Three | Features |
|---|---|---|
| ***International designations*** | | |
| North Norfolk Sandbanks and Saturn Reef cSAC | Coincident with the Hornsea Three offshore ECR corridor search area. | Proposed for designation for Annex I habitats 'sandbanks which are slightly covered by seawater all the time' and 'reefs'. |
| Haisborough, Hammond and Winterton SCI | 3 km from Hornsea Three offshore ECR corridor search area. | Proposed for designation for Annex I habitats 'sandbanks which are slightly covered by seawater all the time' and 'reefs'. |
| The Wash and North Norfolk Coast SAC | Coincident with the Hornsea Three offshore ECR corridor search area. | Proposed for designation for Annex I habitats, including 'sandbanks which are slightly covered by seawater all the time', 'mudflats and sandflats not covered by seawater at low tide', 'large shallow inlets and bays' and 'reefs'. |
| North Norfolk Coast SAC/Ramsar | Coincident with the Hornsea Three offshore ECR corridor search area. | Proposed for designation for Annex I habitats 'coastal lagoons', 'perennial vegetation of stony banks', 'Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)', embryonic shifting dunes', 'shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')', fixed coastal dunes with herbaceous vegetation ('grey dunes')' and 'humid dune slacks'. |
| Klaverbank SCI | 11 km from Hornsea Three array area. | Designated for Annex I 'reefs' which are a primary reason for the designation of the site. |
| ***National designations*** | | |
| North Norfolk Coast SSSI | Coincident with the Hornsea Three offshore ECR corridor search area. | The area consists primarily of intertidal sands and muds, saltmarshes, shingle banks and sand dunes. There are extensive areas of brackish lagoons, reedbeds and grazing marshes. |
| ***Regional destinations*** | | |
| Markham's Triangle recommended Marine Conservation Zone (rMCZ) | Coincident with the Hornsea Three array area. | Proposed for two broadscale habitats: subtidal coarse sediment and subtidal sand. |
| Cromer Shoal Chalk Beds Marine Conservation Zone (MCZ) | Coincident with the Hornsea Three offshore ECR corridor search area. | Designated for high energy circalittoral rock, high energy infralittoral rock, moderate energy circalittoral rock, moderate energy infralittoral rock, subtidal coarse sediment, subtidal mixed sediments, subtidal sand, peat and clay exposures, and subtidal chalk. |

### Proposed approach to the Environmental Impact Assessment (EIA)

7.1.40 The marine processes EIA will follow the methodology set out in Chapter 5: Environmental Impact Assessment Methodology. Specific to the marine processes EIA, the following guidance documents will also be considered:

- Further review of sediment monitoring data. (COWRIE ScourSed-09). (ABPmer, HR Wallingford and Cefas, 2010);
- Coastal Process Modelling for Offshore Wind farm Environmental Impact Assessment: Best Practice Guide. (COWRIE, 2009);
- Guidelines in the use of metocean data through the lifecycle of a marine renewables development (ABPmer *et al*., 2008);

- Review of Cabling Techniques and Environmental Effects applicable to the Offshore Wind farm Industry. (BERR, 2008);
- Review of Round 1 Sediment process monitoring data - lessons learnt. (Sed01) (ABPmer *et al*., 2007);
- Dynamics of scour pits and scour protection - Synthesis report and recommendations. (Sed02) (HR Wallingford *et al*., 2007); and
- Potential effects of offshore wind developments on coastal processes (ABPmer and METOC, 2002).

### *Application of an 'evidence based' approach*

7.1.41 The Project One and Project Two developments completed impact assessments on the basis of a number of project-specific studies, which included the use of detailed numerical modelling to quantify the environmental baseline and scheme impacts on marine processes. Hornsea Three aims to efficiently utilise the body of evidence developed as part of the Project One and Project Two projects as well as other similar developments, in conjunction with previously and newly collected field data, to complete assessments using an 'evidence based approach'.

7.1.42 An evidence based approach to baseline characterisation relies upon the previous collection or development of a sufficient quantity and quality of baseline data. An evidence based approach to impact assessment relies upon the assumption that the aspect of the proposed development being assessed (or other developments in a cumulative sense) remains of a sufficiently similar character (e.g. operation type, foundation type and number) to an existing consented development or other close analogues, located in a similar environmental context.

7.1.43 As part of evaluations undertaken to inform the scoping phase of Hornsea Three, it is considered that the application of an evidence based approach is appropriate for marine processes. The proposed implementation of this approach is discussed in the context of each potential impact scoped into the assessment, in the following section.

7.1.44 A project independent discussion regarding evidence based approaches to EIA for offshore wind farms may be found in ABPmer and HR Wallingford (2009). The methods and approaches proposed for use within the marine processes EIA for Hornsea Three, as presented in the following sections, are informed by and consistent with the recommendations of ABPmer and HR Wallingford (2009).

### Potential project impacts

7.1.45 A range of potential impacts on marine processes have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Hornsea Three. The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 7.4, together with a description of any additional data collection (e.g. project specific surveys) and/or supporting analysis that will be required to complete the assessment.

7.1.46 In addition, Table 7.4 identifies potential impacts in which the receptor groups lie in other offshore EIA topics (for example, benthic subtidal and intertidal ecology (see Chapter 8, Section 8.1). As such, a significance will not be assigned to this impact within the marine processes assessment, although will be assigned in the receptor chapter.

Table 7.4 Impacts proposed to be scoped into the Hornsea Three assessment for marine processes.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Increases in SSC and deposition of disturbed sediment to the seabed within the Hornsea Three array area.<br><br>It is noted that the receptor groups for this potential impact lie in other offshore EIA topics (see Table 8.4 (benthic subtidal and intertidal ecology), Table 8.9 (fish and shellfish ecology), Table 8.13 (marine mammals), Table 9.10 (marine archaeology) and Table 9.17 (infrastructure and other users)). As such, a significance of effect will not be assigned within the marine processes assessment. | Sediment disturbance may arise from a range of construction activities within the array area, such as foundation installation and cable installation. Sediment disturbance from foundation installation may comprise the disposal of drill arisings following monopile installation or seabed preparation prior to gravity base foundation installation. Sediment disturbance from cable installation (in the case of the array area) may result from array cable installation. Elevations in SSC and subsequent deposition of disturbed sediments have the potential to result in adverse and indirect impacts on a variety of receptor groups. | The spatial and temporal coverage of the metocean data collection that has been undertaken within the former Hornsea Zone has been summarised in this document. This coverage includes two deployment locations within the Hornsea Three array area. Each of these locations involved the deployment of a meteorological data buoy, AWAC profiler and OBS sensor, providing datasets covering water levels, tidal currents, waves and suspended sediment concentrations. These datasets are supported by further deployment locations in the wider former Hornsea Zone.<br>The available metocean data provides a spatial and temporal coverage with which to adequately characterise metocean conditions across the Hornsea Three array area. These data are supplemented by available datasets characterising the seabed, in the form of a geophysical survey of the Hornsea Three array area and particle size data from grab samples across the array area.<br>On the basis of the adequacy of the existing data, it is not proposed to undertake further metocean data collection across the Hornsea Three array area. This approach has been agreed with the SNCBs as part of pre-application consultation (see Table 6.1). | The available datasets allow an understanding of spatial variations between conditions within the Hornsea Three array area and the Project One and Project Two array areas to the west. Patterns of SSC as a result of realistic worst case drilling for monopile installation, seabed preparation for gravity base foundations and installation of cables were previously simulated using numerical models for Project One and Project Two, both separately and cumulatively. More generally, sediment disturbance and resulting increases in SSC has previously been the subject of extensive assessment including desktop analysis, modelling and field monitoring. Based on the above, it is not proposed to undertake new numerical modelling in order to assess this potential impact. A robust assessment will therefore be completed drawing on the existing evidence base available from the Project One and Project Two assessments. The use of this evidence base will include careful consideration of any differences in the baseline environment across the array areas and any differences in the details of the construction activities. Where differences exist careful |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| | | | | extrapolation will be applied to the previous outputs.<br>Relevant evidence from the wider EIA evidence base will be used as needed to support the method and conclusions of this assessment. |
| 2 | Increases in SSC and deposition of disturbed sediment to the seabed within the Hornsea Three offshore ECR corridor.<br><br>It is noted that the receptor groups for this potential impact lie in other offshore EIA topics (see Table 8.4 (benthic subtidal and intertidal ecology), Table 8.9 (fish and shellfish ecology), Table 8.13 (marine mammals), Table 9.10 (marine archaeology) and Table 9.17 (infrastructure and other users)). As such, a significance of effect will not be assigned within the marine processes assessment. | Sediment disturbance may arise from export cable installation.<br>Elevations in SSC and subsequent deposition of disturbed sediments have the potential to result in adverse and indirect impacts on a variety of receptor groups. | Survey data will be available to inform the marine processes assessment of potential impacts associated with export cable installation. This data will involve a geophysical survey of the Hornsea Three offshore ECR corridor. This will provide information regarding seabed topography and morphology. This will be supported by particle size data collected along the cable route as part of the benthic survey (see Table 8.4).<br>Collectively this survey data will provide a robust evidence base to characterise the seabed along the cable route to enable impact assessments to be completed. | There is now a large evidence base with regards to the potential environmental effects of cable installation activities (e.g. BERR, 2008). This will be used in conjunction with spreadsheet based tools (providing estimates of plume extent, concentration and associated changes in bed levels) to inform the assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 3 | Impacts to hydrodynamics, sediment transport and beach morphology at the landfall. | Cable installation activities at the landfall have the potential to impact on the physical environment at the shoreline. | Survey data will be available in the form of a geophysical and geotechnical survey at the landfall area. This data will be supported with publically available coastal monitoring data.<br>These project specific surveys and publically available data will provide a robust evidence base with which to characterise the baseline physical environment at the landfall and enable potential impacts to be assessed. | The potential short term physical impact of cable installation at the landfall will be assessed based on desktop analysis.<br>The nature and extent of any disturbance will be assessed with reference to the project description and the wider evidence base.<br>The potential impact will be assessed by an experienced coastal geomorphologist in the context of the baseline understanding of the landfall area. |
| ***Operation and maintenance*** | | | | |
| 4 | Impacts to the wave regime, with associated potential impacts along adjacent shorelines. | The interaction of the turbine foundations and associated infrastructure and the wave regime will result in a reduction to wave energy. This in turn has the potential to impact upon adjacent coastlines and offshore sandbanks. | As previously noted, the spatial and temporal coverage of the metocean data collection that has been undertaken within the former Hornsea Zone has been summarised in this document.<br>The available metocean data provides a spatial and temporal coverage with which to adequately characterise metocean conditions across the Hornsea Three array area. In addition, the available datasets allow an understanding of spatial variations between conditions within the Hornsea Three array area and the Project One and Project Two array areas to the west. | Patterns of wave height reduction have been previously modelled for a range of wave conditions, for a realistic worst case number, layout and type of wind turbine foundations as part of the assessment work supporting the Project One and Project Two applications, both separately and cumulatively. These analyses have primarily been undertaken to inform the assessment of potential changes to coastal morphology.<br>Hornsea Three is exposed to a similar wave climate to Project One and Project Two, has similar water depths and is expected to have a similar realistic worst case turbine foundation type, dimensions and spacing. As such, the same underlying behaviour in terms of wave height reduction observed at Project One and Project Two is expected to apply to the realistic worst case for Hornsea |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| | | | | Three.<br>Using the wave scenarios previously modelled, the underlying behaviour of this impact described above for Project One and Project Two will be quantified and used as a set of 'rules' to conservatively estimate the far-field patterns of wave height reduction for Hornsea Three, both alone and cumulatively with Project One and Project Two. The technique will be validated by application to the individual site model results for Project One and Project Two, and comparing the output to the cumulative scenario model results. Residual uncertainty in the accuracy of the predictions made will be minimised and mitigated by taking a conservative approach at appropriate steps in the process. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 5 | Scour of seabed sediments. | Interaction between the metocean regime (wave, sand and currents) and foundations has the potential to cause localised scouring of seabed sediments leaving a depression around the structure. | As noted for previous impacts, datasets exist across the Hornsea Three array area that will enable the characterisation of both the metocean regime and also the seabed (in terms of both bathymetry and seabed texture from particle size data).<br>These datasets provide a robust basis for baseline characterisation to inform this impact assessment. | A spreadsheet based approach will be used to quantify the scale of the impact as follows. Based on the Hornsea Three Project Description (Chapter 3), the likely dimensions of scour for given foundation types will be estimated using established empirical relationships available from the relevant literature. The area of seabed modified either by scour or scour protection will be calculated. Areas and volumes will be multiplied by the number of foundations. An estimate of the time required to develop the scour described will be made. The results will be presented as an estimated total area of effect and as a proportion of the site area. |
| 6 | Impacts to sediment transport and sediment transport pathways. | Foundations within the array may interrupt sediment transport pathways. In addition, cable protection may result in localised secondary scour or pose an obstacle to sediment transport pathways. | As noted above, available datasets provide a robust basis to enable baseline characterisation to inform this impact assessment. | The potential for foundations and/or cable protection measures to interrupt or obstruct sediment transport will be assessed on a conceptual basis by an experienced geomorphologist. The assessment will consider the realistic worst case nature and dimensions of the foundations and cable protection, the seabed sediment type and expected rates and directions of transport informed by project specific data and the wider environmental evidence base. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 7 | Impacts to beach morphology, hydrodynamics and sediment transport (littoral drift) at the landfall. | Should the cable become exposed at the landfall, there is potential for impact on local coastal processes. | As above, the planned geophysical and geotechnical surveys for Hornsea Three offshore ECR corridor combined with existing publically available data (see Table 7.1) will provide a robust evidence base with which to characterise the baseline physical environment at the landfall and enable potential impacts to be assessed. | Consideration to be given to cable burial depths at the landfall in the context of beach morphology/variability as part of the assessment process. |
| ***Decommissioning*** | | | | |
| 8 | Increases in SSC and deposition of disturbed sediment to the seabed within the Hornsea Three array area.<br><br>It is noted that the receptor groups for this potential impact lie in other offshore EIA topics (see Table 8.4 (benthic subtidal and intertidal ecology), Table 8.9 (fish and shellfish ecology), Table 8.13 (marine mammals), Table 9.10 (marine archaeology) and Table 9.17 (infrastructure and other users)). As such, a significance of effect will not be assigned within the marine processes assessment. | Cutting off/removal of foundations, removal of cables (export and array) decommissioning activities have the potential to elevate background SSC and result in deposition of disturbed sediment to the seabed. This has the potential to result in adverse and indirect impacts on a variety of receptor groups. | Adequate existing data is available with which to characterise the baseline regime to enable a robust impact assessment to be completed. | It is not expected that the operations involved in decommissioning (e.g. cutting of foundations at their base, cut, terminate and rebury ends of cable) will result in a release of sediment into suspension, and subsequent deposition, at a greater rate than that already considered in relation to equivalent activities during the construction phase. No additional modelling is therefore proposed to be undertaken to inform this impact assessment. For further information on the approach taken to inform this impact assessment see marine processes impact no. 1. |
| 9 | Impacts to hydrodynamics, sediment transport and beach morphology at the landfall. | Decommissioning activities at the landfall have the potential to impact on the physical environment at the shoreline. | As noted, project specific surveys and publically available data will provide a robust evidence base with which to characterise the baseline physical environment at the landfall and enable potential impacts to be assessed. | The potential for impacts relating to the decommissioning of cables at the landfall will be assessed as part of the cable landfall desktop analysis described in relation to the construction and operation phases. |

7.1.47 On the basis of the baseline information currently available and the project description outlined in Chapter 3: Project Description, no impacts are proposed to be scoped out of the assessment for marine processes.

### Measures adopted as part of the project

7.1.48 Measures adopted as part of the project will include:

- Scour protection: The use of scour protection around offshore structures as set out in Chapter 3: Project Description; and
- Development of, and adherence to, a Cable Specification and Installation Plan.

7.1.49 The requirement and feasibility of additional measures will be dependent on the significance of the effects on marine processes and will be consulted upon with statutory consultees throughout the EIA process.

### Potential cumulative impacts

7.1.50 There is potential for the predicted impacts from Hornsea Three on marine processes to interact with impacts from other projects and activities in the marine processes study area and lead to a cumulative effect on receptors.

7.1.51 The cumulative assessment will consider the maximum adverse scenarios for each of the projects or activities. The following projects or activities will be considered within the marine processes study area:

- Other offshore wind farms and associated cabling and infrastructure;
- Oil and gas infrastructure/development (cables and pipelines);
- Other forms of cabling (i.e. telecommunications and interlinks);
- Beach replenishment schemes; and
- Aggregate extraction and disposal of dredging spoil.

7.1.52 The CEA will consider the same impacts across all phases of the project, as outlined in Table 7.4 for the Hornsea Three alone assessment.

### Potential transboundary impacts

7.1.53 Transboundary effects relate to impacts that may occur from an activity within one EEA state upon the environment or interests of another. A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there is no potential for significant transboundary effects with regard to marine processes from Hornsea Three upon the interests of other EEA states.

## 7.2 Subsea Noise

### Introduction

7.2.1 This section of the Scoping Report addresses subsea noise sources of relevance to Hornsea Three and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore components of Hornsea Three.

7.2.2 Construction noise and vibration sources may include piling, hammering or drilling and will include the use of barges and vessels, and heavy machinery and generators on the vessels. Operational noise will include aerodynamic noise from wind turbine blades passing through the air and mechanical noise from the gearbox and generator of the turbines.

7.2.3 The subsea noise assessment will be included as an appendix to the Environmental Statement and will include an assessment of the level of subsea noise generated from Hornsea Three. Where applicable, the outputs of the subsea noise assessment will be used within impact assessment of the following receptor chapters:

- Chapter 8, Section 8.2: Fish and Shellfish Ecology;
- Chapter 8, Section 8.3: Marine Mammals;
- Chapter 9, Section 9.1: Commercial Fisheries; and
- Chapter 9, Section 9.6: Infrastructure and Other Users (specifically the assessment of seismic acquisition by the oil and gas industry).

7.2.4 The study area for the subsea noise assessment has therefore not been outlined within this section of the Scoping Report, as this is defined by the receptor and noted in the applicable chapters in Chapter 8 and Chapter 9 below.

### Baseline data

7.2.5 Subsea noise modelling was undertaken for Project One and Project Two and these assessments shall be reviewed and used, where applicable, to inform the subsea noise assessment and modelling strategy for Hornsea Three.

### Baseline environment

7.2.6 Background noise sources within Hornsea Three will arise primarily from shipping and the oil and gas industry. The shipping routes and shipping traffic is discussed in Chapter 9, Section 9.2: Shipping and Navigation and the oil and gas infrastructure and activities in the area are discussed in Chapter 9, Section 9.6: Infrastructure and Other Users.

## Proposed approach to the Environmental Impact Assessment (EIA)

### *Proposed assessment methodology*

7.2.7 The subsea noise assessment will consider the following main legislation and guidance:

- The European Union (EU) Marine Strategy Framework Directive (Directive 2008/56/EC). This seeks to achieve good environmental status (GES) in Europe's seas by 2020. The qualitative descriptors for determining GES include "*Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.*" This Directive has been transposed into UK law by the Marine Strategy Regulations 2010; and
- NPS EN-1 Section 5.11, noise and vibration (DECC, 2011a).

#### *Subsea noise modelling*

7.2.8 Based on previous consultation on Project One and Project Two, a subsea noise assessment, including subsea noise propagation modelling, will be required for Hornsea Three. The exact scope, specification and methodology of the noise propagation modelling will, however, be discussed and agreed with Statutory Nature Conservation Bodies (SNCBs). However, on the basis of the requirements for Project One and Project Two, it is anticipated that the subsea noise assessment will likely include:

- A review of the publically available literature and studies of the impact of impulsive subsea noise on marine mammal and fish species, including an assessment of the sensitivity of fish and marine mammals to underwater sound, and derivation of criteria for estimating the impact to be agreed with the SNCBs;
- Estimation of source level noise for impact piling operations at Hornsea Three (used as a realistic worst case);
- Noise propagation modelling to estimate potential impact ranges for injury to marine mammals and fish as a result of piling during construction within the Hornsea Three array area and along the offshore ECR corridor;
- Noise propagation modelling to estimate potential impact ranges for behavioural effects to marine mammals and fish as a result of piling during construction within the Hornsea Three array area and along the offshore ECR corridor;
- Consideration of subsea noise effects associated with the operation and maintenance phase and decommissioning phases of the Hornsea Three project; and
- Consideration of subsea sound propagation for concurrent piling operations at adjacent offshore wind farm developments.

7.2.9 The noise propagation modelling will consider the different construction scenarios which will allow the potential zone of influence from Hornsea Three (with respect to noise) to be mapped on both spatial and temporal scales. Where relevant, the subsea noise assessment will consider the potential effects associated with up two vessels piling simultaneously (see Chapter 3, Section 3.7: Offshore Infrastructure) within Hornsea Three. This will allow the estimation of impact radii for fish and marine mammals using the area.

7.2.10 The impact radii will depend on the animals' specific sensitivity, the source level and properties of sound (e.g. frequency band, continuous or impulsive), sound radiation at the site and effect level. The assessments of injury and behavioural effects from Hornsea Three will be based on relevant published injury and behaviour thresholds for marine mammals and fish which will be discussed and agreed in advance with the SNCBs.

### Potential project impacts

7.2.11 In addition to the results from the quantitative modelling scenarios, subsea noise impacts shall be assessed by technical experts who can provide an assessment of the potential impacts for aspects which cannot currently be addressed by modelling alone, including:

- Potential physical and behavioural impacts on mammal species (see Chapter 8, Section 8.3: Marine Mammals); and
- Potential impact on fish and shellfish in the region (see Chapter 8, Section 8.2: Fish and Shellfish Ecology).

7.2.12 As noted above in paragraph 7.2.3, this assessment will be presented in the topic chapters rather than in the subsea noise technical report which is appended to the PEIR and Environmental Statement.

#### *Construction phase*

7.2.13 As noted above, the effects of subsea noise during construction from piling of wind turbines and substations at Hornsea Three on marine mammals and fish are expected to be the key potential impacts and will be assessed further within the EIA. The assessments on identified receptors will be considered within the respective Environmental Statement chapters as outlined in Chapter 8, Section 8.3 for marine mammals, Chapter 8, Section 8.2 for fish and shellfish, Chapter 9, Section 9.1 for commercial fishing and Chapter 9, Section 9.6 for the oil and gas industry.

#### *Operation and maintenance phase*

7.2.14 Potential impacts during operation and maintenance, particularly from turbine noise and maintenance vessel noise shall be assessed further within the EIA. The assessments on identified receptors will be considered within the respective Environmental Statement chapters as outlined in Chapter 8, Section 8.3 for marine mammals, Chapter 8, Section 8.2 for fish and shellfish, Chapter 9, Section 9.1 for commercial fishing and Chapter 9, Section 9.6 for the oil and gas industry.

#### *Decommissioning phase*

7.2.15 Potential impacts, particularly from removal of infrastructure, shall be further assessed during the EIA. The assessments on identified receptors will be considered within the respective Environmental Statement chapters as outlined in Chapter 8, Section 8.3 for marine mammals, Chapter 8, Section 8.2 for fish and shellfish, Chapter 9, Section 9.1 for commercial fishing and Chapter 9, Section 9.6 for the oil and gas industry.

### Potential cumulative impacts

7.2.16 Consideration shall be given to cumulative impacts from noise in particular during construction related piling activities. The potential for cumulative impacts with Project Two, as well as other offshore wind farm developments, will be considered in the EIA. A detailed assessment of the wind farm developments within the area and their construction windows will be required for the EIA to identify which other wind farm developments should be considered in terms of the cumulative underwater noise assessment. With regards to Project One, construction will be completed prior to the construction of Hornsea Three and therefore will not be considered within the construction phase cumulative assessment.

7.2.17 The CEA will be considered within the respective Environmental Statement chapters as outlined in Chapter 8, Section 8.3 for marine mammals, Chapter 8, Section 8.2 for fish and shellfish, Chapter 9, Section 9.1 for commercial fishing and Chapter 9, Section 9.6 for the oil and gas industry.

## 7.3 Airborne Noise

### Introduction

7.3.1 This section of the Scoping Report identifies offshore (i.e. those seaward of MHWS) noise sensitive receptors of relevance to Hornsea Three and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore components of Hornsea Three.

7.3.2 Construction noise and vibration sources may include piling, hammering or drilling and will include the use of barges and vessels and heavy machinery and generators on the vessels. Operational noise will include aerodynamic noise from wind turbine blades passing through the air and mechanical noise from the gearbox and generator of the turbines.

### Baseline data

7.3.3 Airborne noise modelling was undertaken for Project One and Project Two and these assessments have been reviewed and used, where applicable, to inform the Hornsea Three Scoping Report.

### Baseline environment

7.3.4 Offshore noise sensitive receptors include:

- Offshore oil and gas accommodation, and manned working platforms;
- Commercial shipping;
- Fishing vessels;
- Near shore leisure and recreational receptors; and
- Residential onshore receptors.

### Potential project impacts

7.3.5 On the basis of the offshore noise sensitive receptors and the project description outlined in Chapter 3: Project Description, all airborne noise impacts are proposed to be scoped out of the Hornsea Three assessment. These impacts are outlined, together with a justification for scoping them out, in Table 7.5 below.

Table 7.5 Impacts proposed to be scoped out of the assessment for airborne noise.

| Impact No. | Impact | Justification |
|---|---|---|
| ***Construction*** | | |
| 1 | Piling activities will generate construction noise that may exceed guideline levels for commercial fishing vessels and commercial shipping traffic. | The assessment for Project Two concluded that potential airborne noise effects from piling were negligible for receptors onboard commercial fishing vessels and commercial shipping traffic. The worst case distance of the receptor from the nearest wind turbine/project boundary is the same for Hornsea Three (500 m for commercial fishing vessel, 1 NM for commercial shipping traffic).The effect of airborne noise from piling on receptors onboard commercial fishing vessels and commercial ships has therefore been scoped out of this assessment.<br>Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 2 | Piling activities will generate construction noise that may exceed guideline levels for manned gas platforms. | The assessment for Project Two concluded that potential airborne noise effects from piling were negligible for receptors onboard gas platforms. The nearest manned gas platform to Hornsea Three (Schooner A) is located at a greater distance from the Hornsea Three project boundary compared with Project Two. The effect of airborne noise from piling on receptors onboard gas platforms has therefore been scoped out of the Hornsea Three EIA.<br>Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 3 | Piling activities will generate construction noise that may exceed guideline levels for residential onshore receptors and leisure and recreational receptors. | The assessment for Project Two concluded that the predicted airborne noise levels generated from piling were well below the threshold of significant impact adopted for receptors at and around the East Riding of Yorkshire coastline. The Hornsea Three array area is located further from the nearest UK coastline. The effect of airborne noise during construction from piling for residential onshore receptors and leisure and recreational receptors has therefore been scoped out of this assessment.<br>Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Operation and maintenance*** | | |
| 4 | Airborne noise may exceed guideline levels for commercial fishing vessels and commercial shipping traffic. | The assessment for Project Two concluded that potential operational noise effects were negligible for receptors onboard commercial fishing vessels and commercial shipping traffic. The worst case distance of the receptor from the nearest wind turbine/project boundary is the same for Hornsea Three (50 m for commercial fishing vessel, 1 NM for commercial shipping traffic). The effect of operational noise for receptors onboard commercial fishing vessels and commercial shipping traffic has therefore been scoped out of this assessment.<br>Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 5 | Airborne noise may exceed guideline values for offshore accommodation platforms. | The assessment for Project Two concluded that potential operational noise effects were negligible for receptors onboard gas accommodation platforms. The nearest gas platform with accommodation to Hornsea Three (Schooner A) is located at a greater distance from the Hornsea Three project boundary compared with Project Two. The effect of operational noise for receptors onboard gas accommodation platforms has therefore been scoped out of this assessment.<br>Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |

| Impact No. | Impact | Justification |
|---|---|---|
| 6 | Airborne noise may exceed guideline levels for residential onshore receptors and leisure and recreational receptors. | The assessment for Project Two concluded that the predicted operational noise levels were well below the threshold of significant impact adopted for receptors at and around the East Riding of Yorkshire coastline. The Hornsea Three array area is located further from the nearest UK coastline. The effect of airborne noise during operations for residential onshore receptors, and leisure and recreational receptors has therefore been scoped out of this assessment.<br>Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Decommissioning*** | | |
| 7 | Airborne noise may exceed guideline levels for commercial fishing vessels and commercial shipping traffic. | Decommissioning activities will be similar to construction activities but with the exception that piling operations will not be required. Given that the level of noise generated from the decommissioning of Hornsea Three will be less than the construction phase, the effect of airborne noise from piling for receptors onboard commercial fishing vessels and commercial ships has therefore been scoped out of this assessment.<br>Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 8 | Airborne noise may exceed guideline values for offshore accommodation platforms. | Decommissioning activities will be similar to construction activities but with the exception that piling operations will not be required. Given that the level of noise generated from the decommissioning of Hornsea Three will be less than the construction phase, the effect of airborne noise from piling for receptors onboard gas accommodation platforms has therefore been scoped out of this assessment.<br>Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 9 | Airborne noise may exceed guideline levels for residential onshore receptors and leisure and recreational receptors. | Decommissioning activities will be similar to construction activities but with the exception that piling operations will not be required. Given that the level of noise generated from the decommissioning of Hornsea Three will be less than the construction phase, the effect of airborne noise from piling for residential onshore receptors, and leisure and recreational receptors has therefore been scoped out of this assessment.<br>Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |

## 7.4 Offshore Air Quality

### Introduction

7.4.1 This section of the Scoping Report considers the offshore (i.e. seaward of MHWS) air quality in the vicinity of Hornsea Three and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore components of Hornsea Three.

7.4.2 Atmospheric emissions from Hornsea Three will arise from the combustion of fuel used to power both vessels and helicopters used in the construction, operation and maintenance, and decommissioning of the offshore wind farm. The pollutants from vessels and helicopters include sulphur dioxide ($SO_2$) and carbon dioxide ($CO_2$), oxides of nitrogen ($NO_X$), which represents the sum of nitrogen dioxide ($NO_2$), and nitrogen oxide (NO), and particulate matter ($PM_{10}$ and $PM_{2.5}$).

### Baseline data

7.4.3 A desk based review of literature and data sources to support this Scoping Report has highlighted the following data sources:

- Emissions of air pollutants in the UK, 1970 to 2015 (Defra, 2015);
- National Emissions Ceiling Directive (NAEI, 2015); and
- Offshore Energy Strategic Environmental Assessment 3, Appendix 1E: Air Quality (DECC, 2016).

### Baseline environment

7.4.4 Defra (2015) notes that generally there has been a long term decrease in the emissions of ammonia, nitrogen oxides, non-methane volatile organic compounds, particulate matter ($PM_{10}$ and $PM_{2.5}$) and sulphur dioxide since 1970.

7.4.5 Industrialisation of the coast and inshore area adjacent to the central North Sea has led to increased levels of pollutants which decrease further offshore, though oil and gas platforms provide numerous point sources of atmospheric pollution (DECC, 2016).

7.4.6 The UK agreed to set emission ceilings through the National Emission Ceilings Directive (EU Directive 2001/81/EC). The National Atmospheric Emissions Inventory provides estimates of the amount of different pollutants that emitted to the air each year from human activity in the UK and identifies that the UK is achieving its targets set by the National Emission Ceilings Directive.

### Potential project impacts

7.4.7 On the basis of the baseline and the project description outlined in Chapter 3: Project Description, all offshore air quality impacts are proposed to be scoped out of the Hornsea Three assessment. These impacts are outlined, together with a justification for scoping them out, in Table 7.6 below.

Table 7.6 Impacts proposed to be scoped out of the assessment for offshore air quality.

| Impact No. | Impact | Justification |
|---|---|---|
| ***Construction*** | | |
| 1 | Atmospheric emissions from vessel and helicopter movements. | Atmospheric emissions from Hornsea Three will be from the fuel used to power vessels and helicopters used in the construction of the offshore wind farm. Given the dispersive nature of the offshore environment (strong winds and flat topography), the distance of Hornsea Three from considerable static sources of pollutants and the relatively small contribution of emissions when compared with the total vessel and helicopter movements in the southern North Sea, it is not considered likely that existing concentrations are at levels of environmental concern within Hornsea Three.<br>Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Operation and maintenance*** | | |
| 2 | Atmospheric emissions from vessel and helicopter movements. | Atmospheric emissions from Hornsea Three will be from the fuel used to power vessels and helicopters used in the operation and maintenance of the offshore wind farm. Given the dispersive nature of the offshore environment (strong winds and flat topography), the distance of Hornsea Three from considerable static sources of pollutants and the relatively small contribution of emissions when compared with the total vessel and helicopter movements in the southern North Sea, it is not considered likely that existing concentrations are at levels of environmental concern within Hornsea Three.<br>Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Decommissioning*** | | |
| 3 | Atmospheric emissions from vessel and helicopter movements. | Atmospheric emissions from Hornsea Three will be from the fuel used to power vessels and helicopters used in the decommissioning of the offshore wind farm. Given the dispersive nature of the offshore environment (strong winds and flat topography), the distance of Hornsea Three from considerable static sources of pollutants and the relatively small contribution of emissions when compared with the total vessel and helicopter movements in the southern North Sea, it is not considered likely that existing concentrations are at levels of environmental concern within Hornsea Three.<br>Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |

# 8. Offshore Biological Environment

## 8.1 Benthic subtidal and intertidal ecology

### Introduction

8.1.1 This section of the Scoping Report identifies benthic subtidal and intertidal ecology resources of relevance to Hornsea Three and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (up to the MHWS mark) of Hornsea Three on benthic ecology.

### Study area

8.1.2 For the purposes of the Hornsea Three benthic subtidal and intertidal EIA, two study areas are defined:

- The Hornsea Three benthic ecology study area - this is the area encompassing Hornsea Three, which includes the Hornsea Three array area, offshore ECR corridor (i.e. encompassing subtidal benthic ecology), and landfall area (i.e. encompassing intertidal benthic ecology). The subtidal section of the Hornsea Three benthic ecology study area also incorporates the former Hornsea Zone (plus a 5 km buffer around the former Hornsea Zone). Surveys undertaken across the former Hornsea Zone, including those for Project One and Project Two have been used to inform this Scoping Report. At the intertidal ECR corridor landfall area, the Hornsea Three benthic ecology study area considers habitats up to the MHWS mark. Habitats landward of MHWS have been considered in the onshore ecology assessment (see Chapter 11, Section 11.1: Ecology and Nature Conservation); and
- The southern North Sea benthic ecology study area - this is the regional benthic ecology study area and is defined by the boundaries of the southern North Sea Marine Natural Area (Jones *et al.,* 2004). This southern North Sea benthic ecology study area provides a wider context for the site-specific data and is the area assessed through the desktop review.

### Baseline data

8.1.3 An initial desk based review of literature and data sources to support this Scoping Report has highlighted the following data sources which provide coverage of the Hornsea Three array area and offshore ECR corridor search area:

- EMODnet broad scale map of sea bed habitats (EUSeaMap2) (EMODnet, 2015);
- UK Benthos Application accessed via Oil and Gas UK (www.ukooa.co.uk). Department for Transport, Local Government and the Regions (DTLR) (2002);
- Benthic sampling programmes coordinated under the North Sea Benthos Project (NSBP, 2000);
- Humber Regional Environmental Characterisation (REC) project funded by the Marine Aggregate Levy Sustainability Fund (Tappin *et al*., 2011);

- The Humber Aggregate Dredging Association Marine Aggregate Regional Environmental Assessment (ERM, 2012);
- Technical reports for SEA Areas 2 and 3 (DTI, 2001a; DTI, 2001b);
- Baseline characterisations from other developments, including offshore wind farms, in the region (e.g. Dudgeon (Royal Haskoning, 2009) and Sheringham Shoal (Scrica Offshore Energy, 2006));
- Data from the surveys undertaken in support of the designation of the Cromer Shoal Chalk Beds MCZ (Defra, 2016a) and Markham's Triangle rMCZ (Wildlife Trusts, 2016a);
- Data from benthic surveys undertaken within the North Norfolk Sandbanks and Saturn Reef candidate Special Area of Conservation (cSAC)/Site of Community Importance (SCI) and Haisborough, Hammond and Winterton cSAC/SCI (e.g. Barrio Froján *et al.,* 2013) in order to support designation and the development of appropriate management advice for the site (e.g. Jenkins *et al*., 2015); and
- Other large scale benthic infauna and epifauna surveys undertaken in the southern North Sea including classic infaunal surveys (Petersen, 1914; 1918) and wide scale trawl, grab and video surveys (Dyer *et al*., 1982 and 1983; Jennings *et al*., 1999; Rees *et al*., 1999; Callaway *et al*., 2002).

8.1.4 In addition to these data sources, information is available for the Hornsea Three array area through site-specific benthic ecology surveys undertaken across the former Hornsea Zone. Detailed benthic subtidal surveys across the former Hornsea Zone were undertaken in 2010 for the Hornsea Zone Characterisation (ZoC) study (Table 8.1). Further benthic subtidal surveys across the Project One array area were completed in 2010, 2011 and infill surveys of the Project Two array area were completed in 2012. The Hornsea ZoC subtidal benthic sampling array was based on a regular grid pattern (of approximately 5 km spacing), to optimise coverage of the former Hornsea Zone and to increase the likelihood of encountering as many different habitats as possible. For Project One and Project Two surveys, sampling locations were selected on a stratified random basis to ensure adequate coverage of the different habitats present within the respective benthic ecology study areas. The data acquisition strategies, including the sampling arrays and methodologies, were discussed and agreed with the MMO and their advisors (i.e. the Centre for Environment, Fisheries and Aquaculture Science (Cefas) and Natural England).

8.1.5 Subtidal benthic habitats were sampled via a combined benthic grab and drop down video (DDV) survey, as well as an epibenthic beam trawl survey. Sediment chemistry samples were also taken at a number of stations across Project One and Project Two. Figure 8.1 shows the coverage of the former Hornsea Zone and the Hornsea Three array area, and Table 8.1 summarises the numbers of samples taken across the different surveys.

8.1.6 In addition, the reader is referred to Table 8.4 below which outlines the additional site specific surveys that are proposed to inform the EIA characterisation of the Hornsea Three offshore ECR corridor.

Table 8.1 Summary of benthic subtidal surveys undertaken within the former Hornsea Zone.

| Survey | Date of survey | Combined benthic grab sampling and DDV | Epibenthic beam trawls | Sites within Hornsea Three |
|---|---|---|---|---|
| ZoC Survey | November 2010 | 122 sites | 40 sites | 27 grab/DDV<br>9 epibenthic trawls |
| Project One Survey | July, September, November 2010 and June, October 2011 | 161 sites (40 sampled for sediment chemistry) | 41 sites | - |
| Project Two Infill Survey | July 2012 | 51 sites (8 sampled for sediment chemistry) | 21 sites | - |

### Baseline environment

8.1.7 The habitats within the Hornsea Three benthic ecology study area comprises predominantly sandy, mixed sands and gravels that support a variety of benthic communities. The distributions of these habitats are influenced by a number of physical factors, such as substrate type, depth, tidal conditions and thermal stability at the seabed.

8.1.8 Broad scale mapping of the habitats within the Hornsea Three benthic ecology study area, provided by the EUSeaMap2 data (EMODnet, 2015), indicates that the dominant habitats are circalittoral fine sands/muddy sand and circalittoral coarse sediments (Figure 8.2).

8.1.9 The following sections provide a high-level overview of the benthic subtidal and intertidal ecology baseline environment for the Hornsea Three array area, offshore ECR corridor search area and ECR corridor landfall area, together with a review of the relevant marine nature conservation designations.

#### *Hornsea Three array area*

8.1.10 Site-specific benthic surveys were carried out between 2010 and 2012 to characterise the benthic communities across the former Hornsea Zone, as well as Project One and Project Two (see Table 8.1 above). According to the Simplified Folk Classification (Long, 2006), the dominant sediment type across the former Hornsea Zone, including the area coinciding with the array area for Hornsea Three, is sand and muddy sand sediments with coarse sediments characteristic of the central sections of the former Hornsea Zone (coinciding with Project One). The dominant sediment types concurred with the data provided by the regional datasets (bulleted above) and the predicted EUSeaMap2 habitats.

8.1.11 Levels of sediment contaminants were generally below relevant guideline concentrations, with the main exception of arsenic, which exceeded guidelines at different locations. Contaminants were therefore at levels below which biological effects in benthic organisms could be expected.

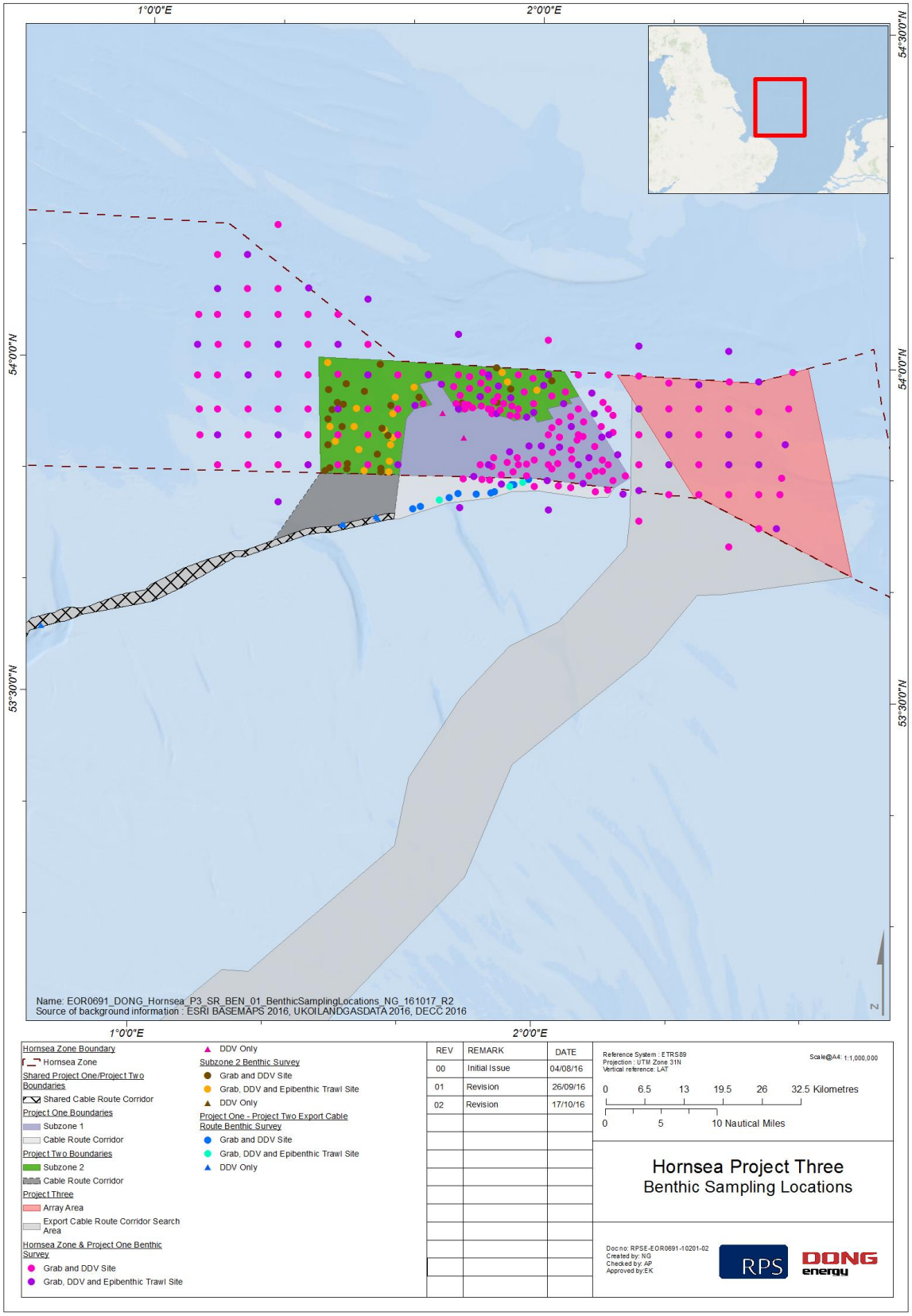



Figure 8.1 Location of subtidal benthic grab, Drop Down Video (DDV) and epibenthic beam trawl locations across Project One, Project Two and the former Hornsea Zone.

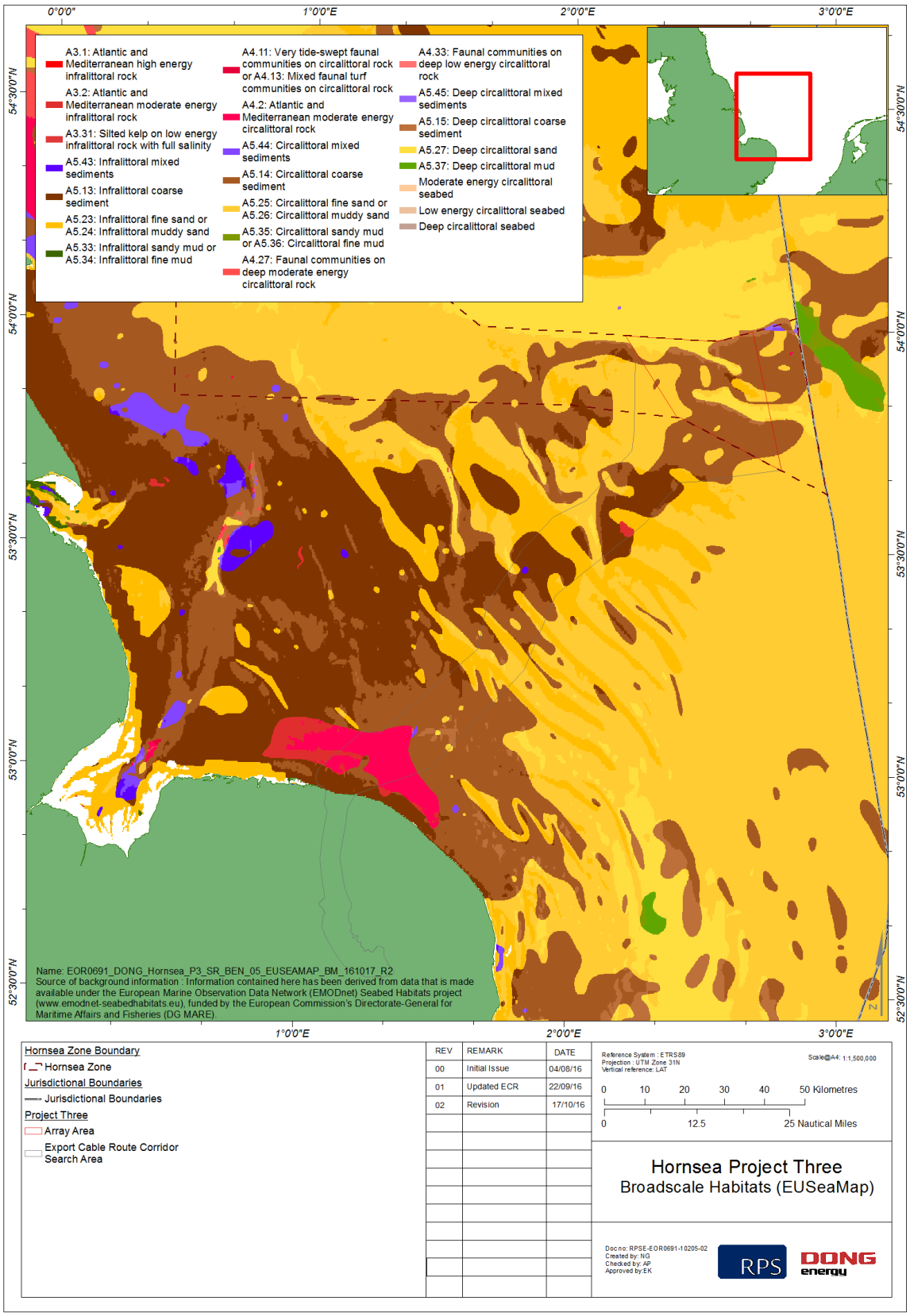



Figure 8.2 EUSeaMap2 (2015) predicted EUNIS habitats.

8.1.12 A total of 399 benthic grab samples were undertaken across the former Hornsea Zone (Figure 8.1) and the infaunal species encountered were, in the majority of cases, characteristic of dynamic, predominantly sand habitats, including a number of small-bodied, short-lived species such as the polychaete worms *Nephtys* spp., *Spiophanes bombyx, Aonides paucibranchiata*, *Ophelia borealis* and *Notomastus* sp., Nemertean worms, amphipod crustaceans *Bathypoeria* spp., the pea urchin *Echinocyamus pusillus* and molluscs including *Tellina fabula, Abra* spp. and *Kurtiella bidentata*. Larger and longer lived species (thereby indicative of more stable sediments) were also represented including the bivalve mollusc *Dosinia* sp., and *Chamelea striatula* which can live upwards of 10 years.

8.1.13 Fourteen infaunal biotopes were identified from the previous surveys and mapped across the whole former Hornsea Zone (Figure 8.3). The biotope SS.SSa.IMuSa.FfabMag '*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand', was recorded adjacent to, and immediately to the west of, the western boundary of the Hornsea Three array area as well extensively in the western part of the former Hornsea Zone. Throughout the central section of the Hornsea Three array area this biotope graded into boundary the sandy biotopes SS.SSa.CFiSa.EpusOborApri '*Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in circalittoral fine sand' and SS.SSa.IFiSa.NcirBat '*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand' in areas of increasing sediment disturbance. Coarser sediments, located along the southern boundary of the Hornsea Three array area, were found to be dominated by the biotope SS.SMx.OMx.PoVen 'Polychaete-rich deep Venus community in offshore mixed sediments'. This biotope also dominated the coarse sediments located to the west of the Hornsea Three array area. Along the northern boundary of the Hornsea Three array area, as well as the wider former Hornsea Zone, the deeper and muddier sediments in these areas were characterised by the SS.SMu.CSaMu.AfilMysAnit '*Amphiura filiformis, Mysella bidentata* and *Abra nitida* in circalittoral sandy mud' biotope.

8.1.14 Epifaunal communities were, on the whole, sparse across the Hornsea Three array area and the former Hornsea Zone, and, where present, typically consisted only of echinoderms including *Asterias rubens*. No potential Annex I *S. spinulosa* reef habitats were identified during the ZoC, Project One or Project Two surveys across the former Hornsea Zone.

### *Hornsea Three offshore export cable route (ECR) corridor search area*

8.1.15 The habitats along the Hornsea Three offshore ECR corridor search area are, on the whole, predicted to be similar to those within the Hornsea Three array area. Broad scale mapping of the habitats provided by the EUSeaMap2 data (EMODnet, 2015), indicates that circalittoral/infralittoral fine sands and infralittoral coarse sediments dominate much of the offshore part of the Hornsea Three offshore ECR corridor search area (Figure 8.2). The Humber REC data (Tappin *et al*., 2011), which provides partial coverage of the northern half of the Hornsea Three offshore ECR corridor search area, indicates that these sediments are predominantly characterised by the EUNIS habitat SS.SSa.CFiSa.PoBivAmp 'Infaunal polychaetes with burrowing bivalves and amphipods in circalittoral fine sand'. Similar communities are present in discrete areas of mixed sediment particularly in the area just to the south of the Hornsea Three array area.

8.1.16 The landward extent of the Hornsea Three offshore ECR corridor search area is characterised by moderate energy infralittoral rock which corresponds with subtidal chalk beds which are a designated feature of the Cromer Shoal Chalk Bed MCZ (Defra, 2016a).

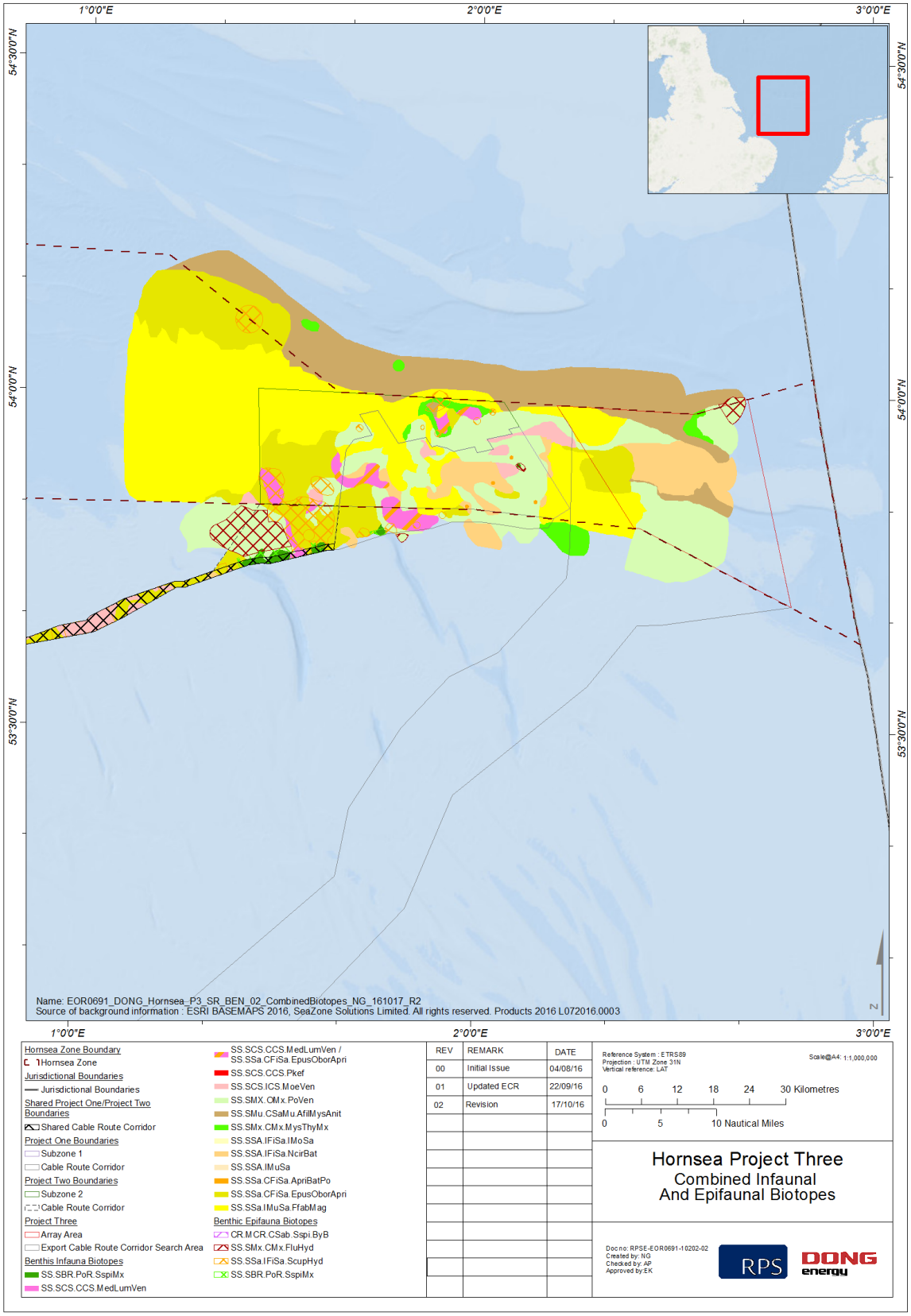



Figure 8.3 Combined infaunal and epifaunal biotope map of Project One, Project Two, Hornsea Three and the former Hornsea Zone.

8.1.17 In addition, the reader is referred to Table 8.4 below which outlines the additional site-specific surveys that are proposed to inform the EIA characterisation of the Hornsea Three offshore ECR corridor.

### *Hornsea Three export cable route (ECR) corridor landfall area*

8.1.18 Much of the shoreline at the landfall area, which extends from Weybourne to West Runton on the north Norfolk coast, comprises a steep shingle beach, fronting eroding maritime cliffs. To the west of the landfall area, the cliffs give way to the shingle ridge of Blakeney Point and sand/shingle barrier island features fronting the low lying coastal fringe with tidal inlets and saltmarsh. According to the EMODnet portal for Seabed Habitats (http://www.emodnet-seabedhabitats.eu/), the intertidal sediments correspond with the EUNIS habitat A2.1 Littoral coarse sediment and comprise predominantly mobile shingle beaches. In the eastern half of the landfall area the intertidal sediments broadly correspond with the EUNIS habitat A2.4 Littoral mixed sediments and comprise sand and shingle beaches.

8.1.19 In addition, the reader is referred to Table 8.4 below which outlines the additional site-specific surveys that are proposed to inform the EIA characterisation of the landfall area.

### *Designated sites*

8.1.20 The identification of designated sites for inclusion in the benthic subtidal and intertidal ecology EIA was carried out as follows:

- Sites, with relevant qualifying features, which overlap with Hornsea Three were screened in for further assessment; and
- Sites, with relevant qualifying features, which are located within the likely zone of influence of effects associated with Hornsea Three were screened in for further assessment. The likely zone of influence has been determined through a review of the modelled zone of effects associated with increased suspended sediment concentrations during construction for Project Two. On this basis, a 16 km buffer around the Hornsea Three array area has been included, based on the evidence base from Project Two which predicted suspended sediment dispersal of up to 2 mg/l extending out to 16 km during seabed preparation works. A buffer of one tidal excursion (approximately 12 km) from the Hornsea Three marine ECR corridor has also been included to capture the zone of likely impacts from cable installation works. This ensures that all sites potentially affected by changes in water quality (e.g. increased suspended sediment concentrations) and potential changes to the hydrodynamic regime are included in the assessment.

8.1.21 Based on these assumptions, the nature conservation designations which have been screened in for consideration in the benthic subtidal and intertidal ecology EIA comprise of European conservation sites (i.e. SACs, SCIs and Ramsar sites), and national designations (i.e. SSSIs, NNRs, recommended and designated MCZs). Further details on these designated sites are provided in Table 8.2 and shown in Figure 8.4.

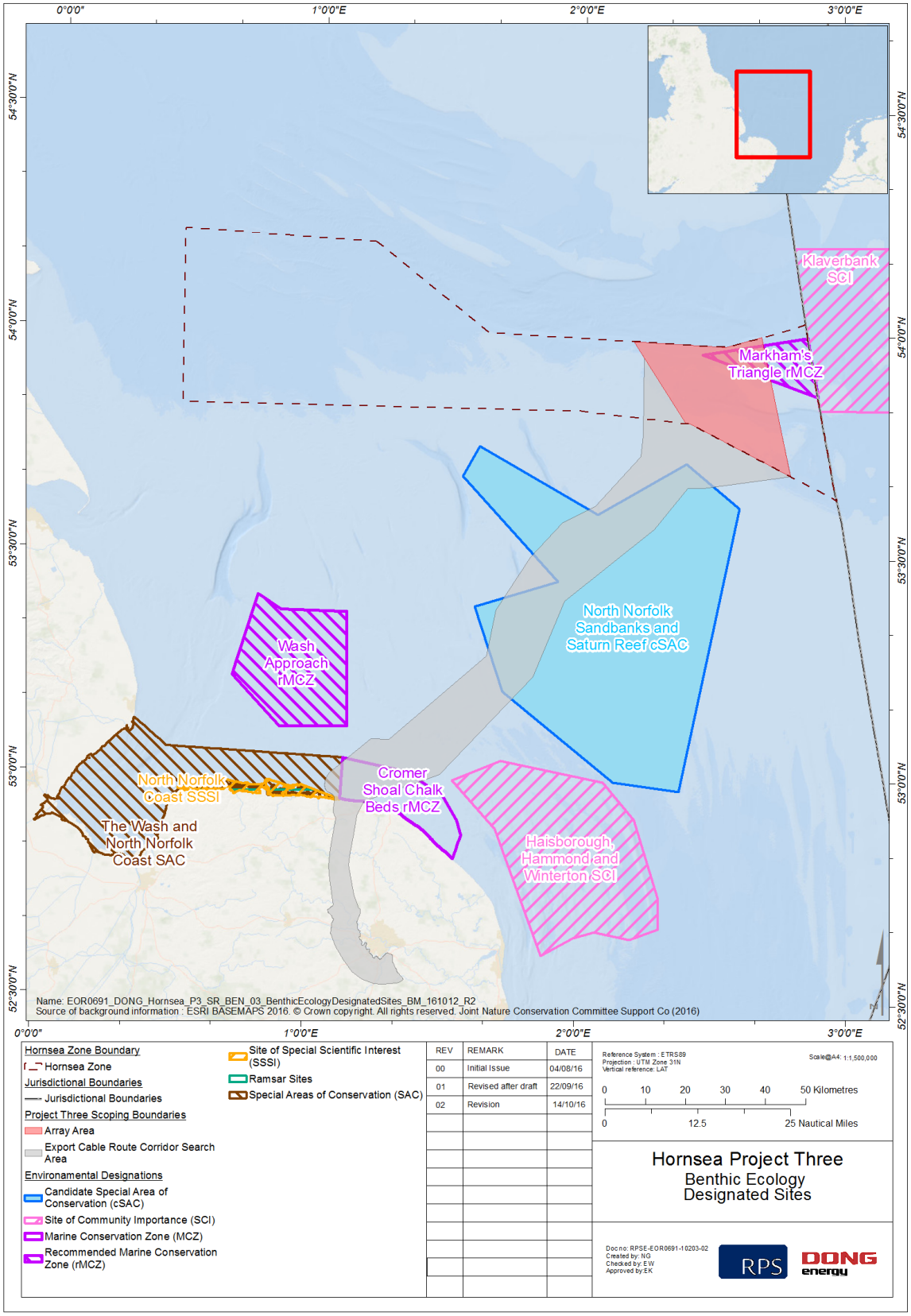



Figure 8.4 Marine nature conservation designations with relevance to benthic subtidal and intertidal ecology and the Hornsea Three EIA.

Table 8.2 Marine nature conservation designations with relevance to benthic subtidal and intertidal ecology and the Hornsea Three EIA.

| Site | Closest distance to Hornsea Three | Features |
|---|---|---|
| ***International designations*** | | |
| North Norfolk Sandbanks and Saturn Reef cSAC | Coincident with the Hornsea Three offshore ECR corridor search area. | Proposed for designation for Annex I habitats 'sandbanks which are slightly covered by seawater all the time' and 'reefs', which are the primary reasons for the designation of the site. |
| Haisborough, Hammond and Winterton SCI | 3 km from Hornsea Three offshore ECR corridor search area. | Proposed for designation for Annex I habitats 'sandbanks which are slightly covered by seawater all the time' and 'reefs', which are the primary reasons for the designation of the site. |
| The Wash and North Norfolk Coast SAC | Coincident with the Hornsea Three offshore ECR corridor search area. | Designated for Annex I habitats 'sandbanks which are slightly covered by seawater all the time', 'mudflats and sandflats not covered by seawater at low tide', 'large shallow inlets and bays', 'reefs' and '*Salicornia* and other annuals colonizing mud and sand' which are the primary reasons for the designation of the site. |
| North Norfolk Coast SAC/Ramsar | Coincident with the Hornsea Three offshore ECR corridor search area. | Designated for Annex I habitats 'coastal lagoons', 'perennial vegetation of stony banks', 'Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)', embryonic shifting dunes', 'shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')', fixed coastal dunes with herbaceous vegetation ('grey dunes')' and 'humid dune slacks' which are the primary reasons for the designation of the site. |
| Klaverbank SCI | 11 km from Hornsea Three array area. | Designated for Annex I 'reefs' which are a primary reason for the designation of the site. |
| ***National designations*** | | |
| North Norfolk Coast SSSI | Coincident with the Hornsea Three offshore ECR corridor search area. | The area consists primarily of intertidal sands and muds, saltmarshes, shingle banks and sand dunes. There are extensive areas of brackish lagoons, reedbeds and grazing marshes. |
| Markham's Triangle rMCZ | Coincident with the Hornsea Three array area. | Proposed for two broadscale habitats: subtidal coarse sediment and subtidal sand. |
| Cromer Shoal Chalk Beds MCZ | Coincident with the Hornsea Three offshore ECR corridor search area. | Designated for high energy circalittoral rock, high energy infralittoral rock, moderate energy circalittoral rock, moderate energy infralittoral rock, subtidal coarse sediment, subtidal mixed sediments, subtidal sand, peat and clay exposures, and subtidal chalk. |
| Wash Approach rMCZ | 10 km from Hornsea Three offshore ECR corridor search area. | Proposed for two broadscale habitats: subtidal mixed sediment and subtidal sand. The site is also proposed for a habitat feature of conservation importance: Subtidal sands and gravels. |

## Proposed approach to the Environmental Impact Assessment (EIA)

### *Proposed assessment methodology*

8.1.22 The benthic subtidal and intertidal ecology EIA will follow the methodology set out in Chapter 5: Environmental Impact Assessment Methodology above. Specific to the benthic subtidal and intertidal ecology EIA, the following guidance documents will also be considered:

- Guidelines for EcIA in Britain and Ireland. Marine and Coastal, Final Document (IEEM, 2010);
- Offshore Wind Farms. Guidance note for EIA in respect of FEPA and CPA requirements (Cefas *et al.*, 2004);

- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008); and
- Guidelines for the conduct of benthic studies at aggregate dredging sites (DTLR, 2002).

8.1.23 In addition, the benthic subtidal and intertidal ecology EIA will follow the legislative framework as defined by the Offshore Marine Conservation (Natural Habitats, and c.) Regulations 2007 (Offshore Habitats Regulations) (as amended), the Conservation of Habitats and Species Regulations 2010 (Habitats Regulations) (as amended), the Wildlife and Countryside Act 1981 (as amended) and the MCAA 2009 (as amended).

### *Valued Ecological Receptors (VERs)*

8.1.24 For the purposes of conducting the EIA, the habitats present across the Hornsea Three benthic ecology study area (including biotopes and Annex I habitats) will be grouped into broad habitat/community types. These broad habitat/community types will serve as the Valued Ecological Receptors (VERs) against which impacts associated with the construction, operation and maintenance, and decommissioning of Hornsea Three will be assessed.

8.1.25 Habitats with similar physical, biological characteristics (including species complement and richness/diversity) as well as conservation status/interest will be grouped together for the purposes of the EIA. Consideration will also be given to the inherent sensitivities of different habitats in assigning the groupings, such that habitats and species with similar vulnerability and recoverability, often as a result of similar broad sediment types and species complements, will be grouped together. The overall value of each VER will then be assessed using the criteria presented in Table 8.3.

Table 8.3 Criteria used to inform the valuation of ecological receptors in the Hornsea Three benthic ecology study area.

| Value of VER | Criteria to define value |
|---|---|
| International | Internationally designated sites.<br>Habitats (and species) protected under international law (i.e. Annex I habitats within an SAC boundary). |
| National | Nationally designated sites.<br>Species protected under national law.<br>Annex I habitats not within an SAC boundary.<br>UK Biodiversity Action Plan (BAP) priority habitats and species that continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework, MCZ/rMCZ features (habitat/species classified as features of conservation importance and broad scale habitats), Natural Environment and Rural Communities habitats and species of principal importance in England, and Nationally Important Marine Species that have nationally important populations within the Hornsea Three benthic ecology study area, particularly in the context of species/habitat that may be rare or threatened in the UK. |
| Regional | UK BAP priority habitats that continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework, MCZ/rMCZ features (habitat/species classified as features of conservation importance and broad scale habitats), Natural Environment and Rural Communities habitats and species of principal importance in England, or Nationally Important Marine Species that have regionally important populations within the Hornsea Three benthic ecology study area (i.e. are locally widespread and/or abundant).<br>Habitats and species that are listed as conservation priorities in regional plans including the southern North Sea Marine Natural Area.<br>Habitats or species that provide important prey items for other species of conservation or commercial value. |
| Local | Habitats and species which are not protected under conservation legislation but which form a key component of the benthic ecology within the Hornsea Three benthic ecology study area. |

### Potential project impacts

8.1.26 A range of potential impacts on benthic subtidal and intertidal ecology have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Hornsea Three. The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 8.4 together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

8.1.27 On the basis of the baseline benthic subtidal and intertidal ecology information currently available and the project description outlined in Chapter 3: Project Description, a number of impacts are proposed to be scoped out of the assessment for benthic subtidal and intertidal ecology. These impacts are outlined, together with a justification for scoping them out, in Table 8.5.

### Measures adopted as part of the project

8.1.28 Measures adopted as part of the project will include:

- Development of, and adherence to, a Code of Construction Practice (CoCP);
- Development of, and adherence to, an appropriate Project Environmental Monitoring and Management Programme (PEMMP); and
- Development of, and adherence to, a Decommissioning Plan.

8.1.29 The requirement and feasibility of additional measures will be dependent on the significance of the effects on benthic subtidal and intertidal ecology and will be consulted upon with statutory consultees throughout the EIA process.

Table 8.4 Impacts proposed to be scoped into the Hornsea Three assessment for benthic subtidal and intertidal ecology.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Temporary habitat loss/ disturbance | There is potential for temporary, direct habitat loss and disturbance due to cable laying operations (including anchor placements), spud-can leg impacts from jack-up operations and seabed preparation works for gravity base foundations. | <u>Hornsea Three array area</u><br>The results of the previous surveys across the former Hornsea Zone (see paragraphs 8.1.10 to 8.1.14) indicate that the sediments and associated benthic communities present across the eastern half of the former Hornsea Zone, corresponding with the Hornsea Three array area, are similar to those that are present across the Project One and Project Two array areas. The desktop information available for this area (e.g. UK SeaMap), also supports this conclusion. Given the scale of the benthic subtidal surveys conducted to date, and the largely homogeneous nature of the benthos, the subtidal habitats and species present across the former Hornsea Zone are considered to have been well characterised. Further dedicated benthic ecology surveys across the Hornsea Three array area for the purposes of EIA characterisation are therefore, not proposed.<br>However, during geophysical surveys undertaken across the Hornsea Three array area in June 2016, 20 grab samples were collected for the purposes of ground-truthing the geophysical data which were also subsequently processed and analysed for benthic infauna and particle size analysis (PSA). It is therefore intended that the data gathered during the ZoC, Project One and Project Two surveys, together with available benthic data from the Hornsea Three site-specific geophysical survey and the surveys of the Markham's Triangle rMCZ in 2012, will be used to characterise the benthos within the array area for the purposes of the EIA for Hornsea Three (see Figure 8.5). | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| | | | Hornsea Three offshore ECR corridor<br>As described in paragraph 8.1.3 there are a number of desktop data sources which cover the Hornsea Three offshore ECR corridor search area including data associated with surveys undertaken within the North Norfolk Sandbanks and Saturn Reef cSAC/SCI and Haisborough, Hammond and Winterton cSAC/SCI as well as from surveys undertaken in support of the designation of the Cromer Shoal Chalk Beds MCZ. These data will be reviewed in order to inform the EIA characterisation of the Hornsea Three offshore ECR corridor. However, unlike the Hornsea Three array area, there have been no previous site-specific surveys undertaken within this area for Project One/Project Two/ZoC. Therefore, there has been no ground-truthing/validation of the desktop data. This is particularly pertinent given that the Hornsea Three offshore ECR corridor search area coincides with two SACs, both of which are designated for *S. spinulosa* reef. As such, a benthic subtidal EIA characterisation survey of the Hornsea Three offshore ECR corridor is proposed and it is anticipated that these will comprise the following surveys which will be undertaken by a specialist benthic contractor in line with standard benthic survey methodologies:<br>• Combined grab and DDV survey with grab samples to be analysed for benthic infauna (abundance and biomass) and PSA; and<br>• Epibenthic beam trawl survey.<br><br>Hornsea Three landfall area<br>No site-specific data exists for the proposed ECR corridor landfall area. Therefore, a Phase 1 intertidal walkover survey will be undertaken at the preferred landfall, when selected, to | |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| | | | include a 250 m buffer zone either side of the ECR corridor. Survey to be undertaken according to standard intertidal survey methodologies as outlined in the Marine Monitoring Handbook (Davies *et al*., 2001) within procedural guidance No 3-1 (Wyn and Brazier, 2001) and The Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey (Wyn *et al*., 2006). | |
| 2 | Temporary increases in suspended sediments / smothering | Sediment disturbance arising from construction activities (e.g. cable and foundation installation) may result in adverse and indirect impacts on benthic communities as a result of temporary increases in suspended sediment concentrations and associated sediment deposition. | As above for benthic ecology impact no. 1. | See approach to Marine Processes assessment in Table 7.4. |
| 3 | Accidental pollution | There is a risk of pollution being accidentally released from sources including construction and installation vessels/vehicles, machinery and offshore fuel storage tanks and from the construction process itself. The release of such contaminants may lead to impacts on the benthic communities present, through toxic effects resulting in reduced benthic diversity, abundance and biomass. | As above for benthic ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| ***Operation and maintenance*** | | | | |
| 4 | Long-term habitat loss | There is the potential for long-term habitat loss to occur directly under all foundation structures and associated scour protection, and all subsea cables, where secondary cable protection is required. | As above for benthic ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 5 | Colonisation of hard structures | Man-made structures placed on the seabed (foundations and scour/cable protection) are expected to be colonised by a range of marine organisms leading to localised increases in biodiversity. These structures also have the potential to act as artificial reef and serving as a refuge for fish and may facilitate the spread of non-native species | As above for benthic ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 6 | Changes in physical processes | The presence of foundation structures, associated scour protection and cable protection may introduce changes to the local hydrodynamic and wave regime, resulting in changes to the sediment transport pathways and associated effects on benthic ecology. Some benthic species and communities may be more vulnerable to reductions in water flow if the decrease is sufficient to reduce the availability of suspended food particles, and consequently inhibit feeding and growth. Scour and increases in flow rates can change the characteristics of the sediment potentially making the habitat less suitable for some species. | As above for benthic ecology impact no. 1. | See approach to Marine Processes assessment in Table 7.4. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 7 | Temporary seabed disturbance | Temporary disturbance/alteration of seabed habitats may occur during the operation and maintenance phase of Hornsea Three as a result of maintenance operations. The impacts associated with these operations are likely to be similar in nature to those associated with the construction phase although of reduced magnitude. | As above for benthic ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 8 | Accidental pollution | There is a risk of pollution being accidentally released from vessels, vehicles, machinery and offshore fuel storage tanks during the operation and maintenance phase as well as from the turbines and offshore substations themselves. The release of such contaminants may lead to impacts on the benthic communities present, through toxic effects resulting in reduced benthic diversity, abundance and biomass. | As above for benthic ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| ***Decommissioning*** | | | | |
| 9 | Temporary habitat loss/disturbance | There is potential for temporary, direct habitat loss and disturbance due to operations to remove array and export cables, and jack-up operations to remove foundations, resulting in potential effects on benthic ecology. | As above for benthic ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 10 | Temporary increases in suspended sediments / smothering | Sediment disturbance arising from decommissioning activities (e.g. cable and foundation removal) may result in adverse and indirect impacts on benthic communities as a result of temporary increases in suspended sediment concentrations and associated sediment deposition. | As above for benthic ecology impact no. 1. | See approach to Marine Processes assessment in Table 7.4. |
| 11 | Removal of hard substrates | The removal of foundations and scour/cable protection during decommissioning has the potential to lead to loss of species/habitats colonising these structures. | As above for benthic ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 12 | Permanent habitat loss | Permanent habitat loss may arise due to presence of scour/cable protection left in situ post decommissioning. | As above for benthic ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 13 | Accidental pollution | There is a risk of pollution being accidentally released from vessels, vehicles, machinery and offshore fuel storage tanks during the decommissioning phase as well as from the turbines and offshore substations themselves. The release of such contaminants may lead to impacts on the benthic communities present, through toxic effects resulting in reduced benthic diversity, abundance and biomass. | As above for benthic ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

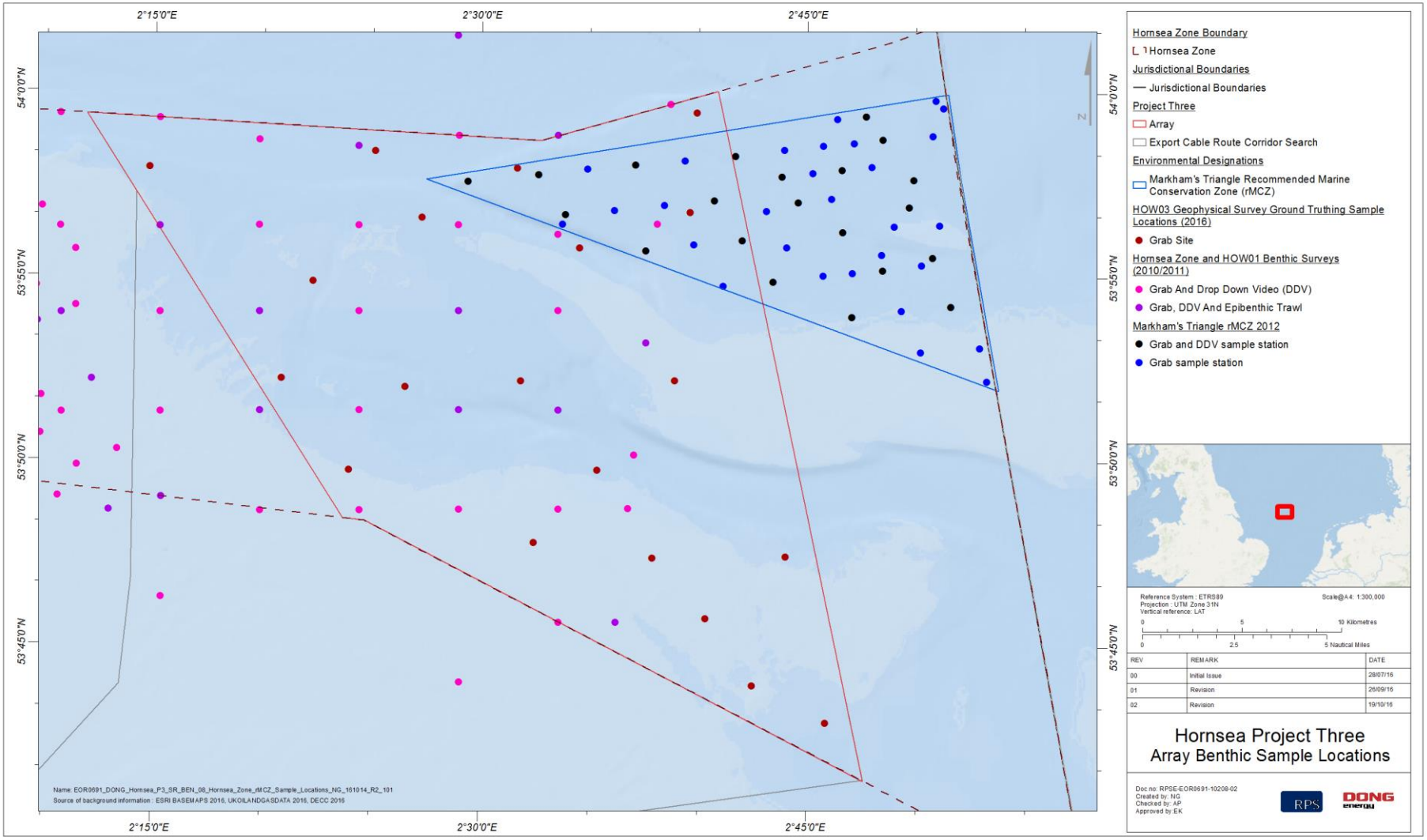



Figure 8.5 Location of benthic samples (from Project One, Project Two, Zonal Characterisation (ZoC) and Hornsea Three site-specific surveys, and Markham's Triangle regional Marine Conservation Zone (rMCZ) survey) to be used to characterise the benthic ecology of the Hornsea Three array area.

Table 8.5 Impacts proposed to be scoped out of the assessment for benthic subtidal and intertidal ecology.

| Impact No. | Impact | Justification |
|---|---|---|
| ***Construction*** | | |
| 1 | Remobilisation of contaminated sediments | Seabed disturbance associated with construction activities (e.g. cable and foundation installation) could lead to the remobilisation of sediment-bound contaminants that may result in harmful and adverse effects on benthic communities. Work undertaken previously for Project One and Project Two suggests that contamination in the offshore sediments is low and at levels which are unlikely to result in adverse effects on benthic communities. Therefore, it is considered unlikely that there would be any pathways for an impact on benthic communities.<br>Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Decommissioning*** | | |
| 2 | Remobilisation of contaminated sediments | As above for benthic ecology impact no. 1. |

### Potential cumulative impacts

8.1.30 The predicted effects of construction, operation and maintenance, and decommissioning from Hornsea Three on benthic and epibenthic communities are considered to be localised to within the footprint of the Hornsea Three project. However, there is potential for cumulative effects to occur on benthic subtidal and intertidal ecology from other projects or activities within the southern North Sea benthic ecology study area, where projects or plans could act collectively with Hornsea Three to affect benthic features.

8.1.31 The following projects or activities will be considered within the southern North Sea benthic ecology study area:

- Other offshore wind farms and associated cabling and infrastructure;
- Oil and gas infrastructure/development (cables and pipelines);
- Other forms of cabling (i.e. telecommunications and interlinks);
- Commercial fishing activity;
- Beach replenishment schemes.
- Navigation and shipping; and
- Aggregate extraction and disposal of dredging spoil.

8.1.32 The CEA will consider the same impacts across all phases of the project, as outlined in Table 8.4 for the Hornsea Three alone assessment.

### Potential transboundary impacts

8.1.33 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there is no potential for significant transboundary effects with regard to benthic subtidal and intertidal ecology from Hornsea Three upon the interests of other EEA states, as the predicted impacts on the benthic and epibenthic communities will largely be focused within the footprint of Hornsea Three.

8.1.34 The potential for Hornsea Three to impact on the benthic and epibenthic interest features of nature conservation designations outside of the UK Exclusive Economic Zone (EEZ) will be considered within the HRA process, including the interaction between physical processes and benthic ecology.

## 8.2 Fish and shellfish ecology

### Introduction

8.2.1 This section of the Scoping Report identifies fish and shellfish ecology resources of relevance to Hornsea Three and considers the potential impacts from the construction, operation and maintenance, and decommissioning of Hornsea Three on fish and shellfish ecology.

### Study area

8.2.2 For the purposes of the Hornsea Three fish and shellfish ecology EIA, two study areas are defined:

- The Hornsea Three fish and shellfish study area – this is the area encompassing Hornsea Three which includes the Hornsea Three array area, offshore ECR corridor and the area in the immediate vicinity of the ECR corridor landfall area. The Hornsea Three fish and shellfish study area also includes much of the wider former Hornsea Zone including a 4 km buffer to the north and south of the boundary (i.e. the zone of potential impact). Surveys undertaken across the former Hornsea Zone, including those for Project One and Project Two have been used to inform this Scoping Report; and
- The southern North Sea fish and shellfish study area – this is the regional fish and shellfish study area and is defined by the boundary of the southern North Sea Marine Natural Area (Jones *et al*., 2004). This study area includes areas within territorial waters of Netherlands, Germany and Denmark, broadly following the 50 m depth contour which separates the southern North Sea fish and shellfish communities from those of the central and northern North Sea (Teal, 2011). This southern North Sea fish and shellfish study area provides a wider context for the site-specific data (collected for Project One and Project Two) and is the area covered by the desktop review.

### Baseline data

8.2.3 An initial desk based review of literature and data sources to support this Scoping Report has highlighted the following data sources which provide coverage of the Hornsea Three array area and offshore ECR corridor search area, and in some cases also the wider southern North Sea fish and shellfish study area:

- Reports from Cefas outlining spawning and nursery habitats in the southern North Sea (e.g. Coull *et al*., 1998; Ellis *et al*., 2012);
- International Herring Larvae Survey data;
- Sandeel habitats mapped by Jensen *et al*. (2010) based on data collected from fishing vessels targeting sandeels;
- Technical reports for SEA Areas 2 and 3 (BGS, 2002a);
- International Council of the Exploration of the Sea (ICES, 2003) FishMap and International Bottom Trawl Surveys data;
- Data presented in the Humber Aggregate Dredging Association Marine Aggregate Regional Environmental Assessment (ERM, 2012);

- Baseline characterisations from other developments, including offshore wind farms, in the region (e.g. Triton Knoll (TKOWFL, 2012), Dudgeon (Royal Haskoning, 2009) and Sheringham Shoal (Scira Offshore Energy, 2006); and
- Other information from broad scale studies of fisheries resources collected (by a range of organisations including Cefas and Natural England) within the southern North Sea (e.g. Teal, 2011; Jones *et al*., 2004; Callaway *et al*., 2002; Rogers *et al*., 1998).

8.2.4 In addition to these desktop data sources, information is available for the Hornsea Three array area through site-specific fish ecology surveys undertaken across the former Hornsea Zone (Figure 8.6). Two seasonal otter trawl surveys, using representative commercial gears (5 m otter trawl and 40 mm cod-end), were undertaken at 41 stations across the central section of the former Hornsea Zone in 2011 for Project One. All mature herring captured during the autumn survey were analysed to determine their spawning condition. On the basis of the robust baseline characterisation provided by the desktop study and the Project One surveys, it was agreed with the SNCBs that further otter trawl surveys for Project Two were not required.

8.2.5 A series of 2 m epibenthic beam trawls were also undertaken between 2010 and 2012 for the ZoC and to inform the Project One and Project Two EIAs, as described in paragraph 8.1.10 for benthic subtidal and intertidal ecology. Figure 8.6 shows the distribution of these trawl sampling locations in relation to the Hornsea Three array area. A total of 12 of the ZoC otter trawl sites and 10 of the ZoC epibenthic trawl sites overlap with, or are in immediate proximity to the boundary of, the Hornsea Three array area. The data acquisition strategies, including the sampling arrays and methodologies, were discussed and agreed with the MMO and their advisors (i.e. Cefas and Natural England). All survey methodologies followed Cefas guidance and were discussed and agreed with the MMO prior to survey mobilisation.

## Baseline environment

### *Fish*

8.2.6 A total of 84 fish species were recorded during the otter trawl and epibenthic beam trawl surveys conducted across the former Hornsea Zone between 2010 and 2012. The fish communities were found to be typical of the southern North Sea.

8.2.7 Key characterising species comprised mainly demersal fish species such as whiting *Merlangius merlangus*, dab *Limanda limanda*, plaice *Pleuronectes platessa*, solenette *Buglossidium luteum* and grey gurnard *Eutrigla gurnardus*; these species were recorded in abundance during site-specific trawl surveys. The fish assemblage was also found to be characterised by other demersal species such as lemon sole *Microstomus kitt*, common sole *Solea solea* and cod *Gadus morhua*. Small demersal species including the short spined sea scorpion *Myoxocephalus scorpius*, lesser weaver *Echiichthys vipera*, dragonet *Callionymus lyra* and scaldfish *Arnoglossus laterna* were also recorded in the site-specific surveys.

8.2.8 Pelagic species including herring *Clupea harengus*, sprat *Sprattus sprattus* and squid (e.g. European common squid *Alloteuthis subulata* and European squid *Loligo vulgaris*) were also frequently recorded during the otter and epibenthic beam trawl surveys.

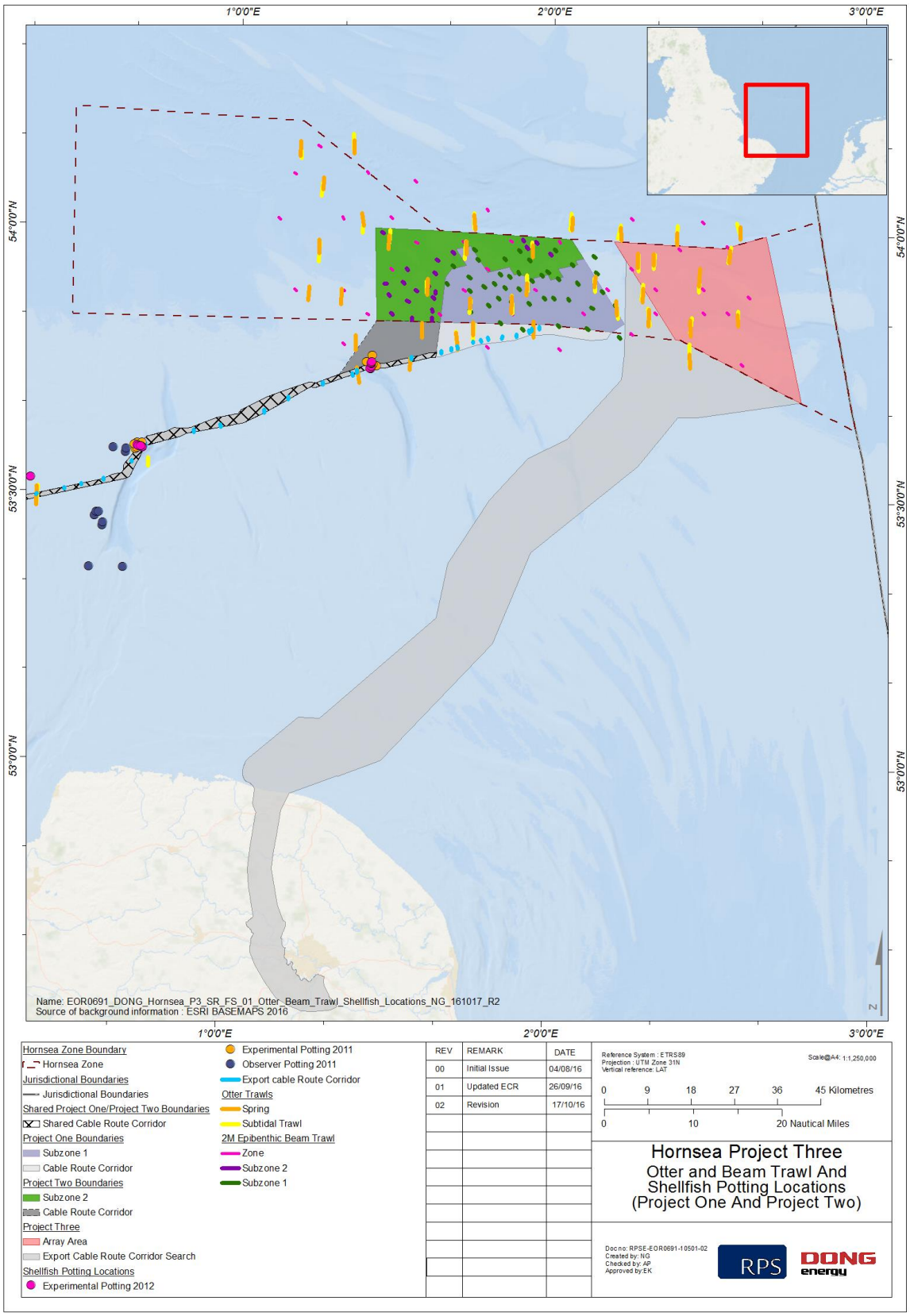



Figure 8.6 Location of previous otter trawl and epibenthic beam trawl sampling locations across Project One, Project Two and the former Hornsea Zone using survey data collected previously across the Hornsea Zone.

8.2.9 Abundance was relatively high across the Hornsea Three fish and shellfish study area, particularly during spring when the pelagic species, herring and sprat, which were also key characterising species of the assemblage, occurred in greater numbers. Conversely, species richness was greatest during autumn. As expected, water depth was identified as one of the key environmental variables affecting community composition.

8.2.10 Commercially important species encountered in high abundances and at high frequencies of occurrence during the previous surveys were whiting, dab, sprat, herring, plaice, mackerel *Scomber scombrus*, and lemon sole. Other commercially important species including cod, haddock *Melanogrammus aeglefinus*, sole, ling *Molva molva* and the spotted ray *Raja montagui*, cuckoo *Leucoraja naevus* and thornback rays were encountered less frequently (less than 50% frequency) and at lower abundances.

8.2.11 The greater sandeel *Hyperlopus lanceolatus* and lesser sandeel *Ammodytidae* spp., (both keystone species as they are important prey items for fish, birds and marine mammals) were recorded during the surveys but generally at low abundances (less than 25% frequency). On the basis of sandeel habitats mapped by Jensen *et al*. (2010) using data collected from fishing vessels targeting sandeels in the North Sea, sandeel habitats occur within the former Hornsea Zone, including the area coinciding with the Hornsea Three array area.

8.2.12 Whilst not the primary intention of the otter trawl surveys, juvenile fish of the following species were recorded in moderate abundance; whiting, dab, herring, grey gurnard and lemon sole. No particular patterns in the distribution of these species were evident; juveniles were present at the majority of sites where adult fish were found. Further details on the distribution of spawning and nursery grounds within the vicinity of the former Hornsea Zone are provided in paragraph 8.2.15 onwards).

### *Shellfish*

8.2.13 Several species of shellfish, some of which are commercially important, were caught in the otter and epibenthic trawls over the former Hornsea Zone.

8.2.14 Shellfish known to occur within the Hornsea Three fish and shellfish study area include brown crab, velvet swimming crab *Necora puber*, European lobster *Homarus gammarus*, Norway lobster *Nephrops norvegicus*, whelk *Buccinum undatum*, brown shrimp *Crangon crangon* and pink shrimp *Pandalus* sp. Crustacean shellfisheries form the main catch for many of the fishermen along the North Norfolk coast, in the vicinity of the Hornsea Three offshore ECR corridor and landfall search area, where crab and lobster are targeted from spring to late autumn off the Norfolk coast.

### *Spawning and nursery grounds*

8.2.15 A wide range of finfish and shellfish are known to utilise the region for spawning and nursery grounds and many of these areas are located within the Hornsea Three fish and shellfish study area. Known spawning and nursery grounds for these species are shown in Figure 8.7 to Figure 8.9, and are summarised in Table 8.6.

8.2.16 Although potential herring spawning grounds have been identified by Coull *et al*. (1998) in the area coinciding with the northeast corner of the Hornsea Three array area and the southern extent of the Hornsea Three offshore ECR corridor search area (Figure 8.8), more recent data from the International Herring Larvae Survey between 2001 and 2010 have shown that the key spawning ground for this herring population (i.e. the Banks population) is located to the west of the former Hornsea Zone, off Flamborough Head. This population spawns in autumn, with peak spawning occurring in September and October. A smaller, spring spawning herring population is also known to occur within The Wash (Cefas, 2009). Furthermore, gonadal assessment during the trawling surveys within the former Hornsea Zone did not confirm any significant fish spawning populations (0.5% of the herring caught in autumn were actively spawning).

8.2.17 Berried individuals of brown crab, lobster and *Nephrops* were all recorded at very low abundances. Brown crab spawning areas were identified to the west of the Hornsea Three array area, whilst *Nephrops* spawning and nursery may overlap the Hornsea Three array area, potentially encompassing the eastern half of the former Hornsea Zone (Figure 8.9).

Table 8.6 Summary of finfish and shellfish spawning and nursery areas within the Hornsea Three array area and offshore ECR corridor search area (Coull *et al*., 1998; Ellis *et al*., 2012).

| Species | Hornsea Three array area | | Hornsea Three offshore ECR corridor search area | |
|---|---|---|---|---|
| | Spawning | Nursery | Spawning | Nursery |
| Cod | ✓ | ✓ | ✓ | ✓ |
| Whiting | ✓ | ✓ | ✓ | ✓ |
| Plaice | ✓ | | ✓ | ✓ |
| Lemon sole | | | ✓ | ✓ |
| Sprat | ✓ | ✓ | ✓ (partial) | ✓ (partial) |
| Herring | ✓ (partial) | ✓ | ✓ (partial) | ✓ |
| Mackerel | ✓ | ✓ | ✓ | ✓ |
| Sandeel | ✓ | ✓ | ✓ | ✓ |
| Sole | | | ✓ | ✓ (partial) |
| Anglerfish | | ✓ | | ✓ (partial) |
| Spurdog | | ✓ | | ✓ (partial) |
| Tope shark | | ✓ | | ✓ (partial) |
| *Nephrops* | ✓ | ✓ | ✓ (partial) | ✓ (partial) |

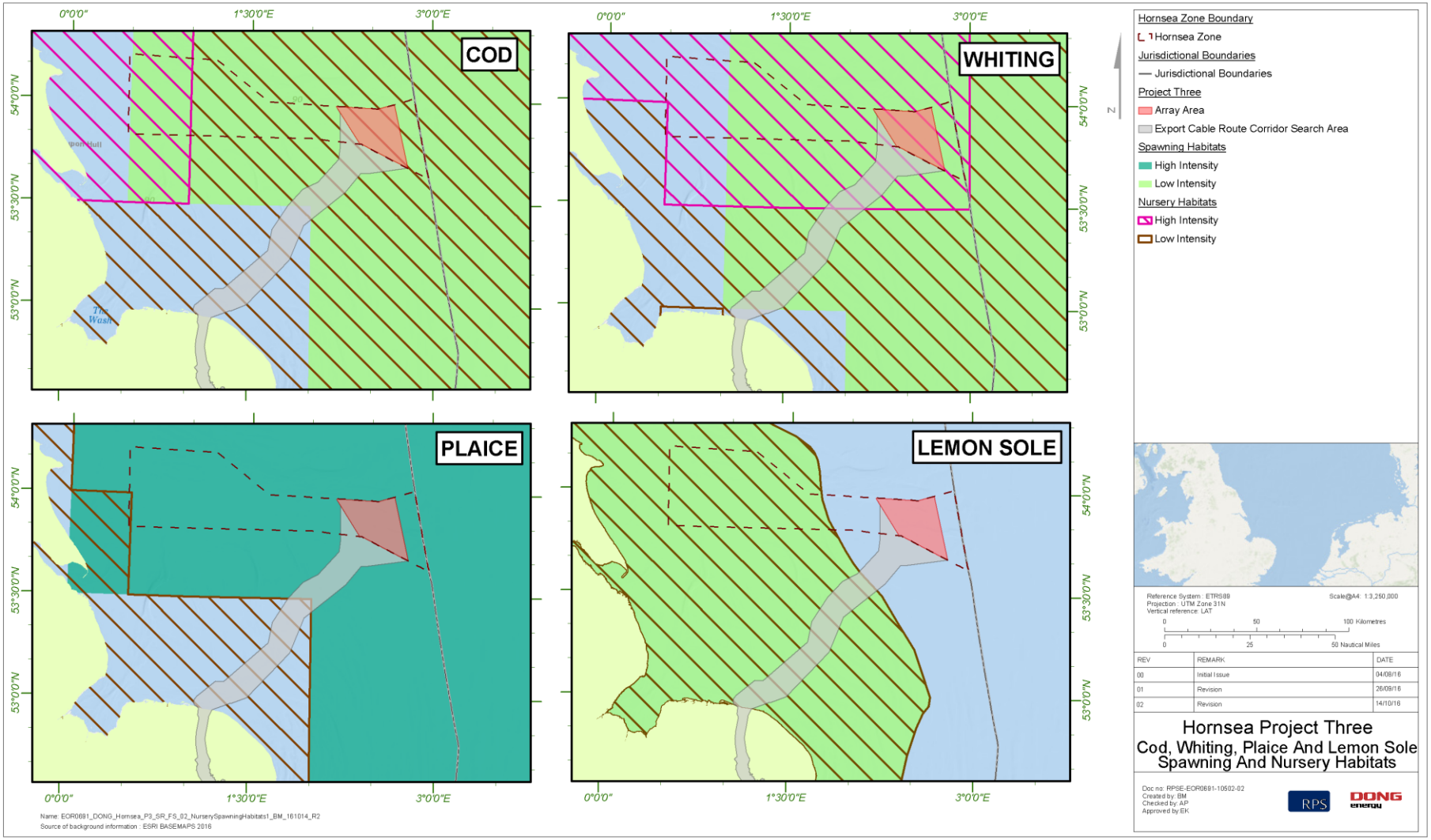



Figure 8.7 Spawning and nursery grounds for cod, whiting, plaice and lemon sole.

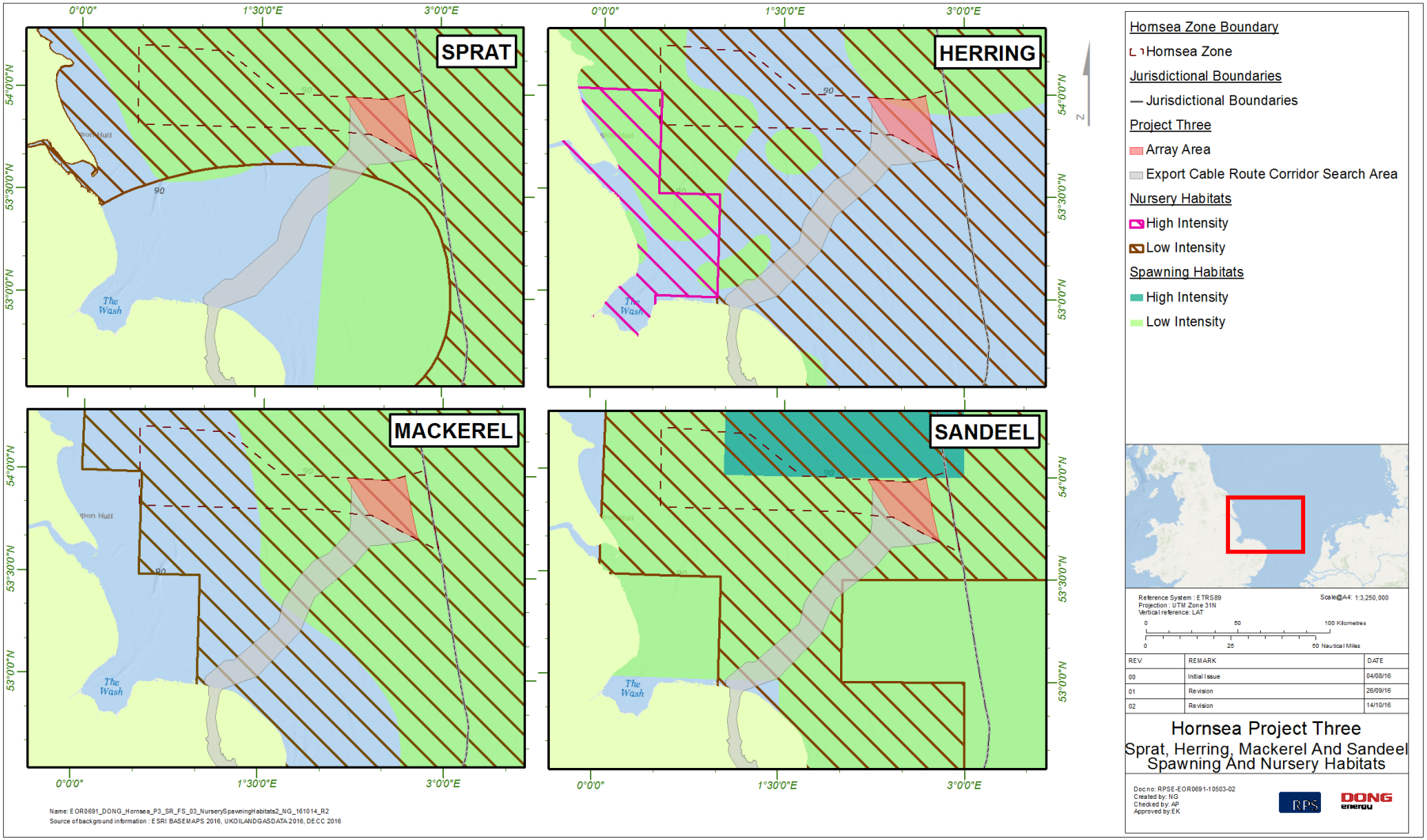



Figure 8.8 Spawning and nursery grounds for sprat, herring, mackerel and sandeel.

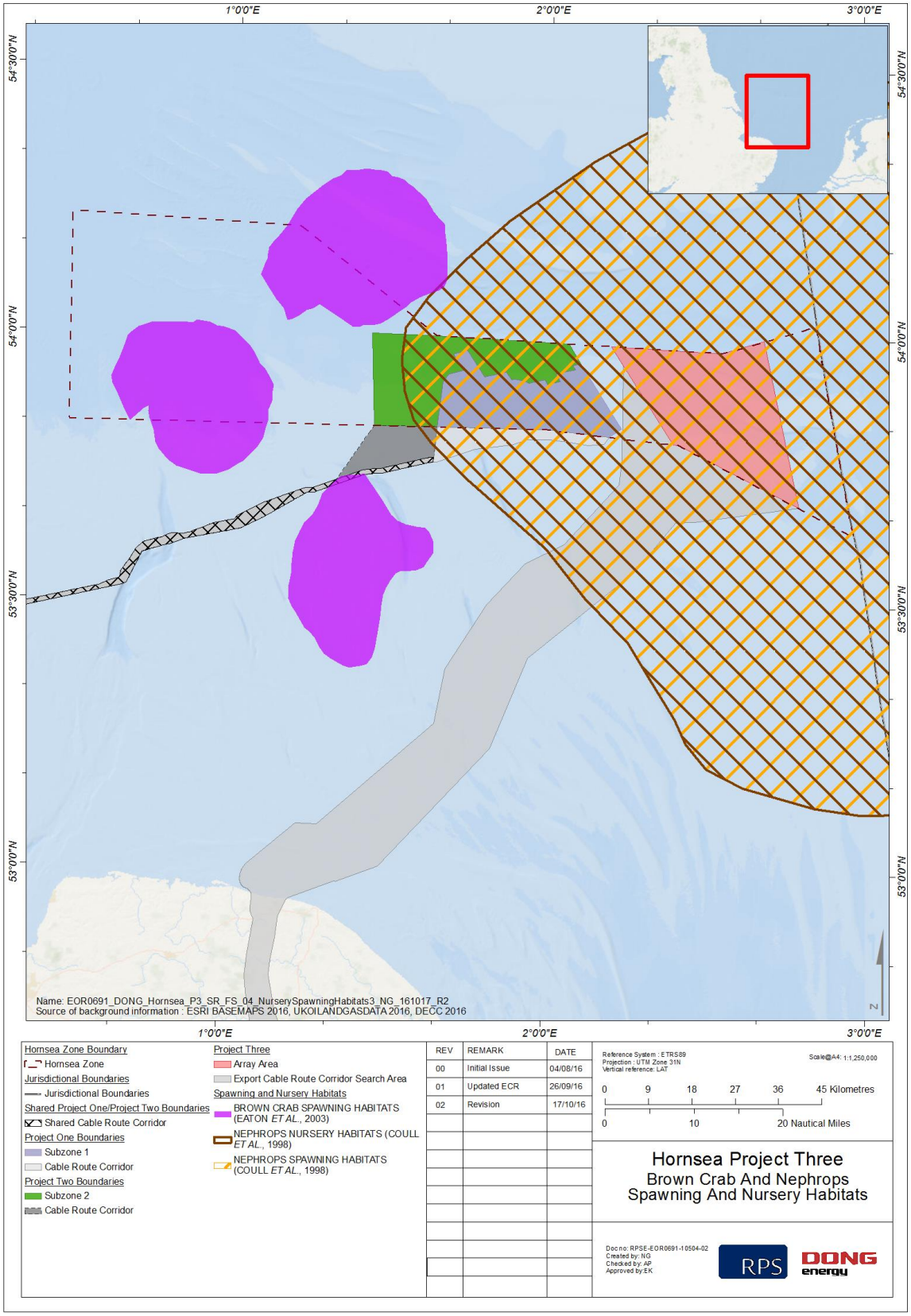



Figure 8.9 Spawning and nursery grounds for *Nephrops* and brown crab.

### *Designated sites*

8.2.18 The identification of sites for inclusion in the fish and shellfish ecology EIA was carried out as follows:

- Sites, with relevant qualifying features, which overlap with Hornsea Three were screened in for further assessment; and
- Sites, with relevant qualifying features, which are located within the southern North Sea fish and shellfish study area (see paragraph 8.2.2) and for which there is the potential for barrier effects to migration of Annex II species to and from these sites as a result of Hornsea Three. This ensures that all sites with qualifying features that may potentially be affected by noise effects (behavioural impacts), electro-magnetic fields (EMF) and potential changes in water quality (e.g. increased suspended sediment concentrations) during migration to/from these sites are included in the assessment. On the basis that Hornsea Three is 76 km from the nearest designated site, there is only considered to be the potential for impacts on behaviour during migration and not whilst Annex II species are within the boundaries of the designated sites.

8.2.19 Based on these assumptions, neither the Hornsea Three array area nor the offshore ECR corridor search area coincides with any designated sites of conservation importance for fish and shellfish features. The Hornsea Three array area does however coincide with the western section of the Markham's Triangle rMCZ. This site is proposed for designation for the presence of subtidal sands which provide ideal habitat for sandeel. At a wider scale (i.e. within the southern North Sea fish and shellfish study area), a Natura 2000 designation (i.e. SAC) and Ramsar site, and national designation (i.e. SSSI), have been screened in. Further details on these designated sites are provided in Table 8.7 and shown in Figure 8.10.

Table 8.7 Marine nature conservation designations with relevance to fish and shellfish ecology and the Hornsea Three EIA.

| Site | Closest distance to Hornsea Three | Features |
|---|---|---|
| ***International designations*** | | |
| Humber Estuary SAC/Ramsar | 67 km from Hornsea Three offshore ECR corridor search area. | Annex II species present as a qualifying feature, but not a primary reason for site selection:<br>• Sea lamprey *Petromyzon marinus*;<br>• River lamprey *Lampetra fluviatilis*. |
| ***National designations*** | | |
| Humber Estuary SSSI | 72 km from Hornsea Three offshore ECR corridor search area. | Sea lamprey and river lamprey. |
| Markham's Triangle rMCZ | Coincident with the Hornsea Three array area. | Shallow sandy sediments provide ideal habitat for sandeel (although not a feature proposed for designation). |

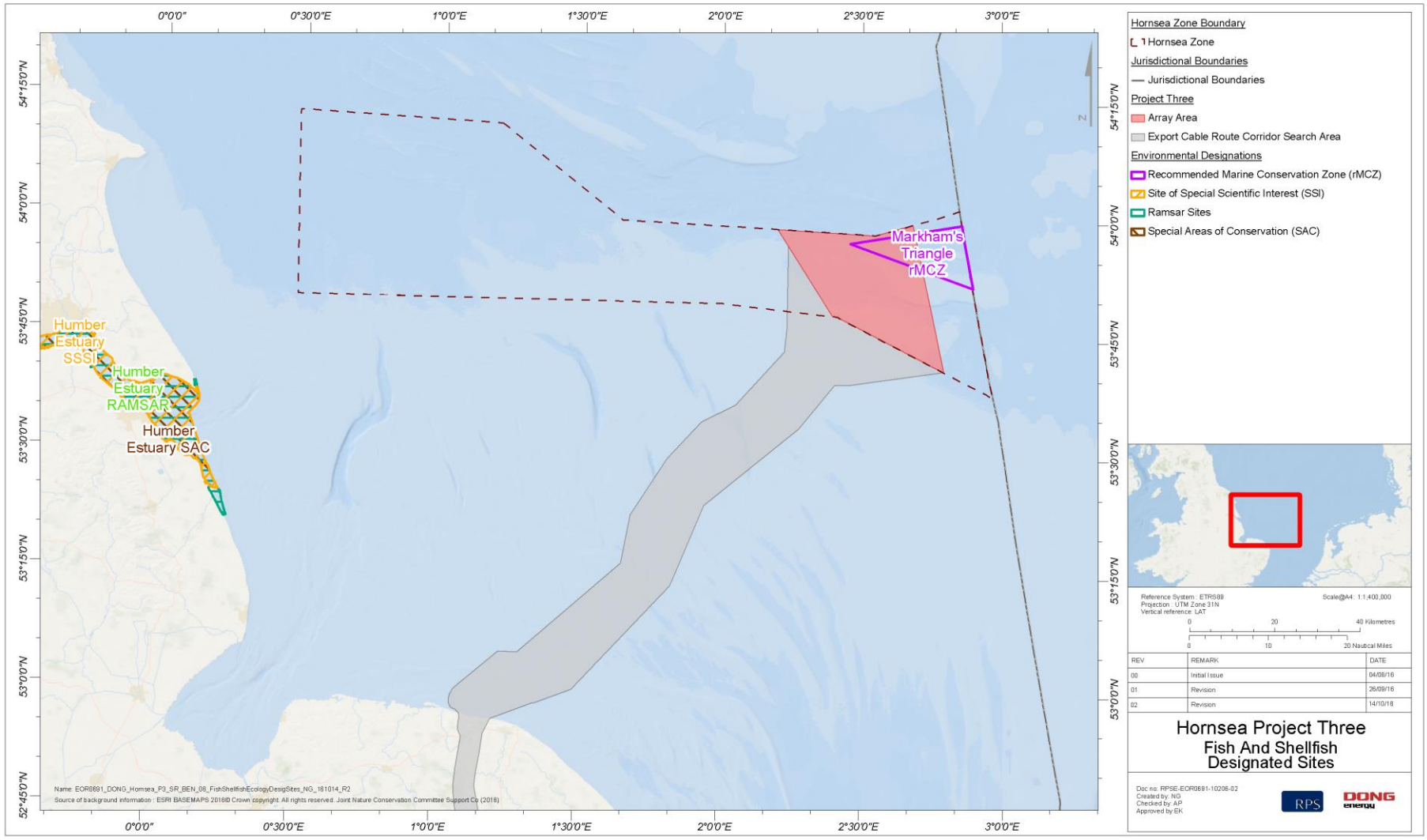



Figure 8.10 Marine nature conservation designations with relevance to fish and shellfish ecology and the Hornsea Three EIA.

## Proposed approach to the Environmental Impact Assessment (EIA)

### *Proposed assessment methodology*

8.2.20 The fish and shellfish ecology EIA will follow the methodology set out in Chapter 5: Environmental Impact Assessment Methodology above. Specific to the fish and shellfish ecology EIA, the following guidance documents will also be considered:

- Guidelines for EcIA in Britain and Ireland. Marine and Coastal, Final Document (IEEM, 2010);
- Offshore Wind Farms. Guidance note for EIA in respect of FEPA and CPA requirements (Cefas *et al*., 2004);
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Judd, 2012); and
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008).

8.2.21 In addition, the fish and shellfish ecology EIA will follow the legislative framework as defined by the Offshore Marine Conservation (Natural Habitats, and c.) Regulations 2007 (Offshore Habitats Regulations) (as amended), the Conservation of Habitats and Species Regulations 2010 (Habitats Regulations) (as amended), the Wildlife and Countryside Act 1981 (as amended) and the MCAA 2009 (as amended).

### *Valued Ecological Receptors (VERs)*

8.2.22 For the purposes of conducting the EIA, a number of VERs will be identified within the southern North Sea fish and shellfish study area, based on the baseline characterisation, against which impacts associated with the construction, operation and maintenance, and decommissioning of Hornsea Three will be assessed. A valuation of the importance of each VER within the Hornsea Three fish and shellfish study area will then be made using the criteria presented in Table 8.8 based on:

- Populations present within the southern North Sea fish and shellfish study area;
- Spawning, nursery and migratory behaviour within the southern North Sea fish and shellfish study area; and
- Commercial, conservation and ecological interest, including importance in supporting species of high trophic levels (e.g. prey species for bird and marine mammal species).

Table 8.8 Criteria used to inform the valuation of ecological receptors in the Hornsea Three fish and shellfish study area.

| Value of VER | Criteria to define value |
|---|---|
| International | Internationally designated sites.<br>Species protected under international law (i.e. Annex II species listed as features of SACs). |
| National | Nationally designated sites.<br>Species protected under national law.<br>Annex II species which are not listed as features of SACs in the Hornsea Three fish and shellfish study area.<br>UK BAP priority species (including grouped action plans) that continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework, MCZ/rMCZ features (species classified as features of conservation importance and broad scale habitats), species of principal importance and Nationally Important Marine Features that have nationally important populations within the Hornsea Three fish and shellfish study area, particularly in the context of species/habitat that may be rare or threatened in the UK.<br>Species that have spawning or nursery areas within the Hornsea Three fish and shellfish study area that are important nationally (e.g. may be primary spawning/nursery area for that species). |
| Regional | UK BAP priority species (including grouped action plans) that continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework, MCZ/rMCZ features (species classified as features of conservation importance and broad scale habitats), species of principal importance or Nationally Important Marine Features that have regionally important populations within the Hornsea Three fish and shellfish study area (i.e. are locally widespread and/or abundant).<br>Species that are of commercial value to the fisheries which operate within the southern North Sea.<br>Species that form an important prey item for other species of conservation or commercial value and that are key components of the fish assemblages within the Hornsea Three fish and shellfish study area.<br>Species that have spawning or nursery areas within the Hornsea Three fish and shellfish study area that are important regionally (i.e. species may spawn in other parts of the UK but that this is key spawning/nursery area within the southern North Sea as the region of interest). |
| Local | Species that are of commercial importance but do not form a key component of the fish assemblages within the Hornsea Three fish and shellfish study area (e.g. they may be exploited in deeper waters outside the Hornsea Three fish and shellfish study area).<br>The spawning/nursery area for the species are outside the Hornsea Three fish and shellfish study area.<br>The species is common throughout the UK but forms a component of the fish assemblages in the Hornsea Three fish and shellfish study area. |

### Potential project impacts

8.2.23 A range of potential impacts on fish and shellfish ecology have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Hornsea Three. The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 8.9 together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

8.2.24 On the basis of the baseline fish and shellfish ecology information currently available and the project description outlined in Chapter 3: Project Description, a number of impacts are proposed to be scoped out of the assessment for fish and shellfish ecology. These impacts are outlined, together with a justification for scoping them out, in Table 8.10.

Table 8.9 Impacts proposed to be scoped into the Hornsea Three assessment for fish and shellfish ecology.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Temporary habitat loss/ disturbance | There is potential for temporary, direct habitat loss and disturbance due to cable laying operations (including anchor placements), spud-can leg impacts from jack-up operations and seabed preparation works for gravity base foundations. | Hornsea Three array area<br>Given the detail, coverage and contemporary nature of fish ecology information available (from desk studies and site-specific surveys; see paragraphs 8.2.3 to 8.2.5) for the former Hornsea Zone and that local fish populations across this area have been shown to be typical of the wider southern North Sea, the fish and shellfish ecology baseline is considered to have been robustly characterised. Therefore, no further site-specific fish ecology surveys to inform the Hornsea Three EIA are proposed across the Hornsea Three array area. The SNCBs have agreed with this approach (see Table 6.1).<br>The desktop data will be updated with any more recent available data on potential herring spawning grounds, collected via the International Herring Larvae Survey. The desktop data on sandeel spawning habitats will also be updated to include the results of the PSA sample collection for benthic subtidal ecology and the PSA results from the Markham's Triangle rMCZ surveys (see Table 8.4) which will be processed according to the methodologies described in Latto *et al*. (2013) in order to further identify preferred, marginal and unsuitable sandeel habitats across the Hornsea Three array area.<br><br>Hornsea Three offshore ECR corridor<br>As described in paragraphs 8.2.3, there are a number of desktop data sources which cover the Hornsea Three offshore ECR corridor search area. The local fish populations for the southern North Sea are well understood | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| | | | and well characterised from these existing data sources. No dedicated fish and shellfish surveys are proposed for the Hornsea Three offshore ECR corridor, however, it is intended that the results of the epibenthic beam trawl survey, which is proposed to characterise the benthic subtidal baseline of the Hornsea Three offshore ECR corridor for the purposes of the EIA (see Table 8.4), can be used to enhance the existing data for fish and shellfish. | |
| 2 | Temporary increases in suspended sediments | Sediment disturbance arising from construction activities (e.g. cable and foundation installation) may result in adverse and indirect impacts on fish and shellfish receptors. | As above for fish and shellfish ecology impact no. 1. | See approach to Marine Processes assessment in Table 7.4. |
| 3 | Sediment deposition | There is potential for sediment deposition/smothering of fish and shellfish habitats as a result of sediment plumes generated during construction activities (e.g. cable and foundation installation). | As above for fish and shellfish ecology impact no. 1. | See approach to Marine Processes assessment in Table 7.4. |
| 4 | Underwater noise | Construction activities, in particular the pile-driving of foundations, will result in high levels of underwater noise that may result in mortality, injury and behavioural effects fish. | As above for fish and shellfish ecology impact no. 1. | See approach to Subsea Noise assessment in Chapter 7, Section 7.2. |
| 5 | Accidental pollution | There is a risk of pollution being accidentally released from sources including construction and installation vessels/vehicles, machinery and offshore fuel storage tanks and from the construction process itself. The release of such contaminants may adversely affect fish and shellfish receptors. | As above for fish and shellfish ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Operation and maintenance*** | | | | |
| 6 | Long-term habitat loss | There is the potential for long-term loss of fish and shellfish habitat to occur directly under all foundation structures and associated scour protection, and all subsea cables, where secondary cable protection is required. | As above for fish and shellfish ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 7 | Underwater noise | Underwater noise as a result of operational turbines and maintenance vessel traffic has the potential to result in effects on fish and shellfish receptors. | As above for fish and shellfish ecology impact no. 1. | See approach to Subsea Noise assessment in Chapter 7, Section 7.2. |
| 8 | Colonisation of hard structures | The introduction of man-made structures on the seabed (foundations and scour/cable protection) may lead to effects on fish and shellfish receptors by creating reef habitat. | As above for fish and shellfish ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 9 | EMF | EMF emitted by array and export cables during the operational phase has the potential to result in behavioural responses in fish and shellfish receptors. | As above for fish and shellfish ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 10 | Temporary seabed disturbance | Temporary disturbance/alteration of seabed habitats may occur during the operation and maintenance phase of Hornsea Three as a result of maintenance operations (i.e. jack-up operations). | As above for fish and shellfish ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 11 | Accidental pollution | There is a risk of pollution being accidentally released from vessels, vehicles, machinery and offshore fuel storage tanks during the operation and maintenance phase as well as from the turbines and offshore substations themselves. | As above for fish and shellfish ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Decommissioning*** | | | | |
| 12 | Temporary habitat loss/disturbance | There is potential for temporary, direct loss and disturbance to fish and shellfish habitats due to operations to remove array and export cables, and jack-up operations to remove foundations. | As above for fish and shellfish ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 13 | Temporary increases in suspended sediments | Sediment disturbance arising from decommissioning activities (e.g. cable and foundation removal) may result in adverse and indirect impacts on fish and shellfish receptors. | As above for fish and shellfish ecology impact no. 1. | See approach to Marine Processes assessment in Table 7.4. |
| 14 | Sediment deposition | There is the potential for sediment deposition as a result of removal of array cables, export cables and turbine foundations. | As above for fish and shellfish ecology impact no. 1. | See approach to Marine Processes assessment in Table 7.4. |
| 15 | Underwater noise | Decommissioning activities producing subsea noise has the potential to affect fish and shellfish receptors. | As above for fish and shellfish ecology impact no. 1. | See approach to Subsea Noise assessment in Chapter 7, Section 7.2. |
| 16 | Removal of hard substrates | The removal of foundations and scour/cable protection during decommissioning has the potential to reduce habitat complexity. | As above for fish and shellfish ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 17 | Permanent habitat loss | Permanent habitat loss may arise due to presence of scour/cable protection left in situ post decommissioning. | As above for fish and shellfish ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 18 | Accidental pollution | There is a risk of pollution being accidentally released from vessels, vehicles, machinery and offshore fuel storage tanks during the operation and maintenance phase as well as from the turbines and offshore substations themselves. | As above for fish and shellfish ecology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

Table 8.10 Impacts proposed to be scoped out of the assessment for fish and shellfish ecology.

| Impact No. | Impact | Justification |
|---|---|---|
| ***Construction*** | | |
| 1 | Remobilisation of contaminated sediments | Work undertaken previously for Project One and Project Two suggests that contamination in the offshore sediments is low and at levels which are unlikely to result in adverse effects on marine receptors. Therefore, it is considered unlikely that there would be any pathways for an impact on fish and shellfish receptors.<br>Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Operation and maintenance*** | | |
| 2 | Potentially reduced fishing pressure within the Hornsea Three array area and potentially increased fishing pressure outside the Hornsea Three array area. | On the basis that no fishing restrictions were proposed to be implemented during the operational phase of Project Two, and the same will be applied for Hornsea Three, this impact may not arise and if it does, the magnitude would be impossible to quantify.<br>Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Decommissioning*** | | |
| 3 | Remobilisation of contaminated sediments | As above for fish and shellfish ecology impact no. 1. |

### Measures adopted as part of the project

8.2.25 Measures adopted as part of the project will include:

- Development of, and adherence to, a CoCP;
- During the construction phase, piling operations of foundations (for both turbine and substation/platform foundation installations) will undergo a soft start and ramp-up;
- Development of, and adherence to, an appropriate PEMMP; and
- Development of, and adherence to, a Decommissioning Plan.

8.2.26 The requirement and feasibility of additional measures will be dependent on the significance of the effects on fish and shellfish ecology and will be consulted upon with statutory consultees throughout the EIA process.

### Potential cumulative impacts

8.2.27 The predicted effects of construction, operation and maintenance, and decommissioning from Hornsea Three on fish and shellfish ecology are, with the exception of subsea noise, considered to be localised to within the footprint of Hornsea Three. However, there is potential for cumulative effects to occur on fish and shellfish ecology from other projects or activities within the southern North Sea fish and shellfish study area where projects or plans could act collectively with Hornsea Three to affect fish and shellfish receptors.

8.2.28 The cumulative assessment will consider the maximum adverse scenarios for each of the projects or activities. The following projects or activities will be considered within the southern North Sea fish and shellfish study area:

- Other offshore wind farms and associated cabling and infrastructure;
- Oil and gas infrastructure/development (cables and pipelines);
- Other forms of cabling (i.e. telecommunications and interlinks);
- Commercial fishing activity;
- Navigation and shipping; and
- Aggregate extraction and disposal of dredging spoil.

8.2.29 The CEA will consider the same impacts across all phases of the project, as outlined in Table 8.9 for the Hornsea Three alone assessment.

### Potential transboundary impacts

8.2.30 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there is the potential for transboundary impacts upon fish and shellfish ecology due to construction, operational and maintenance, and decommissioning impacts of Hornsea Three. These include direct impacts due to underwater noise from piling operations and indirect impacts caused by loss of fish and shellfish habitat or disturbance to habitat due to increased suspended sediments and deposition from the placement/removal of foundations and cables in or on the seabed. These activities have the potential to directly affect Annex II migratory fish species that are listed as features of European Sites in other EEA states, or species that are of commercial importance for fishing fleets of other EEA states. Indirect effects will include loss of or disturbance to fish spawning and nursery habitats in the North Sea that are important for migratory fish species either designated as Annex II species or of commercial importance to other EEA states.

8.2.31 The potential for Hornsea Three to impact on the fish and shellfish interest features of nature conservation designations outside of the UK EEZ will be considered within the HRA process.

## 8.3 Marine mammals

### Introduction

8.3.1 This section of the Scoping Report identifies the marine mammal species which are of relevance to the Hornsea Three array area and offshore ECR corridor search area. It considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore components of Hornsea Three on marine mammals.

### Study area

8.3.2 For the purposes of the Hornsea Three marine mammals EIA, two study areas are defined:

- The Hornsea Three marine mammal study area - defined as the area encompassing the Hornsea Three array area and offshore ECR corridor extending towards the coastal landfall location on the north Norfolk coast. Site-specific marine mammal surveys conducted previously across the Project One and Project Two array areas which extended out to cover the former Hornsea Zone and a 10 km buffer have been used to inform this Scoping Report. In addition, existing data was also collated from a more extensive area which extended west from the former Hornsea Zone to cover the Project One and Project Two offshore cable route corridors towards the coastline and then north and south along the Norfolk and Lincolnshire inshore waters; and
- The regional marine mammal study area, represented largely by Small Cetacean Abundance in the North Sea (SCANS) Block U as the central point of focus, and extending further east and south to ensure the baseline encompasses all key areas within the southern North Sea. The purpose of the regional study area is to provide a wider geographic context for comparison with site-specific Hornsea Three data in terms of the species present and their estimated densities and abundance and therefore is the area covered by the desktop review. Sites designated for conservation of marine mammal features within this region will provide a context to understanding the relative importance of marine mammal species found within the southern North Sea, which may also be important within the former Hornsea Zone. It should be noted that the regional study area is not intended to delineate populations of marine mammals, but to provide a sufficiently large area to understand ecological patterns in the species. Instead, the relevant (reference) populations for marine mammal species identified in the study area (against which impacts will be assessed) will be those provided for the relevant Management Units for each species (described in IAMMWG, 2013 and IAMMWG, 2015).

### Baseline data

8.3.3 An initial desk based review of literature and data sources to inform this Scoping Report has highlighted the following data sources which provide marine mammal data coverage of the Hornsea Three array area and offshore ECR corridor search area:

- Background Information on North Sea Marine Mammals, SEA – Area 2 (DTI, 2001a) and Area 3 (DTI, 2001b);
- Offshore energy SEA 3 (DECC, 2016);
- SCANS data (SCANS-II, 2006; Hammond *et al.,* 2013) including new data from SCANS-III if available;

- An Atlas of Cetaceans Distribution in Northwest European Waters (Reid *et al*., 2003);
- UK Cetacean Status Review (Evans *et al.,* 2003);
- Aerial cetacean survey, cetaceans sighting map for the Greater Wash based on the Wildfowl and Wetlands Trust (WWT) aerial survey data collected between October 2004 and August 2006 (WWT, 2009);
- Annual Reports by the Special Committee on Seals (SCOS) – Scientific Advice on Matters Relating to the Management of Seal Populations;
- Summary of SMRU seal telemetry data from 1998 to 2001 within the Humber area (SMRU, 2011);
- SMRU seal at-sea density maps for grey and harbour seal (Jones and Matthiopoulos, 2012); and
- Various Environmental Statements produced for other offshore wind farms in the regional marine mammal study area (Project One (SMart Wind, 2013), Project Two (SMart Wind, 2015), Triton Knoll (TKOWFL, 2012), Dogger Bank Creyke Beck (Forewind, 2013a), Dogger Bank Teesside (Forewind, 2013b), Dudgeon (Royal Haskoning, 2009), Humber Gateway (E.ON, 2008), East Anglia ONE (Scottish Power Renewables and Vattenfall Wind Power, 2012) and East Anglia THREE (Scottish Power Renewables, 2015).

8.3.4 In addition to these data sources, information is available for the Hornsea Three array area from the site-specific marine mammal surveys undertaken across the former Hornsea Zone for Project One and Project Two between March 2010 and February 2013. The area surveyed during these boat-based surveys included the array areas for Project One and Project Two plus a 4 km buffer and the former Hornsea Zone plus a 10 km buffer (see Figure 8.11). Visual surveys for marine mammals were conducted along transect lines spaced 2 km apart within the Project One and Project Two array areas and 6 km apart within the former Hornsea Zone. The surveys followed the standard Joint Nature Conservation Committee (JNCC) European Seabirds at Sea (ESAS) survey methodology (Webb and Durinck 1992), and complied with Collaborative Offshore Wind Research into the Environment (COWRIE) recommendations (Camphuysen *et al.,* 2004).

8.3.5 The visual marine mammal data was augmented by acoustic data from surveys carried out in order to detect any cetacean vocalisations from either harbour porpoise *Phocoena phocoena* or dolphin species where surface activity may not have been recorded due to poor sea state. Acoustic surveys consisted of a towed hydrophone (see Figure 8.11) and on-board recording station and were undertaken monthly from March 2011 to February 2013. For the first six months of acoustic survey, the hydrophone was deployed continuously during surveys. However, following discussion with fisherman in the former Hornsea Zone in January 2011, the hydrophone was not towed south of 53º50.0000' N (Figure 8.11).

8.3.6 In addition, the reader is referred to Table 8.13 below which outlines the additional site-specific surveys that are underway to inform the EIA characterisation of the Hornsea Three array area.

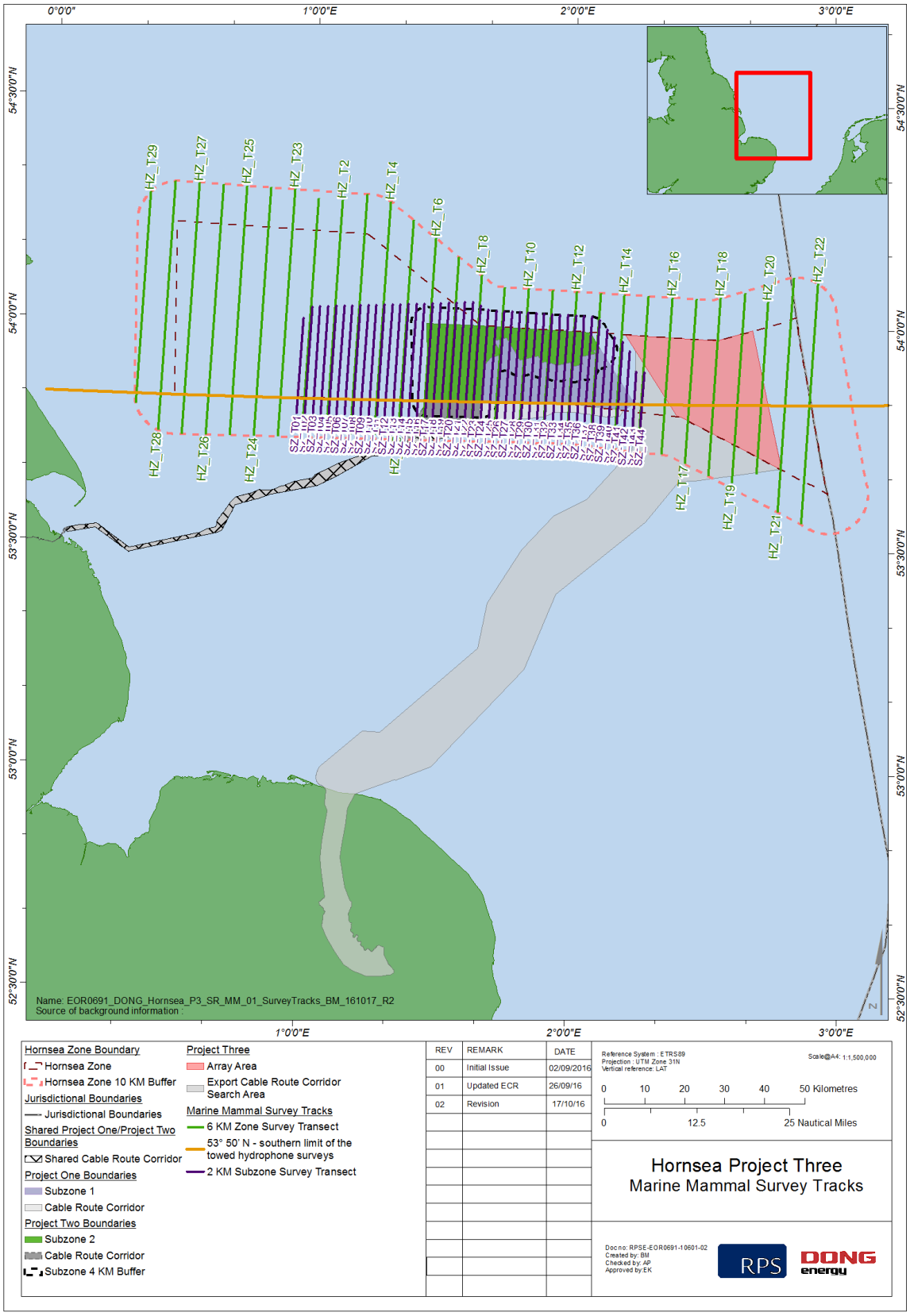



Figure 8.11 Transect lines for boat-based marine mammal surveys across Project One, Project Two and the former Hornsea Zone.

### Baseline environment

8.3.7 The waters around Hornsea Three support a diverse range of marine mammals (cetaceans and pinnipeds). Eight marine mammal species occur regularly throughout the North Sea. Two pinniped species; grey seal and harbour (common) seal, and six cetacean species; harbour porpoise, bottlenose dolphin *Tursiops truncatus*, white-beaked dolphin, Atlantic white-sided dolphin *Lagenorhynchus acutus*, minke whale and killer whale *Orcinus orca* (Hammond *et al*., 2001).

8.3.8 Based on the historic records of marine mammals in the southern North Sea and the results of the site-specific surveys for Project One and Project Two, the five key marine mammal species identified as important receptors within the regional marine mammal study area are: harbour porpoise, white-beaked dolphin, minke whale, harbour seal and grey seal. These species are discussed in the following sections.

#### *Harbour porpoise*

##### *Hornsea Three array area*

8.3.9 Harbour porpoise are the most abundant cetacean species in UK waters and the entirety of the North Sea and North Atlantic coastlines are considered to be key habitats for this species (Reid *et al*., 2003). Harbour porpoise was the most common marine mammal in the site-specific Project One and Project Two surveys. A total of 6,504 observations were recorded within the former Hornsea Zone plus 10 km buffer over the three years of monthly boat based visual surveys accounting for approximately 87% of all marine mammals recorded during the surveys. This species was distributed widely across the former Hornsea Zone and analysis of the site-specific data for Project One and Project Two estimated that approximately 15,955 animals, based on visual data, or 20,599 animals, based on acoustic data, may be present within the former Hornsea Zone plus 10 km buffer.

8.3.10 Mean absolute densities for the former Hornsea Zone plus 10 km buffer were estimated at 1.718 to 2.218 animals $km^{-2}$ for visual and acoustic data (Figure 8.12), respectively. In comparison, the SCANS Block U average density estimate is 0.598 animals $km^{-2}$ (Figure 8.13). The mean encounter rate for the former Hornsea Zone plus 10 km buffer showed a peak from May to July and was lowest during the winter months.

##### *Hornsea Three marine export cable route (ECR) corridor*

8.3.11 Modelled abundance data from the SCANS-II project (SCANS-II, 2006) (Figure 8.13), as well as historical data from the WWT aerial surveys (Figure 8.14; WWT, 2009), show that harbour porpoise are regularly sighted along inshore areas and therefore are likely to occur within the proposed Hornsea Three offshore ECR corridor search area.

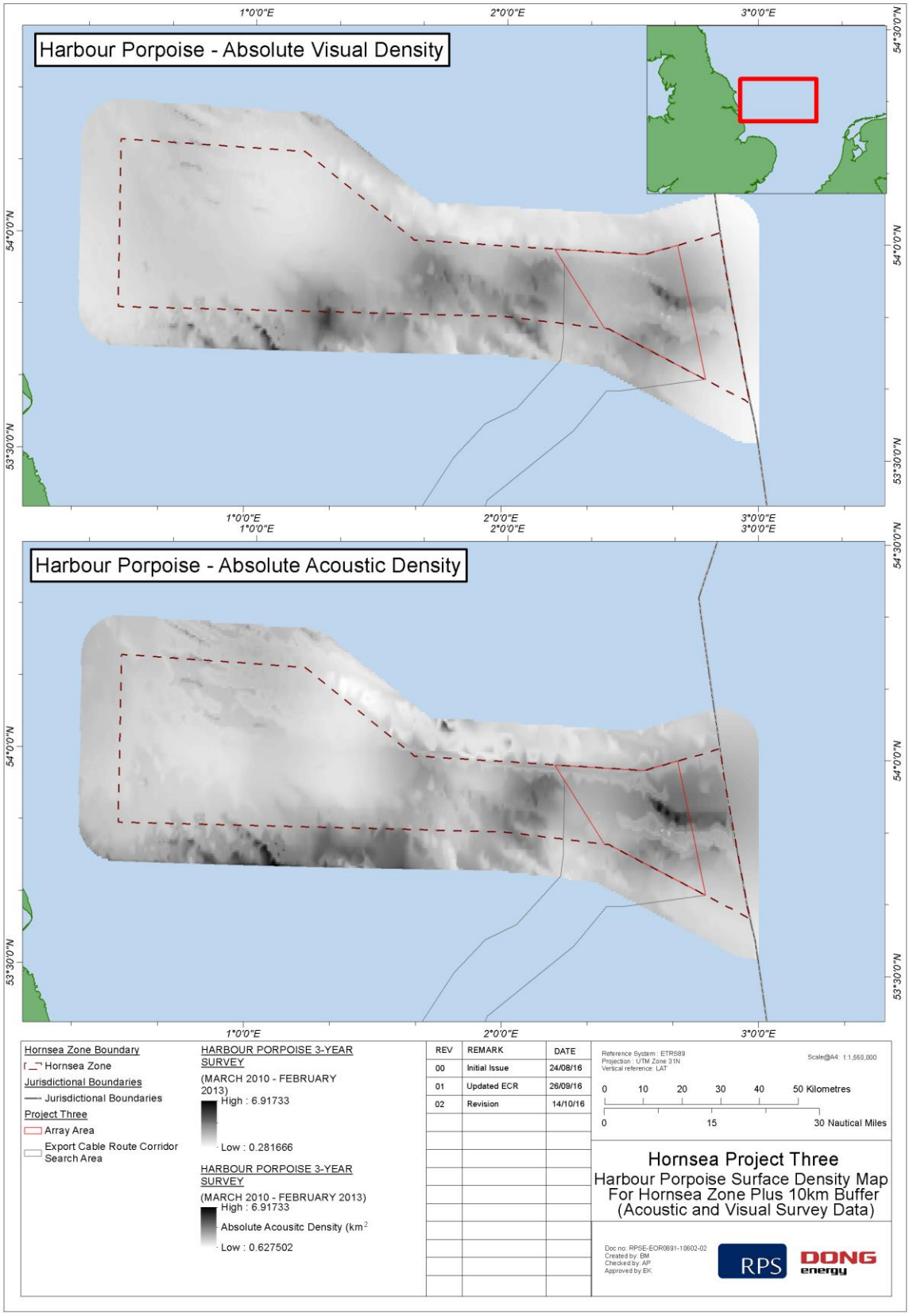



Figure 8.12 Modelled surface density estimates (absolute density) for harbour porpoise across the former Hornsea Zone plus 10 km buffer based on three years of visual survey data.

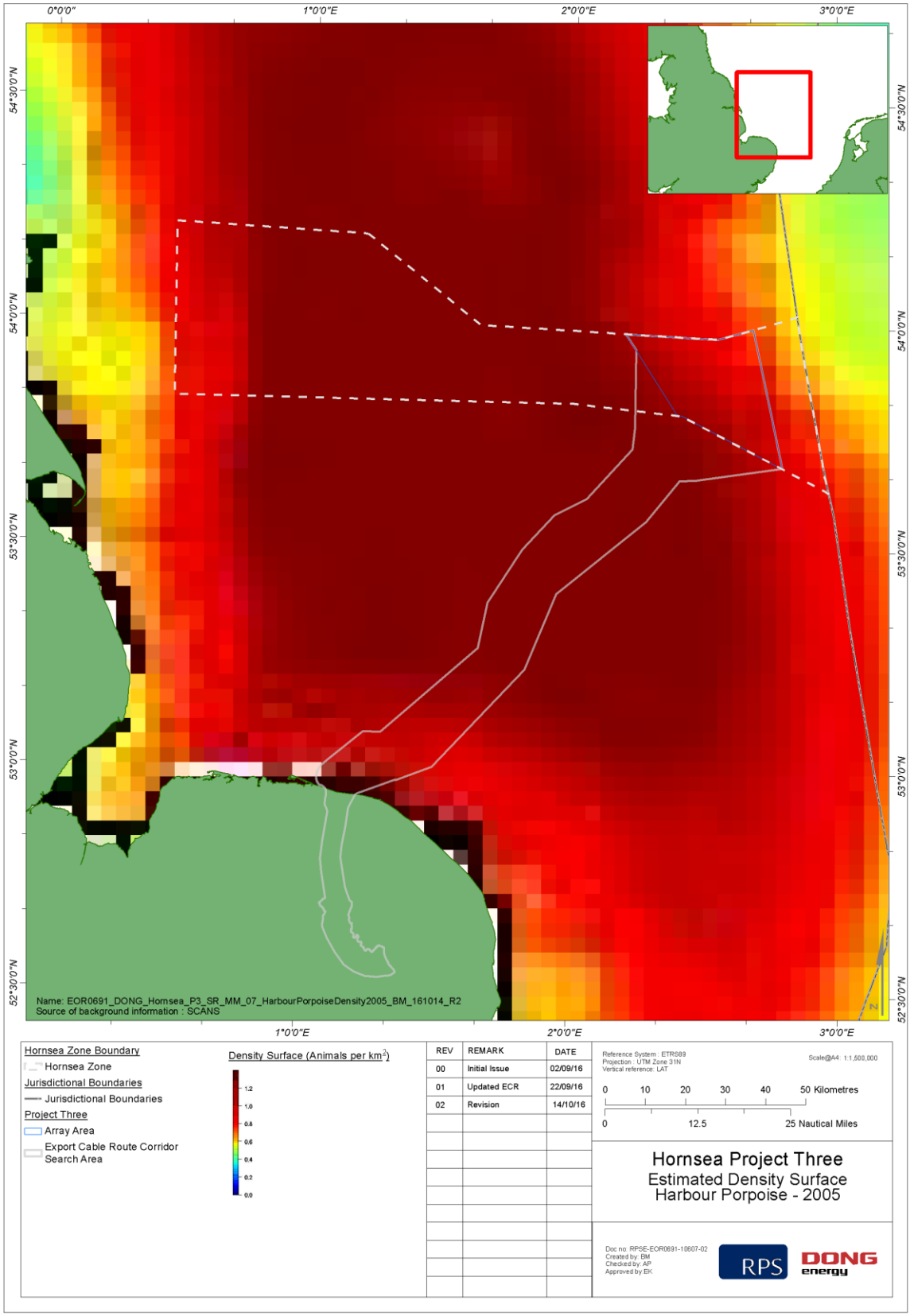



Figure 8.13 Harbour porpoise estimated density surface (animals km$^{-2}$) in 2005, data from SCANS-II survey.

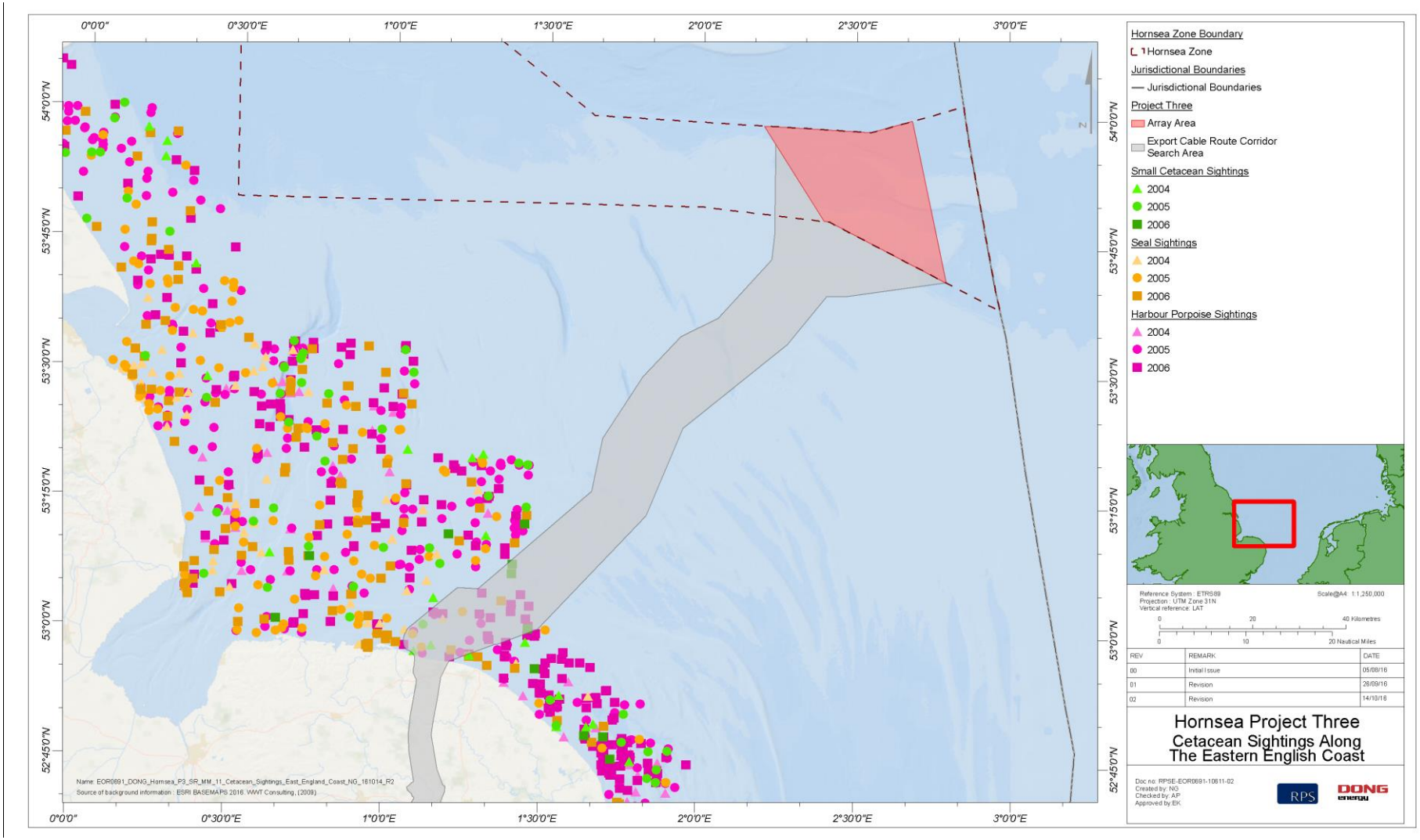



Figure 8.14 Aerial sightings of harbour porpoise (and other small cetaceans and pinnipeds) along the inshore waters of the east Coast between 2004 and 2006 (source: WWT Consulting, 2009).

### *White-beaked dolphin*

#### *Hornsea Three array area*

8.3.12 White-beaked dolphin was the second most commonly recorded marine mammal in the site-specific Project One and Project Two surveys. A total of 298 observations were recorded in the former Hornsea Zone plus 10 km buffer over the three years of monthly boat based visual surveys accounting for approximately 4% of the total number of marine mammals recorded. Sightings of white-beaked dolphin were predominantly distributed in the western half of the former Hornsea Zone.

8.3.13 The site-specific data from Project One and Project Two suggest that the highest abundances of white-beaked dolphin occur in the former Hornsea Zone from November to February, echoing their preference for cooler waters, whereas the lowest abundances were recorded from July to October in all years. The mean relative abundance estimated within the former Hornsea Zone plus 10 km buffer was 148.6 individuals which represented just a small proportion (1.4%) of the wider North Sea population based on SCANS-II data (SCANS-22, 2006) (10,557 individuals). This comparison is caveated with the fact that the SCANS-II data provides absolute, rather than relative abundance estimates. However, previous studies have found relatively high values for detection probability (e.g. g(0)=0.8; Cañadas *et al*., 2004), possibly reflecting the fact that this species is not deterred by vessel presence, and therefore relative numbers may be approaching absolute numbers.

8.3.14 The mean encounter rate during the Project One and Project Two surveys was generally low across all three years and the modelled surface density estimates for white-beaked dolphin were estimated at 0.016 animals $km^{-2}$ for the former Hornsea Zone plus 10 km buffer (Figure 8.15). These figures suggest that the Hornsea Three marine mammal study area is not important in the context of the wider North Sea. SCANS-II data also corroborates this, with the mean density for white-beaked dolphin recorded within the south central North Sea (Block U) of 0.003 animals $km^{-2}$ being at the lower density range for the North Sea, reflecting the fact that there is clear temperature partitioning for this species (Canning *et al*., 2008; MacLeod *et al*., 2008).

#### *Hornsea Three marine export cable route (ECR) corridor search area*

8.3.15 Data from the WWT aerial surveys (Figure 8.15); WWT, 2009) suggest that low number of small cetaceans, which may include white-beaked dolphin, are sighted within inshore areas. The Atlas of Cetacean Distribution (Reid *et al*., 2003) indicates, however, that the former Hornsea Zone is likely to be near the southern limit of white-beaked dolphin distribution so the Hornsea Three offshore ECR corridor search area may not be an important area for this species. Data from SCANS-III and additional sources will be investigated to explore this for Hornsea Three.

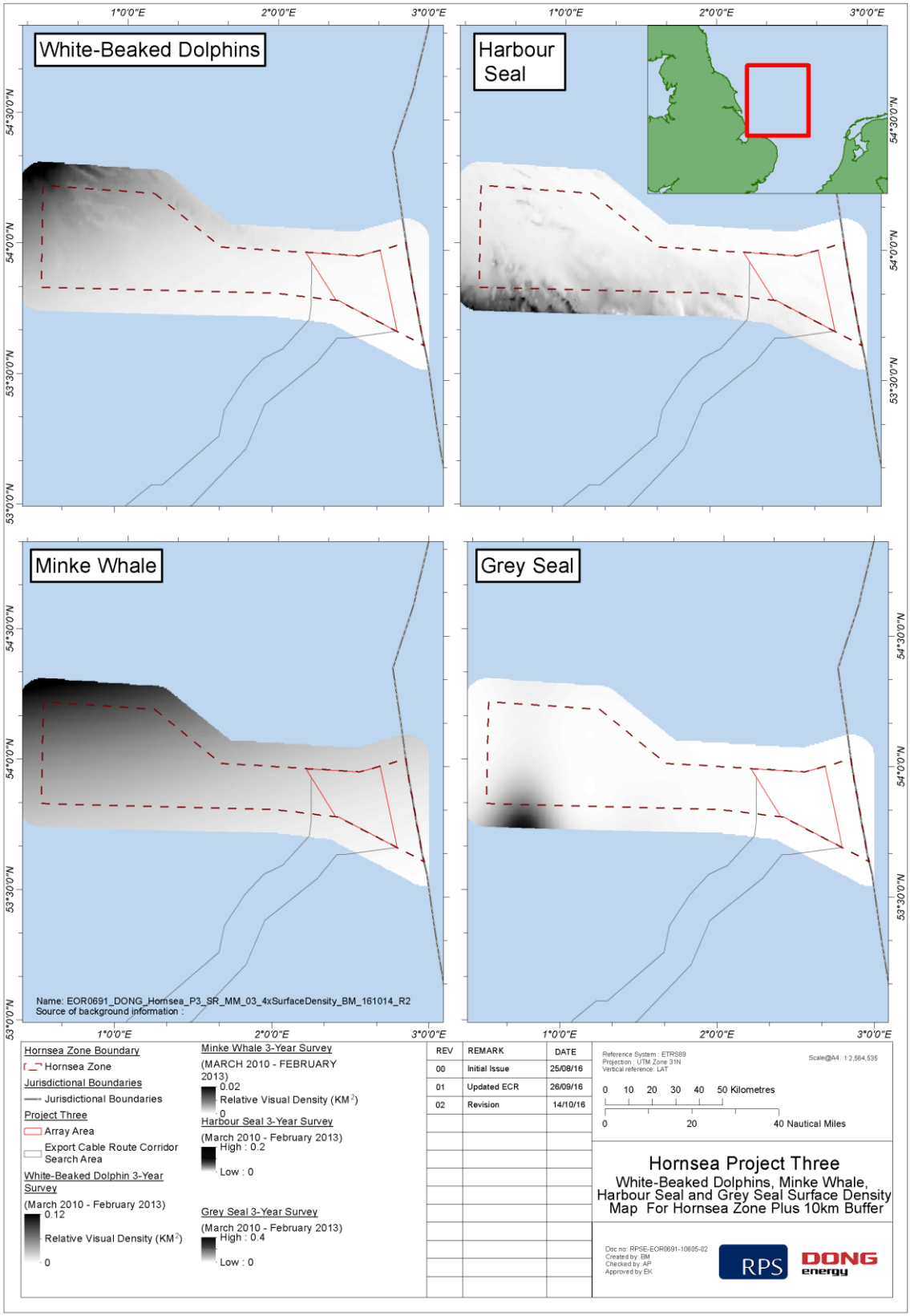



Figure 8.15 Modelled surface density estimates (relative densities) for white-beaked dolphin, minke whale, harbour seal and grey seal across the former Hornsea Zone plus 10 km buffer based on three years of survey data*.

*Note - The density scales for each of the species are different (see legend) and should not be compared.

### *Minke whale*

*Hornsea Three array area*

8.3.16 Minke whale was also one of the more common species during the Project One and Project Two surveys. A total of 158 observations were recorded within the former Hornsea Zone plus 10 km buffer over the three years of monthly boat-based surveys accounting for 2.1% of the total marine mammals observed. The distribution of minke whale was mainly concentrated towards the northwest part of the former Hornsea Zone.

8.3.17 During the site-specific surveys for Project One and Project Two, the highest encounter rates occurred during the summer months, whilst minke were either absent or present in very low numbers over the winter period.

8.3.18 The modelled surface density (relative) estimate for minke whale was 0.006 animals $km^{-2}$ over the former Hornsea Zone plus 10 km buffer (Figure 8.15), and a published value of g(0)=0.55 (Hammond *et al*., 2013) for this species suggests that absolute densities may be approximately twice this estimate (=0.011 animals $km^{-2}$). In comparison, the SCANS Block U (absolute) density estimate for minke whale is 0.023 animals $km^{-2}$, indicating that the Hornsea Zone is at the southern limit of minke whale distribution within the North Sea. Based on the site-specific Project One and Project Two surveys, the mean abundance of minke whale in the former Hornsea Zone plus 10 km buffer was estimated as 55.7 individuals.

*Hornsea Three marine export cable route (ECR) corridor*

8.3.19 In the North Sea, minke whales are often spotted close to the coast during the summer months when sandeel populations are at their year high. However, the former Hornsea Zone is considered to be at the southern limit of minke whale distribution so the Hornsea Three offshore ECR corridor search area may not be an important area for this species. Data from SCANS-III and additional sources will be investigated to explore this for Hornsea Three.

### *Harbour seal*

*Hornsea Three array area*

8.3.20 The majority of the harbour seal population in the UK is found in Scottish waters although the densest concentration of haul-out sites along the North Sea UK coastline is found at The Wash in East Anglia (SMRU, 2004). In the Wash, harbour seals haul out during June and July to give birth to pups and breed, and during August to undergo their annual moult. The Wash and North Norfolk Coast SAC is home to the largest breeding colony of harbour seal in the UK, and hosts 7% of the total UK population of this species.

8.3.21 A total of 147 harbour seal were recorded during the three years of monthly boat-based Project One and Project Two surveys, accounting for 2.0% of marine mammals across all surveys. The mean encounter rate showed that, generally, there were sightings of harbour seal in most months, however, numbers were reduced in November and December.

8.3.22 Modelled surface density estimates for harbour seal are shown in Figure 8.15. The highest harbour seal densities were in the southwest region of the former Hornsea Zone and no animals were recorded in the northeast region of the former Hornsea Zone (i.e. in the area coinciding with the Hornsea Three array area). The relative mean densities within the former Hornsea Zone plus 10 km buffer were 0.018 animals $km^{-2}$. The mean number of animals estimated to occur offshore within the former Hornsea Zone plus 10 km buffer, based on site-specific Project One and Project Two data, was 167.2 individuals. Telemetry data (SMRU, 2011) for tagged seals at east coast haul-outs shows that individuals regularly travel to areas along the southern edge of the former Hornsea Zone plus 10 km buffer (Figure 8.16).

*Hornsea Three offshore export cable route (ECR) corridor*

8.3.23 The historical WWT aerial survey data (WWT, 2009) also recorded seals along the coastline to the north and south of The Wash and in the area coinciding with the Hornsea Three offshore ECR corridor search area (Figure 8.14). Given the proximity of known breeding colonies in the region, as well as the telemetry data for harbour seal tagged in The Wash (Figure 8.16) it is considered likely that harbour seal will regularly occur within the proposed Hornsea Three offshore ECR corridor search area.

***Grey seal***

*Hornsea Three array area*

8.3.24 Grey seal is commonly found around the entirety of the British Isles coastline, although its distribution is centred in the north of Scotland. The most important haul-out sites in the southern North Sea are those at Donna Nook, Scroby Sands and The Wash on the Lincolnshire coastline. At these sites, grey seal haul-out during September to December for the pupping and breeding season. After weaning, the pups moult their natal coat and subsequently the adult moulting season occurs early in the new year.

8.3.25 A total of 247 grey seal were recorded during the three years of monthly boat-based Project One and Project Two surveys accounting for 3.3% of marine mammals across all surveys. The majority of sightings of grey seal were in the southwest corner of the former Hornsea Zone.

8.3.26 The average absolute abundance of individuals occurring offshore within the former Hornsea Zone plus 10 km buffer based on site-specific surveys for Project One and Project Two was estimated as 372 individuals. Offshore abundances varied seasonally: the mean encounter rate decreased considerably during September to December, coinciding with the main haul-out period, and peaked in July and February for all three survey years.

8.3.27 The mean absolute density for the former Hornsea Zone plus 10 km buffer was 0.04 animals $km^{-2}$ (Figure 8.15).

*Hornsea Three offshore export cable route (ECR) corridor*

8.3.28 The historical WWT aerial survey data (WWT, 2005) also recorded seals along the coastline to the north and south of The Wash and in the area coinciding with the Hornsea Three offshore ECR corridor search area (Figure 8.16). Given the proximity of known breeding colonies in the region it is considered likely that grey seal will regularly occur within the proposed Hornsea Three offshore ECR corridor search area.

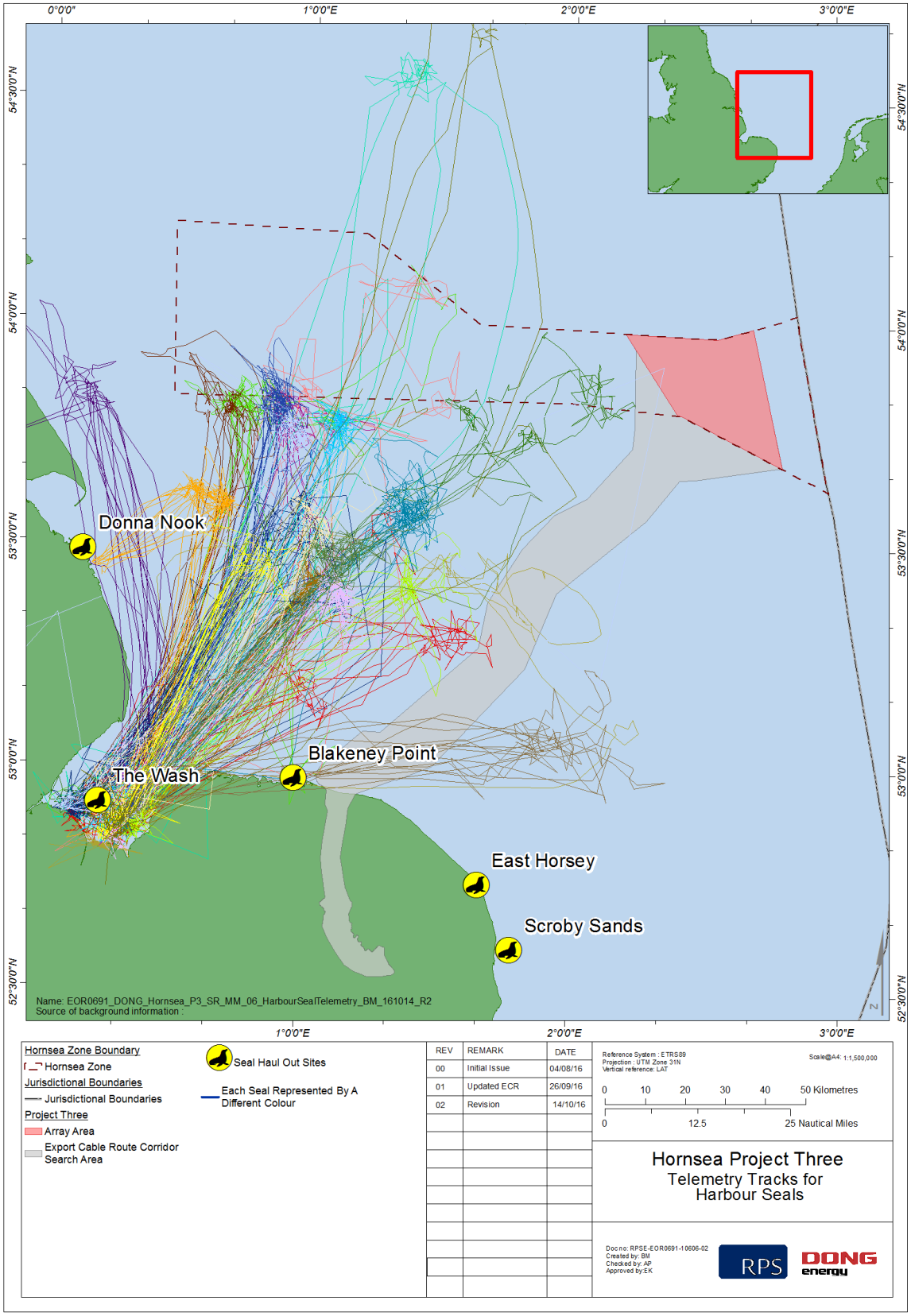



Figure 8.16 Tracks of the 24 harbour seal which were tagged in The Wash (SMRU, 2011).

### Designated sites

8.3.29 The identification of designated sites for inclusion in the marine mammal EIA was carried out as follows:

- Sites, with relevant qualifying features, which overlap with Hornsea Three were screened in for further assessment to ensure that all sites potentially affected by impacts that reach further afield (e.g. behavioural effects from subsea noise or changes in water quality arising from increased suspended sediment concentrations) are included in the assessment; and
- Sites, with relevant qualifying features, which are located within the regional marine mammal study area. The region is represented largely by SCANS Block U as the central point of focus, and extends further east and south. This ensures that all sites potentially affected by noise effects (behavioural impacts) and potential changes in water quality (e.g. increased suspended sediment concentrations) are included in the assessment.

8.3.30 Based on these assumptions, the nature conservation designations which have been screened in for consideration in the marine mammal EIA comprise of European conservation sites (i.e. SACs, SCIs and Ramsar sites), and national designations (i.e. SSSIs, NNRs, recommended and designated MCZs). Further details on these designated sites are provided in Table 8.11 and shown in Figure 8.17.

Table 8.11 Marine nature conservation designations with relevance to marine mammals and the Hornsea Three EIA.

| Site | Closest distance to Hornsea Three | Features |
|---|---|---|
| ***International designations*** | | |
| Southern North Sea proposed Special Area of Conservation (pSAC) | Coincident with the Hornsea Three offshore ECR corridor search area. | Primary reason for site selection - harbour porpoise. |
| The Wash and North Norfolk Coast SAC | Coincident with the Hornsea Three offshore ECR corridor search area. | Primary reason for site selection - harbour seal. |
| Humber Estuary SAC/Ramsar | 67 km from Hornsea Three offshore ECR corridor search area. | Present as a qualifying species – grey seal. |
| Haisborough, Hammond and Winterton SCI | 3 km from Hornsea Three offshore ECR corridor search area. | Present as non-qualifying species' – grey seal and harbour porpoise. |
| Inner Dowsing, Race Bank and North Ridge SCI | 12 km from Hornsea Three offshore ECR corridor search area. | Present as non-qualifying species' – grey seal and harbour porpoise. |
| Doggerbank (UK) SCI | 31 km from Hornsea Three array area. | Present as non-qualifying species' – grey seal, harbour seal and harbour porpoise. |
| Doggerbank (German Doggerbank) SCI | 182 km from Hornsea Three array area. | Primary reason for site selection – harbour porpoise.<br>Present as a qualifying species – harbour seal. |
| Doggersbank (Dutch Doggerbank) SCI | 42 km from Hornsea Three array area. | Present as qualifying species' – harbour porpoise, harbour seal and grey seal. |
| Klaverbank SCI | 11 km from Hornsea Three array area. | Present as a qualifying species – harbour porpoise and grey and harbour seal. |
| Noordzeekustzone SAC | 139 km from Hornsea Three offshore ECR corridor search area. | Primary reason for site selection – harbour porpoise and grey and harbour seal. |
| Noordzeekustzone II pSCI | 139 km from Hornsea Three offshore ECR corridor search area. | Primary reason for site selection – harbour porpoise and grey and harbour seal. |

| Site | Closest distance to Hornsea Three | Features |
|---|---|---|
| Vadehavet med Ribe Å, Tved Å og Varde Å vest for Varde SAC | 382 km from Hornsea Three array area. | Primary reason for site selection – harbour porpoise.<br>Present as a qualifying species – harbour seal and grey seal. |
| Waddenzee SAC | 146 km from Hornsea Three offshore ECR corridor search area. | Primary reason for site selection –grey and harbour seal. |
| ***National designations*** | | |
| Humber Estuary SSSI | 72 km from Hornsea Three offshore ECR corridor search area. | Important breeding ground for grey seal. |
| The Wash SSSI | 37 km from Hornsea Three offshore ECR corridor search area. | Important breeding ground for harbour seal. |
| Farne Islands SSSI | 304 km from Hornsea Three array area. | Important breeding ground for grey seal. |
| Donna Nook NNR | 75 km from Hornsea Three offshore ECR corridor search area. | Important breeding ground for grey seal and harbour seal. |
| The Wash NNR | 45 km from Hornsea Three offshore ECR corridor search area. | Important breeding ground for harbour seal. |
| Spurn NNR | 90 km from Hornsea Three offshore ECR corridor search area. | Of conservation interest for harbour porpoise, grey seal and harbour seal. |
| Blakeney NNR | 1 km from Hornsea Three offshore ECR corridor search area. | Important breeding ground for harbour seal. |
| Cromer Shoal Chalk Beds MCZ | Within the Hornsea Three offshore ECR corridor search area. | Important foraging ground for grey seal, harbour seal and harbour porpoise. |
| Holderness Inshore MCZ | 85 km from Hornsea Three offshore ECR corridor search area. | Important for grey seal, harbour seal, harbour porpoise and minke whale. |
| Runswick Bay MCZ | 196 km from Hornsea Three array area. | Important foraging grounds for marine mammals. |
| Coquet to St Mary's MCZ | 259 km from Hornsea Three array area. | White-beaked dolphin, harbour porpoise and several whale species observed in area. |
| Farnes East MCZ | 271 km from Hornsea Three array area. | Foraging and breeding white-beaked dolphin. |
| North East of Farnes Deep MCZ | 253 km from Hornsea Three array area. | White-beaked dolphin, harbour porpoise, minke whale and humpback whale observed in area. |
| Swallow Sand MCZ | 178 km from Hornsea Three array area. | Sandy, gravelly seabeds within the site attract spawning mackerel and sprat, which are important prey items for marine mammals. |
| Markham's Triangle rMCZ | Coincident with the Hornsea Three array area. | Large sandeel resource, important prey item for marine mammals. |
| Wash Approach rMCZ | 6 km from Hornsea Three offshore ECR corridor search area. | Important foraging ground for grey seal, harbour seal and harbour porpoise. |
| Lincs Belt rMCZ | 55 km from Hornsea Three offshore ECR corridor search area. | Grey seal breeding ground. |
| Castle Ground rMCZ | 162 km from Hornsea Three array area. | Marine mammals, including harbour porpoise and minke whale are common in the area particularly to the east of the site. The site is also a foraging ground for grey seal and harbour seal. |
| Holderness Offshore rMCZ | 62 km from Hornsea Three offshore ECR corridor search area. | Important for grey seal, harbour seal, harbour porpoise and minke whale. |
| Silver Pit rMCZ | 47 km from Hornsea Three offshore ECR corridor search area. | White-beaked dolphin, minke whale and harbour porpoise have been sighted in small numbers within the site, with the latter more abundant. |
| Compass Rose rMCZ | 118 km from Hornsea Three array area. | Important foraging grounds for marine mammals. |

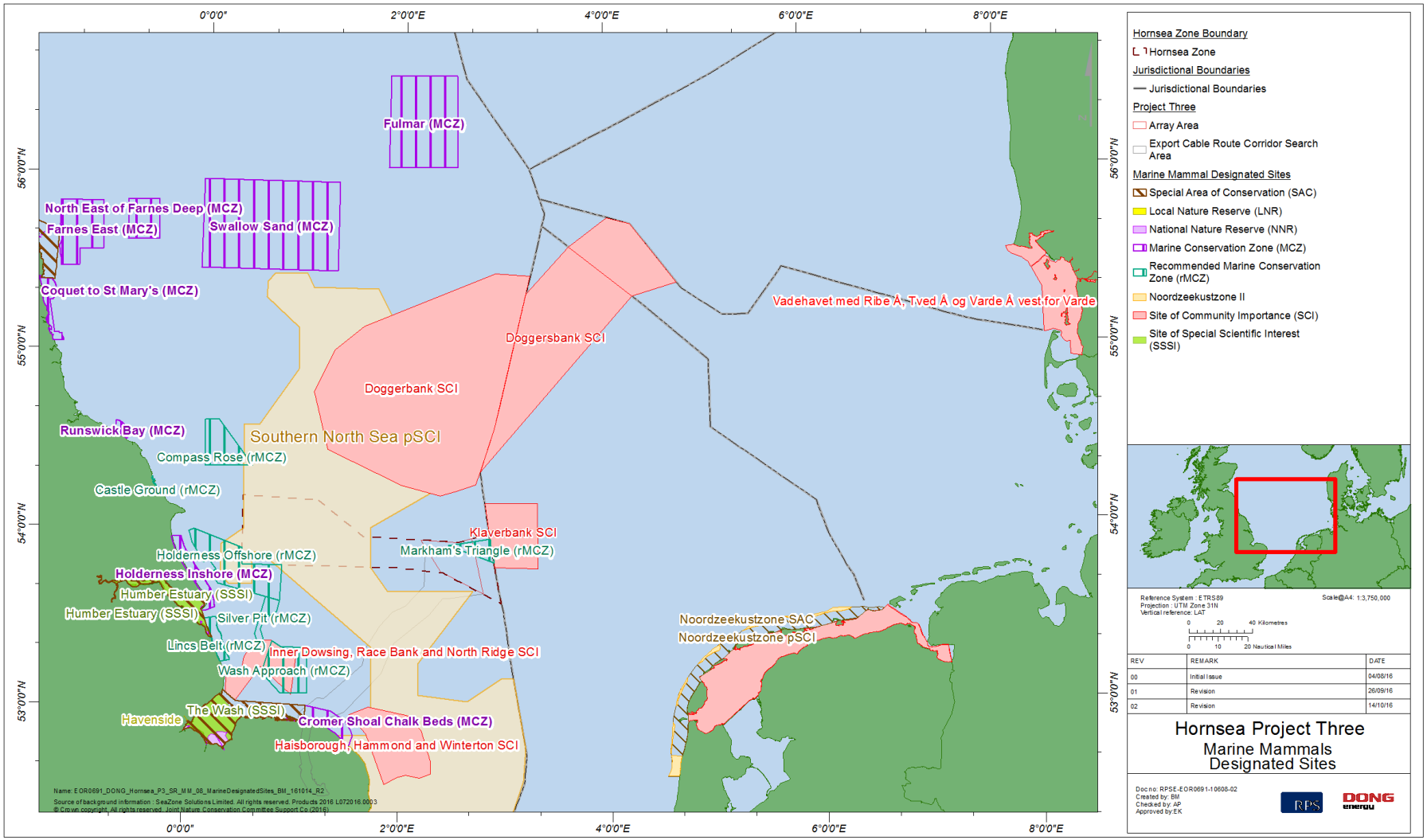



Figure 8.17 Marine nature conservation designations with relevance to marine mammals and the Hornsea Three EIA.

## Proposed approach to the Environmental Impact Assessment (EIA)

### *Proposed assessment methodology*

8.3.31 The marine mammal EIA will follow the methodology set out in Chapter 5: Environmental Impact Assessment Methodology above. Specific to the marine mammal EIA, the assessment method to be used will draw on the most recent Institute of Ecology and Environmental Management guidelines (IEEM, 2010). In addition, the EIA approach will take note of the legislative requirements of the Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2007 (Offshore Habitats Regulations) (as amended), the Conservation of Habitats and Species Regulations 2010 (Habitats Regulations) (as amended), the Wildlife and Countryside Act 1981 (as amended) and the MCAA 2009 (as amended).

### *Valued Ecological Receptors (VERs)*

8.3.32 For the purposes of conducting the EIA, a summary of the marine mammal VERs and their value within the Hornsea Three marine mammal study area will be provided. The valuation is based on their legislative status together with the relative importance of the populations present within the Hornsea Three marine mammal study area compared to the wider regional marine mammal study area and UK as a whole. The overall value of each VER will be assessed using the criteria presented in Table 8.12.

Table 8.12 Criteria used to inform the valuation of ecological receptors in the Hornsea Three marine mammal study area.

| Value of VER | Criteria to define value |
|---|---|
| International | Internationally protected species that are the primary reason for designation for internationally protected sites (i.e. Annex II protected species designated as features of an SAC/pSAC within the regional marine mammal study area).<br>Internationally protected species, which are not the primary reason for designation, but are qualifying features of an SAC, and for which the regional marine mammal study area is considered to be important for that species nationally. Recognition of national importance may be through designation of Marine Protected Areas which list marine mammals as a feature.<br>Internationally protected species with known breeding or nursery areas within the regional marine mammal study area that are considered to be important either nationally or internationally for that species, even where this has not been recognised through designation. |
| National | Internationally protected species that are not qualifying features of an SAC and are regularly recorded within the regional marine mammal study area, but in relatively low densities and therefore the area is not considered to be important for the species in a national or international context.<br>Internationally protected species that are not qualifying features of an SAC, but are recognised as a BAP priority species either alone or under a grouped action plan, and are listed on the local action plan relating to the regional marine mammal study area. |
| Regional | Internationally protected species that are not qualifying features of an SAC and are infrequently recorded within the regional study area in very low numbers compared to other regions of the British Isles. |
| Local | There are no criteria given for local due to the high level of protection under international law for all marine mammal species which makes this category irrelevant. |

### Potential project impacts

8.3.33 A range of potential impacts on marine mammals have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Hornsea Three. The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 8.13, together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

8.3.34 On the basis of the baseline marine mammal information currently available and the project description outlined in Chapter 3: Project Description, no impacts have been identified at this stage to be scoped out of the assessment for marine mammals.

### Measures adopted as part of the project

8.3.35 Measures adopted as part of the project will include:

- Development of, and adherence to, a CoCP;
- Implementation of a Marine Mammal Mitigation Protocol during construction;
- During the construction phase, piling operations of foundations (for both turbine and substation/platform foundation installations) will undergo a soft start and ramp-up;
- Development of, and adherence to, an appropriate PEMMP; and
- Development of, and adherence to, a Decommissioning Plan.

8.3.36 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Table 8.13 Impacts proposed to be scoped into the Hornsea Three assessment for marine mammals.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Underwater noise (Hornsea Three array area) | There is the potential for underwater noise arising from foundation piling and other construction activities (e.g. drilling of piles) within the Hornsea Three array area to cause physical/auditory injury or disturbance to marine mammals. | Hornsea Three array area<br>The site-specific marine mammal boat based surveys undertaken across the former Hornsea Zone plus 10 km buffer, between 2010 to 2013, provides a considerable body of marine mammal data and will form the basis for the marine mammal baseline for the key species across the Hornsea Three array area. These baseline data will be enhanced for specific species, namely harbour porpoise, grey seal and harbour seal, with the outputs of the Hornsea Three site-specific aerial surveys. The existing boat based survey data will, however, be reanalysed for Hornsea Three to provide information on spatial variability in mean densities of, and seasonal patterns in, key marine mammal species within the Hornsea Three array area plus 4 km buffer.<br>The main objectives of this exercise are:<br>• To map the mean surface densities of key species within the Hornsea Three array area plus 4 km buffer, corrected for g(0) where possible;<br>• To compare mean densities for the Hornsea Three array area with mean densities for the wider Hornsea Zone plus 10 km buffer; and<br>• To investigate seasonal patterns in encounter rate/density/group size for the Hornsea Three array area plus 4 km buffer and compare to seasonality for the wider former Hornsea Zone plus 10 km buffer.<br>The outcomes of this exercise will also be used to determine if/how the existing boat-based dataset can be integrated into the aerial survey data being collected for Hornsea Three to provide further baseline information.<br>The Hornsea Three site-specific marine mammal aerial survey will consist of monthly flights, which commenced in April 2016, | See approach to Subsea Noise assessment in Chapter 7, Section 7.2. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| | | | along 20 parallel transects aligned north to south within the Hornsea Three array area and a 4 km buffer. Footage from two high-resolution digital video cameras to be analysed to achieve 10% coverage of the Hornsea Three array area plus buffer. The aerial survey methodology has been agreed with the SNCBs. The aerial survey will be used to provide additional baseline information, primarily for harbour porpoise, grey seal and harbour seal. Where the aerial data can be corrected for detection probability, g(0) (i.e. for harbour porpoise and grey seal), it may be possible to use the aerial data for comparison with the site-specific boat-based data.<br><br><u>Hornsea Three offshore ECR</u><br>Extrapolation of data from Hornsea Three site-specific aerial/boat-based surveys for key species (i.e. harbour porpoise). The use of published datasets (e.g. SCOS, SCANS-III, WWT) to inform marine mammal baseline. This approach has been agreed with the SNCBs. | |
| 2 | Underwater noise (Hornsea Three offshore ECR corridor search area) | There is the potential for underwater noise arising from foundation piling and other construction activities (e.g. drilling of piles) within the Hornsea Three offshore ECR corridor (i.e. for the offshore HVAC booster station) to cause physical/auditory injury or disturbance to marine mammals. | As above for marine mammal impact no. 1. | See approach to Subsea Noise assessment in Chapter 7, Section 7.2. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 3 | Vessel noise disturbance | Increased vessel traffic during construction may result in an increase in noise disturbance to marine mammals. | As above for marine mammal impact no. 1. In addition, reference will be made to the Shipping and Navigation Chapter (Chapter 9, Section 9.2) to understand the baseline levels of vessel traffic in the Hornsea Three array area and offshore ECR corridor to estimate the potential uplift arising from vessel activity during construction. The types of vessels to be utilised during construction will be considered and an evaluation of the potential for noise disturbance, based on a literature review of all available data, will be undertaken. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 4 | Vessel collision risk | Increased vessel traffic during construction may result in an increased collision risk to marine mammals. | As above for marine mammal impact no. 1 and impact no. 3. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 5 | Increased suspended sediments | There is the potential that increased suspended sediments, arising from construction activities such as cable and foundation installation, may impair the foraging ability of marine mammals. | As above for marine mammal impact no. 1. | See approach to Marine Processes assessment in Table 7.4. |
| 6 | Accidental pollution | There is a risk of pollution being accidentally released from sources including construction and installation vessels/vehicles, machinery and offshore fuel storage tanks and from the construction process itself. The release of such contaminants may lead to impacts on marine mammals. | As above for marine mammal impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 7 | Changes in the fish and shellfish community | Changes in the fish and shellfish community resulting from construction impacts may lead to a loss in prey resources for marine mammals. | As above for marine mammal impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Operation and Maintenance*** | | | | |
| 8 | Operational noise | The operating noise of turbines may result in potential effects on marine mammals. | As above for marine mammal impact no. 1. | See approach to Subsea Noise assessment in Chapter 7, Section 7.2. |
| 9 | Vessel noise disturbance | Increased vessel traffic during operation and maintenance may result in an increase in noise disturbance to marine mammals. | As above for marine mammal impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 10 | Vessel collision risk | Increased vessel traffic during operation and maintenance may result in an increased collision risk to marine mammals. | As above for marine mammal impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 11 | Increased suspended sediments | There is the potential that increased suspended sediments, arising from construction activities such as cable installation and seabed preparation, may impair the foraging ability of marine mammals. | As above for marine mammal impact no. 1. | See approach to Marine Processes assessment in Table 7.4. |
| 12 | EMF | EMF emitted by array and export cables may potentially affect marine mammal behaviour. | As above for marine mammal impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 13 | Accidental pollution | There is a risk of pollution being accidentally released from vessels, vehicles, machinery and offshore fuel storage tanks during the operation and maintenance phase as well as from the turbines and offshore substations themselves. The release of such contaminants may lead to impacts on the marine mammals. | As above for marine mammal impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 14 | Changes in the fish and shellfish community | Changes in the fish and shellfish community resulting from operation and maintenance impacts may lead to a loss in prey resources for marine mammals. | As above for marine mammal impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| ***Decommissioning*** | | | | |
| 15 | Underwater noise | Underwater noise arising from turbine and cable removal within the Hornsea Three array area and offshore ECR corridor, and associated vessels may cause disturbance to marine mammals. | As above for marine mammal impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 16 | Vessel collision risk | Increased vessel traffic during decommissioning may result in an increased collision risk to marine mammals. | As above for marine mammal impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 17 | Increased suspended sediments | There is the potential that increased suspended sediments, arising from decommissioning activities such as cable and foundation removal, may impair the foraging ability of marine mammals. | As above for marine mammal impact no. 1. | See approach to Marine Processes assessment in Table 7.4. |
| 18 | Accidental pollution | There is a risk of pollution being accidentally released from vessels, vehicles, machinery and offshore fuel storage tanks during the decommissioning phase as well as from the turbines and offshore substations themselves. The release of such contaminants may lead to impacts on the marine mammals present. | As above for marine mammal impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 19 | Changes in the fish and shellfish community | Changes in the fish and shellfish community resulting from decommissioning impacts may lead to a loss in prey resources for marine mammals. | As above for marine mammal impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

### Potential cumulative impacts

8.3.37 There is potential for cumulative effects to occur on marine mammals from other projects or activities within the wider area where projects or plans may act collectively with Hornsea Three to affect marine mammals. The scale over which effects could occur will be determined on the basis of a cumulative screening exercise, where each plan or project will be screened in where it is considered likely that a given species that occurs within these sites could also occur within the Hornsea Three marine mammal study area. Thus, the scale over which cumulative impacts could occur is likely to be different for each of the key species.

8.3.38 The cumulative assessment will consider the maximum adverse scenarios for each of the projects or activities. The following projects or activities will be considered within the regional marine mammal study area:

- Other offshore wind farms and associated cabling and infrastructure;
- Oil and gas infrastructure/development; and
- Aggregate extraction and disposal of dredging spoil.

8.3.39 The marine mammal cumulative assessment will consider the same impacts across all phases of the project, as outlined in Table 8.13 for the Hornsea Three alone assessment.

### Potential transboundary impacts

8.3.40 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that, due to the highly mobile nature of marine mammals, and the proximity of the Hornsea Three array area to Dutch, German and Danish waters, there is the potential for transboundary effects from the proposed development. The potential for Hornsea Three to impact on marine mammal features of nature conservation designations outside of the UK EEZ will be considered within the HRA process, including the interaction between subsea noise from piling and marine mammals.

## 8.4 Ornithology

### Introduction

8.4.1 This section of the Scoping Report identifies those bird populations in the offshore environment with which Hornsea Three is likely to interact. It also considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore components of Hornsea Three on these populations.

8.4.2 It was agreed in consultation with the SNCBs that offshore ornithology would encompass all those bird populations with the likelihood to interact with Hornsea Three below MHWS. This was on account of only a narrow strip of sub-optimal habitat existing for waterbirds at the Hornsea Three landfall area, rendering a standalone ornithology topic on intertidal as unnecessary. Those bird populations with a greater propensity to interact with Hornsea Three above MHWS (e.g. breeding ringed plover), are considered within Chapter 11, Section 11.1: Onshore Biological Environment.

### Study area

8.4.3 For the purposes of the Hornsea Three offshore ornithology EIA, four study areas are defined:

- The Hornsea Zone comprises the former Hornsea Zone plus 10 km buffer;
- The Hornsea Three array area plus 4 km buffer. Surveys undertaken across the former Hornsea Zone have overlapped spatially with the proposed Hornsea Three array area. Natural England and JNCC recommend a buffer of up to 4 km for the most sensitive species (divers and sea ducks; Natural England and JNCC, 2012);
- The Hornsea Three offshore ECR corridor search area – all areas of the Hornsea Three offshore ECR corridor search area and landfall area that are below MHWS; and
- The North Sea – this is the regional offshore ornithology study area and coincides with the northern and southern North Sea as defined by the regional seas identified by JNCC for implementing UK nature conservation strategy (JNCC, 2004). This North Sea offshore ornithology study area provides a wider context for the site-specific data and is the area covered by the desktop review including consideration of species specific foraging ranges, migration routes and wintering areas.

8.4.4 Figure 8.18 illustrates the former Hornsea Zone, Hornsea Three array area and the Hornsea Three offshore ECR search area, as well as their associated buffers.

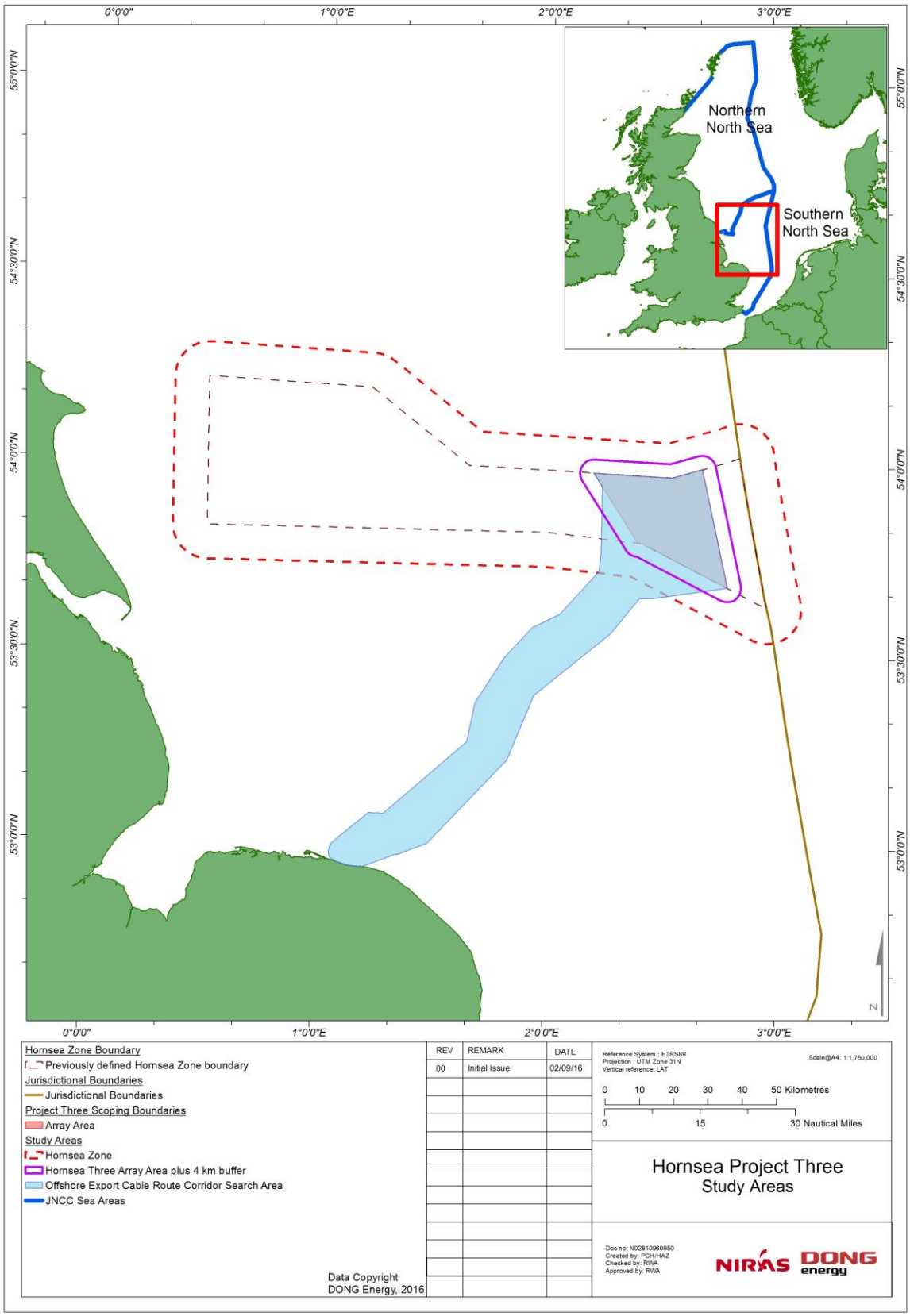



Figure 8.18 Ornithology study areas.

## Methodology to inform baseline

### *Desk-based literature review*

8.4.5 An initial desk based review of literature and data sources to support this Scoping Report has highlighted the following information on the ornithological interest of the former Hornsea Zone and Hornsea Three offshore ECR corridor, including their respective importance in a regional, national and international context. This review included general seabird ecology, migration behaviour, population sizes and conservation status, particularly on the east coast of Britain, the southern North Sea, and Britain as a whole.

8.4.6 Relevant literature and data sources identified for the EIA in respect to offshore ornithology included:

- A review of assessment methodologies for offshore wind farms (Maclean *et al*., 2009);
- British Trust for Ornithology (BTO) online profiles of birds occurring in Britain and Ireland, BirdFacts (Robinson, 2016);
- Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas (Thaxter *et al*., 2012);
- Data from aerial surveys carried out between 2004 and 2008 collated in reports produced by the Department of Energy and Climate Change (DECC, formerly BERR) and the Department for Trade and Industry (DTI) (DTI, 2006; BERR, 2007; DECC, 2009b);
- Atlas of seabird distribution in northwest European waters (Stone *et al*., 1995);
- JNCC Online SPA standard data forms (JNCC, 2016) [http://jncc.defra.gov.uk/page-1400];
- Biologically appropriate, species-specific, geographically non-breeding season population estimates for seabirds (Furness, 2015);
- An analysis of the numbers and distribution of seabirds within the British Fishery Limit aimed at identifying areas that qualify as possible marine SPAs (Kober *et al*., 2010);
- The Migration Atlas (Wernham *et al*., 2002);
- Population estimates of birds in Great Britain and the UK. British Birds (Musgrove *et al*., 2013);
- Wetland Bird Survey (WeBS) Annual Reports and Report Online interface (e.g. Frost *et al*., 2016a and b);
- Assessing the risk of offshore wind farm development to migratory birds designated as features of UK SPAs (Wright *et al*., 2012); and
- Existing offshore wind farm Environmental Statements and Monitoring Reports (e.g. SMart Wind, 2013; SMart Wind, 2015; Vattenfall, 2015).

### *Site-specific surveys of the former Hornsea Zone*

8.4.7 In addition to these data sources, information is available for the Hornsea Three array area through site-specific offshore ornithology surveys undertaken across the former Hornsea Zone. A series of monthly boat-based visual surveys of seabirds of the former Hornsea Zone were carried out over a three year period from March 2010 until February 2013 (SMart Wind, 2013; SMart Wind, 2015; Table 8.14). Boat-based visual surveys were carried out monthly throughout the whole of the former Hornsea Zone plus a 10 km buffer with a series of transects with 6 km spacing running north to south across the area. These surveys overlapped spatially with the proposed Hornsea Three site (Figure 8.19). During this time, boat-based visual surveys ran concurrently along a series of transects with 2 km spacing running north to south across the Project One array area plus a 4 km buffer between March 2010 and February 2012, and Project Two array area plus a 4 km buffer between March 2010 and February 2013.

8.4.8 The methods used for the baseline seabird surveys were based on the standard COWRIE survey methodology (Camphuysen *et al*., 2004). Seabirds were recorded using an adaptation of the standard JNCC Seabirds at Sea survey method, which uses line transect methodology (see Webb and Durinck, 1992; Wilson *et al*., 2014 for further details).

Table 8.14 Timeline of ornithological surveys in the former Hornsea Zone.

| Survey Area | March 2010 to February 2011 | March 2011 to February 2012 | March 2012 to February 2013 |
|---|---|---|---|
| Former Hornsea Zone (6 km spacing transects) | Monthly surveys | Monthly surveys | Monthly surveys |
| Project One (2 km spacing transects) | Monthly surveys (Year 1) | Monthly surveys (Year 2) | |
| Project Two (2 km spacing transects) | | Monthly surveys (Year 1) | Monthly surveys (Year 2) |

### *Surveys of the Hornsea Three offshore export cable route (ECR) corridor*

8.4.9 Baseline data covering the Hornsea Three offshore ECR corridor search area was not collected by the Project One or Project Two projects beyond the former Hornsea Zone, although relevant publically available data include:

- WWT aerial survey data (collected as part of the extensive DTI/DECC funded programme 2005-2008);
- Natural England Seabird Sensitivity Mapping Tool (which includes the WWT aerial survey dataset);
- Data held and published for other offshore wind projects (e.g. Sheringham Shoal, Dudgeon); and
- Visual tracking data for tern species at North Norfolk Coast SPA and Great Yarmouth North Denes SPA (Parsons *et al*., 2015; Wilson *et al*., 2014).

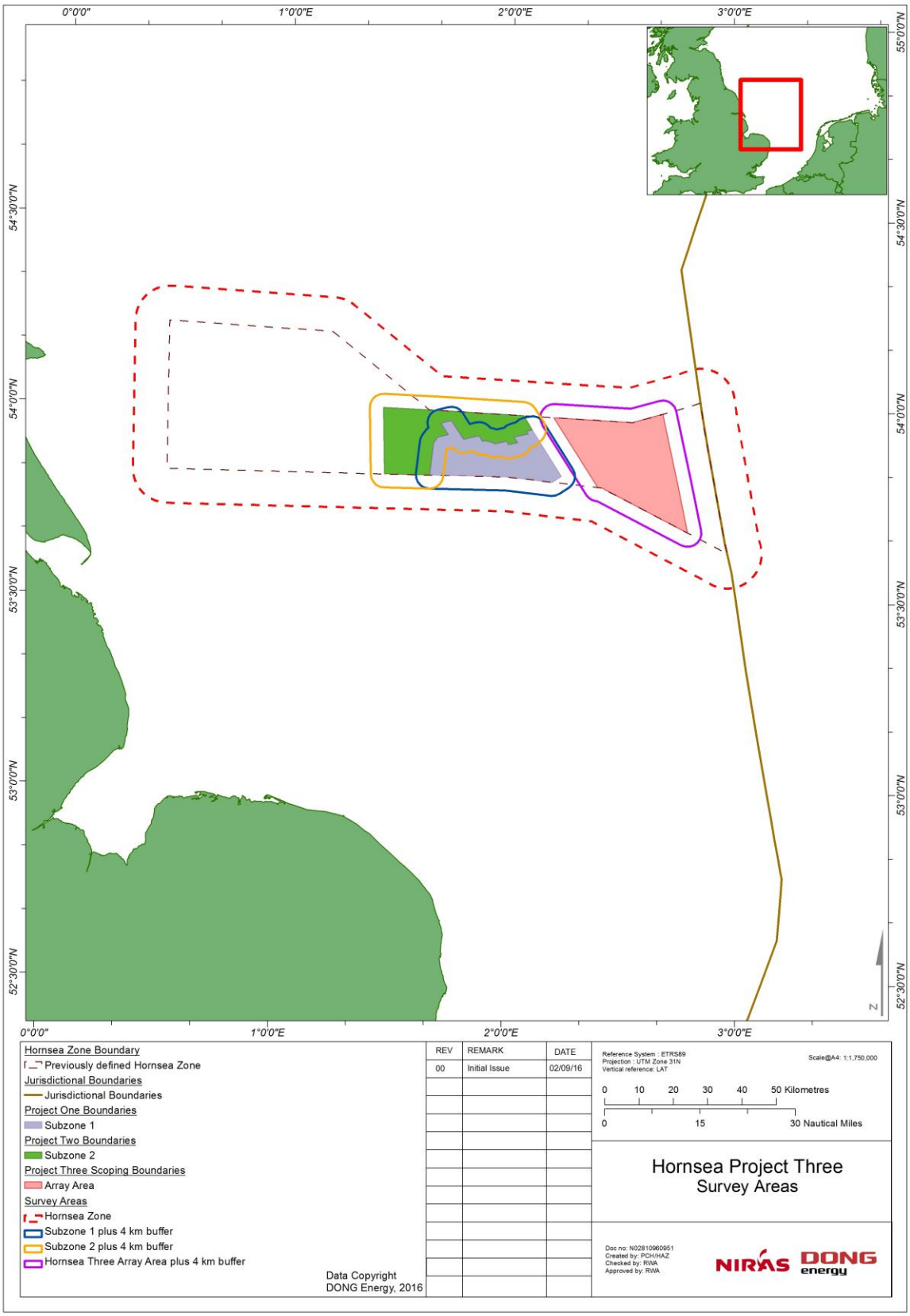



Figure 8.19 Site-specific survey areas of the former Hornsea Zone.

### Baseline environment

8.4.10 This section provides a high-level overview of the offshore ornithology baseline environment for the former Hornsea Zone in the context of our existing understanding of North Sea bird populations. This is followed by a high-level overview of the offshore ornithology baseline environment for the former Hornsea Zone informed from baseline characterisation surveys that entirely captures the Hornsea Three array area and buffer. This wider area is useful for providing a wider context for determining changes in distribution and abundance within and between years and also increases the probability of capturing migratory movements for relatively rare species.

8.4.11 Finally this section provides a review of the relevant ornithological nature conservation designations.

#### *The North Sea*

8.4.12 Extensive ornithological surveys (e.g. Carter *et al*., 1993; Stone *et al*., 1995), reviews (e.g. Stienen *et al*., 2007) as well as results from previous Round 1 and 2 offshore wind farm Environmental Statements and monitoring reports have shown that the North Sea offshore ornithology study area (see paragraph 8.4.3) is an important area for seabirds. This is particularly the case during passage and in winter months when British breeding birds are joined by birds that have migrated from continental Europe and Fennoscandia. Because of the mix of birds present, it is probable that the former Hornsea Zone is used at different times by birds (i) overwintering in the area; (ii) foraging from nearby breeding coastal colonies; and (iii) on post-breeding dispersal, migration and pre-breeding return.

8.4.13 As well as true pelagic seabirds (e.g. gannet, fulmars and auks), other species that spend part of their annual life cycle at sea (e.g. divers, gulls and seaducks) may also be present in particular months, with periodic numbers of non-seabird migrants also present (e.g. wildfowl, waders and passerines).

8.4.14 Stienen *et al*. (2007) demonstrated that within the southern North Sea area (JNCC, 2004) is an important corridor for migration of some seabird species in particular. For instance, the great majority (40-100%) of the flyway population of great skua use the Strait of Dover to leave the North Sea, as well as 30-70% of the lesser black-backed gull population.

8.4.15 Based on divisions according to geographic, hydrographic and physical differences within the North Sea in Stone *et al*. (1995), the former Hornsea Zone potentially falls within three sectors for ornithology; (i) the Western North Sea sector, which stretches along a relatively coastal strip from northeast Scotland to the Greater Wash; (ii) the Central and Northern North Sea sector which is mainly marine in nature, although encompasses the western coastline of Norway; and (iii) the South and East North Sea sector, which stretches from Kent, across the English Channel and northwards to Norfolk, and includes much of coastal Netherlands, Belgium and Denmark, including the Kattegat, Wadden Sea and German Bight Figure 8.20.

8.4.16 The Western North Sea sector contains breeding colonies such as at Flamborough Head and the Farne Islands and was characterised by Stone *et al*. (1995) as being important for auks throughout the year. The area was also used in winter by gulls and eider, with gulls and terns abundant in summer. Skuas, among other species, pass through the area on autumn passage.

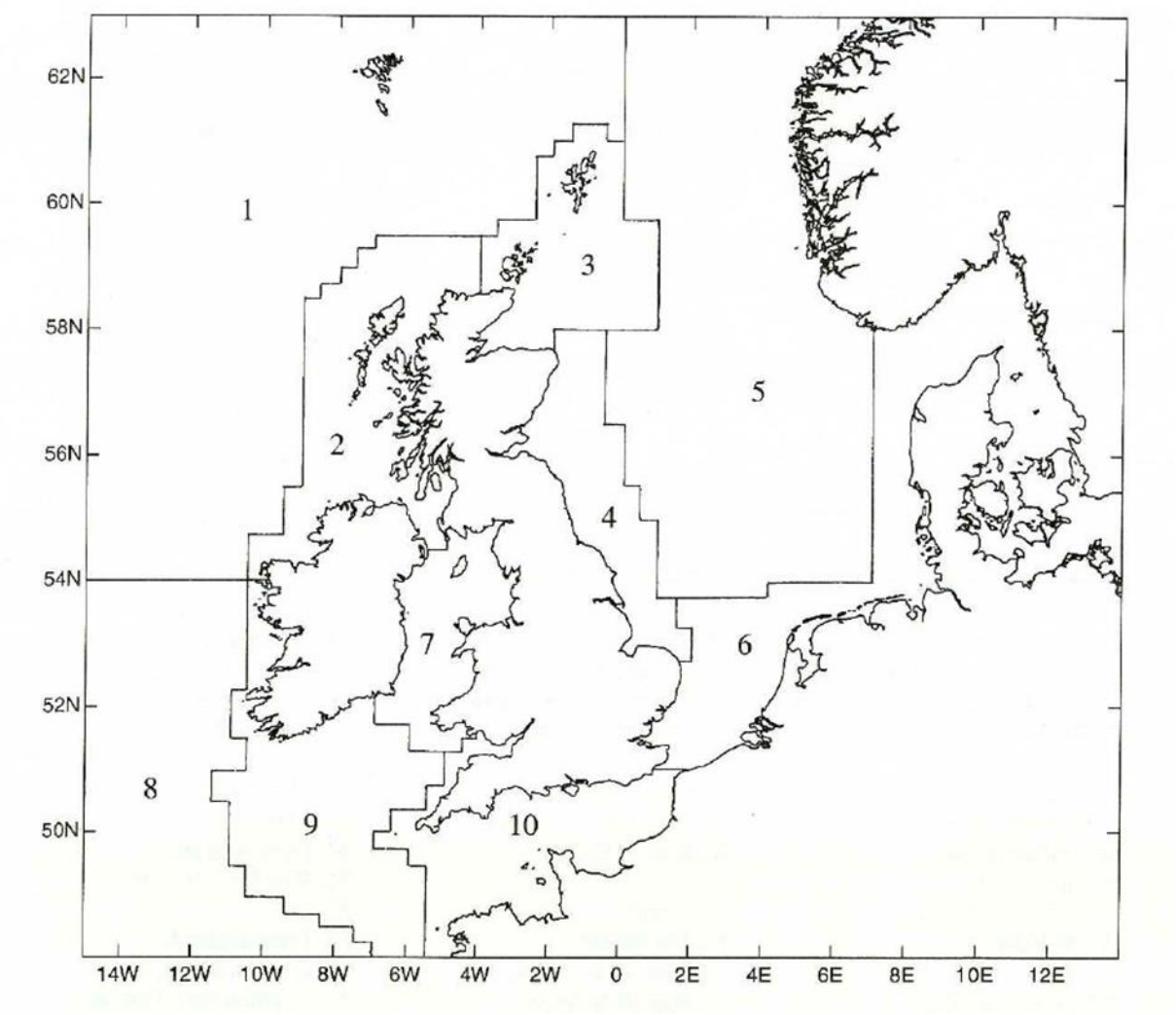



Figure 8.20 Sea areas as defined in Stone *et al.* (1995)*.

* Note - The sectoral divisions shown in Figure 8.20 are: (1) North-west oceanic, (2) North-west shelf, (3) Shetland, Orkney and Moray Firth, (4) Western North Sea, (5) Central and northern North Sea, (6) South and east North Sea, (7) Irish Sea, (8) South-west oceanic, (9) Celtic Sea, and (10) English and Bristol Channels.

8.4.17 The Central and North Sea sector was characterised as being important for guillemots, although less so during the breeding season, when birds are constrained to coastal colonies. Fulmars, gannets and kittiwakes were also found throughout the year, with other gulls more widespread during winter. Depth in this sector is mostly shallow (0 to 50 m), with the exception of the Rinne off the coast of Norway.

8.4.18 The South and East North Sea sector is characterised as being a shallow area of low salinity which forms a distinct zone of distribution for many species. During winter, it was described by Stone *et al*. (1995) as being the most important area in northwest European waters for divers, grebes and seaduck. Gulls are common throughout the year, with common gulls and great black-backed gulls most abundant in winter, lesser black-backed gulls in summer, and herring gulls throughout the year. Little gulls are abundant during migration peaks. The area is also important for terns in summer and for auks in winter.

### *Former Hornsea Zone and Hornsea Three array area*

#### *Seabirds*

8.4.19 Site-specific offshore ornithology surveys were carried out between 2010 and 2012 to characterise the bird communities across the former Hornsea Zone, as well as Project One and Project Two (see paragraph 8.4.7). Table 8.15 and Table 8.16 summarises seabird population estimates and distributions recorded within the former Hornsea Zone, in particular between 2011 and 2012. Those two survey years (Year 1 March 2011 to February 2012; Year 2 March 2012 to February 2013) are when two previously unsurveyed transects in the east of the former Hornsea Zone were included in the survey area so as to entirely capture the Hornsea Three array area with buffer. The survey extensions also included six previously unsurveyed transects in the west of the former Hornsea Zone. This wider area is also useful for providing a wider context for determining changes in distribution and abundance within and between years and also increases the probability of capturing migratory movements for relatively rare species. This overview of this data indicates that Hornsea Three does not represent an area of significant importance for breeding, passage or wintering seabirds.

8.4.20 Information on non-seabird species recorded during baseline characterisation surveys of the former Hornsea Zone between 2011 and 2012 (SMart Wind Ltd, 2015) is summarised in the next section.

#### *Non-seabird species*

8.4.21 This section summarises the data available for non-seabird species including, wildfowl (e.g. geese and ducks), raptors (e.g. hawks and falcons), waders (sandpipers and plovers) and passerines.

8.4.22 The passerine redwing was the most frequently recorded non-seabird species representing 21.1% of all non-seabird species recorded in Year 2 surveys (128 individuals). In both years, in both Project Two and the former Hornsea Zone, geese were relatively infrequently recorded, which may in part be due to the limitations of the boat-based survey method in recording such species which often migrate at high altitude during periods of darkness. Of the four species recorded, greylag goose was the most numerous, with a total of nine individuals recorded between Project Two and the former Hornsea Zone over both years. Ducks were similarly infrequently recorded, with teal being the most numerous (49 recorded in total between Project Two and the former Hornsea Zone over both years). Of the wader species, turnstone was the most abundant species when data from Project Two and the former Hornsea Zone are combined, with 30 individuals recorded over both years.

Table 8.15 Population estimates of species in the former Hornsea Zone[5] plus 10 km buffer recorded by monthly boat-based surveys in Year 1 (March 2011 – February 2012) and Year 2 (March 2012 – February 2013) of Project Two's baseline characterisation surveys (SMart Wind Ltd, 2015). Coloured shading representative of seasons used by Project Two which were informed by Furness (2015) (Pre-breeding = green, breeding = red, post-breeding = orange, non-breeding = blue)[6]

| | Survey | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Red-throated diver | Year 1 | 0 | 298 | 0 | 0 | 0 | 0 | # | # | + (0) | # | # | # |
| | Year 2 | 40 | + (104) | 0 | 0 | 0 | 0 | + (0) | + (0) | # | # | + (0) | # |
| Fulmar | Year 1 | 3,546 | 792 | 11,732 | 5,116 | 3,403 | 1,864 | # | # | + (377) | # | # | # |
| | Year 2 | 1,637 | + (2,154) | 25,357 | 4,364 | 7,733 | 3,118 | + (7,104) | + (1,108) | # | # | + (2,344) | # |
| Sooty shearwater | Year 1 | 0 | 0 | 0 | 29 | 0 | 27 | # | # | + (0) | # | # | # |
| | Year 2 | 0 | + (0) | 0 | 0 | 27 | 26 | + (0) | + (0) | # | # | + (0) | # |
| Manx shearwater | Year 1 | 0 | 0 | 0 | 117 | 332 | 80 | # | # | + (0) | # | # | # |
| | Year 2 | 0 | + (0) | 0 | 37 | 27 | 130 | + (0) | + (0) | # | # | + (0) | # |
| European storm petrel | Year 1 | 0 | 0 | 0 | 0 | 0 | 62 | # | # | + (155) | # | # | # |
| | Year 2 | 0 | + (0) | 0 | 0 | 0 | 0 | + (0) | + (0) | # | # | + (0) | # |
| Gannet | Year 1 | 3,275 | 1,143 | 874 | 2,884 | 2,287 | 2,998 | # | # | + (6,306) | # | # | # |
| | Year 2 | 2,680 | + (856) | 2,073 | 4,987 | 4,998 | 5,250 | + (2,704) | + (6,259) | # | # | + (2,896) | # |
| Arctic skua | Year 1 | 0 | 0 | 76 | 0 | 104 | 107 | # | # | + (0) | # | # | # |
| | Year 2 | 0 | + (140) | 47 | 0 | 80 | 133 | + (0) | + (0) | # | # | + (0) | # |
| Great skua | Year 1 | 0 | 128 | 0 | 0 | 55 | 45 | # | # | + (0) | # | # | # |
| | Year 2 | 0 | + (60) | 0 | 26 | 66 | 19 | + (248) | 97 | # | # | + (0) | # |
| Little gull | Year 1 | 0 | 0 | 0 | 33 | 36 | 61 | # | # | + (0) | # | # | # |
| | Year 2 | 0 | + (0) | 0 | 0 | 582 | 2,404 | + (0) | + (0) | # | # | + (0) | # |
| Black headed gull | Year 1 | 0 | 0 | 0 | 0 | 0 | 0 | # | # | + (0) | # | # | # |
| | Year 2 | 0 | + (0) | 0 | 0 | 57 | 28 | + (0) | + (0) | # | # | + (0) | # |
| Common gull | Year 1 | 409 | 984 | 34 | 25 | 52 | 55 | # | # | + (178) | # | # | # |
| | Year 2 | 1,604 | + (258) | 0 | 18 | 128 | 23 | + (0) | + (432) | # | # | + (1,761) | # |
| Lesser black-backed gull | Year 1 | 302 | 4,917 | 1,528 | 346 | 391 | 78 | # | # | + (0) | # | # | # |
| | Year 2 | 413 | + (3,600) | 261 | 178 | 670 | 354 | + (248) | + (0) | # | # | + (0) | # |
| Herring gull | Year 1 | 746 | 777 | 509 | 281 | 0 | 29 | # | # | + (178) | # | # | # |
| | Year 2 | 43 | + (0) | 39 | 26 | 286 | 14 | + (0) | + (0) | # | # | + (916) | # |
| Great black-backed gull | Year 1 | 3,341 | 4,507 | 602 | 311 | 825 | 169 | # | # | + (5,984) | # | # | # |
| | Year 2 | 2,772 | + (1,066) | 623 | 824 | 4,684 | 500 | + (2,018) | + (2,373) | # | # | + (11,104) | # |

[5] Hornsea Zone is 4,735 km$^2$ in area.

[6] The biological seasons for each seabird species to be used for Hornsea Three will be agreed in consultation with the statutory consultees.

| | Survey | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kittiwake | Year 1 | 16,571 | 12,217 | 8,625 | 19,608 | 17,625 | 12,058 | # | # | + (1,912) | # | # | # |
| | Year 2 | 17,972 | + (13,333) | 12,392 | 24,703 | 20,409 | 14,418 | + (5,942) | + (6,954) | # | # | + (4,312) | # |
| Common tern | Year 1 | 0 | 0 | 56 | 38 | 101 | 3,168 | # | # | + (0) | # | # | # |
| | Year 2 | 0 | + (0) | 0 | 0 | 87 | 6,993 | + (0) | + (0) | # | # | + (0) | # |
| Arctic tern | Year 1 | 0 | 111 | 0 | 0 | 2,154 | 135 | # | # | + (0) | # | # | # |
| | Year 2 | 0 | + (60) | 0 | 0 | 488 | 412 | + (0) | + (0) | # | # | + (0) | # |
| Guillemot | Year 1 | 23,593 | 77,140 | 31,951 | 63,183 | 98,316 | 155,392 | # | # | + (6,641) | # | # | # |
| | Year 2 | 66,084 | + (51,745) | 70,624 | 66,574 | 84,937 | 173,412 | + (66,652) | + (23,966) | # | # | + (43,393) | # |
| Razorbill | Year 1 | 9,655 | 17,678 | 4,775 | 22,810 | 43,866 | 59,276 | # | # | + (983) | # | # | # |
| | Year 2 | 22,085 | + (12,622) | 9,312 | 18,574 | 18,103 | 44,810 | + (5,970) | + (414) | # | # | + (2,718) | # |
| Little auk | Year 1 | 0 | 0 | 0 | 0 | 0 | 0 | # | # | + (4,640) | # | # | # |
| | Year 2 | 0 | + (0) | 0 | 0 | 0 | 0 | + (0) | + (198) | # | # | + (0) | # |
| Puffin | Year 1 | 2,147 | 3,533 | 1,494 | 2,314 | 5,635 | 22,150 | # | # | + (13,476) | # | # | # |
| | Year 2 | 10,771 | + (5,246) | 5,086 | 419 | 5,940 | 16,607 | + (11,188) | + (3,249) | # | # | + (3,497) | # |

# No survey coverage

+ Limited survey coverage

Table 8.16 The distribution of seabird species in the former Hornsea Zone as recorded by the baseline characterisation surveys for Project Two (SMart Wind, 2015).

| Species | Distribution in the former Hornsea Zone |
|---|---|
| Red-throated diver | Records scattered throughout the former Hornsea Zone, with no discernible pattern of site use. |
| Fulmar | Homogenously distributed across the zone in both survey years. |
| Sooty shearwater | Records scattered throughout the former Hornsea Zone, with no discernible pattern of site use. |
| Manx shearwater | No indication of any pattern in spatial distribution. |
| European storm petrel | No indication of any pattern in spatial distribution. |
| Gannet | Gannet distribution was consistent throughout the year, with individuals observed throughout the former Hornsea Zone. As this species forages widely, a lack of pattern in spatial distribution on the site is to be expected. |
| Common Scoter | No indication of any pattern in spatial distribution. |
| Arctic skua | Records scattered throughout area with no discernible pattern of site use. |
| Great skua | Records scattered throughout area with no discernible pattern of site use. |
| Little gull | The abundance of birds recorded during the autumn indicates regular use by individuals on passage. |
| Black headed gull | Records scattered throughout the former Hornsea Zone, with no discernible pattern of site use. |
| Common gull | Records were distributed throughout the former Hornsea Zone. |
| Lesser black-backed gull | The majority of records were distributed in the eastern section of the former Hornsea Zone, to the east of Project Two. |
| Herring gull | Records scattered throughout area with no discernible pattern of site use. |
| Great black-backed gull | Records scattered throughout area with no discernible pattern of site use. |
| Kittiwake | Distributed throughout area, with no discernible pattern of site use. |
| Common tern | Records scattered throughout area with no discernible pattern of site use. |
| Arctic tern | Records scattered throughout area with no discernible pattern of site use. |
| Guillemot | Records were distributed throughout the former Hornsea Zone, with no discernible pattern of site use. The exception to this was during the breeding season months in Year 2 when comparatively fewer birds were recorded in the western quarter of the area when compared with the remainder of the former Hornsea Zone in the breeding season where the species was homogenously distributed. |
| Razorbill | Records distributed throughout the former Hornsea Zone, with no discernible pattern of site use. |
| Little auk | The species was observed in a limited number of former Hornsea Zone transects, with too few observations to discern any distribution trends. |
| Puffin | Records of puffin are distributed throughout the former Hornsea Zone, although there is a distinct pattern of higher abundance of this species occurring in the western half of the zone (for both breeding and non-breeding seasons). |

### *Hornsea Three offshore ECR corridor*

8.4.23 The Hornsea Three offshore ECR corridor (Figure 8.18) enters inshore waters at the Greater Wash[7] where the waterbird community has been characterised from aerial surveys, the most recent undertaken in 2008 (Lawson *et al*., 2016; DECC, 2009b; DTI, 2006). Three species, red-throated diver, common scoter and little gull dominate the Greater Wash wintering bird community (Lawson *et al*., 2016). For common scoter in particular, main aggregations occurred towards The Wash, away from the Hornsea Three offshore ECR corridor where the mean density was less than 0.7 birds per $km^2$. Little gulls were observed throughout the Greater Wash, though the majority of them were also recorded to the north and east of Hornsea Three offshore ECR corridor. Particularly large numbers in these areas were observed during October and November surveys (Wilson *et al*., 2009). Along the Hornsea Three offshore ECR corridor the mean density of little gull was less than 0.1 birds per $km^2$. Red-throated divers were observed throughout the Greater Wash with higher densities of birds recorded close inshore, including along the eastern part of North Norfolk Coast extending south of Hornsea Three landfall area.

8.4.24 The Hornsea Three offshore ECR corridor transits a sea area within which assessments of offshore wind projects such as Race Bank, Sheringham Shoal and Dudgeon, have all highlighted during the breeding season Sandwich tern as the key offshore ornithological issue. Wilson *et al*. (2014) quantifies usage of the marine environment by Sandwich tern and common tern around respective breeding colonies on the Norfolk coast from work undertaken between 2009 and 2013. The modelling predicted relative usage of the waters around the breeding colonies monitored in Norfolk (Scolt Head and Blakeney Point for both tern species, Breydon Water for common tern only). Wilson *et al*. (2014) indicates that the relative usage of the waters in the vicinity of the Hornsea Three offshore ECR corridor is at least low if not negligible.

### *Hornsea Three landfall area*

8.4.25 An initial desk based appraisal and site walkover in July 2016 at the Hornsea Three landfall area established the intertidal area to be a narrow strip of sub-optimal habitat for foraging waterbirds throughout the year during the non-breeding seasons. There is limited coverage of the Hornsea Three landfall area by WeBS with only the westernmost extent of the export cable route landfall covered. This is indicative of the majority of the export cable corridor landfall being of minimal importance for intertidal birds. This is supported by the results of the site walkover at the Hornsea Three landfall area which did not record birds using the intertidal area and found no suitable areas of intertidal foraging habitat for wading bird species.

### *Designated sites*

8.4.26 Nature conservation designations with relevance to birds comprise international Natura 2000 designations (i.e. SPAs), Ramsar sites, national and regional designations. There are no current or proposed designated sites within the Hornsea Three array area or the wider former Hornsea Zone. There are, however, a number of SPAs and pSPAs along the eastern British coastline that support qualifying species that have been recorded during surveys within Hornsea Three and the former Hornsea Zone.

[7] The Greater Wash is broadly defined as the sea area between Bridlington Bay, Yorkshire to Great Yarmouth, Norfolk.

8.4.27 It is also considered that there is the potential for an impact on an SPA if the wind farm lies within the regular foraging range of any of its qualifying breeding features. In the absence of specific information on the foraging patterns of breeding birds, Natural England (2015) advises that the 'mean maximum' range (i.e. the maximum range reported in each study averaged across studies per species) as reported by Thaxter *et al.* (2012) is used to establish likely connectivity. Use of this metric takes into account different maxima having been quantified by studies for the same species, and the mean maximum range incorporates this variability without relying on single values that might be unrepresentative of all colonies.

8.4.28 In some cases colony-specific evidence is available from tracking studies for examining if connectivity between breeding colonies and Hornsea Three is supported or not, such as, for example, Wakefield *et al*., 2013, the Future of the Atlantic Marine Environment (FAME; http://www.fameproject.eu/en/project/partnership/) and Seabird Tracking and Research projects.

8.4.29 With the exception of fulmar there is only one SPA designated seabird colony, Flamborough and Filey Coast potential Special Protection Area (pSPA), potentially at risk of being affected by development in the Hornsea Three array area during the breeding period. Table 8.17 shows the qualifying and seabird assemblage species of Flamborough and Filey Coast pSPA recorded during baseline surveys in the former Hornsea Zone with their respective maximum and mean maximum foraging range based on values estimated by Thaxter *et al*. (2012). The Hornsea Three array area is within the mean-maximum foraging range of both fulmar (a listed assemblage feature) and gannet from this pSPA, and within the maximum foraging range of puffin (a non-listed assemblage feature) also interacting with the Hornsea Three array area. The Hornsea Three array area is within the mean-maximum foraging range of fulmar from one further SPA, the Forth Islands SPA. Fulmar is listed as an assemblage feature at this SPA.

8.4.30 Table 8.17 shows that the mean-maximum foraging range for kittiwake from Flamborough and Filey Coast pSPA does not overlap with the Hornsea Three array area, suggesting limited connectivity with the Hornsea Three site. However, the Future of the Atlantic and Marine Environments and Seabird Tracking and Research projects tracking data from the colony during the breeding season shows for kittiwake some connectivity with the Hornsea Three array area, whilst also supporting the existence of connectivity for gannet (Wakefield *et al*., 2013).

8.4.31 Natural England has undertaken formal consultation on the extension of the Flamborough Head and Bempton Cliffs SPA. Currently the extension is a potential SPA and has been renamed Flamborough and Filey Coast pSPA. The pSPA is based on a revised site boundary, revised interest features and new reference populations. The Flamborough Head and Bempton Cliffs SPA was designated for breeding kittiwake (and in the reviewed citation, also guillemot and razorbill) but also regularly supports 300,000 individual seabirds including fulmar, herring gull, puffin and gannet.

8.4.32 There is considered to be the potential for birds found within the Hornsea Three array area and offshore ECR corridor at particular times of the non-breeding season to be connected to other more distant UK designated sites. This may include migratory seabirds (e.g. skuas and terns) or seabirds that may utilise areas in the North Sea during the winter (e.g. auk species) that are qualifying features at other UK SPAs.

8.4.33 The Hornsea Three offshore ECR corridor search area lies within the area proposed as the Greater Wash draft SPA (Natural England, 2015) and North Norfolk Coast SPA (Natural England, 2014b). It is also in close proximity to several international and national sites of conservation importance which may support bird populations that utilise the Hornsea Three offshore ECR corridor (e.g. waterbirds commuting daily between intertidal and inland sites for the purposes of foraging and roosting (e.g. Ward *et al.*, 2003). These sites are summarised, together with the features for which they are designated, in Table 8.18 and Figure 8.21. All of those sites identified within Table 8.17 and 8.18 have been scoped into the EIA.

8.4.34 Natural England has indicated that they take the approach of treating species which are named components of an SPA assemblage in the same way as cited species, although noting that the assemblage rather than individual species is the cited feature. Therefore, for the purpose of this assessment, species which are named under the assemblage qualification on the SPA citation will be treated identically to species identified as qualifying interests in their own right.

Table 8.17 Qualifying and seabird breeding assemblage species of Flamborough and Filey Coast pSPA recorded during baseline surveys of the former Hornsea Zone and their respective maximum and mean maximum foraging ranges.

| pSPA site | Distance to Hornsea Three array area (km) | Species | Foraging range (km) (Thaxter *et al.*, 2012) | | Cited pSPA population (pairs)[8] |
|---|---|---|---|---|---|
| | | | Mean-maximum (±1 SD) | Maximum | |
| Flamborough and Filey Coast pSPA | 149 | Qualifying species | | | |
| | | Gannet | 229.4 (±124.3) | 590 | 8,469 |
| | | Kittiwake | 60 (±23.3) | 120 | 44,520 |
| | | Guillemot | 84.2 (±50.1) | 135 | 41,607 |
| | | Razorbill | 48.5 (±35.0) | 95 | 10,570 |
| | | Listed assemblage feature | | | |
| | | Fulmar | 400 (±245.8) | 580 | 1,447 |
| | | Non-listed assemblage feature | | | |
| | | Puffin | 105.4 (±46.0) | 200 | 980 |
| | | Herring gull | 61.1 (±44) | 92 | 711 |
| | | Shag | 14.5 (3.5) | 17 | 28 |
| | | Cormorant | 25 (10) | 35 | 33 |

[8] Population figures for the Flamborough and Filey Coast pSPA are taken from Natural England (2014).

Table 8.18 Statutory designated sites of bird conservation importance within proximity of Hornsea Three with cited features of relevance to offshore ornithology.

| Site | Closest distance to Hornsea Three | Cited features of relevance to offshore ornithology |
|---|---|---|
| ***International designations*** | | |
| Flamborough Head and Bempton Cliffs SPA | 149 km from Hornsea Three array area. | Breeding: kittiwake |
| Flamborough and Filey Coast pSPA | 149 km from Hornsea Three array area. | Breeding: gannet, kittiwake and puffin<br>A breeding seabird assemblage of European importance |
| The Greater Wash possible SPA | Coincident with the Hornsea Three offshore ECR corridor search area. | Non-breeding: red-throated diver, common scoter and little gull<br>Breeding: Sandwich tern, common tern and little tern |
| North Norfolk Coast SPA | Coincident with the Hornsea Three landfall area. | Breeding: Sandwich tern, common tern, little tern, marsh harrier, Montagu's harrier and avocet.<br>Non-breeding: Pink-footed goose, dark-bellied brent goose and wigeon.<br>The site qualifies as an internationally important wetland, regularly supporting, in winter, over 10,000 wildfowl (average over 20,000) and internationally important numbers of the following waterfowl species dark-bellied Brent geese, pink-footed-geese, knot and wigeon.<br>Nationally important wintering numbers of the following species are also supported: European white-fronted geese, pintails, shelducks, grey plovers, ringed plovers, oystercatchers and redshanks. The site supports also nationally important breeding populations of rare species, including gadwall, shoveler and black-tailed godwit. |
| North Norfolk Coast Ramsar | Coincident with the Hornsea Three landfall area. | Breeding: Sandwich tern, common tern, little tern, marsh harrier, black-headed gull and roseate tern.<br>On passage: knot, ringed plover, sanderling, bar-tailed godwit, cormorant, little egret, gadwall, grey plover, ruff, black-tailed godwit, whimbrel, curlew, spotted redshank, greenshank and turnstone.<br>Wintering: Pink-footed goose, dark-bellied brent goose, wigeon, pintail, white-fronted goose, shelduck, teal, shovelor, common scoter, velvet scoter, red-breasted merganser, oystercatcher, golden plover and redshank. |
| ***National designations*** | | |
| North Norfolk Coast SSSI | Coincident with the Hornsea Three landfall area. | Breeding: Sandwich tern, common tern, little tern, marsh harrier, avocet and black-tailed godwit.<br>Migratory birds, notably waders<br>Wintering: brent geese, pink-footed geese and white-fronted geese |
| Weybourne Cliffs SSSI | Coincident with the Hornsea Three landfall area. | Breeding: fulmar |

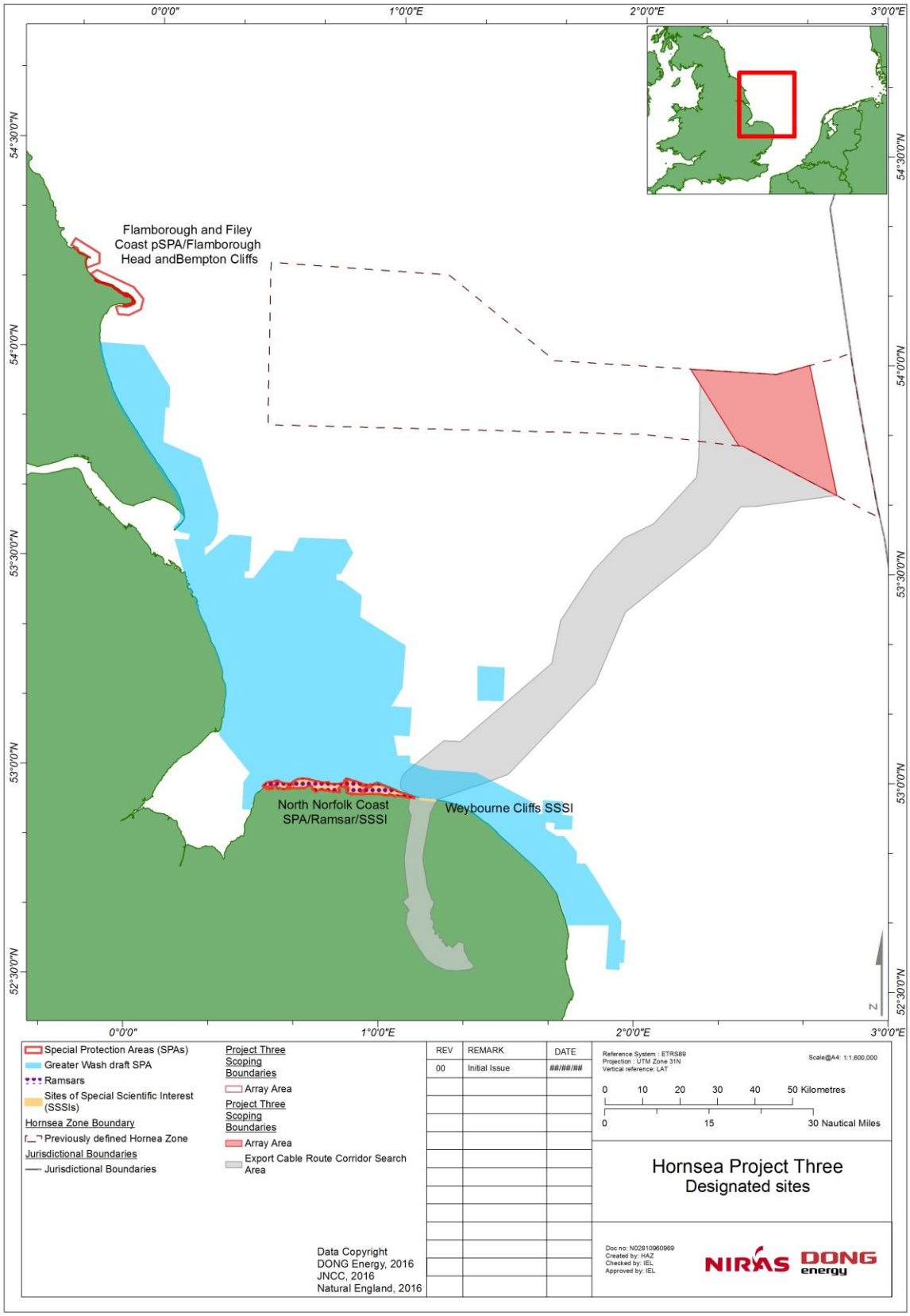



Figure 8.21 Designated sites within proximity of Hornsea Three.

## Proposed approach to the Environmental Impact Assessment (EIA)

### *Proposed assessment methodology*

8.4.35 The offshore ornithology EIA will follow the methodology set out in Chapter 5: Environmental Impact Assessment Methodology above. Specific to the offshore ornithology EIA, the following guidance documents will also be considered:

- Guidelines for EcIA in Britain and Ireland. Marine and Coastal, Final Document (IEEM, 2010);
- Guidelines for EcIA in the UK and Ireland. Terrestrial, Freshwater and Coastal. 2nd edition (CIEEM, 2016);
- Offshore Wind Farms. Guidance note for EIA in respect of FEPA and CPA requirements (CEFAS *et al*., 2004); and
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008).

8.4.36 In addition, the offshore ornithology EIA will follow the legislative framework as defined by the Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (the 'Birds Directive'), Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive'), the Wildlife and Countryside Act 1981 (as amended) and the MCAA 2009 (as amended).

8.4.37 The key international conventions promoting the conservation of birds of relevance to the offshore ornithology EIA are the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the 'Ramsar Convention'), the Convention on the Conservation of Migratory Species of Wild Animals (the 'Bonn Convention') and the Convention on the Conservation of European Wildlife and Natural Habitats (the 'Bern Convention').

### *Valued Ornithological Receptors (VORs)*

8.4.38 In accordance with the Chartered Institute of Ecology and Environmental Management guidelines on EcIA (IEEM, 2010; CIEEM, 2016), the assessment of the likely ecological effects of the Proposed Development has focused on 'valued ornithological receptors' (VORs). VORs receptors are species populations and assemblages of high ecological value, present within the zone of influence of the Proposed Development, that any potential effect upon them as a result of the Proposed Development would be considered to be significant.

8.4.39 The value of species populations and of assemblages will be evaluated with reference to their importance in terms of 'biodiversity conservation' value (which relates to the need to conserve representative areas of different habitats and the genetic diversity of species populations) and their legal status.

8.4.40 For the purposes of this assessment, species populations and assemblages will be valued using the following scale:

- International/European;
- National;
- Regional area; and
- Local.

8.4.41 The Chartered Institute of Ecology and Environmental Management guidelines on EcIA (IEEM 2010; CIEEM, 2016) recommends an approach to valuation that involves defining the different values that could be attached to the ornithological receptors under consideration. The criteria to be used in the valuation process have been summarised in Table 8.19.

Table 8.19 Definition of terms relating to the ecological value (Sensitivity) of bird species.

| Value of VOR | Criteria to define value |
|---|---|
| International / European | Bird species that form part of a cited interest of an SPA or Ramsar site that may potentially interact with Hornsea Three at some stage of their life cycle[9]<br>At least 20% of the European breeding or non-breeding population is found in the UK; and/or<br>A species which is present within Hornsea Three in numbers of greater than 1% of the international biogeographic population. |
| National | Species listed on Schedule 1 of the Wildlife and Countryside Act 1981 not already covered by International criteria;<br>Species listed on Annex 1 of the EU Birds Directive;<br>Bird species that form part of an SSSI that may potentially interact with Hornsea Three at some stage of their life cycle;<br>At least 50% of the UK breeding or non-breeding population found in ten or fewer sites;<br>An impact on an ecologically-sensitive species (<300 breeding pairs or <900 wintering individuals in the UK); and/or<br>A species which is present within Hornsea Three in numbers of greater than 1% of the national population. |
| Regional | Species listed on the Birds of Conservation Concern Red list (Eaton *et al.,* 2015);<br>Species that are the subject of a specific action plan within the UK or are listed as Species of Principal Importance in England (Section 41 of the Natural Environment and Rural Communities Act 2006); and/or<br>A species which is present within Hornsea Three in numbers of greater than 1% of the regional population. |
| Local | Any other species of conservation value (e.g. Amber-listed species listed on the Birds of Conservation Concern (Eaton *et al*., 2015)) not covered in the categories below. |

### Potential project impacts

8.4.42 A range of potential impacts on ornithological features has been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Hornsea Three. The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 8.20, together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

8.4.43 On the basis of the offshore ornithology information currently available and the project description outlined in Chapter 3: Project Description, a number of impacts are proposed to be scoped out of the assessment for offshore ornithology. These impacts are outlined, together with a justification for scoping them out, in Table 8.21.

[9] For the purposes of this assessment species listed on SPA assemblage criteria or Ramsar crtieria 'noteworthy fauna', and not qualifying features in their own right, are treated identically and are awarded International conservation value.

Table 8.20 Impacts proposed to be scoped into the Hornsea Three assessment for ornithology.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Direct temporary habitat loss/disturbance | The impact of construction activities such as increased vessel activity and underwater noise may result in direct disturbance or displacement of birds from important feeding and roosting areas.<br>Within the intertidal zone, this applies only to little tern, which has been observed to forage within near shore areas. There are no other intertidal VORs that are predicted to be affected by construction activities. | <u>Hornsea Three array area:</u><br>The results of the previous surveys across the former Hornsea Zone (see paragraph 8.4.7) indicate that the bird communities present across the eastern half of the former Hornsea Zone, corresponding with the Hornsea Three array area, are similar to those that are present across the Project One and Project Two array areas.<br>An analysis of survey data for the former Hornsea Zone and Hornsea Three areas is being conducted and this will be supplemented with additional site-specific bird surveys. DONG Energy has commissioned monthly digital video aerial surveys across Hornsea Three and a 4 km buffer. These surveys commenced in April 2016.<br><br><u>Hornsea Three offshore ECR corridor:</u><br>It is considered that there is sufficient existing data (available from the literature) to describe the ornithological baseline of the offshore components of the ECR corridor and no further surveys are proposed.<br>Site visits undertaken during July 2016 confirm that the location for options for cable landfall (within Hornsea Three landfall areas) do not comprise important intertidal habitat for bird populations. Specific surveys were also undertaken in July 2016 to quantify use of these coastal areas by Little Tern. These data are considered sufficient for the purposes of describing the ornithological interests of | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| | | | the cable landfall locations and no further ornithological survey of these areas are proposed. | |
| 2 | Indirect temporary habitat loss/ disturbance | The impact of construction activities such as increased vessel activity and underwater noise may result in disturbance or displacement of prey from important bird feeding areas.<br>Within the intertidal zone, this applies only to little tern, which has been observed to forage within near shore areas. There are no other intertidal VORs that are predicted to be affected by construction activities. | As above for ornithology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| ***Operation and maintenance*** | | | | |
| 3 | Permanent habitat loss/disturbance | The impact of physical displacement from an area around turbines and other ancillary structures during the operational phase of the development may result in effective habitat loss and reduction in species survival rates and fitness.<br>No permanent habitat loss within the intertidal zone is predicted. | As above for ornithology impact no. 1. | Displacement impact assessment will be conducted using the 'Displacement Matrix Approach' in line with interim guidance (Natural England and JNCC, 2012). The displacement and mortality rate for a species will be both assessed via a matrix approach from 0 to 100% of the population affected. The level of displacement will be based on currently available evidence (where it exists) and from standard guidance on species sensitivity to displacement (e.g. Wade *et al*., 2016). |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 4 | Collision | Collisions with rotating turbine blades will result in direct mortality of an individual. Increased mortality may reduce species' survival rates. | As above for ornithology impact no. 1. | Collision Risk Modelling will be undertaken using the Band model (Band 2012) to quantify the potential risk of additional mortality through collisions with operational turbines above the current baseline for each species. Whether use is made of the latest version of the model that takes better account of the uncertainty around collision risk prediction (Madsen, 2015) is to be agreed with the relevant SNCBs. |
| 5 | Barrier effect | The impact of barrier effects caused by the physical presence of turbines and ancillary structures may prevent clear transit of birds between foraging and breeding sites, or on migration. Additional energetic costs incurred may reduce fitness and survival rate of a species. | As above for ornithology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 6 | Temporary habitat loss/disturbance | The impact of disturbance as a result of activities associated with maintenance of operational turbines, cables and other infrastructure may result in disturbance or displacement of birds.<br>Within the intertidal zone, this applies only to little tern, which has been observed to forage within near shore areas. There are no other intertidal VORs that are predicted to be affected by construction activities. | As above for ornithology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Decommissioning*** | | | | |
| 7 | Direct temporary habitat loss/disturbance | The impact of decommissioning activities such as increased vessel activity and underwater noise may result in direct disturbance or displacement of birds from important feeding and roosting areas. | As above for ornithology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 8 | Indirect temporary habitat loss/ disturbance | The impact of decommissioning activities such as increased vessel activity and underwater noise may result in disturbance or displacement of prey from important bird feeding areas. | As above for ornithology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

Table 8.21 Impacts proposed to be scoped out of the assessment for ornithology.

| Impact No. | Impact | Justification |
|---|---|---|
| ***Construction*** | | |
| 1 | Permanent habitat loss | Construction of infrastructure and changes to physical processes may lead to changes in habitat available to birds and their prey species. The development of any such permanent subtidal habitat loss during the construction phase will be identical to that present throughout the Operation and Maintenance phase. This impact will therefore be solely addressed under Operation and Maintenance. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, Hornsea Three intends to scope this impact during the construction phase out of further consideration within the EIA (although considered in the operational phase) |
| 2 | Accidental pollution | The impact of pollution including accidental spills and contaminant releases associated with the construction of infrastructure and use of supply/service vessels may lead to direct mortality of birds or a reduction in prey availability either of which may affect species' survival rates. With implementation of an appropriate CoCP it was agreed with the SNCB's for Project One and Project Two, that complete mortality within the equivalent extent of a windfarm's array plus buffer area is considered very unlikely to occur, and a major incident that may impact any species at a population level is considered very unlikely. It was predicted that any impact would be of local spatial extent, short term duration, intermittent and medium reversibility within the context of the regional populations and be not significant in EIA terms. This is considered to be equally applicable to Hornsea Three for which construction will be comparable in scale and operation within the same environment, whilst implementing an appropriate CoCP. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Operation and maintenance*** | | |
| 3 | Accidental pollution | The impact of pollution including accidental spills and contaminant releases associated with maintenance or supply/service vessels which may lead to direct mortality of birds or a reduction in prey availability. With implementation of an appropriate PEMMP it was agreed with the SNCB's for Project One and Project Two, that complete mortality within the equivalent extent of a windfarm's array plus buffer area is considered very unlikely to occur, and a major incident that may impact any species at a population level is considered very unlikely. It was predicted that any impact would be of local spatial extent, short term duration, intermittent and medium reversibility within the context of the regional populations and be not significant in EIA terms. This is considered to be equally applicable to Hornsea Three for which operation and maintenance will be comparable in scale and operation within the same environment, whilst implementing an appropriate PEMMP. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 4 | Indirect permanent habitat loss/disturbance | No impact is predicted from indirect effects due to changes to physical processes and habitat from operational infrastructure that may lead to significant changes in prey availability. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |

| Impact No. | Impact | Justification |
|---|---|---|
| 5 | Disturbance from lighting | The impact of attraction to lit structures by migrating birds in particular may cause disorientation, reduction in fitness and possible mortality. Aviation and navigation lighting is to be optimised to avoid attracting birds taking into account impacts on safety.<br>The seabird species that are likely to be present in largest numbers (kittiwake, gannet and guillemot) are unlikely to be active at night (Furness *et al*. 2012)), either returning to colonies or roosting on the sea surface. Since gulls are visual foragers that may follow lit trawlers and other vessels, it is unlikely that birds, at least those local to the area, would be disoriented by lit turbines to a significant degree. The migratory seabird species (skuas, little gull and terns) may theoretically all move at night and therefore be at risk, although all of these species are given the lowest ranking for nocturnal activity rate by Furness *et al*. (2013). Numbers of birds travelling through Hornsea Three array area during hours of darkness are likely in relation to national or international populations, to be proportionately low, particularly as most flights would be below potential collision height.<br>It was agreed with the SNCB's for Project One and Project Two that any impact from attraction to lit structures on birds was predicted to be of local spatial extent, short term duration, intermittent and of medium reversibility within the context of any international, national or regional population and be not significant in EIA terms. This is considered to be equally applicable to Hornsea Three for which the operation and maintenance will be comparable in scale and operation within the same environment. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Decommissioning*** | | |
| 6 | Accidental pollution | The impact of pollution including accidental spills and contaminant releases associated with removal of infrastructure and supply/service vessels may lead to direct mortality of birds or a reduction in prey availability either of which may affect species' survival rates. With implementation of an appropriate Decommissioning Plan it was agreed with the SNCB's for Project One and Project Two, that complete mortality within the equivalent extent of a windfarm's array plus buffer area is considered very unlikely to occur, and a major incident that may impact any species at a population level is considered very unlikely. It was predicted that any impact would be of local spatial extent, short term duration, intermittent and medium reversibility within the context of the regional populations and be not significant in EIA terms. This is considered to be equally applicable to Hornsea Three for which decommissioning will be comparable in scale and operation within the same environment, whilst implementing an decommissioning programme and appropriate Decommissioning Plan. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 7 | Permanent habitat loss | The impact of changes to physical processes and removal of structures, may lead to changes in habitat available for prey species. Such permanent subtidal habitat loss during the decommissioning phase will be identical to that present throughout the Operation and Maintenance phase. This impact will therefore be solely addressed under Operation and Maintenance. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, Hornsea Three intends to scope this impact during the construction phase out of further consideration within the EIA. |

### Measures adopted as part of the project

8.4.44 Measures adopted as part of the project will include a review and assessment of options to minimise collision risk.

8.4.45 The requirement and feasibility of additional measures will be dependent on the significance of the effects on ornithology and will be consulted upon with statutory consultees throughout the EIA process.

### Potential cumulative impacts

8.4.46 The cumulative assessment will consider the same impacts across all phases of the project, as outlined in Table 8.20 for the Hornsea Three alone assessment. The range of other projects considered will be dependent on the particular impact as well as each species' population distribution and behaviour (e.g. foraging range). The CEA will however include not only consideration of other existing, proposed or planned offshore wind farms but also other types of development or activities taking place in the wider area such as:

- Aggregate extraction, dredging and spoil disposal;
- Navigation and shipping;
- Established commercial fishing activities;
- Potential port and harbour developments; and
- Existing and potential future oil and gas installations.

8.4.47 As a result the CEA will consider the effects drawn from both the existing baseline and the future predicted baseline for the construction, and operation and maintenance phase of Hornsea Three.

8.4.48 Guidance provided in the COWRIE report "Developing Guidance on Ornithological CEA for offshore wind farm Developers" (King *et al*., 2009) will inform the assessment of cumulative impacts within the EIA process.

### Potential transboundary impacts

8.4.49 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there was potential for significant transboundary effects with regard to offshore ornithology from Hornsea Three upon the interests of other EEA states. In the IPC's (IPC, 2010) Scoping Opinion for Project One, it was noted that given the movements of birds between SPAs across the North Sea, it was considered necessary to consider the potential impact of this development on the interest features of mainland European coastal SPAs.

8.4.50 The potential for Hornsea Three to impact on the offshore ornithology interest features of nature conservation designations outside of the UK EEZ will be considered within the HRA process.

# 9. Offshore Human and Socio-economic Environment

## 9.1 Commercial fisheries

### Introduction

9.1.1 This section of the Scoping Report identifies the commercial fisheries receptors which are of relevance to the Hornsea Three array area and offshore ECR corridor search area. It considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore components of Hornsea Three on commercial fisheries activity.

9.1.2 It should be noted that this chapter of the Scoping Report does not cover all fishing activity in the commercial fisheries regional study area. For instance the landings and effort statistics generally only record data for UK vessels landing in the UK and at European ports and non-UK vessels landing in the UK. As a result landings taken by non-UK vessels landing into ports in Europe are not captured and these will need to be obtained from relevant national governments. The same applies to effort statistics. In addition it should also be noted that the aerial surveillance and VMS datasets only cover vessels larger than 10 m and 15 m respectively.

### Study area

9.1.3 The proposed Hornsea Three array area is located within the southwest portion of the ICES Division IVb (Central North Sea) statistical area; outside the 12 NM limit in UK EEZ waters. For the purpose of recording fisheries landings, ICES Division IVb is divided into statistical rectangles which are consistent across all Member States operating in the North Sea.

9.1.4 The Hornsea Three commercial fisheries study area is defined by the ICES statistical rectangles that the Hornsea Three boundary overlaps (Figure 9.1). The Hornsea Three commercial fisheries study areas is therefore defined as follows:

- Hornsea Three commercial fisheries regional study area: 16 ICES Rectangles in total to ensure adequate representation of surrounding fisheries activity (ICES Rectangles 37F0 to F3, 36F0 to F3, 35F0 to F3 and 34F0 to F3);
- Hornsea Three commercial fisheries array study area: ICES Rectangle 36F2; and
- Hornsea Three commercial fisheries offshore ECR corridor study area: ICES statistical Rectangles 36F1, 36F2, 35F1, 35F2 and 34F1.

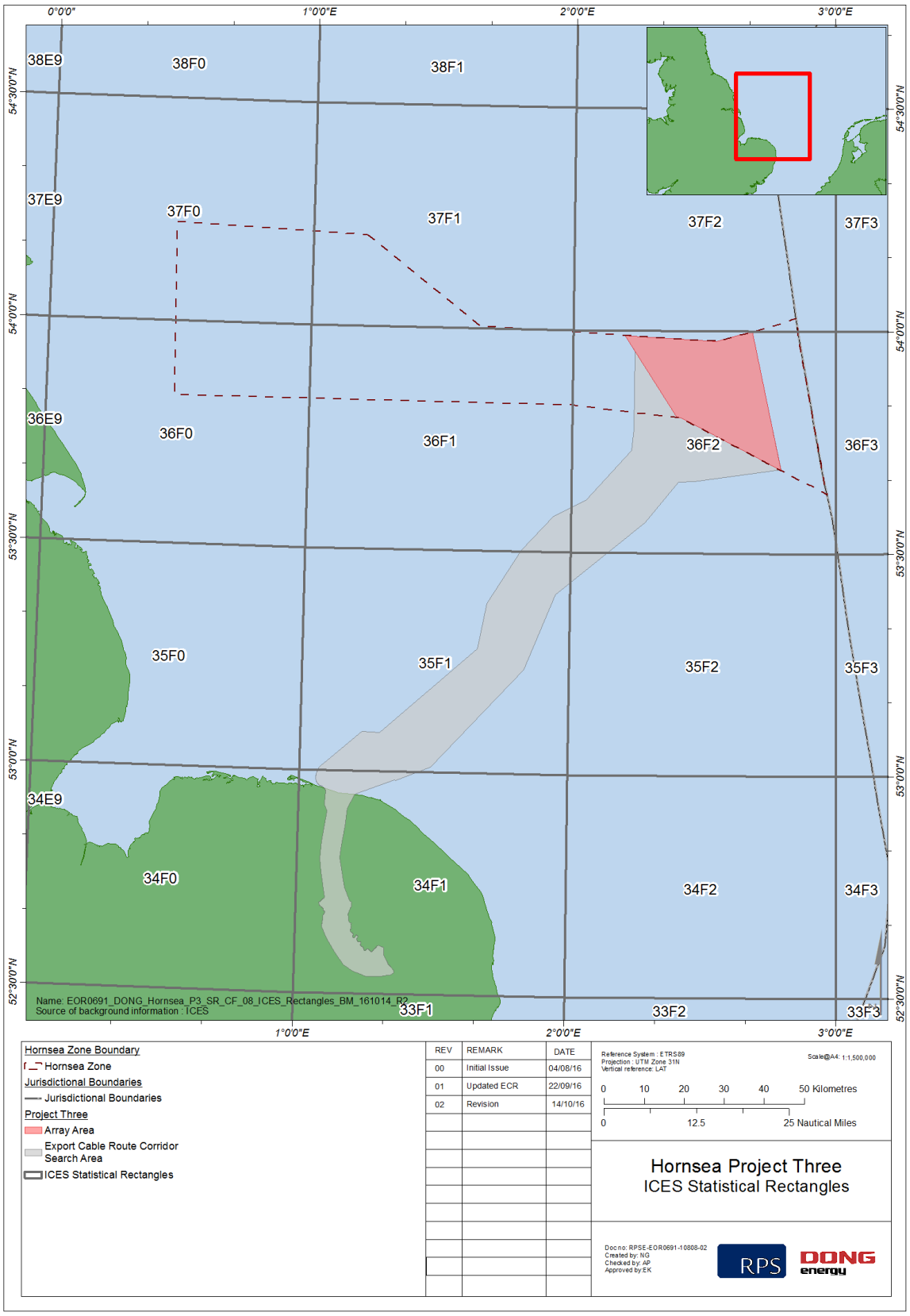



Figure 9.1 The proposed Hornsea Three relative to ICES rectangles.

### Baseline data

9.1.5 An initial desk based review of literature and data sources to support this Scoping Report has highlighted the following data sources which provide coverage of the Hornsea Three array area and offshore ECR corridor search area:

- **Landing Statistics:** For the six year period, 2010 to 2015, nationally registered fishing vessels operating within the Hornsea Three commercial fisheries regional study area, and landing to their home nation ports, which include the UK, Netherlands and France (MMO, 2016);
- **Effort Statistics:** For the six year period, 2010 to 2015, nationally registered fishing vessels operating within the Hornsea Three commercial fisheries regional study area by EU Member States (MMO, 2016);
- **Aerial Surveillance Data:** For the five year period, 2010 to 2014, Aerial Surveillance Data for vessels greater than 10 m in length operating within the Hornsea Three commercial fisheries regional study area (MMO, 2016); and
- **Vessel Monitoring System (VMS) Data:** For the five year period, 2010 to 2014, VMS data (effort, landings (tonnes) and value (pounds sterling)) for vessels greater than 15 m in length operating within the Hornsea Three commercial fisheries regional study area (MMO, 2016).

9.1.6 As noted in paragraph 9.1.2, it should be noted that the above datasets do not cover all fishing activity in the commercial fisheries regional study area. For instance the landings and effort statistics generally only record data for UK vessels landing in the UK and at European ports and non-UK vessels landing in the UK. As a result landings taken by non-UK vessels landing into ports in Europe are not captured and these will need to be obtained from relevant national governments. The same applies to effort statistics. In addition it should also be noted that the aerial surveillance and VMS datasets only cover vessels larger than 10 m and 15 m respectively. However, published data does provide some details of the fishing activity undertaken in inshore areas (e.g. Walmsley and Pawson, 2007, ESFJC, 2010) and this data has been utilised to provide some context to this activity. Further information on baseline data gaps are provided in Table 9.1.

### Baseline environment

9.1.7 The Hornsea Three commercial fisheries regional study area lies within OSPAR Region 2 – Greater North Sea. The Hornsea Three array area and offshore ECR corridor search area overlaps ICES Rectangles 36F1, 36F2, 35F1, 35F2 and 34F1, which have an annual average value of £20.58 million for all vessels for the years 2010 to 2014.

9.1.8 The average total tonnage of historical landings across the Hornsea Three commercial fisheries regional study area is presented below in Figure 9.2 and the average annual value across the Hornsea Three commercial fisheries regional study area is presented in Figure 9.3. For the Hornsea Three commercial fisheries regional study area, the offshore ICES rectangles are dominated by UK landings, however, as noted in paragraph 9.1.6, this data is not representative of non-UK landings taken by non-UK vessels which may be potentially higher. Data that was obtained to inform the Project One and Project Two EIAs suggest that substantial Belgian, Dutch and Danish landings are taken from the area, with a smaller contribution made by French and German vessels. The ICES rectangle which overlaps with the Hornsea Three array area represents 16% of the total value of landings across the ICES rectangles of the entire Hornsea Three commercial fisheries regional study area. However, it is important to note that the Hornsea Three array area occupies only a portion of these ICES rectangles (25.2%).

9.1.9 Figure 9.4 shows the top twelve species landed from the entire Hornsea Three commercial fisheries regional study area, by weight and by value, from 2010 to 2015. The key species in terms of weight are brown crab *Cancer pagarus*, cockles *Cerastoderma edule*, plaice *Pleuronectes platessa* and whelks *Buccinum undatum*, although mussels *Mytilus edulis* in 2011 showed a very large catch compared to other years which put it on a similar level to that of the other key species. When compared with the value of landings in the Hornsea Three commercial fisheries regional study area, it can be seen that while catches of lobsters *Homarus gammarus* are considerably lower by weight than brown crabs, their value is similar, owing to a higher market price. The data suggests that the brown crab and lobster landings are important in the Hornsea Three commercial fisheries regional study area and are the most valuable landings in all five years. Based on both the weight and value data, other key species include brown shrimp *Crangon crangon*, Nephrops *Nephrops norvegicus*, cockles, scallops, plaice and whelks. It is also worth noting that a number of species with low catch weights have relatively high total values (e.g. cod *Gadus morhua*, turbot *Scophthalmus maximus*) and can also be considered key target species in the Hornsea Three commercial fisheries regional study area, as can some species such as sprats, with high catch weight but low total value.

9.1.10 In addition to landings and effort data, aerial surveillance and VMS data have also been obtained for all ICES Rectangles within the Hornsea Three commercial fisheries regional study area from 2010 to 2014 (MMO, 2016). The aerial surveillance data is shown in Figure 9.5 to Figure 9.6 by fishing gear type and nationality respectively. The VMS data will be presented in the Environmental Statement.

9.1.11 From Figure 9.5, it can be seen that the majority of fishing vessels working the Hornsea Three commercial fisheries regional study area are trawlers, with the most popular type being beam trawlers. Further inshore, potters/whelkers are the more popular vessel type, particularly along coastal regions especially in the northwest of the Hornsea Three commercial fisheries regional study area.

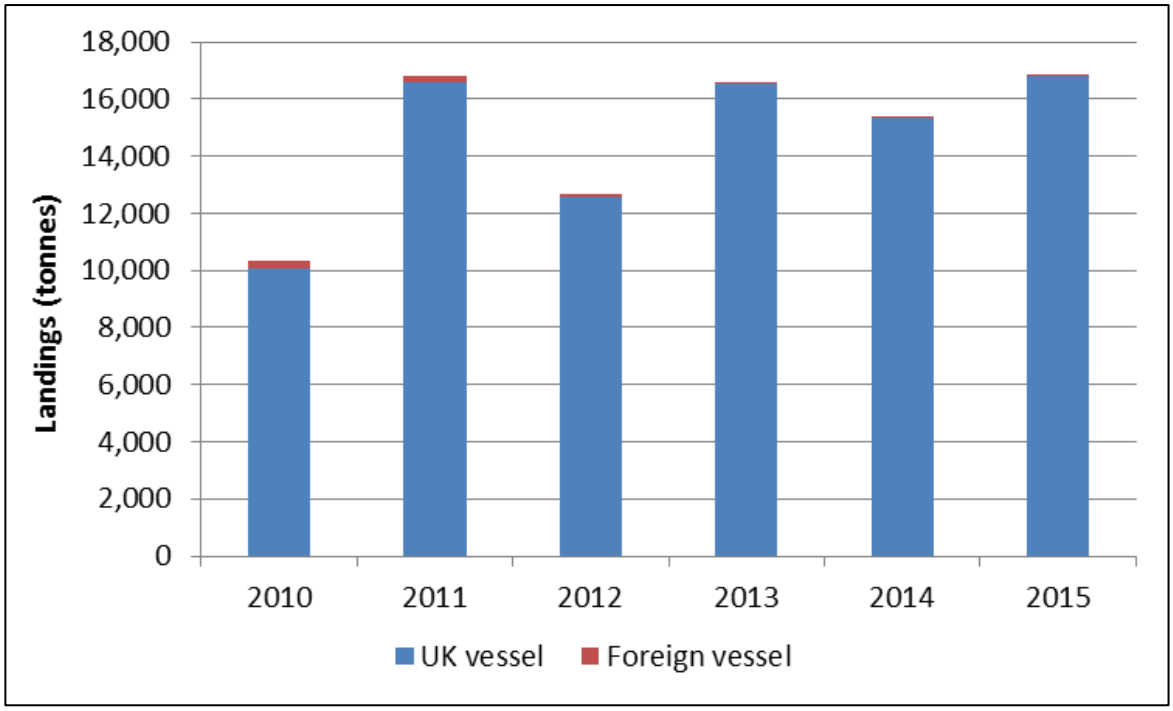



Figure 9.2 Total volume (tonnes) of landings from 2010 to 2015 from the Hornsea Three commercial fisheries regional study area by vessel registered nationality (MMO, 2016).

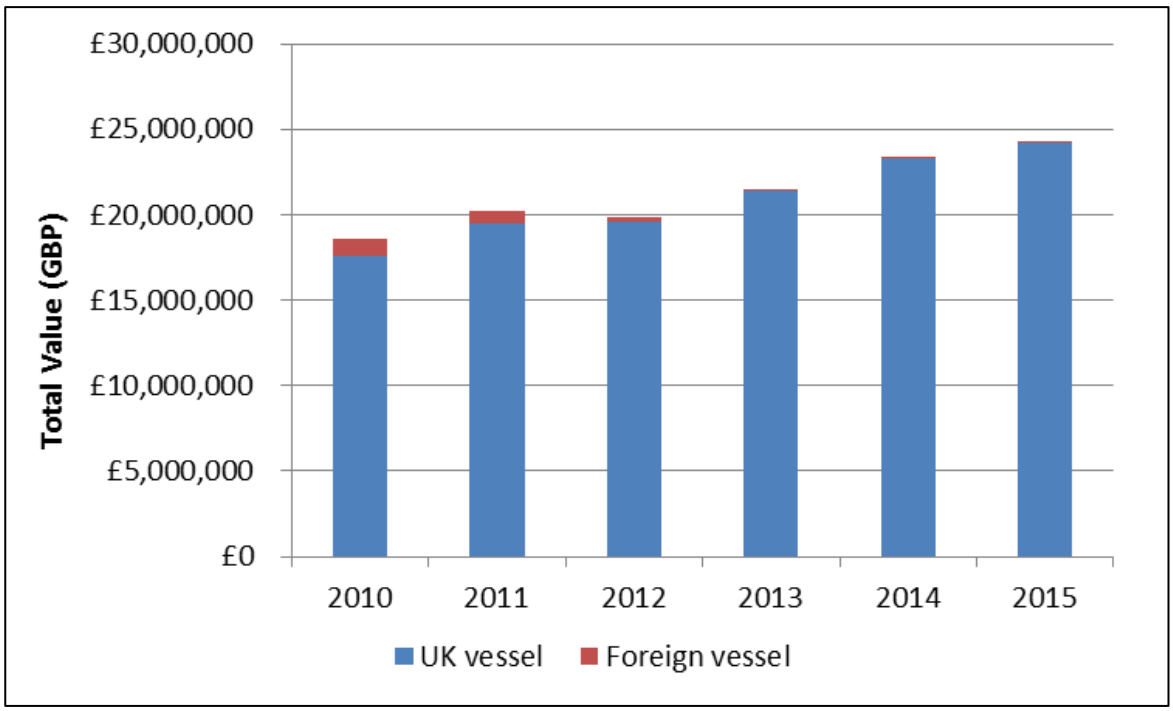
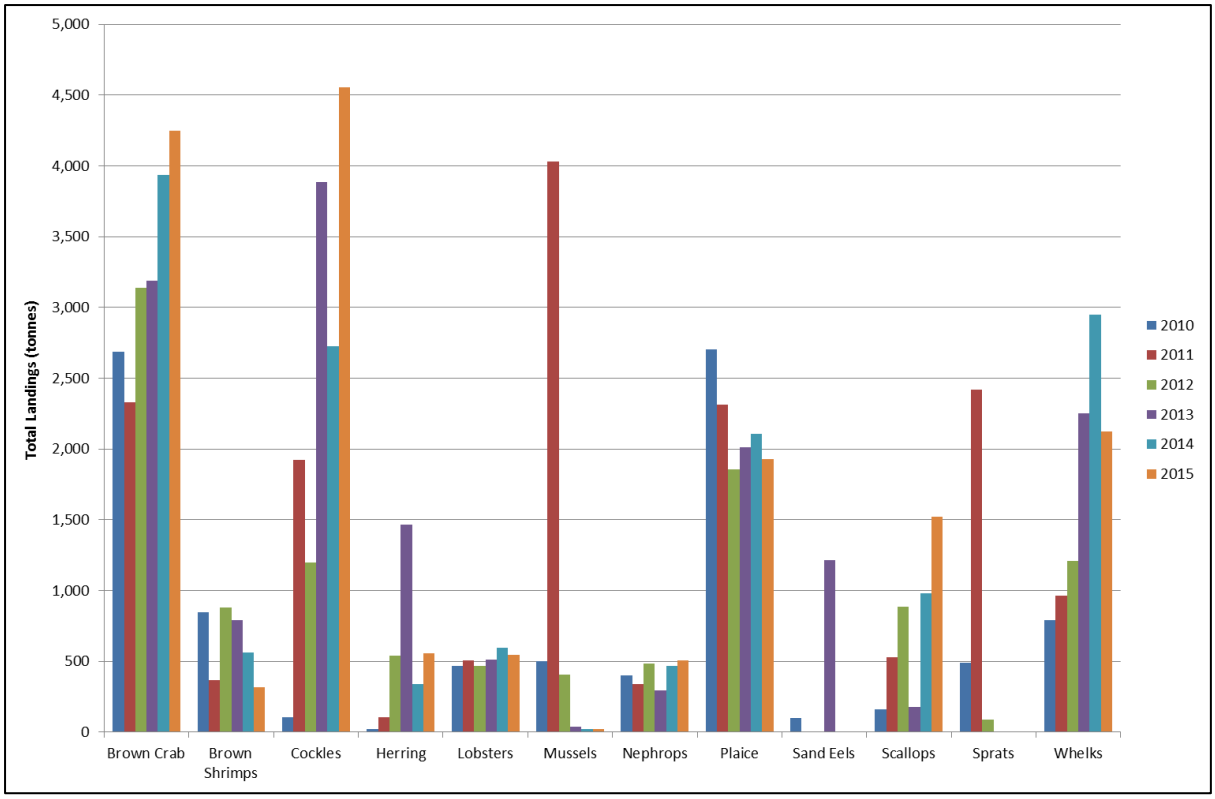
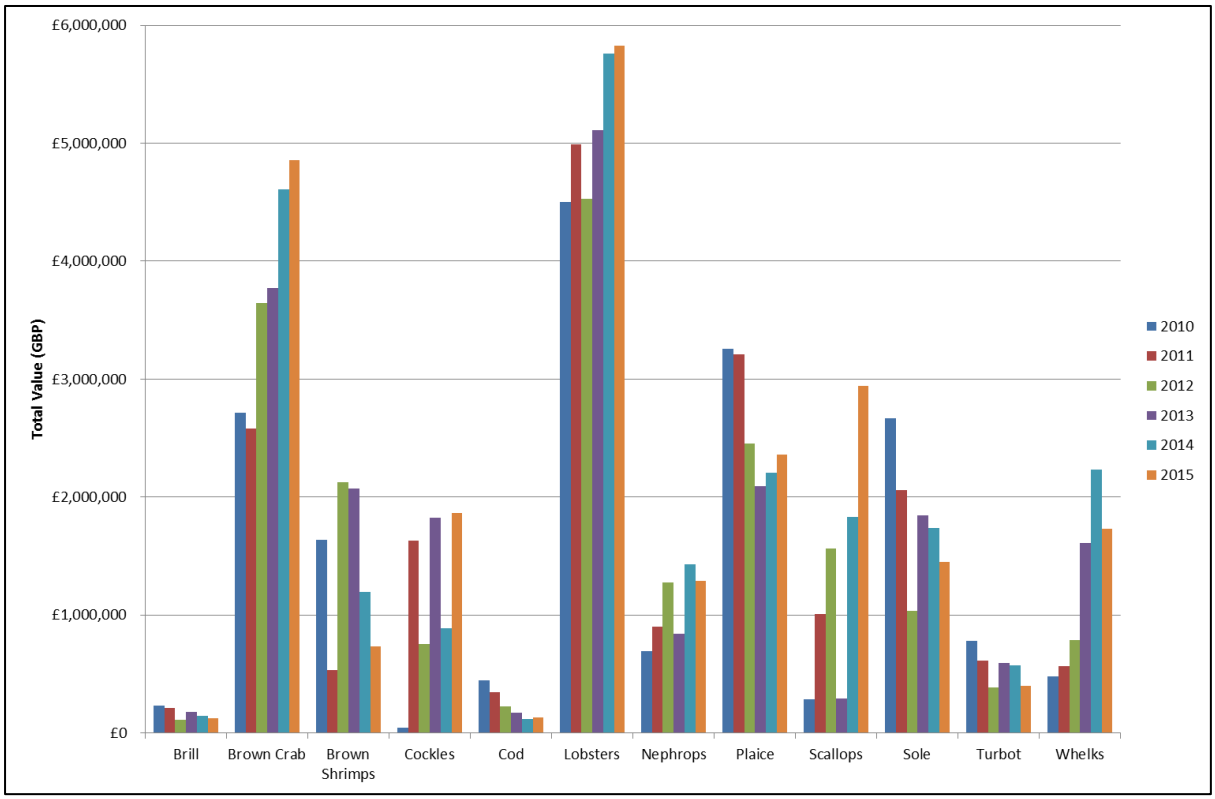



Figure 9.3 Total value (GBP) of landings from 2010 to 2015 from the Hornsea Three commercial fisheries regional study area by vessel registered nationality (MMO, 2016).




a




b

Figure 9.4 Top twelve species by (a) weight (tonnes) and (b) value (GBP) from 2010 to 2015 landed from the Hornsea Three commercial fisheries regional study area (MMO, 2016).

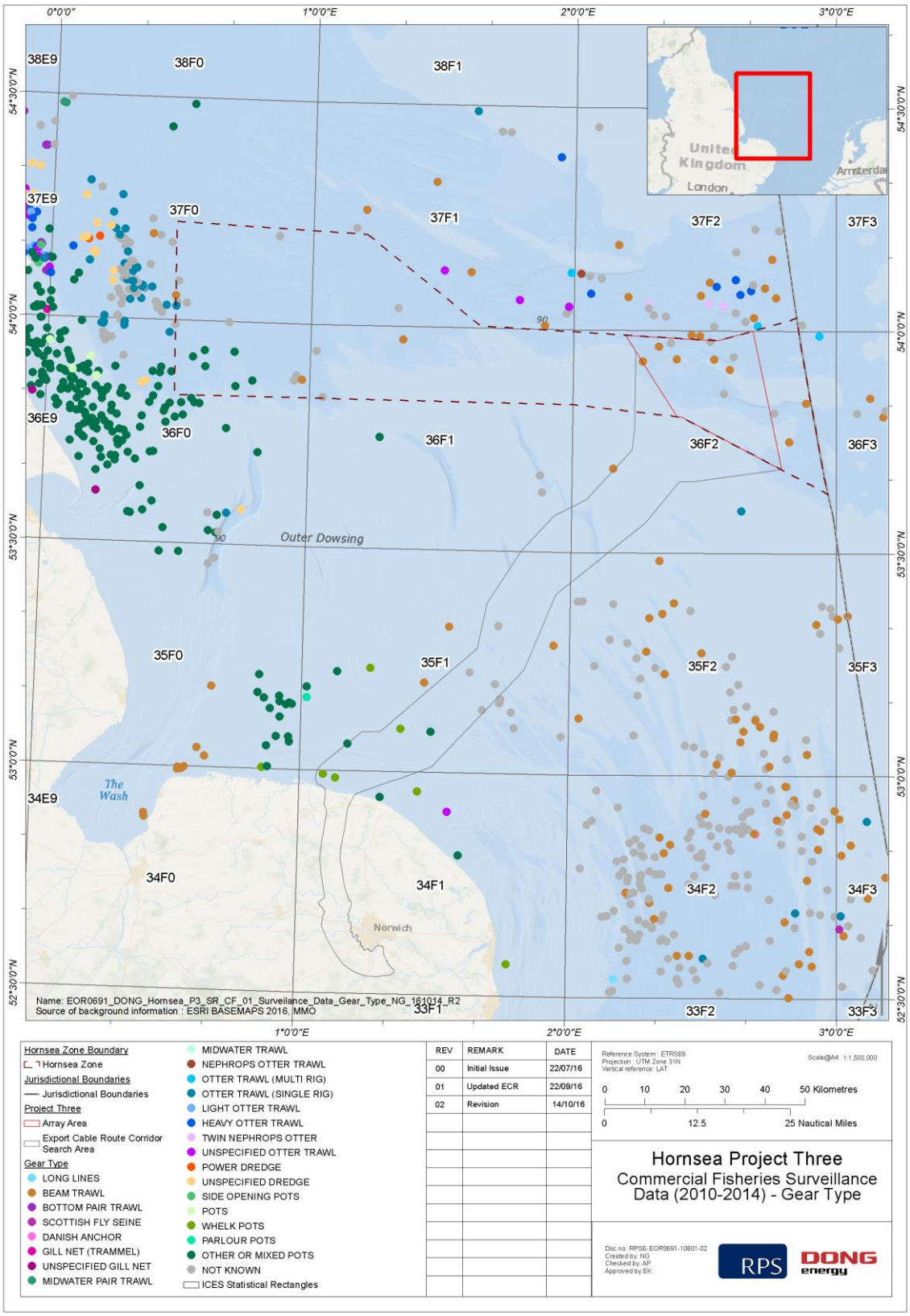



Figure 9.5 Aerial surveillance data (2010 to 2014) for vessels greater than 10 m in length across the Hornsea Three commercial fisheries regional study area by fishing gear type (MMO, 2016)*.

* Note - Only fishing vessels actively engaged in fishing activity have been plotted; fishing vessels marked as 'steaming' or 'laid stationary' have not been included.

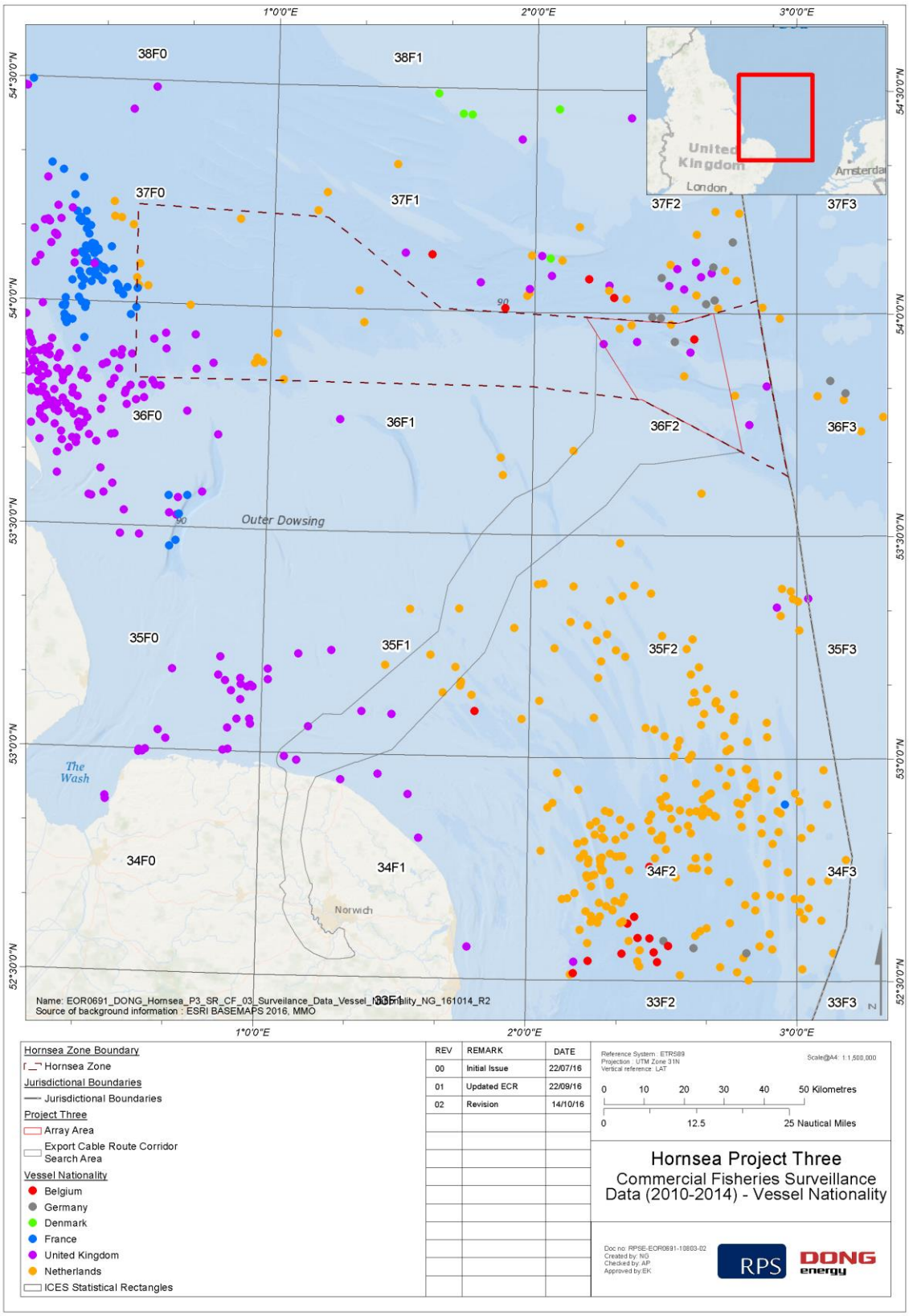



Figure 9.6 Aerial Surveillance data (2010 to 2014) for vessels greater than 10 m in length across the Hornsea Three commercial fisheries regional study area by nationality (MMO, 2016)*.

* Note - Only fishing vessels actively engaged in fishing activity have been plotted; fishing vessels marked as 'steaming' or 'laid stationary' have not been included.

9.1.12 Figure 9.6 provides data on the nationality of vessels operating in the Hornsea Three commercial fisheries regional study area. Vessels from the UK, Belgium, Germany, Denmark, France and the Netherlands are seen fishing across the Hornsea Three commercial fisheries regional study area. Vessels form the Netherlands dominate sightings across the Hornsea Three array area, followed by UK and French vessels. In the Hornsea Three commercial fisheries array study area, vessels from the Netherlands, Germany, Belgium and the UK have been observed fishing between 2010 and 2014, whereas within the Hornsea Three commercial fisheries offshore ECR corridor, vessels form the Netherlands were most commonly observed fishing in offshore areas, with UK vessels operating closer to shore. The distribution of the data suggest the majority of vessels form the Netherlands are trawlers using beam trawls and UK vessels are potters operating close to shore.

9.1.13 The large number of non-UK vessels observed operating in the area suggests that landings by other nations are likely to be higher than demonstrated by the data captured by the MMO. MMO landings datasets do not capture landings into foreign ports by non-UK vessels and therefore, these landings are not represented in the datasets presented here. However, this data will be sought for inclusion in the Environmental Statement to provide a full baseline characterisation for commercial fisheries.

### Proposed approach to the Environmental Impact Assessment (EIA)

9.1.14 The commercial fisheries EIA will broadly follow the EIA methodology set out in Chapter 5: Environmental Impact Assessment Methodology. Specifically, the commercial fisheries EIA will take note of the guidance contained within the NPS for Renewable Energy Infrastructure (NPS EN-3) (DECC, 2011b) with regard to consultation and impact assessment upon commercial fisheries.

9.1.15 Relevant issues that were raised during the previously conducted consultations for Project One and Project Two, as well as the Race Bank offshore wind farm (which is located 26 km from the Hornsea Three offshore ECR corridor search area) will also be taken into account for the Hornsea Three impact assessment, where applicable.

### Potential project impacts

9.1.16 A range of potential impacts on commercial fisheries have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Hornsea Three. The potential impacts that have been scoped into the Hornsea Three commercial fisheries EIA are outlined in Table 9.1 below, together with a description of any additional data collection (e.g. site-specific surveys) that will be required to enable a full assessment of the impacts.

9.1.17 On the basis of the baseline commercial fisheries information currently available and the project description outlined in Chapter 3: Project Description, a number of impacts are proposed to be scoped out of the assessment for commercial fisheries. These impacts are outlined, together with a justification for scoping them out, in Table 9.2.

Table 9.1 Potential impacts proposed to be scoped into the Hornsea Three impact assessment for commercial fisheries.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Reduction in access to, or exclusion from, established fishing grounds within the Hornsea Three array area. | The physical presence of construction vessels and equipment is likely to obstruct fishing activities in the Hornsea Three array area. | Detailed analysis of existing datasets, will be utilised to characterise the status of historic commercial fisheries patterns across the area and predict the potential impacts upon future commercial fishing activities, including:<br>• Fisheries landings statistics from 2010 to 2015 (MMO, 2016);<br>• Fisheries effort statistics from 2010 to 2015 (MMO, 2016);<br>• VMS Data from 2010 to 2014 (MMO, 2016); and<br>• Aerial Surveillance data from 2010 to 2014 (MMO, 2016).<br>For areas close to shore within the offshore ECR corridor search area, where vessels less than 10 m in length operate (which are not recorded in VMS and surveillance datasets), consultation will be required to understand fishing activity. This information will also be supplemented by results of vessel-based fishing activity reconnaissance survey work that will be undertaken by DONG Energy in the area.<br>Recent data from Belgian, Danish, Dutch, French, German, Swedish and Norwegian authorities for their fleets fishing within the Hornsea Three commercial fisheries regional study area will be collected. It is anticipated that data would include VMS (indicating hours fished and value of catch by area) and landing statistics by ICES rectangle. Additional datasets including maps of key fishing grounds may also be provided if available. These datasets will be requested from the relevant fishing industry representatives and/or consultee from each country in order to inform the commercial fisheries EIA. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 2 | Reduction in access to, or exclusion from, established fishing grounds within the Hornsea Three offshore ECR corridor. | The physical presence of construction vessels and equipment, cable laying vessels and equipment is likely to obstruct fishing activities along the Hornsea Three offshore ECR corridor. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 3 | Gear conflict and increased fishing pressure on adjacent grounds. | Displacement of fishing activities away from the Hornsea Three array area has the potential to increase fishing activity in surrounding areas, increasing the likelihood of gear conflict between fishing vessels. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 4 | Gear conflict and increased fishing pressure on adjacent grounds. | Displacement of fishing activities away from the Hornsea Three offshore ECR corridor has the potential to increase fishing activity in surrounding areas, increasing the likelihood of gear conflict between fishing vessels. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 5 | Displacement or disruption of commercially important fish and shellfish resources. | Fish and shellfish species could potentially move away from disturbed areas, changing the spatial distribution of local fish and shellfish populations. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 6 | Longer steaming distances to alternative fishing grounds. | Fishing vessels may face longer steaming distances to alternative fishing grounds due to the presence of construction traffic in the Hornsea Three array area. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 7 | Interference with fishing activity. | Increased vessel traffic within fishing grounds as a result of changes to shipping routes and construction vessel traffic associated with the Hornsea Three array area may result in fishing fleets suffering increased interaction with other fishing vessels as fleets deviate away from or around disturbed areas. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| ***Operation and maintenance*** | | | | |
| 8 | Reduction in access to established fishing grounds within the Hornsea Three array area. | The physical presence of the wind farm infrastructure may obstruct fishing activities in the Hornsea Three array area. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 9 | Reduction in access to established fishing grounds within the Hornsea Three offshore ECR corridor. | The physical presence of the Hornsea Three export cable and offshore HVAC booster station (if required) may obstruct fishing activities in the vicinity due to concerns of fishing gear snagging. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 10 | Gear conflict and increased fishing pressure on adjacent grounds. | Displacement of fishing activities away from the Hornsea Three array area has the potential to increase fishing activity in surrounding areas, increasing the likelihood of gear conflict between fishing vessels. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 11 | Gear snagging within the Hornsea Three array area. | Potential for snagging fishing gear on array cables. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 12 | Gear snagging within the Hornsea Three offshore ECR corridor. | Potential for snagging fishing gear on export cables. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 13 | Displacement or disruption of commercially important fish and shellfish resources. | Displacement or disruption of commercially important fish and shellfish resources (e.g. potential EMF effects from array and export cables) has the potential to displace or disrupt fish species. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 14 | Interference with fishing activity. | Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic associated with the Hornsea Three array area may result in fishing fleets suffering increased interaction with other fishing vessels as fleets deviate away from or around the Hornsea Three array area. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| ***Decommissioning*** | | | | |
| 15 | Reduction in access to, or exclusion from, established fishing grounds within the Hornsea Three array area. | The physical presence of vessels involved with decommissioning is likely to obstruct fishing activities in the Hornsea Three array area. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 16 | Reduction in access to, or exclusion from, established fishing grounds within the Hornsea Three offshore ECR corridor. | The physical presence of vessels involved with decommissioning, is likely to obstruct fishing activities along the Hornsea Three offshore ECR corridor. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 17 | Gear conflict and increased fishing pressure on adjacent grounds. | Displacement of fishing activities away from the Hornsea Three array area has the potential to increase fishing activity in surrounding areas, increasing the likelihood of gear conflict between fishing vessels. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 18 | Gear conflict and increased fishing pressure on adjacent grounds. | Displacement of fishing activities away from the Hornsea Three offshore ECR corridor has the potential to increase fishing activity in surrounding areas, increasing the likelihood of gear conflict between fishing vessels. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 19 | Displacement or disruption of commercially important fish and shellfish resources. | Fish and shellfish species could potentially move away from disturbed areas, changing the spatial distribution of local fish populations. | As above for commercial fisheries impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 20 | Increased steaming distances to alternative fishing grounds | Fishing vessels may face longer steaming distances to alternative fishing grounds due to the presence of decommissioning traffic and wind farm infrastructure. | As above for commercial fisheries impact no. 16. | As above for commercial fisheries impact no. 16. |
| 21 | Interference with fishing activity. | Increased vessel traffic within fishing grounds as a result of changes to shipping routes and decommissioning vessel traffic associated with the Hornsea Three array area may result in fishing fleets suffering increased interaction with other fishing vessels as fleets deviate away from or around disturbed areas. | As above for commercial fisheries impact no. 16. | As above for commercial fisheries impact no. 16. |

Table 9.2 Potential impacts proposed to be scoped out of the Hornsea Three impact assessment for commercial fisheries.

| Impact No. | Impact | Justification |
|---|---|---|
| ***Construction*** | | |
| 1 | Hornsea Three offshore ECR corridor construction activities leading to longer steaming distances to alternative fishing grounds. | Given cable laying will be a temporary activity and once construction activity has ceased, fishing vessels will be able to return to their original fishing grounds so that longer steaming distances will have only occurred for a short period of time, it is unlikely that any potential impacts will be significant. Furthermore, the construction of the offshore HVAC booster station(s), if required, will be limited in spatial extent and temporary. Therefore, subject to consultation with commercial fishermen and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 2 | Increased vessel traffic within fishing grounds as a result of changes to shipping routes and construction vessel traffic from the Hornsea Three offshore ECR corridor leading to interference with fishing activity. | As per Impact No. 1, any potential impacts will be temporary. In addition, the number of vessels required during construction of the export cable will be minimal and will not add significantly to the marine traffic already present within the area. As cable laying moves along the export cable, any effects will be temporary, therefore any potential impacts are likely to be not significant in EIA terms. Therefore, subject to consultation with commercial fishermen and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Operation and maintenance*** | | |
| 3 | Physical presence of the Hornsea Three array area infrastructure leading to longer steaming distances to alternative fishing grounds. | Once Hornsea Three has been constructed, fishing activity will be able to return to the array area, ensuring that the physical presence of the array does not affect steaming distances. As a consequence any potential impacts are considered to be not significant in EIA terms. Therefore, subject to consultation with commercial fishermen and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |

| Impact No. | Impact | Justification |
|---|---|---|
| 4 | Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic from the Hornsea Three offshore ECR corridor leading to interference with fishing activity. | Operation and maintenance activity along the Hornsea Three offshore ECR corridor is expected to be significantly lower in frequency and duration than during construction. Any potential impacts are therefore expected to be of similar or lower magnitude, and not significant in EIA terms. The number of vessels required during operation and maintenance activity of the export cable will be minimal and will not add significantly to the marine traffic already present within the area. Any effects will be temporary at any given location and any increase in vessel activity will only be experienced in one location at a time for a limited period. As a result any effect will be temporary and will occur infrequently during the operational lifetime of the offshore wind farm. As a result any impact will be not significant in EIA terms.<br>Therefore, subject to consultation with commercial fishermen and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Decommissioning*** | | |
| 5 | Hornsea Three offshore ECR corridor decommissioning activities leading to longer steaming distances to alternative fishing grounds. | Given cables will be either left in situ or, if decommissioned will be a temporary activity and once decommissioning activity has ceased within any given area, fishing vessels will be able to return to their original fishing grounds so that longer steaming distances will have only occurred for a short period, it is unlikely that any potential impacts will be significant. Furthermore, the decommissioning of the offshore HVAC booster station(s), if required, will be limited in spatial extent and temporary. Therefore, subject to consultation with commercial fishermen and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 6 | Increased vessel traffic within fishing grounds as a result of changes to shipping routes and decommissioning vessel traffic from the Hornsea Three offshore ECR corridor leading to interference with fishing activity. | As per Impact No. 6, any potential impacts are likely to be temporary. In addition, the number of vessels required during decommissioning of the export cable will be minimal and will not add significantly to the marine traffic already present within the area. As cable decommissioning activity moves along the export cable, any effects will be temporary, therefore any potential impacts are likely to be not significant in EIA terms.<br>Therefore, subject to consultation with commercial fishermen and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |

### Measures adopted as part of the project

9.1.18 Measures adopted as part of the project will include:

- Liaison with fishing fleets via an Offshore Fisheries Liaison officer, a Company Fisheries Liaison Office and an Onshore Fishing Industry Representative;
- Advance warning to fishing fleets of construction and decommissioning operations;
- Use of guard vessels during the construction and decommissioning phases;
- Notices to mariners;
- Aids to navigation deployed;
- Development of, and adherence to, a CoCP;
- Permanent navigational marking installed;
- Update of marine charts through UKHO;
- Array and export cables to be buried where possible; and
- Development of, and adherence to, a Decommissioning Plan.

9.1.19 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

### Potential cumulative impacts

9.1.20 There is potential for cumulative effects to occur on the commercial fisheries industry from other projects or activities within the Hornsea Three commercial fisheries regional study area where projects or plans could act collectively with the proposed Hornsea Three to affect commercial fisheries interests.

9.1.21 The CEA will consider the worst case adverse scenarios for each of the projects or activities. The following types of project/activity within the Hornsea Three commercial fisheries regional study area will be considered within the CEA:

- Other offshore wind farms and associated cabling and infrastructure;
- Oil and gas infrastructure/development (cables and pipelines);
- Navigation and shipping; and
- Aggregate extraction and disposal of dredging spoil.

9.1.22 The CEA will consider the same impacts across all three phases of the project as outline above in Table 9.1.

### Potential transboundary impacts

9.1.23 An initial screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that, due to the highly mobile nature of both commercial fish species and fishing fleets, and the proximity of the Hornsea Three array area to Dutch, German and Danish waters, there is the potential for transboundary effects from the proposed development.

## 9.2 Shipping and navigation

### Introduction

9.2.1 This section of the Scoping Report identifies the shipping and navigation receptors of relevance to Hornsea Three and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (up to the MHWS mark) of Hornsea Three on these shipping and navigation receptors.

### Study area

9.2.2 The shipping and navigation study area for Hornsea Three includes all shipping and navigation receptors within an area which has the potential to be affected by Hornsea Three. This includes the offshore development area comprising the Hornsea Three array area and offshore ECR corridor search area, including the offshore HVAC booster station(s). As such, a 10 NM buffer around the offshore components of Hornsea Three has been defined as the shipping and navigational study area in order to provide context to the analysis of risks. The shipping and navigation study area is shown in Figure 9.7 below.

9.2.3 It should be noted that, due to the national and international nature of shipping activities, such as vessel routeing, a wider North Sea perspective has been considered where relevant.

### Baseline data

9.2.4 The baseline datasets available to inform the shipping and navigation EIA are outlined in Table 9.3. Table 9.3 also includes a description of the marine traffic surveys planned to be undertaken to inform the shipping and navigation EIA.

### Baseline environment

#### *Bathymetry*

9.2.5 Water depths typically range from 30 mLAT to 70 mLAT in the Hornsea Three array area and are typically less than 30 mLAT in the Hornsea Three offshore ECR corridor search area. The shallowest water depths are associated with the crests of the Norfolk sandbanks which shallow to approximately 5 mLAT.

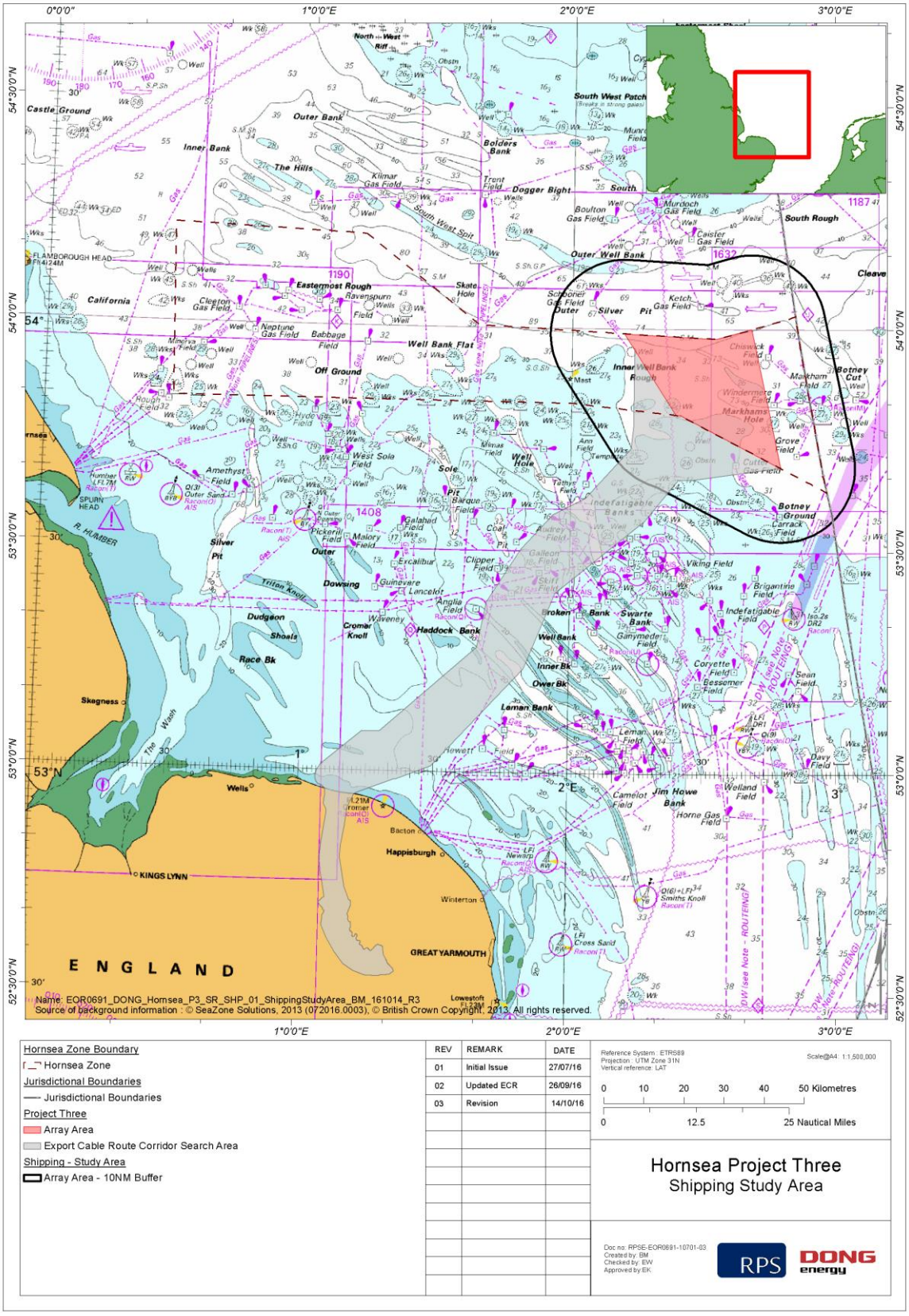



Figure 9.7 Study area for the shipping and navigation Environmental Impact Assessment (EIA).

Table 9.3 Data sources to inform the shipping and navigation Environmental Impact Assessment (EIA).

| Topic | Data Source |
|---|---|
| Marine traffic surveys | An Automatic identification System (AIS), radar and visual marine traffic survey data, with a minimum of two, 14 day periods, for both the Hornsea Three array and offshore HVAC booster station(s) collected within two years of consent submission, which takes account of seasonal and tidal variations, will be undertaken. This survey will meet the requirements of MGN 543.<br>AIS data will also be collated for the ECR.<br>The AIS, radar and visual data shall be analysed to identify the following:<br>• Volume of marine traffic;<br>• Type of marine traffic;<br>• Size (length and draught) of marine traffic;<br>• Identify regular commercial operations including ferry operations;<br>• Characterise commercial fishing vessel activity, including gear type analysis;<br>• Characterise the nature of recreational vessel transits;<br>• Undertake main route identification (based on MCA principles) and undertake assessment of MCA; necessary deviations.<br>• Consideration of baseline and future case traffic volumes; and<br>• Undertake assessment of allision, collision and encounters both for passing traffic, vessels not under command and for internal navigation. |
| Marine hazard workshop | MCA and THLS and local stakeholders representing all the different maritime interests, including ports, fishing, commercial shipping, oil and gas, recreation and emergency services, will be invited to the Hazard Review Workshop, which is a key element of the Navigational Risk Assessment (NRA) and a useful method of identifying risks at a local level. |
| Fishing vessel data | Fisheries VMS satellite data.<br>Fisheries sightings and patrols data. |
| Recreational vessels | Royal Yachting Association (RYA) Cruising Routes and Areas.<br>RYA (2016) UK Atlas of Recreational Boating.<br>RYA (2013) The RYA's Position on Offshore Renewable Energy Developments: Paper 1 (of 3) Wind Energy, November 2013. |
| Other offshore wind farms | TCE Charts Offshore Wind Lease Agreement Areas. |
| Offshore cables | SeaZone Solutions Ltd.<br>Kingfisher Information Service – Cable Awareness. |
| Gas platforms/ pipelines | DECC.<br>UKOilandGasData. |
| Admiralty charts and pilot books | Navigational information (e.g. Aids to Navigation, IMO routeing measures, charted wrecks, etc.). |
| Disposal sites | SeaZone Solution Ltd.<br>Cefas – GIS Shapefile of Disposal Sites. |
| Marine aggregate extraction | TCE Aggregate Licence Area Charts.<br>British Marine Aggregate Producers Association (BMAPA) dredger reports.<br>BMAPA GIS Shapefile of Dredger Routes. |
| MoD training and practise and exercise areas | SeaZone Hydrospatial One dataset. |

### *Navigational features*

9.2.6 Hornsea Three will be situated in the southern North Sea where some of the busiest shipping routes presently operate and safely co-exist alongside a number of notable marine activities, including:

- Oil and gas activities - including a large number of operational gas platforms with pipelines running to and from offshore fields;
- Commercial fishing activities;
- Telecommunications cables and interconnectors;

- A number of offshore wind farms, including Dudgeon, Humber Gateway, Inner Dowsing, Lincs, Lynn, Race Bank, Sheringham Shoal and Westermost Rough;
- Disposal sites; and
- Marine aggregate extraction areas.

9.2.7 The key marine activities within the southern North Sea are presented in Figure 9.8 and Figure 9.9.

### *Commercial vessel analysis*

9.2.8 The main commercial vessel routes identified in the Hornsea Three shipping and navigation study area are shown in Figure 9.9. It should be noted that this data is preliminary and will be further informed by the marine traffic surveys that are being undertaken to inform the NRA (see Table 9.3 for further details).

9.2.9 As shown in Figure 9.9, a number of commercial ferry routes (transiting between UK and mainland European ports) are known to pass through the Hornsea Three shipping and navigation study area.

### *Fishing vessel density*

9.2.10 Fishing occurs within the Hornsea Three shipping and navigation study area, with the waters surrounding Markham's Hole and within the Silver Pit known to be more actively fished than surrounding waters. Fishing vessel density data will be recorded during the Hornsea Three marine traffic surveys (see Table 9.3 for further details). Further detail on commercial fishing activity is provided in Chapter 9, Section 9.1: Commercial Fisheries.

### *Recreational user activity*

9.2.11 Recreational activity is defined for the purpose of the shipping and navigation assessment as sailing and motor craft (including those undertaking dive/fish excursions) of between 2.5 m and 24 m in length. A plot of the recreational activity, based on the latest RYA Cruising Routes (RYA, 2016), is presented in Figure 9.9.

9.2.12 There are no cruising routes, areas or racing areas within the Hornsea Three array area. However it is noted that larger cross continent recreational races can occur in the area and will be identified as part of the NRA process.

9.2.13 There is low to medium recreational vessel activity in the near shore area of the Hornsea Three offshore ECR search area (Figure 9.18). The Hornsea Three offshore ECR corridor search area also crosses a general boating area, which runs parallel to the coast. A number of offshore routes fan out from the coastal area, which are likely to intersect the Hornsea Three offshore ECR search area. Given the proximity to the coast and the shallow waters it is likely that there will be non-AIS recreational activity in the area.

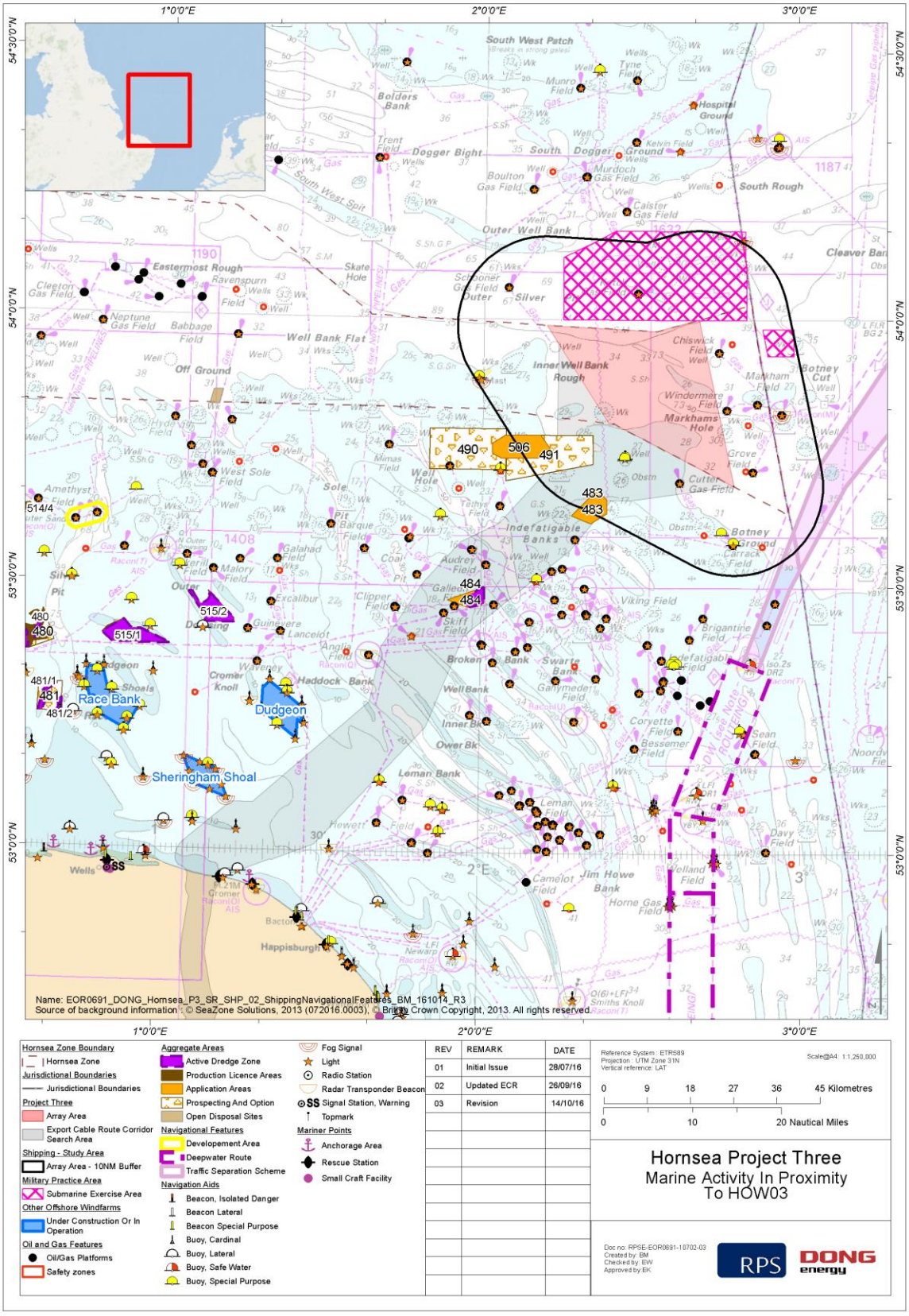



Figure 9.8 Marine activities in the vicinity of the Hornsea Three shipping and navigation study area.

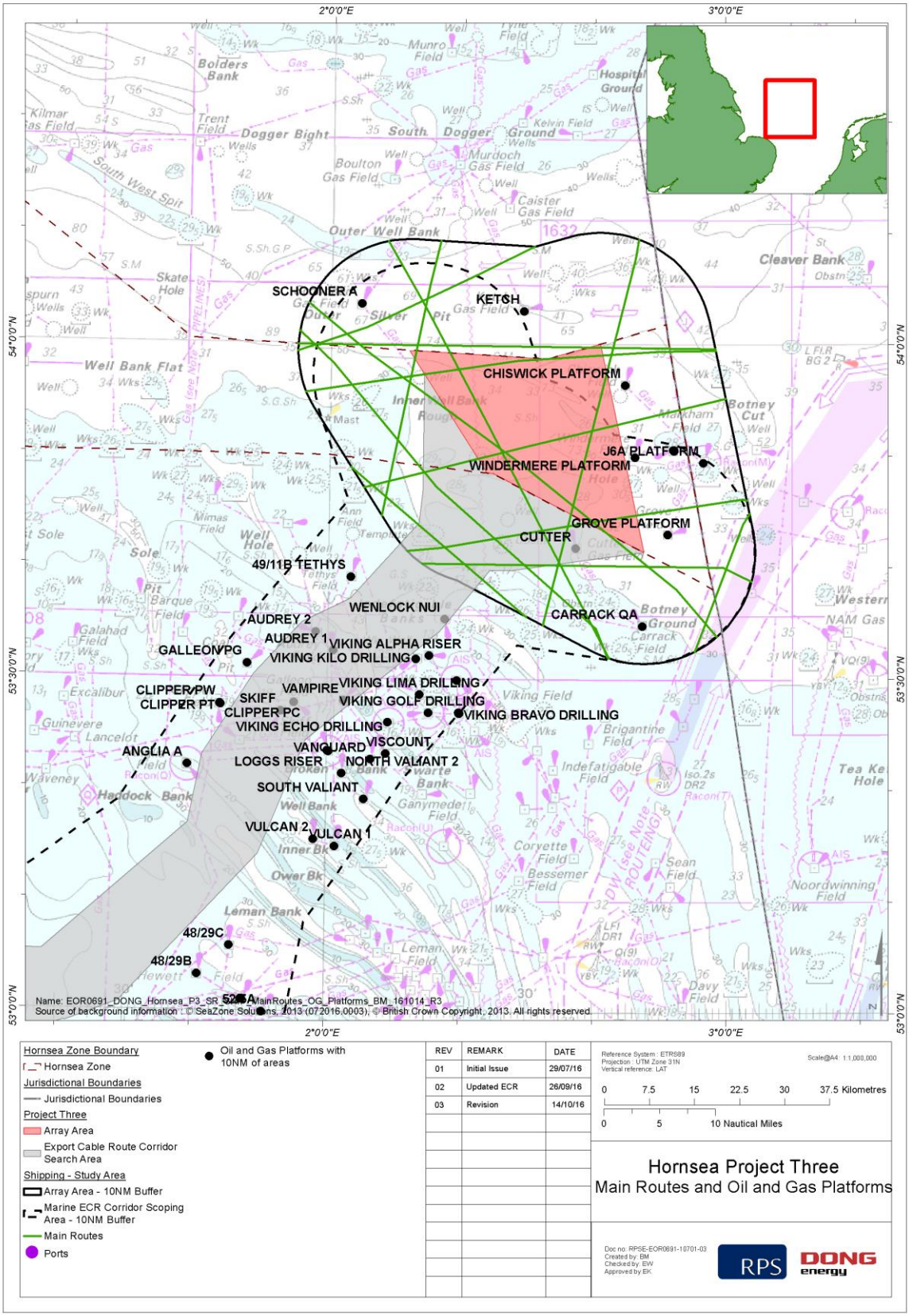



Figure 9.9 Main shipping and recreational sailing routes, and oil and gas platforms in vicinity of the Hornsea Three shipping and navigation study area.

### *Search and Rescue (SAR)*

9.2.14 Search and Rescue (SAR) within the UK is coordinated by the MCA, with other organisations providing declared assets to undertake SAR operations. These different organisations are outlined below.

9.2.15 The MCA provides a coordination service for SAR, counter pollution and salvage. SAR is coordinated through a National Marine Operations Centre at Fareham (operational since September 2014), supported by a network of Coastguard Operation Centres situated throughout the UK. Hornsea Three falls within the area of responsibility of the Humber Coastguard Operation Centres.

9.2.16 SAR helicopters, available to the MCA for use during a SAR incident, are provided by the Bristow Group. The Bristow Group took over service of SAR helicopter provision from April 2015 onwards and currently employs two models of SAR helicopters (Sikorsky S-92 and Agusta Westland AW189). The Humber SAR helicopter base is the closest to Hornsea Three, located approximately 94 NM / 175 km from the northwest corner of the Hornsea Three array area. The Sikorsky S-92, which has a radius of action of 250 NM and a top speed of 140 knots, is currently operated from the Humber SAR helicopter base.

9.2.17 The Royal National Lifeboat Institute provides a 24-hour SAR service maintaining a fleet of over 340 lifeboats, ranging from 3.8 to 17 m in length, from 236 stations positioned around the coast of the UK and Ireland. There are a number of lifeboat stations positioned along the east coast of England that operate a variety of both smaller (open-deck) inshore lifeboats and larger all-weather lifeboats that are capable of high speed and able to safely undertake operations in all weather. Due to the distance offshore it is most likely that only all-weather lifeboats would respond to an incident in the vicinity of Hornsea Three. The closest all-weather lifeboat station is Cromer, located approximately 70 NM/130 km from the southeastern corner of the Hornsea Three array area.

9.2.18 In addition to the organisations previously discussed, other offshore operators (e.g. oil and gas and other renewable energy developments) have resources which could be used to assist with an incident in the vicinity of Hornsea Three. As part of the EIA process, Hornsea Three will undertake further consultation with the MCA in order to inform the assessment of SAR capability in the region.

### *Maritime accidents and incidents*

9.2.19 Data on maritime accidents and incidents will be analysed as part of the NRA for Hornsea Three to inform this assessment.

## Proposed approach to the Environmental Impact Assessment (EIA)

9.2.20 Shipping and navigation is assessed primarily in accordance with guidance provided by the statutory consultees. The MCA require that their methodology is used as a template for undertaking the EIA (see MCA, 2013). This template is centred on risk management and requires a submission that shows that sufficient controls are, or will be, in place in order for the assessed risk (base case and future case) to be judged as broadly acceptable or tolerable.

9.2.21 As such, the EIA for shipping and navigation broadly follows the methodology presented in Chapter 5: Environmental Impact Assessment Methodology, but presents risk within the assessment of magnitude.

9.2.22 The following paragraphs provide an overview of Hornsea Three's proposed approach to assessing risk to navigational receptors and how the outputs of the NRAs will be carried through into the EIA in order to assess the significance of effect.

### *Hazard workshop*

9.2.23 In order to gather expert opinion and local knowledge, a hazard workshop will be undertaken, during which a project and site-specific hazard log will be prepared. The hazard log will be used to identify direct or indirect hazards relating to the development of Hornsea Three, the level of risk associated with the hazards, the controls to be put in place and the tolerability of the residual risks.

9.2.24 The hazard log will also be used to identify standard and additional mitigation measures required to demonstrate that the hazards associated with Hornsea Three are broadly acceptable or tolerable on the basis of As Low As Reasonably Practicable declarations, in line with regulatory requirements. This information is then fed into the Formal Safety Assessment (FSA) process (see paragraph 9.2.25 to 9.2.26 below) to identify impacts associated with the development.

### *Formal safety assessment process*

9.2.25 The IMO FSA process (IMO, 2007; 2002) is the process that shall be applied to the NRA. This is a structured and systematic methodology based on risk. As part of the FSA, the impact of Hornsea Three is considered against the baseline data sets identified.

9.2.26 There are five basic steps within this process:

- Step 1 - Identification of hazards (a list of all relevant accident scenarios with potential causes and outcomes);
- Step 2 - Risk analysis (evaluation of risk factors);
- Step 3 - Risk control options (devising measures to control and reduce the identified risks);
- Step 4 - Cost benefit analysis (determining cost effectiveness of risk control measures); and
- Step 5 - Recommendations for decision-making (information about the hazards, their associated risks and the cost effectiveness of alternative risk control measures).

### *Navigational Risk Assessment*

9.2.27 As noted in Table 9.3, in addition to the existing data, the shipping and navigation EIA will be informed through a Navigational Risk Assessment (NRA) undertaken in accordance with Marine Guidance Note (MGN) 543 Safety of Navigation Offshore Renewable Energy Installations (OREIs) - UK Navigational Practice, Safety and Emergency Response (hereafter referred to as MGN 543) (MCA, 2016). The NRA will be supported by a hazard workshop and marine traffic surveys, both of which will also be conducted in accordance with MGN 543.

### *Environmental Impact Assessment (EIA) methodology*

9.2.28 Following the completion of the FSA and the NRA, the information will be fed into the shipping and navigation EIA.

9.2.29 The main guidance that will be referred to during the completion of the shipping and navigation EIA are listed below:

- MGN 543 (M+F) Safety of Navigation: OREIs - UK Navigational Practice, Safety and Emergency Response (MCA, 2016); and
- Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms (MCA, 2013).

9.2.30 MGN 543 (MCA, 2016) highlights issues that shall be taken into consideration when assessing the impact on navigational safety from offshore renewable energy developments, proposed within UK internal waters, territorial sea or Renewable Energy Zones. This guidance also provides the template for preparing NRAs. The MCA methodology is centred on risk management and requires the submission of the NRA that shows that sufficient controls are, or will be, in place for the assessed risk (base case and future case) for it to be judged as broadly acceptable or tolerable.

9.2.31 Other guidance that will be referred to during the completion of the shipping and navigation EIA are listed below:

- Marine Guidance Notice 372, OREIs: Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2008);
- Recommendation O-139 On the Marking of Man-Made Offshore Structures (IALA, 2013);
- Guidelines for FSA for use in the IMO rule-making process (IMO, 2007);
- UK Coastal Atlas of Recreational Boating; plus GIS Shapefiles (RYA, 2016); and
- Admiralty Sailing Directions – North Sea (West) Pilot (UKHO, 2009).

### Potential project impacts

9.2.32 A range of potential impacts on shipping and navigation have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Hornsea Three. Other potential impacts may be identified following the results of the scoping exercise and the marine traffic surveys. The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 9.4, together with a description of any additional data collection and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

9.2.33 On the basis of the baseline information currently available and the project description outlined in Chapter 3: Project Description, no impacts are proposed to be scoped out of the assessment for shipping and navigation.

Table 9.4 Preliminary list of Impacts proposed to be scoped into the Hornsea Three assessment for shipping and navigation.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for undertaking Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Increased vessel to vessel collision risk. | Construction activities within Hornsea Three array area, including construction vessels and safety zones, may displace operators' own vessels, commercial vessels, commercial fishing vessels (in transit) and recreational vessels, leading to an increase in collision risk. Shipping routes are known to transit through and within the site and the presence of construction activities will increase the risk of collision. | AIS and radar marine traffic surveys will be undertaken to inform the NRA. The NRA will be used to inform the assessment. | Collision modelling using Anatec's COLLRISK model to assess change in risk due to Hornsea Three. |
| 2 | Increased allision risk to vessels not under command including commercial vessels, recreational users and commercial fishing vessels in an emergency situation (including machinery related problems or navigational system errors). | Physical presence of partially constructed wind farm infrastructure in previously open sea areas within the Hornsea Three array area will increase the risk of allision. | As above for shipping and navigation impact no. 1. | Allision risk will be calculated using Anatec's COLLRISK model. |
| 3 | Additional allision risk for commercial vessels, recreational craft and commercial fishing vessels. | Physical presence of partially constructed wind farm infrastructure within Hornsea Three array, within previously open sea areas, will increase the risk of allision. | As above for shipping and navigation impact no. 1. | As above for shipping and navigation impact no. 2. |
| 4 | Increased risk of anchor snagging for commercial vessels and commercial fishing vessels (in transit). | Physical presence of partially installed cables (which may be exposed or partially buried) will present risk to commercial vessels and commercial fishing vessels (in transit). | The NRA will be used to inform the assessment. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for undertaking Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 5 | Diminished emergency response capability (including SAR) within the southern North Sea during construction. | Given the distance offshore and the limited response capability there will be impacts to onsite emergency response capability with potential for self-help capability required as a result of construction activities associated with Hornsea Three. | As above for shipping and navigation impact no. 4. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 6 | Diminished pollution and salvage response capability for emergency responders. | Given the distance offshore and the limited response capability there will be impact to on site pollution response capability with potential for self-help capability required as a result of construction activities associated with Hornsea Three. | As above for shipping and navigation impact no. 4. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 7 | Increased allision risk for all sea users transiting the offshore ECR corridor. | The presence of infrastructure within the Hornsea Three offshore ECR search area, in previously open sea areas will increase the risk of allision. | As above for shipping and navigation impact no. 1. | As above for shipping and navigation impact no. 2. |
| ***Operation and maintenance*** | | | | |
| 8 | Deviations to commercial routes. | Physical presence of wind farm infrastructure within the Hornsea Three array area may require deviations to shipping routes and result in increased transit times for some routes. | As above for shipping and navigation impact no. 1. | As above for shipping and navigation impact no. 1. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for undertaking Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 9 | Increased vessel to vessel collision risk. | Physical presence of wind farm infrastructure within the Hornsea Three array area may displace operators' own vessels, commercial shipping, fishing vessels and recreational vessels leading to increased collision risk for vessels that currently transit within and in proximity to the site. | As above for shipping and navigation impact no. 1. | As above for shipping and navigation impact no. 1. |
| 10 | Increased allision risk to vessels not under command including commercial vessels, recreational users and commercial fishing vessels in an emergency situation (including machinery related problems or navigational system errors). | Physical presence of wind farm infrastructure within the Hornsea Three array area, and previously open sea areas, may increase the risk of allision. | As above for shipping and navigation impact no. 1. | As above for shipping and navigation impact no. 2. |
| 11 | Increased vessel to structure allision risk for commercial vessels, recreational users and commercial fishing vessels. | Physical presence of wind farm infrastructure within the Hornsea Three array area, and previously open sea areas, may increase the risk of allision. | As above for shipping and navigation impact no. 1. | As above for shipping and navigation impact no. 2. |
| 12 | Increased vessel to oil and gas platform allision risk. | Physical presence of wind farm infrastructure within the Hornsea Three array area, and previously open sea areas, may displace commercial shipping, fishing vessels and recreational vessels leading to an increased risk of allision including third party gas platforms. | As above for shipping and navigation impact no. 1. | As above for shipping and navigation impact no. 2. |
| 13 | Anchor snagging risk for commercial vessels and commercial fishing vessels (in transit). | Presence of new cables will present risk to vessels anchoring. | As above for shipping and navigation impact no. 4. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 14 | Reduction in navigable water depth for commercial vessels, fishing and recreational vessels. | Presence of new cable /scour protection may reduce navigable water depths and present a risk to commercial vessels, fishing and recreational vessels. | As above for shipping and navigation impact no. 4. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for undertaking Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 15 | Diminished emergency response capability (including SAR) for all sea users. | Given the distance offshore and the limited response capability there will be impacts to onsite emergency response capability with potential for self-help capability required as a result of the operation of Hornsea Three. | As above for shipping and navigation impact no. 4. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 16 | Diminished pollution and salvage response for emergency responders and sea users. | Given the distance offshore and the limited response capability there will be impact to on site pollution response capability with potential for self-help capability required as a result of the operation of Hornsea Three. | As above for shipping and navigation impact no. 4. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 17 | Increased allision risk for all sea users transiting the offshore ECR corridor. | Physical presence of the potential offshore HVAC booster station(s), within previously open sea areas will increase the risk of allision. | As above for shipping and navigation impact no. 1. | As above for shipping and navigation impact no. 2. |
| 18 | Electromagnetic interference for vessels using magnetic compasses. | Dependent on small craft traffic within the near shore area there may be interference with the use of magnetic compasses associated with EMF arising from the presence of DC export cable. | As above for shipping and navigation impact no. 4. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| ***Decommissioning*** | | | | |
| 19 | Increase in vessel to vessel collision risk. | Shipping routes are known to transit through and within the site and the presence of decommissioning vessels and safety zones will increase the risk of collision. | As per shipping and navigation impact no. 1. | As per shipping and navigation impact no. 1. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for undertaking Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 20 | Increased allision risk to vessels not under command including commercial vessels, recreational users and commercial fishing vessels in an emergency situation (including machinery related problems or navigational system errors). | The presence of partially decommissioned wind farm infrastructure within the Hornsea Three array area will increase the risk of allision. | As above for shipping and navigation impact no. 1. | As above for shipping and navigation impact no. 2. |
| 21 | Increased allision risk for commercial vessels, recreational craft and commercial fishing vessels. | The presence of partially decommissioned infrastructure within the Hornsea Three array area will increase the risk of allision. | As above for shipping and navigation impact no. 1. | As above for shipping and navigation impact no. 2. |
| 22 | Increased risk of anchor snagging for commercial vessels and commercial fishing vessels (in transit). | Physical presence of partially removed cables (array and export cables) which may be exposed or partially buried could present risk to commercial vessels and commercial fishing vessels (in transit). | As above for shipping and navigation impact no. 4. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 23 | Diminished emergency response capability (including SAR) within the southern North Sea during decommissioning. | Given the distance offshore and the limited response capability there will be impacts to onsite emergency response capability with potential for self-help capability required as a result of the decommissioning of Hornsea Three. | As above for shipping and navigation impact no. 4. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 24 | Diminished pollution and salvage response capability for emergency responders. | Given the distance offshore and the limited response capability there will be impact to on site pollution response capability with potential for self-help capability required as a result of the decommissioning of Hornsea Three. | As above for shipping and navigation impact no. 4. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for undertaking Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 25 | Increased allision risk for all sea users in southern North Sea. | The presence of partially decommissioned infrastructure within open sea areas will increase the risk of allision as a result of the decommissioning of the offshore HVAC booster substations in the Hornsea Three offshore ECR corridor. | As above for shipping and navigation impact no. 1. | As above for shipping and navigation impact no. 2. |

### Measures adopted as part of the project

9.2.34 Measures adopted as part of the project will include:

- Use of advisory safety distances and safety zones;
- Adherence to the International Association of Marine Aids to Navigation and Lighthouse Authorities guidance and use of aids to navigation;
- Establishment of a marine communication centre, and promulgation of information using Notice to Mariners, Admiralty Charts and fishermen's awareness charts;
- Development of, and adherence to, an Emergency Response and Cooperation Plan (ERCoP) and provision of self-help capabilities; and
- Development of, and adherence to, a Marine Pollution Contingency Plan.

9.2.35 The requirement and feasibility of additional measures will be dependent on the significance of the effects on shipping and navigation and will be consulted upon with statutory consultees throughout the EIA process.

### Potential cumulative impacts

9.2.36 There is the potential for cumulative effects to occur from other projects or activities within the southern North Sea area where projects or activities could act collectively with Hornsea Three to affect shipping and navigation receptors.

9.2.37 The cumulative assessment will consider the worst case adverse scenarios for each of the projects or activities. The following projects or activities will be considered within the shipping and navigation study area:

- Other offshore wind farms and the creation of a proposed corridor (see paragraph 9.2.38 below);
- Any new oil and gas infrastructure or activity areas;
- Any new or proposed pipelines and cables, carbon capture and storage (CCS), natural gas storage and Underground Coal Gasification (UCG), disposal sites; and
- Any new or changes to aggregate extraction area.

9.2.38 The cumulative assessment will include the introduction of a corridor which is proposed to separate Hornsea Three from Project One and Project Two. The corridor will be developed in consultation with the MCA and other key stakeholders, and will consider guidance contained within MGN 543 (MCA, 2016).

9.2.39 The cumulative assessment will consider the same impacts across all phases of the project, as outlined in Table 9.4 for the Hornsea Three alone assessment.

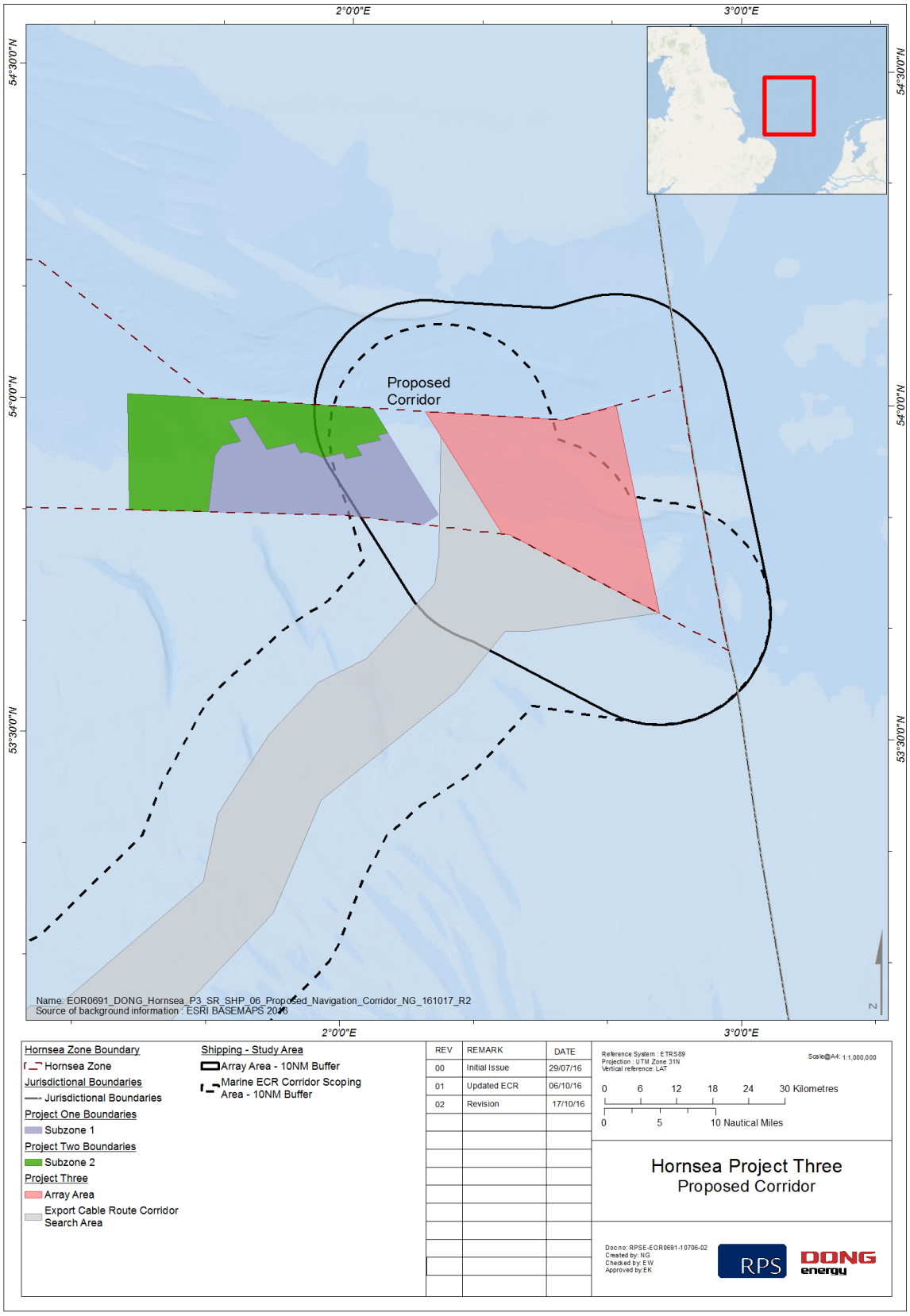



Figure 9.10 The proposed corridor between Hornsea Three and the other former Hornsea Zone wind farm developments; Project One and Project Two.

### Potential transboundary impacts

9.2.40 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there was the potential for transboundary effects with regard to the following shipping and navigation receptors:

- The shipping and navigation EIA will assess the potential impact of Hornsea Three on shipping routes which transit to/from other EEA countries; and
- Transboundary issues could also arise from impacts upon international ports, other international shipping routes and/or routes affected by other international offshore renewable energy developments.

## 9.3 Aviation, military and communications

### Introduction

9.3.1 This section of the Scoping Report identifies the aviation, military and communications receptors of relevance to Hornsea Three and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (up to MHWS) of Hornsea Three on aviation, military and communications receptors.

### Study area

9.3.2 The aviation, military and communications study area for Hornsea Three includes all aviation, military and communications receptors within an area which has the potential to be affected by Hornsea Three. This includes the offshore development area comprising the Hornsea Three array area and the offshore ECR corridor search area and the following specific receptors:

- Radars on the east coast of England that could potentially detect the wind turbines within the Hornsea Three array area;
- Offshore platforms where their 9 NM consultation zone overlaps with the Hornsea Three array area;
- HMRs from Norwich airport;
- Microwave links within the vicinity of Hornsea Three; and
- Low flying areas and military practice areas that intersect or are adjacent to the Hornsea Three offshore development area.

### Baseline data

9.3.3 The baseline datasets available for aviation, military and communications are listed in Table 9.5. This includes consideration of international data sources due to the proximity of Hornsea Three to the international boundary. In addition to existing data, the assessment will be informed through desk studies and computer modelling carried out by Osprey aviation consultants, including radar line of sight analysis. Other supporting data will be obtained from stakeholder consultation.

### Baseline environment

#### *Airspace*

9.3.4 The airspace in the vicinity of Hornsea Three, including low flying areas and military practice areas, is shown in Figure 9.11. Hornsea Three is situated in an area of Class G uncontrolled airspace, which is established from the surface up to Flight Level (FL) 195 (approximately 19,500 ft.). Class C controlled airspace is established above FL 195.

Table 9.5 Data sources for aviation, military and communications.

| Topic | Data source (UK) | Data source (Holland) |
|---|---|---|
| Airports and Aerodromes | VFR Chart/OS OPEN DATA | VFR Chart |
| Low Flying Areas | Consultation with MoD | No data sources as Hornsea Three is located within UK waters. |
| Military Practice Areas | SeaZone Hydrospatial Data | No data sources as Hornsea Three is located within UK waters. |
| HMRs | Consultation with the Civil Aviation Authority (CAA) | Consultation |
| Offshore platforms | UKOilandGasData | NL Oil and Gas Portal |
| Meteorological radar sites | Met Office | No data sources as Hornsea Three is located within UK waters. |
| NERL radar | Consultation with NATS | No data sources as Hornsea Three is located within UK waters. |
| RAF sites | VFR Chart/OS OPEN DATA | No data sources as Hornsea Three is located within UK waters. |
| Military Air Traffic Control (ATC) radar | VFR Chart/OS OPEN DATA | No data sources as Hornsea Three is located within UK waters. |
| Microwave links | Ofcom/Consultation with Oil and Gas Operators | Consultation |
| International radar sites | No data sources as Hornsea Three is located within UK waters. | Consultation |

9.3.5 The Class G uncontrolled airspace below FL 195 is sub-divided into areas with the following aviation stakeholder responsibility:

- Anglia Radar: based at Aberdeen Airport and employing NATS Primary Surveillance Radars (PSRs), has its area of responsibility established for the provision of ATC services to commercial helicopter operations that support the offshore Oil and Gas industry, from the surface up to FL 65 (approximately 6,500 ft.); and
- MoD Air Surveillance and Control Systems: uses its ADR resources in support of operational flights within UK airspace and for training exercises. Within a Military Danger Area, air combat training, high energy manoeuvres and supersonic flight can be expected. The Southern Military Danger Area (EGD323C) is located above the Hornsea Three array area and, when active, operates from FL 50 up to FL 660.

9.3.6 When the Southern Military Danger Area is in use, Anglia Radar will restrict offshore helicopter operations to FL 40 and below. When the Southern Military Danger Area is not in use, this airspace reverts to Class G uncontrolled airspace.

9.3.7 The UK Low Flying System, used for Military Low Flying activity, covers the open airspace over the entire UK land mass and surrounding sea areas generally out to 2 NM from the coastline, from the surface to 2,000 ft. above MSL. Infrastructure within the Hornsea Three array area will not therefore affect routine Military Low Flying activity.

9.3.8 A Military Practice Area lies in the location of the Outer Silver Pit area, immediately north of the Hornsea Three array area and shall be considered within the EIA.

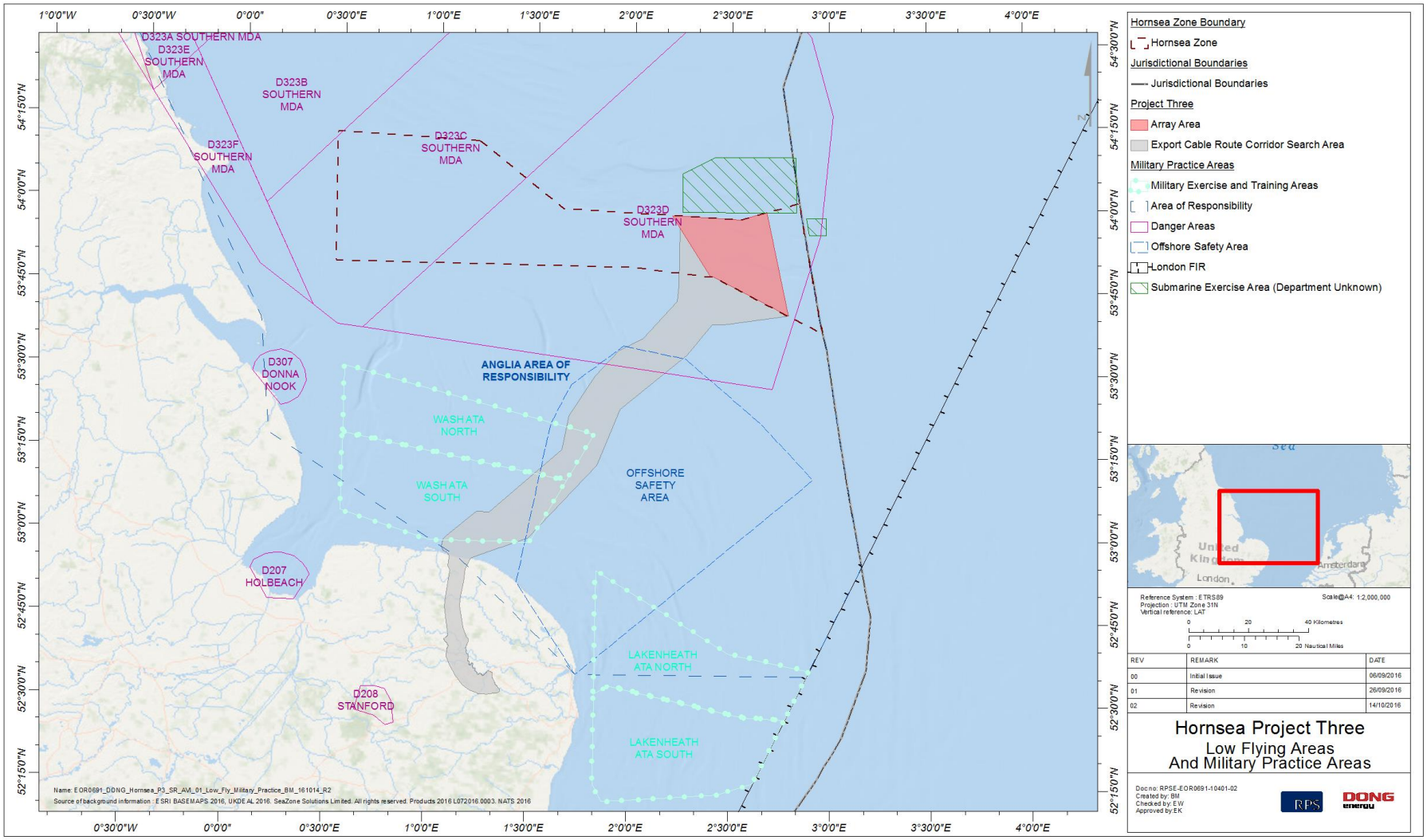



Figure 9.11 Low flying areas and military practice areas in the vicinity of Hornsea Three (UK data only).

### *Civil aviation*

9.3.9 A network of HMRs is established to support the transport of personnel and equipment to offshore oil and gas installations. Such routes have no separate airspace classification (i.e. they remain Class G, uncontrolled airspace), but they provide a network of offshore routes that may be used by civilian helicopters. The purpose of an HMR as detailed in CAP 764 (CAA, 2016), is to effectively provide an obstacle free zone for safe flight when Visual Flight Rules (the rules governing flight conducted visually (i.e. with the crew maintaining separation from obstacles and other aircraft visually) cannot be used. HMRs have no defined lateral dimensions (only route centre-lines are charted), although the guidance states that 2 NM either side of the route centre-line should be kept obstacle free (CAA, 2016). One HMR (HMR 2) cross the Hornsea Three array area, and is used predominantly for transit from the heliport at Norwich International Airport to the oil and gas platforms to the north of the Hornsea Three array area. The HMR system is shown in Figure 9.12.

9.3.10 In order to help achieve a safe operating environment, a consultation zone of 9 NM radius exists around offshore installations serviced by helicopters (CAA, 2016). This consultation zone is not considered a prohibition on development, but a trigger for consultation between offshore helicopter operators, the operators of existing installations and developers of proposed offshore wind farms, in order to determine a solution that maintains safe offshore helicopter operations. The Hornsea Three array area extends into the 9 NM consultation zones established around nine platforms. These platforms are also listed in Table 9.6, along with information on the platform operator and distance from the Hornsea Three array area.

9.3.11 Temporary facilities, such as mobile drilling rigs or vessels which have a helideck, may also be affected by the physical presence of infrastructure within the Hornsea Three array area. All active subsurface infrastructure and wells may at some time require access from a rig or vessel with a helideck. A 9 NM consultation zone should again be a trigger for consultation, with the operators of subsea infrastructure and wells requiring helicopter access (CAA, 2016). Subsea infrastructure and wells are shown in Table 9.7. Those wells which are directly under an existing platform are not included. Further consultation will advise the access requirements to this subsea infrastructure.

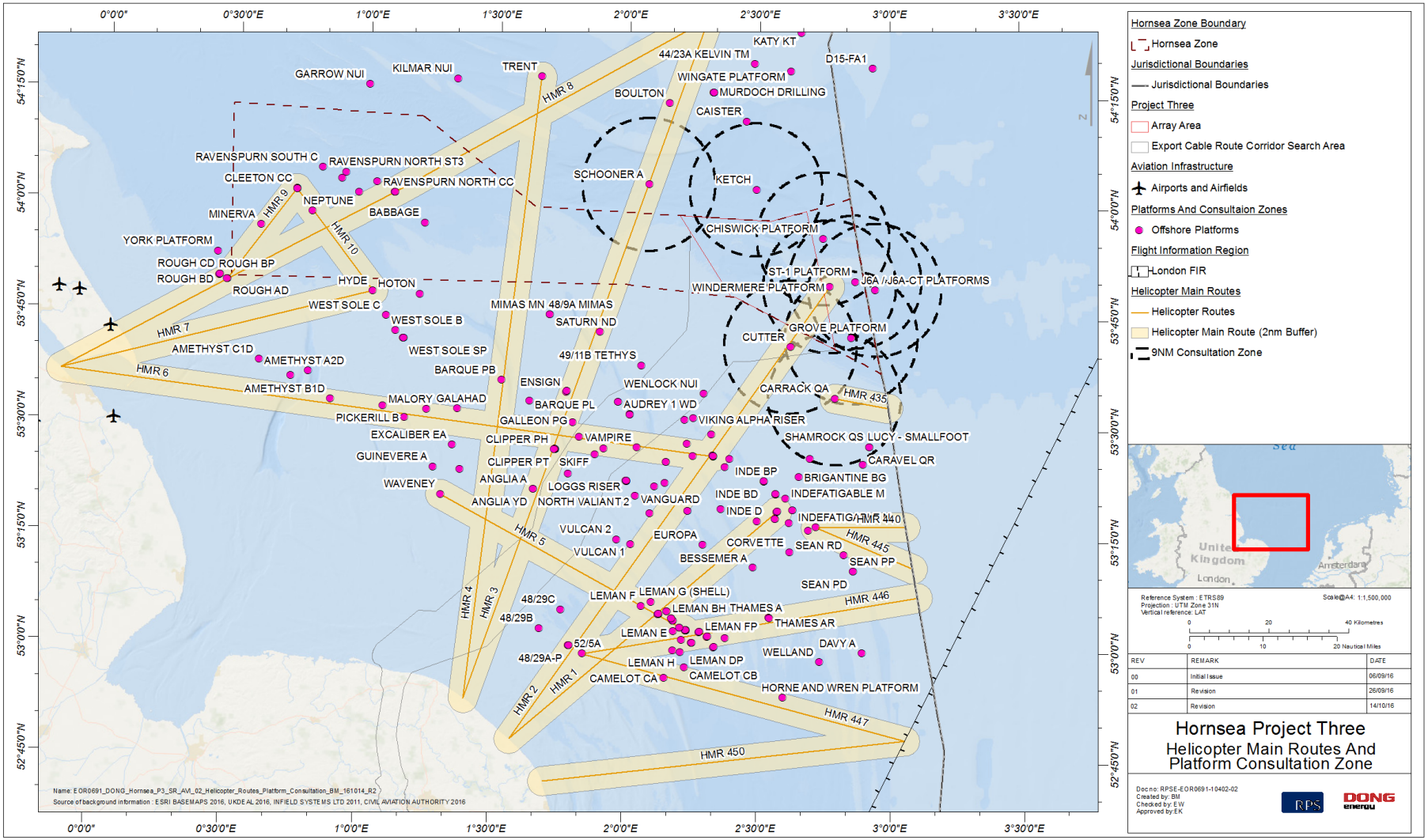



Figure 9.12 Provisional information on Helicopter Main Routes (HMRs) and platform consultation zones in the vicinity of Hornsea Three (UK data only).

Table 9.6 Platforms with 9 NM consultation zones which overlap with Hornsea Three array area.

| Platform | Operator | Distance to Hornsea Three array area | |
|---|---|---|---|
| | | NM | km |
| Schooner A | Faroe Petroleum | 5.98 | 11.07 |
| Ketch | Faroe Petroleum | 4.14 | 7.67 |
| Chiswick | Centrica | 1.45 | 2.69 |
| ST-1 | Centrica | 4.48 | 8.29 |
| J6A/J6A-CT | Centrica | 6.90 | 12.77 |
| Grove | Centrica | 2.43 | 4.50 |
| Windermere | INEOS | 0.98 | 1.82 |
| Cutter* | Shell | 2.52 | 4.67 |
| Carrack QA | Shell | 6.65 | 12.31 |

* Note - The Cutter platform has no helideck however it has been included as it will require helicopter access during decommissioning.

Table 9.7 Active subsea infrastructure within 9 NM of Hornsea Three array area (not accessed from an existing gas platform).

| Name | Subsea structure | Field | Status | Operator |
|---|---|---|---|---|
| North West Schooner Subsea | Well head (well: 44/26a-7) | Schooner | Active | Faroe Petroleum |
| 44/28a-6 | Well | No information | Suspended | Centrica |
| 44/29-1A | Well | No information | No information | GDF Suez |
| Well head Topaz | Well head (well: 49/02a-6z) | Topaz | Active | INEOS |
| 49/08b-3 | Well | No information | Suspended | Centrica |
| Kew subsea wellhead | Well head (wells: 49/04c/7z and 49/04c-7Z) | Kew | Active | Centrica |
| Stamford | Well head (Well: 49/10c-7) | Stamford | Active | Centrica |
| Grove west | Wellhead (well: 49/10a-6Y) and Choke Valve | Grove | Active | Centrica |
| 49/10a-9 | Well | Grove | Suspended | Centrica |
| Carrack West wellhead | Wellhead (well: 49/14b-7) | Carrack | Active | Shell |
| Carrack east wellhead | Wellhead (well: 49/15a-3) | Carrack | Active | Shell |

### *Civil and military radar*

9.3.12 Civil airspace and air traffic surveillance and management infrastructure is comprised of the following systems which may be affected by wind farms:

- PSR;
- Secondary Surveillance Radar; and
- Aeronautical Navigation Aids.

9.3.13 NATS use PSRs based in North Lincolnshire (Claxby) and Norfolk (Cromer) to support their provision of ATC services to aircraft operating between the UK and mainland Europe, and to those overflying the UK Flight Information Region in the region of Hornsea Three. Anglia Radar also employs NATS radar to support their provision of services to aircraft associated with the oil and gas industry within the lateral confines of their area of responsibility over the southern North Sea.

9.3.14 The Hornsea Three array area is located within the operational range of the NATS Claxby PSR (200 NM). The Hornsea Three array area is also within the operational range of the MoD's Air Surveillance and Control Systems ADR located at Staxton Wold and Trimingham (which have a range of over 400 km).

9.3.15 A wide range of systems, including aids such as Instrument Landing Systems (ILS), VHF Omni-Directional Radio-Range/Distance-Measuring Equipment and Direction Finders, together with air-ground communications facilities, could potentially be affected by offshore wind farm developments. The CAA are working with NATS and others to test a variety of civil VHF aircraft radios and a smaller number of military UHF airborne radios against a simulated wind farm signature waveform. Until further information is available, the CAA advises that "*issues concerning wind turbines and VHF communications should be dealt with on a case-by-case basis and reference made to the guidance contained in Section GEN-01 of CAP 670*" (CAA, 2016).

9.3.16 Military air traffic management is supported by military ATC radars with an instrumented range of 60 NM. Military air traffic management is also supported by military landing aid precision approach radar at certain airfields. These have a much shorter instrumented range and are only safeguarded out to 20 NM in certain directions. Wind turbines in Hornsea Three (at a distance of 65 NM at the closest point to land) would not be detectable by Military ATC Radars or military landing aids and therefore it is proposed that impacts on these receptors are scoped out of the assessment (see Table 9.9).

9.3.17 The Meteorological (Met) Office radar infrastructure is safeguarded by the MoD. The Met Office works to wind turbine safeguarding guidelines that stipulate a 20 km separation between any development and a weather radar system. There are no weather radar stations within 20 km of Hornsea Three and therefore it is proposed that impacts on these receptors are scoped out of the assessment.

### *Search and rescue (SAR) operations*

9.3.18 When on an operational mission, SAR aircraft are not constrained by the normal rules of the air, and operate in accordance with their Aircraft Operator Certificate. This allows them total flexibility to manoeuvre using the pilot's best judgement. As such helicopters involved in SAR will be affected in a different manner to helicopters flown for commercial operations. The MCA has provided guidance to mitigate SAR risks from OREIs (CAA, 2016).

### *Communications*

9.3.19 Military and civil aviation rely on communication, navigation and surveillance infrastructure to support airspace and air traffic management. Military communication, navigation and surveillance have a crucial role in providing air defence surveillance and control for UK and the North Atlantic Treaty Organization.

9.3.20 Subsea telecommunication cables are discussed in Chapter 9, Section 9.6: Infrastructure and Other Users. Radar interference associated with shipping and vessel navigation is discussed in Chapter 9, Section 9.2: Shipping and Navigation.

9.3.21 Maritime communications devices within the scope of the assessment include cellular telephones, satellite communications, VHF radio, television and offshore microwave fixed links.

9.3.22 Cellular telephone service providers do not provide coverage for users located in the vicinity of Hornsea Three array area, which means there will be no interference to these services, therefore it is proposed that potential impacts on these receptors are scoped out of the assessment (see Table 9.9).

9.3.23 Satellite communications users include surface vessels or rigs/platforms. The Ofcom Tall Structures guidance document indicates that the principal impact of new structures, such as wind turbines, upon satellite television is potential blocking between the receiver and the satellite (Ofcom, 2009). Satellite signals are however generally received from a high elevation, meaning that disruption to satellite reception is usually limited only to cases where a receiver is very close to a tall structure (for example a ship passing a turbine).

9.3.24 Trials undertaken for the North Hoyle offshore wind farm tested Global Positioning System performance in the vicinity of the North Hoyle wind turbines, and found there to be no significant impact (MCA and QinetiQ Ltd, 2004).

9.3.25 VHF radio is used by large commercial container ships, offshore service vessels, fishing vessels and pleasure craft in the marine band (approx. 156 to 174 MHz) for ship to ship, ship to platform and ship to shore voice communication. The North Hoyle trials (MCA and QinetiQ Ltd, 2004) indicated that wind turbines had no noticeable effects upon any voice communications system, vessel to vessel or vessel to shore station. These included ship borne, shore based and hand held VHF transceivers and mobile telephones. Digital Selective Calling was also satisfactorily tested. The VHF Direction Finding equipment carried in the lifeboats did not function correctly when very close to wind turbines (within about 50 m).

9.3.26 Microwave links operate on a 'line of sight' basis and as such the known links will not be obscured by any Hornsea Three infrastructure. Further consultation will be required to identify any additional microwave links in the vicinity, including a search by Ofcom.

### Proposed approach to the Environmental Impact Assessment (EIA)

9.3.27 The aviation, military and communications EIA will follow the methodology set out in Chapter 5: Environmental Impact Assessment Methodology. Specific to the aviation, military and communications EIA, the following guidance documents will also be considered:

- CAP 393 Air Navigation: The Order and the Regulations (CAA, 2015);
- CAP 437 Standards for Offshore Helicopter Landing Areas, Seventh Edition (CAA, 2013);
- CAP 764: CAA Policy and Guidelines on Wind Turbines, Sixth Edition (CAA, 2016);
- CAP 670: Air Traffic Services Safety Requirements, Third Edition (CAA, 2014);
- OREIs - Guidance on UK Navigational Practice, Safety and Emergency Response, MGN 543 (M+F) (MCA, 2016);
- OREIs: Guidance to Mariners Operating in the Vicinity of UK OREIs, MGN 372 (M+F) (MCA, 2008);
- The effects of offshore wind farms on marine radar, navigation and communication systems, MNA 53/10/366 (MCA and QinetiQ, 2004);
- Offshore Renewable Energy Installations, ERCoP for Construction and Operations Phase, and Requirements for Emergency Response and SAR Helicopter Operations, (Last Updated 4 November 2014) (MCA, 2014);
- Clarification on NATS role in the safeguarding of the ATC infrastructure (Letter dated 13 August 2012) (NATS, 2012);
- Wind Farm Coordination Policy (Ofcom, 2016); and
- Ofcom guidance on tall structures and their impact on broadcast and other wireless services (Ofcom, 2009).

### Potential project impacts

9.3.28 A range of potential impacts on aviation, military and communications receptors have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Hornsea Three. The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 9.8, together with a description of any additional data collection and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

9.3.29 On the basis of the baseline Aviation, Military and Communications information currently available and the project description outlined in Chapter 3: Project Description, a number of impacts are proposed to be scoped out of the assessment for Aviation, Military and Communications. These impacts are outlined, together with a justification for scoping them out, in Table 9.9.

Table 9.8 Impacts proposed to be scoped into the Hornsea Three assessment for aviation, military and communications.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Interference with operations within the Military Practice areas located in the Outer Silver Pit area. | There is potential for temporary interference with operations within the Military Practice Area located in the Outer Silver Pit area, due to the requirement for construction related safety zones around infrastructure within the Hornsea Three array area and due to associated vessel movements. | SeaZone Hydrospatial Data has been used to identify the boundary of the Military Practice Area. Consultation shall be undertaken with the MoD to ascertain the range, frequency and timing of operations within the Military Practice Area located in the Outer Silver Pit area. This consultation shall be used to inform the assessment. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 2 | Disruption to HMR 2. | The physical presence of wind turbines within the Hornsea Three array area will form a physical aerial obstruction to helicopters using the HMR 2. | Consultation shall be required with the CAA to ascertain any amendments to the HMR structure. Further consultation will be required with the helicopter operators who use the affected HMR structure. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 3 | Increased helicopter traffic to and from Hornsea Three. | Hornsea Three may require helicopter operations during the construction phase which may affect the available airspace for other users. | Consultation will be required with the UK east coast aerodromes, NATS and the helicopter operators to provide a baseline of current helicopter density, and frequency of movement in the Hornsea Three vicinity. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| ***Operation and maintenance*** | | | | |
| 4 | Disruption to HMR 2. | The physical presence of wind turbines within the Hornsea Three array area will form a physical aerial obstruction to helicopters using the HMR 2. | As above for aviation, military and communications impact no. 2. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 5 | Disruption to cross-zone transit helicopter traffic. | The physical presence of wind turbines to a maximum blade tip height of 325 m will form an aerial obstruction to cross-zone helicopter transit below 2,500 ft. | Consultation will be required with the CAA with regard to helicopter height restrictions. Consultation will be required with the helicopter operators who presently transit the Hornsea Three array area. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 6 | Increased helicopter traffic to and from Hornsea Three. | Hornsea Three will require helicopter operations during the operational phase which may affect the available airspace for other users including oil and gas operators. | As above for Aviation, Military and Communications impact 3.<br>Oil and gas activity in the region has been identified by UKOilandGasData. Further consultation will be required with the operators of licences and/or operators of infrastructure which overlaps, is adjacent to, or requires transit over, Hornsea Three array area. This includes Tullow, Centrica, INEOS, and Total. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 7 | Helicopter hoist operations. | The physical presence of project hoist operations above wind turbines may form an aerial obstruction to cross-zone helicopter transit below 2,500ft. | As above for aviation, military and communications impact no. 5. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 8 | Physical obstruction and disruption to helicopter access to the Schooner A and Ketch platforms (Faroe Petroleum), Chiswick, ST-1, J6A/J6A-CT and Grove platforms (Centrica), Windermere platform (INEOS) and Cutter and Carrack QA platforms (Shell). | The Hornsea Three array area overlaps with the 9 NM consultation zones of the Schooner A, Ketch, Chiswick, ST-1, J6A/J6A-CT, Grove, Windermere, Cutter and Carrack QA platforms. The presence of wind farm infrastructure in helicopter operational airspace will form a physical obstruction and may disrupt helicopter operations. | The platform locations have been informed by UKOilandGasData. Further consultation will be required with the operator of the platforms (Faroe Petroleum, Centrica, INEOS and Shell) and the helicopter service provider to the platforms to understand the helicopter access requirements. A desk study shall then be undertaken by Osprey to inform the assessment. | A desk study shall be undertaken by Osprey to inform the assessment. |
| 9 | Impacts on helicopter emergency evacuation procedures for the Schooner A, Ketch, Chiswick, ST-1, J6A/J6A-CT, Grove, Windermere, Cutter and Carrack QA platforms. | The Hornsea Three array area overlaps with the 9 NM consultation zones of the Schooner A, Ketch, Chiswick, ST-1, J6A/J6A-CT, Grove, Windermere, Cutter and Carrack QA platforms. Wind turbines may obstruct instrument approach and missed approach procedures to these platforms and may impact on platform safety cases. | The platform locations have been informed by UKOilandGasData. Further consultation will be required with the operators of the platforms (Faroe Petroleum, Centrica, INEOS and Shell UK) and the helicopter service provider to the platforms to understand the safety case requirements. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 10 | Temporary disruption to access requirements to drilling rigs and operational vessels. | The physical presence of wind turbines and associated infrastructure will form an aerial obstruction. Long term access is required to active subsea infrastructure. There is active subsea infrastructure and wells within 9 NM of Hornsea Three array area. | DECC and UKOilandGasData datasets have been used to inform the assessment. Further consultation will be required with the operators or subsea structures to inform the assessment. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 11 | Disruption to radar coverage of NATS Claxby PSR. | The Hornsea Three array area is within the range of the NATS Claxby PSR and therefore the physical presence of wind turbines within Hornsea Three array area could affect the radar performance. | A review of the data sources set out in Table 9.5 would be carried out in order to ensure that the Hornsea Three Aviation, Military and Communications baseline is informed by the latest available datasets.<br>VFR Chart/OS OPEN DATA has been used to identify radar. NATS shall be consulted to provide an assessment of the potential effect of Hornsea Three on their radar systems. | Osprey shall carry out a line of sight analysis to inform the assessment. |
| 12 | Disruption of radar coverage of Military ADR located at Staxton Wold and Trimingham. | The Hornsea Three array area is within the range of the Military ADR at Staxton Wold and Trimingham, and therefore the physical presence of wind turbines within Hornsea Three array area could affect their performance. | A review of the data sources set out in Table 9.5 would be carried out in order to ensure that the Hornsea Three Aviation, Military and Communications baseline is informed by the latest available datasets.<br>VFR Chart/OS OPEN DATA has been used to identify radar. The MoD shall be consulted to provide an assessment of the potential effect of Hornsea Three on Military ADR. | Osprey shall carry out a line of site analysis to inform the assessment. |
| 13 | Obstruction to SAR helicopter operations. | The physical presence of infrastructure within a previously open sea area may cause an obstruction to SAR operations. | Consultation will be required with the SAR operators to inform the assessment. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 14 | Interference with existing offshore microwave and other communication links. | The physical presence of infrastructure within the path of a microwave link or other communication links may cause interference. | Ofcom and the oil and gas operators shall be consulted to identify all microwave and other communication links which could be affected by the Hornsea Three array area. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Decommissioning*** | | | | |
| 15 | Interference with operations within the Military Practice Area located in the Outer Silver Pit area. | There is potential for temporary interference with operations within the Military Practice Area located in the Outer Silver Pit area, due to the requirement for decommissioning related safety zones around infrastructure within the Hornsea Three array area and due to associated vessel movements. | SeaZone Hydrospatial Data has been used to identify the boundary of the Military Practice Area. Consultation shall be undertaken with the MoD to ascertain the range, frequency and timing of operations within the Military Practice Area located in the Outer Silver Pit area. This consultation shall be used to inform the assessment. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 16 | Disruption to HMR 2. | The physical presence of partially dismantled wind turbines within the Hornsea Three array area will form a physical aerial obstruction to helicopters using the HMR 2. | Consultation shall be required with the CAA to ascertain any amendments to the HMR structure. Further consultation will be required with the helicopter operators who use the affected HMR structure. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 17 | Increased helicopter traffic to and from Hornsea Three. | Hornsea Three will require helicopter operations during the decommissioning phase which may affect the available airspace for other users. | Consultation will be required with the UK east coast aerodromes, NATS and the helicopter operators to provide a baseline of current helicopter density, and frequency of movement in the Hornsea Three vicinity. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

Table 9.9 Impacts proposed to be scoped out of the assessment for aviation, military and communications.

| Impact No. | Impact | Justification |
|---|---|---|
| ***Operation and maintenance*** | | |
| 1 | Impact of physical presence of wind turbines in Hornsea Three array area on military ATC radar and landing aids. | Military ATC radars have an instrumented range of 60 NM. Military landing aid precision approach radar are only safeguarded out to 20 NM in certain directions. Wind turbines in Hornsea Three (at a distance of 65 NM at the closest point to land) would not be detectable by Military ATC Radars or military landing aids.<br>Therefore, subject to consultation with stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 2 | Impact of physical presence of wind turbines in Hornsea Three array area on meteorological radar. | The nearest meteorological radars to Hornsea Three array area, with a range of 20 km, are sited at Ingham and High Moorsley, The Hornsea Three array area is at a greater distance than this range and therefore would not affect these meteorological radar.<br>Therefore, subject to consultation with stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 3 | Impact of physical presence of wind turbines in Hornsea Three array area on cellular telephones. | Cellular telephone providers do not provide coverage for users located in the vicinity of the Hornsea Three array area.<br>Therefore, subject to consultation with stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |

### Measures adopted as part of the project

9.3.30 Measures adopted as part of the project will include:

- The Defence Infrastructure Organisation (DIO) will be kept informed of the nature and timing of construction and decommissioning activities. This will be implemented through the appropriate distribution of Notices to Mariners;
- The DIO will be informed of the construction start and end dates; the maximum height of construction equipment; and the latitude and longitude of each wind turbine;
- Prior to the start of construction and decommissioning, the UKHO will be informed of the locations, heights and lighting status of the wind turbines, including estimated and actual dates of activities, and the maximum height of any equipment to be used, to allow inclusion on Aviation Charts;
- The Hornsea Three operator will issue, as necessary, requests to the UK Aeronautical Information Service to submit Notices to Airmen in the event of any failure of aviation lighting; and
- Development of, and adherence to, an ERCoP and provision of self-help capabilities.

9.3.31 The requirement and feasibility of additional measures will be dependent on the significance of the effects on aviation, military and communications and will be consulted upon with statutory consultees throughout the EIA process.

### Potential cumulative impacts

9.3.32 There is the potential for cumulative effects to occur from other projects or activities within the southern North Sea area where projects or activities could act collectively with Hornsea Three to affect aviation, military and communications receptors.

9.3.33 The cumulative assessment will consider the worst case adverse scenarios for each of the identified projects or activities. The following projects or activities will be considered within the aviation, military and communications study area:

- Other offshore wind farms and associated helicopter requirements; and
- Other infrastructure projects (e.g. cables and pipelines).

9.3.34 The cumulative assessment will consider the same impacts across all phases of the project, as outlined in Table 9.8 for the Hornsea Three alone assessment.

### Potential transboundary impacts

9.3.35 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening.

9.3.36 Hornsea Three is entirely within the UK Flight Information Region and therefore no transboundary effects are predicted in relation to aviation airspace.

9.3.37 This screening exercise identified that there was the potential for transboundary effects with regard to the following aviation, military and communications receptors:

- Civil and military radar coverage from The Netherlands; and
- Restricted access to oil and gas subsea infrastructure within the Dutch sector.

9.3.38 These potential impacts will be considered further through consultation as part of the EIA process for Aviation Military and Communications.

## 9.4 Marine archaeology

### Introduction

9.4.1 This section of the Scoping Report identifies marine archaeology resources of relevance to Hornsea Three and considers the potential impacts from the construction, operation and maintenance, and decommissioning of Hornsea Three on marine archaeology receptors.

### Study area

9.4.2 For the purposes of the Hornsea Three marine archaeology EIA, two study areas are defined:

- The Hornsea Three marine archaeology study area - defined as the area encompassing the offshore components of Hornsea Three (i.e. the array area, offshore ECR corridor search area and intertidal zone seaward of MHWS) as this area was considered to be directly affected by the proposed development; and
- The regional marine archaeology study area – defined as the boundary of the Humber REC (Tappin *et al*., 2011) and extended to include the Hornsea Three offshore ECR corridor search area (see Figure 9.13). This regional marine archaeology study area is the area covered by the desktop review and therefore provides a wider context for the site-specific data, as well as the extent of the marine archaeology CEA.

### Baseline data

9.4.3 An initial desk based review of literature and data sources to support this Scoping Report has highlighted the following data sources which provide coverage of the regional marine archaeology study area:

- Records of the UKHO wrecks and obstructions provided by SeaZone Ltd;
- Records held by the National Record of the Historic Environment (NRHE), which include reports of finds recovered as a result of aggregate extraction and reported under the BMAPA Protocol for Reporting Finds of Archaeological Interest (BMAPA and English Heritage, 2003 and 2005);
- Admiralty Charts 1187 (Outer Silver Pit) and 1503 (Outer Dowsing to Smiths Knoll including Indefatigable Banks); and
- Secondary sources related to the maritime history, submerged prehistory and the archaeology of the southern North Sea including:
  - The Humber REC (Tappin *et al*., 2011); and
  - The North Sea Palaeolandscapes Project (Gaffney *et al.,* 2007).

9.4.4 The reader is referred to Table 9.10 below which outlines the additional site-specific surveys that are proposed inform the EIA.

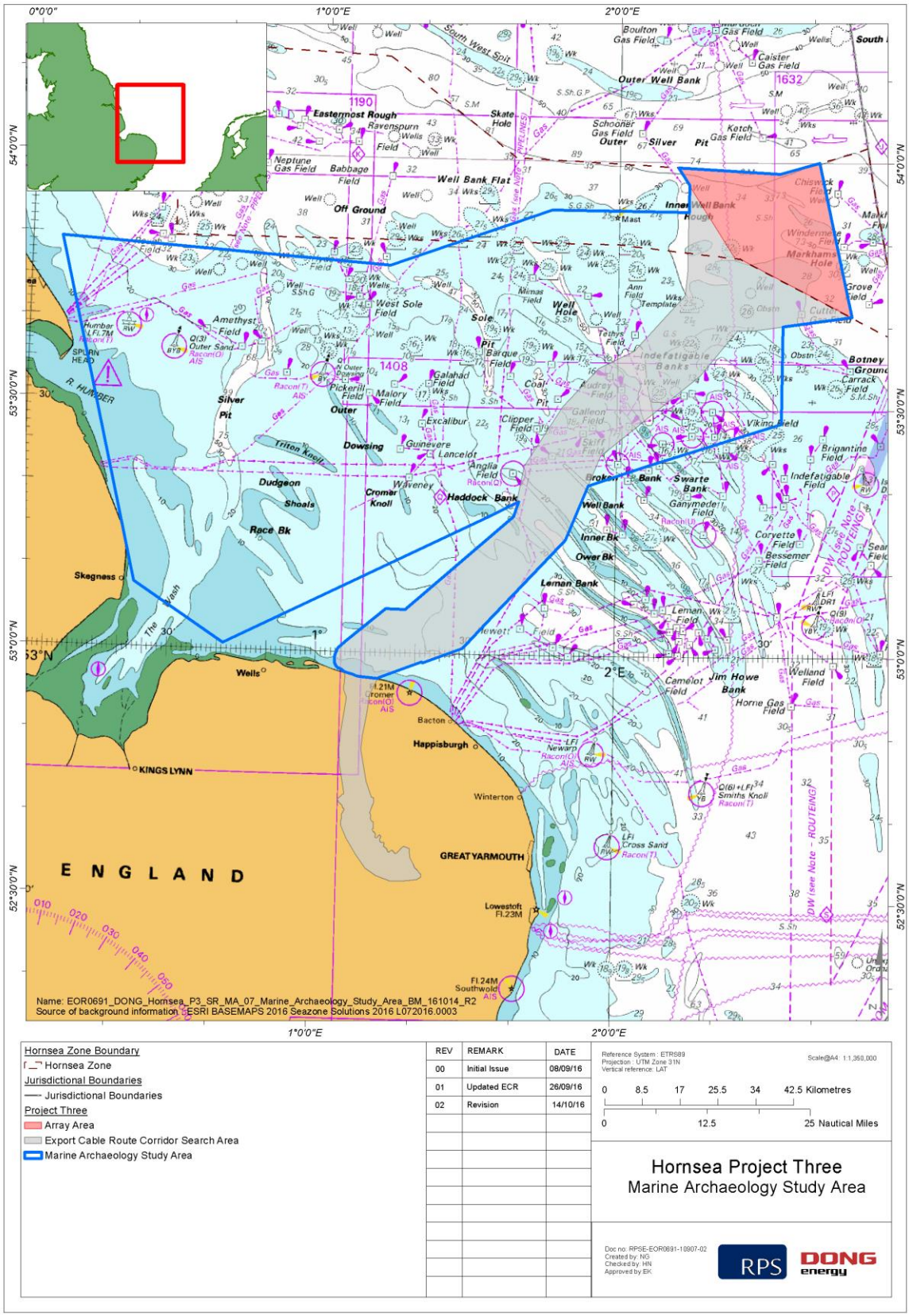



Figure 9.13 Regional and Hornsea Three marine archaeology study areas.

## Baseline environment

### *Offshore environment*

#### *Seafloor topography*

9.4.5 The depth of water and character of the regional marine archaeology study area varies considerably, from shallow intertidal and subtidal waters close to the proposed landfall, to the ocean 'deeps', such as the Outer Silver Pit where depths are up to 75 m. The varying topography of the seafloor and its relationship with the adjacent coast has a direct relationship with nature, density and character of the archaeological remains found on and under it.

#### *Submerged prehistoric archaeology*

9.4.6 The prehistoric archaeological record of the British Isles covers the period from the earliest hominin occupation more than 780,000 BP to the Roman invasion of Britain in 43 AD. During this long span of time, sea level fluctuations caused by three major glaciations (the Anglian, Wolstonian and the Devensian) have shaped the submerged prehistoric landscape within the regional marine archaeology study area. The changes in sea level have at times exposed the floor of the southern North Sea, including within the Hornsea Three marine archaeology study area creating an inhabitable environment suitable for hominin occupation and exploitation.

9.4.7 The submerged prehistoric archaeology of the Hornsea Three array area and offshore ECR corridor search area is discussed below in terms of the following three broad temporal divisions:

- The Pre-Devensian, >780,000 to approximately 73,000 BP;
- The Devensian and Late Glacial Maximum, approximately 73,000 to 18,000 BP; and
- The post-Late Glacial Maximum and early Holocene, approximately 18,000 to 6,000 BP.

#### *Maritime archaeology*

9.4.8 Maritime archaeological sites and materials can be defined as the physical remains of boats and ships that have been wrecked, sunk or have foundered, aircraft losses, historical human structures (such as settlements) and artefacts which rest upon the seabed as the result of being jettisoned or lost overboard (for example, anchors, cannon or fishing gear).

9.4.9 Records of known wreck sites and losses in UK waters are biased towards the recent, predominantly post-medieval and Modern periods. Although the existence and survival of Palaeolithic watercraft are highly speculative in the UK, Bronze and Iron Age, sea-going vessels are likely to have been lost in the regional marine archaeology study area.

9.4.10 The precise location of most wrecks in UK waters is not known. The majority of known and recorded wreck sites lie relatively close to the coast, in the area that is crossed by the offshore ECR corridor search area. The proximity of many historical sailing routes to the coast and the natural hazards of the southern North Sea can be expected to have been a determining factor in many maritime casualties in the past, as addressed in the Aggregate Levy Sustainability Fund project on English Shipping (Wessex Archaeology, 2004).

9.4.11 Data for known shipwrecks and recorded shipping losses within the regional marine archaeology study area were obtained from SeaZone and the NRHE (see Figure 9.14). These datasets provide a general picture of maritime casualties in the regional marine archaeology study area, but should not be viewed as representing the totality of the potential maritime archaeological remains in the area. Wrecks and obstructions listed by SeaZone are generally charted, although a small number lack accurate positional information.

9.4.12 There are a total of 158 SeaZone records in the Hornsea Three marine archaeology study area. Of these, 129 are identified as wrecks: six in the Hornsea Three array area and 123 in the Hornsea Three offshore ECR corridor search area. The remainder are classified as obstructions (29 in total). A total of 12 of the obstruction records are considered by the UKHO to be 'dead' (i.e. not seen in repeated surveys). The remainder (17) are designated 'live' and should be assumed to be present in or on the seabed at or near the positions given.

9.4.13 The NRHE lists 50 recorded positions in the Hornsea Three offshore ECR corridor search area. All recorded positions lie within 35 km from the shoreline. Of these, a total of 41 wrecks are recorded, of which 30 are named vessels, there are two records of aircraft remains.

9.4.14 In certain instances the NRHE creates Named Locations, which are aggregations at a single, arbitrary position of one or more maritime records, for which no other grid reference or position is available. These positions reflect the general loss locations of ships and/or aircraft, usually drawn from descriptions in the documentary records, or the indicative positions of seabed finds. They do not (except by chance) relate to the position of the physical remains of the sites on the seabed which they list. Seven NRHE Named Location polygons fall within or adjacent to the Hornsea Three offshore ECR corridor search area. Together these Named Locations contain records of 132 maritime casualties. The remains of none, some, or all of these ships and aircraft may be present within the limits of their respective Named Location polygons. By the same token, material associated with records listed in some of the Named Location polygons which lie outside, but near the boundary of the Hornsea Three marine archaeology study area could also be encountered within the boundary of Hornsea Three.

*Aviation archaeology*

9.4.15 Thousands of military and civilian aircraft casualties have occurred in UK waters since the advent of powered flight in the early 20th Century. The bulk of these are casualties of WWII and most are concentrated off the south and southeast coasts of England. However, there is evidence for substantial numbers of aircraft casualties for most of the east coast of England (Wessex Archaeology, 2008).

9.4.16 Whilst this aviation archaeology record is potentially very large, the ephemeral nature of aircraft wrecks ensures that many sites remain unknown and unrecorded. In addition, although records of aircraft losses at sea are extensive, they are seldom tied to an accurate position, which further complicates any assessment of the likely presence of aircraft wreckage on any particular area of the seabed.

9.4.17 Since WWII, despite the volume of both military and civilian air traffic, there have been few aviation losses off the east coast of England and in the vicinity of the regional marine archaeology study area. Post-war aircraft remains are, therefore, unlikely to be discovered within the Hornsea Three marine archaeology study area. Civilian aircraft wrecks are not subject to protection under the terms of the Protection of Military Remains Act 1986.

9.4.18 SeaZone and the NRHE both hold records of known aircraft casualties in the area. There are no SeaZone records of aircraft within the Hornsea Three marine archaeology study area.

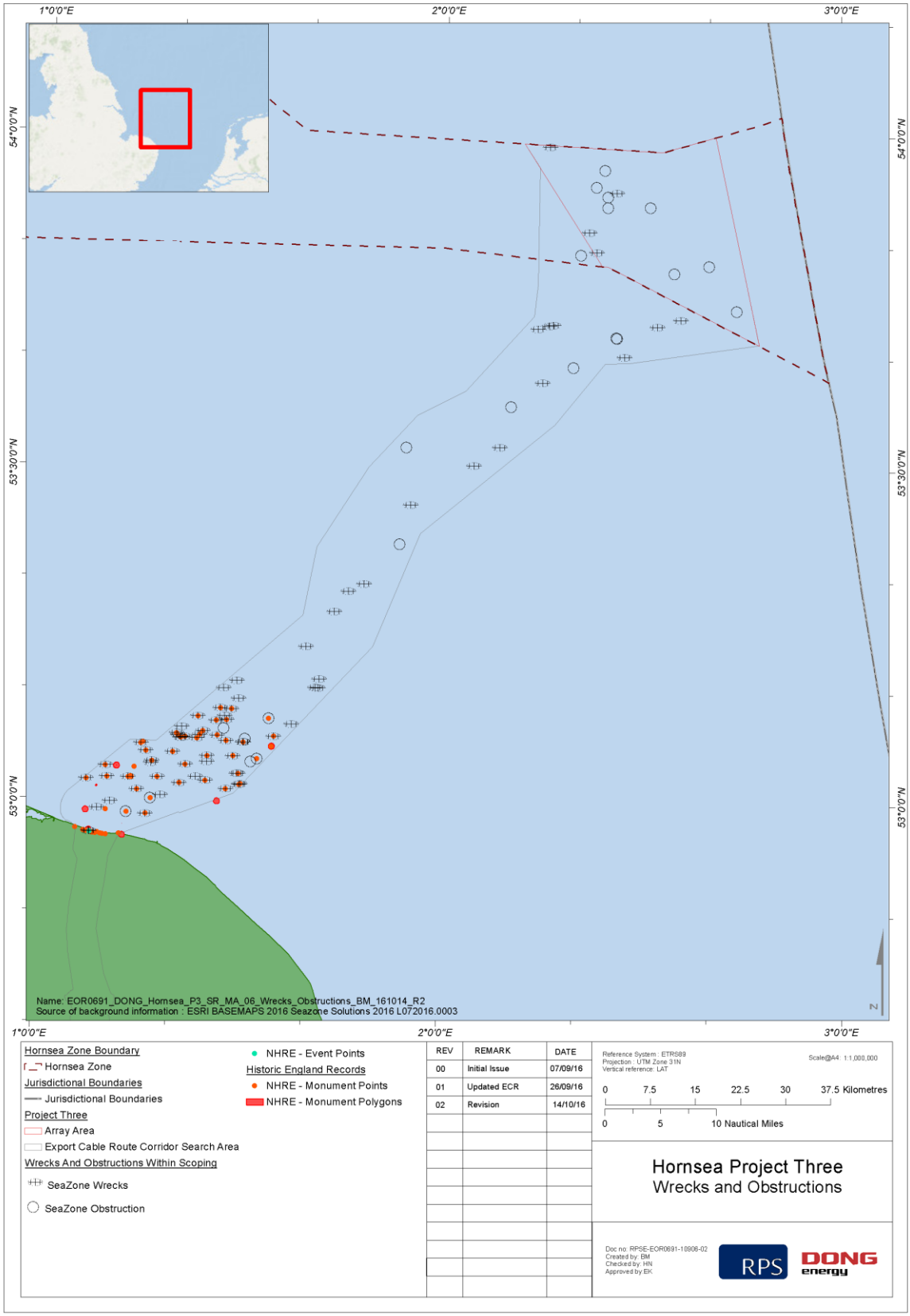



Figure 9.14 The positions of SeaZone and NRHE records within the Hornsea Three marine archaeology study area.

### *Intertidal environment*

9.4.19 The Norfolk Rapid Coastal Zone Assessment Survey (Robertson *et al.,* 2005) comprised of a desk based assessment and archaeological fieldwork through a reconnaissance survey in the intertidal zone along the coastline of the county, providing baseline information.

9.4.20 Within the intertidal area, some 120 separate finds or sites of material were observed during fieldwork. The material ranged widely in date from prehistoric flints to 20th century material.

## Proposed approach to the Environmental Impact Assessment (EIA)

9.4.21 The marine archaeology EIA will follow the methodology set out in Chapter 5: Environmental Impact Assessment Methodology. Specific to the marine archaeology EIA, the following guidance will also be considered:

- Historic Environment Guidance for the Offshore Renewable Energy Sector (COWRIE, 2007); and
- Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (COWRIE, 2008).

## Potential project impacts

9.4.22 A range of potential impacts on marine archaeology have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Hornsea Three. The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 9.10 together with a description of any additional data collection (e.g. site-specific surveys) that will be required to enable a full assessment of the impacts.

9.4.23 On the basis of the baseline information currently available and the project description outlined in Chapter 3: Project Description, no impacts are proposed to be scoped out of the assessment for marine archaeology.

## Measures adopted as part of the project

9.4.24 Measures adopted as part of the project will include:

- The development of, and adherence to, a Draft Written Scheme of Investigation; and
- Exclusion zones around sites of archaeological sensitivity.

9.4.25 The requirement and feasibility of additional measures will be dependent on the significance of the effects on marine archaeology and will be consulted upon with statutory consultees throughout the EIA process.

Table 9.10 Impacts proposed to be scoped into the Hornsea Three assessment for marine archaeology.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Removal or disturbance of sediments. | There is potential for removal or disturbance of sediments due to cable laying operations (including anchor placements), spud-can leg impacts from jack-up operations and seabed preparation works for turbine foundations resulting in a potential effect on near-surface and deeply buried prehistoric land surfaces. | As described in paragraph 9.4.3, there are a number of desktop data sources which cover the Hornsea Three marine archaeology study area.<br>In addition, a geophysical survey of the Hornsea Three marine archaeology study area is proposed in order to establish the ground conditions. High specification geophysical data will be acquired to provide a representation of the conditions to be expected on and below the seafloor.<br>Once collected, the geophysical data will be scanned to provide an understanding of the geological nature of the area and then interpreted for any objects of possible anthropogenic origin. This involves creating a database of anomalies by tagging individual features of possible archaeological potential, recording their positions and dimensions, and acquiring an image of each anomaly for future reference.<br>The magnetometer data will be processed using Geometrics MagPick software, or similar, in order to identify any discrete magnetic contacts which could represent buried metallic debris or structures such as wrecks.<br>The shallow seismic data will be studied in order to detect any in-filled palaeochannels, ravinement surfaces and peat/fine-grained sediment horizons that may have archaeological potential. An initial interpretation comprising 20% of the collected lines will be undertaken, with additional lines (specifically the cross lines) interpreted around any identified features of possible archaeological potential.<br>Any small reflectors which appear to be buried material such as a wreck site covered by sediment will be recorded, the position and dimensions of any such objects noted in a gazetteer, and an image of each anomaly acquired. It should be noted that anomalies of this type are | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| | | | rare, as the sensors must pass directly over such an object in order to produce an anomaly.<br>The multibeam bathymetry data will be used to provide a vertical reference for the sub-bottom profiler data, and assessed and analysed to identify any unusual seabed structures that could be shipwrecks or other anthropogenic debris. The data will be gridded and analysed using IVS Fledermaus software, or similar. | |
| 2 | Removal or disturbance of sediments. | There is potential for removal or disturbance of sediments due to cable laying operations (including anchor placements), spud-can leg impacts from jack-up operations and seabed preparation works for turbine foundations resulting in a potential effect on shipwrecks and aircraft wrecks. | As above for marine archaeology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 3 | Sediment deposition on the seabed. | Seabed preparation in connection with turbine foundation installation and cable installation may result in sediment deposition on the seabed resulting in a potential effect on a variety of heritage assets. | As above for marine archaeology impact no. 1. | See approach to Marine Processes assessment in Table 7.4. |
| ***Operation and maintenance*** | | | | |
| 4 | Removal or disturbance of sediments. | Maintenance of the scheme may involve the deployment of jack-up vessels and other vessel moorings which may affect a variety of heritage assets through the removal or disturbance of sediments. | As above for marine archaeology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Decommissioning*** | | | | |
| 5 | Removal or disturbance of sediments. | There is potential for removal or disturbance of sediments due to foundation cutting/ removal and cable removal resulting in a potential effect on near-surface and deeply buried prehistoric land surfaces. | As above for marine archaeology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 6 | Removal or disturbance of sediments. | There is potential for removal or disturbance of sediments due to foundation cutting/ removal and cable removal resulting in a potential effect on shipwrecks and aircraft wrecks. | As above for marine archaeology impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

### Potential cumulative impacts

9.4.26 The predicted effects of construction, operation and maintenance, and decommissioning from Hornsea Three on marine archaeology are considered to be localised to within the footprint of Hornsea Three. However, there is potential for cumulative effects to occur on marine archaeology from other projects or activities within the regional marine archaeology study area where projects or plans could act collectively with Hornsea Three to affect marine archaeology receptors.

9.4.27 The cumulative assessment will consider the maximum adverse scenarios for each of the projects or activities. The following projects or activities will be considered within the regional marine archaeology study area:

- Other offshore wind farms and associated cabling and infrastructure;
- Oil and gas infrastructure/development (cables and pipelines);
- Other cables (i.e. telecommunications and interconnectors);
- Commercial fishing activity;
- Navigation and shipping;
- Aggregate extraction and disposal of dredging spoil; and
- Beach replenishment schemes.

9.4.28 The CEA will consider the same impacts across all phases of the project, as outlined in Table 9.10 for the Hornsea Three alone assessment.

### Potential transboundary impacts

9.4.29 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there is no potential for significant transboundary effects with regard to marine archaeology from Hornsea Three upon the interests of other EEA states as the predicted impacts on marine archaeology receptors will largely be focused within the footprint of Hornsea Three.

## 9.5 Seascape and visual resources

### Introduction

9.5.1 This section of the Scoping Report identifies seascape and visual resources of relevance to Hornsea Three and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore components (up to the MLWS mark) of Hornsea Three on these resources.

### Study area

9.5.2 For the purposes of the Hornsea Three seascape and visual EIA, three study areas are defined:

- The seascape and visual array study area - defined as the Hornsea Three array area plus a 50 km buffer (see Figure 9.15). The seascape and visual array study area is not intended to provide a boundary beyond which the operational Hornsea Three infrastructure located within the array area cannot be seen, although is considered to be the maximum extent within which a significant seascape or visual effect could occur. The recommendation for the determination of the radius of the seascape and visual array study area are set out in the Visual Representation of Wind farms: Good Practice Guidance - Version 2 (SNH, 2014) which gives recommended initial Zone of Theoretical Visibility (ZTV) distances from the nearest turbine;
- The seascape and visual offshore HVAC booster station(s) study area - defined as the offshore HVAC booster station(s) search area plus a 20 km buffer. As the offshore HVAC booster station(s) search area still needs to be defined (i.e. its location is only currently identified as occurring between 40% and 60% of the total Hornsea Three offshore ECR corridor search area length, see Chapter 3: Project Description, paragraph 3.7.54) the seascape and visual offshore HVAC booster station(s) study area is not currently shown on any figures in this document; and
- The Historic Seascape Character (HSC) study area – defined as the area in which there would be a direct effect, namely those areas which including the Hornsea Three array area and offshore ECR corridor (see Figure 9.15).

9.5.3 The seascape and visual resources EIA will consider all receptors seaward of MLWS. Receptors landward of MLWS, including those receptors who are able to view offshore components of Hornsea Three (such as cable laying during the construction phase) will be considered in the landscape and visual resources assessment (see Chapter 12, Section 12.1: Landscape and Visual Resources).

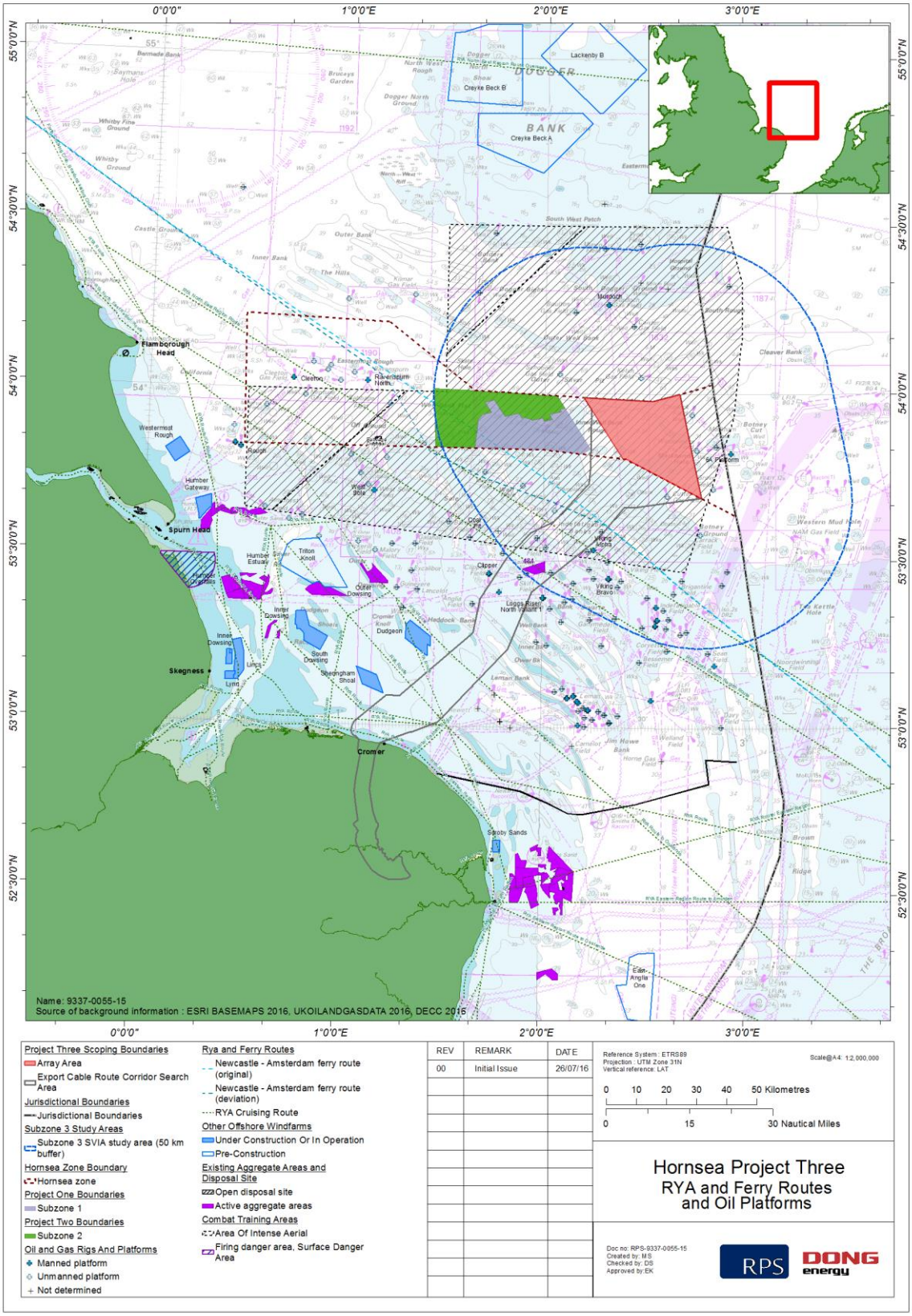



Figure 9.15 Hornsea Three seascape and visual resources array and Historic Seascape Character (HSC) study area*.

* Note – RYA data from 2005 to 2015 has been shown on this figure as the most recent data (from 2016) does not include data beyond 12 NM.

### Baseline data

9.5.4 An initial desk based review of literature and data sources to support this Scoping Report has highlighted the following data sources which provide coverage of the Hornsea Three array area and offshore ECR corridor search area:

- Admiralty Charts 1187 (Outer Silver Pit) and 1503 (Outer Dowsing to Smiths Knoll including Indefatigable Banks);
- HSC East Yorkshire to Norfolk Section One: Background, Methodology and Results (Aldred, 2013a);
- HSC East Yorkshire to Norfolk Section Two: Applications Review and Case Studies (Aldred, 2013b);
- HSC East Yorkshire to Norfolk Section Three: National and Regional Perspective Character Type Texts (Aldred, 2013c);
- Seascape character area assessment for East Inshore and East Offshore marine plan areas (MMO, 2012);
- Seascape Characterisation around the English Coast (Marine Plan Areas 3 and 4) (Natural England, 2012); and
- England's Historic Seascapes: Withernsea to Skegness Pilot Study (MoLAS, 2009).

### Baseline environment

#### *Present day National Seascape Character Areas (NSCAs)*

9.5.5 The two present day seascape and visual study areas are located within the marine plan areas 3 and 4 (East Inshore and East Offshore respectively) which extend as far as the median line between the UK and the Netherlands. A seascape character area assessment for the East Inshore and East Offshore Marine Plan areas assessment was published by the MMO in 2012. The purpose of the MMO assessment was to provide a strategic scale seascape character assessment to inform the marine planning process. The MMO seascape assessment is based upon an earlier pilot study seascape assessment commissioned by Natural England in 2012.

9.5.6 Both the MMO and the Natural England seascape character assessments divide the East Inshore and East Offshore marine plan areas into ten National Seascape Character Areas (NSCAs). These are 'Dogger Bank', 'Dogger Deep Water Channel', 'East Midlands Offshore Gas Fields', 'East Anglian Shipping Waters', 'Holderness Coastal Waters', 'Humber Waters', 'East Midlands Coastal Waters', 'The Wash', 'Norfolk Coastal Waters' and 'Suffolk Coastal Waters' (Figure 9.16).

9.5.7 The majority of the Hornsea Three array area (582 $km^2$, equivalent to 84% of the Hornsea Three array area) is located in the 'Dogger Deep Water Channel' NSCA and a small area (114 $km^2$, equivalent to 16% of the Hornsea Three array area) lies within the 'East Midlands Offshore Gas Fields' NSCA. The seascape and visual array study area also covers the Dogger Bank and East Anglian Shipping Waters NSCAs, and Dutch waters.

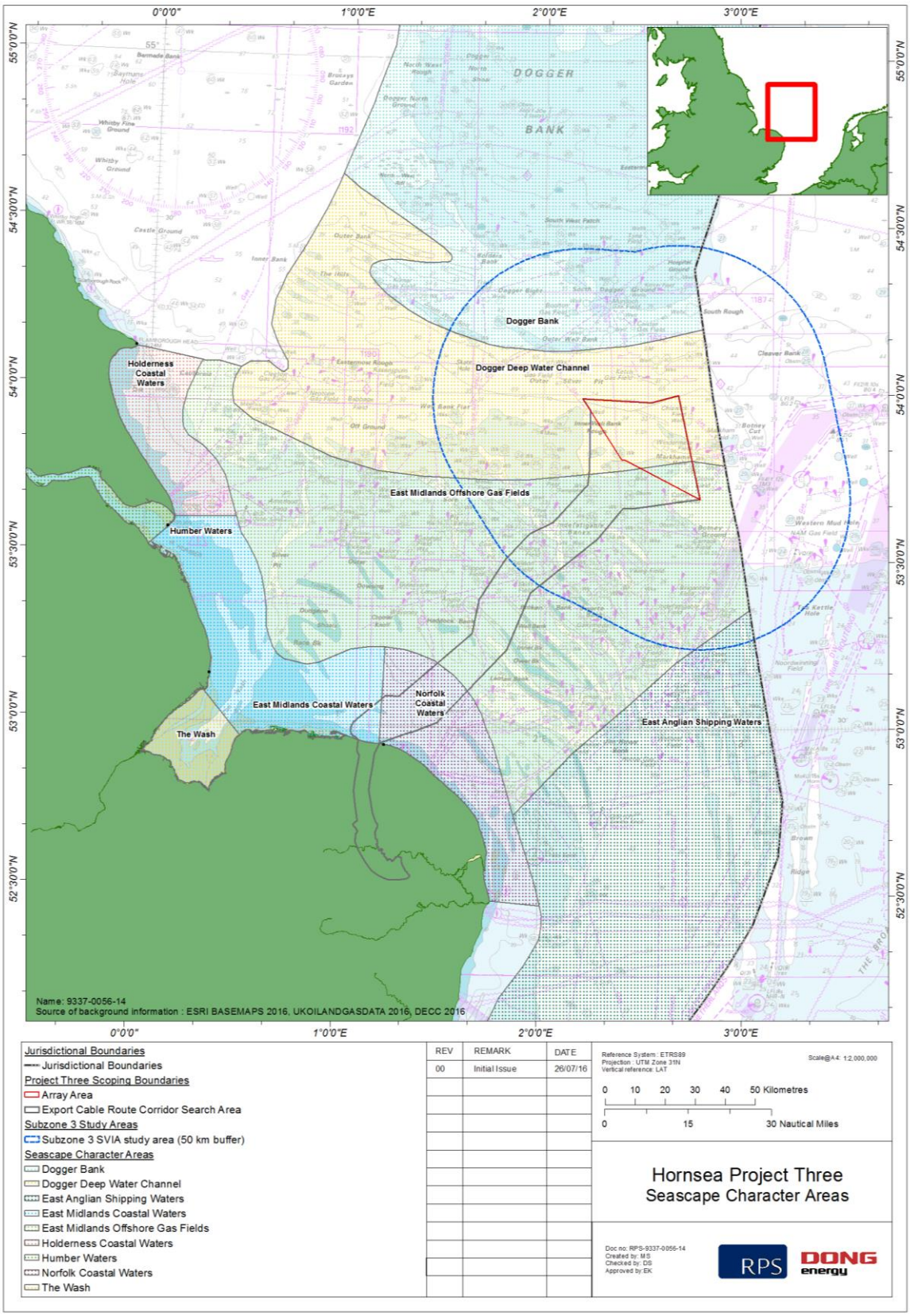



Figure 9.16 Present day UK seascape character areas in the vicinity of Hornsea Three.

9.5.8 The majority of the Hornsea Three offshore ECR corridor search area (1,531 km$^2$, equivalent to 55%) is located in the 'East Midlands Offshore Gas Fields' NSCA and a smaller area (404 km$^2$, equivalent to 15%) within the 'Norfolk Coastal Waters' NSCA. The remainder of the Hornsea Three offshore ECR corridor search area is located within the 'Dogger Deep Water Channel' NSCA (730 km$^2$, equivalent to 26%) and the 'East Midlands Coastal Waters (96 km$^2$, equivalent to 3%).

### *Existing structures and users of the seascape and visual array study area*

9.5.9 In total, 14 manned platforms lie within the seascape and visual array study area (see Figure 9.15, illustrating J6A to the east in Dutch waters; Murdock to the north; and INDE AC, AP, AQ, AT, CD and CP, Viking Alpha Riser and Viking Bravo to the south).

9.5.10 One aggregate area (Humber 3), to the southwest of the Hornsea Three array area, but no disposal areas, lie within the seascape and visual array study area.

9.5.11 The RYA cruising routes and the cruise ferry routes are shown in Figure 9.15. Most views from these locations are of the open sea with occasional glimpses of gas platforms or associated infrastructure and other vessels. Air combat training takes place over the Hornsea Three array area and northern part of the Hornsea Three offshore ECR corridor search area (Figure 9.15).

9.5.12 The types of visual receptor known to be present within the vicinity of Hornsea Three can therefore be described as follows:

- Sailors following the cruising routes identified by the RYA;
- Passengers and workers on board commercial ferries or cruise liners;
- People at their place of work on passing cargo, tanker or other commercial vessels;
- People at their place of work on manned static gas platforms or travelling to the platforms;
- People at their place of work on commercial fishing vessels;
- People at their place of work on aggregate dredging vessels; and
- Military personnel using identified Military Practice Areas.

9.5.13 The visual characteristics of the Hornsea Three array area could therefore be described as relatively homogenous with a:

- Lack of inter-visibility with coastal areas due to distance from shore;
- Open seas with occasional views of offshore structures, such as gas platforms;
- Regular patterns of use by sea-going vessels for a variety of purposes, including recreational cruising, commercial 'cruise ferry' routes, commercial fishing activities, tankers and cargo vessels; and
- Use by aeroplane users for air combat training.

### *Historic Seascape Character (HSC) areas*

9.5.14 The HSC study area is located within the HSC East Yorkshire to Norfolk Project Area 2 which extends as far as the median line between the UK and the Netherlands. A HSC assessment for this area was published by the University of Durham on behalf of English Heritage in 2013 (Aldred 2013a; 2013b and 2013c). The overall aim of the assessment was to carry out a GIS-based characterisation of a specified area of England's coastal and marine zones using the national method for HSC.

9.5.15 The MMO (2012) HSC assessment divides the HSC study area into a number of Broad Historic Character Types (BHCT) (see Figure 9.17). The Hornsea Three array area is located within an area which is identified as having the following BHCTs: 'Fishing', 'Industry', cultural topography and 'Communications'. The Hornsea Three offshore ECR corridor search area is located within an area which is identified as having the following BHCTs: 'Fishing', 'Industry' and 'Communications' and the landfall area is located in an area which is identified as having the 'Fishing' and 'Communications' BHCT.

9.5.16 At a more detailed level, the conflated BHCTs are divided into Historic Character Subtypes. The Historical Character Subtypes are mapped at the 'Sea Surface', 'Water Column', 'Sea Floor' and 'Subsea Floor Levels'.

#### *Seascape designations*

9.5.17 There are no national or regional seascape designations within the Hornsea Three seascape and visual resources study areas for this assessment.

### Proposed approach to the Environmental Impact Assessment (EIA)

#### *Present day seascape and visual resources assessment*

9.5.18 On the basis of the baseline seascape and visual resources information currently available and the project description outlined in Chapter 3: Project Description, all present day seascape and visual resource assessments are proposed to be scoped out of the assessment (see paragraph 9.5.20 below). No EIA methodology is therefore proposed.

#### *Historic Seascape Character (HSC) assessment*

9.5.19 The HSC EIA will follow the methodology set out in Chapter 5: Environmental Impact Assessment Methodology. Specific to the HSC assessment, the following guidance documents will also be considered:

- Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (COWRIE, 2008);
- Historic Environment Guidance for the Offshore Renewable Energy Sector (COWRIE and Wessex Archaeology, 2007); and
- The European Landscape Convention - The English Heritage Action Plan for Implementation (English Heritage, 2009).

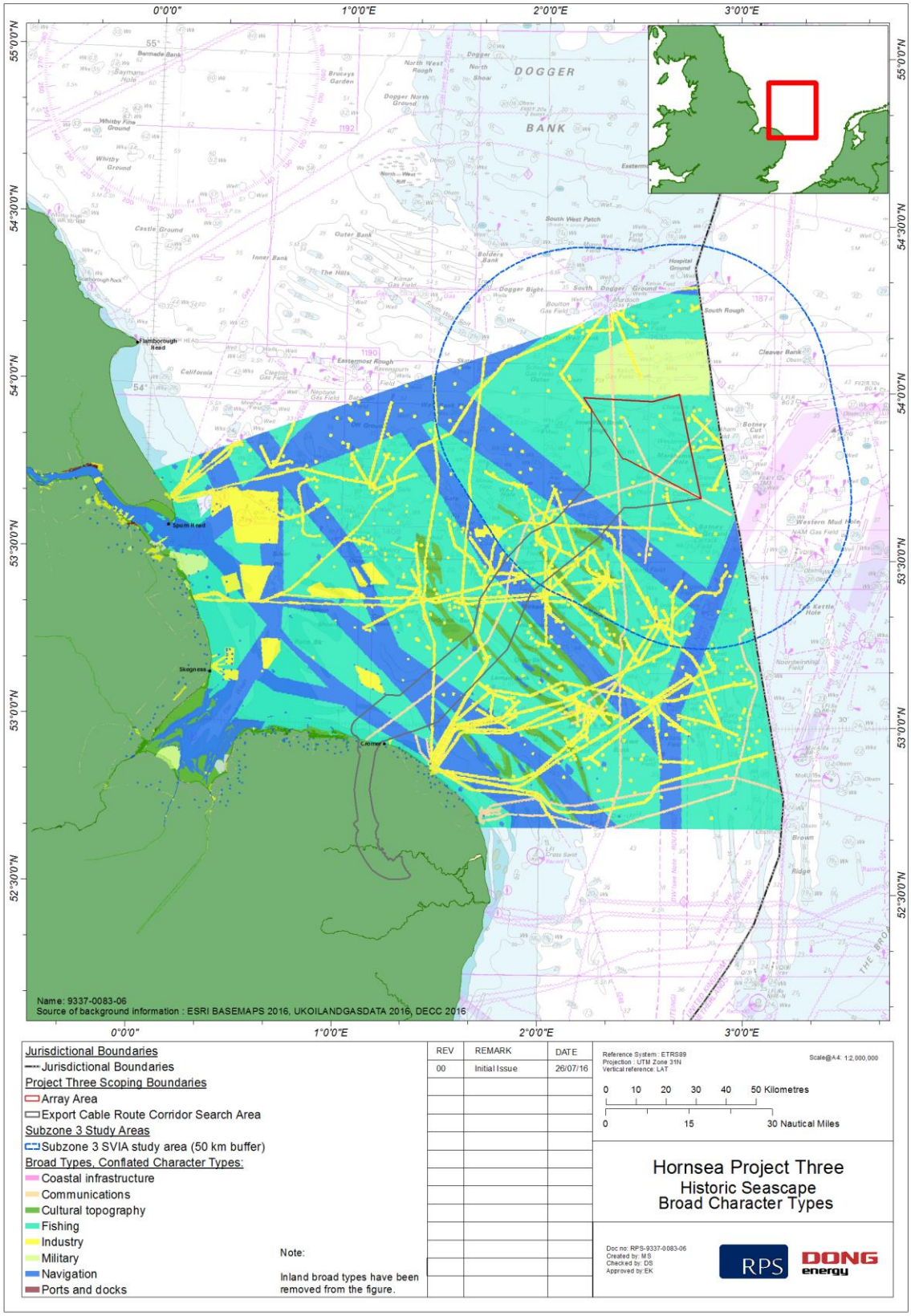



Figure 9.17 Broad Historic Character Types (BHCT).

### Potential project impacts

#### *Present day seascape and visual resources assessment*

9.5.20 On the basis of the baseline seascape and visual resources information currently available and the project description outlined in Chapter 3: Project Description, a number of impacts are proposed to be scoped out of the assessment for seascape and visual resources. These impacts are outlined, together with a justification for scoping them out, in Table 9.11.

#### *Historic Seascape Character (HSC) assessment*

9.5.21 Potential impacts on HSC have been identified which may occur during the operation and maintenance phases of Hornsea Three. The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 9.12, together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

9.5.22 On the basis of the baseline HSC information currently available and the project description outlined in Chapter 3: Project Description, a number of impacts are proposed to be scoped out of the assessment. These impacts are outlined, together with a justification for scoping them out, in Table 9.13.

9.5.23 Although this scoping section is titled 'Seascape and Visual Resources', it is proposed that impacts on present day seascape during the construction, operation and maintenance, and decommissioning phases, and HSC during the construction and decommissioning phases, are scoped out of the assessment. It is therefore proposed that the HSC assessment during the operation and maintenance phase is included in the Hornsea Three Marine Archaeology Environment Statement chapter rather than a standalone Seascape and Visual Resources chapter.

### Measures adopted as part of the project

9.5.24 The requirement and feasibility of measures will be dependent on the significance of the effects on seascape and visual resources, and will be consulted upon with statutory consultees throughout the EIA process.

Table 9.11 Impacts proposed to be scoped out of the present day seascape and visual resources assessment.

| Impact No. | Impact | Justification |
|---|---|---|
| ***Construction, operation and maintenance, and decommissioning*** | | |
| *Array Area* | | |
| 1 | The change to the existing present day seascape character through the introduction of new or uncharacteristic elements/features. | The majority of Hornsea Three array area lies within the 'Dogger Deep Water Channel' NSCA, as does the Project One (granted Development Consent in December 2014) and Project Two (granted Development Consent in August 2016) offshore wind farms. Given that Hornsea Three does not represent a significant change in the character of the area when considering the project alone and cumulatively with neighbouring projects located in the former Hornsea Zone, the Applicant intends to scope out the seascape character assessment of the Hornsea Three infrastructure in the array area, during the construction, operational and maintenance and decommissioning phase. |
| 2 | The day time change in the existing visual scenario. | Given that the Hornsea Three array area will be located approximately 121 km from the nearest coastal location (19 km further than the closest turbines in Project Two), the effects of the curvature of the earth and the refraction of light over the distances involved, prevent any views of Hornsea Three wind turbines from onshore locations. The upper blade tip height for the tallest turbines proposed is 325 m above LAT. Turbines of this height would cease to be visible from the shoreline at locations beyond 75 km out to sea. On this basis, the Applicant intends to scope out the visual assessment of the Hornsea Three turbines, during the construction, operational and maintenance and decommissioning phase, on onshore receptors.<br>Recreational cruising, commercial 'cruise ferry' routes, commercial fishing activities, tankers and cargo vessels would be able to view the turbines within a maximum of 89 km (for ferries and tankers) and 77 km (for commercial fishing and recreational sailing/cruising) from the wind farm. However, on the basis that these receptors will be of transitory nature, and none of the receptors raised any concern/issues with the seascape and visual impact of Project One and Project Two, during any consultation event/meeting (including on the PEIR as part of Section 42 and Section 47 consultation, and as part of the Examination process), the Applicant intends to scope out the visual assessment of the Hornsea Three turbines, during the construction, operational and maintenance, and decommissioning phase, on transitory receptors.<br>As noted in paragraph 9.5.9 above, 14 manned platforms are located in the study area of the Hornsea Three array area. On the basis that these receptors will be on the platforms for work purposes, will have limited visibility of the turbines (will appear as a distant feature on the Horizon) and none of the receptors raised any concern/issues with the seascape and visual impact of Project One and Project Two, during any consultation event/meeting (including on the PEIR as part of Section 42 and Section 47 consultation, and as part of the Examination process), the Applicant intends to scope out the day time visual assessment of the Hornsea Three turbines, during the construction, operational and maintenance and decommissioning phase, on oil and gas platforms. |
| 3 | The night time change in the existing visual scenario. | Navigation and aviation warning lights will be visible at the edges and corners of the wind turbine array. However, it is noted that existing guidance (CAA, 2012) requires a reduction in intensity of the red light below the horizontal plane of the light fitment. It is also anticipated that varying meteorological conditions will reduce the actual distance over which the light is visible. On this basis, the Applicant intends to scope out the night time visual assessment of the Hornsea Three turbines, during the construction, operational and maintenance and decommissioning phase, on all visual receptors. |

| Impact No. | Impact | Justification |
|---|---|---|
| *Offshore ECR corridor* | | |
| 4 | The change to the existing present day seascape character through the introduction of new or uncharacteristic elements/ features. | The construction/installation and decommissioning of the Hornsea Three offshore ECR corridor will result in a temporary and short term impact on seascape and visual resources. Once the export cable has been installed, it will not be visible. On this basis, the Applicant intends to scope out the visual impact of the Hornsea Three offshore ECR corridor, during the construction, operational and maintenance, and decommissioning phase, on all visual receptors.<br>The offshore HVAC booster station(s), if required, are likely to be located in the East Midlands Offshore Gas Fields NSCA. Given that the introduction of the offshore HVAC booster station(s) does not represent a significant change in the character of the area when considering the other oil and gas platforms located in this area. The Applicant therefore intends to scope out the seascape character assessment of the Hornsea Three offshore HVAC booster station(s), during the construction, operational and maintenance and decommissioning phase.<br>The reader is further referred to Chapter 12, Section 12.1: Landscape and Visual Resources for the consideration of the offshore HVAC booster station(s) on onshore receptors. |
| 5 | The day time change in the existing visual scenario may cause effects (both during the day and at night) that will be experienced by a variety of visual receptors. | With regards to the Hornsea Three offshore ECR corridor, see seascape and visual resources impact no. 4 above.<br>Recreational cruising, commercial 'cruise ferry' routes, commercial fishing activities, tankers and cargo vessels would be able to view the offshore HVAC booster station(s) with a maximum distance of 38 km. However, on the basis that these receptors will be of transitory nature the Applicant intends to scope out the visual assessment of the Hornsea Three offshore HVAC booster station(s), during the construction, operational and maintenance, and decommissioning phase, on transitory receptors.<br>Should any offshore platforms have visibility of the offshore HVAC booster station(s), receptors will be on the platforms for work purposes and will have limited visibility of the substations. The Applicant therefore intends to scope out the day time visual assessment of the Hornsea Three offshore HVAC booster station(s), during the construction, operational and maintenance and decommissioning phase, on oil and gas platforms.<br>The reader is further referred to Chapter 12, Section 12.1: Landscape and Visual Resources for the consideration of the offshore HVAC booster station(s) on onshore receptors. |

Table 9.12 Impacts proposed to be scoped into the Hornsea Three HSC assessment.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Operation and maintenance*** | | | | |
| *HSC* | | | | |
| 1 | Introduction of new or uncharacteristic elements/ features | The existing HSC may change through the introduction of new or uncharacteristic elements/features | The HSC study area is located within the HSC East Yorkshire to Norfolk Project Area 2 which extends as far as the median line between the UK and the Netherlands. A HSC assessment for this area was published by English Heritage in 2013 (Aldred 2013a; 2013b and 2013c).<br>In addition, the MMO (2012) HSC assessment divides the HSC study area into a number of BHCT, which are divided into Historical Character Subtypes. These will be used to inform the assessment. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

Table 9.13 Impacts proposed to be scoped out of the Historic Seascape Character (HSC) assessment.

| Impact No. | Impact | Justification |
|---|---|---|
| ***Construction*** | | |
| 1 | The existing HSC may temporarily change through the introduction of new or uncharacteristic elements/features. | Any impacts from the construction and decommissioning phases would be short term and temporary in nature. The Applicant therefore proposes to scope this assessment out of the Hornsea Three EIA. |
| ***Operation and maintenance*** | | |
| 2 | The existing HSC may change through the introduction of new or uncharacteristic elements/features. | Effects of both Project One and Project Two on the sea surface and water column were considered to be of minor significance, which is not considered to be significant in EIA terms. On the basis that Hornsea Three is similar, both in terms of its nature and location, to Project One and Project Two, it is intended to scope out the assessment of the water column and assess only the seafloor and sub-seafloor sub character types in the Hornsea Three EIA. These latter sub character types should be assessed because it is considered that there is the potential for Hornsea Three to have an effect on buried prehistoric remains and that this effect should be understood at the landscape level as well as the effect on individual features. |
| ***Decommissioning*** | | |
| 3 | The existing HSC may temporarily change through the introduction of new or uncharacteristic elements/features. | As above for HSC impact no. 1. |

### Potential cumulative impacts

9.5.25 There is potential for cumulative impacts to occur on HSC from other projects or activities where projects or plans could act collectively with Hornsea Three to affect the HSC within the HSC study area.

9.5.26 The cumulative assessment will consider the maximum adverse scenarios for each of the projects or activities. The following projects or activities will be considered within the HSC study area:

- Other offshore wind farms and associated cabling and infrastructure;
- Oil and gas infrastructure/development (cables and pipelines);
- Other cables (i.e. telecommunications and interconnectors);
- Commercial fishing activity;
- Navigation and shipping; and
- Aggregate extraction and disposal of dredging spoil.

9.5.27 The cumulative assessment will consider the same impacts across all phases of the project, as outlined in Table 9.12 for the Hornsea Three alone assessment.

### Potential transboundary impacts

9.5.28 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there is no potential for significant transboundary effects with regard to HSC from Hornsea Three upon the interests of other EEA states as the predicted impacts on HSC will largely be focused within the footprint of Hornsea Three.

## 9.6 Infrastructure and other users

### Introduction

9.6.1 This section of the Scoping Report identifies the infrastructure and other user receptors of relevance to Hornsea Three and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (up to MHWS) of Hornsea Three on infrastructure and other users receptors.

9.6.2 Many of the potential impacts upon infrastructure and other users are related to navigational safety and collision risk. To avoid duplication, navigational safety and risk to all vessel types from Hornsea Three is considered in Chapter 9, Section 9.2: Shipping and Navigation. The infrastructure and other users EIA will only consider impacts that have likely significant effects on the undertaking of a certain marine activity or the operational effectiveness of marine infrastructure.

### Study area

9.6.3 The infrastructure and other users study area for Hornsea Three includes all infrastructure and other user receptors within an area which has the potential to be affected by Hornsea Three. This includes the offshore development area comprising the Hornsea Three array area, and the offshore ECR corridor search area. Figure 9.18 shows the study area for the following receptors:

- Recreational sailing and motor cruising;
- Recreational fishing;
- Kite surfing;
- Surfing;
- Windsurfing;
- Sea/surf kayaking and canoeing;
- Scuba Diving;
- Pipelines and cables;
- CCS, natural gas storage and underground coal gasification;
- Disposal sites; and
- Aggregate extraction.

9.6.4 The study area for offshore wind farms extends to the whole of the southern North Sea.

9.6.5 The study area for oil and gas operations includes all licence blocks which are intersected by, or are adjacent to, the Hornsea Three offshore development area (see Figure 9.18).

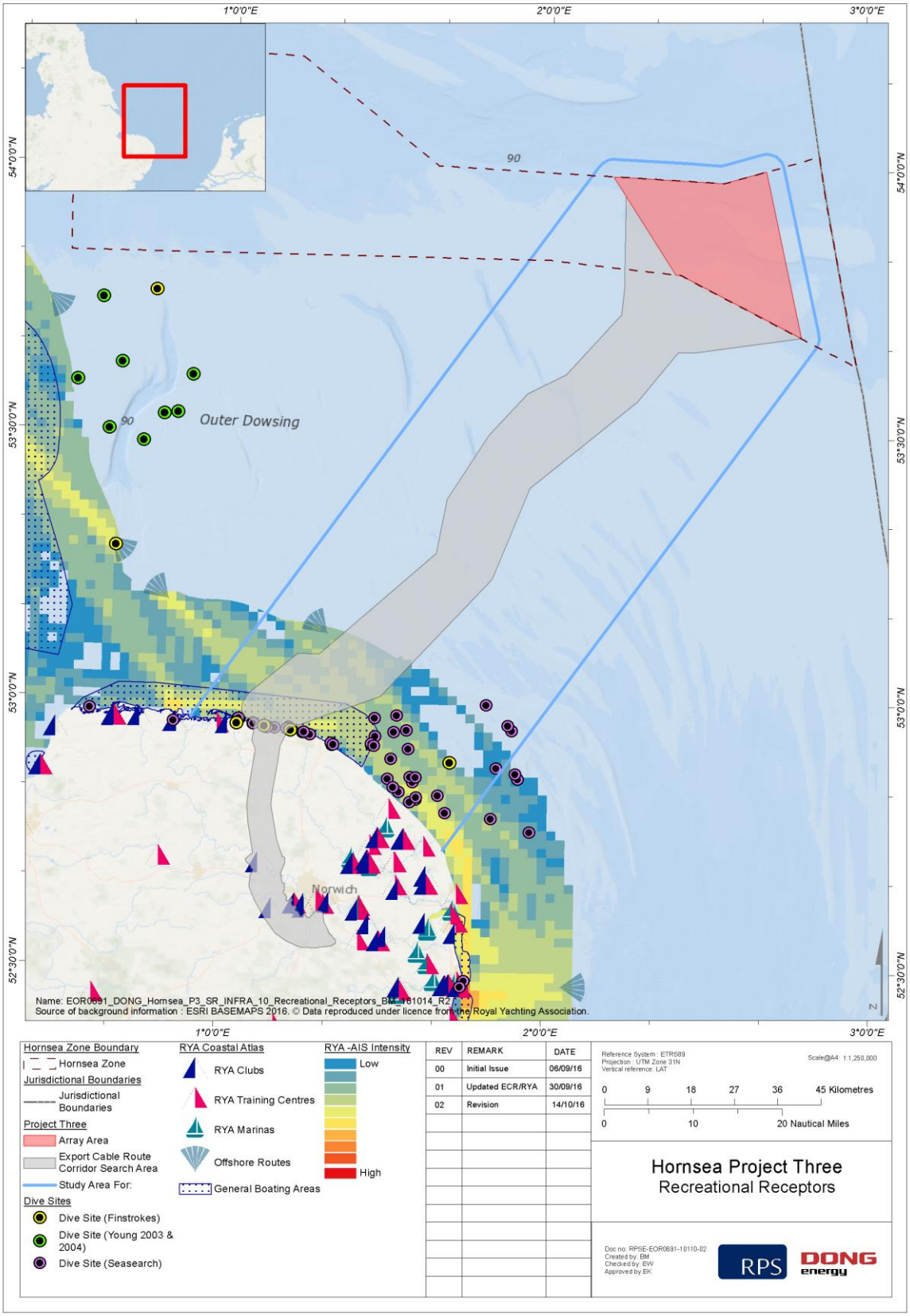



Figure 9.18 Study area for infrastructure and other users (except oil and gas operations).

### Baseline data

9.6.6 The baseline datasets available for infrastructure and other users are listed in Table 9.14. In addition to existing data, the assessment will be informed through desk studies and computer modelling carried out by Manchester University on REWS. Other supporting data will be obtained from stakeholder consultation.

Table 9.14 Data sources for infrastructure and other users.

| Topic | Data source |
|---|---|
| Recreational activities | UK Atlas of Recreational Boating<br>SeaSearch<br>Finstrokes |
| Recreational fishing | Defra (2013) Sea Angling 2012 – a survey of recreational sea angling activity and economic value in England, November 2013.<br>Results from the Defra Sea Angling 2016 project (if available). |
| Other offshore wind farms | TCE Charts Offshore Wind Lease Agreement Areas |
| Offshore cables | SeaZone Solutions Ltd<br>Kingfisher Information Service – Cable Awareness (KIS-ORCA). |
| Disposal sites | SeaZone Solution Ltd<br>Cefas – GIS Shapefile of Disposal Sites |
| Marine aggregate extraction | TCE Aggregate Licence Area Charts<br>BMAPA dredger reports<br>BMAPA GIS Shapefile of Dredger Routes |
| CCS | TCE |
| Natural gas storage | TCE |
| Oil and gas | DECC<br>UKOilandGasData |

### Baseline environment

#### *Recreational sailing and motor cruising*

9.6.7 Recreational sailing is generally divided into two categories: offshore and inshore. Offshore sailing is usually undertaken by yachts in the form of either cruising or organised offshore racing. Inshore sailing is typically undertaken by smaller vessels including dinghies and recreational vessels that are used for either cruising at leisure or racing. Cruising may include day trips between local ports and often includes a return journey to the home port on the same day. Inshore racing takes place around racing marks and navigational buoyage.

9.6.8 As noted in paragraph 9.6.2, it should be noted that recreational sailing and motor cruising will be considered in the NRA as a specific vessel size category, to be undertaken as part of the shipping and navigation EIA (see Chapter 9, Section 9.2: Shipping and Navigation). The Infrastructure and Other Users EIA will only consider receptors undertaking recreational sailing and motor cruising as an activity.

9.6.9 Due to the distance of the Hornsea Three array area from the coast (120 km/65 NM); any sailing would likely consist of offshore cruising and racing.

9.6.10 The East Anglia and Humber coasts are recognised as popular UK sailing areas with several RYA clubs and marinas (DECC, 2009c). The Hornsea Three offshore ECR corridor search area lies within the RYA Eastern Region. There is low to medium recreational vessel activity in the near shore area of the Hornsea Three offshore ECR search area (Figure 9.18). The Hornsea Three offshore ECR corridor search area also crosses a general boating area, which runs parallel to the coast. A number of offshore routes fan out from the coastal area, which are likely to intersect the Hornsea Three offshore ECR search area. These routes will be identified in the NRA.

### *Kite Surfing, surfing and windsurfing*

9.6.11 Kite surfing, surfing and wind surfing all occur almost entirely in coastal waters, usually within 1 NM of the shore. Due to the distance of the Hornsea Three array area from the shore, it is highly unlikely that kite surfing, surfing or windsurfing would occur within the Hornsea Three array area.

9.6.12 Kite surfing, surfing and wind surfing all have the potential to occur within the Hornsea Three offshore ECR corridor search area and landfall area.

### *Kayaking and canoeing*

9.6.13 There is no physical restriction on the offshore range of kayaks and canoes however for logistical and safety reasons most will stay relatively close to the shore, undertaking coastal rather than seaward trips. Due to the distance of the Hornsea Three array area from the shore, it is highly unlikely that kayaking or canoeing would occur within the Hornsea Three array area.

9.6.14 Kayaking and canoeing have the potential to occur within the Hornsea Three offshore ECR corridor search area and landfall area.

### *Scuba diving*

9.6.15 Due to the distance of the Hornsea Three array area from the coast (120 km/65 NM) the site is outside the range of most recreational diving vessels for day trips. As such, recreational diving is not expected to occur within the Hornsea Three array area.

9.6.16 There are several dive sites within the landward stretch of the Hornsea Three offshore ECR corridor search area and landfall area.

### *Recreational fishing*

9.6.17 As noted in paragraph 9.6.2, it should be noted that recreational fishing vessels will be considered in the NRA as a specific vessel size category, to be undertaken as part of the shipping and navigation EIA (see Chapter 9, Section 9.2: Shipping and Navigation). The Infrastructure and Other Users EIA will only consider receptors undertaking recreational fishing as an activity.

9.6.18 Recreational fishing day trips typically extend out to a maximum of 60 miles (96.5 km/52.1 NM) due to their licence conditions as Category 2, as stated in MGN 280 (MCA, 2004). Vessels can operate to a greater distance under a Category 1 or 0 licence but the MCA advised (SMart Wind, 2015) that very few vessels have such a licence. Both Charter Boats UK (www.charterboats-uk.co.uk) and UK Charter Boats (www.ukcharterboats.co.uk) do not list vessels which can go beyond 60 miles (96.5 km/52.1 NM).

9.6.19 The Hornsea Three array area is located 120 km/65 NM from the coast at its nearest point and so Category 2 recreational fishing day trips cannot travel out this far.

9.6.20 Inshore recreational fisheries in the Hornsea Three offshore ECR corridor search area include beach angling, beach shellfish fishing and charter vessel sea angling. Recreational fishing in the East Anglia region is subject to controls set by the Eastern Inshore Fisheries and Conservation Authority which includes restrictions on takings for whelk (where an emergency whelk byelaw is currently in place), shrimp and bass (EIFCA, 2016a; 2016b).

9.6.21 Chartered angling trips from boats and the shore occur along the majority of the coast in the area, especially the Humber and Yorkshire coast towns of Humberside, Whitby and Bridlington. The most popular species targeted by recreational anglers are cod *Gadus morhua*, whiting *Merlangius merlangus*, saithe *Pollachius virens*, ling *Molva molva* and Pollack *Pollachius* (Offshore Energy SEA, 2009).

9.6.22 A coastal site at Sheringham, within the Hornsea Three offshore ECR corridor, is listed in the British Sea Fishing list of sites. Species fished here include flatfish such as dab and flounder, bass, whiting and mackerel. Cod can be caught at greater depth.

### *Other offshore wind farms*

9.6.23 The offshore wind farms, under construction or in operation, in the southern North Sea, are shown in Figure 9.19. The nearest under construction wind farm is Dudgeon, located 47 NM/87 km from the Hornsea Three array area and 2.2 NM/4.1 km from the Hornsea Three offshore ECR corridor search area. The nearest operational wind farm is Sheringham Shoal located 58.7 NM/108.8 km from the Hornsea Three array area and 0.6 NM/1.2 km from the Hornsea Three offshore ECR corridor search area. The closest consented, but yet to be constructed offshore wind farm to Hornsea Three, is Project One at a distance of 3.9NM/7.2 km from the Hornsea Three array area and 0.1 NM/0.2 km from the Hornsea Three offshore ECR corridor search area.

### *Cables*

9.6.24 Cables are shown in Figure 9.19. There is one active telecoms cable route, the Norsea Comms operated by Tampnet AS, which crosses north-south across the Hornsea Three array area. There is one disused telecoms cable route with two branches within the Hornsea Three array area.

9.6.25 The Norsea Comms cable crosses the northern end of the Hornsea Three offshore ECR corridor search area. The disused telecoms cable route runs the length of the Hornsea Three offshore ECR corridor search area, coming ashore in the area of the Hornsea Three landfall area.

9.6.26 Where the Hornsea Three cables (either array, interconnector or export cables) will be required to cross an active cable, it is intended that a commercial 'Crossing Agreement' will be entered into with the cable operator. This is a formal arrangement that establishes the responsibilities and obligations of both parties and to allow operations to be managed safely. A crossing agreement based upon the Oil and Gas UK 'Oil and Gas Crossing Agreement Template' will be used for any cable crossings. Where a cable is inactive, the Developer will consult with the cable operator to ascertain if such a crossing agreement is required.

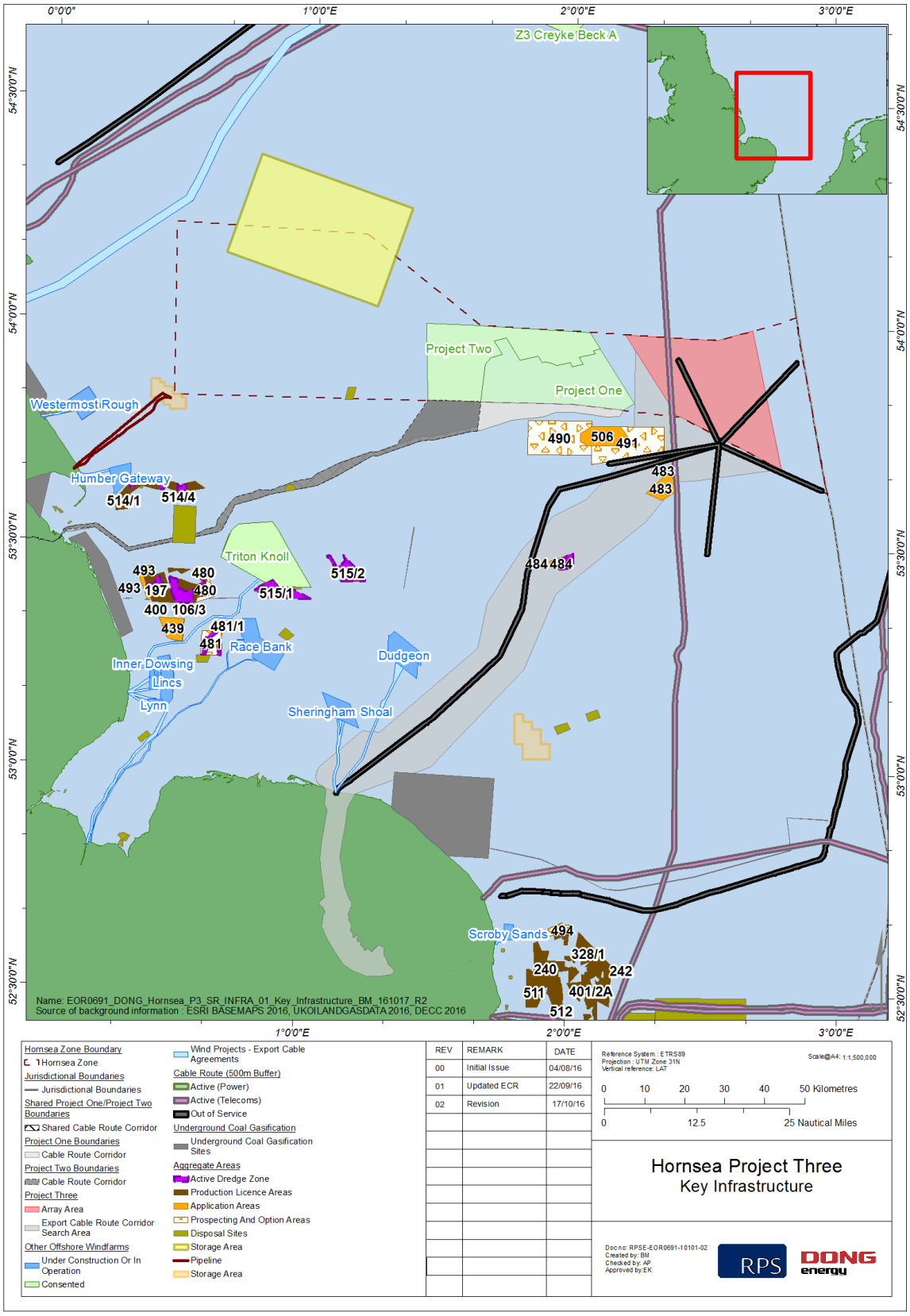



Figure 9.19 Key infrastructure in the study area for infrastructure and other users.

### *Carbon capture and storage, natural gas storage and Underground Coal Gasification (UCG)*

9.6.27 There are no proposed CCS developments, or natural gas storage sites within the Hornsea Three array area or the offshore ECR corridor search area.

9.6.28 There is a Coal Mining Report Area which just intersects the eastern edge of the Hornsea Three offshore ECR corridor search area (Figure 9.19). The Coal Authority granted a Conditional UCG Licence for the East Anglia Offshore Area which ran from 2009 to 2013 and has now expired.

### *Disposal sites*

9.6.29 Chemical weapons and munitions have been dumped at sea since the end of World War One. The UK Offshore Energy SEA does not report any chemical munitions disposal sites in the Regional Sea encompassing the former Hornsea Zone (DECC, 2011c). The UXO survey required as part of pre-construction works for the Hornsea Three array area and offshore ECR corridor will be used to determine any ad-hoc ordnance disposal.

9.6.30 There are no disposal sites within the Hornsea Three array area or the Hornsea Three offshore ECR corridor search area. The nearest disposal site to the Hornsea Three array area is at Babbage at a distance of 68.6 km/37 NM to the west.

### *Marine aggregate extraction*

9.6.31 There are currently no aggregate extraction sites within the Hornsea Three array area, however there are four sites located within or adjacent to the Hornsea Three offshore ECR corridor search area (Figure 9.19).

### *Oil and gas operations*

9.6.32 Licences for the exploration and extraction of oil and gas on the UK Continental Shelf have been offered since 1964 and are granted by the Oil and Gas Authority (OGA). These licences are granted for identified geographical United Kingdom Hydrographic Office (UKHO) areas (blocks and sub-blocks) in consecutive rounds, with the most recent being the 28th licensing round (blocks offered January 2014), and the 29th licensing round was launched in July 2016.

9.6.33 The main type of offshore licence is the Seaward Production Licence. A Seaward Production Licence may cover the whole, or part of a specified block or a group of blocks, and grants exclusive rights to the holders 'to search and bore for, and extract, petroleum' (including gas) in the area covered by the licence. The traditional licence (the most common type of Seaward Production Licence), has an initial term of four years, though can be renewed for a further four years with a third term of 18 years. Longer terms may apply in certain areas. Exclusive rights may also include retained rights within an existing licenced acreage.

9.6.34 Figure 9.20 presents licence blocks located within or surrounding the Hornsea Three array area and Hornsea Three offshore ECR corridor search area. There are no blocks wholly within the Hornsea Three array area. There are 11 currently licenced blocks coincident with the Hornsea Three array area operated by Centrica, INEOS and Shell. There are five open licence blocks coincident with the Hornsea Three array area. There are no additional licence blocks immediately adjacent to the Hornsea Three array area.

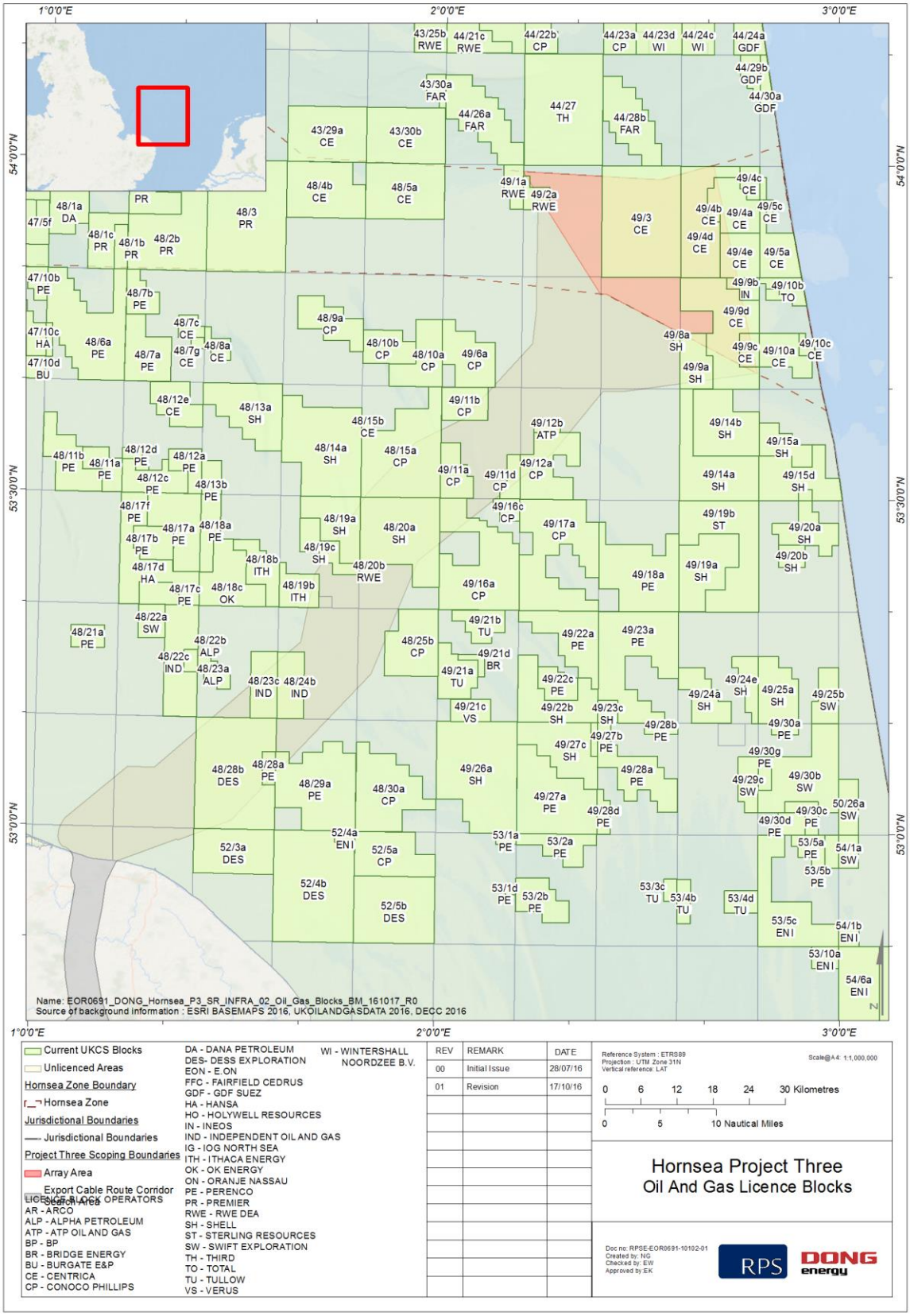



Figure 9.20 Oil and gas licence blocks in the infrastructure and other users study area.

9.6.35 There are 25 currently licenced blocks coincident with the Hornsea Three offshore ECR corridor search area, operated by INEOS, ConocoPhillips, Centrica, Shell, Ithaca, Perenco, Independent and Alpha Petroleum. There are 21 open licence blocks within the Hornsea Three offshore ECR corridor search area.

### *Hydrocarbon fields*

9.6.36 Areas with hydrocarbon potential have been extensively explored, with many fields brought into production in the southern North Sea. There is a consensus view that the great majority of large fields in shelf depth waters (<200 m) have already been discovered (DECC, 2011c), however with technological advances in seismic processing and drilling techniques new fields are still being discovered. There is a strong drive however by the OGA to increase exploration and a competition has been launched prior to the 29th round to stimulate exploration activity, with for the first time seismic data from the Government-funded seismic surveys of the Rockall Basin and Mid North Sea High areas being made available free of charge. These areas are outside of the Hornsea Three development area.

9.6.37 Owing to the geology of the southern North Sea, the hydrocarbon fields in this region are gas or gas condensate fields rather than oil fields (Figure 9.21). There are four gas fields coincident with the Hornsea Three array area, operated by INEOS and Centrica, namely Windermere, Chiswick, Grove and Topaz. There are 20 known gas fields within the Hornsea Three offshore ECR corridor search area. Production has ceased in one of these fields, one is suspended and, one is under development.

### *Surface structures*

9.6.38 Oil and gas related surface structures include permanent and temporary structures. Permanent infrastructure includes gas platforms while temporary structures include drilling rigs and vessels. Relevant information about temporary structures will be ascertained from consultation during the EIA process.

9.6.39 Figure 9.22 presents the current gas platforms located within and near the Hornsea Three development area. There are no gas platforms located within the Hornsea Three array area. Gas platforms are protected by a 500 m safety zone. There are no platforms within a 500 m distance of the Hornsea Three array area. Platforms whose 9 NM consultation zones overlap with the Hornsea Three array area include Schooner-A, Ketch, Chiswick, ST-1, J6A/J6A-CT, Grove, Windermere and Carrack QA. The Cutter platform is within 9 NM of the Hornsea Three array area, but this platform does not have a heli-deck. These platforms have the potential to be affected in regard to aviation access, which is discussed in Chapter 9, Section 9.3 Aviation, Military and Communications.

9.6.40 There are eight active gas platforms located within the Hornsea Three offshore ECR corridor search area. In addition, there is one proposed gas platform located within the Hornsea Three offshore ECR corridor search area.

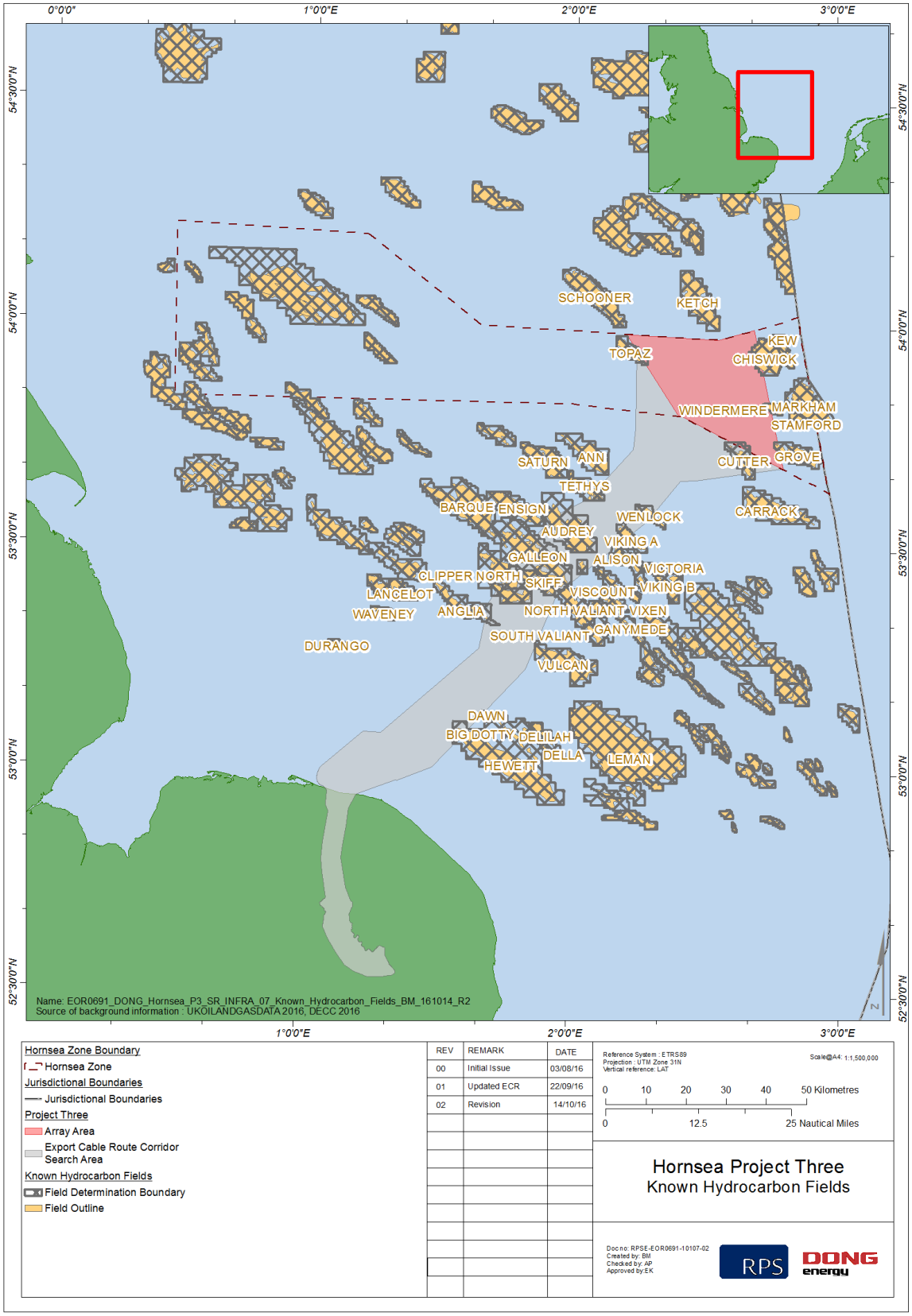



Figure 9.21 Known hydrocarbon fields in infrastructure and other users study area.

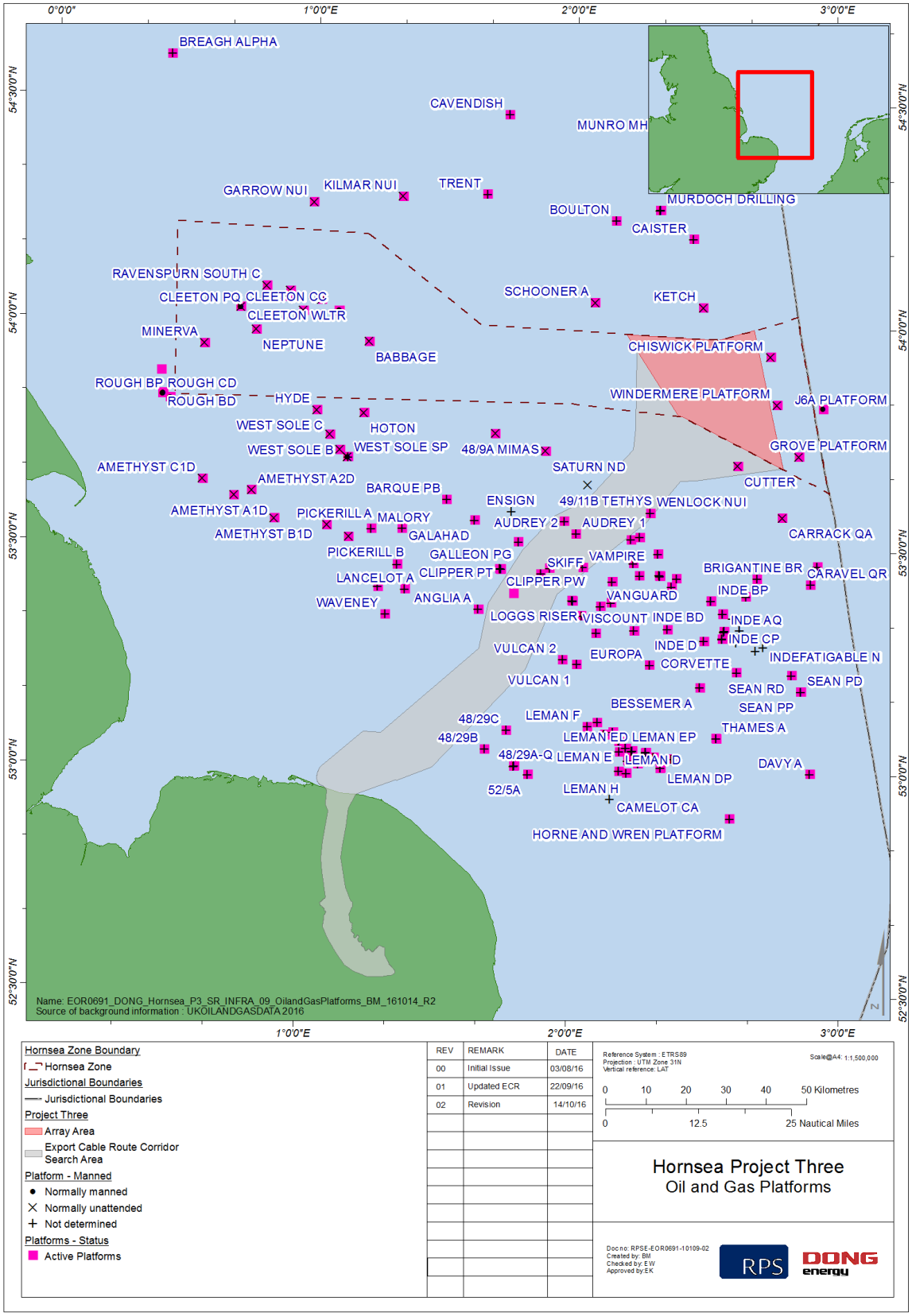



Figure 9.22 Oil and gas platforms within the infrastructure and other users study area.

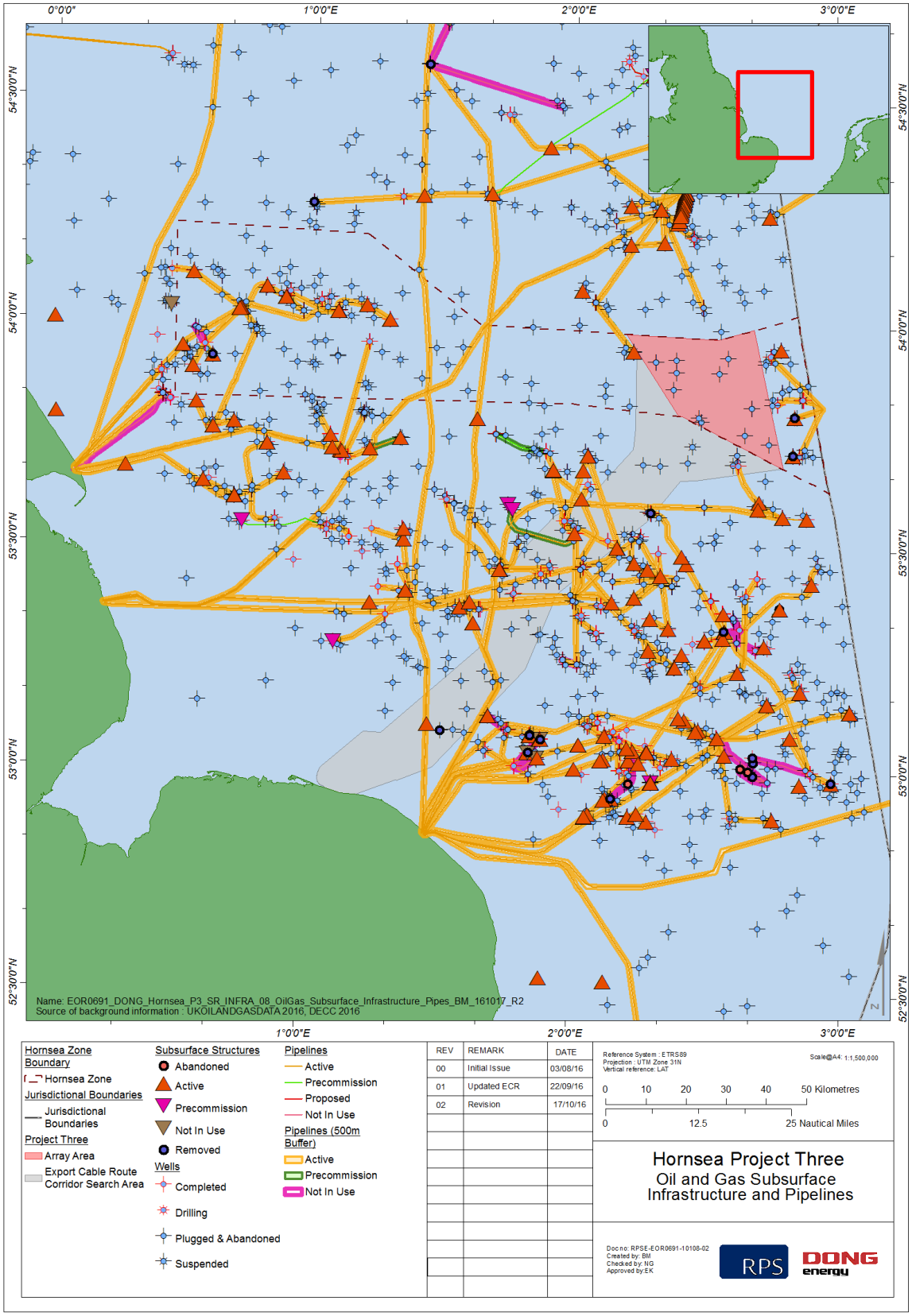



Figure 9.23 Subsurface structures in the infrastructure and other users study area.

### *Subsea structures*

9.6.41 Subsea structures (excluding wells) include protective structures, pipe junctions, manifolds, wellheads, trees and valves. Subsea structures are usually protected by a 500 m safety zone. Subsea structures are shown in Figure 9.23. Subsea structures may require long term access by a mobile rig or vessel which is discussed in Chapter 9, Section 9.3: Aviation, Military and Communications.

9.6.42 There are no subsea structures within the Hornsea Three array area or within a 500 m buffer of the Hornsea Three array area. There is one active subsea structures within the Hornsea Three offshore ECR corridor search area. There is one seabed fastener listed which is an unknown object presenting a potential anchor snagging risk.

### *Wells*

9.6.43 Wells are classified into four categories as described below:

- Completed wells – When a well is completed it is ready for production (or injection);
- Drilling wells – Wells in the process of being drilled. These are temporary in nature, as drilling lasts several months. These could be one of the following:
  - Exploration well: A well drilled as part of an exploration programme for information gathering purposes, to determine the presence of oil and gas;
  - Appraisal well: A well drilled as part of an appraisal drilling programme which is carried out to determine the physical extent of reserves and the likely production rate of a field;
  - Production well: A well, intended to produce gas from an already appraised field or reserve; or
  - Development well: A well drilled within a proved production field or area of an oil or gas reservoir, to the depth of a stratigraphic horizon known to be productive.
- Plugged and abandoned wells – Where work has ceased on a well because it has become non-productive or non-viable. The standard requirement when a well is to be plugged and abandoned is to remove the well head and cut and remove the casings 10 feet below the seabed (Oil and Gas UK, 2015). The well is plugged with cement plugs and salvage of all recoverable equipment is undertaken; and
- Suspended wells – After initial drilling, a well may be temporarily suspended if an operator intends to carry out further operations at a later date. In this event the well head may be left protruding a metre or two above the seabed and a guide base is left on the seabed to facilitate re-entry.

9.6.44 Completed and drilling wells typically have a 500 m safety zone. Suspended, and plugged and abandoned wells do not have safety zones attached to their location. Completed and suspended wells may require long term access in the form of a mobile rig or vessel which is discussed in Chapter 9, Section 9.3: Aviation, Military and Communications.

9.6.45 There is one suspended well and 13 plugged and abandoned wells within the Hornsea Three array area. There are no additional wells within 500 m of the Hornsea Three array area. There are 38 completed wells, and 10 suspended wells in the Hornsea Three offshore ECR corridor search area. There are a further 66 plugged and abandoned wells within the Hornsea Three offshore ECR corridor search area.

### *Pipelines*

9.6.46 There are no pipelines which intersect the Hornsea Three array area. Pipelines are usually protected by a 500 m safety zone. There are no pipelines within 500 m of the Hornsea Three array area.

9.6.47 There are 47 active pipelines which intersect the Hornsea Three offshore ECR corridor search area. Where the Hornsea Three export cables will be required to cross an active pipeline, it is intended that a commercial 'Crossing Agreement' will be entered into with the pipeline operator. This is a formal arrangement that establishes the responsibilities and obligations of both parties and to allow operations to be managed safely. A crossing agreement based upon the Oil and Gas UK 'Oil and Gas Crossing Agreement Template' will be used for the pipeline crossings. Where the Hornsea Three export cables will be required to come within 500 m of an active pipeline, it is intended that a commercial Proximity Agreement' will be entered into with the pipeline operator. This, in the same way as the crossing agreement, establishes the responsibilities and obligations of both parties and to allow operations to be managed safely. The pipeline locations are shown in Figure 9.23.

### *Services associated with the oil and gas industry*

9.6.48 The following services are associated with the oil and gas industry:

- Helicopters – The oil and gas industry relies on helicopters for personnel transfer. Helicopter and associated aviation aspects are considered separately in Chapter 9, Section 9.3: Aviation, Military and Communications;
- Shipping – The oil and gas industry requires supply or support vessels for its operations. Shipping aspects are considered separately in Chapter 9, Section 9.2: Shipping and Navigation;
- REWS – A variety of early warning systems are used on oil and gas platforms to prevent vessel collision with a platform, including REWS, which utilises radar mounted on the platform which detects approaching vessels. The gas platforms equipped with REWS and located close to the Hornsea Three array area that have been identified through consultation (DONG Energy 2015) are presented in Figure 9.24. The operational range of several radars may overlap with the Hornsea Three array area. An assessment will be conducted by Manchester University on the impact of the Hornsea Three array on REWS; and
- Seismic survey operations – Carried out by the oil and gas industry in order to identify sub-surface geological structures that might trap oil and gas deposits. The technique involves releasing pulses of acoustic energy along designated lines, the energy penetrates the sub-surface rocks and is reflected back to the surface where it can be detected by acoustic transducers and relayed to a recording vessel. The potential for subsea noise generated from piling activities to interfere with the seismic acoustic signal has been identified and will be assessed in the infrastructure and other users EIA. Subsea noise, resulting from Hornsea Three, is further discussed within Chapter 7, Section 7.2: Subsea Noise.

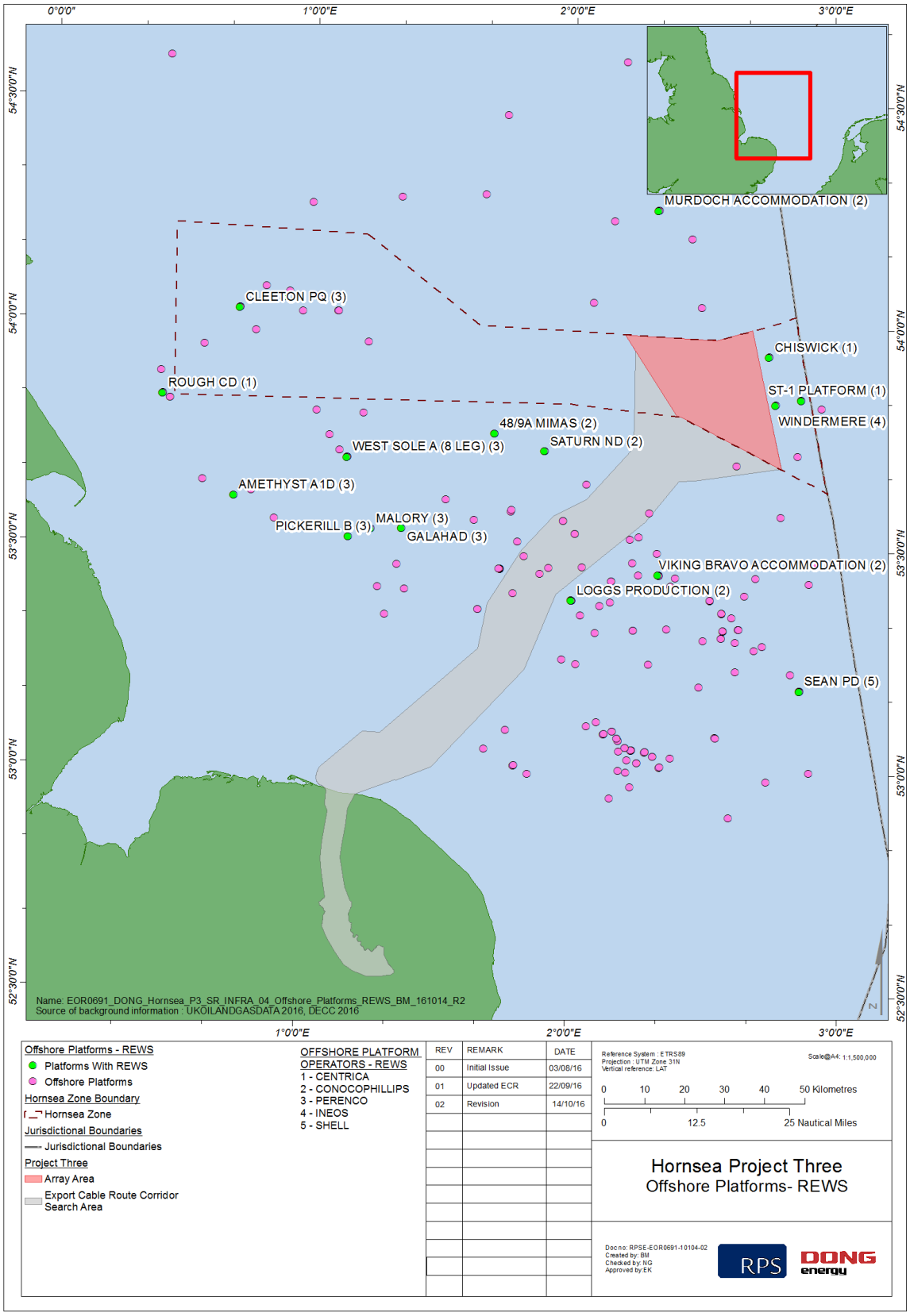



Figure 9.24 Platforms with REWS installed in the vicinity of the Hornsea Three array area.

### Proposed approach to the Environmental Impact Assessment (EIA)

9.6.49 The infrastructure and other users EIA will follow the methodology set out in Chapter 5: Environmental Impact Assessment Methodology. Specific to the infrastructure and other users EIA, the following guidance documents will also be considered:

- The RYA's Position on Offshore Renewable Energy Developments: Paper 1 (of 43) – Wind Energy, September 2015 (RYA, 2015);
- Guidance on Environmental Impact Assessment of Offshore Renewable Energy Development on Surfing Resources and Recreation (SAS, 2009);
- European Subsea Cables UK Association (ESCA) Guideline No 6, The Proximity of Offshore Renewable Energy Installations and Submarine Cable Infrastructure in UK Waters (ESCA, 2016);
- The International Cable Protection Committee (ICPC) has issued a series of recommendations for marine cables, specifically:
  - Recommendation No.2. Recommended Routing and Reporting Criteria for Cables in Proximity to Others (ICPC, 2015);
  - Recommendation No.3. Criteria to be Applied to Proposed Crossings Submarine Cables and/or Pipelines (ICPC, 2014); and
  - Recommendation No.13. The Proximity of Offshore Renewable Wind Energy Installations and Submarine Cable Infrastructure in National Waters (ICPC, 2013).
- National and Regional Guidelines for Aggregates Provision in England 2005 to 2020, (DCLG, 2009);
- Guidelines for the Management of Marine Sediment Extraction (ICES, 2003);
- MGN 543: (M+F) Safety of Navigation. Offshore Renewable Energy Installations – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2016);
- Oil and Gas Licencing Rounds (OGA, 2016);
- Oil and Gas UKOP115, - Pipeline Crossing Agreement and Proximity Agreement Pack (Oil and Gas UK, 2015); and
- TCE Guidance: Offshore wind farms and electricity export cables – crossing agreements (TCE, 2012).

### Potential project impacts

9.6.50 A range of potential impacts on infrastructure and other users have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Hornsea Three.

9.6.51 Oil and gas operators have interests in several different activities which are potentially impacted by Hornsea Three. For this reason a summary table will be provided within the EIA in order to sign post the operator to all relevant sections of the EIA where potential impacts on their interests or activities are discussed. This is presented as a preliminary guide in Table 9.15 and will be expanded during the EIA process.

9.6.52 The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 9.16 (recreational users and recreational fishing), Table 9.17 (aggregate extraction, UCG, cables and pipelines) and Table 9.18 (oil and gas operators, and infrastructure), together with a description of any additional data collection and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

9.6.53 Indirect impacts upon aggregate resource and subsea infrastructure may arise from construction activities mobilising sediment, leading to subsequent deposition of material, and also potential changes to sediment transport pathways during operation. These processes are considered in Chapter 7, Section 7.1: Marine Processes and the indirect impacts upon aggregate resource and subsea infrastructure is considered within the infrastructure and other users EIA.

9.6.54 On the basis of the baseline infrastructure and other users information currently available and the project description outlined in Chapter 3: Project Description, a number of impacts are proposed to be scoped out of the assessment for infrastructure and other users, specifically on recreational users and recreational fishing. These impacts are outlined, together with a justification for scoping them out, in Table 9.16.

### Measures adopted as part of the project

9.6.55 Measures adopted as part of the project will include:

- Promulgation of information including regular Notices to Mariners, navigational aids and marine charting updates will be utilised;
- Continued consultation with oil and gas operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities;
- The crossing or laying of array, interconnector and export cables, and the foundations of infrastructure (such as turbines, platforms and substations), from Hornsea Three over or adjacent to an existing or future pipelines or cables, will be subject to crossing/proximity agreements between the two parties, prior to the start of the construction phase; and
- Development of, and adherence to, a Decommissioning Plan which will include consideration of existing crossing/proximity agreements for existing pipelines and cables.

9.6.56 The requirement and feasibility of additional measures will be dependent on the significance of the effects on infrastructure and other users and will be consulted upon with statutory consultees throughout the EIA process.

Table 9.15 Summary of potential Hornsea Three impacts on oil and gas operators.

| Operator | Potential impacts | | | | | |
|---|---|---|---|---|---|---|
| | Activities within licenced acreage | REWS | Helicopter access to platforms | Helicopter access to subsea structures* | Vessel access** | Pipelines |
| Centrica | Assessed in Infrastructure and Other Users, Table 9.18. | Assessed in Infrastructure and Other Users, Table 9.18. | Assessed in Aviation, Military and Communications (see Chapter 9, Section 9.3). | Assessed in Aviation, Military and Communications (see Chapter 9, Section 9.3). | Assessed in Shipping and Navigation (see Chapter 9, Section 9.2). | Assessed in Infrastructure and Other Users, Table 9.17. |
| INEOS | Assessed in Infrastructure and Other Users, Table 9.18. | Assessed in Infrastructure and Other Users, Table 9.18. | Assessed in Aviation, Military and Communications (see Chapter 9, Section 9.3). | Assessed in Aviation, Military and Communications (see Chapter 9, Section 9.3). | Assessed in Shipping and Navigation (see Chapter 9, Section 9.2). | Assessed in Infrastructure and Other Users, Table 9.17. |
| Shell | Assessed in Infrastructure and Other Users, Table 9.18. | Assessed in Infrastructure and Other Users, Table 9.18. | Assessed in Aviation, Military and Communications (see Chapter 9, Section 9.3). | Assessed in Aviation, Military and Communications (see Chapter 9, Section 9.3). | Assessed in Shipping and Navigation (see Chapter 9, Section 9.2). | Assessed in Infrastructure and Other Users, Table 9.17. |
| ConocoPhillips | Assessed in Infrastructure and Other Users, Table 9.18. | Assessed in Infrastructure and Other Users, Table 9.18. | Assessed in Aviation, Military and Communications (see Chapter 9, Section 9.3). | Not assessed as no subsea structures requiring helicopter access in the vicinity of Hornsea Three. | Assessed in Shipping and Navigation (see Chapter 9, Section 9.2). | Assessed in Infrastructure and Other Users, Table 9.17. |
| Tullow | Not assessed as no activities within licenced acreage. | Not assessed as no platforms with REWS in the vicinity of Hornsea Three. | Not assessed as no platforms requiring helicopter access in the vicinity of Hornsea Three. | Not assessed as no subsea structures requiring helicopter access in the vicinity of Hornsea Three. | Assessed in Shipping and Navigation (see Chapter 9, Section 9.2). | Not assessed as no pipelines in the vicinity of Hornsea Three. |
| Ithaca | Assessed in Infrastructure and Other Users, Table 9.18. | Not assessed as no platforms with REWS in the vicinity of Hornsea Three. | Not assessed as no platforms requiring helicopter access in the vicinity of Hornsea Three. | Not assessed as no subsea structures requiring helicopter access in the vicinity of Hornsea Three. | Assessed in Shipping and Navigation (see Chapter 9, Section 9.2). | Assessed in Infrastructure and Other Users, Table 9.17. |
| Perenco | Assessed in Infrastructure and Other Users, Table 9.18. | Assessed in Infrastructure and Other Users, Table 9.18. | Not assessed as no platforms requiring helicopter access in the vicinity of Hornsea Three. | Not assessed as no subsea structures requiring helicopter access in the vicinity of Hornsea Three. | Assessed in Shipping and Navigation (see Chapter 9, Section 9.2). | Assessed in Infrastructure and Other Users, Table 9.17. |

| Operator | Potential impacts | | | | | |
|---|---|---|---|---|---|---|
| | Activities within licenced acreage | REWS | Helicopter access to platforms | Helicopter access to subsea structures* | Vessel access** | Pipelines |
| Independent | Assessed in Infrastructure and Other Users, Table 9.18. | Not assessed as no platforms with REWS in the vicinity of Hornsea Three. | Not assessed as no platforms requiring helicopter access in the vicinity of Hornsea Three. | Not assessed as no subsea structures requiring helicopter access in the vicinity of Hornsea Three. | Assessed in Shipping and Navigation (see Chapter 9, Section 9.2). | Not assessed as no pipelines in the vicinity of Hornsea Three. |
| Alpha Petroleum | Assessed in Infrastructure and Other Users, Table 9.18. | Not assessed as no platforms with REWS in the vicinity of Hornsea Three. | Not assessed as no platforms requiring helicopter access in the vicinity of Hornsea Three. | Not assessed as no subsea structures requiring helicopter access in the vicinity of Hornsea Three. | Assessed in Shipping and Navigation (see Chapter 9, Section 9.2). | Assessed in Infrastructure and Other Users, Table 9.17. |
| Total | Not assessed as no activities within the licenced acreage. | Not assessed as no platforms with REWS in the vicinity of Hornsea Three. | Not assessed as no platforms requiring helicopter access in the vicinity of Hornsea Three. | Not assessed as no subsea structures requiring helicopter access in the vicinity of Hornsea Three. | Assessed in Shipping and Navigation (see Chapter 9, Section 9.2). | Not assessed as no pipelines in the vicinity of Hornsea Three. |
| Wintershall | Not assessed as no activities within the licenced acreage. | Not assessed as no platforms with REWS in the vicinity of Hornsea Three. | Not assessed as no platforms requiring helicopter access in the vicinity of Hornsea Three. | Not assessed as no subsea structures requiring helicopter access in the vicinity of Hornsea Three. | Assessed in Shipping and Navigation (see Chapter 9, Section 9.2). | Not assessed as no pipelines in the vicinity of Hornsea Three. |
| eni | Not assessed as no activities within the licenced acreage. | Not assessed as no platforms with REWS in the vicinity of Hornsea Three. | Not assessed as no platforms requiring helicopter access in the vicinity of Hornsea Three. | Not assessed as no subsea structures requiring helicopter access in the vicinity of Hornsea Three. | Assessed in Shipping and Navigation (see Chapter 9, Section 9.2). | Assessed in Infrastructure and Other Users, Table 9.17. |
| BBL | Not assessed as no activities within the licenced acreage. | Not assessed as no platforms with REWS in the vicinity of Hornsea Three. | Not assessed as no platforms requiring helicopter access in the vicinity of Hornsea Three. | Not assessed as no subsea structures requiring helicopter access in the vicinity of Hornsea Three. | Assessed in Shipping and Navigation (see Chapter 9, Section 9.2). | Assessed in Infrastructure and Other Users, Table 9.17. |

| Operator | Potential impacts | | | | | |
|---|---|---|---|---|---|---|
| | Activities within licenced acreage | REWS | Helicopter access to platforms | Helicopter access to subsea structures* | Vessel access** | Pipelines |
| Interconnector | Not assessed as no activities within the licenced acreage. | Not assessed as no platforms with REWS in the vicinity of Hornsea Three. | Not assessed as no platforms requiring helicopter access in the vicinity of Hornsea Three. | Not assessed as no subsea structures requiring helicopter access in the vicinity of Hornsea Three. | Assessed in Shipping and Navigation (see Chapter 9, Section 9.2). | Assessed in Infrastructure and Other Users, Table 9.17. |
| Faroe Petroleum | Not assessed as no activities within the licenced acreage. | Not assessed as no platforms with REWS in the vicinity of Hornsea Three. | Assessed in Aviation, Military and Communications (see Chapter 9, Section 9.3). | Assessed in Aviation, Military and Communications (see Chapter 9, Section 9.3). | Assessed in Shipping and Navigation (see Chapter 9, Section 9.2). | Not assessed as no pipelines in the vicinity of Hornsea Three. |
| GDF Suez | Not assessed as no activities within the licenced acreage. | Not assessed as no platforms with REWS in the vicinity of Hornsea Three. | Not assessed as no platforms requiring helicopter access in the vicinity of Hornsea Three. | Assessed in Aviation, Military and Communications (see Chapter 9, Section 9.3). | Not assessed as no licences, platforms, subsea structures of wells that require vessel access within the Hornsea Three development area. | Not assessed as no pipelines in the vicinity of Hornsea Three. |

* Note - *Helicopter access considerations include operators of subsea structures (active) and wells (completed or suspended) within 9 NM of the Hornsea Three array area.*

**Note - *Vessel access considerations include operators of licence, platforms, subsea structures (active) and wells (completed or suspended) in the Hornsea Three development area and advisory safety distances.*

Table 9.16 Impacts proposed to be scoped into the Hornsea Three assessment for infrastructure and other users: recreational users and recreational fishing.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Displacement of recreational craft. | Safety zones and advisory safety distances during cable installation and offshore HVAC booster station(s) construction activities have the potential to impact recreational activities in particular as the Hornsea Three offshore ECR corridor crosses a racing area, potentially resulting in a loss of recreational resource. | UK Atlas of Recreational Boating, SeaSearch, and Finstrokes datasets will be used to inform the infrastructure and other users EIA. Furthermore, consultation will be undertaken to inform the assessment. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 2 | Displacement of recreational fishing vessels. | Safety zones and advisory safety zones during cable and offshore HVAC booster station(s) construction activities have the potential to impact recreational fishing particularly in the coastal areas of the Hornsea Three offshore ECR corridor, where recreational fishing is popular, potentially resulting in a loss of recreational resource. | Datasets from the offshore energy SEA (2009), Sea Angling 2012 (Defra, 2013) and Sea Angling 2016 (if available) will be used to inform the infrastructure and other users EIA. Furthermore, information from fishing density data (MMO) and the maritime traffic surveys undertaken as part of the NRA (Chapter 9, Section 9.2: Shipping and Navigation) shall be used to inform the assessment. | Maritime traffic survey (Chapter 9, Section 9.2: Shipping and Navigation). |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Operation and maintenance*** | | | | |
| 3 | Displacement of recreational craft and recreational fishing vessels. | Advisory safety distances around vessels during major maintenance activity along the Hornsea Three offshore ECR corridor and 500 m safety zones around potential offshore HVAC booster station(s) have the potential to impact recreational activities particularly as the ECR corridor search area crosses a racing area, potentially resulting in the loss of recreational resource. | As above for infrastructure and other users impact no. 1 and 2. | As above for infrastructure and other users impact no. 2 |
| ***Decommissioning*** | | | | |
| 4 | Displacement of recreational craft. | Safety zones and advisory safety distances within the Hornsea Three offshore ECR corridor during decommissioning activities have the potential to impact recreational activities in particular as the offshore ECR corridor search area crosses a racing area, potentially resulting in the loss of recreational resource. | As above for infrastructure and other users impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 5 | Displacement of recreational fishing vessels. | Safety zones and advisory safety distances within the Hornsea Three offshore ECR corridor during decommissioning activities have the potential to impact recreational fishing particularly in the coastal areas of the Hornsea Three offshore ECR corridor, potentially resulting in the loss of recreational resource. | As above for infrastructure and other users impact no. 2. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

Table 9.17 Impacts proposed to be scoped into the Hornsea Three assessment for infrastructure and other users: aggregate extraction, UCG, cables and pipelines.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 6 | Impacts to existing pipelines or cables or restrictions on access to pipelines or cables. | There are several cables and pipelines within the Hornsea Three development area. The installation of array, offshore interconnector and export cables and the foundations of infrastructure (such as turbines, platforms and substations), may affect existing pipelines or cables or restrict access to pipelines or cables. Crossing and proximity agreements will be required with known existing pipeline and cables operators. | Datasets form SeaZone Solutions Ltd, Kingfisher Information Service – Cable Awareness, DECC and UKOilandGasData will be used to inform the infrastructure and other users EIA. In addition, consultation will be undertaken with cable and pipeline operators to inform the assessment. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 7 | Increased suspended sediment concentrations and deposition. | There are four aggregate extraction areas within and a further two adjacent to the Hornsea Three offshore ECR corridor. Installation of offshore infrastructure has the potential to lead to increased suspended sediment concentrations and deposition, which could cause a change in aggregate resource in aggregate extraction areas. | Datasets from TCE Aggregate Licence Area Charts and BMAPA dredger reports will be used to inform the infrastructure and other users EIA. The impact of Hornsea Three on marine processes will be assessed (see Chapter 7, Section 7.1: Marine Processes) which will inform the assessment of indirect impacts on aggregate extraction areas. | See Chapter 7, Section 7.1: Marine Processes). |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Operation and maintenance*** | | | | |
| 8 | Temporary loss of access to existing pipelines or cables for repair or maintenance. | There are several cables and pipelines within the Hornsea Three development area. In the event that safety zones around infrastructure within the Hornsea Three array area and the potential offshore HVAC booster station(s) are required, a temporary loss of access to existing pipelines or cables for repair or maintenance may occur. Crossing and proximity agreements will be required with known existing pipeline and cables operators. | As above for infrastructure and other users impact no. 6. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 9 | Alterations to sediment transport pathways. | There are four aggregate extraction areas within and a further two adjacent to the Hornsea Three offshore ECR corridor search area. Presence of offshore infrastructure has the potential to affect sediment transport pathways, which could cause a change in aggregate resource in aggregate extraction areas. | As above for infrastructure and other users impact no. 7. | As above for infrastructure and other users impact 7. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Decommissioning*** | | | | |
| 10 | Direct impacts to existing pipelines or cables or restrictions on access to existing pipelines or cables. | There are several cables and pipelines within the Hornsea Three development area. The physical removal of the array, offshore interconnector and export cables and the foundations for other infrastructure, may affect existing pipelines or cables or restrict access to existing pipelines or cables. Crossing and proximity agreements will be required with known existing pipeline and cables operators which will be required to consider decommissioning activities. | As above for infrastructure and other users impact no. 6. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 11 | Increased suspended sediment concentrations and deposition. | There are four aggregate extraction areas within and a further two adjacent to the Hornsea Three offshore ECR corridor search area. Removal of offshore infrastructure has the potential to lead to increased suspended sediment concentrations and deposition, which could cause a change in aggregate resource in aggregate extraction areas. | As above for infrastructure and other users impact no. 7. | As above for infrastructure and other users impact no. 7. |

Table 9.18 Impacts proposed to be scoped into the Hornsea Three assessment for infrastructure and other users: oil and gas operations, and infrastructure.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 12 | Reduction in potential seismic survey area within the Hornsea Three array area. | There are currently 11 licenced blocks coincident with the Hornsea Three array area. Safety zones and advisory safety distances around Hornsea Three array area may cause a reduction in potential seismic survey area. | The DECC, OGA and UKOilandGasData datasets will be used to inform the infrastructure and other users EIA. In addition, consultation with each potentially affected licence block operator will be undertaken to inform the assessment. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 13 | Restriction on drilling and the placement of infrastructure within the Hornsea Three array area and within 500 m from the boundary of the Hornsea Three array area. | There are currently 11 licenced blocks coincident with the Hornsea Three array area. | As above for infrastructure and other users impact no. 12. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 14 | Reduction in potential seismic survey area along the Hornsea Three offshore ECR corridor. | There are 25 currently licenced blocks coincident with the Hornsea Three offshore ECR corridor search area. Safety zones around the potential offshore HVAC booster station(s) and advisory safety distances along the Hornsea Three offshore ECR corridor may cause a reduction in potential seismic survey area. | As above for infrastructure and other users impact no. 12. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 15 | Restriction on drilling and the placement of infrastructure within the offshore ECR corridor and within 500 m from the boundary of the Hornsea Three offshore ECR corridor. | There are 25 currently licenced blocks coincident with the Hornsea Three offshore ECR corridor search area. | As above for infrastructure and other users impact no. 12. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 16 | The piling of wind turbine and substation foundations will generate underwater noise that may Acoustic interference with oil and gas seismic survey operations. | There are 11 currently licenced blocks coincident with the Hornsea Three array area and 25 currently licenced blocks coincident with the Hornsea Three offshore ECR corridor search area. The piling of wind turbine and substation foundations will generate underwater noise that may acoustically interfere with oil and gas seismic survey operations. | A review of the data sources set out in Table 9.14 will be carried out in order to ensure that the Hornsea Three infrastructure and other users EIA will be informed by the latest available datasets. Underwater noise modelling will also be undertaken (see Chapter 7, Section 7.2: Subsea Noise) which will be used to inform this assessment. In addition, consultation with each potentially affected licence block operator will be undertaken to inform the assessment. | See Chapter 7, Section 7.2: Subsea Noise. |
| ***Operation and maintenance*** | | | | |
| 17 | Reduction in potential seismic survey area within the Hornsea Three array area. | There are 11 currently licenced blocks coincident with the Hornsea Three array area. The presence of infrastructure within the Hornsea Three array area may cause a reduction in potential seismic survey area. | As above for infrastructure and other users impact no. 12. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 18 | Restriction on drilling and the placement of infrastructure within the Hornsea Three array area and within 500 m from the boundary of the Hornsea Three array area. | There are 11 currently licenced blocks coincident with the Hornsea Three array area. | As above for infrastructure and other users impact no. 12. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 19 | Reduction in potential seismic survey area along the Hornsea Three offshore ECR corridor. | There are 25 currently licenced blocks coincident with the Hornsea Three offshore ECR corridor search area. In the event that safety zones around the potential offshore HVAC booster station(s) are required during maintenance activities, a reduction in potential seismic survey area may occur. | As above for infrastructure and other users impact no. 12. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 20 | Restriction on drilling and the placement of infrastructure within the Hornsea Three offshore ECR corridor and within 500 m from the boundary of the Hornsea Three offshore ECR corridor. | There are 25 currently licenced blocks coincident with the Hornsea Three offshore ECR corridor search area. | As above for infrastructure and other users impact no. 12. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 21 | Interference with the performance of the REWS located on oil and gas platforms. | The presence of new wind turbines in previously open sea areas may cause interference with the performance of the REWS located on oil and gas platforms. There are several platforms with REWS in the vicinity of the Hornsea Three array area which have the potential to be affected by the wind turbines within the Hornsea Three array area. | The baseline has been informed by consultation undertaken for the Project Two EIA. Further Hornsea Three specific consultation will be required to identify platforms with REWS and with regard to the REWS range and capabilities which will be used to inform the modelling to be carried out by Manchester University for the Infrastructure and Other Users EIA. | REWS modelling to be carried out by Manchester University. |
| ***Decommissioning*** | | | | |
| 22 | Reduction in potential seismic survey area within the Hornsea Three array area. | There are 11 currently licenced blocks coincident with the Hornsea Three array area. Safety zones and advisory safety distances during decommissioning of the Hornsea Three array area may cause a reduction in potential seismic survey area. | As above for infrastructure and other users impact no. 12. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 23 | Restriction on drilling and the placement of infrastructure within the Hornsea Three array area and within 500 m from the boundary of the Hornsea Three array area during decommissioning. | There are 11 currently licenced blocks coincident with the Hornsea Three array area. | As above for infrastructure and other users impact no. 12. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 24 | Reduction in potential seismic survey area within the Hornsea Three offshore ECR corridor. | There are 25 currently licenced blocks coincident with the Hornsea Three offshore ECR corridor search area. Safety zones around the potential offshore HVAC booster station(s) and advisory safety distances along the ECR corridor during decommissioning may cause a reduction in potential seismic survey area. | As above for infrastructure and other users impact no. 12. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 25 | Restriction on drilling and the placement of infrastructure within the Hornsea Three offshore ECR corridor and within 500 m from the boundary of the Hornsea Three offshore ECR corridor during decommissioning. | There are 25 currently licenced blocks coincident with the Hornsea Three offshore ECR corridor search area. | As above for infrastructure and other users impact no. 12. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

Table 9.19 Impacts proposed to be scoped out of the assessment for infrastructure and other users: recreational users and recreational fishing.

| Impact No. | Impact | Justification |
|---|---|---|
| ***Construction*** | | |
| 1 | Safety zones and advisory safety distances within the Hornsea Three array area may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource. | Due to the distance offshore of the Hornsea Three array area (65 NM at closest point), kite surfing, surfing, windsurfing, sea/surf kayaking, canoeing, self-contained underwater breathing apparatus (SCUBA) and recreational sailing and recreational fishing are considered extremely unlikely to take place in this area. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Operation and maintenance*** | | |
| 2 | The physical presence of the Hornsea Three array area and safety zones may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource. | Due to the distance offshore of the Hornsea Three array area (65 NM at closest point), kite surfing, surfing, windsurfing, sea/surf kayaking, canoeing, SCUBA and recreational sailing and recreational fishing, are considered extremely unlikely to take place in this area. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Decommissioning*** | | |
| 3 | Safety zones and advisory safety distances within the Hornsea Three array area may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource. | Due to the distance offshore of the Hornsea Three array area (65 NM at closest point), kite surfing, surfing, windsurfing, sea/surf kayaking, canoeing, SCUBA and recreational sailing and recreational fishing are considered extremely unlikely to take place in this area. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |

### Potential cumulative impacts

9.6.57 There is the potential for cumulative effects to occur from other projects or activities within the southern North Sea area where projects or activities could act collectively with Hornsea Three to affect infrastructure and other user receptors.

9.6.58 The cumulative assessment will consider the maximum adverse scenarios for each of the projects or activities. The following projects or activities will be considered within the infrastructure and other user study area:

- Other offshore wind farms;
- Any new or proposed pipelines and cables, CCS, natural gas storage and UCG, disposal sites; and
- Any new or changes to aggregate extraction areas.

9.6.59 The cumulative assessment will consider the same impacts across all phases of the project, as outlined in Table 9.16 to Table 9.18 for the Hornsea Three alone assessment.

### Potential transboundary impacts

9.6.60 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there was the potential for transboundary effects with regard to REWS coverage from gas platforms in the Dutch sector of the southern North Sea.

9.6.61 This potential impact will be considered further through consultation in the EIA for infrastructure and other users.

# 10. Onshore Physical Environment

## 10.1 Geology and ground conditions

### Introduction

10.1.1 This section of the Scoping Report identifies the onshore geology and ground conditions of relevance to Hornsea Three and considers the likely significant impacts and effects from the construction, operation and maintenance, and decommissioning of the onshore components (above MHWS mark) of Hornsea Three on geology and ground conditions on these receptors.

### Study area

10.1.2 The geology and ground conditions study area is, at this stage, defined as the areas within the Hornsea Three onshore ECR corridor search area landward of MHWS (see Figure 10.1).

10.1.3 Upon finalisation of the Hornsea Three onshore ECR corridor (including the proposed locations for the onshore HVAC/HVDC substation and onshore HVAC booster station), the geology and ground conditions study area will be refined to include both the temporary and permanent land take for the onshore elements of Hornsea Three.

### Baseline data

10.1.4 An initial desk based review of literature and data sources to support the Scoping Report has highlighted the following data sources which provide coverage of the onshore ECR corridor search area:

- British Geological Survey (BGS) 1:50,000 geological mapping 131 Cromer, 132/148 Mundesley and North Walsham, and 147 Aylsham;
- BGS Aquifer Designation Maps;
- BGS borehole records obtained from the BGS website;
- Environment Agency (EA) information on groundwater vulnerability and Source Protection Zones (SPZs) (http://maps.environment-agency.gov.uk/wiyby);
- County Geodiversity Sites – Norfolk County Council (www.norfolk.gov.uk); and
- MAGIC (www.magic.gov.uk).

10.1.5 In addition to the above data sources, site-specific data will be obtained from Envirocheck/Groundsure for the Hornsea Three geology and ground conditions study area once the onshore ECR corridor has been refined.

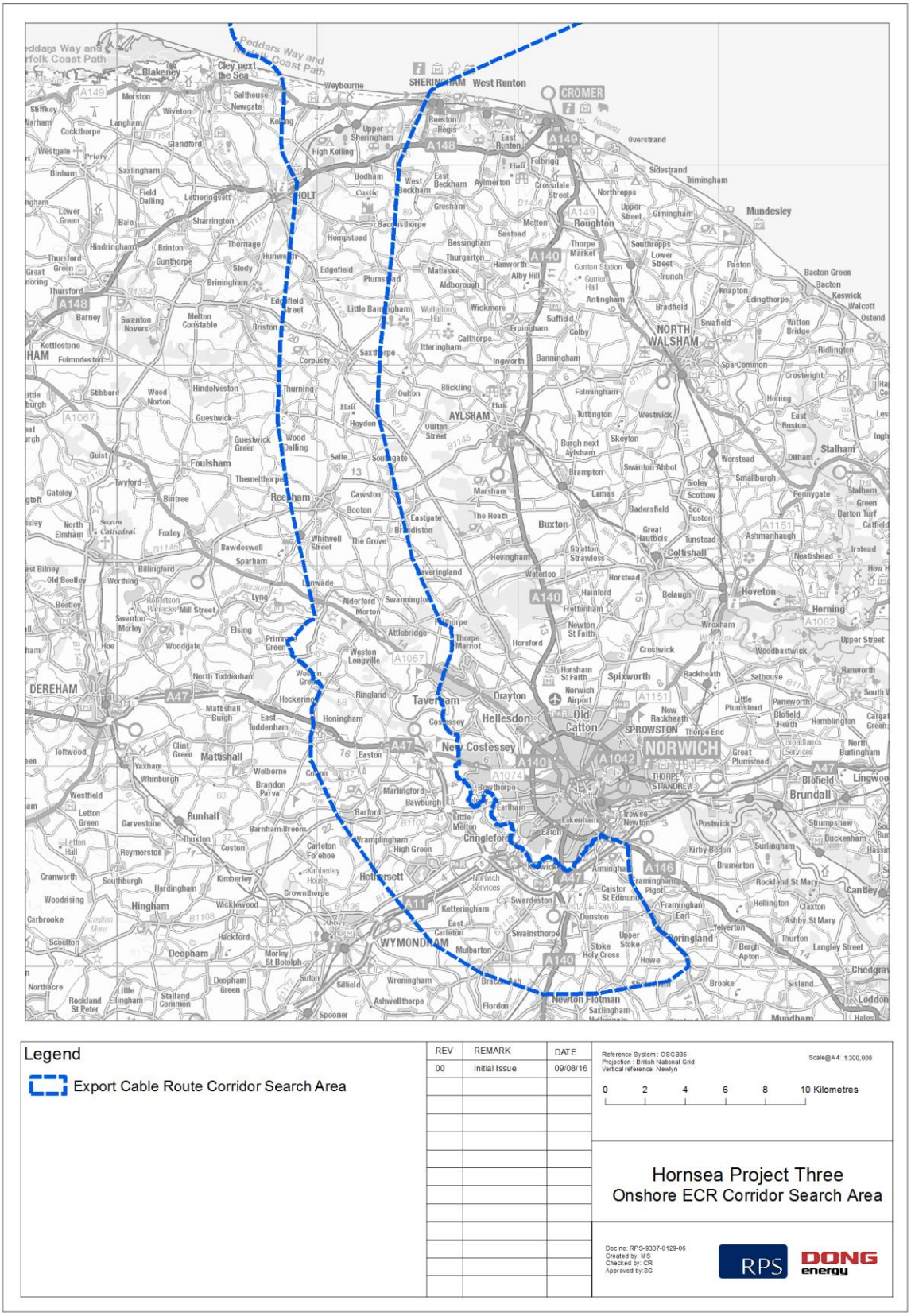



Figure 10.1 Onshore ECR corridor search area.

### Baseline environment

#### *Onshore export cable route (ECR) corridor area*

10.1.6 An initial review of the published geology mapping referred to in paragraph 10.1.4 shows that the onshore ECR corridor area is underlain by a number of different superficial deposits. These deposits include:

- Briton's Lane Sand and Gravel;
- Weybourne Town Till Member;
- Head;
- Till Mid Pleistocene;
- Brickearth;
- Sheringham Cliffs Formation;
- Alluvium;
- Glaciofluvial Deposits;
- River Terrace Deposits;
- Leet Hall Sand and Gravel; and
- Lowestoft Formation.

10.1.7 The classification of these deposits using the BGS Aquifer Designation Maps is based on geological mapping and the designations reflect the importance of aquifers in terms of a groundwater resource. The maps show that the majority of the superficial deposits within the onshore ECR corridor area are Secondary Aquifers or Secondary Undifferentiated Aquifers. The Secondary Aquifers may provide locally important groundwater resources.

10.1.8 The superficial deposits are underlain by bedrock. The BGS geology maps show the bedrock in the western section of the onshore ECR corridor area to comprise chalk from one of following formations:

- Lewes Nodular Chalk;
- Seaford Chalk Formation; or
- Newhaven Chalk Formation.

10.1.9 The remaining section of the onshore ECR corridor area is underlain by the Wroxham Crag Formation and the Crag Group made up of sand and gravel. Both the chalk and the crag are classified as Principal Aquifers and may provide regionally important groundwater resources.

10.1.10 Groundwater resources may be susceptible to pollution from land based activities in the vicinity of groundwater abstractions. To protect groundwater quality, the EA designates groundwater SPZs around potable water abstractions. A number of SPZs have been designated within the onshore ECR corridor area in the vicinity of Plumstead, Bessingham and Upper Sheringham.

10.1.11 Land use within the onshore ECR corridor area is predominantly rural although, there may be existing and historical uses with the potential to cause contamination (e.g. landfill sites or petrol filling stations). The potential for contamination to exist will be confirmed within the EIA by a review of historical OS maps and other environmental information, such as the location of waste management facilities and industrial land uses and recorded pollution incidents.

### *Designated sites*

10.1.12 The geological and geodiversity designations within the geology and ground conditions study area are national designations. Further details on these designated sites are provided in Table 10.1.

Table 10.1 Designations within the Hornsea Three onshore ECR search area relevant to geology and ground conditions.

| Site | Closest distance to Hornsea Three | Features |
|---|---|---|
| ***National designations*** | | |
| Weybourne Cliffs SSSI | Within the Hornsea Three onshore ECR corridor search area. | Cliffs east of Weybourne afford the best Pleistocene sections showing the pre-Cromerian deposits of the Cromer Forest bed. The type locality for the Pastonian Weybourne Crag. |
| Weybourne Town Pit SSSI | Within the Hornsea Three onshore ECR corridor search area. | The type locality for the Pleistocene 'Marly Drift', a chalk-rich glacial till of supposed Anglian age. |
| Kelling Heath SSSI | Within Hornsea Three onshore ECR corridor search area. | Kelling Heath SSSI provides one of the best examples of glacial outwash plain in England. It has steep slopes and is dissected by deep dry valleys and is a geomorphological site of national importance. |
| Caistor St Edmund Chalk Pit | Within the Hornsea Three onshore ECR corridor search area. | Exposure of The Upper Cretaceous (Late Campanian) Beeston Chalk (not normally exposed in coastal section) which represents some of the youngest *in situ* chalk in Britain. |

### Proposed approach to the Environmental Impact Assessment (EIA)

10.1.13 The EIA assessment will follow the source–pathway-receptor approach to identify potential sources of contamination within the study area, the type and location of environmental receptors and the pathways by which the receptors may be affected.

10.1.14 The assessment will consider the likelihood of harm occurring, taking into account potential sources of contamination and receptors that may be affected by such contamination.

10.1.15 The significance of likely effects during construction, operation and decommissioning of Hornsea Three will be assessed by consideration of the sensitivity of the key attributes of the geology and hydrogeology resources that may be affected and the magnitude of the predicted impact on them.

### Potential project impacts

10.1.16 A range of potential effects on geology and ground conditions have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Hornsea Three. The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 10.2, together with a description of any additional data collection (e.g. site-specific surveys) that will be required to enable a full assessment of the likely impacts.

10.1.17 On the basis of the baseline geology and ground conditions information currently available and the project description outlined in Chapter 3: Project Description, no impacts are proposed to be scoped out of the assessment for geology and ground conditions.

Table 10.2 Impacts proposed to be scoped into the Hornsea Three assessment for geology and ground conditions.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Damage to designated geological sites. | The construction of the onshore elements of Hornsea Three could damage designated geological resources, in particular exposures of rock. | A desk-based study of the designated geological sites within the Hornsea Three onshore ECR corridor would be undertaken once the corridor has been refined. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 2 | Disturbance or contamination of Secondary aquifers and reduction of the Water Framework Directive (WFD) status. | Direct impacts may occur to the superficial deposits underlying the onshore elements of Hornsea Three due to the intrusive nature of trenching. This may be as a result of the construction works or from the mobilisation of existing contaminants. | A desk-based study of the Secondary Aquifers would be undertaken. This would consider the existing and historical land uses, geology and depth of the aquifer, monitoring data (if available), any abstractions, and the WFD status of the aquifer. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 3 | Deterioration in groundwater quality and quantity of the Principal aquifer including at SPZs. Also reduction in WFD status. | Direct impacts may occur from vertical hydraulic connections between shallow perched groundwater and the Principal aquifer groundwater during piling and open trench construction. This may be as a result of the construction works or from the mobilisation of existing contaminants. | A desk-based study of the Principal Aquifers would be undertaken. This would consider the existing and historical land uses, geology and depth of the aquifer, depth of overlying deposits, monitoring data (if available), any abstractions, location of any SPZs, and the WFD status of the aquifer. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 4 | Deterioration in groundwater quality and quantity of the Principal aquifer, including at SPZs. Also reduction in WFD status. | Direct impacts to the Principal aquifer may occur from deep ground workings associated to horizontal drilling operations beneath surface infrastructure. This may be as a result of the construction works or from the mobilisation of existing contaminants. | A desk-based study of the principal aquifers would be undertaken. This would consider the existing and historical land uses, geology and depth of the aquifer, depth of overlying deposits, monitoring data (if available), any abstractions, location of any SPZs, and the WFD status of the aquifer. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 5 | Reduction in quantity and deterioration quality of surface waters fed by groundwater. Also reduction in WFD status. | Indirect impacts may occur from hydraulic connections between shallow perched groundwater affected by trenching or piling. | A desk-based study would be undertaken to establish areas of potential hydraulic connectivity between aquifers and surface waters. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| ***Operation and maintenance*** | | | | |
| 6 | Deterioration of water quality of Secondary aquifers and any associated surface waters together with the Principal aquifer. Reduction in WFD status. | Indirect impacts may occur as a result of leakage of stored materials or spilled materials used during operation and maintenance. | A desk-based study of the secondary aquifers would be undertaken. This would consider the geology and depth of the aquifer, monitoring data (if available), any abstractions, and the WFD status of the aquifer. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 7 | Thermal effects on groundwater quality. Also reduction in WFD status. | The transmission cables must be kept within safe operating temperatures. Heat from the cables dissipates into the surrounding soil and can affect the local surrounding environment. | A desk-based study would be undertaken of the Secondary and Principal Aquifer properties. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| ***Decommissioning*** | | | | |
| 8 | Disturbance or contamination of Secondary aquifers. Also a reduction in WFD status. | Direct impacts may occur to the superficial deposits underlying the onshore elements of Hornsea Three if cabling and associated infrastructure is removed. | A desk-based study would be undertaken of the Secondary Aquifer properties. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |

### Measures adopted as part of the project

10.1.18 Measures adopted as part of the project will include:

- Development of, and adherence to, a CoCP;
- Development of, and adherence to, a chemical/fuel storage and handling procedures; and
- Development of, and adherence to, a Decommissioning Plan.

10.1.19 The requirement and feasibility of additional measures will be dependent on the significance of the effects on geology and ground conditions. The requirement and feasibility of any additional measures will be consulted upon with statutory consultees throughout the EIA process.

### Potential cumulative impacts

10.1.20 Cumulative impacts on geology and ground conditions would be likely to occur during the construction and decommissioning phase because this is when ground breaking and intrusive works would be undertaken.

10.1.21 The predicted effects of construction, operation and maintenance, and decommissioning from Hornsea Three on geology and ground conditions are considered to be localised to within the footprint of the Hornsea Three project. However, there is the potential for cumulative effects to occur from other projects or activities within the geology and ground conditions study area where projects or plans could act collectively with Hornsea Three to affect sensitive receptors.

10.1.22 The following projects will be considered within the geology and ground conditions study area:

- Other offshore wind farms and associated onshore cabling and infrastructure;
- Onshore energy generation projects (excluding householder scale projects);
- Roads and rail projects;
- Major residential, commercial and leisure projects; and
- Minerals extraction and landfill projects.

10.1.23 Hornsea Three will monitor the status of identified and emerging projects throughout the pre-application phase, and consider these within the assessment of cumulative impacts within the EIA as necessary.

### Potential transboundary impacts

10.1.24 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there is no potential for significant transboundary effects with regard to geology and ground conditions from Hornsea Three upon the interests of other EEA states as the predicted impacts on geology and ground conditions will largely be focused within the footprint of Hornsea Three.

## 10.2 Hydrology and flood risk

### Introduction

10.2.1 This section of the Scoping Report identifies the hydrology and flood risk conditions of relevance to Hornsea Three and considers the likely significant impacts and effects from the construction, operation and maintenance, and decommissioning of the onshore components (above MHWS mark) of Hornsea Three on hydrology and flood risk receptors.

### Study area

10.2.2 The study area for the Hornsea Three hydrology and flood risk EIA is, at this stage, defined as the area within the onshore ECR corridor search area landward of MHWS (see Figure 10.1).

10.2.3 Upon finalisation of the onshore ECR corridor (including the proposed locations for the onshore HVAC/HVDC substation and onshore HVAC booster station), the hydrology and flood risk study area will be refined to include the temporary and permanent land take for the onshore elements of Hornsea Three.

### Baseline data

10.2.4 An initial desk based review of literature and data sources to support this Scoping Report has highlighted the following sources of baseline data which provide coverage of the Hornsea Three onshore ECR corridor search area:

- BGS 1:50,000 geological mapping 131 Cromer, 132/148 Mundesley and North Walsham, and 147 Aylsham;
- BGS Aquifer Designation Maps;
- North Norfolk Shoreline Management Plan (Defra, 2010);
- North Norfolk Catchment Flood Management Plan (Environment Agency, 2009a);
- Broadland Rivers Catchment Flood Management Plan (Environment Agency, 2009b);
- Environment Agency website (2016);
- Strategic Flood Risk Assessment (North Norfolk, Broadland District Council, The Broads Authority, Norwich City Council and South Norfolk District Council, 2008);
- The Centre for Ecology and Hydrology (CEH) website (2016);
- EA Flood Hazard Mapping;
- Anglian River Basin District River Basin Management Plan: 2009 (Defra and Environment Agency (2009); updated in 2016);
- Climate data (Met Office, 2016); and
- Draft Norfolk Local Flood Risk Management Strategy (Norfolk County Council, 2015).

10.2.5 In addition to the above data sources, site-specific hydrological data will be obtained via consultation with the Environment Agency, Lead Local Flood Authority, Drainage Board, Envirocheck/Groundsure and site reconnaissance once the onshore ECR corridor (including the location of the onshore HVAC/HVDC substation and onshore HVAC booster station) has been refined.

### Baseline environment

#### *Onshore export cable route (ECR) corridor area*

10.2.6 An initial review of published OS maps and Environment Agency data shows that the Hornsea Three onshore ECR corridor search area includes the following designated Main Rivers:

- Mulbarton Reach 1;
- Mulbarton Reach 2;
- River Bure (fluvial);
- River Glaven;
- River Tas;
- River Tiffey;
- River Tud;
- River Wensum (fluvial);
- River Yare (fluvial);
- Weybourne; and
- Whitewater River.

10.2.7 In addition to the above, the onshore ECR corridor area includes a network of ordinary watercourses, streams, drains and waterbodies.

#### *Designated sites*

10.2.8 Under the WFD, hydrological features often contribute either directly or indirectly to the overall framework designation. Hydrological designations within the onshore ECR corridor search area are provided at an international and national level. Further details on the designated sites within the Hornsea Three onshore ECR corridor search area are provided in Table 10.3.

### Proposed approach to the Environmental Impact Assessment (EIA)

10.2.9 The EIA will assess the likelihood of harm occurring, taking into account potential sources of flooding and receptors that may be affected.

10.2.10 The significance of likely effects during construction, operation and maintenance, and decommissioning of Hornsea Three will be determined by considering the sensitivity of the key attributes of the hydrological environment and flood risk that may be affected and the magnitude of the predicted impact.

Table 10.3 Designations within the Hornsea Three onshore ECR search area relevant to hydrology and flood risk.

| Site | Closest distance to Hornsea Three | Features |
|---|---|---|
| ***National designations*** | | |
| River Wensum SAC | Within the Hornsea Three onshore ECR search area. | The River Wensum provides an Annex 1 habitat – water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. It also contains white-clawed crayfish (an Annex II species). |
| ***Regional destinations*** | | |
| River Wensum SSSI | Within the Hornsea Three onshore ECR corridor search area. | The River Wensum is an enriched, calcareous lowland river which supports over 100 species of plants and a rich invertebrate fauna. The upper reaches are fed by springs that rise from the chalk and by run-off from calcareous soils rich in plant nutrients. The corridor of the river is relatively natural with much of the adjacent land traditionally managed for hay crops and by grazing. |
| Flood Zones | Areas in the onshore ECR search area within Flood Zones 2 and 3 broadly correspond with Main Rivers, watercourses and coastal areas. There is a greater coverage of Flood Zone 2 and 3 within the Broads. | Flood Zone 1 - land assessed as having a less 0.1% annual probability of river or sea flooding.<br>Flood Zone 2 - land assessed as having between 1% – 0.1% annual probability of river flooding, or between a 0.5% – 0.1% annual probability of sea flooding in any year.<br>Flood Zone 3 - land assessed as having >1% annual probability of river flooding, or a 0.5% or greater annual probability of flooding from the sea in any year. |

### Potential project impacts

10.2.11 A range of likely effects on hydrology and flood risk have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Hornsea Three. The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 10.4, together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

10.2.12 On the basis of the baseline hydrology and flood risk information currently available and the project description outlined in Chapter 3: Project Description, no impacts are proposed to be scoped out of the assessment for hydrology and flood risk.

Table 10.4 Impacts proposed to be scoped into the Hornsea Three assessment for hydrology and flood risk.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Potential increase to flood risk. | The construction of low permeability areas could directly impact flood risk on adjoining land. | A desk-based study of the flood risk within the Hornsea Three onshore ECR corridor, onshore HVAC/HVDC substation site, onshore HVAC booster station and the surrounding area. | A Flood Risk Assessment of the onshore HVAC/HVDC substation site and onshore HVAC booster station would be undertaken to identify the likely impact on flood risk. |
| 2 | Potential to increase temporary flood risk. | Impacts in flood risk could arise from any change in run-off over areas affected during construction, such as construction compounds, haul roads. | A desk-based study of the flood risk within the Hornsea Three onshore ECR corridor, onshore HVAC/HVDC substation site, onshore HVAC booster station and the surrounding area. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 3 | Damage to existing flood defences. | Direct impacts may occur from open trench construction if adopted. | A desk-based study of the existing flood defences at the Hornsea Three landfall area. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 4 | Deterioration of water quality in 'Main Rivers'. | Direct impacts to water quality may occur from workings associated with trenchless crossings beneath surface waters. | A desk-based study of Main Rivers in particular, the chemical and biological objectives set by the WFD. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 5 | Deterioration of water quality of ordinary and private surface watercourses. | Direct impacts to water quality as a result of the Hornsea Three onshore ECR corridor and temporary access roads crossing a number of ordinary and private watercourses and drains. | A desk-based study would be undertaken to establish the location and sensitivity of ordinary and private watercourses and drains. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 6 | Damage to water pipeline infrastructure. | Water supply pipelines may be located within the onshore ECR corridor, which could be damaged by construction activities. | A desk-based study would be undertaken to establish the location of water pipelines. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 7 | Damage to field drainage and infrastructure. | The onshore ECR corridor is located in predominantly rural location. | The location of field drainage would be established (where possible) through consultations with landowners. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 8 | Deterioration of WFD objectives | The onshore ECR contains a number of Main Rivers and ordinary watercourses which are classified under the WFD. | A review of the Anglian River Basin Management Plan to identify the WFD classification of watercourses within 1 km of the onshore ECR corridor | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| ***Operation and maintenance*** | | | | |
| 9 | Deterioration of water quality of Main Rivers. | Indirect impacts may occur as a result of leakage of stored materials or spilled materials used during operation and maintenance. | A desk-based study of Main Rivers in particular, the chemical and biological objectives set by the WFD. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 10 | Deterioration of water quality of ordinary and private watercourses. | Indirect impacts may occur as a result of leakage of stored materials or spilled materials used during operation and maintenance. | A desk-based study would be undertaken to establish the location and sensitivity of ordinary and private watercourses and drains. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 11 | Potential increase in flood risk. | The onshore elements of Hornsea Three may be located within a flood zone. | A desk-based study of the flood risk within the Hornsea Three onshore ECR corridor, onshore HVAC/HVDC substation site, onshore HVAC booster station and the surrounding area. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| ***Decommissioning*** | | | | |
| 12 | Deterioration of water quality of Main Rivers. | Direct impacts to water quality may occur from workings associated to the removal of cabling and associated infrastructure. | A desk-based study of Main Rivers in particular, the chemical and biological objectives set by the WFD. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 13 | Deterioration of water quality of ordinary and private watercourses and drains. | Direct impacts to water quality may occur from workings associated to the removal of cabling and associated infrastructure. | A desk-based study would be undertaken to establish the location and sensitivity of minor watercourses and drains. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |

### Measures adopted as part of the project

10.2.13 Measures adopted as part of the project will include:

- Development of, and adherence to, a Surface Water Management Plan;
- Preparation of an onshore HVAC booster station and HVAC/HVDC substation site drainage strategy;
- Development of, and adherence to, a CoCP;
- Development of, and adherence to, a chemical/fuel storage and handling procedures;
- Preparation of a Flood Risk Assessment; and
- Development of, and adherence to, a Decommissioning Plan.

10.2.14 The requirement and feasibility of additional measures will be dependent on the significance of the effects on hydrology and flood risk. The requirement and feasibility of any additional measures will be consulted upon with statutory consultees throughout the EIA process.

### Potential cumulative impacts

10.2.15 Cumulative impacts on hydrology and flood risk arising from Hornsea Three alongside other projects within the hydrology and flood risk study area from other industries/activities (e.g. industrial development, coastal infrastructure associated with oil and gas activities or electrical infrastructure) would be likely to occur during the construction, operation and maintenance, and decommissioning phases.

10.2.16 The predicted effects of construction, operation and maintenance, and decommissioning from Hornsea Three on hydrology and flood risk are considered to be localised to within the footprint of the Hornsea Three project. However, there is the potential for cumulative effects to occur from other projects or activities within the hydrology and flood risk study area where projects or plans could act collectively with Hornsea Three to affect sensitive receptors.

10.2.17 The following projects will be considered within the hydrology and flood risk study area:

- Other offshore wind farms and associated onshore cabling and infrastructure;
- Onshore energy generation projects (excluding householder scale projects);
- Roads and rail projects;
- Major residential, commercial and leisure projects; and
- Minerals extraction and landfill projects.

10.2.18 Hornsea Three will monitor the status of identified and emerging projects throughout the pre-application phase, and consider these within the assessment of cumulative impacts within the EIA as necessary.

### Potential transboundary impacts

10.2.19 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there is no potential for significant transboundary effects with regard to hydrology and flood risk from Hornsea Three upon the interests of other EEA states as the predicted impacts on hydrology and flood risk will largely be focused within the footprint of Hornsea Three.

# 11. Onshore Biological Environment

## 11.1 Ecology and nature conservation

### Introduction

11.1.1 This section of the Scoping Report identifies the ecology and nature conservation receptors of relevance to the Hornsea Three EIA and considers the likely significant impacts and effects from the construction, operation and maintenance, and decommissioning of the onshore components of Hornsea Three (i.e. above MHWS mark) on these receptors.

### Study area

11.1.2 The study area for the Hornsea Three ecology and nature conservation EIA is, at this stage, defined as land within the onshore ECR corridor search area landward of MHWS.

11.1.3 Upon finalisation of the onshore ECR corridor (including the proposed locations for the onshore HVAC/HVDC substation and onshore HVAC booster station), the ecology and nature conservation study area will be refined to include the temporary and permanent land take for the onshore elements of Hornsea Three.

### Baseline data

11.1.4 International, national and local designated sites information for the onshore ECR corridor search area has been obtained to support the Scoping Report and to inform the EIA process. Data sources include:

- Site notifications and further details of SACs, SPAs, Ramsar Sites, SSSIs, NNRs and Ancient Woodland provided by Natural England; and
- Details of County Wildlife Sites (CWS), Sites of Nature Conservation Importance, Local Wildlife Sites and BAP Habitats provided by JNCC, Natural England and Norfolk County Council.

11.1.5 In addition, biological records from the following data sources have been obtained:

- Natural England;
- Norfolk Wildlife Trust;
- Norfolk Amphibian and Reptile Group;
- Norwich Bat Group;
- Norfolk Bat Group; and
- Norfolk Barbastelle Group.

11.1.6 In addition to the above data sources, a number of site-specific surveys are underway or are proposed:

- Preliminary Ecological Appraisal – comprising a desk study from the sources listed above and an Extended Phase 1 Habitat Survey;
- Wintering bird survey (subject to results of Preliminary Ecological Appraisal);

- Reptile survey (subject to results of Preliminary Ecological Appraisal);
- Badger survey (subject to results of Preliminary Ecological Appraisal);
- Otter and water vole survey (subject to results of Preliminary Ecological Appraisal);
- Breeding birds survey (subject to results of Preliminary Ecological Appraisal);
- Bat survey - bat roosts and emergence/activity surveys - (subject to results of Preliminary Ecological Appraisal);
- Invertebrate survey (subject to results of Preliminary Ecological Appraisal);
- Great Crested Newt survey (subject to results of Preliminary Ecological Appraisal); and
- Hedgerow survey.

11.1.7 The Preliminary Ecological Appraisal will help refine the scope and extent of the detailed ecological surveys for the onshore ECR corridor. The scope and methodology for the Preliminary Ecological Appraisal will be discussed and agreed with the SNCBs.

## Baseline environment

### *Overview*

11.1.8 An initial review of published OS maps shows that land use within the Hornsea Three onshore ECR search area is predominantly rural with a number of villages and small towns. Potential habitats include areas of woodland (including areas of ancient woodland), grassland, rivers and a network of smaller watercourses such as streams, drains and ponds. Chapter 10, Section 10.2: Hydrology and Flood Risk.

### *Designated sites*

11.1.9 The ecology and nature conservation designated sites within the Hornsea Three onshore ECR search area comprise a number of international, national and regional designations. Further details on these designated sites are provided in Table 11.1 below.

Table 11.1 Designations within the Hornsea Three onshore ECR search area relevant to ecology and nature conservation.

| Site | Closest distance to Hornsea Three | Features |
|---|---|---|
| ***International designations*** | | |
| River Wensum SAC | Within the Hornsea Three onshore ECR corridor search area. | The River Wensum provides an Annex 1 habitat – water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. It also contains white-clawed crayfish (an Annex II species). |
| Norfolk Valley Fens SAC | Within the Hornsea Three onshore ECR corridor search area. | See 'Holt Lowes SSSI'. |
| North Norfolk Coast SPA and RAMSAR | Within the Hornsea Three onshore ECR corridor search area. | See 'North Norfolk Coast SSSI'. |

| Site | Closest distance to Hornsea Three | Features |
|---|---|---|
| ***National designations*** | | |
| Weybourne Cliffs SSSI | Within the Hornsea Three onshore ECR corridor search area. | A geological site showing the pre-Cromerian deposits of the Cromer Forest bed. It is a historic site with outstanding Pleistocene sections of national importance, which has yielded large and small mammal remains of the Pastonian age. The site also has biological interest with colonies of sand martins in the cliff face and fulmars on the cliff ledges. |
| North Norfolk Coast SSSI | Within the Hornsea Three onshore ECR corridor search area. | The site extends for approximately 40km and primarily comprises intertidal sands and muds, saltmarshes, shingle banks and sand dunes. There are extensive areas of brackish lagoons, reedbeds and grazing marshes. It contains a wide range of coastal plant communities including many rare and local species occur. The whole coast is of great ornithological interest. Its range of habitats make it particularly valuable for migratory birds and wintering wildfowl. |
| Kelling Heath SSSI | Within the Hornsea Three onshore ECR corridor search area. | The site is crossed by a railway line whose embankments support a heathland community including good reptile habitat and a variety of heathland birds such as nightjar, nightingale and hen harrier roosts in the winter. |
| Holt Lowes SSSI | Within the Hornsea Three onshore ECR corridor search area. | The site comprises an area of dry sandy heathland that grades into flushed slopes along the valley of the River Glaven and it provides an important example of mixed mire communities within a small tributary valley bisecting a heath. The mixed mire communities are diverse and reflect the variations in alkalinity and nutrient availability. The habitat supports a rich invertebrate fauna particularly in the wet boggy areas. |
| Edgefield Little Wood SSSI | Within the Hornsea Three onshore ECR corridor search area. | It consists of lowland sessil-pedunculate oakwood, which is very rare in Norfolk. The woodland is surrounded by ancient banks and the woodland is of ancient origin. |
| River Wensum SSSI | Within the Hornsea Three onshore ECR corridor search area. | The River Wensum is an enriched, calcareous lowland river which supports over 100 species of plants and a rich invertebrate fauna. The upper reaches are fed by springs that rise from the chalk and by run-off from calcareous soils rich in plant nutrients. The corridor of the river is relatively natural with much of the adjacent land traditionally managed for hay crops and by grazing. |
| Booton Common SSSI | Within the Hornsea Three onshore ECR corridor search area. | It lies in the valley of a tributary of the River Wensum, approximately a mile east of Reepham. The main interest of the site is associated with a mosaic of wet calcareous fen grassland and acid heath communities which have developed. In additional to the floristic value, the site also supports a variety of breeding birds including Snipe, Woodcock, Grasshopper Warbler and Lesser Whitethroat. |

| Site | Closest distance to Hornsea Three | Features |
|---|---|---|
| Whitwell Common SSSI | Within the Hornsea Three onshore ECR corridor search area. | The site lies in the valet of a tributary of the River Wensum and supports a wide range of wetland plant communities characteristic of peat-based soils. Calcareous flushes are present in low-lying hollows created by past peat cutting. Wet valley alder wood, fen communities and unimproved neutral grassland are also represented on the site. Land adjacent to the SSSI is also designated as a CWS. |
| Alderford Common SSSI | Within the Hornsea Three onshore ECR corridor search area. | The site is situated on gently undulating ground and supports a wide range of habitats developed in response to variations in the soil and topography. A diverse chalk flora has developed in the old pits and the site forms the only remaining example of species-rich chalk grassland in East Norfolk. A bat roost and an outstanding assemblage of breeding birds provide additional interest. |
| Swannington Upgate Common SSSI | Within the Hornsea Three onshore ECR corridor search area. | It comprises sands and gravels giving way to shallow peats on low lying ground with impeded drainage. These variations in soils and wetness have led to the development of an exceptionally wide range of semi-natural vegetation. The variety of habitats supports a wide range of breeding birds. |
| ***Regional destinations*** | | |
| Kelling Heath Park and 100 Acre Wood CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Sheringham Wood and Park CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Cat Pits Wood CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Muckleburgh Hill CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Oak Wood CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Old Decoy, Selbrigg Pond, The Lows CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Land south of High Kelling CWS. | Within the Hornsea Three onshore ECR corridor search area. | |
| Church Farm Marsh CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Pond Hill Meadows CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Pond Hills CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Fir and Nineways Plantation CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Barningham Green Plantation CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| New Covert CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Old Carr CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Tan Office Farm CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Moor Hall CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Small Hopes Farm CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Corpusty Fen CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Mossymere Wood CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| The Oaks CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Blackwater Valley CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Triumph and Foxburrow Plantations CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Attlebridge Hill CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Walsingham Plantation CWS | Within the Hornsea Three onshore ECR corridor search area. | |

| Site | Closest distance to Hornsea Three | Features |
|---|---|---|
| Yare Valley CWS split across several locations (e.g. Yare Valley (Colton) CWS, Yare Valley (Barford) CWS and Yare Valley (Marlingford Hall) CWS) | Within the Hornsea Three onshore ECR corridor search area. | |
| Pasture at Easton College CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Melton Beck CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Low Common CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Marston Marshes CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Eaton Street Meadow CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Intwood Carr CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| The Carrs Woodland CWS | Within the Hornsea Three onshore ECR corridor search area. | |
| Catbridge Meadows CWS | Within the Hornsea Three onshore ECR corridor search area. | |

## Proposed approach to the Environmental Impact Assessment (EIA)

### *Proposed assessment methodology*

11.1.10 The ecology and nature conservation assessment process will be undertaken in accordance with the Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland – Terrestrial, Freshwater and Coastal, 2nd Edition (CIEEM, 2016).

### *Valued Ecological Receptors (VERs)*

11.1.11 Habitats, species populations and assemblages within the ecology and nature conservation study area will be evaluated with reference to their importance in terms of 'biodiversity conservation' and the need to conserve representative areas of habitats and genetic diversity of species populations. Valued Ecological Receptors (VERs) are habitats or species that are of conservation concern and that could be affected by Hornsea Three. The criteria that will be referred to for the valuation of habitats and plant communities will include Annex III of the EC Habitats Directive, guidelines for the selection of biological SSSIs and criteria used by the local authority and Wildlife Trust for the selection of sites for local designation.

11.1.12 Individual species populations and communities will be valued on the basis of their size, recognised status (such as recognised through published lists of species of conservation concern and designation of BAP status) and legal protection. For example, bird populations exceeding 1% of published information on biogeographic populations are considered to be of international importance; those exceeding 1% of published data for national populations are considered to be of national importance and so on.

11.1.13 In assigning values to species populations, it is important to take into account the status of the species in terms of any legal protection. It is also important to consider other factors such as its distribution, rarity, population trends and the size of the population which would be affected. For example, whilst the Great Crested Newt is protected under European law and therefore conservation of the species is of significance at the international level, this does not mean that every population of Great Crested Newt is internationally important. It is appropriate to consider the particular population in its local context. Therefore, in assigning values to species the geographic scale at which they are important has been considered. The assessment of value will rely on the professional opinion and judgement of experienced ecologists.

11.1.14 As part of the EcIA process due regard will also be paid to the legal protection afforded to species during the development of mitigation and compensation measures to be implemented during Hornsea Three. For European protected species there is a requirement that Hornsea Three should not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

11.1.15 Plant communities will be assessed both in terms of their intrinsic value and as habitat for protected species whose habitat is also specifically protected and for species of nature conservation concern which are particularly associated with them.

### Potential project impacts

11.1.16 A range of potential impacts on ecology and nature conservation have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Hornsea Three. The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 11.2, together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses that will be required to enable a full assessment of the impacts.

11.1.17 On the basis of the baseline ecology and nature conservation information currently available and the project description outlined in Chapter 3:Project Description, no impacts are proposed to be scoped out of the assessment for ecology and nature conservation.

### Measures adopted as part of the project

11.1.18 Measures adopted as part of the project will include:

- Development of, and adherence to, a CoCP;
- Development of, and adherence to, an Ecological Management Plan;
- Development of, and adherence to, a PEMMP; and
- Development of, and adherence to, a Decommission Plan.

11.1.19 The requirement and feasibility of additional measures will be dependent on the significance of the effects on ecology and nature conservation. The requirement and feasibility of any additional measures will be consulted upon with statutory consultees throughout the EIA process.

Table 11.2 Impacts proposed to be scoped into the Hornsea Three assessment for ecology and nature conservation.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Disturbance or damage to habitats/ species. | Protected or important habitats/species could be damaged or disturbed as a result of an increase in noise, vibration, light and other activities associated with construction of the onshore elements of Hornsea Three. | A Preliminary Ecological Survey and protected species surveys (where required) within the Hornsea Three onshore ECR corridor, onshore HVAC/HVDC substation site, onshore HVAC booster station and the surrounding area. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 2 | Habitat fragmentation and severance. | Cable trenching could result in the fragmentation or severance of habitats, particularly for bats. | As above for ecology and nature conservation impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 3 | Temporary displacement of species. | Temporary construction activities and land take may result in temporary displacement of species. | As above for ecology and nature conservation impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 4 | Habitat loss and disturbance/ displacement of species. | The permanent land take required for the construction of the onshore HVAC/HVDC substation and onshore HVAC booster station may result in the permanent loss of habitats. | As above for ecology and nature conservation impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 5 | Disturbance to species as a result of release of pollutants. | Construction activities in proximity to watercourses (e.g. construction of crossings) may result in the accidental release of potential pollutants. | As above for ecology and nature conservation impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| ***Operation and maintenance*** | | | | |
| 6 | Disturbance to species. | Disturbance of species as a result of noise and light. | As above for ecology and nature conservation impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 7 | Disturbance to species as a result of release of pollutants. | Maintenance activities may results in the accidental release of pollutants. | As above for ecology and nature conservation impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| ***Decommissioning*** | | | | |
| 8 | Disturbance or damage to habitats/ species. | Protected or important habitats/species could be damaged or disturbed as a result of an increase in noise, vibration, light and other activities associated with decommissioning of onshore elements. | A Preliminary Ecological Survey and protected species surveys (where required) within the Hornsea Three onshore ECR corridor, onshore HVAC/HVDC substation site, onshore HVAC booster station and the surrounding area. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 9 | Habitat fragmentation and severance. | Decommissioning of trenches could result in the fragmentation or severance of habitats, particularly for bats. | As above for ecology and nature conservation impact no. 8. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 10 | Temporary displacement of species. | Temporary decommissioning activities and land take may result in temporary displacement of species. | As above for ecology and nature conservation impact no. 8. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 11 | Disturbance to species from release of pollutants. | Decommissioning activities in proximity to watercourses may result in the release of potential pollutants. | As above for ecology and nature conservation impact no. 8. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |

### Potential cumulative impacts

11.1.20 Cumulative impacts on ecology and nature conservation arising from Hornsea Three alongside other projects within the ecology and nature conservation study area from other industries/activities (e.g. industrial development, coastal infrastructure associated with oil and gas activities or electrical infrastructure) would be likely to occur during the construction and decommissioning phases.

11.1.21 The predicted effects of construction, operation and maintenance, and decommissioning from Hornsea Three on ecology and nature conservation are considered to be localised to within the footprint of the Hornsea Three project. However, there is the potential for cumulative effects to occur from other projects or activities within the ecology and nature conservation study area where projects or plans could act collectively with Hornsea Three to affect sensitive receptors.

11.1.22 The following projects will be considered within the ecology and nature conservation study area:

- Other offshore wind farms and associated onshore cabling and infrastructure;
- Onshore energy generation projects (excluding householder scale projects);
- Roads and rail projects;
- Major residential, commercial and leisure projects; and
- Minerals extraction and landfill projects.

11.1.23 Hornsea Three will monitor the status of identified and emerging projects throughout the pre-application phase, and consider these within the assessment of cumulative impacts within the EIA as necessary.

### Potential transboundary impacts

11.1.24 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there is no potential for significant transboundary effects with regard to ecology and nature conservation from Hornsea Three upon the interests of other EEA states as the predicted impacts on ecology and nature conservation will largely be focused within the footprint of Hornsea Three.

# 12. Onshore Human and Socio-economic Environment

## 12.1 Landscape and visual resources

### Introduction

12.1.1 This section of the Scoping Report identifies the landscape and visual receptors that are of relevance to Hornsea Three and considers the likely significant impacts and effects of construction, operation and maintenance, decommissioning of the onshore and intertidal components of Hornsea Three (i.e. above MLWS mark) on these receptors.

### Study area

12.1.2 The study area for the Hornsea Three landscape and visual resources EIA is at this stage, defined as land within the onshore ECR corridor search area above MLWS.

12.1.3 The Hornsea Three array area lies approximately 120 km from the coast at its closest point, and although there may be some offshore elements of Hornsea Three that are closer to land (e.g. the offshore HVAC booster station) it is anticipated that these will be located too far offshore to be visible from land during the construction, and operation and maintenance phase.

12.1.4 Upon finalisation of the onshore ECR corridor (including the proposed locations for the onshore HVAC/HVDC substation and onshore HVAC booster station), the landscape and visual resources study area will be refined in accordance with Visual Representation of Windfarms (SNH, 2014) and by the application of a Zone of Theoretical Visibility (ZTV).

### Baseline data

12.1.5 An initial desk-based review of designated sites within the onshore ECR corridor search area has identified various landscape designations (Figure 12.1) that have the potential to be affected, depending upon final site selection, by Hornsea Three.

12.1.6 The National Character Areas (NCA) that the onshore ECR corridor search area interacts with are illustrated on Figure 12.2. NCAs note the broad landscape features that define landscapes at a national level. The county and/or district (local) level LCAs and/or Landscape Character Types that the Hornsea Three onshore ECR corridor search area interacts with are illustrated on Figure 12.3.

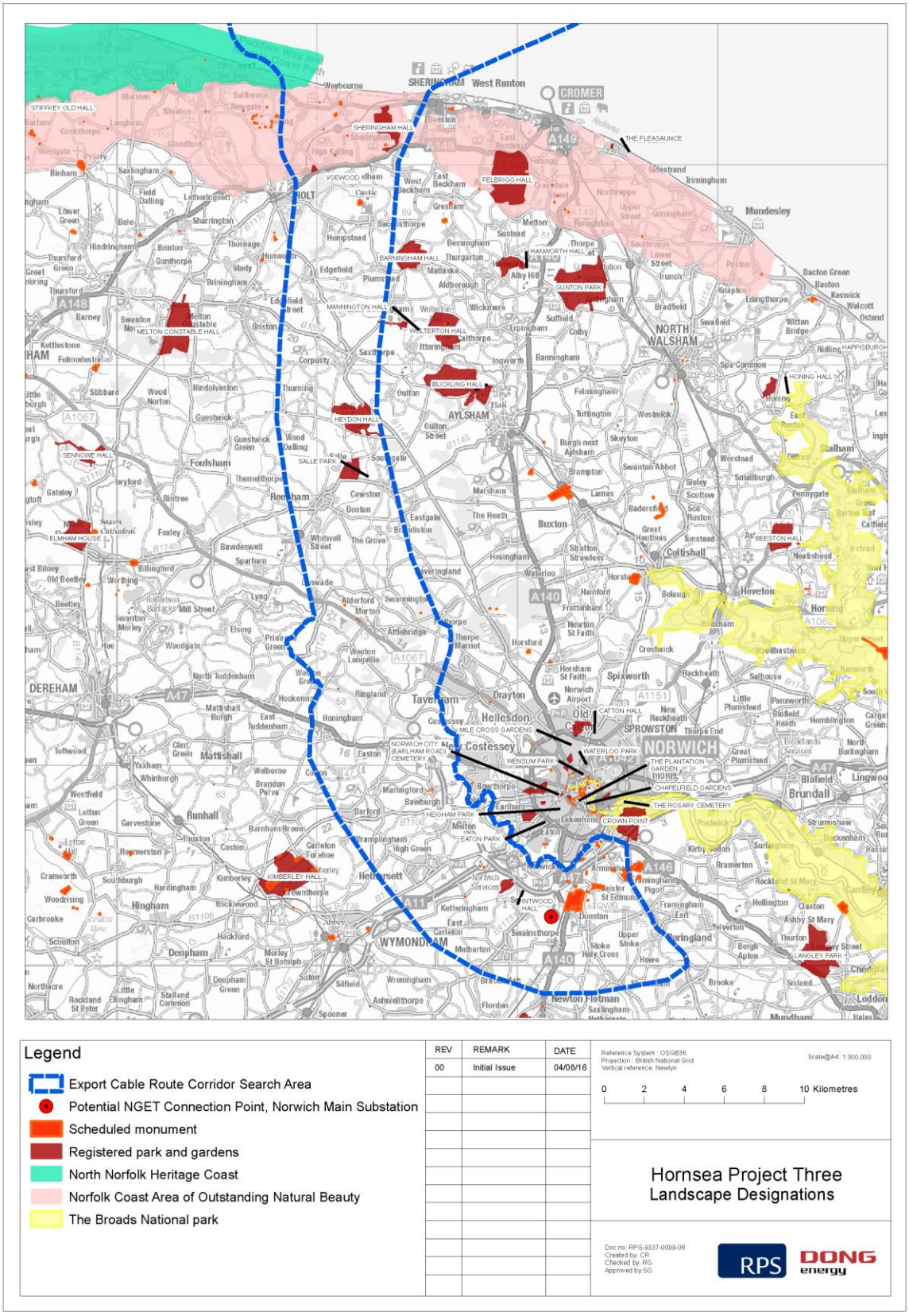



Figure 12.1 Landscape designations.

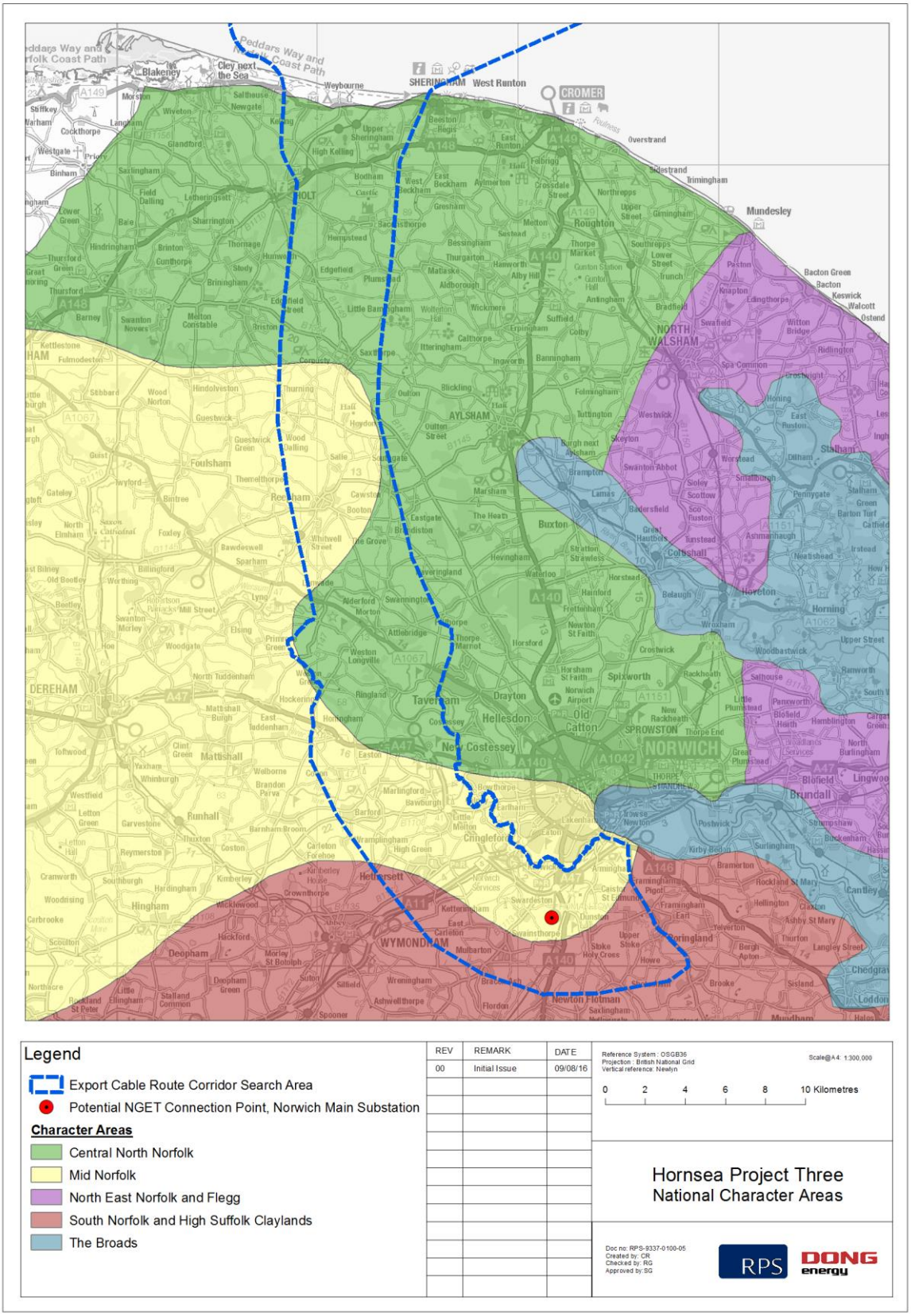



Figure 12.2 National Character Areas (NCA).

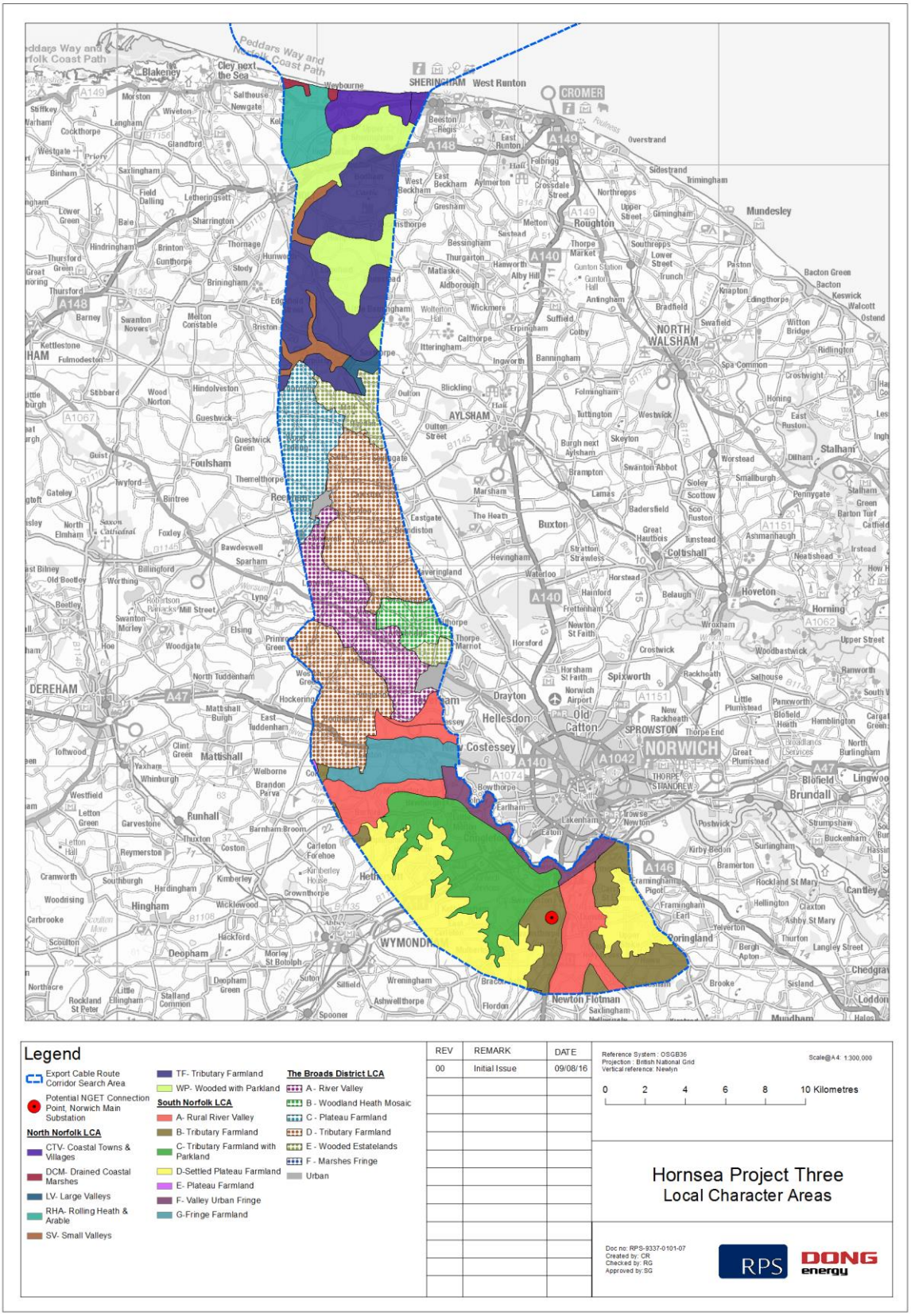



Figure 12.3 Local level Landscape Character Areas (LCAs) and/or Landscape Character Types.

12.1.7 In addition to the above data sources, the EIA will be supplemented by:

- Establishment of the landscape and visual resources study area (including the generation of a ZTV) ;
- Desk studies (to identify landscape receptors (e.g. physical elements, features and characteristics) and visual receptors (e.g. the residents and visitors to the area); and
- Field surveys (including the selection of representative or sensitive viewpoints (in consultation with the local authorities) to be illustrated through photography and photomontages/wirelines/annotated photographs).

## Baseline environment

### *Overview*

12.1.8 The onshore ECR corridor search area coincides with the following NCAs, as shown on Figure 12.2:

- NCA 78: Central North Norfolk;
- NCA 83: South Norfolk and High Suffolk Claylands; and
- NCA 84: Mid Norfolk.

12.1.9 The county/district (local) level LCAs and Landscape Character Types falling within the onshore ECR corridor search area are shown in Figure 12.3.

### *Landscape designations*

12.1.10 Landscape designations within the Hornsea Three onshore ECR search area comprise a number of national designations. Further details on these designated sites are provided in Table 12.1 below.

Table 12.1 Landscape designations with relevance to Hornsea Three onshore ECR corridor search area.

| Site | Closest distance to Hornsea Three |
|---|---|
| ***National designations*** | |
| Norfolk Coast Area of Outstanding Natural Beauty (AONB) | Within the Hornsea Three onshore ECR corridor search area. |
| North Norfolk Heritage Coast | Within the Hornsea Three onshore ECR corridor search area. |
| Voewood Grade II* Registered Park and Garden | Within the Hornsea Three onshore ECR corridor search area. |
| Hanworth Hall Grade II Registered Park and Garden | 5.29 km from Hornsea Three onshore ECR corridor search area. |
| Mile Cross Gardens Grade II Registered Park and Garden | 4.09 km from Hornsea Three onshore ECR corridor search area. |
| Norwich City (Earlham Road) Cemetery Grade II Registered Park and Garden | 1.42 km from Hornsea Three onshore ECR corridor search area. |
| Heigham Park Grade II Registered Park and Garden | 1.81 km from Hornsea Three onshore ECR corridor search area. |
| Intwood Hall Grade II* Registered Park and Garden | Within the Hornsea Three onshore ECR corridor search area. |
| The Plantation Garden, Norwich Grade II Registered Park and Garden | 2.65 km from Hornsea Three onshore ECR corridor search area. |
| Chapelfield Gardens Grade II Registered Park and Garden | 2.23 km from Hornsea Three onshore ECR corridor search area. |
| Crown Point Grade II Registered Park and Garden | 0.08 km from Hornsea Three onshore ECR corridor search area. |

| Site | Closest distance to Hornsea Three |
|---|---|
| The Rosary Cemetery Grade II* Registered Park and Garden | 1.76 km from Hornsea Three onshore ECR corridor search area. |
| Wensum Park Grade II Registered Park and Garden | 3.55 km from Hornsea Three onshore ECR corridor search area. |
| Catton Hall Grade II* Registered Park and Garden | 4.98km from Hornsea Three onshore ECR corridor search area. |
| Langley Park Grade II Registered Park and Garden | 5.66km from Hornsea Three onshore ECR corridor search area. |
| Raveningham Hall Grade II* Registered Park and Garden | 11.5 km from Hornsea Three onshore ECR corridor search area. |
| Rainthorpe Hall Grade II Registered Park and Garden | 1.2 km from Hornsea Three onshore ECR corridor search area. |
| Kimberley Hall Grade II* Registered Park and Garden | 2.37 km from Hornsea Three onshore ECR corridor search area. |
| The Pleasaunce, Overstrand Grade II Registered Park and Garden | 6.2 km from Hornsea Three onshore ECR corridor search area. |
| Felbrigg Hall Grade II* Registered Park and Garden | 4.18 km from Hornsea Three onshore ECR corridor search area. |
| Sheringham Hall Grade II* Registered Park and Garden | Within the Hornsea Three onshore ECR corridor search area. |
| Barningham Hall Grade II Registered Park and Garden | 0.2 km from Hornsea Three onshore ECR corridor search area. |
| Mannington Hall Grade II Registered Park and Garden | Within the Hornsea Three onshore ECR corridor search area. |
| Wolterton Hall Grade II* Registered Park and Garden | 2 km from Hornsea Three onshore ECR corridor search area. |
| Blickling Hall Grade II* Registered Park and Garden | 2.3 km from Hornsea Three onshore ECR corridor search area. |
| Heydon Hall Grade II* Registered Park and Garden | Within the Hornsea Three onshore ECR corridor search area. |
| Salle Park Grade II Registered Park and Garden | Within the Hornsea Three onshore ECR corridor search area. |
| Gunton Park Grade II* Registered Park and Garden | 8.23 km from Hornsea Three onshore ECR corridor search area. |
| Eaton Park Grade II* Registered Park and Garden | 0.6 km from Hornsea Three onshore ECR corridor search area. |
| Waterloo Park Grade II* Registered Park and Garden | 3.87 km from Hornsea Three onshore ECR corridor search area. |

### Proposed approach to the Environmental Impact Assessment (EIA)

12.1.11 The landscape and visual impact assessment (LVIA) will consider the likely significant effects of the development upon:

- Individual seascape, landscape and townscape features, elements and characteristics;
- Seascape, landscape and townscape character; and
- Visual amenity and the people who view the landscape or townscape (visual receptors).

12.1.12 As set out in the 'Guidelines for Landscape and Visual Impact Assessment: Third Edition' (GLVIA3) (Landscape Institute and the Institute of Environmental Management and Assessment, 2013) the LVIA will assess landscape and visual effects separately, although the procedure for assessing each of these is closely linked. A clear distinction will be drawn between landscape and visual effects as described below:

- Landscape effects relate to the effects of Hornsea Three on the physical and other characteristics of the landscape and its resulting character and quality; and

- Visual effects relate to the effects on views experienced by visual receptors (e.g. residents, footpath users, tourists etc.) and on the visual amenity experienced by those people.

12.1.13 The LVIA will assess the short term effects of the construction and decommissioning phases and the long term effects relating to the operation and maintenance phase. ZTVs would be generated to show the extent of theoretical visibility of the Hornsea Three onshore HVAC/HVDC substation and the Hornsea Three onshore HVAC booster station within the landscape and visual resources study area.

12.1.14 Consideration will be given to the likely seasonal variations in the visibility of the development, including variations in weather conditions and deciduous vegetation. Consideration will also be given to changes in the level of effects likely to take place as new planting, proposed as part of Hornsea Three, and existing planting matures.

### Potential project impacts

12.1.15 A range of potential impacts upon the landscape and visual resources have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Hornsea Three. The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 12.2.

12.1.16 Any impacts that are identified to be scoped out have been outlined, together with a justification, in Table 12.3.

### Measures adopted as part of the project

12.1.17 Measures adopted as part of the project will include:

- Development of, and adherence to, a Landscape Management Plan;
- Development of, and adherence to, a CoCP; and
- Development of, and adherence to, a Decommissioning Plan.

12.1.18 The requirement and feasibility of additional measures will be dependent on the significance of the effects on landscape and visual resources. The requirement and feasibility of any additional measures will be consulted upon with statutory consultees throughout the EIA process.

Table 12.2 Impacts proposed to be scoped into the Hornsea Three assessment for landscape and visual resources.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Impacts upon NCAs and SCAs. | The construction of the onshore elements of Hornsea Three and the offshore HVAC booster station(s) could cause direct impacts upon various NCAs and SCAs. | Desktop analysis of NCAs with notes confirmed and refined during site investigation. | ZTV production would show where onshore ECR corridor, onshore HVAC/HVDC substation and onshore HVAC booster station(s) would have influence over NCAs and SCAs that they are not located within. |
| 2 | Impacts upon county LCAs. | The construction of the onshore elements of Hornsea Three and the offshore HVAC booster station(s) could cause direct impacts upon various county LCAs. | Desktop analysis of various LCAs with notes confirmed and refined during site investigation. | ZTV production would show where onshore ECR corridor, onshore HVAC/HVDC substation and onshore HVAC booster station(s) would have influence over LCAs that they are not located within. |
| 3 | Impacts upon designated landscapes. | The construction of the onshore elements of Hornsea Three could cause direct and indirect impacts upon various designated landscapes. | Desktop analysis of the reason for designation with notes confirmed and refined during site investigation. | ZTV production would show where onshore ECR corridor, onshore HVAC/HVDC substation and onshore HVAC booster station(s) would have influence over the designations. |
| 4 | Visual impacts experienced by residents | The construction of the onshore elements of Hornsea Three and the offshore HVAC booster station(s) could be visible to visual receptors within residential properties. | Desktop analysis of mapping with notes confirmed and refined during field work. | ZTV production would show where onshore ECR corridor, onshore HVAC/HVDC substation and onshore/offshore HVAC booster station(s) would be likely to be visible from individual properties. |
| 5 | Visual impacts experienced by dynamic receptors. | The construction of the onshore elements of Hornsea Three and the offshore HVAC booster station(s) could be visible to number of visual receptors travelling on roads and railway. | As above for LVIA impact no. 4. | ZTV production would show where Hornsea Three onshore ECR corridor, Hornsea Three onshore HVAC/HVDC substation and Hornsea Three onshore/offshore HVAC booster station(s) would be likely to be visible from transport networks. |
| 6 | Visual impacts experienced by receptors occupied in recreational pursuits other than those using PRoWs. | The construction of the onshore elements of Hornsea Three and the HVAC booster station(s) could be visible to visual receptors occupied in recreational pursuits other than those using PRoWs. | As above for LVIA impact no. 4. | ZTV production would show where onshore ECR corridor, onshore HVAC/HVDC substation and onshore HVAC booster station(s) would be likely to be visible from recreational facilities. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 7 | Visual impacts experienced by receptors using PRoWs. | The construction of the onshore elements of Hornsea Three and the offshore HVAC booster station(s) could be visible to number of visual receptors using PRoWs. | As above for LVIA impact no. 4. | ZTV production would show where onshore ECR corridor, onshore HVAC/HVDC substation and onshore HVAC booster station(s) would be likely to be visible from PRoWs. |
| 8 | Visual impacts experienced by people at their place of work (e.g. commercial or business premises). | The construction of the onshore elements of Hornsea Three HVAC booster station(s) could be visible to a number of people at their place of work (e.g. commercial or business premises). | As above for LVIA impact no. 4. | ZTV production would show where onshore ECR corridor, onshore HVAC/HVDC substation and Hornsea Three onshore HVAC booster station(s) would be likely to be visible from commercial premises. |
| ***Operation and maintenance*** | | | | |
| 9 | Impacts upon NCAs. | Once defined, the onshore elements of Hornsea Three HVAC booster station(s) could cause direct impacts upon NCAs. | As above for LVIA impact no. 1. | As above for LVIA impact no. 1. |
| 10 | Impacts upon county LCAs. | Once defined, the onshore elements of Hornsea Three HVAC booster station(s) could cause direct impacts upon various county LCAs. | As above for LVIA impact no. 2. | As above for LVIA impact no. 2. |
| 11 | Impacts upon designated landscapes. | Once defined, the onshore elements of Hornsea Three HVAC booster station(s) could cause direct and indirect impacts upon various designated landscapes. | As above for LVIA impact no. 3. | As above for LVIA impact no. 3. |
| 12 | Visual impacts experienced by residents. | Once defined, the onshore elements of Hornsea Three and the offshore HVAC booster station(s) could be visible to visual receptors within residential properties. | As above for LVIA impact no. 4. | As above for LVIA impact no. 4. |
| 13 | Visual impacts experienced by dynamic receptors. | Once defined, the onshore elements of Hornsea Three and the offshore HVAC booster station(s) could be visible to dynamic visual receptors. | As above for LVIA impact no. 4. | As above for LVIA impact no. 5. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 14 | Visual impacts experienced by receptors occupied in recreational pursuits other than those using PRoWs. | Once defined, the onshore elements of Hornsea Three HVAC booster station(s) could be visible to visual receptors occupied in recreational pursuits other than those using PRoWs. | As above for LVIA impact no. 4. | As above for LVIA impact no. 6. |
| 15 | Visual impacts experienced by receptors using PRoWs. | Once defined, the onshore elements of Hornsea Three HVAC booster station(s) could be visible to visual receptors using PRoWs. | As above for LVIA impact no. 4. | As above for LVIA impact no. 7. |
| 16 | Visual impacts experienced by people at their place of work (e.g. commercial or business premises). | Once defined, the onshore elements of Hornsea Three HVAC booster station(s) could be visible to visual receptors/people at their place of work (e.g. commercial or business premises). | As above for LVIA impact no. 4. | As above for LVIA impact no. 8. |
| ***Decommissioning*** | | | | |
| 17 | Impacts upon NCAs. | Decommissioning of the onshore elements of Hornsea Three HVAC booster station(s) could cause direct impacts upon NCAs. | As above for LVIA impact no. 1. | As above for LVIA impact no. 1. |
| 18 | Impacts upon county LCAs. | Decommissioning of the onshore elements of Hornsea Three and the HVAC booster station(s) could direct impacts upon various county LCAs. | As above for LVIA impact no. 2. | As above for LVIA impact no. 2. |
| 19 | Impacts upon designated landscapes. | Decommissioning of the onshore elements of Hornsea Three could cause direct and indirect impacts upon various designated landscapes. | As above for LVIA impact no. 3. | As above for LVIA impact no. 3. |
| 20 | Visual impacts experienced by residents. | Decommissioning of the onshore elements of Hornsea Three could be visible to visual receptors within residential properties. | As above for LVIA impact no. 4. | As above for LVIA impact no. 4. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 21 | Visual impacts experienced by dynamic receptors. | Decommissioning of the onshore elements of Hornsea Three could be visible to dynamic visual receptors. | As above for LVIA impact no. 4. | As above for LVIA impact no. 5. |
| 22 | Visual impacts experienced by receptors occupied in recreational pursuits other than those using PRoWs. | Decommissioning of the onshore elements of Hornsea Three could be visible to visual receptors occupied in recreational pursuits other than those using PRoWs. | As above for LVIA impact no. 4. | As above for LVIA impact no. 6. |
| 23 | Visual impacts experienced by receptors using PRoWs. | Decommissioning of the onshore elements of Hornsea Three could be visible to visual receptors using PRoWs. | As above for LVIA impact no. 4. | As above for LVIA impact no. 7. |
| 24 | Visual impacts experienced by people at their place of work (e.g. commercial or business premises). | Decommissioning of the onshore elements of Hornsea Three could be visible to visual receptors/people at their place of work (e.g. commercial or business premises). | As above for LVIA impact no. 4. | As above for LVIA impact no. 8. |

Table 12.3 Impacts proposed to the scoped out of the assessment for landscape and visual resources.

| Impact No. | Impact | Justification |
|---|---|---|
| ***Construction*** | | |
| 1 | Any indirect impacts that fall outside the influence of the ZTV. | There would be no change to landscape character or visual amenity for receptors that are located outside the visual influence of any aspect of the construction phase of Hornsea Three. Therefore, subject to consultation with statutory consultees and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 2 | Visual impacts onshore from the offshore booster station(s) | It is considered unlikely that there would be any onshore visual impact from the construction of the offshore booster station given its distance from land. Therefore, subject to consultation with statutory consultees and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Operation and maintenance*** | | |
| 3 | Any indirect impacts that fall outside the influence of the ZTV. | There would be no change to landscape character or visual amenity for receptors that are located outside the visual influence of any aspect of the operation and maintenance phase of Hornsea Three. Therefore, subject to consultation with statutory consultees and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 4 | Impacts of the onshore ECR corridor. | During the operation and maintenance phase Hornsea Three, there would be no significant changes to landscape character or visual amenity along the Hornsea Three onshore ECR corridor as it would be buried underground. Therefore, subject to consultation with statutory consultees and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 5 | Visual impacts onshore of the offshore HVAC booster station(s) | It is considered unlikely that there would be any onshore visual impact from the operation of the offshore booster station given its distance from land. Therefore, subject to consultation with statutory consultees and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Decommissioning*** | | |
| 6 | Any indirect impacts that fall outside the influence of the ZTV. | There would be no change to landscape character or visual amenity for receptors that are located outside the visual influence of any aspect of the decommissioning phase of Hornsea Three. Therefore, subject to consultation with statutory consultees and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 7 | Impacts of the Hornsea Three onshore ECR corridor. | During the decommissioning phase Hornsea Three, there would be no changes to landscape character or visual amenity along the Hornsea Three onshore ECR corridor as the buried cables would be left in place underground. Therefore, subject to consultation with statutory consultees and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 8 | Visual impacts onshore of the offshore HVAC booster station(s) | It is considered unlikely that there would be any onshore visual impact from the decommissioning of the offshore booster station given its distance from land. Therefore, subject to consultation with statutory consultees and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |

### Potential cumulative impacts

12.1.19 In accordance with GLVIA3, the types of cumulative effect that would be considered include:

- Effects of extension to an existing development;
- Filling an area with the same development or different types of development over time;
- Interactions between different types of development;
- Incremental change as a result of successive individual development;
- Temporal effects;
- Indirect effects of development such as enabling other development; and
- Future actions that remove elements which may have consequences for other existing or proposed development.

12.1.20 Any construction, operation and maintenance or decommissioning activities of Hornsea Three that coincide with the landscape and visual resources study area of any phases of proposed development (including large infrastructure developments, large residential developments, large areas of commercial development, pipeline or cable routes) would be considered in the CEA.

12.1.21 The following projects will be considered within the landscape and visual resources study area:

- Other offshore wind farms and associated onshore cabling and infrastructure;
- Onshore energy generation projects (excluding householder scale projects);
- Roads and rail projects;
- Major residential, commercial and leisure projects; and
- Minerals extraction and landfill projects.

### Potential transboundary impacts

12.1.22 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there is no potential for significant transboundary effects with regard to landscape and visual resources from Hornsea Three upon the interests of other EEA states as the predicted impacts on landscape and visual receptors will largely be focused within the footprint of Hornsea Three.

## 12.2 Historic environment

### Introduction

12.2.1 This section of the Scoping Report identifies historic environment receptors of relevance to Hornsea Three and considers the potential impacts and effects from the construction, operation, maintenance and decommissioning of the onshore components (above the MHWS mark) of Hornsea Three on these receptors. Specifically, the following receptors are considered:

- World Heritage Sites;
- Listed Buildings (both nationally and locally listed);
- Conservation areas;
- Locally important historic landscapes (including battlefields);
- Registered Parks and Gardens;
- Registered Battlefields;
- Scheduled Monuments; and
- Buried and above ground heritage assets.

### Study area

12.2.2 The Hornsea Three historic environment EIA study area is, at this stage, defined by the Hornsea Three onshore ECR corridor search area.

12.2.3 Once the Hornsea Three onshore ECR corridor is finalised, the historic environment study area will be refined to include the actual onshore ECR corridor, including both permanent and temporary land take areas, HVAC/HVDC substation site(s) and onshore HVAC booster station, plus a 1 km buffer around the corridor and a 10 km radius of the onshore HVAC/HVDC substation site and onshore HVAC booster station within which any potential temporary and permanent impacts on the setting of designated heritage assets of the highest significance will be assessed (Grade I and II* listed buildings and Scheduled Monuments). Potential temporary and permanent impacts on the setting of other designated heritage assets (e.g. Grade II listed buildings and Conservation Areas) will be assessed within a 1 km buffer around the corridor and a 5 km radius of the onshore HVAC/HVDC substation and onshore HVAC booster station. Potential temporary and permanent impacts on buried archaeology will be assessed within a 1 km buffer around the onshore ECR corridor with a focus on a smaller core area of 250 m either side of the corridor.

### Baseline data

12.2.4 A review of heritage designations, including nationally designated sites, listed buildings and Conservation Areas has been undertaken utilising data sources including:

- Details of Listed Buildings, Scheduled Monuments, Battlefields, Registered Parks and Gardens, and World Heritage;
- Historic Environment Records and Conservation Areas from Norfolk County Council; and

- Historic mapping both published and unpublished including manuscript maps, historic Ordinance Survey maps and historic charts held by the United Kingdom Hydrographic Office.

12.2.5 A detailed desk-based archaeological assessment will be undertaken to inform the EIA in accordance with the Chartered Institute for Archaeologists' Standards and Guidelines for desk-based assessments. The desk-based study will include:

- Conservation area character appraisals, where available;
- Documentary resources from the Archaeology Data Service website (www.ads.ahds.ac.uk); and
- A review of relevant documentary and archival material held in libraries and archives will be undertaken. An iterative approach will be adopted during this process to determine the scope of the above consultations/searches.

12.2.6 Based on the results of the desk-based assessment, subject to further discussion with the County Archaeologist, some of the following field surveys may be undertaken as appropriate:

- A walk-over by a suitably qualified and experienced archaeologist, including all designated historic assets within the historic environment study area; and
- Agreement of subsequent fieldwork potentially including targeted geophysical survey and targeted trial trenching.

12.2.7 The scope of field studies will be discussed with Norfolk County Council and Historic England, as required, prior to any work taking place.

### Baseline environment

12.2.8 There are a number of nationally designated historic environment sites within the onshore ECR search area. These designated sites are summarised in Table 12.4.

12.2.9 Where further details have been included in the official entries for the asset/site these have been included in the 'features' column in the table.

Table 12.4 Designations with relevance to historic environment.

| Site | Closest distance to Hornsea Three | Features |
|---|---|---|
| ***National designations*** | | |
| Weybourne Priory Scheduled Monument | Within the Hornsea Three onshore ECR corridor search area. | The core of the monastic precinct survives well and retains a variety of features some of which are of particular architectural importance. The context of the priory within the village, and the documented relationship between the priory and the parish and manor of Weybourne give the monument additional interest. |
| Moated Site Scheduled Monument | Within the Hornsea Three onshore ECR corridor search area. | |
| Earthworks of a bowl barrow Scheduled Monument | Within the Hornsea Three onshore ECR corridor search area. | The barrow is approximately 16m in diameter and it stands within Kelling Heath Holiday Park. |

| Site | Closest distance to Hornsea Three | Features |
|---|---|---|
| Bowl barrow Scheduled Monument (north side of Muckleburgh Hill) | Within the Hornsea Three onshore ECR corridor search area. | |
| Oval barrow Scheduled Monument (Bodham Wood) | Within the Hornsea Three onshore ECR corridor search area. | |
| Sheringham Hall Registered Park and Garden | Within the Hornsea Three onshore ECR corridor search area. | It comprises an early 19th century hall by John Repton set within a landscape park designed by Humphry Repton. Sheringham Hall is grade II* listed two-storey, five bay country house. The registered park covers c130 hectares and is enclosed on all boundaries by woodland belts and plantations. A Scheduled Monument is also located within the park. |
| Listed buildings In Weybourne and Holt | Within the Hornsea Three onshore ECR corridor search area. | |
| Baconsthorpe Castle Scheduled Monument | Within the Hornsea Three onshore ECR corridor search area. | It comprises a moated and fortified 15th century manor house which was occupied by the Heydon family for over 200 years. It has been uninhabited since the 1920s. |
| Heydon Hall Registered Park and Garden | Within the Hornsea Three onshore ECR corridor search area. | The hall was built in the 1580s and was originally surrounded by a deer park and walled gardens. By 1776, these had been cleared to make space for a landscape park. It features a serpentine lake and a formal yew-hedged parterre. |
| Salle Park Registered Park and Garden | Within the Hornsea Three onshore ECR corridor search area. | The house was built in the 1760s and is grade II* listed. The gardens form part of the Salle Park Estate. |
| Listed buildings in Reepham and Cawston and the surrounding countryside. | Within the Hornsea Three onshore ECR corridor search area. | |
| Round barrow Scheduled Monument – south east of the Lodges | Within the Hornsea Three onshore ECR corridor search area. | |
| Tumulus Scheduled Monument – in the Warren | Within the Hornsea Three onshore ECR corridor search area. | |
| Round barrow Scheduled Monument - north of Sandy Lane. | Within the Hornsea Three onshore ECR corridor search area. | |
| Listed buildings in Swannington, Attlebridge, Weston Longville and Bawburgh. | Within the Hornsea Three onshore ECR corridor search area. | |
| Bawburgh Hall Scheduled Monument | Within the Hornsea Three onshore ECR corridor search area. | |
| Listed buildings along Newmarket Road in Cringleford and Heathersett. | Within the Hornsea Three onshore ECR corridor search area. | |
| Cringleford Bridge Scheduled Monument | Within the Hornsea Three onshore ECR corridor search area. | |
| Two Tumuli - Big Wood | Within the Hornsea Three onshore ECR corridor search area. | |
| Two round barrows Scheduled Monument – near Ketteringham Hall. | Within the Hornsea Three onshore ECR corridor search area. | |

| Site | Closest distance to Hornsea Three | Features |
|---|---|---|
| Crown Point (also known as Whitlingham Hall) Registered Park and Garden | 0.08 km from Hornsea Three onshore ECR corridor search area. | Consists of mid-19th century gardens designed by William Broderick Thomas around what is now called Whitlingham Hall. The Hall is set in wider parkland and the former estate, which includes the ruins of Trowse Newton Hall and a late 19th century lime avenue. |
| Remains of a medieval settlement Scheduled Monument - east of Church Farm | Within the Hornsea Three onshore ECR corridor search area. | |
| Moated site at the Manor House Scheduled Monument | Within the Hornsea Three onshore ECR corridor search area. | |
| Roman town Scheduled Monument | Within the Hornsea Three onshore ECR corridor search area. | (Venta Icenorum) and associated prehistoric and medieval remains. |
| Roman sites outside town walls Scheduled Monument | Within the Hornsea Three onshore ECR corridor search area. | |
| Anglo-Saxon cemetery Scheduled Monument - south west of Markshall Farm | Within the Hornsea Three onshore ECR corridor search area. | |
| Anglo-Saxon cemetery Scheduled Monument | Within the Hornsea Three onshore ECR corridor search area. | |
| 'Woodhenge' at Arminghall Scheduled Monument | Within the Hornsea Three onshore ECR corridor search area. | |
| Several Scheduled Monument sites discovered in Markshall and Arminghall | Within the Hornsea Three onshore ECR corridor search area. | |

### Proposed approach to the Environmental Impact Assessment (EIA)

12.2.10 The significance of potential impacts will be assessed by taking into account the potential magnitude of impacts (e.g. a high magnitude impact could involve the total loss of a heritage asset) and the sensitivity of heritage assets.

#### *Sensitivity of heritage assets*

12.2.11 The sensitivity of heritage assets will depend on factors such as the condition of the site and the perceived heritage value/importance of the site. The importance of the receptor will in part be assessed in terms of national, regional or local statutory or non-statutory protection and grading of the asset.

#### *Assessment of asset importance*

##### *Archaeological assets*

12.2.12 There are no national government guidelines for evaluating the importance of heritage assets. For archaeological assets, the Department of Culture, Media and Sport (DCMS) has adopted a series of recommended (i.e. non-statutory) criteria for use in the determination of national importance when scheduling monuments. These are expressed in the document Scheduled Monuments - Identifying, Protecting, Conserving and Investigating Nationally Important Archaeological Sites under the Ancient Monuments and Archaeological Areas Act 1979 (DCMS, 2010).

*Historic buildings*

12.2.13 For historic buildings, assessment of importance is usually based on the designations used in the Listed Building process. Where historic buildings are not listed professional judgement will be used.

*Historic landscapes*

12.2.14 The sub-topic of Historic Landscape is recognised as having significant overlaps with other topics, such as landscape and townscape and therefore a multi-disciplinary approach to assessment will be adopted. This is to avoid double counting and duplication of effort. There are also significant overlaps with the other cultural heritage sub-topics of archaeological remains and historic buildings.

### *Assessment of impact magnitude*

*Archaeological assets*

12.2.15 The magnitude of an impact is assessed without regard to the value of the heritage asset. In considering the magnitude of impact, the principle established in Section 12 of the National Planning Policy Framework (NPPF) that preservation of the asset is preferred, and that total physical loss of the asset is least preferred, has been taken into account.

12.2.16 It is not always possible to assess the physical impact in terms of percentage loss and therefore it can be important in such cases to try to assess the capacity of the heritage asset to retain its character and significance following any impact. Similarly, impacts resulting from changes within the settings of buried archaeological assets may also be more difficult to assess as they do not involve physical loss of the resource and may be reversible.

*Historic buildings*

12.2.17 As for archaeological assets, the magnitude of impact in relation to historic buildings is assessed without regard to the importance of the asset, so the total destruction of an insignificant historic building has the same degree of magnitude of impact as the total loss of a high value historic building. Determination of the magnitude of impact is based on the principle that preservation of the asset and its setting is preferred and that total physical loss of the asset and/or its setting is the least preferred.

*Historic landscapes*

12.2.18 Historic landscapes cannot be destroyed or damaged but impacts on them can change their character. Impacts are assessed using evaluated HLC units, not the elements/parcels/components that contribute towards the character. There may be impacts resulting from changes within the settings of identified units, especially with regard to designated historic landscapes.

### Potential project impacts

12.2.19 A range of potential impacts on the historic environment have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Hornsea Three. The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 12.5, together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses that will be required to enable a full assessment of the impacts.

Table 12.5 Impacts proposed to be scoped into the Hornsea Three assessment for historic environment.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Direct impacts on heritage assets. | Construction works at the landfall, cable route, onshore HVAC/HVDC substation and onshore HVAC booster station could result in permanent loss of or damage to, buried archaeological assets. | A desk based study of heritage assets and the agreement of a subsequent campaign of fieldwork, potentially including targeted geophysical survey as appropriate. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 2 | Temporary impacts on the settings of heritage assets. | The onshore elements of Hornsea Three (including compounds and temporary accesses) could result in temporary impacts on the settings of heritage assets. | As above for historic environment impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 3 | Temporary impacts on the historic landscape (landfall, onshore cable, onshore HVAC/HVDC substation and onshore HVAC booster station). | The onshore elements of Hornsea Three (including compounds and temporary accesses) could result in temporary impacts on the overall historic landscape. | As above for historic environment impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| ***Operation and maintenance*** | | | | |
| 4 | Impact on the setting of heritage assets. | Potential long term, reversible, impacts from the onshore elements of Hornsea Three on the settings of heritage assets. | A desk based study of heritage assets and the agreement of a subsequent campaign of fieldwork, potentially including targeted geophysical survey as appropriate. Consideration of key views to/from heritage assets, where appropriate. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Decommissioning*** | | | | |
| 5 | Impacts on the setting of heritage assets. | Potential temporary impacts from the decommissioning of the onshore elements of Hornsea Three (including compounds and temporary accesses) on the settings of heritage assets. | As above for historic environment impact no. 4. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |
| 6 | Impacts on the overall historic landscape. | Potential temporary impacts from the decommissioning of the onshore elements of Hornsea Three (including compounds and temporary accesses) on the settings of heritage assets. | As above for historic environment impact no. 4. | No Hornsea Three specific modelling is proposed to be undertaken to inform this assessment. |

Table 12.6 Impacts proposed to the scoped out of the assessment for historic environment.

| Impact No. | Impact | Justification |
|---|---|---|
| ***Operation and maintenance*** | | |
| 1 | Impacts on the historic landscape (landfall and onshore cable). | It is considered unlikely that the operation and maintenance of the landfall/onshore cable route will lead to any impacts on the character of the overall historic landscape.<br>Therefore, subject to consultation with Norfolk County Council and Historic England and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Decommissioning*** | | |
| 2 | Impacts on buried archaeological remains (landfall, onshore cable, onshore HVAC/HVDC substation and onshore HVAC booster station). | It is considered unlikely that the decommissioning of the onshore project will lead to any further impacts on the character of the overall historic landscape. Any such impacts would have been assessed in the EIA already.<br>Therefore, subject to consultation with Norfolk County Council and Historic England and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |

### Measures adopted as part of the project

12.2.20 Measures adopted as part of the project will include:

- Development of, and adherence to, a Written Scheme of Investigation (WSI);
- Development of, and adherence to, a CoCP; and
- Landscape planting, if required.

12.2.21 The requirement and feasibility of additional measures will be dependent on the significance of the effects on historic environment. The requirement and feasibility of any additional measures will be consulted upon with statutory consultees throughout the EIA process.

### Potential cumulative impacts

12.2.22 Cumulative impacts on historic environment resources arising from the proposed development alongside other projects within the historic environment study area from other industries/activities (e.g. industrial development, coastal infrastructure associated with oil and gas activities or electrical infrastructure) would only be likely to occur during the construction, and operation and maintenance phases.

12.2.23 There is the potential for cumulative effects to occur from other projects or activities within the historic environment study area where projects or plans could act collectively with Hornsea Three to affect sensitive receptors.

12.2.24 The following projects will be considered within the historic environment study area:

- Other offshore wind farms and associated onshore cabling and infrastructure;
- Onshore energy generation projects (excluding householder scale projects);
- Roads and rail projects;
- Major residential, commercial and leisure projects; and
- Minerals extraction and landfill projects.

12.2.25 Hornsea Three will monitor the status of identified and emerging projects throughout the pre-application phase, and consider these within the assessment of cumulative impacts within the EIA as necessary.

### Potential transboundary impacts

12.2.26 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there is no potential for significant transboundary effects with regard to the historic environment from Hornsea Three upon the interests of other EEA states as the predicted impacts on the historic environment will largely be focused within the footprint of Hornsea Three.

## 12.3 Land use, agriculture and recreation

### Introduction

12.3.1 This section of the Scoping Report identifies the land use, agricultural and recreational receptors of relevance to Hornsea Three and considers the assessment of the potential impacts and likely significant effects from the construction, operation, maintenance and decommissioning of the onshore and intertidal components of Hornsea Three on these resources (i.e. above the MLWS mark). Specifically, the potential impacts on the following resources are considered:

- Soil types and patterns of soils;
- The quality of the agricultural land according to the Ministry of Agriculture, Fisheries and Food Agricultural Land Classification (ALC) Guidelines (MAFF,1988), in particular the presence of the "best and most versatile" Grades 1, 2 and 3a land;
- Farm holdings and/or the farming framework; and
- Recreational resources (recreational facilities, areas of public access and PRoW).

12.3.2 Regarding the amenity, or relative pleasantness of a recreational resource or receptor, these issues are dependent largely on factors such as noise and visual effects. The landscape and visual resources, and noise and vibration assessments therefore address these matters, as appropriate, with cross references provided in the land use and recreation assessment.

### Study area

12.3.3 The study area for the Hornsea Three land use and recreation EIA is, at this stage, defined as the area within the landfall area and the onshore ECR corridor search area.

12.3.4 Upon finalisation of onshore ECR corridor (including the proposed locations for the onshore HVAC/HVDC substation and onshore HVAC booster station), the land use and recreation study area would be refined as the area encompassing the temporary and permanent land take for the intertidal and onshore elements of Hornsea Three.

### Baseline data

12.3.5 An initial desk based review of literature and data sources to support this Scoping Report has highlighted the following data sources which provide coverage of the land use and recreation study area:

- Soils and their Use in Eastern England (Harpenden, 1984) Soil Survey of England and Wales; 1:250,000 map and accompanying Bulletin (13);
- Soils of Norfolk II (Barningham/Sheringham) Soil Survey of England and Wales Soil Record No.21 (1974);
- Soils of Norfolk III (Horning) Soil Survey of England and Wales Soil Record No. 41 (1977);

- Soils of Norfolk V (Attlebridge) Soil Survey of England and Wales Soil Record No. 64 (1980);
- ALC of England 1:250,000 (Defra, accessed via www.magic.gov.uk);
- Natural England Access to ALC evidence;
- Climatological Data for ALC (Meteorological Office, 1989);
- BGS 1:50,000 scale geological map (England and Wales, Bedrock and Superficial Deposits);
- Government farming statistical data;
- Other available mapped information that provides information on the characteristics of farming within the land use and recreation study area;
- Ordnance survey mapping;
- Definitive map of PRoW;
- Registers of Common Land, Town and Village Greens;
- Sustrans web based data;
- North Norfolk District Council website;
- Broadland District Council website;
- South Norfolk District Council website;
- MAGIC (www.magic.gov.uk); and
- Visitor England website.

12.3.6 Further information including bathing beaches, Country Parks and tourist infrastructure such as caravan parks will be considered within the EIA process.

### Baseline environment

#### *Onshore export cable route (ECR) corridor*

12.3.7 In the vicinity of the ECR corridor landfall area, the agricultural land between the coastal cliff and the A419 is shown to be predominantly of Grade 3 quality, according to the Provisional ALC map[10]. There are a number of recreational and tourism resources within this area, including a visitor accommodation and attractions in and around Weybourne. To the far eastern extent of the ECR corridor landfall area is Sheringham Golf Course. Sheringham beach is also a blue flag beach.

[10] Whilst the provisional map can be used to provide a useful tool to identify the relative quality of land across a large area, these maps were drawn up using reconnaissance survey work and a system of ALC that has since been comprehensively revised. They cannot therefore be relied upon for an accurate analysis of ALC in specific locations.

12.3.8 The Peddars Way and Norfolk Coast Path (National Trail) runs along the coastline at this location and a section of the England Coast Path extends from Weybourne to Sea Palling. There is a public car parking to the north of Weybourne.

12.3.9 Further inland, the agricultural land within the onshore ECR corridor area is shown on the provisional ALC map to comprise a mixture of predominantly Grade 2 and Grade 3 land, with some small strips of Grade 4 land associated with low lying alluvial areas within river corridors. ALC mapping in the vicinity of Norwich shows that the surrounding area comprises areas of Grade 2, Grade 3a and Grade 3b quality land. Some areas of land within the corridor have been surveyed in more detail by Natural England, which are located mainly in the vicinity of Norwich.

12.3.10 The landfall and northern sections of the onshore ECR corridor lie within the Norfolk Coast AONB which attracts visitors for walking and sight-seeing.

12.3.11 The following cycle routes are within the onshore ECR corridor:

- Route 1 - Fakenham to Harwich National Cycle Network: a long distance cycle route connecting Dover and the Shetland Islands, via the east coast of England and Scotland;
- Regional Route 30 Eastern Route; and
- A local route to the west of Norwich.

12.3.12 There are also numerous PRoW and promoted routes within the onshore ECR corridor, including the Tas Valley Way and Boudicca Way.

12.3.13 Access land, as defined by the Countryside and Rights of Way Act 2000 and as mapped by the Countryside Agency (now Natural England), comprises open country (predominantly mountain, moor, heath, and down) and registered common land. There are several areas of access land and also common land within the onshore ECR corridor.

12.3.14 Other recreational resources located within the onshore ECR corridor include Sheringham Park, the North Norfolk Railway, the Royal Norfolk showground, together with golf courses and county parks.

### *Land use and recreation designated sites*

12.3.15 Land use and recreational designations within the Hornsea Three onshore ECR search area comprise a number of locations which have national designations. Further details on these designated sites are provided in Table 12.7 below.

Table 12.7 Designations within the onshore ECR corridor search area relevant to land use and recreation.

| Site | Closest distance to Hornsea Three | Features |
|---|---|---|
| ***National designations*** | | |
| Norfolk Coast AONB | Within the Hornsea Three onshore ECR corridor search area. | Conservation and enhancement of the natural beauty of the area under the Countryside and Rights of Way Act 2000. |
| Access Land | Within the Hornsea Three onshore ECR corridor search area. Located at Upper Sheringham and High Kelling. | Land with a right of public access on foot under the Countryside and Rights of Way Act 2000. |
| Registered Common Land | Within the Hornsea Three onshore ECR corridor search area. Located near Holt and Court Green, High Kelling, The Dale, Barningham Green, Corpusty Common, Salle Common, Swannington, Drayton and Ringland, Mulbarton and Swardeston. | Registered Common Land to which there is a right of public access under the Countryside and Rights of Way Act 2000. |
| Airfields | Within the Hornsea Three onshore ECR corridor search area. | Airfields within the onshore ECR corridor search area are found at Felthorpe and Weybourne. |

### Proposed approach to the Environmental Impact Assessment (EIA)

12.3.16 There are no standard criteria for assessing environmental effects on land use, agriculture and recreation. Therefore, account will be taken of the guidance that is provided on these topics in the DMRB, including:

- Volume 11, Section 2 in relation to the approach to EIA (Highways Agency *et al.*, 2008);
- Volume 11, Section 3, Part 8 relating to 'Pedestrians, Cyclists Equestrians and Community Effects' (Highways Agency *et al.*, 1993); and
- Volume 11, Section 3, Part 6 'Land Use' (Highways Agency *et al.*, 2001).

12.3.17 Although developed for highways projects, the DMRB has developed methodologies that are also useful for other linear developments such as cable routes.

### Potential project impacts

12.3.18 A range of potential impacts on land use, agricultural and recreational resources have been identified which may occur during the construction, operation and maintenance and decommissioning phases of Hornsea Three. The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 12.8 together with a description of any additional data collection and/or supporting analyses that will be required to enable a full assessment of the impacts to be undertaken.

12.3.19 On the basis of the baseline land use, agriculture and recreation information currently available and the project description outlined in Chapter 3: Project Description, no impacts are proposed to be scoped out of the assessment for land use, agriculture and recreation.

Table 12.8 Impacts proposed to be scoped into the Hornsea Three assessment for land use, agriculture and recreation.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Temporary excavation for cable laying, construction compounds and temporary construction side access routes. | The onshore ECR search area is on agricultural land and areas of good to best quality land may be affected. | A desk-based study of agricultural land affected by Hornsea Three would be undertaken. In addition, a targeted ALC survey within the range of soil types identified in the desk top study would be undertaken. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 2 | Temporary excavation for cable laying, construction compounds and temporary construction side access routes. | Construction could impact on access, drainage, spread animal/plant diseases | Desktop review of farming information to be provided by the land agent. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 3 | Temporary excavation of the cable route at the landfall. | There are recreational uses in the vicinity of the landfall area. | A desktop review of recreational resources likely to be affected will be undertaken. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 4 | Temporary excavation for cable laying, construction compounds and temporary construction side access routes. | There are National Trails, National Cycle Network routes, other PRoWs and promoted routes within the onshore ECR corridor search area. | A desktop review of these linear recreational routes and a targeted walkover survey to establish their nature and condition. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 5 | Temporary excavation for cable laying. | There are recreational and tourist resources within the scoping corridor. | A desktop review of recreational and tourist resources to be affected will be undertaken. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 6 | Construction of the onshore HVDC/HVAC substation, onshore HVAC booster station, link boxes and TJBs. | The onshore ECR search area is on agricultural land and areas of good to best quality land may be affected. | A desk-based study of agricultural land affected by Hornsea Three would be undertaken. In addition, a targeted ALC survey within the range of soil types identified in the desk top study would be undertaken. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 7 | Construction of the onshore HVDC/HVAC substation, onshore HVAC booster station, link boxes and TJBs. | Construction could impact on access, drainage and spread of animal/plant diseases. | Desktop review of farming information to be provided by the land agent. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 8 | Temporary impacts of the construction activities. | Weybourne and Felthorpe Airfields are located within the onshore ECR search corridor. In the interests of safety, potential hazards for aircraft using the grass airstrip during the construction phase would be considered. | Consultation between Hornsea Three and the operators of Weybourne and Felthorpe Airfields would be required. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| ***Operation and maintenance*** | | | | |
| 9 | Temporary impacts of cable route maintenance activities. | The onshore ECR search corridor is on agricultural land and areas of good to best quality land may be affected temporarily if sections of cable need to be uncovered for repair/investigation. | A desk-based study of agricultural land affected by Hornsea Three would be undertaken. In addition, a targeted ALC survey within the range of soil types identified in the desk top study would be undertaken. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 10 | Temporary impacts of cable route maintenance activities. | The onshore ECR search area is on agricultural land. Temporary effects may occur if sections of cable need to be uncovered for repair/investigation. | Desktop review of farming information to be provided by the land agent. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 11 | Temporary impacts of cable route maintenance activities. | There are National Trails, National Cycle Network routes, other PRoWs and promoted routes within the onshore ECR corridor search area. Temporary effects may occur if cable maintenance requires temporary stopping up or diversion of PRoWs/ cycleways. | A desktop review of these linear recreational routes and a targeted walkover survey to establish their nature and condition. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| ***Decommissioning*** | | | | |
| 12 | Decommissioning of the HVDC/HVAC substation and onshore HVAC booster station. | Decommissioning could impact on access, drainage and spread of animal/plant diseases. | As above for land use, agriculture and recreation impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 13 | Decommissioning of the HVDC/HVAC substation and onshore HVAC booster station. | There are National Trails, National Cycle Network routes, other PRoWs and promoted routes within the onshore ECR corridor search area. | As above for land use, agriculture and recreation impact no. 2. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

### Measures adopted as part of the project

12.3.20 Measures adopted as part of the project will include:

- Development of, and adherence to, a CoCP;
- Development of, and adherence to, a PEMMP; and
- Development of, and adherence to, a Decommissioning Plan.

12.3.21 The requirement and feasibility of additional measures will be dependent on the significance of the effects on land use, agriculture and recreation. The requirement and feasibility of any additional measures will be consulted upon with statutory consultees throughout the EIA process.

### Potential cumulative impacts

12.3.22 Cumulative impacts on agricultural land arising from the proposed development alongside other projects within the land use, agriculture and recreation study area from other industries/activities (e.g. industrial development, coastal infrastructure associated with oil and gas activities or electrical infrastructure) would only be likely to occur during the construction phases as the soils and agricultural land quality would be restored and the land returned to their current farm holdings on completion of construction.

12.3.23 The predicted effects of construction, operation and maintenance, and decommissioning from Hornsea Three on land use, agriculture and recreation are considered to be localised to within the footprint of Hornsea Three. However, there is potential for cumulative effects to occur from other projects or activities within the Hornsea Three land use, agriculture and recreation study area where projects or plans could act collectively with Hornsea Three to affect sensitive receptors.

12.3.24 The following projects or activities will be considered within the onshore study area:

- Other offshore wind farms and associated onshore cabling and infrastructure;
- Onshore energy generation projects (excluding householder scale projects);
- Road and rail projects;
- Major residential, commercial and leisure projects; and
- Minerals extraction and landfill projects.

12.3.25 Potential cumulative effects on recreational resources would also only occur during the construction phase of Hornsea Three. The reason for this is that following the construction and decommissioning phase, any recreational resources impacted by the works would be reinstated and public access would continue to be provided (e.g. by the existing PRoW network).

12.3.26 Hornsea Three will monitor the status of identified and emerging projects throughout the pre-application phase, and consider these within the assessment of cumulative impacts within the EIA as necessary.

### Potential transboundary impacts

12.3.27 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there is no potential for significant transboundary effects with regard to the land use, agricultural or recreational resource from Hornsea Three upon the interests of other EEA states as the predicted impacts on land use, agricultural and recreational resource will largely be focused within the footprint of Hornsea Three.

## 12.4 Traffic and transport

### Introduction

12.4.1 This section of the Scoping Report identifies the relevant traffic, transport and highways receptors for Hornsea Three, and considers the potential impacts and likely significant effects from the construction, operation and maintenance, and decommissioning of the onshore components of Hornsea Three (above the MHWS mark) on those receptors.

### Study area

12.4.2 The study area for the Hornsea Three traffic and transport EIA is defined as the area within the onshore ECR corridor search area, landward of MHWS, and all highways within it.

12.4.3 Upon finalisation of the onshore ECR corridor, the traffic and transport study area would be refined to include particular focus on minor roads that are likely to be affected more directly by traffic generated during the construction phase, and to consider what additional temporary roads may need to be installed and from which network points. Pending further discussion and feedback from the local highways authority additional points on the network outside of the traffic and transport study area may be considered.

### Baseline data

12.4.4 An initial desk based review of literature and data sources to support this Scoping Report has identified roads and infrastructure within the onshore ECR search area from OS mapping.

12.4.5 On refinement of the traffic and transport study area, the following data will be obtained to inform the traffic and transport EIA:

- Existing traffic flow information will be obtained from the local highways authority (and Highways England where relevant) to identify the current capacity and potential constraints of the road network. This will include results from Automated Traffic Counts and Annual Average Daily Flow calculations.
- Personal Injury Accident data for road traffic accidents will also be obtained from the local highways authority.
- Records of existing bus service routes, cycle paths and train services will be obtained from Norfolk County Council, Network Rail and relevant service operators.
- New traffic surveys will be undertaken in 2016 and 2017 to supplement the local highways authority traffic flow data. Site visits may also be undertaken to audit the transport networks within the traffic and transport study area.

### Baseline environment

12.4.6 The main road connections within the Hornsea Three onshore ECR corridor search area are as follows:

- A47 and A11 (both trunk roads (A (T) roads) and therefore part of the Strategic Road Network) and the following A roads:
- A11;
- A1074;

- A148;
- A1067;
- A140; and
- A149.

12.4.7 The remainder of roads within the Hornsea Three onshore ECR corridor search area are Class B and minor roads.

12.4.8 There are two rail lines within the Hornsea Three onshore ECR corridor search area, specifically:

- Great Eastern Mainline; and
- Breckland Line.

12.4.9 The location of these roads and other infrastructure is shown on Figure 12.4.

### Proposed approach to the Environmental Impact Assessment (EIA)

12.4.10 Regardless of its final alignment, the Hornsea Three onshore ECR corridor will need to cross a number of public highways. The proposed crossing methods will be discussed and developed in consultation with the local highways authority, Highways England and the LPA, as required.

12.4.11 Transport movements associated with the onshore works will also be identified once the onshore ECR corridor has been finalised. A desktop review will then be undertaken to identify the key locations where transport issues may be raised including the potential disruption to rail services. These baseline studies will identify potential road network constraints and inform potential routes for delivery and construction and decommissioning vehicles (types and numbers). The local highways authorities and Highways England will be consulted during this period to ascertain any potential issues with the proposed access routes.

12.4.12 The assessment of impacts on the local road network will assess the flows predicted as a result of the onshore construction of Hornsea Three against existing baseline flows. The scope and duration of predicted impacts will be quantified in terms of phases of delivery, construction and operation.

12.4.13 A precautionary approach will be adopted for the traffic and transport EIA in relation to assumptions about the proportion of the haul road and construction compounds that will require aggregate surfacing and the timescale and phasing of construction. The Environmental Statement will outline a high-level construction compound strategy, which will be further developed once the route is finalised, to indicate the potential size and broad spread of construction compounds that are likely to be required.

12.4.14 Methodologies to cross rail lines will be discussed with Network Rail and/or the relevant operator and an assessment of the potential impact of disruption to rail services as a result of onshore export cable construction under railway lines will be undertaken in consultation with Network Rail.

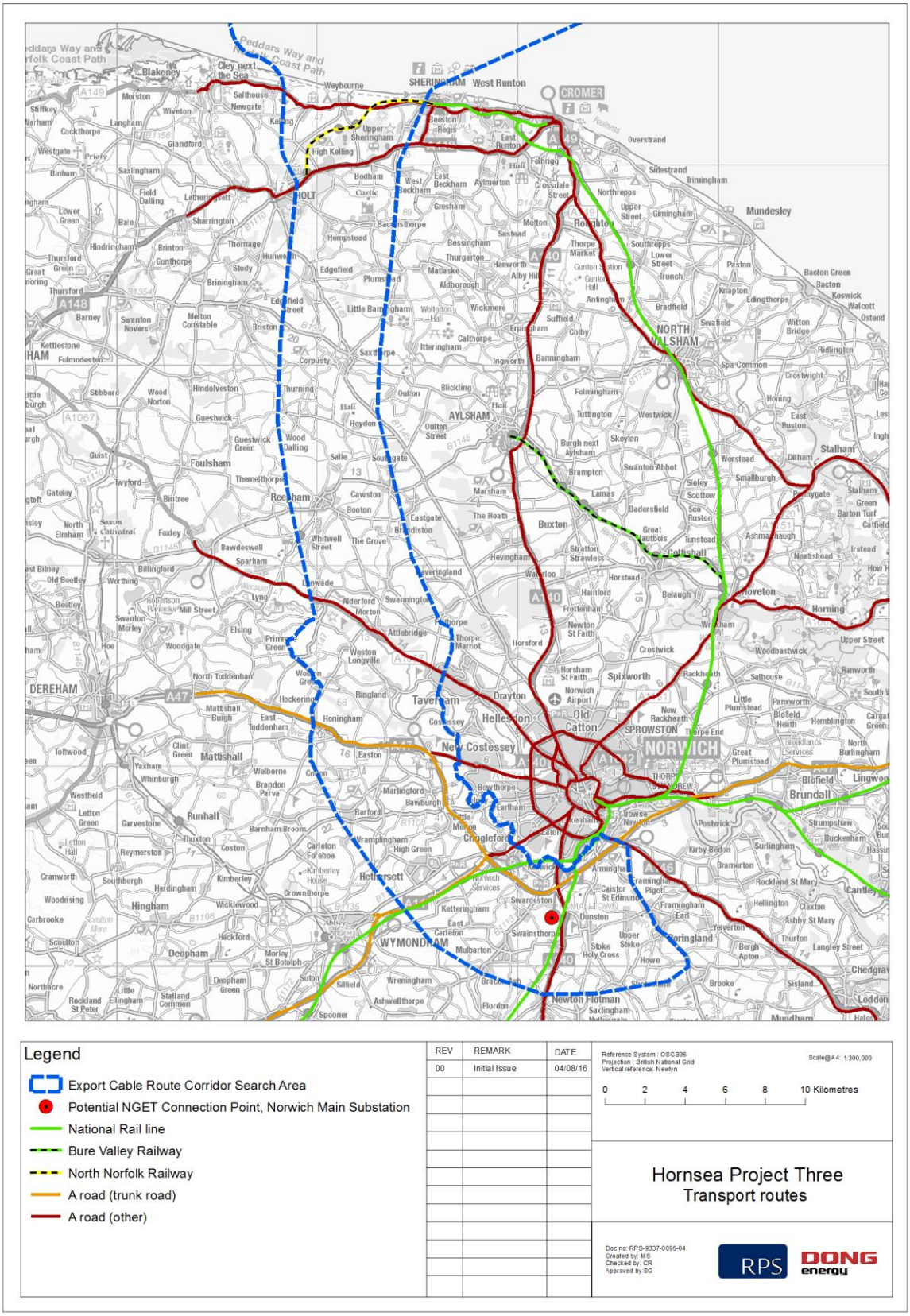



Figure 12.4 Location of roads and infrastructure with Hornsea Three onshore ECR search area.

### *Assessment criteria and assessment methodology*

12.4.15 The traffic and transport EIA will be based on the following guidance:

- Planning Practice Guidance: Travel Plans, Transport Assessments and Statements in Decision Taking (PPG, 2014);
- Guidelines for the Environmental Assessment of Road Traffic (IEMA, 1993); and
- The DMRB Volume 11 Environmental Assessment (Highways Agency *et al*., 2008).

12.4.16 The significance of transport environmental effects will be assessed by considering the interaction between the magnitude of the impacts and the sensitivity of the receptors in the vicinity of transport corridors. This assessment compares the baseline situation with the development, taking into account other schemes that are likely to affect future baseline conditions.

12.4.17 Consistent with the IEMA guidelines, the following will be considered within the traffic and transport EIA:

- Driver delay;
- Severance of routes;
- Pedestrian delay;
- Fear and Intimidation (pedestrian amenity);
- Accidents and road safety; and
- Hazardous, dangerous and abnormal loads.

### Potential project impacts

12.4.18 There is a potential for a range of traffic and transport impacts which may occur as a result of the construction, operation and decommissioning phases of Hornsea Three. The impacts which have been scoped into the Hornsea Three assessment are outlined in Table 12.9 below, together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

12.4.19 On the basis of the baseline traffic and transport information currently available and the project description, a number of impacts are proposed to be scoped out of the assessment for traffic and transport. These impacts are outlined, together with a justification for screening them out, in Table 12.10.

### Measures adopted as part of the project

12.4.20 Measures adopted as part of the project will include:

- Development of, and adherence to, a Construction Traffic Management Plan; and
- Development of, and adherence to, a CoCP.

12.4.21 The requirement and feasibility of additional measures will be dependent on the significance of the effects on traffic and transport. The requirement and feasibility of any additional measures will be consulted upon with statutory consultees throughout the EIA process.

Table 12.9 Impacts proposed to be scoped into the Hornsea Three assessment for traffic and transport.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Temporary highways network impacts from deliveries and construction staff movements. | The construction of Hornsea Three has the potential to affect the strategic and local road networks through the delivery of machinery, materials, cabling and the movements generated by construction workers. | Baseline road traffic data from the local highways authority, drawing on Automatic Traffic Counts and ADDF information.<br>Local highways authority records for Personnel Injury Accident data and public transport services.<br>New traffic survey data will be commissioned and obtained as required. | Modelling for anticipated construction traffic generation in terms of workers/construction staff, and Heavy Goods Vehicle (HGV)/goods deliveries. |
| 2 | Temporary highways network impacts from the movement of wastes generated during the construction phase. | Wastes generated from offshore construction could come ashore and need to be transferred. There would also be waste generated from the onshore construction works. | The types and likely volumes of waste will be identified within a separate Site Waste Management Plan which will accompany the application for Development Consent. | Traffic movements generated as a result of waste transfer will be predicted as part of the wider construction traffic modelling exercise. |
| 3 | Temporary delays to public transport services. | Hornsea Three has the potential to result in temporary delays to public transport services as a result of onshore export cable construction beneath local roads and under rail lines causing delays on the highway network.<br>The installation of cables beneath A(T) and A roads using HDD will mean no road closures would be necessary and no disruption to traffic would occur. | Local highways authority records for the operation and use of public transport services will be obtained. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| ***Operation and maintenance*** | | | | |
| No impacts are proposed to be scoped in at this stage. | | | | |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Decommissioning*** | | | | |
| 4 | Temporary delays to public transport services. | The decommissioning phase has the potential to cause similar impacts to the construction phase as a result of project decommissioning beneath local roads and under rail lines, although to a lesser degree. It is possible that the onshore cable will be left in situ once works are completed, in which case no traffic and transport impacts are likely to occur in connection with that aspect. In that scenario most impact would come from the decommissioning of the HVAC/HVDC substation and the onshore HVAC booster station. | Local highways authority records for the operation and use of public transport services will be obtained. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

Table 12.10 Impacts proposed to the scoped out of the assessment for traffic and transport.

| Impact No. | Impact | Justification |
|---|---|---|
| ***Operation and maintenance*** | | |
| 1 | Traffic generated by routine checks and maintenance activities during the operational phase of Hornsea Three. | Although routine maintenance visits will require vehicles to access the landfall area, onshore HVAC/HVDC substation site and onshore HVAC booster station during operation, it is not anticipated that these will have a significant impact on the local traffic or transport during the operation of the onshore project infrastructure as it will involve a small increase in traffic. It is suggested that no further assessment is therefore required.<br>Therefore, subject to consultation with the local highways authority and LPA, and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |

### Potential cumulative impacts

12.4.22 Cumulative impacts on traffic arising from the proposed development alongside other projects within the EIA study area (e.g. port development, industrial development, other coastal infrastructure (e.g. associated with oil and gas activities)) will be considered within the Environmental Statement.

12.4.23 The predicted effects of construction, operation and maintenance, and decommissioning from Hornsea Three on traffic and transport are considered to be localised to within the traffic and transport study area. However, there is potential for cumulative effects to occur from other projects or activities within the Hornsea Three traffic and transport study area where projects or plans could act collectively with Hornsea Three to affect sensitive receptors.

12.4.24 The following projects or activities will be considered within the onshore study area:

- Other offshore wind farms and associated onshore cabling and infrastructure;
- Onshore energy generation projects (excluding householder scale projects);
- Road and rail projects;
- Major residential, commercial and leisure projects; and
- Minerals extraction and landfill projects.

12.4.25 For traffic and transport the worst case scenario would be that which results in the highest levels of HGV movements, particularly at sensitive locations, if a combination of strategic projects were to come forward to construction at the same time. A worst case, or several if there is more than one equal worst case scenario, will be considered in more detail in the traffic and transport CEA. Hornsea Three will develop and agree the worst case scenario to be assessed in the traffic and transport EIA in consultation with the relevant stakeholders.

12.4.26 Hornsea Three will monitor the status of identified and emerging projects throughout the pre-application phase, and consider within the assessment of cumulative impacts within the EIA as necessary.

### Potential transboundary impacts

12.4.27 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there is no potential for significant transboundary effects with regard to the traffic and transport from Hornsea Three upon the interests of other EEA states as the predicted impacts on the traffic and transport will largely be focused within the footprint of Hornsea Three.

## 12.5 Noise and vibration

### Introduction

12.5.1 This section of the Scoping Report considers the assessment of onshore noise and vibration effects of relevance to the Hornsea Three project and considers the potential impacts and likely significant effects from the construction, operation, maintenance and decommissioning of the onshore components (above MHWS mark) of Hornsea Three in terms of noise and vibration effects on prescribed receptors.

### Study area

12.5.2 The noise and vibration EIA study area is, at this stage defined as the areas within the Hornsea Three onshore ECR corridor search area.

12.5.3 Upon finalisation of the Hornsea Three onshore ECR corridor, the noise and vibration study area will be refined to include the temporary and permanent land take for the onshore elements of Hornsea Three, and the location of the Hornsea Three onshore HVAC booster station and the Hornsea Three onshore HVAC/HVDC substation, and the closest noise sensitive receptors, if necessary, in consultation with the relevant Local Authorities.

### Baseline data

12.5.4 No baseline sound monitoring has been undertaken to date. Once the noise and vibration study areas has been refined, baseline conditions will be established by undertaking baseline noise surveys. The locations for the survey would be identified from a review of the site and its environs using OS mapping and aerial photography. The locations would be representative of the potentially most affected noise sensitive receptors and would be agreed with Environmental Health Officers of the Local Authorities. A weather station would also be deployed at one of the locations to identify site-specific meteorological conditions during the surveys.

12.5.5 The surveys will be undertaken during suitable weather conditions, based on available weather forecasts. The noise data will be scoped using the meteorological information to ensure that a dataset representative of ambient and background sound levels can be derived. The surveys and data screening will be in accordance with the requirements of British Standard BS 4142:2014 ‘Methods for rating and assessing industrial and commercial sound’ and British Standard 7445:1991 ‘Description and measurement of environmental noise Part 2:Guide to the acquisition of data pertinent to land use’.

12.5.6 A review of baseline data contained within Environmental Statements for other developments would also be undertaken where data is available and relevant.

### Baseline environment

12.5.7 The onshore ECR corridor search area is primarily located in a rural location. These rural locations are ranked moderate to high in terms of tranquillity according to the Campaign to Protect Rural England tranquillity maps of England. However, the urban areas around Norwich and some of the towns/villages within the onshore ECR corridor search areas are rated less tranquil.

#### *Designated sites*

12.5.8 There are no international, national or local designations specifically related to matters of noise and vibration, or how it should be controlled. Noise and vibration effects have the potential to have an effect on sensitive receptors, including residential properties, members of the public using publicly accessible resources (for example, PRoWs, common land, playing fields, visitor attractions), commercial properties and designated heritage assets.

### Proposed approach to the Environmental Impact Assessment (EIA)

12.5.9 There is no nationally adopted guidance on how the significance of noise effects should be determined. The significance of predicted effects will be evaluated in accordance with the methodology set out in Chapter 5: Environmental Impact Assessment Methodology.

12.5.10 The magnitude of the noise impacts will however be identified using semantic scales following guidance from BS 5228-2: Code of Conduct for Noise and Vibration Control on Construction and Open Sites (2009), and the semantic scales in the DMRB (Volume 11, Section 3, Part 7, HD 213/11 Revision 1, Chapter 3, paragraph 3.37) would be used for impact magnitude related to change in road traffic noise. The threshold for significant operational noise effects at noise sensitive receptors would follow BS 4142: Methods for Rating and Assessing Industrial and Commercial Sound.

### Potential project impacts

12.5.11 A range of potential impacts on noise and vibration have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Hornsea Three. The impacts that have been scoped into the Hornsea Three assessment are outlined in Table 12.11, together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

12.5.12 On the basis of the baseline noise and vibration information currently available and the project description outlined in Chapter 3: Project Description, a number of impacts are proposed to be scoped out of the assessment for noise and vibration. These impacts are outlined, together with a justification for screening them out, in Table 12.12.

Table 12.11 Impacts proposed to be scoped into the Hornsea Three assessment for noise and vibration.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Temporary increase in noise and vibration during cable installation. | The construction of the onshore elements of Hornsea Three could directly affect sensitive receptors. | A desk-based study to identify noise sensitive receptors would be undertaken and where appropriate baseline noise measurements would be taken in key areas (e.g. major crossings and construction compounds). | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 2 | Temporary increase in noise and vibration during the construction of cable route construction access. | The construction of the onshore elements of Hornsea Three could directly affect sensitive receptors. | As above for noise and vibration impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 3 | Temporary increase in noise and vibration at construction access compounds due to vehicle movements. | The construction of the onshore elements of Hornsea Three could directly affect sensitive receptors. | As above for noise and vibration impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 4 | Temporary increase in noise and vibration due to traffic generation on the local road network. | The construction of the onshore elements of Hornsea Three could directly affect sensitive receptors. | As above for noise and vibration impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 5 | Temporary increase in noise and vibration due to the construction of the onshore HVAC/HVDC substation and onshore HVAC booster station. | The construction of the onshore elements of Hornsea Three could directly affect sensitive receptors. | As above for noise and vibration impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 6 | Temporary increase in vibration due to tubular steel piling (percussive piling). | The construction of the onshore elements of Hornsea Three could directly affect sensitive receptors. | As above for noise and vibration impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Operation and maintenance*** | | | | |
| 7 | Operation of the onshore HVAC/HVDC substation and onshore HVAC booster station. | The ongoing operation and maintenance of the onshore HVAC/HVDC substation could directly affect sensitive receptors. | As above for noise and vibration impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| ***Decommissioning*** | | | | |
| 8 | Temporary increase in noise and vibration as a result of cable decommissioning. | The decommissioning of the Hornsea Three onshore ECR could directly affect sensitive receptors. | As above for noise and vibration impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 9 | Temporary increase in noise and vibration as a result of the decommissioning of the onshore HVAC/ HVDC substation and onshore HVAC booster station. | The decommissioning of the onshore HVAC/HVDC substation could directly affect sensitive receptors. | As above for noise and vibration impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

Table 12.12 Impacts proposed to be scoped out of the assessment for noise and vibration.

| Impact No. | Impact | Justification |
|---|---|---|
| ***Operation and maintenance*** | | |
| 1 | The temporary impacts of cable operation and maintenance may affect receptors sensitive to noise or vibration. | It is considered unlikely that the operation and maintenance of the landfall/onshore cable route will lead to any significant noise and vibration effects.<br>Therefore, subject to consultation with the Local Authority Environmental Health Officers and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 2 | The temporary impacts of the onshore HVAC/HVDC substation and onshore HVAC booster station maintenance may affect receptors sensitive to noise or vibration. | It is considered unlikely that the maintenance of the onshore HVAC/HVDC substation will lead to any significant noise and vibration effects.<br>Therefore, subject to consultation with the Local Authority Environmental Health Officers and feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |

### Measures adopted as part of the project

12.5.13 Measures adopted as part of the project will include:

- Development of, and adherence to, a CoCP; and
- Development of, and adherence to, a Decommissioning Plan.

12.5.14 The requirement and feasibility of any mitigation measures will be dependent on the significance of the effects on noise and vibration. The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

### Potential cumulative impacts

12.5.15 Cumulative impacts in terms of noise and vibration arising from Hornsea Three alongside other projects within the noise and vibration study area from other industries/activities (e.g. industrial development, coastal infrastructure associated with oil and gas activities or electrical infrastructure) would only be likely to occur during the construction phase.

12.5.16 The predicted effects of construction, operation and maintenance, and decommissioning from Hornsea Three on noise and vibration are considered to be localised to within the noise and vibration study area. However, there is potential for cumulative effects to occur from other projects or activities within the Hornsea Three noise and vibration study area where projects or plans could act collectively with Hornsea Three to affect sensitive receptors.

12.5.17 The following projects or activities will be considered within the onshore study area:

- Other offshore wind farms and associated onshore cabling and infrastructure;
- Onshore energy generation projects (excluding householder scale projects);
- Road and rail projects;
- Major residential, commercial and leisure projects; and
- Minerals extraction and landfill projects.

12.5.18 Hornsea Three will monitor the status of identified and emerging projects throughout the pre-application phase, and consider these within the assessment of cumulative impacts within the EIA as necessary.

### Potential transboundary impacts

12.5.19 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there is no potential for significant transboundary effects with regard to noise and vibration from Hornsea Three upon the interests of other EEA states as the predicted impacts on noise and vibration will largely be focused within the footprint of Hornsea Three.

## 12.6 Air quality and health

### Introduction

12.6.1 This section of the Scoping Report identifies the relevant impacts and effects on air quality and health on receptors from the construction, operation and maintenance, and decommissioning of the onshore components (above MHWS mark) of Hornsea Three in terms of air quality and health.

12.6.2 For the construction phase, the key pollutant is dust, including both particulate matter that is suspended in the air that can be breathed, and deposited dust that has fallen out of the air onto surfaces and which can potentially cause temporary annoyance effects.

12.6.3 The main pollutants from road traffic with potential for local air quality impacts are Nitrogen Oxides (NOx) and particulate matter.

### Study area

12.6.4 The study area for the Hornsea Three air quality and health EIA is, at this stage, defined as the area within the onshore ECR corridor search area, landward of MWHS.

12.6.5 Upon finalisation of an onshore ECR corridor, the air quality and health study area will be refined as follows:

- **Dust assessment:** For human receptors, areas within 350 m from the boundary of the cable corridor or within 50 m of the routes used by construction vehicles, up to 500 m from site entrances. For ecological receptors, areas within 50 m from the cable corridor or 50 m of the routes used by construction vehicles on the public highway, up to 500 m from site entrances. These are the screening criteria set out in the Institute of Air Quality Management (IAQM) guidance (IAQM, 2014).
- **Vehicle pollutant assessment:** The road links to be included in the assessment determined by the indicative threshold criteria for determining when an assessment is required set out in the EPUK/IAQM guidance (EPUK/IAQM, 2015):

  *"1. Cause a significant change in Light Duty Vehicle traffic flows on local roads with relevant receptors. (Light Duty Vehicles = cars and small vans <3.5t gross vehicle weight)*

  *A change of Light Duty Vehicle flows of:*

  - *More than 100 AADT [Annual Average Daily Traffic] within or adjacent to an Air Quality Management Area (AQMA); and*
  - *More than 500 AADT elsewhere.*

  *2. Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5t gross vehicle weight).*

  *A change of HDV flows of:*

  - *More than 25 AADT within or adjacent to an AQMA; and*
  - *More than 100 AADT elsewhere".*

12.6.6 The study area for vehicle emissions would encompass human-health receptors and nature conservation sites within 200 m of the affected road links (Highways Agency, 2007).

### Baseline data

12.6.7 The background concentration often represents a large proportion of the total pollution concentration, so it is important that the background concentration selected for the assessment is realistic. National Planning Practice Guidance and EPUK/IAQM guidance highlight public information from Defra and local monitoring studies as potential sources of information on background air quality. Local Air Quality Management Technical Guidance 16 (LAQM.TG16) (Defra, 2016b) recommends that Defra mapped concentration estimates are used to inform the background concentrations in air quality modelling and states that *"where appropriate, these data can be supplemented by and compared with local measurements of background, although care should be exercised to ensure that the monitoring site is representative of background air quality"*.

12.6.8 For the air quality assessment, background air quality will be characterised by drawing on information from the following public sources:

- Defra maps (Defra, 2016c) which show estimated pollutant concentrations across the UK in 1 km grid squares; and
- Published results of local authority Review and Assessment studies of air quality, including local monitoring and modelling studies.

12.6.9 For the assessment of impacts at nature conservation sites within 200 m for roads affected by the development, background air quality will be characterised by drawing on information from the Air Pollution Information System (APIS, 2016).

### Baseline environment

12.6.10 There are no AQMAs within the air quality and health study area. Air quality within the districts of North Norfolk, Broadland or South Norfolk is understood to be generally good on the basis that all concentrations of all pollutants are below the relevant objectives. There are however nine AQMAs within the administrative boundary of Norwich City Council, beyond the boundary of the air quality and health study area.

### Proposed approach to the Environmental Impact Assessment (EIA)

12.6.11 The air quality EIA will be based on the following guidance:

- Guidance on the assessment of dust from demolition and construction (IAQM, 2014);
- Land-Use Planning and Development Control: Planning for Air Quality (EPUK / IAQM, 2015); and
- Where appropriate, Local Air Quality Management Technical Guidance LAQM.TG16 (Defra, 2016b).

#### *Dust assessment*

12.6.12 The potential effect on air quality from dusts and particulates generated during the construction phase of the Hornsea Three onshore cables, onshore HVAC booster station and onshore HVAC/HVDC substation will be assessed qualitatively, using the IAQM method 'Guidance on the assessment of dust from demolition and construction' (IAQM, 2014).

12.6.13 The IAQM dust guidance aims to estimate the effects of suspended particulate matter ($PM_{10}$) and deposited dust through a risk-based assessment procedure, using the well-established source-pathway-receptor approach (suspended particulate matter refers to particles with a mean aerodynamic diameter less than 10 µm, also known as the $PM_{10}$ fraction). The dust risk categories for demolition, earthworks, construction and trackout will be used to define the appropriate site-specific mitigation measures based on those described in the IAQM dust guidance (IAQM, 2014).

### *Vehicle emissions*

12.6.14 The prediction of air quality effects associated with the changes in traffic flow characteristics on the local road network will be undertaken using ADMS-Roads, a version of the Atmospheric Dispersion Modelling System, which is a model representing dispersion of pollutants from industrial and road traffic sources. This is a formally validated model, developed in the UK by Cambridge Environmental Research Consultants Ltd and widely used in the UK and internationally for regulatory purposes. The UK Air Quality Strategy identifies the pollutants associated with road traffic emissions and local air quality as $NO_X$, $PM_{10}$, carbon monoxide (CO), 1, 3-butadiene and benzene.

12.6.15 Emissions of total $NO_X$ from motor vehicle exhausts comprise nitric oxide (NO) and nitrogen dioxide ($NO_2$). NO oxidises in the atmosphere to form $NO_2$. Emissions of total $NO_x$ from combustion sources comprise NO and $NO_2$. The NO oxidises in the atmosphere to form $NO_2$.

12.6.16 Currently, AQMAs designated in the UK attributable to road traffic emissions are associated with high concentrations of $NO_2$ and $PM_{10}$. This assessment will focus on potential changes in $NO_2$ and $PM_{10}$ concentrations associated with construction traffic generated by Hornsea Three. The impact from fine particulate matter, known as $PM_{2.5}$ (a subset of $PM_{10}$) concentrations will also be considered.

### Potential project impacts

12.6.17 There is potential for a range of air quality impacts which may occur as a result of the construction, operation and maintenance, and decommissioning phases of Hornsea Three. The impacts which have been scoped into the Hornsea Three assessment are outlined in Table 12.13 below, together with a description of any additional data collection and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

12.6.18 Based on the available baseline air quality information and the project description outlined in Chapter 3: Project Description, a number of impacts are proposed to be scoped out of the assessment for air quality and health. These impacts are outlined, together with a justification for screening them out in Table 12.14. In particular, although this scoping chapter is titled ‘Air Quality and Health’, it is proposed that impacts on health due to EMF are scoped out of the assessment. Overall, no measurable impact on health due to EMF exposure from the Hornsea Three is anticipated. It is therefore proposed that the Hornsea Three Environmental Statement chapter would be focussed on the impacts on air quality, and as such, would be titled ‘Air Quality’.

Table 12.13 Impacts proposed to be scoped into the Hornsea Three assessment for air quality.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Temporary increase in dust due to construction at the landfall. | Landfall construction works would include dust-generating activities, such as constructing temporary compounds and drilling, which may affect receptors sensitive to duct (human and ecological). | Details of the volume of any buildings to be demolished, the site area and the length of construction activities would be used in the assessment.<br>The proximity and orientation of human-health and ecological dust sensitive receptors would be collated. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 2 | Temporary increase in dust due to installation of the onshore cable and construction site access. | Cable construction works would include dust-generating activities such as trench excavation and there is potential for dust trackout from construction site accesses, which may affect receptors sensitive to duct (human and ecological). | As above for air quality impact no. 1. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 3 | Temporary increase in dust due to construction of the onshore HVAC/HVDC substation and onshore HVAC booster station. | Construction works may include dust-generating activities such as excavation for foundations and earthworks and there is potential for dust trackout from construction site accesses, which may affect receptors sensitive to duct (human and ecological). | Details of the volume of any buildings to be demolished, the site area, length of construction activities and the volume of any buildings to be constructed would be used in the assessment.<br>The proximity and orientation of human-health and ecological dust sensitive receptors would be collated. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 4 | Temporary impact on air quality due to construction traffic. | During construction, there is likely to be an increase in traffic volume, particularly HGVs which would affect air quality. | Defra background concentrations for $NO_2$ and particulate matter would be sought.<br>Data from the most representative meteorological observation station would be sought as an input to the modelling.<br>A representative selection of sensitive human-health receptors within 200 m of roads affected would be identified.<br>Nature conservation sites within 200 m of roads affected would be identified. | Construction traffic flow data for road links that exceed the EPUK and LAQM (2015) indicative criteria thresholds for assessment would be obtained.<br><br>Annual-mean NOx and PM10 concentrations would be predicted at selected sensitive receptors using ADMS-Roads then added to relevant background concentrations. Annual-mean $NO_2$ concentrations will be derived from the modelled road-related annual-mean $NO_x$ concentration using the LAQM.TG(09) calculator (Defra, 2013). |
| ***Operation and maintenance*** | | | | |
| No impacts are proposed to be scoped in at this stage. | | | | |
| ***Decommissioning*** | | | | |
| 5 | Temporary increase in dust due to the decommissioning of the onshore HVAC/HVDC substation and the onshore HVAC booster station. | Demolition of the onshore HVAC/HVDC substation and onshore HVAC booster station; and any earthworks to restore the site(s) would generate dust which could potentially affect receptors sensitive to dust (human and ecological). | Details of the volume of any buildings to be demolished, the site area, length of construction activities and the volume of any buildings to be constructed would be used in the assessment.<br>The proximity and orientation of dust sensitive receptors would be collated. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 6 | Temporary impact on air quality due to traffic during the decommissioning phases. | The decommissioning phase of Hornsea Three (i.e. demolition of the onshore HVAC/HDVC substation and onshore HVAC booster station) may generate a significant change in traffic numbers on local roads, particularly HGVs, which would affect air quality. | Defra background concentrations for $NO_2$ and particulate matter would be sought.<br>Data from the most representative meteorological observation station would be sought as an input to the modelling.<br>A representative selection of sensitive human-health receptors within 200 m of roads affected would be identified.<br>Nature conservation sites within 200 m of roads affected would be identified. | Construction traffic flow data for road links that exceed the EPUK and LAQM (2015) indicative criteria thresholds for assessment would be obtained.<br><br>Annual-mean NOx and PM10 concentrations would be predicted at selected sensitive receptors using ADMS-Roads then added to relevant background concentrations. Annual-mean $NO_2$ concentrations will be derived from the modelled road-related annual-mean NOx concentration using the LAQM.TG(09) calculator (Defra, 2013). |

Table 12.14 Impacts proposed to be scoped out of the assessment for air quality.

| Impact No. | Impact | Justification |
|---|---|---|
| ***Construction*** | | |
| 1 | The EMF impacts during construction of the underground onshore cables, onshore HVAC booster station and onshore HVAC/HVDC substation traffic may affect human and ecological receptors. | The underground cables, onshore HVAC/HVDC substation and onshore HVAC booster station would not be energised during construction (no electricity transmitted) and there would be no electric or magnetic field generated.<br>Therefore, subject to feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Operation and maintenance*** | | |
| 2 | The impacts due to operation of the underground onshore cables, onshore HVAC booster station and onshore HVAC/HVDC substation traffic may affect human and ecological receptors. | The operation of the HVAC/HVDC substation and onshore HVAC booster station will generate a small number of staff trips with occasional maintenance vehicle movements. The number of vehicle movements generated during this phase is anticipated to be negligible, and the traffic impacts would be considerably smaller than those for the construction phase.<br>There would be no significant sources of atmospheric pollutant releases from mobile sources (vehicular traffic) or stationary sources; therefore, there would be no likely significant air quality effects during the operation of Hornsea Three.<br>Therefore, subject to feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |

| Impact No. | Impact | Justification |
|---|---|---|
| 3 | The EMF impacts during operation of the underground onshore cables, onshore HVAC booster station and onshore HVAC/HVDC substation traffic may affect human and ecological receptors. | Electric and magnetic fields arise from generation, transmission, distribution and use of electricity and will occur around all equipment that carries electricity. Hornsea Three will involve the installation of underground cables, the Hornsea Three HVAC/HVDC substation, and onshore HVAC booster station.<br>Detailed route planning will seek to avoid individual properties where practicable. The cable sheath and trench fill material will provide complete screening of the electric field from the cables, and no electric field from the cables will be experienced above ground level. However, they still produce magnetic fields, which are strongest close to or directly above the cable. The EMF assessment from Project Two demonstrated that the field strength drops rapidly with distance from the cable corridor, and at 25 m distance, the field strengths are well below public exposure limits for both HVAC and HVDC cable. The anticipated maximum electric and magnetic strengths that would be generated by the proposed HVDC or HVAC infrastructure fell well within the relevant guideline public exposure values, specified by the former Health Protection Agency and International Commission on Non-Ionizing Radiation, which are set to protect health.<br>The Hornsea Three Onshore HVAC/HVDC substation and onshore HVAC booster station would be a source of electric and magnetic fields, but these are anticipated not to be significant outside the boundary of those sites, with the most significant source being transmission connections entering or exiting it. National Grid publishes calculated worst case maximum magnetic and electric field strengths for representative designs of 400 kV overhead lines and underground cables under high load conditions (National Grid, These can be used as a conservative proxy to assess EMF exposure, as EMF strength from the substation itself at its perimeter would be lower. The National Grid information indicates that the maximum electric and magnetic field strengths from such infrastructure are significantly below the occupational exposure guideline in all cases. As such, field strength experienced at the boundary of the onshore substation would also be well below the guideline levels.<br>Therefore, subject to feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| ***Decommissioning*** | | |
| 4 | The possibility of EMF impacts during decommissioning of the underground onshore cables, onshore HVAC booster station and onshore HVAC/HVDC substation traffic affecting human and ecological receptors. | The underground cables, onshore HVAC booster station and HVDC converter/HVAC substation would not be energised during decommissioning (no electricity transmitted) and there would be no electric or magnetic field generated.<br>Therefore, subject to feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |
| 5 | The temporary impacts of decommissioning of the cable route on receptors sensitive to dust (human and ecological). | It is anticipated that the cables would be left in the ground and therefore there would be no requirement for any excavation work.<br>Therefore, subject to feedback received on this Scoping Report, Hornsea Three intends to scope this impact out of further consideration within the EIA. |

### Measures adopted as part of the project

12.6.19 Measures adopted as part of the project will include:

- Development of, and adherence to, a CoCP; and
- Development of, and adherence to, a Decommissioning Plan.

12.6.20 The requirement and feasibility of additional measures will be dependent on the significance of the effects on air quality and health. The requirement and feasibility of any additional measures will be consulted upon with statutory consultees throughout the EIA process.

### Potential cumulative impacts

12.6.21 Cumulative impacts on air quality arising from Hornsea Three alongside other developments within the area (e.g. port development, industrial development, other coastal infrastructure (e.g. associated with oil and gas activities)) will be considered within the Environmental Statement.

12.6.22 Detailed consideration of the potential for cumulative impacts will be limited to the construction phase because air quality impacts from the operational phase of the proposed development are expected to be negligible. Effects during decommissioning would be of a similar nature to construction but would be lower less and thus construction represents the worst case.

12.6.23 The study area for cumulative assessment for air quality is 700 m from the proposed Hornsea Three development. At a distance greater than 350 m from construction activities, the IAQM guidance (2014) advises that impacts are expected to be 'negligible'. Schemes within 700 m (i.e. 350 m from each development) of the proposed onshore ECR corridor could be expected to have a cumulative impact with regard to air quality if construction activities at other development sites take place during the same period. With appropriate mitigation in accordance with normal good construction practice, cumulative impacts would be expected to be minimal.

12.6.24 For vehicle emissions, the worst case scenario would be that which results in the highest levels of HGV movements, particularly at sensitive locations, if a combination of strategic projects were to come forward to construction at the same time. Only receptors within 200 m of road sources are considered to be at risk of impacts from traffic emissions (Highways Agency, 2007).

12.6.25 The following projects or activities will be considered within the air quality study area:

- Other offshore wind farms and associated onshore cabling and infrastructure;
- Onshore energy generation projects (excluding householder scale projects);
- Road and rail projects;
- Major residential, commercial and leisure projects; and
- Minerals extraction and landfill projects.

12.6.26 Hornsea Three will monitor the status of identified and emerging projects throughout the pre-application phase, and consider within the assessment of cumulative impacts within the EIA as necessary.

### Potential transboundary impacts

12.6.27 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that there is no potential for significant transboundary effects with regard to air quality and health from Hornsea Three upon the interests of other EEA states as the predicted impacts on air quality and health will largely be focused within the onshore footprint of Hornsea Three.

## 12.7 Socio-economics

### Introduction

12.7.1 This section of the Scoping Report identifies sources of information that will help define the baseline socioeconomic environment and the potential impacts and likely significant effects on identified socioeconomics receptors arising from the construction, operation and maintenance, and decommissioning of Hornsea Three project, both onshore and offshore.

### Study area

12.7.2 The selection of study areas for the socio-economic impact analysis will take account of the spatial scale at which impacts upon different receptors are likely to materialise. This is likely to vary across receptors.

#### *Tourism and Recreation Receptors*

12.7.3 It is reasonable to expect potential impacts of onshore and offshore infrastructure on tourism and recreation activity to materialise in a localised impact area which reflects the location of individual or groups of tourism and recreation receptors. The scale of this impact area would need to be informed by findings of analysis underpinning other chapters of the Environmental Statement, namely::

- Seascape and visual resources (Chapter 9, Section 9.5);
- Landscape and visual resources (Chapter 12, Section 12.1);
- Land use, agriculture and recreation (Chapter 12, Section 12.3); and
- Noise and vibration (Chapter 12, Section 12.5).

12.7.4 Effects on tourism and recreation are likely to be largely focused on the local authority areas through which the onshore ECR corridor search area crosses. These are:

- North Norfolk District Council;
- Broadland District Council; and
- South Norfolk District Council.

12.7.5 These local authorities will form the provisional Local Impact Area for tourism and recreation related receptors although this might need to be extended to include other neighbouring authorities, should the EIA undertaken for other chapters of the Environmental Statement indicate that recreational and tourism effects could be more widespread. The Broads Authority could also be considered to be sensitive to any effects on tourism and recreation outside of the above local authorities.

### *Employment and Gross Value Added (GVA) related receptors*

12.7.6 Likely significant effects on employment and Gross Value Added (GVA) can reasonably be expected to materialise across a much larger spatial area to reflect the geographic spread of the various tiers of the development's construction, operation and decommissioning supply chain. The appropriate socio-economic study area will be closely linked to the search area for construction, and operation and maintenance ports. In light of the uncertainty that currently exists in relation to the selection of construction, and operation and maintenance ports, the assessment will include two separate impact areas for employment and GVA related effects these are:

- The New Anglia Local Enterprise Partnership is the strategic economic development body for Norfolk and Suffolk; and
- The Humber Local Enterprise Partnership is the strategic economic development body for the Humber region.

12.7.7 Both Local Enterprise Partnership (LEP) areas encompass ports which, at this stage, appear to have potential to play a role in the construction and/or operation and maintenance of the offshore wind farm. The selection of construction and operation ports will be determined by the outcome of the procurement exercise and will not be determined until after the Environmental Statement has been prepared. In light of this, the assessment will consider each of the LEP areas as separate impact areas when considering the employment and GVA related receptors.

12.7.8 The appropriate socio-economic study areas for the EIA will need to be determined in light of the findings of various parallel parts of the EIA.

12.7.9 Representatives from both LEP areas would be consulted and engaged with during the EIA process to assist in defining and characterising the socio-economic study area and exploring the potential magnitude and significance of employment and GVA related impacts.

12.7.10 Given the scale of investment associated with the construction and operation of Hornsea Three, and its status as an NSIP, it is appropriate to include a national socio-economic study area. The UK Impact Area covers the whole of the UK (England, Scotland, Wales and Northern Ireland) and has been defined to enable the national significance of effects to be assessed. Effects within the UK Impact Area will only be assessed where they are relevant to the receptor. The UK Impact Area will only be used for receptors relating to employment and GVA created during the construction, operation and maintenance, and decommissioning phases.

### Baseline data

12.7.11 The key sources of data used to assess the baseline environment include relevant national datasets from the Office for National Statistics (ONS) providing intelligence on population, labour market and employment base conditions. The analysis will draw on the most up to date sources of data available for all key socio-economic indicators although the year that the data relates to varies according to the release calendar for each dataset. The baseline year will therefore vary slightly across the indicators considered in the baseline.

12.7.12 The socio-economic baseline assessment will cover:

- Population;
- Employment and economic activity;
- Industry;
- Income and wealth;
- Transport and commuting; and
- Tourism and leisure.

12.7.13 The key socio-economic and tourism topics which will be covered by the baseline assessment, the measures used to assess the topics and the data sources which will be used are outlined in Table 12.15.

Table 12.15 Socio-economic and tourism baseline measures and data source.

| Measure | Topic | Source |
|---|---|---|
| Population | Population | ONS Mid-year population estimates |
| | Population structure:<br>• Sex;<br>• Age; and<br>• Working age. | ONS Mid-year population estimates |
| | Dependency ratios | ONS Mid-year population estimates |
| | Changes over time | ONS Mid-year population estimates |
| | Population projections | ONS Sub-national population projections |
| Industry | Sectoral and size band structure of the business base: change over time | ONS Business Demography |
| | Sectoral and size band structure of the employment base:<br>• Change over time; and<br>• Location quotients. | Business Register and Employment Survey |
| | Major employers | Existing baseline studies; consultations |
| | Enterprise 'birth' and 'death' rates | ONS Business demography |
| | Business survival rates | ONS Business demography |
| | Trends in GVA of main industrial sectors | ONS Regional GVA estimates |
| Employment and economic activity | Economic activity:<br>• Economically active – FT, PT, self- employment; and<br>• Economically inactive. | Annual Population Survey |
| | Occupational breakdown | Annual Population Survey |
| Income and Wealth | Workplace and residence based earnings | Annual Survey of Hours and Earnings |
| | GVA per employee | Online National Statistics/Scottish Annual Business Statistics |
| Transport and commuting | Commuting and travel patterns | Desk research and consultations (to be identified as study progresses)<br>2011 Census |
| Tourism and leisure | Review of existing attractions Tourist numbers.<br>Volume and Value of tourism activity. | Desk research and consultations (to be identified as study progresses).<br>STEAM, Visit England. |

12.7.14 In addition to baseline sources, a number of secondary sources will be used in assessing the potential socio-economic and tourism impacts of Hornsea Three. Reports and resources include, but are not limited to the following:

- UK Offshore Wind: Charting the Right Course: Building the Offshore Wind Supply Chain (BWEA, 2009);
- A Guide to an Offshore Wind Farm (TCE, 2012);
- Impact of DONG Energy Investments in the Humber Area (Regeneris Consulting, November 2015);
- Socio-economic indicators of marine-related activities in the UK economy (TCE, 2008);
- Scroby Sands - Supply Chain Analysis (Douglas Westwood Limited and ODE Limited, 2005);
- The Economic Impacts of Wind Farms on Scottish Tourism: A report for the Scottish Government (Glasgow Caledonian University, 2008);
- Strategic Review of UK East Coast Staging and Construction Facilities (Offshore Wind Industry Council, 2016);
- Analysis of the Employment Effects of the Operation and Maintenance of Offshore Wind Parks in the UK. A Report for Vestas Offshore (Oxford Economics; 2010);
- Working for a Greener Britain: Vol 2 – Future Employment and Skills in the UK Wind and Marine Industries (RenewableUK, 2011a);
- Offshore Wind. Forecasts of future costs and benefits (RenewableUK, 2011b);
- Economic and Community Benefit Study Final Report (Scottish Government, 2009); and
- Tourist Attitude Towards Wind Farms (Scottish Renewables and British Wind Energy Association, 2002).

### Proposed approach to the Environmental Impact Assessment (EIA)

12.7.15 There is no specific guidance for assessing the impact of offshore wind farms on socio-economics.

12.7.16 The assessment will consider the likely significant effects associated with both onshore and offshore infrastructure. For offshore infrastructure, (e.g. the turbines) the assessment will consider the onshore and offshore receptors. For instance, in relation to tourism activity, the assessment will consider the effect on both onshore and offshore recreational activities. The assessment of effects associated with onshore infrastructure is limited to onshore receptors.

12.7.17 The absolute scale of economic impacts (i.e. the number of jobs which construction, operation and maintenance, and decommissioning activity is expected to support) will be calculated using an approach consistent with methods for economic impact assessment set out in HM Treasury Green Book (2003). The socioeconomic impact magnitude will be determined by consideration of the predicted deviation from baseline conditions.

12.7.18 Magnitude of impact and sensitivity of receptor will be combined to determine the overall significance of effect. These can be either adverse or beneficial, depending on the receptor being assessed.

### Potential project impacts

12.7.19 There is potential for a range of socioeconomic impacts arising from the construction, operation and maintenance, and decommissioning phases of Hornsea Three. The impacts which have been scoped into the Hornsea Three assessment are outlined in Table 12.16 below, together with a description of any additional data collection and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

12.7.20 At this stage, it is not proposed that any socioeconomic impacts are scoped out of the assessment.

### Measures adopted as part of the project

12.7.21 The requirement and feasibility of additional mitigation measures will be dependent on the significance of the effects on socio-economics. The requirement and feasibility of any additional measures will be consulted upon with statutory consultees throughout the EIA process.

Table 12.16 Impacts proposed to be scoped into the Hornsea Three assessment for socioeconomics.

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Construction*** | | | | |
| 1 | Impact on employment in construction in the supply chain: UK Impact Area. | There is potential for expenditure on the construction of Hornsea Three to support employment in UK companies that are directly engaged in the Hornsea Three construction supply chain. The construction of Hornsea Three could also go on to support employment indirectly in the wider supply chain (i.e. amongst the companies that supply goods and services to firms directly engaged in the upper tiers of the Hornsea Three supply chain). | Desk based analysis of baseline employment conditions in sectors related to the construction of offshore wind farms. This will draw predominantly on publicly available datasets. | Bespoke economic impact model to estimate the direct, indirect and induced employment impact of expenditure on construction of Hornsea Three in the UK impact area. Assumptions about the extent and nature of UK level supply chain sourcing will be central to the employment estimates. These assumptions will be informed by published research and consultation evidence. |
| 2 | Impact on employment in construction in the supply chain: LEP level Impact Areas. | There is potential for expenditure on the construction of Hornsea Three to support employment in companies in the LEP areas that are directly engaged in the Hornsea Three construction supply chain. The construction of Hornsea Three could also go on to support employment indirectly in the wider supply chain (i.e. amongst the companies that supply goods and services to firms directly engaged in the upper tiers of the Hornsea Three supply chain). | As above for socio-economics impact no. 1. | Bespoke economic impact model to estimate the direct, indirect and induced employment impact of expenditure on construction of Hornsea Three in the LEP impact areas. Assumptions about the extent and nature of UK level supply chain sourcing will be central to the employment estimates. These assumptions will be informed by published research and consultation evidence. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 3 | Impact on the amount of GVA supported by construction activity: UK Impact Area. | There is potential for expenditure on the construction of Hornsea Three to support GVA in UK companies that are directly engaged in the Hornsea Three construction supply chain. The construction of Hornsea Three could also go on to support employment indirectly in the wider supply chain in the UK (i.e. amongst the companies that supply goods and services to firms directly engaged in the upper tiers of the Hornsea Three construction supply chain). | Desk based analysis of baseline GVA conditions in sectors related to the construction of offshore wind farms. This will draw predominantly on publicly available datasets. | Bespoke economic impact model to estimate the direct, indirect and induced GVA impact of expenditure on construction of Hornsea Three in the UK impact area. Assumptions about the extent and nature of UK level supply chain sourcing will be central to the GVA estimates. These assumptions will be informed by published research and consultation evidence. |
| 4 | Impact on the amount of GVA supported by construction activity: LEP level Impact Areas. | There is potential for expenditure on the construction of Hornsea Three to support GVA in companies in the LEP areas that are directly engaged in the Hornsea Three construction supply chain. The construction of Hornsea Three could also go on to support GVA indirectly in the wider supply chain (i.e. amongst the companies that supply goods and services to firms directly engaged in the upper tiers of the Hornsea Three supply chain). | Desk based analysis of baseline employment conditions sectors related to the construction of offshore wind farms. This will draw predominantly on publicly available datasets. | Bespoke economic impact model to estimate the direct, indirect and induced employment impact of expenditure on construction of Hornsea Three in the LEP impact areas. Assumptions about the extent and nature of LEP level supply chain sourcing will be central to the employment estimates. These assumptions will be informed by published research and consultation evidence. |
| 5 | Impact on access to construction-related employment amongst local residents: LEP level Impact Areas. | The direct and indirect employment associated with the construction of Hornsea Three could increase the range and supply of employment opportunities that are accessible to residents of the LEP areas. | Desk based analysis of current labour market capacity and the existence of appropriately skilled residents in local impact areas. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 6 | Impact on the demand for housing, accommodation and local services: LEP level Impact Areas. | Direct and indirect employment generated during the construction phase could increase demand for housing, accommodation and local services during the construction phase. | Consultation with relevant local authority officers to ascertain current conditions and capacity in the supply of housing, accommodation and local services. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 7 | Impact on the performance of the renewable energy sector: LEP level Impact Areas. | Any additional economic activity associated with the construction of Hornsea Three could support the creation of wider catalytic benefits for the renewable energy sector that could be sustained after the construction phase is complete. | Analysis of the current conditions in the renewable energy sector in the LEP impact areas will be based on a combination of desk based research (drawing on published datasets) and consultation with relevant economic development officers locally to understand the performance of the sector locally. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 8 | Impact on offshore and coastal tourism and recreation activity and associated economic value: Local Impact Area. | Potential effects on tourism and recreation could be created by visual, noise and vibration impacts associated with construction and installation of offshore and onshore infrastructure. Any disruption of onshore or offshore recreational activates occurring as a result of construction activities could also have an effect on the level and nature of tourism and recreation activity locally. | The nature, volume and economic value of coastal tourism and recreation activity will be assessed drawing on published datasets and analysis (e.g. via Visit Britain or local partners). | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 9 | Impact on local tourism and recreational resources, including PRoW. | The construction of Hornsea Three could lead to disruption of local tourism and recreational resources (e.g. as a result of the construction of onshore cabling or substations). | The baseline for this receptor will be established in Chapter 12, Section 12.3: Land Use, Agriculture and Recreation. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Operation and maintenance*** | | | | |
| 10 | Impact on employment in operation and maintenance and in the supply chain: UK Impact Area. | There is potential for the direct employment created by the operation and maintenance of Hornsea Three to increase employment in the UK. The supply chain expenditure on the operation and maintenance of Hornsea Three also has potential to support employment in UK companies that are directly engaged in the Hornsea Three operation and maintenance supply chain. The operation and maintenance of Hornsea Three could also go on to support employment indirectly in the wider supply chain (i.e. amongst the companies that supply goods and services to firms directly engaged in the upper tiers of the Hornsea Three supply chain). | Desk based analysis of baseline employment conditions in sectors related to the operation and maintenance of offshore wind farms. This will draw predominantly on publicly available datasets. | Bespoke economic impact model to estimate the direct, indirect and induced employment impact of expenditure on operation and maintenance of Hornsea Three in the UK impact area. Assumptions about the location of the operation and maintenance base and the extent and nature of UK level supply chain sourcing will be central to the employment estimates. These assumptions will be informed by published research and consultation evidence. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 11 | Impact on employment in operation and maintenance and in the supply chain: LEP impact areas. | There is potential for the direct employment created by the operation and maintenance of Hornsea Three to increase employment in the LEP impact areas. The supply chain expenditure on the operation and maintenance of Hornsea Three also has potential to support employment in companies in the LEP area that are directly engaged in the Hornsea Three operation and maintenance supply chain. The operation and maintenance of Hornsea Three could also go on to support employment indirectly in the wider supply chain in the LEP areas (i.e. amongst the companies that supply goods and services to firms directly engaged in the upper tiers of the Hornsea Three supply chain). | Desk based analysis of baseline employment conditions in sectors related to the operation and maintenance of offshore wind farms. This will draw predominantly on publicly available datasets. | Bespoke economic impact model to estimate the direct, indirect and induced employment impact of expenditure on operation and maintenance of Hornsea Three in the LEP impact areas. Assumptions about the location of the operation and maintenance base and the extent and nature of LEP level supply chain sourcing will be central to the employment estimates. These assumptions will be informed by published research and consultation evidence. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 12 | Impact on the amount of GVA (£m) supported by operation and maintenance activity: UK Impact Area. | There is potential for the direct employment created by the operation and maintenance of Hornsea Three to increase GVA in the UK. The supply chain expenditure on the operation and maintenance of Hornsea Three also has potential to support GVA creation through companies directly engaged in the Hornsea Three operation and maintenance supply chain. The operation and maintenance of Hornsea Three could also go on to support GVA indirectly in the wider supply chain (i.e. amongst the companies that supply goods and services to firms directly engaged in the upper tiers of the Hornsea Three supply chain). | Desk based analysis of baseline GVA conditions in sectors related to the operation and maintenance of offshore wind farms. This will draw predominantly on publicly available datasets. | Bespoke economic impact model to estimate the direct, indirect and induced GVA impact of expenditure on operation and maintenance of Hornsea Three in the UK impact area. Assumptions about the location of the operation and maintenance base and the extent and nature of UK level supply chain sourcing will be central to the GVA estimates. These assumptions will be informed by published research and consultation evidence. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 13 | Impact on the amount of GVA (£m) supported by operation and maintenance activity: LEP level Impact Areas. | There is potential for the direct employment created by the operation and maintenance of Hornsea Three to support an increase in GVA in the LEP impact areas if an operation and maintenance base is located within them. The supply chain expenditure on the operation and maintenance of Hornsea Three also has potential to support GVA companies within the LEP area that are directly engaged in the Hornsea Three operation and maintenance supply chain. The operation and maintenance of Hornsea Three could also go on to support GVA indirectly in the wider supply chain in the LEP areas (i.e. amongst the companies that supply goods and services to firms directly engaged in the upper tiers of the Hornsea Three supply chain). | Desk based analysis of baseline GVA conditions in sectors related to the operation and maintenance of offshore wind farms. This will draw predominantly on publicly available datasets. | Bespoke economic impact model to estimate the direct, indirect and induced GVA impact of expenditure on operation and maintenance of Hornsea Three in the LEP impact areas. Assumptions about the location of the operation and maintenance base and the extent and nature of LEP level supply chain sourcing will be central to the GVA estimates. These assumptions will be informed by published research and consultation evidence. |
| 14 | Impact on access to operation and maintenance related employment amongst local residents: LEP level Impact Areas. | The direct and indirect employment associated with the operation and maintenance of Hornsea Three could increase the range and supply of employment opportunities that are accessible to residents of the LEP areas. | Desk based analysis of current labour market capacity and the existence of appropriately skilled residents in local impact areas. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 15 | Impact on demand for housing, accommodation and local services: LEP level Impact Areas. | Direct and indirect employment generated during the operation and maintenance phase could increase demand for housing, accommodation and local services during the operation and maintenance phase. | Consultation with relevant local authority officers to ascertain current conditions and capacity in the supply of housing, accommodation and local services. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 16 | Impact on the performance of the renewable energy sector: LEP level Impact Areas. | Any additional economic activity associated with the operation and maintenance of Hornsea Three could support the creation of wider catalytic benefits for the renewable energy sector. | Analysis of the current conditions in the renewable energy sector in the LEP impact areas will be based on a combination of desk based research (drawing on published datasets) and consultation with relevant economic development officers locally to understand the performance of the sector locally. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 17 | Impact on offshore and coastal tourism and recreation activity and associated economic value: local impact areas. | Potential effects on tourism and recreation could be created by visual, noise and vibration impacts associated with operation and maintenance of offshore and onshore infrastructure. Any disruption of onshore or offshore recreational activates occurring as a result of operation and maintenance could also have an effect on the level and nature of tourism and recreation activity locally. | The nature, volume and economic value of coastal tourism and recreation activity will be assessed drawing on published datasets and analysis (e.g. via Visit Britain or local partners). | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 18 | Impact on local tourism and recreational resources, including PRoW: local impact areas. | The operation and maintenance of Hornsea Three could lead to disruption of local tourism and recreational resources (e.g. as a result of the operation and maintenance of onshore cabling or substations). | The baseline for this receptor will be established in Chapter 12, Section 12.3: Land Use, Agriculture and Recreation. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| ***Decommissioning*** | | | | |
| 19 | Impact on decommissioning related employment: UK Impact Area. | There is potential for expenditure on the decommissioning of Hornsea Three to support employment in UK companies that are directly engaged in the Hornsea Three decommissioning supply chain. The decommissioning of Hornsea Three could also go on to support employment indirectly in the wider supply chain (i.e. amongst the companies that supply goods and services to firms directly engaged in the upper tiers of the Hornsea Three supply chain). | Desk based analysis of baseline employment conditions in sectors related to the decommissioning of offshore wind farms. This will draw predominantly on publicly available datasets. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 20 | Impact on decommissioning related employment: LEP level Impact Areas. | There is potential for expenditure on the decommissioning of Hornsea Three to support employment in companies in the LEP areas that are directly engaged in the Hornsea Three decommissioning supply chain. The decommissioning of Hornsea Three could also go on to support employment indirectly in the wider supply chain (i.e. amongst the companies that supply goods and services to firms directly engaged in the upper tiers of the Hornsea Three supply chain). | Desk based analysis of baseline employment conditions in sectors related to the decommissioning of offshore wind farms. This will draw predominantly on publicly available datasets. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 21 | Impact on the amount of GVA (£m) supported during decommissioning activity: LEP Impact Areas. | There is potential for expenditure on the decommissioning of Hornsea Three to support GVA in UK companies that are directly engaged in the Hornsea Three decommissioning supply chain. The decommissioning of Hornsea Three could also go on to support employment indirectly in the wider supply chain in the UK (i.e. amongst the companies that supply goods and services to firms directly engaged in the upper tiers of the Hornsea Three decommissioning supply chain). | Desk based analysis of baseline GVA conditions in sectors related to the decommissioning of offshore wind farms. This will draw predominantly on publicly available datasets. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 22 | Impact on the amount of GVA (£m) supported during decommissioning activity: LEP level Impact Areas | There is potential for expenditure on the decommissioning of Hornsea Three to support GVA in companies in the LEP areas that are directly engaged in the Hornsea Three decommissioning supply chain. The decommissioning of Hornsea Three could also go on to support GVA indirectly in the wider supply chain (i.e. amongst the companies that supply goods and services to firms directly engaged in the upper tiers of the Hornsea Three supply chain). | Desk based analysis of baseline employment conditions sectors related to the decommissioning of offshore wind farms. This will draw predominantly on publicly available datasets. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |

| Impact No. | Impact | Justification | Data collection and analysis required to characterise the baseline environment for the EIA | Proposed approach for the undertaking of Hornsea Three specific modelling to inform the assessment of potential impacts |
|---|---|---|---|---|
| 23 | Impact on access to decommissioning related employment amongst local residents: LEP level Impact Areas. | The direct and indirect employment associated with the construction of Hornsea Three could increase the range and supply of employment opportunities that are accessible to residents of the LEP areas. | Desk based analysis of current labour market capacity and the existence of appropriately skilled residents in local impact areas. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 24 | Impact on demand for housing, accommodation and local services: LEP level Impact Areas. | Direct and indirect employment generated during the construction phase could increase demand for housing, accommodation and local services during the construction phase. | Consultation with relevant local authority officers to ascertain current conditions and capacity in the supply of housing, accommodation and local services. | No Hornsea Three specific modelling is proposed to be undertaken to inform this impact assessment. |
| 25 | Impact on offshore and coastal tourism and recreation activity and associated economic value: local impact areas. | Any additional economic activity associated with the construction of Hornsea Three could support the creation of wider catalytic benefits for the renewable energy sector that could be sustained after the construction phase is complete. | Analysis of the current conditions in the renewable energy sector in the LEP impact areas will be based on a combination of desk based research (drawing on published datasets) and consultation with relevant economic development officers locally to understand the performance of the sector locally. | As above, a high level qualitative assessment of the potential impact will need to take account of the substantial uncertainty that exists about the scale and nature of decommissioning impacts. |
| 26 | Impact on local tourism and recreational resources, including PRoW: local impact areas. | Potential effects on tourism and recreation could be created by visual, noise and vibration impacts associated with construction and installation of offshore and onshore infrastructure. Any disruption of onshore or offshore recreational activates occurring as a result of construction activities could also have an effect on the level and nature of tourism and recreation activity locally. | The nature, volume and economic value of coastal tourism and recreation activity will be assessed drawing on published datasets and analysis (e.g. via Visit Britain or local partners). | As above, a high level qualitative assessment of the potential impact will need to take account of the substantial uncertainty that exists about the scale and nature of decommissioning impacts. |

### Potential cumulative impacts

12.7.22 Cumulative impacts on socioeconomics arising from the proposed development alongside other projects within the socio-economic study area will be considered within the Environmental Statement.

12.7.23 Should there be a number of developments for which the construction period would coincide with that of Hornsea Three, then there is likely to be a degree of overlap in the supply chain and skills that would be required with those needed for the construction of Hornsea Three.

12.7.24 The predicted effects of construction, operation and maintenance, and decommissioning from Hornsea Three on socio-economics are considered to be localised to within the socio-economic study area. However, there is potential for cumulative effects to occur from other projects or activities within the Hornsea Three socio-economic study area where projects or plans could act collectively with Hornsea Three to affect sensitive receptors.

12.7.25 The following projects or activities will be considered within the onshore study area:

- Other offshore wind farms and associated onshore cabling and infrastructure;
- Onshore energy generation projects (excluding householder scale projects);
- Road and rail projects;
- Major residential, commercial and leisure projects; and
- Minerals extraction and landfill projects.

12.7.26 Hornsea Three will monitor the status of identified and emerging projects throughout the pre-application phase, and consider these within the assessment of cumulative impacts within the EIA as necessary.

### Potential transboundary impacts

12.7.27 A screening of transboundary impacts has been carried out and is presented in Appendix A: Transboundary Impacts Screening. This screening exercise identified that, there is the potential for transboundary impacts arising from the activities of foreign shipping and navigation and foreign commercial fishing. In addition, potential transboundary impacts upon the economies of other EEA states through the purchase of project components, equipment and the sourcing of labour from companies based outside the UK.

# 13. Scoping Conclusions

## 13.1 Overview

13.1.1 The information set out in this Scoping Report is provided to support Hornsea Three's request for a Scoping Opinion from PINS in relation to the development of Hornsea Project Three offshore wind farm (Hornsea Three).

13.1.2 Hornsea Three comprises of an offshore generating station with a capacity of greater than 100 MW and therefore is a NSIP, as defined by Section 15(3) of the Planning Act 2008. As such, there is a requirement to submit an application for Development Consent to the PINS.

13.1.3 Hornsea Three will have a total capacity of up to 2,400 MW and will include all associated offshore (including up to 400 turbines) and onshore infrastructure. The Hornsea Three offshore ECR corridor search area extends from the Norfolk coast, offshore in a northeasterly direction to the western and southern boundary of the Hornsea Three array area. The route is approximately 120 km in length. From the Norfolk coast, onshore cables will connect the offshore wind farm to the onshore HVAC substation/ HVDC converter substation, potentially utilising an offshore and/or onshore HVAC booster station, which will in turn, connect to an existing National Grid substation. Hornsea Three will connect to the Norwich Main National Grid substation, located to the south of Norwich. The onshore ECR corridor search area is approximately 55 km in length, at its fullest extent.

13.1.4 This Scoping Report is intended to support engagement with PINS and statutory consultees in the EIA process, inviting them to provide relevant information and to comment on the proposed approach to the EIA, to ensure that a robust EIA is undertaken. As such this Scoping Report has identified the main aspects of the offshore and onshore, human, biological and physical environment likely to be significantly affected by the construction, operation and decommissioning of the proposed Hornsea Three. For each of these identified aspects, the Scoping Report has identified the extent of relevant environmental studies to be undertaken as part of an EIA. The Environmental Statement will outline the full EIA and will be submitted alongside the application for Development Consent.

13.1.5 Potential impacts of the proposed development have been identified according to each EIA topic area. For some of these identified potential impacts, further data collection and assessment will be required in order to determine the significance of the impact. These impacts have been scoped into the assessment and are listed in Chapter 7 to 12 of this Scoping Report. For other potential impacts it is proposed, based on an understanding of the nature of the development (including measures adopted as part of the project) in the context of the baseline environment, that they be scoped out of the EIA (i.e. no further data collection or assessment is proposed). These proposed scoped-out impacts are listed in Chapter 7 to 12 and a summary listed is also provided in Table 13.1 below.

Table 13.1 Summary of impacts proposed to be scoped out (and not requiring further consideration in the Environmental Impact Assessment (EIA)).

| EIA topic/receptor group | Project stage | | |
|---|---|---|---|
| | Construction | Operation and maintenance | Decommissioning |
| ***Offshore*** | | | |
| Airborne noise | Piling activities will generate construction noise that may exceed guideline levels for commercial fishing vessels and commercial shipping traffic. | Airborne noise may exceed guideline levels for commercial fishing vessels and commercial shipping traffic. | - |
| | Piling activities will generate construction noise that may exceed guideline levels for manned gas platforms. | Airborne noise may exceed guideline values for offshore accommodation platforms. | - |
| | Piling activities will generate construction noise that may exceed guideline levels for residential onshore receptors and leisure and recreational receptors. | Airborne noise may exceed guideline levels for residential onshore receptors and leisure and recreational receptors. | - |
| Benthic subtidal and intertidal ecology | Remobilisation of contaminated sediments | - | Remobilisation of contaminated sediments |
| Fish and shellfish ecology | Remobilisation of contaminated sediments | Potentially reduced fishing pressure within the Hornsea Three array area and potentially increased fishing pressure outside the Hornsea Three array area. | Remobilisation of contaminated sediments |
| Ornithology | Accidental pollution | Accidental pollution | Accidental pollution |
| | Permanent habitat loss | Disturbance | Permanent habitat loss |
| | - | Indirect permanent habitat loss/disturbance | - |
| Commercial fisheries | Hornsea Three offshore ECR corridor construction activities leading to longer steaming distances to alternative fishing grounds. | Increased vessel traffic within fishing grounds as a result of changes to shipping routes and maintenance vessel traffic from the Hornsea Three offshore ECR corridor leading to interference with fishing activity. | Hornsea Three offshore ECR corridor decommissioning activities leading to longer steaming distances to alternative fishing grounds. |
| | Increased vessel traffic within fishing grounds as a result of changes to shipping routes and construction vessel traffic from the Hornsea Three offshore ECR corridor leading to interference with fishing activity. | - | Increased vessel traffic within fishing grounds as a result of changes to shipping routes and decommissioning vessel traffic from the Hornsea Three offshore ECR corridor leading to interference with fishing activity. |

| EIA topic/receptor group | Project stage | | |
|---|---|---|---|
| | Construction | Operation and maintenance | Decommissioning |
| Aviation, military and communications | - | Impact of physical presence of wind turbines in Hornsea Three array area on military ATC radar and landing aids. | - |
| | | Impact of physical presence of wind turbines in Hornsea Three array area on meteorological radar. | |
| | | Impact of physical presence of wind turbines in Hornsea Three array area on cellular telephones. | |
| Seascape and visual resources | The existing HSC may temporarily change through the introduction of new or uncharacteristic elements/features. | The existing HSC (water column) may temporarily change through the introduction of new or uncharacteristic elements/features. | The existing HSC may temporarily change through the introduction of new or uncharacteristic elements/features. |
| | The change to the existing present day seascape character through the introduction of new or uncharacteristic elements/features. | Introduction of new or uncharacteristic elements/ features | The existing HSC may temporarily change through the introduction of new or uncharacteristic elements/features. |
| | The day time change in the existing visual scenario. | The day time change in the existing visual scenario. | The day time change in the existing visual scenario. |
| | The night time change in the existing visual scenario. | The night time change in the existing visual scenario. | The night time change in the existing visual scenario. |
| | The change to the existing present day seascape character through the introduction of new or uncharacteristic elements/ features. | The change to the existing present day seascape character through the introduction of new or uncharacteristic elements/ features. | The change to the existing present day seascape character through the introduction of new or uncharacteristic elements/ features. |
| | The day time change in the existing visual scenario may cause effects (both during the day and at night) that will be experienced by a variety of visual receptors. | The day time change in the existing visual scenario may cause effects (both during the day and at night) that will be experienced by a variety of visual receptors. | The day time change in the existing visual scenario may cause effects (both during the day and at night) that will be experienced by a variety of visual receptors. |
| Infrastructure and other users: recreational users and recreational fishing | Safety zones and advisory safety distances within the Hornsea Three array area may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource. | The physical presence of the Hornsea Three array area and safety zones may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource. | Safety zones and advisory safety distances within the Hornsea Three array area may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource. |

| EIA topic/receptor group | Project stage | | |
|---|---|---|---|
| | Construction | Operation and maintenance | Decommissioning |
| ***Onshore*** | | | |
| Landscape and visual resources | Any indirect impacts that fall outside the influence of the ZTV. | Any indirect impacts that fall outside the influence of the ZTV. | Any indirect impacts that fall outside the influence of the ZTV. |
| | Any impacts that fall outside the landscape and visual resources study area. | Any impacts that fall outside the landscape and visual resources study area. | Any impacts that fall outside the landscape and visual resources study area. |
| | - | Impacts of the onshore ECR corridor. | Impacts of the Hornsea Three onshore ECR corridor. |
| Historic environment | - | Impacts on the historic landscape (landfall and onshore cable). | Impacts on buried archaeological remains at the landfall, onshore ECR corridor and onshore HVAC/HVDC substation. |
| Traffic and transport | - | Traffic generated by routine checks and maintenance activities during the operational phase of Hornsea Three. | - |
| Noise and vibration | - | The temporary impacts of cable operation and maintenance may affect receptors sensitive to noise or vibration. | - |
| | | The temporary impacts of the onshore HVAC/HVDC substation and onshore HVAC booster station maintenance may affect receptors sensitive to noise or vibration. | |
| Air quality and health | The EMF impacts during construction of the underground onshore cables, onshore HVAC booster station and onshore HVAC/HVDC substation traffic may affect human and ecological receptors. | The impacts due to operation of the underground onshore cables, onshore HVAC booster station and onshore HVAC/HVDC substation traffic may affect human and ecological receptors. | The possibility of EMF impacts during decommissioning of the underground onshore cables, onshore HVAC booster station and onshore HVAC/HVDC substation traffic affecting human and ecological receptors. |
| | | The EMF impacts during operation of the underground onshore cables, onshore HVAC booster station and onshore HVAC/HVDC substation traffic may affect human and ecological receptors. | The temporary impacts of decommissioning of the cable route on receptors sensitive to dust (human and ecological). |

13.1.6 In addition, the Scoping Report has proposed an approach to CEA for Hornsea Three that is consistent with PINS Advice Note Seventeen: (PINS, 2015a) and the Renewable UK CIA Guidelines, specifically Guiding Principle 4 and Guiding Principle 7 (Renewable UK, 2013).

13.1.7 A screening assessment has been completed and presented within the Scoping Report (Appendix A) of potential transboundary impacts arising from Hornsea Three which have the potential to affect other EEA states. This screening has been carried out in accordance with PINS Advice Note 12.

13.1.8 Based on what is currently known of the likely spatial scale of effects arising from Hornsea Three and the economic interests of other member states in the vicinity, transboundary impacts have been screened into the EIA process for the following topics:

- Fish and Shellfish Ecology;
- Marine Mammals;
- Ornithology;
- Commercial Fisheries;
- Shipping and Navigation;
- Aviation, Military and Communications; and
- Socio-economics.

13.1.9 A WFD Stage 1 screening assessment has been completed and presented within the Scoping Report (Appendix B) of the relevant coastal/estuarine water bodies that could be potentially affected by the Hornsea Three offshore export cable installation activities (due to their locations and associated proximity to the cable installation activities). Specifically a Stage 1 screening assessment was completed of the Norfolk East coastal water body and the Norfolk North coastal water body. In addition, an initial review of the Main Rivers water bodies located within the onshore ECR search area was undertaken. This review identified that the onshore ECR search area included the following Main Rivers: River Bure, River Glaven, River Tiffey, River Tud, River Wensum, River Yare, River Tas and Mulbarton Reach.

13.1.10 A preliminary initial screening of designated MCZs, which it is proposed are carried forward for consideration in the Stage 1 MCZ Assessment, has been completed and presented within the Scoping Report (Appendix C). It is currently anticipated that the following designated MCZ and rMCZs, which coincide with the Hornsea Three array area and offshore ECR corridor search area, will be carried forward for the Stage 1 MCZ Assessment:

- Cromer Shoal Chalk Beds MCZ;
- Markham's Triangle rMCZ; and
- Wash Approach rMCZ.

## 13.2 Consultation

13.2.1 Before an application for a DCO is submitted to PINS, extensive consultation with key stakeholders (local authorities, statutory bodies, the local community and interest groups) is required.

13.2.2 Hornsea Three will undertake this consultation according to a series of phases. Hornsea Three has produced this Scoping Report as part of the Phase One (informal) Consultation. A Scoping Opinion, coordinated by PINS, will result in feedback will be fed into the ongoing EIA process for the development.

13.2.3 In parallel to the Scoping Opinion, Hornsea Three will also hold a number of public consultation events, at various locations in and around the onshore search area between 31 October and 9 November 2016. Anyone who could potentially be affected by, or may have an active interest in Hornsea Three is encouraged to attend.

## 13.3 Next Steps

13.3.1 Consultees are invited to consider all of the information provided in this Scoping Report and advise on whether they agree with the conclusions. Several broad questions are presented to encourage reflection of the key elements discussed in this Scoping Report:

- Are there any additional baseline data sources available that could be used to inform the EIA?
- Have all potential impacts resulting from Hornsea Three been identified for each the EIA topics within this Scoping Report?
- In light of the significant and relevant existing data and knowledge established through surveys and assessments undertaken for Project One and Project Two, does the reader agree that the intended evidence-based approach is appropriate for the Hornsea Three EIA?
- Does the reader agree with the impacts to be scoped in, and out, of the assessment (including from Hornsea Three alone, cumulatively with other projects and on other European Economic Area interests (i.e. transboundary impacts)?
- For those impacts scoped in, does the reader agree that the methods described are sufficient to inform a robust impact assessment?

13.3.2 Following receipt of the Scoping Opinion from PINS, a PEIR will be produced and consulted on during the summer of 2017. The PEIR will provide an initial statement of the environmental information available for the Hornsea Three study area, including descriptions of the likely environmental effects and measures adopted as part of the Hornsea Three development. The initial PEIR is intended to allow those taking part in the consultation to understand the nature, scale, location and likely significant environmental effects of Hornsea Three, such that they can make an informed contribution to the process of pre-application consultation under the Planning Act 2008 and to the EIA process.

13.3.3 DONG Energy plan to further refine Hornsea Three based upon the consultation responses received from the PEI process. The final results of the EIA will be presented in an Environmental Statement and a summary of all the consultation responses received will be presented in a Consultation Report, both of which will accompany the DCO application.

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# Appendix A Transboundary Impacts Screening

## A.1 Introduction

### Background

A.1.1 DONG Energy is promoting the development of Hornsea Three. Hornsea Three is an offshore wind farm located in the southern North Sea, which is proposed to have a total generating capacity of up to 2,400 MW.

A.1.2 The Hornsea Three array area (i.e. the area in which the offshore turbines are located) is approximately 696 km$^2$, and is located approximately 160 km east from the coast of Yorkshire, 120 km northeast from the coast of Norfolk and 10 km from the median line between UK and Dutch waters (Figure A.1). Hornsea Three lies to the east of Project One and Project Two offshore wind farms, and is located within the former Hornsea Zone.

A.1.3 Transboundary impacts relate to those impacts that may arise from an activity within one EEA state, that affect the environment or other interests of another EEA state. This transboundary appendix sets out the screening assessment of the potential for such effects to occur on the environment or interests of other EEA member states as a result of Hornsea Three, based on what is currently known of the likely spatial scale of effects arising from the development and the economic interests of other member states in the vicinity.

A.1.4 This appendix is intended to provide information to PINS; such that the Secretary of State can evaluate the likelihood of such effects occurring and the need, if any, for transboundary consultation with other member states during the pre-application period, and where necessary subsequent to the application being made. The screening of transboundary effects will be revisited during the Hornsea Three pre-application period once EIA's are completed to ensure that any significant transboundary effects are fully considered within the final Environmental Statement submitted alongside the application for Development Consent.

## A.2 Legislative context

A.2.1 The need to consider transboundary impacts has been embodied by The United Nations Economic Commission for Europe Convention on Environmental Impact Assessment in a Transboundary Context, adopted in 1991 in the Finnish city of Espoo and commonly referred to as the 'Espoo Convention'. The Convention requires that assessments are extended across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary impacts.

A.2.2 The Espoo Convention has been implemented by the European Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment, which was amended by Directive 97/11/EC, Directive 2003/35/EC and Directive 2009/31/EC. In 2011, the initial 1985 Directive and its three amendments were codified by Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the EIA Directive).

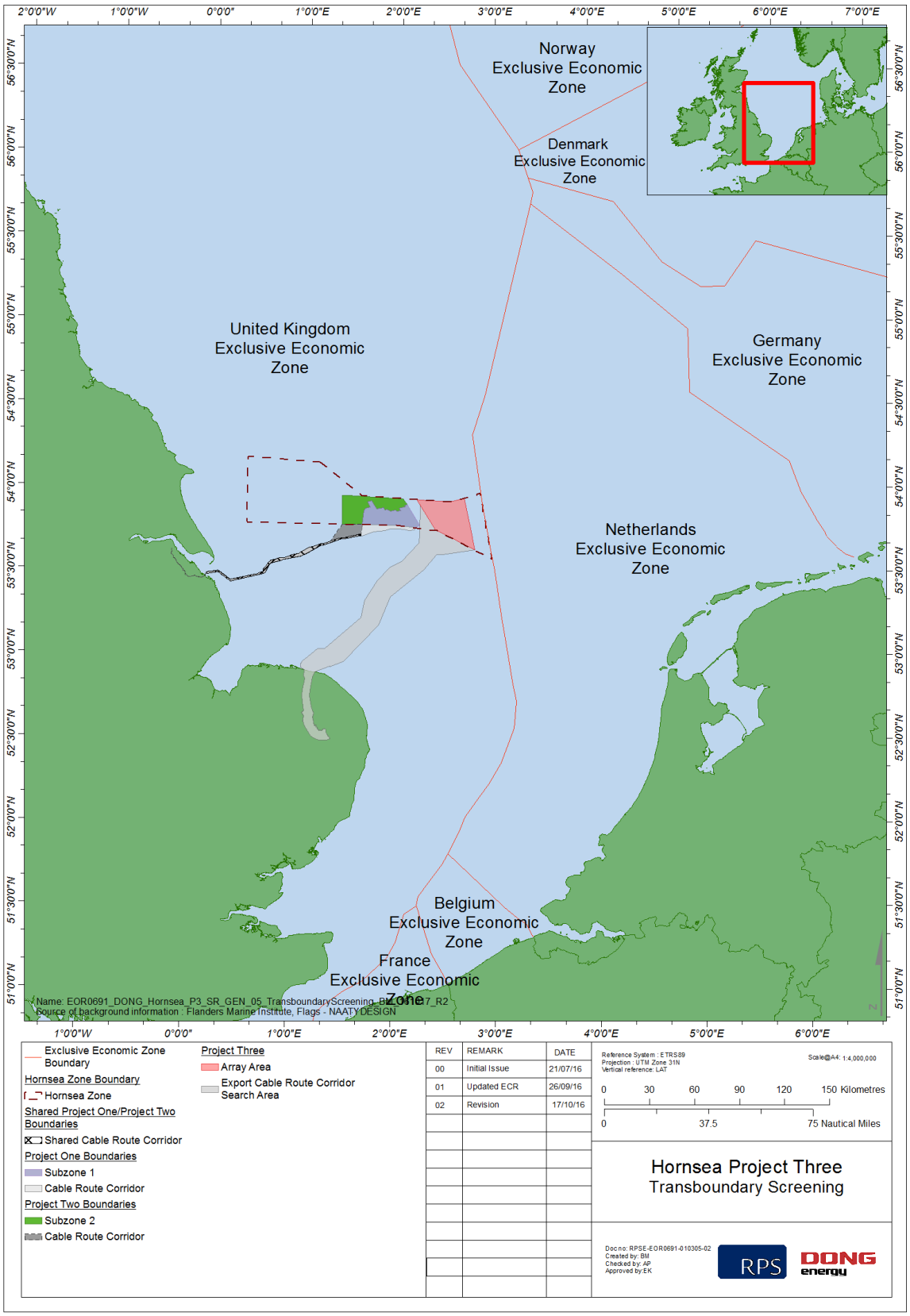


Figure A.1 Location of the proposed Hornsea Three within the former Hornsea Zone and relevant jurisdictional boundaries.

A.2.3 The EIA Directive is transposed into UK law by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (as amended) (the EIA Regulations). Regulation 24 of the EIA Regulations requires that where the Secretary of State is of a view that an EIA application will have significant effects on the environment of another EEA state, or the Secretary of State receives a request for involvement from another EEA state, it must undertake a prescribed process of consultation and notification.

A.2.4 PINS Advice Note 12: Transboundary Impacts (PINS, 2015) sets out the procedures for consultation in association with an application for a DCO, where such development may have significant transboundary impacts. The note sets out the roles of PINS, other EEA states and developers. In respect of the latter, developers have no formal role under the Regulation 24 process, as the duties prescribed by Regulation 24 in notifying and consulting with other EEA States on potential transboundary impacts are the responsibility of the Secretary of State. However, developers are advised to:

- Consider, when preparing documents for consultation and application, that PINS Inspectorate may notify the relevant EEA State of their particular project;
- Carry out preparatory work to complete a transboundary screening matrix to assist to assist the Secretary of State in determining the potential for likely significant effects on the environment in other EEA States; and
- To submit the transboundary screening matrix along with the scoping request, if a scoping opinion is sought by the developer.

A.2.5 This transboundary appendix is provided in response to Advice Note 12 and the bullet points noted in paragraph A.2.3 above. It provides information about Hornsea Three which will be the subject of the DCO application and sets out information relating to the potential effects of the scheme and the interests of the other member states in the vicinity, in order to assist PINS in forming a view on the likelihood of significant transboundary effects arising from Hornsea Three. The information contained within the Annex to Advice Note 12, which sets out the criteria and relevant considerations that will be taken into account by PINS during screening, have also been used in the preparation of this transboundary screening appendix.

## A.3 Consultation

A.3.1 Hornsea Three will conduct pre application consultation for Hornsea Three in accordance with the Planning Act 2008 plus associated guidance and Regulations, which includes the aforementioned EIA Regulations. As part of this consultation, the following EU ministries and industries will be consulted:

- Belgium ministries/representatives:
  - Flemish Government - Environment Nature and Energy Department;
  - Ministère de la Santé Publique et de l'Environnement;
  - Ministry of Brussels;
  - Federale Overheidsdienst Mobiliteit en Vervoer;
  - Royal Belgian Ship-owners Association;
  - Ministry of Wallonia;
  - Federal Public Service Health, Food Chain Safety and Environment;
  - Sydvestjysk Fiskeriforening; and

  - Rederscentrale.
- Danish ministries/representatives:
  - Danish Ministry of the Environment;
  - Danish Maritime Authority;
  - Danmarks Rederiforening; and
  - Danmarks Fiskeriforening/ Danish Fishermen's Association.
- German ministries/representatives:
  - Federal Ministry for the Environment Nature Conservation and Nuclear Safety;
  - Wasser-und Schifffahrtsverwaltung des Bundes;
  - Verband Deutscher Reeder; and
  - BSH Bundesamt für Seeschifffahrtund Hydrographie.
- French ministries/representatives:
  - Ministère des Affaires étrangères;
  - Armateurs de France;
  - Préfecture Maritime de la Manche et de la Mer du Nord;
  - Secrétariat Général de la Mer;
  - FROM Nord; and
  - CME Organisation de Producteur.
- Dutch ministries/representatives:
  - Ministry of Infrastructure and the Environment – Directorate General for Spatial Development and Water Affairs;
  - Rijkswaterstaat - Dutch Ministry of Infrastructure and Environment;
  - Rijkswaterstaat - Ministerie van Verkeer en Waterstaat;
  - Royal Association of Netherlands Ship Owners;
  - Ministry of Transport, Public Works and Water Management;
  - Policy Officer Nature and Spatial Planning - Dutch Fish Product Board; and
  - Vis Ned.
- Norwegian ministries/representatives:
  - Ministry of Environment;
  - Norges Rederiforbund;
  - Norwegian Maritime Directorate;
  - Portuguese ministries/representatives;
  - Ministère des Affaires étrangères;
  - Republic of Ireland ministry/representatives;
  - Department of Environment; and
  - Norwegian Fishing Vessel Owners Union.
- Swedish ministries/representatives:
  - Implementation and Enforcement Department;

- Marine Standards Department;
- Hornsea Three will also consult with any additional consultees provided by the EU Ministries and Industries.

## A.4 Screening of transboundary impacts

A.4.1 In accordance with the requirements of Advice Note 12 (PINS, 2015), a series of screening matrices for potential transboundary impacts associated with Hornsea Three are presented in Table A.2, Table A.3 and Table A.4 for offshore biological, offshore human and onshore activities, respectively. These screening matrices have been based upon the assessment of impacts, as presently known, from the project description presented in Chapter 3: Project Description and follow the suggested format set out in the Annex to the PINS Advice Note 12.

A.4.2 The screening matrices consider all potential transboundary impacts that may occur from all phases of Hornsea Three (i.e. construction, operation and maintenance, and decommissioning). The matrices also addresses the predicted spatial and temporal scale of potential transboundary impacts for those interests that are proposed to be screened in the assessment within the Environmental Statement.

A.4.3 Potential effects upon European designated sites within other EEA states (as well as those in the UK) are considered separately within the screening process for the HRA.

A.4.4 The distance of Hornsea Three from the boundary of the EEZ or 'median line' of other EEA states considered is presented in Table A.1 and shown on Figure A.1.

Table A.1 Summary of approximate distance to nearest Exclusive Economic Zone (EEZ) (median line) of other European Economic Area (EEA) states.

| EEZ | Distance from Hornsea Three to nearest border (km) |
|---|---|
| The Netherlands | 10 |
| Germany | 164 |
| Belgium | 117 |
| Denmark | 205 |
| Norway | 235 |
| France | 141 |
| Iceland | 1,232 |

### Offshore transboundary impacts

#### *Physical and biological environment*

A.4.5 Hornsea Three have completed a transboundary screening matrix for offshore transboundary effects for the physical and biological environment, in line with the suggested format set out in the Annex to PINS Advice Note 12. This screening matrix is set out in Table A.2 below.

A.4.6 The conclusions of the transboundary screening for each physical environment topic are presented, together with additional justification, in the following sections.

*Marine processes*

A.4.7 The offshore component of Hornsea Three lies wholly within UK territorial waters and any impacts on marine processes will be confined to a localised area within the footprint of the offshore components of Hornsea Three. Therefore there are no potential transboundary impacts upon marine process anticipated. Furthermore, it is anticipated, based on an understanding of the baseline environment (e.g. sediment types and the tidal regime) in addition to previous modelling work carried out for the Project One and Project Two EIA, impacts from sediment disturbance when installing foundations and cables are likely to be localised and of temporary duration due to resettlement of sediments. Transboundary impacts are therefore not expected.

A.4.8 It is therefore proposed that transboundary impacts upon marine processes are screened out of the EIA process.

*Benthic subtidal and intertidal ecology*

A.4.9 It is considered that there is no pathway by which direct or indirect effects arising from Hornsea Three could significantly affect the benthic subtidal or intertidal of another member state. The extent of any predicted impacts upon benthic intertidal and subtidal ecological receptors are likely to be limited in extent to the:

- Hornsea Three offshore footprint (i.e. the Hornsea Three array area and the proposed offshore ECR corridor) for temporary/long term habitat loss and habitat modification (i.e. from the introduction of hard substrates); and
- One tidal excursion for suspended sediment/deposition assessments.

A.4.10 Therefore no potential transboundary impacts upon benthic intertidal and subtidal ecology are anticipated and it is proposed that transboundary impacts on benthic intertidal and subtidal ecology are screened out of the EIA process.

*Fish and shellfish ecology*

A.4.11 There is the potential for transboundary impacts upon fish and shellfish ecology due to construction, operational and decommissioning impacts of Hornsea Three.

A.4.12 These include direct impacts due to underwater noise from piling operations and indirect impacts caused by loss of fish and shellfish habitat or disturbance to habitat due to increased suspended sediments and deposition from the placement/removal of foundations and cables in or on the seabed.

A.4.13 These activities have the potential to directly affect Annex II migratory fish species that are listed as features of European Sites in other EEA states, or species that are of commercial importance for fishing fleets of other EEA states. Indirect effects will include loss of or disturbance to fish spawning and nursery habitats in the North Sea that are important for migratory fish species either designated as Annex II species or of commercial importance to other EEA states. The fish and shellfish receptors likely to be present within Hornsea Three fish and shellfish study area are outlined in full in paragraphs 8.2.6 to 8.2.9 of Chapter 8, Section 8.2: Fish and Shellfish Ecology and include a number of commercially important species as well as diadromous species likely to be found in the area. Paragraphs 8.2.15 to 8.2.17 of Chapter 8, Section 8.2: Fish and Shellfish Ecology also identify the spawning and nursery grounds located within and around the Hornsea Three array area and offshore ECR corridor.

Table A.2 Offshore transboundary screening matrix for Hornsea Three – physical environment.

| Screening Criteria | Marine Processes | Benthic Subtidal and Intertidal Ecology | Fish and Shellfish Ecology | Marine Mammals | Ornithology |
|---|---|---|---|---|---|
| **Characteristics of the Development** | For a detailed description, see Chapter 3: Project Description.<br>The proposed development is for an offshore generating station (wind farm) comprising up to 400 wind turbines with an overall generating capacity of up to 2,400 MW.<br>A range of turbine models will be considered although, it is anticipated that each turbine will have a maximum rotor diameter of 265 m and a maximum blade tip height of 325 m LAT (highest point of the structure). The minimum distance between the bottom of the blade and the water surface will be 35.97 m LAT.<br>Foundation design has not yet been determined, with options under consideration including steel monopile, steel jackets supported on piles or suction piles, mono suction buckets, concrete gravity based systems and floating foundations. Scour protection including rock and gravel dumping, protective aprons, mattresses and sand bags is being considered as part of the Project Description (Chapter 3).<br>Offshore platforms will be installed which, depending on the transmission system, may include supporting transformer and offshore converter substations and an offshore HVAC booster station(s). Offshore platforms supporting accommodation facilities for operation and maintenance will also be required. The exact number of platforms to be installed is yet to be determined. Subsea array cables, offshore interconnector cables and subsea export cables will be installed to connect the turbines to the substations and to connect the substations to the onshore transition pits at the landfall. Cable protection (type not specified) will also be installed. | | | | |
| **Geographical Area** | The Hornsea Three array area is located approximately 160 km east from the coast of Yorkshire, 120 km northeast from the coast of Norfolk and 10 km from the Dutch EEZ. | | | | |
| **Location of Development (including existing use)** | The Hornsea Three array area is located within the former Hornsea Zone, which covers approximately 4,735 km$^2$. The Hornsea Three array area lies approximately 160 km east from the coast of Yorkshire, 120 km northeast from the coast of Norfolk and 10 km from the median line between UK and Dutch waters | | | | |
| **Cumulative Impacts** | Paragraphs 7.1.50 to 7.1.51 of the Scoping Report. | Paragraphs 8.1.30 to 8.1.32 of the Scoping Report. | Paragraphs 8.2.27 to 8.2.29 of the Scoping Report. | Paragraph 8.3.37 to 8.3.39 of the Scoping Report. | Paragraph 8.4.46 to 8.4.48 of the Scoping Report. |
| **Carrier** | No significant transboundary impacts are predicted. | No significant transboundary impacts are predicted. | ✓ See paragraph A.4.12. | ✓ See paragraph A.4.17. | ✓ See paragraph A.4.20. |
| **Environmental Importance** | | | ✓See paragraph A.4.13. | ✓ See paragraph A.4.16. | |
| **Extent** | ✓ See paragraph A.4.7. | ✓ See paragraph A.4.9. | ✓ See paragraph A.4.14. | ✓ See paragraph A.4.18. | ✓ See paragraphs A.4.21 to A.4.22. |
| **Magnitude** | The magnitude of the impacts will be subject to the assessment to be undertaken for the EIA and have, therefore, not been determined at this stage. | | | | |
| **Probability** | No significant transboundary impacts are predicted. | No significant transboundary impacts are predicted. | ✓ See paragraph A.4.14. | ✓ See paragraph A.4.17 and A.4.18. | ✓ See paragraphs A.4.21 to A.4.22. |
| **Duration** | | | | | |
| **Frequency** | | | | | |
| **Reversibility** | | | | | |

A.4.14 The probability of impacts occurring during construction, particularly as a result of underwater noise from piling, is high although the extent cannot be determined at this stage and will be subject to assessment in the EIA. The majority of impacts during construction are however considered to be short term and temporary. The operation and maintenance phase is considered less likely to result in significant impacts although the effects associated with EMF and long term habitat loss are, by nature, longer term effects which may be reversible depending on the decommissioning strategy.

A.4.15 Therefore, it is proposed that transboundary impacts on fish and shellfish ecology and their nature conservation interests are screened into the EIA process. Potential impacts upon European Sites with fish as a qualifying feature will be assessed within the HRA.

*Marine mammals*

A.4.16 There is the potential for transboundary impacts upon marine mammals due to the mobile nature of marine mammal species and the proximity of Hornsea Three to the border of other EEA states. The marine mammal species likely to be present in the Hornsea Three marine mammal study area are outlined in full in paragraphs 8.3.7 to 8.3.28 of Chapter 8, Section 8.3: Marine Mammals and include harbour porpoise, minke whale, white-beaked dolphin, grey seal and harbour seal.

A.4.17 Direct impacts may occur due to underwater noise generated during construction and decommissioning, particularly construction piling during the installation of foundations. Indirect impacts may cause disturbance to prey (fish) species from loss of fish spawning and nursery habitat and suspended sediments and deposition. The operation and maintenance phase is considered less likely to result in significant impacts although the effects associated with the operational noise of turbines and EMF are, by nature, longer term effects which will be reversible depending on the decommissioning strategy.

A.4.18 The probability of impacts to marine mammals occurring during construction, particularly as a result of underwater noise from piling, is high although the extent cannot be determined at this stage and will be subject to assessment in the EIA. The majority of impacts during construction are however considered likely to be short term and temporary.

A.4.19 Therefore, it is proposed that transboundary impacts upon marine mammals and their nature conservation interests are screened into the EIA process. Potential impacts upon European Sites with marine mammals as a qualifying feature will be assessed within the HRA.

*Ornithology*

A.4.20 There is the potential for transboundary impacts upon ornithological receptors (up to the MHWS mark) due to the wide foraging and migratory ranges of typical bird species in the North Sea. In addition, a number of bird species that have been recorded during previous surveys include those that are listed as qualifying features of European Sites in other EEA states. The bird species likely to be present in the Hornsea Three array area and offshore ECR corridor search area, based on the outputs of the boat-based ZoC surveys and those carried out for Project One and Project Two, are outlined in full in paragraphs 8.4.7 to 8.4.8 of Chapter 8, 8.4: Ornithology and include true pelagic seabirds (e.g. gannet, fulmars and auks), other species that spend part of their annual life cycle at sea (e.g. divers, gulls and seaducks) as well as non-seabird migrants (e.g. wildfowl, waders and passerines).

A.4.21 The key direct impacts for ornithological receptors are likely to arise during the operation and maintenance phase as a result of potential collisions with rotating turbine blades which may result in direct mortality of individuals and barrier effects caused by the physical presence of structures which may prevent clear transit of birds between foraging and breeding sites, or on migration. Direct impacts to ornithological receptors may, however, also occur due to temporary habitat loss/disturbance across all phases of Hornsea Three and permanent habitat loss during the operation and maintenance phase. Indirect impacts may cause disturbance to prey (fish) species from important bird feeding areas or changes to prey availability due to changes to physical processes and habitat as a result of the presence of operational infrastructure.

A.4.22 It is likely that there will be impacts to ornithological receptors occurring during operation and maintenance, particularly as a result of displacement and collision risk. The magnitude of these impacts is not known at this stage and will be subject to assessment in the EIA. Unlike the majority of impacts during construction, which are considered likely to be short term and temporary, impacts during the operation and maintenance phase are likely to be long term, continuous and of varying spatial extent depending on the species, although it is likely that they will be reversible following the decommissioning of Hornsea Three.

A.4.23 Therefore, it is proposed that transboundary impacts upon birds and their nature conservation interests are screened into the EIA process. Potential impacts upon European Sites with birds as a qualifying feature will be assessed within the HRA.

### *Human environment*

A.4.24 Hornsea Three have completed a transboundary screening matrix for offshore transboundary effects for the human environment, in line with the suggested format set out in the Annex to PINS Advice Note 12. This screening matrix is set out in Table A.3 below.

A.4.25 The conclusions of the transboundary screening for each offshore human environment topic are presented, together with additional justification, in the following sections.

#### *Commercial fisheries*

A.4.26 The commercial fisheries likely to be operating in the Hornsea Three commercial fisheries study area are outlined in full in paragraphs 9.1.7 to 9.1.13 of Chapter 9, Section 9.1: Commercial Fisheries and include a number of fleets from EEA states.

A.4.27 Due to the highly mobile nature of both commercial fish species and fishing fleets and the proximity of the Hornsea Three array area to Dutch, German and Danish waters, and the presence of Belgian, Dutch, Danish, French and German fishing vessels within the Hornsea Three area, there is the potential for transboundary impacts upon commercial fisheries to arise from two sources:

- Effects on commercial fishing fleets as a result of impacts from Hornsea Three 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 the Hornsea Three area, 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 the Hornsea Three area to alternative fishing grounds in other EEA states, which will have direct implications to that fishing ground.

Table A.3 Offshore transboundary screening matrix for Hornsea Three – human environment.

| Screening Criteria | Commercial Fisheries | Shipping and Navigation | Aviation, Military and Communications | Marine Archaeology | Seascape and Visual Resources | Infrastructure and Other Users |
|---|---|---|---|---|---|---|
| **Characteristics of the Development** | See Table A.2. | | | | | |
| **Geographical Area** | See Table A.2. | | | | | |
| **Location of Development (including existing use)** | See Table A.2. | | | | | |
| **Cumulative Impacts** | Paragraph 9.1.21 of the Scoping Report. | Paragraph 9.2.37 of the Scoping Report. | Paragraph 9.3.33 of the Scoping Report. | Paragraph 9.4.27 of the Scoping Report. | Paragraph 9.5.26 of the Scoping Report. | Paragraph 9.6.58 of the Scoping Report. |
| **Carrier** | ✓ See paragraph A.4.27. | ✓ See paragraph A.4.31 to A.4.32. | ✓ See paragraph A.4.36 to A.4.38. | No significant transboundary impacts are predicted. | No significant transboundary impacts are predicted. | ✓ See paragraph A.4.47 to A.4.49. |
| **Environmental Importance** | | | | | | |
| **Extent** | | | | ✓ See paragraph A.4.41. | ✓ See paragraph A.4.44. | |
| **Magnitude** | The magnitude of the impacts will be subject to the assessment to be undertaken for the EIA and have, therefore, not been determined at this stage. | | | | | |
| **Probability** | ✓ See paragraph A.4.28. | ✓ See paragraph A.4.33. | ✓ See paragraph A.4.36 to A.4.38. | No significant transboundary impacts are predicted. | No significant transboundary impacts are predicted. | ✓ See paragraph A.4.47 to A.4.49. |
| **Duration** | | | | | | |
| **Frequency** | | | | | | |
| **Reversibility** | | | | | | |

A.4.28 The probability of impacts occurring during operation, particularly as a result of the presence of the offshore infrastructure associated with Hornsea Three, is likely to be high although the extent cannot be determined at this stage. This will be determined by the final project description (e.g. requirement for safety zones etc.) and will therefore be subject to assessment in the EIA. Although such impacts have the potential to be long term, it is likely that following completion of construction that some fishing activity may be able to resume, depending upon the final design of the infrastructure. In addition, it is likely that any impacts from the final installed design would be reversible after decommissioning, as it is anticipated that all structures above the seabed will be completely removed and fishing activity would be able to resume once decommissioning is completed. The construction phase is considered less likely to result in significant impacts although the effects associated with the interference caused by the presence of infrastructure will progressively increase as the development is progressed.

A.4.29 Therefore, it is proposed that transboundary impacts upon commercial fisheries are screened into the EIA process.

*Shipping and navigation*

A.4.30 Hornsea Three is situated in the southern North Sea where some of the busiest shipping routes presently operate. The shipping and navigation baseline for the Hornsea Three array area and the offshore ECR corridor are outlined in full in paragraphs 9.2.5 to 9.2.19 of Chapter 9, Section 9.2: Shipping and Navigation.

A.4.31 Therefore, there is the potential for transboundary impacts upon shipping routes which transit to/from other EEA countries including the potential effects on shipping routes to/from The Netherlands, Denmark, Sweden, Iceland and Germany. Transboundary issues could also arise from impacts upon international ports, other international shipping routes and/or routes affected by other international offshore renewable energy developments.

A.4.32 Routes transiting between Humber and Germany will have to align with proposed traffic routeing being developed by the German government for its own offshore renewable energy development. However due to the presence of IMO routeing measures (in particular the Off Botney Ground Traffic Separation System), traffic will already have to align prior to the approach to German waters.

A.4.33 The probability of impacts occurring during operation, particularly as a result of the presence of the offshore infrastructure associated with Hornsea Three, is likely to be high although the extent cannot be determined at this stage. This will be determined by the final project description and will therefore be subject to assessment in the EIA. Although such impacts would be long term, it is likely that they would be reversible after decommissioning, as it is anticipated that all structures above the seabed will be completely removed. The construction phase is considered less likely to result in significant impacts although the effects associated with the interference caused by the presence of infrastructure on shipping and navigation will progressively increase as the development is progressed.

A.4.34 Therefore, it is proposed that transboundary impacts upon shipping and navigation are screened into the EIA process.

*Aviation, military and communications*

A.4.35 The aviation, military and communications baseline for the Hornsea Three array area and the offshore ECR corridor are outlined in full in paragraphs 9.3.3 to 9.3.26 of Chapter 9, Section 9.3: Aviation, Military and Communications.

A.4.36 Potential impacts upon aviation during the operation and maintenance phase include potential disturbance to commercial helicopters transiting to oil and gas installations in the southern North Sea from UK airports. There are some platforms within the vicinity of Hornsea Three that are located in the Dutch EEZ, however, these platforms are serviced from The Netherlands (i.e. from the east) and therefore no transboundary effects are predicted in relation to disruption to transit routes to these platforms and use of available airspace. Hornsea Three is entirely within the UK Flight Information Region and therefore no transboundary effects are predicted in relation to aviation airspace.

A.4.37 There is the potential for transboundary impacts to arise from the presence of the wind turbines during the operation and maintenance phase, affecting helicopter access to offshore platforms in the Dutch sector of the southern North Sea which are located within 9 NM of the Hornsea Three array area. There is also the potential for transboundary impacts to arise in the event that temporary drilling rigs in the Dutch sector of the southern North Sea are located within 9 NM of the Hornsea Three array area. Although such impacts would be long term, it is likely that they would be reversible after decommissioning, as it is anticipated that all structures above the seabed will be completely removed. These potential impacts will therefore be subject to assessment in the EIA.

A.4.38 The potential for transboundary impacts may also arise from the presence of the wind turbines during the operation and maintenance phase disrupting civil and military radar coverage from The Netherlands. The probability of impacts occurring during the operation and maintenance phase as a result of the presence of the offshore infrastructure associated with Hornsea Three is likely to be high, although the extent cannot be determined at this stage. This will be determined once all the baseline data has been obtained for the Dutch sector, and once the project description has been further refined. Although such impacts would be long term, it is likely that they would be reversible after decommissioning, as it is anticipated that all structures above the seabed will be completely removed. These potential impacts will therefore be subject to assessment in the EIA.

A.4.39 Therefore, it is proposed that transboundary impacts upon aviation, military and communications during the operational and maintenance phase are screened in to the EIA process.

*Marine archaeology*

A.4.40 The marine archaeology baseline for the Hornsea Three array area and the offshore ECR corridor are outlined in full in paragraphs 9.4.3 to 9.4.20 of Chapter 9, Section 9.4: Marine Archaeology.

A.4.41 The extent of any predicted impacts upon marine archaeology receptors are likely to be limited in extent to the:

- Hornsea Three offshore footprint (i.e. the Hornsea Three array area and the proposed offshore ECR corridor) for impacts associated with direct physical seabed disturbance; and
- One tidal excursion for impacts associated with sediment deposition on the seabed.

A.4.42 Therefore no potential transboundary impacts upon marine archaeology are anticipated and it is proposed that transboundary impacts on marine archaeology are scoped out of the EIA process.

### *Seascape and visual resources*

A.4.43 The seascape and visual resources baseline for the Hornsea Three array area and the offshore ECR corridor are outlined in full in paragraphs 9.5.4 to 9.5.17 of Chapter 12: Seascape and Visual Resources.

A.4.44 The only impact which has been screened into the assessment is the introduction of new/uncharacteristic elements/features and potential effects on the existing HSC. The extent of any predicted impacts upon the HSC is therefore likely to be largely focused on the Hornsea Three offshore footprint (i.e. the Hornsea Three array area and the proposed offshore ECR corridor).

A.4.45 Therefore no potential transboundary impacts upon seascape and visual resources are anticipated and it is proposed that transboundary impacts on seascape and visual resources are scoped out of the EIA process.

### *Infrastructure and other users*

A.4.46 The baseline for infrastructure and other users for the Hornsea Three array area and the offshore ECR corridor are outlined in full in paragraphs 9.6.6 to 9.6.48 of Chapter 9, Section 9.6: Infrastructure and Other Users.

A.4.47 Potential impacts upon infrastructure and other users of other EEA states are limited to activities surrounding oil and gas operations. There is the potential for transboundary impacts to arise from the piling of wind turbine and substation foundations during the construction phase, which may interfere with seismic survey operations in the Dutch EEZ.

A.4.48 The probability of impacts occurring during the construction phase as a result of the piling, and its extent, cannot be determined at this stage. This will be determined through consultation with the relevant oil and gas operators in the Dutch sector of the Southern North Sea and the final project description and will therefore be subject to assessment in the EIA. Any impacts would be short term and would be reversible after construction activities are complete.

A.4.49 There is the potential for transboundary impacts to also arise during the operation and maintenance phase, from the presence of the Hornsea Three wind turbines causing interference with the performance of REWS located on gas platforms in the Dutch sector of the southern North Sea. The probability of impacts occurring during the operation and maintenance phase as a result of the presence of the offshore infrastructure associated with Hornsea Three is likely to be high, although the extent cannot be determined at this stage. This will be determined once the project description has been further refined and through consultation with the applicable oil and gas operators, and will therefore be subject to assessment in the EIA. Although such impacts would be long term, they would be reversible after decommissioning, as it is anticipated that all structures above the seabed will be completely removed.

A.4.50 Therefore, it is proposed that transboundary impacts upon infrastructure and other users for the construction, and operation and maintenance phase are screened in to the EIA process.

## Onshore transboundary impacts

A.4.51 Hornsea Three have completed a transboundary screening matrix for onshore transboundary effects, in line with the suggested format set out in the Annex to PINS Advice Note 12. This screening matrix is set out in Table A.4 below.

A.4.52 The conclusions of the transboundary screening for each onshore topic are presented, together with additional justification, in the following sections.

*Geology and ground conditions*

A.4.53 Any impacts on geology and ground conditions arising from the construction, operation and maintenance and decommissioning of Hornsea Three will be confined to a localised area within the footprint of the Hornsea Three onshore ECR corridor. There is no pathway by which direct or indirect effects arising from Hornsea Three could significantly affect the geology or ground conditions of another member state.

A.4.54 It is therefore proposed that transboundary impacts on geology and ground conditions are scoped out of the EIA process.

*Hydrology and flood risk*

A.4.55 Any impacts on hydrology and flood risk arising from the construction, operation and maintenance and decommissioning of Hornsea Three will be confined to a localised area within the footprint of the Hornsea Three onshore ECR corridor. There is no pathway by which direct or indirect effects arising from Hornsea Three could significantly affect the hydrology and flood risk of another member state.

A.4.56 It is therefore proposed that transboundary impacts on hydrology and flood risk are scoped out of the EIA process.

*Onshore ecology and nature conservation*

A.4.57 Any impacts on onshore ecology and nature conservation arising from the construction, operation and maintenance and decommissioning of Hornsea Three will be confined to a localised area within the footprint of the Hornsea Three onshore ECR corridor. There is no pathway by which direct or indirect effects arising from Hornsea Three could significantly affect the onshore ecology and nature conservation of another member state including those that are listed as qualifying features of European Sites in other EEA states.

A.4.58 It is therefore proposed that transboundary impacts on onshore ecology and nature conservation are scoped out of the EIA process.

*Traffic and transport*

A.4.59 Any impacts on traffic and transport arising from the construction, operation and maintenance and decommissioning of Hornsea Three will be confined to a localised area of the UK road infrastructure. There is no pathway by which direct or indirect effects arising from Hornsea Three could significantly affect traffic and transport in another member state.

A.4.60 It is therefore proposed that transboundary impacts on traffic and transport are scoped out of the EIA process.

*Historic environment*

A.4.61 Any impacts on the onshore historic environment arising from the construction, operation and maintenance and decommissioning of Hornsea Three will be confined to a localised area within the footprint of the Hornsea Three onshore ECR corridor. There is no pathway by which direct or indirect effects arising from Hornsea Three could significantly affect the onshore historic environment of another member state.

A.4.62 It is therefore proposed that transboundary impacts on the onshore historic environment are scoped out of the EIA process.

Table A.4 Onshore transboundary screening matrix for Hornsea Three.

| Screening Criteria | Geology and Ground Conditions | Hydrology and Flood Risk | Onshore Ecology and Nature Conservation | Traffic and Transport | Historic Environment | Landscape and Visual Resources | Land Use, Agriculture and Recreation | Noise and Vibration | Air Quality and Health | Socio Economics |
|---|---|---|---|---|---|---|---|---|---|---|
| **Characteristics of the Development** | For a detailed description of the development, see Chapter 3: Project Description. Onshore transition pits will connect the wind farm to an onshore substation. An onshore ECR corridor, which will be approximately 55 km in length at its fullest extent, with jointing pits will then connect the substation to Norwich Main Substation, an existing 400 kV substation located to the south of Norwich, which is owned by National Grid. | | | | | | | | | |
| **Geographical Area** | N/A[11] | | | | | | | | | The Hornsea Three array area is located approximately 160 km east from the coast of Yorkshire, 120 km northeast from the coast of Norfolk and 10 km from the Dutch EEZ. |
| **Location of Development (including existing use)** | The offshore export cable will make landfall on the North Norfolk coast with the onshore cable route extending to Norwich Main Substation located south of Norfolk. | | | | | | | | | |
| **Cumulative Impacts** | No significant transboundary impacts are predicted. | | | | | | | | | Paragraph 12.7.22 of the Scoping Report. |
| **Carrier** | | | | | | | | | | ✓ See paragraph A.4.72. |
| **Environmental Importance** | | | | | | | | | | |
| **Extent** | | | | | | | | | | ✓ See paragraph A.4.73. |
| **Magnitude** | | | | | | | | | | The magnitude of the impacts will be subject to the assessment to be undertaken for the EIA and have, therefore, not been determined at this stage. |
| **Probability** | | | | | | | | | | ✓ See paragraph A.4.73. |
| **Duration** | | | | | | | | | | |
| **Frequency** | | | | | | | | | | |
| **Reversibility** | | | | | | | | | | |

[11] 'Geographical Area' here refers to the geographical area(s) within the jurisdiction of other EEA member states that will suffer potential impacts from the development. This transboundary impacts review note concludes that there will be no significant transboundary impacts from Hornsea Three on onshore receptors.

*Landscape and visual resources*

A.4.63 Any impacts on landscape and visual resources arising from the construction, operation and maintenance and decommissioning of Hornsea Three will be confined to a localised area in the vicinity of the Hornsea Three onshore ECR corridor. There is no pathway by which direct or indirect effects arising from Hornsea Three could significantly affect the landscape and visual resources of another member state.

A.4.64 It is therefore proposed that transboundary impacts on landscape and visual resources are scoped out of the EIA process.

*Land use, agriculture and recreation*

A.4.65 Any impacts on land use, agriculture and recreation arising from the construction, operation and maintenance and decommissioning of Hornsea Three will be confined to a localised area within the footprint of the Hornsea Three onshore ECR corridor. There is no pathway by which direct or indirect effects arising from Hornsea Three could significantly affect the land use, agriculture and recreation of another member state.

A.4.66 It is therefore proposed that transboundary impacts on land use, agriculture and recreation are scoped out of the EIA process.

*Noise and vibration*

A.4.67 Any noise and vibration impacts arising from the construction, operation and maintenance and decommissioning of Hornsea Three will be confined to a localised area in the vicinity of the Hornsea Three onshore ECR corridor. There is no pathway by which direct or indirect effects arising from Hornsea Three could result in significant noise and vibration effects in another member state.

A.4.68 It is therefore proposed that transboundary impacts on noise and vibration are scoped out of the EIA process.

*Air quality and health*

A.4.69 Potential transboundary impacts to air quality and health arising from the construction, operation and maintenance and decommissioning of Hornsea Three are anticipated to be minor and localised in extent and will be confined to the duration of the construction phase only. Any potential impacts to health related to air quality will also be localised and confined to the onshore construction phase. Potential transboundary health impacts due to the generation of an EMF around the onshore ECR corridor will be confined to the immediate vicinity of the onshore ECR corridor.

A.4.70 It is therefore proposed that transboundary impacts on air quality and health are scoped out of the EIA process.

*Socio-economics*

A.4.71 The socio economics baseline for the Hornsea Three array area and the offshore ECR corridor are outlined in full in of Chapter 12, Section 12.7: Socio-economics.

A.4.72 There is the potential for transboundary impacts arising from the activities of foreign shipping and navigation and foreign commercial fishing. In addition, potential transboundary impacts upon the economies of other EEA states may arise through the purchase of project components, equipment and the sourcing of labour from companies based outside the UK.

A.4.73 The probability of transboundary impacts occurring during both construction and operation is likely to be high although the extent cannot be determined at this stage. This will be determined by the final project description and will therefore be subject to assessment in the EIA. The location of construction and operation and maintenance ports and procurement of turbines will be particularly important. Although impacts associated with construction would be temporary and short term, there is the potential for long term impacts associated with operation and maintenance for the lifetime of Hornsea Three.

A.4.74 It is therefore proposed that transboundary impacts on socio economics are screened in to the EIA process.

## A.5 Conclusions

A.5.1 This technical annex has been prepared in accordance with PINS Advice Note 12 and associated Annex. The primary purpose of this note is to provide a screening assessment of potential transboundary impacts which have the potential to affect other EEA states.

A.5.2 On the basis of the current information available, as detailed within the Hornsea Three Scoping Report, the proposed development is considered likely to have a significant effect on the environment in other EEA States. Transboundary impacts have been screened into the EIA process for the following topics:

- Fish and Shellfish Ecology;
- Marine Mammals;
- Ornithology;
- Commercial Fisheries;
- Shipping and Navigation;
- Aviation, Military and Communications; and
- Socio Economics.

# Appendix B Water Framework Directive Screening

## B.1 Introduction

### Background

B.1.1 This report provides a preliminary WFD screening assessment for the Hornsea Three development which will be updated to include the WFD scoping assessment for submission with the Preliminary Environmental Information Report (PEIR).

B.1.2 Consideration of the WFD (2000/60/EC) is required for any DCO application which has the potential to cause deterioration in the ecological and chemical status of a water body or to compromise improvements which might otherwise lead to a water body meeting its WFD objectives. The WFD aims to protect and enhance water bodies within Europe and covers all estuarine and coastal waters out to 1 NM.

B.1.3 Using the Environment Agency Clearing the Waters guidance (Environment Agency, 2012a; 2012b) and referring to the relevant chapters of the Hornsea Three Scoping Report, a preliminary WFD screening assessment of the potential for Hornsea Three to have a significant non-temporary effect on WFD parameters at water body level has been carried out. This has been undertaken on the basis of the Hornsea Three information detailed within Chapter 3: Project Description and, where the requirement for further assessment has been identified, this will be presented in full in the PEIR and based on refined project information and the outcomes of the topic specific assessments.

B.1.4 It should be noted that the WFD assessment guidance documentation is principally designed to consider effects arising from dredging activities (Environment Agency, 2012a; Environment Agency, 2012b) but the process has been applied to the cable installation works as a process analogous to dredging works (i.e. an activity leading to disturbance of sediments, habitats etc.). Therefore, where reference is made to dredging activity this should be taken as referring to the cable installation works for the purposes of this WFD screening and for any future assessment.

### Brief project overview

B.1.5 This preliminary WFD screening assessment focuses on those elements of Hornsea Three relevant to the offshore/coastal areas designated for WFD consideration. As such, the construction activities of relevance relate to the installation of the offshore export cable within 1 NM of the coast and at the landfall (i.e. rather than considering any of the offshore elements of the scheme seawards of 1 NM from the coast).

B.1.6 The WFD assessment which will be presented in the PEIR will also include, where relevant, those inland WFD water bodies landward to the grid connection point at Norwich Main Substation. An initial review of the Main Rivers water bodies located within the onshore ECR search area has been undertaken and the results are presented in this document. The list of inland bodies that will be subject to assessment will be refined once the onshore ECR corridor is confirmed.

B.1.7 Export cables are used for the transfer of power from the offshore substations to the onshore HVAC/HVDC substation. Up to six export cables will be required for Hornsea Three. The export cables shall be located within the ECR corridor, the exact location and orientation of which shall be determined during an iterative route planning process following the grant of the DCO. The ECR will be located wholly within the ECR corridor search area shown in Figure B.1 and Figure B.2.

B.1.8 Drawing on the information outlined in Chapter 3: Project Description, the primary effects associated with laying of the Hornsea Three export cable that are considered to be relevant to the WFD assessment are:

- Offshore cabling (offshore export cable installation via trenching, dredging, jetting, ploughing or vertical injection);
- Offshore export cable landfall (between Weybourne and Salthouse);
- Crossing the intertidal via HDD, trenching, dredging, jetting, ploughing, rock cutting or vertical injection; and
- Crossing of inland water bodies via open cut trenching and trenchless techniques (i.e. HDD).

## B.2 Methodology

B.2.1 Under the WFD, coastal waters, estuaries, rivers, man-made docks and canals are divided into a series of water bodies. Within each water body, the WFD sets ecological as well as chemical objectives. The aim of the WFD was for all water bodies to achieve “good status” by 2015. This aim (“good status” for all water bodies by 2015) was not achieved and therefore the Environment Agency is subsequently aiming to achieve good status in at least 60% of waters by 2021 and in as many waters as possible by 2027. Under all conditions, it requires that there should be no deterioration in status.

B.2.2 “Good status” comprises two parts. The first is “good ecological status” (or “good ecological potential”, for water bodies classed as heavily modified or artificial). The second is “good chemical status”. “Good ecological status/potential” includes biological, hydromorphological and physicochemical quality elements and specific pollutants. “Good chemical status” concerns a series of priority substances, including a number of priority hazardous substances. The WFD also requires that relevant protected area objectives are achieved (Environment Agency, 2012c).

B.2.3 The current status of water bodies is detailed within River Basin Management Plans (RBMPs) and supporting Appendices. The first RBMPs were published in 2009 and have been superseded by the updated 2015 plans which included the work undertaken over the last five years and the plans/objectives for the next six years. Due to the location of the offshore ECR corridor search area for Hornsea Three, the updated 2015 Anglian RBMP (Environment Agency, 2015) is applicable to the project and information provided within this plan has been drawn upon to provide the characterisation of the environment required for this preliminary WFD screening assessment.

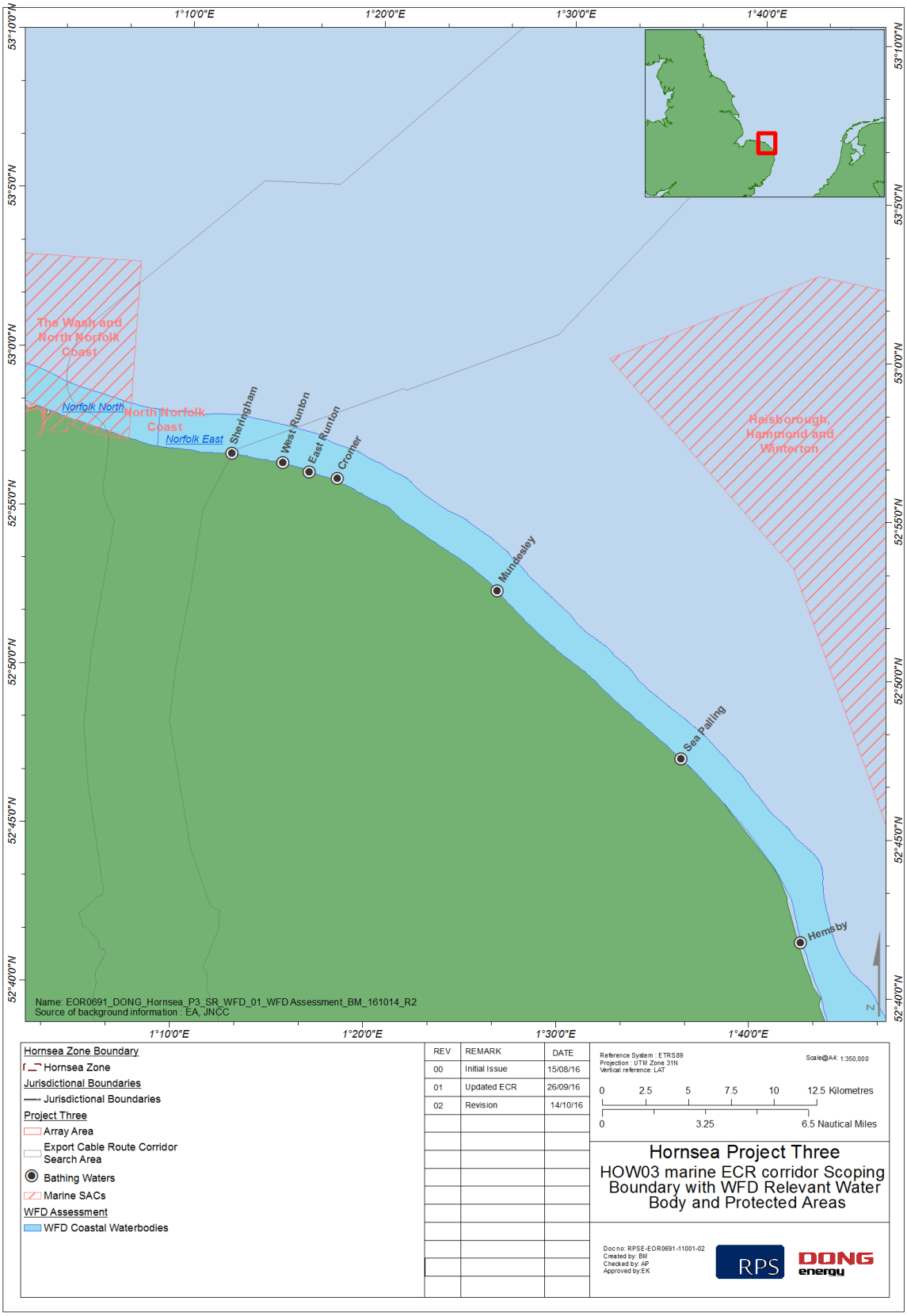


Figure B.1 Hornsea Three offshore ECR corridor search area and relevant Water Framework Directive (WFD) water bodies, Natura 2000 sites and Bathing Water Directive beaches.

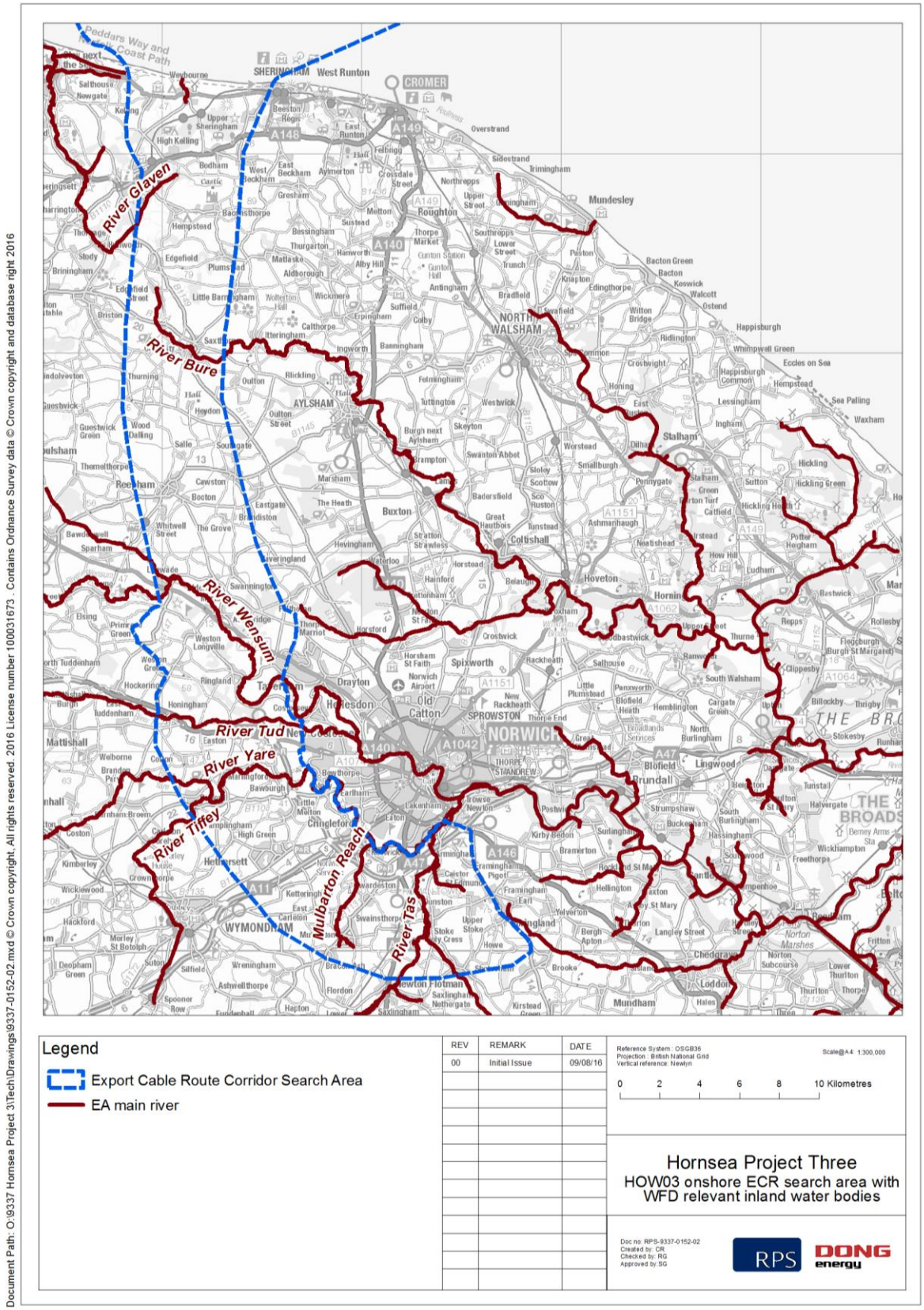


Figure B.2 Hornsea Three onshore ECR corridor search area and relevant Water Framework Directive (WFD) inland water bodies.

B.2.4 According to the Environment Agency *Clearing the Waters* guidance (Environment Agency, 2012a; Environment Agency, 2012b), Hornsea Three is categorised as a new project (i.e. one which has started after 1 January 2009) (Environment Agency, 2012a). As a result, the assessment of the export cable installation activities is not required to include the screening stage (Stage 1; Environment Agency, 2012c) and therefore is required to commence at the scoping stage (Stage 2). However, initial screening information is necessary as part of the scoping stage and, therefore, this stage is still often completed in practice in order to inform Stage 2. Additionally, screening the construction and operational activities of projects enables a high level initial assessment of those activities that could impact on compliance parameters within WFD water bodies. It is this Stage 1 screening which has been undertaken within this report to support the Hornsea Three Scoping Report. A flow chart of the sequence of Screening, Scoping and Assessment stages used in this WFD compliance report is shown in Figure B.3.

## B.3 Identification of relevant water bodies

B.3.1 With reference to the 2015 Anglian RBMP, the relevant coastal/estuarine water bodies that could be potentially affected by proposed Hornsea Three offshore export cable installation activities, due to their locations and associated proximity to the cable installation activities, include the Norfolk East coastal water body and/or the Norfolk North coastal water body (ID GB640503300000).

B.3.2 In terms of relevant inland water bodies from the 2015 Anglian RBMP, an initial review of the onshore ECR search area has identified the following Main Rivers that could potentially be affected by Hornsea Three:

- River Bure;
- River Glaven;
- River Tiffey;
- River Tud;
- River Wensum;
- River Yare;
- River Tas; and
- Mulbarton Reach.

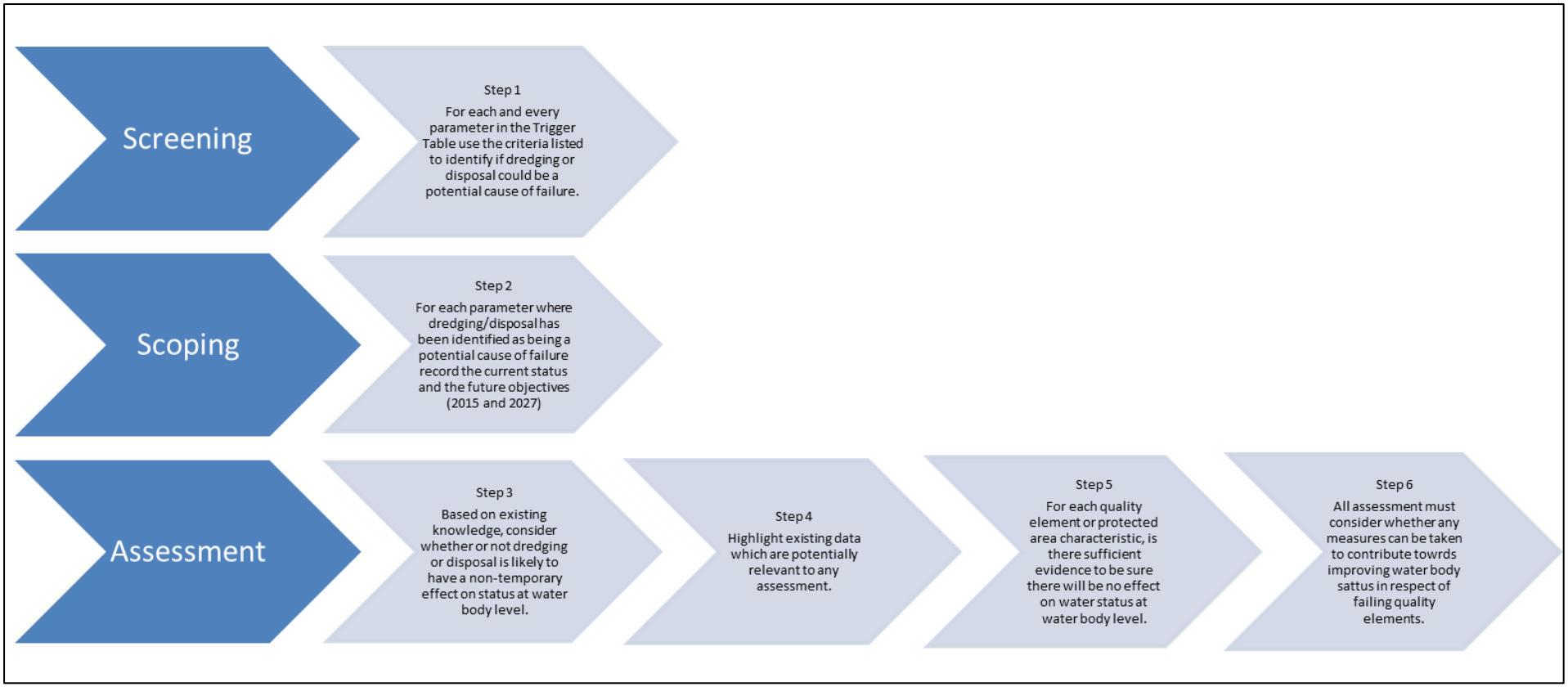


Figure B.3 Water Framework Directive (WFD) assessment methodology flow chart.

## B.4 Current water body status

B.4.1 The following sections provide information on the current status of the Norfolk East coastal water body, the Norfolk North coast water body, protected areas and inland water bodies.

B.4.2 The water body specific summary tables list the following protected area designations as being relevant to the Norfolk East/Norfolk North water bodies:

- Bathing Waters Directive;
- Natura 2000 (Habitats and/or Birds Directive); and
- Shellfish Waters Directive.

B.4.3 The following protected area designations are relevant to the Rivers Glaven, Tas, Yare, Bure, Tud, Tiffey and Wensum and the Mulbarton Reach:

- Freshwater Fish Directive;
- Natura 2000 (Habitats and/or Birds Directive);
- Nitrates Directive;
- Shellfish Waters Directive; and
- Urban Wastewater Treatment Directive.

### Coastal water bodies

#### *Norfolk East (coastal water body; ID GB650503520003)*

B.4.4 The Norfolk East coastal water body is designated as a heavily modified water body (HMWB), with flood protection and coastal protection cited as the reasons for this classification. The WFD ecological target for HMWBs is typically good ecological potential, although the target for Norfolk East coastal water body is moderate ecological potential[12] (Environment Agency, 2015) with the justification cited that good ecological potential would be disproportionately expensive. As with all surface water bodies, the default chemical status objective is good chemical status.

B.4.5 The Norfolk East WFD coastal water body is at moderate status overall, moderate ecological potential and good chemical potential. The data from the latest 2015 RBMP (Cycle 2) indicates that the water body is currently meeting its WFD objectives in respect of all biological, physico-chemical and supporting elements and specific pollutants. The latest data also indicates that the water body is currently meeting its WFD objectives for chemical quality.

#### *Protected areas*

B.4.6 The 2015 Anglian RBMP provides the status of Protected Areas and only lists the Great Yarmouth North Denes Special Protection Area (SPA), Outer Thames Estuary SPA and Winterton-Horsey Dunes SAC for the Norfolk East WFD water body. However, none of these protected areas fall within either the Hornsea Three landfall area or within the MMO 'environmental sensitivity supplement' 2 km Screening trigger.

[12] By definition, heavily modified water bodies are not able to achieve natural conditions. Instead the classification and objectives for these water bodies, and the biology they represent, are measured against 'ecological potential' rather than status.

B.4.7 The only protected area that falls within the 2 km screening trigger is designated under the Bathing Water Directive. The only designated beach which falls within the screening trigger is Sheringham, which is located within 2 km of the landfall area (see Figure B.1). Based on the new Bathing Water Directive standards, this Bathing Water is rated as Excellent in 2014 and is not considered to be at risk of failing to comply in 2015.

B.4.8 Exactly which, if any Natura 2000 sites and/or Bathing Waters, fall within the 2 km screening trigger, and will be carried forward for the assessment, will be determined once the zone of effect has been determined through the EIA process and through the marine processes assessment in particular (i.e. for plume effects).

#### *Norfolk North (coastal water body; ID GB650503520003)*

B.4.9 The Norfolk North coastal water body is also designated as a HMWB, with flood protection cited as the reason for this classification. The WFD ecological target is moderate ecological potential (Environment Agency, 2015) with the justification cited that good ecological potential would be disproportionately expensive. The default chemical status objective is good chemical status. As with all surface water bodies, the default chemical status objective is good chemical status.

B.4.10 The Norfolk North coastal water body is at moderate status overall, moderate ecological potential and good chemical potential. The data from the latest 2015 RBMP (Cycle 2) indicates that the water body is currently meeting its WFD objectives in respect of its biological quality elements (angiosperms, invertebrates and phytoplankton), physico-chemical (dissolved inorganic nitrogen and dissolved oxygen) and supporting elements. The water body is also meeting its WFD objectives for specific pollutants (arsenic, copper and zinc) as well as its WFD objectives for chemical quality.

##### *Protected areas*

B.4.11 The nearest Natura 2000 sites of relevance to the Norfolk North coastal water body are the Wash and North Norfolk Coast SAC and the Norfolk Coast SAC/SPA (see Figure B.1). The Hornsea Three offshore ECR corridor search area is located within both of these Natura 2000 sites at the landfall area and both sites are currently failing to meet their water quality objectives.

B.4.12 The 2015 Anglian RBMP also lists a number of Bathing Waters and designated waters under the Shellfish Directive, all of which are located outside the Hornsea Three offshore ECR corridor search area and therefore outside the MMO 'environmental sensitivity supplement' 2 km screening trigger of the dredge footprint or zone of effect. Therefore, only the Natura 2000 sites are proposed to be carried forward for the assessment.

### Inland water bodies

#### *Broadlands River Catchment (Rivers Bure, Wensum, Tas and Yare)*

B.4.13 The Broadlands River Catchment includes the Rivers Bure, Wensum, Tas and Yare and their tributaries. Priority issues for this catchment are diffuse pollution from rural areas, physical modification of rivers and lakes, and pollution from wastewater. Actions include individual sub catchment plans (e.g. Bure, Wensum and Yare) to facilitate strategic self-sustaining river restoration and invasive species recording and control, and to develop locally relevant agreements with farmer and community forums.

B.4.14 The River Bure is the longest river on the Broads stretching for 51 km from Aylsham to where it joins the sea at Gorelston. The majority of the river is navigable and includes a number of historic mills. The WFD overall status for the River Bure (ID GB105034055690) was poor (Environment Agency, 2009) with a status objective of achieving overall status (and ecological status) of good by 2027. The 2009 data indicates that in terms of biological elements, fish status is poor however its invertebrate status is high.

B.4.15 The River Tud (ID GB105034051000) is a tributary of the River Wensum and its source is close to East Dereham. It is relatively fast flowing and contains populations of crayfish, lampreys and bullheads. Its WFD overall potential is moderate with an overall status potential (and ecological potential) of good by 2027.

B.4.16 The WFD overall status for the River Wensum (ID GB105034055881) is bad with an overall status objective (including a chemical status and ecological potential) of good by 2027. The 2009 data indicates that in terms of biological elements, fish status is moderate, invertebrate status is high, however its phytobenthos status is very bad.

B.4.17 The River Tiffey (ID GB105034051150) is a tributary of the River Yare. It rises near Hethel and passes through Wymnondham and joins the River Yare at Swan's Harbour. Its WFD overall potential is moderate with an overall status potential (and ecological potential) of good by 2027.

B.4.18 The source of the River Yare is south of Dereham from where it flow east to the south of Norwich. At Whitlingham the Yare is joined by the River Wensum and the river downstream of their confluence continues to be called the Yare. The WFD overall potential for the River Yar (ID GB105034051280) is poor with an overall status potential (and ecological potential) of good by 2027.

B.4.19 The River Tas (ID GB105034051203) joins the River Yare to the south of Norwich. Its WFD overall potential is moderate with an overall status potential (and ecological potential) of good by 2027.

B.4.20 The Mulbarton Reach (also known as Intwood Stream (D GB105034051240) joins the River Yare to the south west of Norwich. Its WFD overall potential is moderate with an overall status potential (and ecological potential) of good by 2027.

### *North Norfolk River Catchment (River Glaven)*

B.4.21 The North Norfolk area comprises a relatively narrow strip of land along the North Norfolk coast and the catchment is predominantly rural. The River Glaven is one of the main watercourses in the catchment. It is relatively small in terms of flow and length (approximately 17 km) but is important in terms of the biodiversity it supports. Fisheries in the Glaven are diverse, although populations are limited in some parts by degraded habitats and barriers to migration. Priority issues for this catchment are physical modifications (as a result of agriculture) vulnerability to abstraction and barriers to fish passage. Actions include the Glaven Eel project to improve habitat and access for the eel along several kilometres for the Glaven, phosphate reduction by integrated wetlands and silt management in and around the river. The WFD overall status for the River Glaven (ID GB105034055780) was moderate (Environment Agency, 2009) with an overall status objective (and ecological status objective) of good by 2027. The 2009 data indicates that in terms of biological elements, fish status is moderate, however its invertebrate status is good.

## B.5 Water body assessments – screening

### Norfolk East (coastal water body; ID GB650503520003)

B.5.1 The preliminary WFD Screening assessment for the Norfolk East WFD water body is presented in Table B.1. This preliminary screening has been undertaken on the basis of the current project knowledge and project description as detailed in Chapter 3: Project Description. The following sections provide a summary of the screening assessment and are caveated with the fact that Table B.1 will be revisited and updated for the PEIR, once the project description has been finalised, prior to the assessment being carried out.

#### *Screened out elements (Environment Agency)*

B.5.2 The following elements are screened out within the assessment tables (Table B.1) by the Environment Agency (Environment Agency, 2012a) for a coastal water body:

- Phytoplankton;
- Fish fauna;
- Freshwater Flow;
- Thermal conditions; and
- Salinity.

#### *Screened out elements (Screening triggers)*

B.5.3 On the basis of the current knowledge of Hornsea Three, and by applying the Screening trigger tables for the assessment of marine dredging activities within this coastal water body (Table B.1), the following additional elements are proposed to be screened out of the Scoping Assessment for Hornsea Three:

- Morphological conditions including depth variation and bed properties;
- Wave exposure;
- Oxygenation;
- Nutrient conditions;
- Specific pollutants;
- All priority substances;
- Areas designated for the protection of economically significant aquatic species (for example shellfish waters) as these are >2 km from the Hornsea Three offshore ECR corridor search area; and
- Nutrient-sensitive areas.

Table B.1 Screening trigger table for cable installation effects on Water Framework Directive (WFD) parameters in Norfolk East coastal water body.

| WFD parameter (quality elements, specific pollutant priority substance, protected area) | Classification | Dredging triggers for potential effects on WFD parameters at water body level (where possible) | Assessment required? |
|---|---|---|---|
| ***Biological elements*** | | | |
| Phytoplankton | Composition, abundance and biomass. | Screened out as there is no obvious mechanism by which dredging could affect phytoplankton at the water body level. (Environment Agency, 2012a). | N/A |
| Other aquatic flora (for example angiosperms; saltmarsh, seagrass or macroalgae; seaweed). | Composition and abundance. | a. Will the dredging directly remove intertidal area or is it within 10 m of MLWS?<br>Or<br>b. Proportion of water body impacted by dredging activity.<br>Zone of effect (X) = 1.5 x dredge footprint = X $m^2$.<br>Water body size (Y) = Y $m^2$.<br>or<br>c. High level risk assessment.<br>Dredge methodology:<br>dispersive = 1;<br>non-dispersive = 0.<br>Timing: March to October = 1;<br>November to February = 0;<br>Duration of dredging activity:<br><25% year = 0;<br>25–50% = 0.5;<br>>50% = 1.<br>Dispersive dredging includes (but is not limited to):<br>– discharge into a water body through pipe from a cutter suction dredger.<br>– ploughing.<br>– water injection dredging.<br>– water agitation dredging. | If yes.<br>Yes. The activity will take place within the intertidal and therefore requires screening in.<br><br>If X is >5 % of Y (i.e. the dredging will affect more than 5% of the water body).<br>Unlikely but will be confirmed via the EIA process.<br><br>If total score is 2 or more. (Scores should be added together to give a total score).<br>Total score will be determined via the EIA process. |
| Benthic invertebrate fauna. | Composition and abundance. | | |
| Fish fauna (transitional only) | Composition and abundance. | | |

| WFD parameter (quality elements, specific pollutant priority substance, protected area) | Classification | Dredging triggers for potential effects on WFD parameters at water body level (where possible) | Assessment required? |
|---|---|---|---|
| ***Hydromorphological elements supporting biological elements*** | | | |
| ***Morphological Conditions*** | | | |
| Depth variation | | Proportion of water body impacted by dredging activity.<br>Zone of effect = 1.5 x dredge footprint = X $m^2$.<br>Water body size = Y $m^2$. | If X is > 5% of Y (i.e. the dredging will effect more than 5% of the water body).<br>X is unlikely to be > 5% and therefore these parameters are likely to be screened out. This can only be confirmed through the EIA process and will be dependent on the final landfall area selection. |
| Bed | Quantity (transitional only), structure and substrate. | | |
| Intertidal zone structure. | | Will the dredging directly remove inter-tidal area or is it within 10m of MLWS? | If yes.<br>Yes. The activity will take place within the intertidal and therefore requires screening in. |
| ***Tidal Regime*** | | | |
| Dominant currents (relevant to coastal water bodies only) | Direction | Is the dredge a capital or dredge or a significant change to a maintenance dredge?<br>For this parameter the definition of maintenance dredging should generally be taken to be the MMO definition of dredging that has been carried during the previous 10 years. | If yes.<br>This is likely to be the case and therefore this parameter is likely to be screened in. This can only be confirmed through the EIA process and will be dependent on the final project description. |
| Freshwater flow (relevant to transitional water bodies only) | | Screened out (Environment Agency, 2012a). | |
| Wave exposure | | Is the activity a capital dredge that will take place in a shallow water body? | If yes.<br>This is unlikely to be the case and therefore this parameter is likely to be screened out. |
| ***Chemical and physico-chemical elements supporting biological elements*** | | | |
| Transparency | | High level risk assessment. Score dredge as follows:<br>Zone of effect: >5% = 1; <5% = 0.<br>Dredge methodology: dispersive = 1; non-dispersive = 0.<br>Timing: March to October = 1; November to February = 0.<br>Duration of dredging activity: <25% year = 0; 25–50% = 0.5; >50% = 1. | If the total score is 1.5–4.<br>This is likely to be the case and therefore this parameter is likely to be screened in. This can only be confirmed through the EIA process and will be dependent on the final project description. |
| Thermal conditions. | | Screened out (Environment Agency, 2012a). | |

| WFD parameter (quality elements, specific pollutant priority substance, protected area) | Classification | Dredging triggers for potential effects on WFD parameters at water body level (where possible) | Assessment required? |
|---|---|---|---|
| Oxygenation conditions. | | High level risk assessment. Score dredge as follows:<br>Zone of effect: >5% = 1; <5% = 0.<br>Dredge methodology: dispersive = 1; non-dispersive = 0.<br>Timing: March to October = 1; November to February = 0.<br>Duration of dredging activity: <25% year = 0; 25–50% = 0.5; >50% = 1.<br>Sediment COD.<br>Dredge site near to major raw sewage inputs = 3.<br>No known inputs or issues = 0.<br>Water body background dissolved oxygen.<br>Identified as an issue in RBMP = 3.<br>Not identified as an issue in RBMP = 0. | If the total score is 4 or more.<br>This is unlikely to be the case and therefore this parameter is likely to be screened out. This can, however, only be confirmed through the EIA process and will be dependent on the final project description, |
| Salinity. | | Screened out (Environment Agency, 2012a). | |
| Nutrient conditions (for example nitrogen). | | Is the dredge a capital or new dredge? | If yes.<br>Yes, however the Trigger Description in Environment Agency guidance (2012a) emphasises that dredging does not generally affect nutrient conditions and that on a precautionary basis dredges should be assessed if within a Nutrient Sensitive Area. The Norfolk North coastal water body is not considered to be a nutrient sensitive area and nutrient conditions are therefore proposed to be screened out. |

| WFD parameter (quality elements, specific pollutant priority substance, protected area) | Classification | Dredging triggers for potential effects on WFD parameters at water body level (where possible) | Assessment required? |
|---|---|---|---|
| **Specific pollutants** | The trigger for specific pollutants will need to be refined using the awaited Defra guidance on the EQS Directive, results of the CEFAS dredging research programme and potentially the development of sediment contaminant levels that can reliably be shown to result in breaches of EQS levels. In the interim, and in accordance with the precautionary principle, it is proposed to require an assessment for dredging activities where a marine licence for the associated disposal is not in place or, if not relevant, where a specific pollutant is present in sediments above CEFAS action level 1. | | |
| Arsenic. | | Is a marine licence for the disposal of dredged material in place?<br>Or, if not applicable.<br>Is the pollutant present in sediments above CEFAS Action Level 1?<br>Repeat for each Specific Pollutant. | If no.<br><br>If yes.<br>Sediment contaminant sampling in the intertidal and nearshore regions are not proposed (see Chapter 8, Section 8.1: Benthic Subtidal and Intertidal Ecology) and impacts associated with the release of sediment contaminants are proposed to be screened out of the assessment on the basis of the sediments be present (i.e. low fines) and the location of the proposed landfall area (i.e. in an area without significant industrial inputs). Therefore it is proposed that specific pollutants are screened out. |
| Chromium. | | | |
| Copper. | | | |
| Zinc. | | | |
| PCBs (congeners to be determined) | | | |

| WFD parameter (quality elements, specific pollutant priority substance, protected area) | Classification | Dredging triggers for potential effects on WFD parameters at water body level (where possible) | Assessment required? |
|---|---|---|---|
| **Selected priority substances** | The screening trigger for priority substances will need to be refined using the awaited Defra guidance on the EQS Directive, results of the CEFAS dredging research programme and potentially the development of sediment contaminant levels that can reliably be shown to result in breaches of EQS levels. In the interim, and in accordance with the precautionary principle, it is proposed to screen in dredging operations where a Priority substance is present in sediments above CEFAS action level 1. | | |
| Anthracene (PHS). | | Is a marine licence for the disposal of dredged material in place?<br>Or, if not applicable.<br>Is the pollutant present in sediments above CEFAS Action Level 1?<br>Repeat for each Specific Pollutant. | If no.<br><br>If yes.<br>Sediment contaminant sampling in the intertidal and nearshore regions are not proposed (see Chapter 8, Section 8.1: Benthic Subtidal and Intertidal Ecology) and impacts associated with the release of sediment contaminants are proposed to be screened out of the assessment on the basis of the sediments be present (i.e. low fines) and the location of the proposed landfall area (i.e. in an area without significant industrial inputs). Therefore it is proposed that specific pollutants are screened out. |
| Hexachlorobenzene, Hexachlorobutadiene and | | | |
| Hexachlorocyclohexane. These substances are not measured by CEFAS. Research may be required to demonstrate the need for analysis. Analysis not usually requested Environment Agency. | | | |
| Penta bromodiphenyl ethers. Only measured by CEFAS in certain locations. Analysis not usually requested by Environment Agency. | | | |
| Cadmium and its compounds (PHS). | | | |
| Fluoranthene. | | | |
| Lead and its compounds. | | | |
| Mercury and its compounds (PHS). | | | |
| Naphthalene. | | | |
| Nickel and its compounds | | | |
| Polyaromatic hydrocarbons (PHS).<br>• (Benzo(a)pyrene) (PHS).<br>• (Benzo(b)fluoranthene) (PHS).<br>• (Benzo(g,h,i)perylene) (PHS).<br>• (Benzo(k)fluoranthene).<br>• (Indeno(1,2,3-cd)pyrene). | | | |
| Tributyltin compounds (PHS). | | | |
| **Protected areas (relevant to dredging and disposal activities)** | **Relevant legislation** | | |
| Areas designated for the protection of economically significant aquatic species (for example shellfish waters). | Freshwater Fish Directive 78/659/EEC. Shellfish Waters Directive 76/160/EEC and 20006/7/EEC. | Is the dredge footprint or zone of effect located in or within 2 km of a protected area? | If yes.<br>No, the Hornsea Three offshore ECR search area is not within 2 km of an area designated for the protection of economically significant aquatic species. Therefore, it is proposed to screen this out for this water body. |

| WFD parameter (quality elements, specific pollutant priority substance, protected area) | Classification | Dredging triggers for potential effects on WFD parameters at water body level (where possible) | Assessment required? |
|---|---|---|---|
| Bodies of water designated as recreational waters (for example bathing waters). | Bathing Waters Directive 76/160/EEC and 2006/7/EEC. | Is the dredge footprint or zone of effect located in or within 2 km of a protected area? | If yes.<br>Yes, the Hornsea Three offshore ECR search area is within 2 km of designated Bathing Waters. Therefore, it is proposed to screen this in for this water body. |
| Nutrient-sensitive areas including Nitrate Vulnerable Zones, polluted waters and sensitive Areas. | Nitrates Directive 91/676/EEC.<br>Urban Wastewater Treatment Directive 91/271/EEC. | Is the dredge a capital or new dredge? | If yes.<br>Yes, although this is proposed to be screened out for this water body on the basis that the Norfolk North coastal water body has no nutrient sensitive areas within it. |
| Areas designated for the protection of habitats or species where maintenance or improvement of the status of water is an important factor in their protection, including Natura 2000 sites (for example Special Areas of Conservation or Special Protection Areas). | Habitats Directive 92/43/EEC (SACs).<br>Birds Directive 79/409/EEC (SPAs). | Is the dredge footprint or zone of effect located in or within 2 km of a protected area? | If yes.<br>Yes, the Hornsea Three offshore ECR search area is within 2 km of Natura 2000 sites. Therefore, it is proposed to screen this in for this water body. |

### *Screened in elements*

B.5.4 The elements proposed to be screened in for the Scoping assessment for the Norfolk North coastal water body are:

- Biological elements including aquatic flora and benthic invertebrates;
- Intertidal zone structure;
- Dominant currents;
- Transparency;
- Bodies of water designated as recreational waters (for example bathing waters) as these are <2 km from the Hornsea Three offshore ECR corridor search area; and
- Protected areas: SACs and SPAs.

### Norfolk North (coastal water body; ID GB650503520003)

B.5.5 The preliminary WFD Screening assessment for the Norfolk North WFD water body is presented in Table B.2. This preliminary screening has been undertaken on the basis of the current project knowledge and project description presented in Chapter 3: Project Description. The following sections provide a summary of the screening assessment and are caveated with the fact that Table B.2 will be revisited and updated for the PEIR, once the project description has been finalised, prior to the assessment being carried out.

### *Screened out elements (Environment Agency)*

B.5.6 The following elements are screened out within the assessment tables (Table B.2) by the Environment Agency (Environment Agency, 2012a) for a coastal water body:

- Phytoplankton;
- Fish fauna;
- Freshwater Flow;
- Thermal conditions; and
- Salinity.

Table B.2 Screening trigger table for cable installation effects on Water Framework Directive (WFD) parameters in Norfolk North coastal water body.

| WFD parameter (quality elements, specific pollutant priority substance, protected area) | Classification | Dredging triggers for potential effects on WFD parameters at water body level (where possible) | Assessment required? |
|---|---|---|---|
| ***Biological elements*** | | | |
| Phytoplankton | Composition, abundance and biomass. | Screened out as there is no obvious mechanism by which dredging could affect phytoplankton at the water body level. (Environment Agency, 2012a). | N/A |
| Other aquatic flora (for example angiosperms; saltmarsh, seagrass or macroalgae; seaweed). | Composition and abundance. | a. Will the dredging directly remove intertidal area or is it within 10 m of MLWS?<br><br>Or<br>b. Proportion of water body impacted by dredging activity.<br>Zone of effect (X) = 1.5 x dredge footprint = X $m^2$.<br>Water body size (Y) = Y $m^2$.<br>or<br>c. High level risk assessment.<br>Dredge methodology:<br>dispersive = 1;<br>non-dispersive = 0.<br>Timing: March to October = 1;<br>November to February = 0;<br>Duration of dredging activity:<br><25% year = 0;<br>25–50% = 0.5;<br>>50% = 1.<br>Dispersive dredging includes (but is not limited to):<br>– discharge into a water body through pipe from a cutter suction dredger.<br>– ploughing.<br>– water injection dredging.<br>– water agitation dredging. | If yes.<br>Yes. The activity will take place within the intertidal and therefore requires screening in.<br><br>If X is >5 % of Y (i.e. the dredging will affect more than 5% of the water body).<br>Unlikely but will be confirmed via the EIA process.<br>If total score is 2 or more. (Scores should be added together to give a total score).<br>Total score will be determined via the EIA process. |
| Benthic invertebrate fauna. | Composition and abundance. | | |
| Fish fauna (transitional only) | Composition and abundance. | | |

| WFD parameter (quality elements, specific pollutant priority substance, protected area) | Classification | Dredging triggers for potential effects on WFD parameters at water body level (where possible) | Assessment required? |
|---|---|---|---|
| ***Hydromorphological elements supporting biological elements*** | | | |
| ***Morphological Conditions*** | | | |
| Depth variation. | | Proportion of water body impacted by dredging activity.<br>Zone of effect = 1.5 x dredge footprint = X $m^2$.<br>Water body size = Y $m^2$. | If X is > 5% of Y (i.e. the dredging will effect more than 5% of the water body).<br>X is unlikely to be > 5% and therefore these parameters are likely to be screened out. This can only be confirmed through the EIA process and will be dependent on the final landfall area. |
| Bed | Quantity (transitional only), structure and substrate. | | |
| Intertidal zone structure. | | Will the dredging directly remove inter-tidal area or is it within 10m of MLWS? | If yes.<br>Yes. The activity will take place within the intertidal and therefore requires screening in. |
| ***Tidal Regime*** | | | |
| Dominant currents (relevant to coastal water bodies only). | Direction. | Is the dredge a capital or dredge or a significant change to a maintenance dredge?<br>For this parameter the definition of maintenance dredging should generally be taken to be the MMO definition of dredging that has been carried during the previous 10 years. | If yes.<br>This is likely to be the case and therefore this parameter is likely to be screened in. This can only be confirmed through the EIA process and will be dependent on the final project description. |
| Freshwater flow (relevant to transitional water bodies only). | | Screened out (Environment Agency, 2012a). | |
| Wave exposure. | | Is the activity a capital dredge that will take place in a shallow water body? | If yes.<br>This is unlikely to be the case and therefore this parameter is likely to be screened out. |

| WFD parameter (quality elements, specific pollutant priority substance, protected area) | Classification | Dredging triggers for potential effects on WFD parameters at water body level (where possible) | Assessment required? |
|---|---|---|---|
| ***Chemical and physico-chemical elements supporting biological elements*** | | | |
| Transparency | | High level risk assessment. Score dredge as follows:<br>Zone of effect: >5% = 1; <5% = 0.<br>Dredge methodology: dispersive = 1; non-dispersive = 0.<br>Timing: March to October = 1; November to February = 0.<br>Duration of dredging activity: <25% year = 0; 25–50% = 0.5; >50% = 1. | If the total score is 1.5–4.<br>This is likely to be the case and therefore this parameter is likely to be screened in. This can only be confirmed through the EIA process and will be dependent on the final project description. |
| Thermal conditions. | | Screened out (Environment Agency, 2012a). | |
| Oxygenation conditions. | | High level risk assessment. Score dredge as follows:<br>Zone of effect: >5% = 1; <5% = 0.<br>Dredge methodology: dispersive = 1; non-dispersive = 0.<br>Timing: March to October = 1; November to February = 0.<br>Duration of dredging activity: <25% year = 0; 25–50% = 0.5; >50% = 1.<br>Sediment COD.<br>Dredge site near to major raw sewage inputs = 3.<br>No known inputs or issues = 0.<br>Water body background dissolved oxygen.<br>Identified as an issue in RBMP = 3.<br>Not identified as an issue in RBMP = 0. | If the total score is 4 or more.<br>This is unlikely to be the case and therefore this parameter is likely to be screened out. This can, however, only be confirmed through the EIA process and will be dependent on the final project description, |
| Salinity. | | Screened out (Environment Agency, 2012a). | |
| Nutrient conditions (for example nitrogen). | | Is the dredge a capital or new dredge? | If yes.<br>Yes, however the Trigger Description in Environment Agency guidance (2012a) emphasises that dredging does not generally affect nutrient conditions and that on a precautionary basis dredges should be assessed if within a Nutrient Sensitive Area. The Norfolk North coastal water body is not considered to be a nutrient sensitive area and nutrient conditions are therefore proposed to be screened out. |

| WFD parameter (quality elements, specific pollutant priority substance, protected area) | Classification | Dredging triggers for potential effects on WFD parameters at water body level (where possible) | Assessment required? |
|---|---|---|---|
| **Specific pollutants** | The trigger for specific pollutants will need to be refined using the awaited Defra guidance on the EQS Directive, results of the CEFAS dredging research programme and potentially the development of sediment contaminant levels that can reliably be shown to result in breaches of EQS levels. In the interim, and in accordance with the precautionary principle, it is proposed to require an assessment for dredging activities where a marine licence for the associated disposal is not in place or, if not relevant, where a specific pollutant is present in sediments above CEFAS action level 1. | | |
| Arsenic. | | Is a marine licence for the disposal of dredged material in place?<br>Or, if not applicable.<br>Is the pollutant present in sediments above CEFAS Action Level 1?<br>Repeat for each Specific Pollutant. | If no.<br><br>If yes.<br>Sediment contaminant sampling in the intertidal and nearshore regions are not proposed (see Chapter 8, Section 8.1: Benthic Subtidal and Intertidal Ecology) and impacts associated with the release of sediment contaminants are proposed to be screened out of the assessment on the basis of the sediments be present (i.e. low fines) and the location of the proposed landfall area (i.e. in an area without significant industrial inputs). Therefore it is proposed that specific pollutants are screened out. |
| Chromium. | | | |
| Copper. | | | |
| Zinc. | | | |
| PCBs (congeners to be determined) | | | |
| **Selected priority substances** | The screening trigger for priority substances will need to be refined using the awaited Defra guidance on the EQS Directive, results of the CEFAS dredging research programme and potentially the development of sediment contaminant levels that can reliably be shown to result in breaches of EQS levels. In the interim, and in accordance with the precautionary principle, it is proposed to screen in dredging operations where a Priority substance is present in sediments above CEFAS action level 1. | | |

| WFD parameter (quality elements, specific pollutant priority substance, protected area) | Classification | Dredging triggers for potential effects on WFD parameters at water body level (where possible) | Assessment required? |
|---|---|---|---|
| Anthracene (PHS). | | Is a marine licence for the disposal of dredged material in place?<br>Or, if not applicable.<br>Is the pollutant present in sediments above CEFAS Action Level 1?<br>Repeat for each Specific Pollutant. | If no.<br><br>If yes.<br>Sediment contaminant sampling in the intertidal and nearshore regions are not proposed (see Chapter 8, Section 8.1: Benthic Subtidal and Intertidal Ecology) and impacts associated with the release of sediment contaminants are proposed to be screened out of the assessment on the basis of the sediments be present (i.e. low fines) and the location of the proposed landfall area (i.e. in an area without significant industrial inputs). Therefore it is proposed that specific pollutants are screened out. |
| Hexachlorobenzene, Hexachlorobutadiene and | | | |
| Hexachlorocyclohexane. These substances are not measured by CEFAS. Research may be required to demonstrate the need for analysis. Analysis not usually requested Environment Agency. | | | |
| Penta bromodiphenyl ethers. Only measured by CEFAS in certain locations. Analysis not usually requested by Environment Agency. | | | |
| Cadmium and its compounds (PHS). | | | |
| Fluoranthene. | | | |
| Lead and its compounds. | | | |
| Mercury and its compounds (PHS). | | | |
| Naphthalene. | | | |
| Nickel and its compounds | | | |
| Polyaromatic hydrocarbons (PHS).<br>• (Benzo(a)pyrene) (PHS).<br>• (Benzo(b)fluoranthene) (PHS).<br>• (Benzo(g,h,i)perylene) (PHS).<br>• (Benzo(k)fluoranthene).<br>• (Indeno(1,2,3-cd)pyrene). | | | |
| Tributyltin compounds (PHS). | | | |

| WFD parameter (quality elements, specific pollutant priority substance, protected area) | Classification | Dredging triggers for potential effects on WFD parameters at water body level (where possible) | Assessment required? |
|---|---|---|---|
| **Protected areas (relevant to dredging and disposal activities)** | **Relevant legislation** | | |
| Areas designated for the protection of economically significant aquatic species (for example shellfish waters). | Freshwater Fish Directive 78/659/EEC.<br>Shellfish Waters Directive 76/160/EEC and 20006/7/EEC. | Is the dredge footprint or zone of effect located in or within 2 km of a protected area? | If yes.<br>No, The Hornsea Three offshore ECR search area is not within 2 km of an area designated for the protection of economically significant aquatic species. Therefore, it is proposed to screen this out for this water body. |
| Bodies of water designated as recreational waters (for example bathing waters). | Bathing Waters Directive 76/160/EEC and 2006/7/EEC. | Is the dredge footprint or zone of effect located in or within 2 km of a protected area? | If yes.<br>No, the Hornsea Three offshore ECR search area is not within 2 km of designated Bathing Waters. Therefore, it is proposed to screen this out for this water body. |
| Nutrient-sensitive areas including Nitrate Vulnerable Zones, polluted waters and sensitive Areas. | Nitrates Directive 91/676/EEC.<br>Urban Wastewater Treatment Directive 91/271/EEC. | Is the dredge a capital or new dredge? | If yes.<br>Yes, although this is proposed to be screened out for this water body on the basis that the Norfolk North coastal water body has no nutrient sensitive areas within it. |
| Areas designated for the protection of habitats or species where maintenance or improvement of the status of water is an important factor in their protection, including Natura 2000 sites (for example Special Areas of Conservation or Special Protection Areas). | Habitats Directive 92/43/EEC (SACs).<br>Birds Directive 79/409/EEC (SPAs). | Is the dredge footprint or zone of effect located in or within 2 km of a protected area? | If yes.<br>Yes, the Hornsea Three offshore ECR search area is within 2 km of Natura 2000 sites. Therefore, it is proposed to screen this in. |

### *Screened out elements (Screening triggers)*

B.5.7 On the basis of the current knowledge of Hornsea Three, and by applying the Screening trigger tables for the assessment of marine dredging activities within this coastal water body (Table B.2), the following additional elements are proposed to be screened out of the Scoping Assessment:

- Morphological conditions including depth variation and bed properties;
- Wave exposure;
- Oxygenation;
- Nutrient conditions;
- Specific pollutants;
- All priority substances;
- Areas designated for the protection of economically significant aquatic species (for example shellfish waters) as these are >2 km from the Hornsea Three offshore ECR corridor search area;
- Bodies of water designated as recreational waters (for example bathing waters) as these are >2 km from the Hornsea Three offshore ECR corridor search area; and
- Nutrient-sensitive areas.

### *Screened in elements*

B.5.8 The elements proposed to be screened in for the Scoping assessment for the Norfolk North coastal water body are:

- Biological elements including aquatic flora and benthic invertebrates;
- Intertidal zone structure;
- Dominant currents;
- Transparency; and
- Protected areas: SACs and SPAs.

### Inland water bodies

B.5.9 A preliminary WFD Screening assessment for the inland water bodies cannot be undertaken until the onshore ECR has been finalised and the crossing techniques have been identified in the project description. The WFD Screening Assessment for inland water bodies will be presented within the PEIR.

## B.6 Water body assessments – scoping

### Norfolk East coastal water body

B.6.1 A full scoping assessment for all elements identified as scoped in for the Norfolk East coastal water body will be presented in the PEIR according to the draft tables outlined in Table B.3 and Table B.4. These tables have not been completed for the purposes of the Scoping Report and are intended to only provide an indication of the elements which are likely to be taken forward for the fully scoping assessment.

Table B.3 Scoping and assessment (Steps 1-3) table for cable installation effects on Water Framework Directive (WFD) parameters in Norfolk East coastal water body.

| Step | Stage Two: Scoping - Step 1 | | Stage Two: Scoping - Step 2 | | Stage Three: Assessment - Step 2 | | | | Stage Three: Assessment - Step 3 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Identify issues | | Record current status and 2015 objective | | Indicate likelihood of effect | | | | Indicate data availability | |
| | Tick all potentially-affected quality elements or identify all potentially affected protected area characteristics | | Record current status of quality element (include level of confidence in assessment) | Record 2015 objective | Using existing knowledge and information indicate likelihood of a non-temporary effect on status at water body level | | | | Indicate whether potentially useful data already exist for that quality element | |
| WFD parameter (quality elements, specific pollutant priority substance, protected area) | Tick quality elements highlighted via Screening steps 3–4 | Referring to trigger tables, tick quality elements where potential causal link exists | High/good/moderate/poor/bad for ecological elements or high/ fail for chemical elements or protected area status or not assessed | | None | Unlikely | Likely | Not known | Data exist | Data do not exist |
| ***Biological elements*** | | | | | | | | | | |
| Phytoplankton | | N/A | | | | | | | | |
| Other aquatic flora | | Y | Good | Good | To be completed for the PEIR based on the assessments presented in the Benthic Subtidal and Intertidal Ecology PEIR chapter. | | | | | |
| Benthic invertebrate fauna. | | Y | Good | Good | | | | | | |
| Fish fauna (transitional only) | | N/A | | | | | | | | |
| ***Hydromorphological elements supporting biological elements*** | | | | | | | | | | |
| ***Morphological Conditions*** | | | | | | | | | | |
| Depth variation. | | N | | | | | | | | |
| Bed | | N | | | | | | | | |
| Intertidal zone structure. | | Y | Not assessed. | Not assessed. | To be completed for the PEIR based on the assessments presented in the Marine Processes PEIR chapter. | | | | | |

| Step | Stage Two: Scoping - Step 1 | | Stage Two: Scoping - Step 2 | | Stage Three: Assessment - Step 2 | | | | Stage Three: Assessment - Step 3 | |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Tidal Regime*** | | | | | | | | | | |
| Dominant currents (relevant to coastal water bodies only). | | Y | Not assessed. | Not assessed. | To be completed for the PEIR based on the assessments presented in the Marine Processes PEIR chapter. | | | | | |
| Freshwater flow (relevant to transitional water bodies only). | | N/A | | | | | | | | |
| Wave exposure. | | N | | | | | | | | |
| ***Chemical and physico-chemical elements supporting biological elements*** | | | | | | | | | | |
| Transparency | | Y | Not assessed. | Not assessed. | To be completed for the PEIR based on the assessments presented in the Benthic Subtidal and Intertidal Ecology PEIR chapter and Marine Processes PEIR chapter. | | | | | |
| Thermal conditions. | | N/A | | | | | | | | |
| Oxygenation conditions. | | N | | | | | | | | |
| Salinity. | | N/A | | | | | | | | |
| Nutrient conditions (for example nitrogen). | | N | | | | | | | | |
| ***Specific pollutants*** | | | | | | | | | | |
| Arsenic. | | N | | | | | | | | |
| Chromium. | | N | | | | | | | | |
| Copper. | | N | | | | | | | | |
| Zinc. | | N | | | | | | | | |
| PCBs (congeners to be determined) | | N | | | | | | | | |
| ***Selected priority substances*** | | | | | | | | | | |
| Anthracene (PHS). | | N | | | | | | | | |
| Hexachlorobenzene, Hexachlorobutadiene and | | N | | | | | | | | |

| Step | Stage Two: Scoping - Step 1 | | Stage Two: Scoping - Step 2 | | Stage Three: Assessment - Step 2 | | | | Stage Three: Assessment - Step 3 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Hexachlorocyclohexane. These substances are not measured by CEFAS. Research may be required to demonstrate the need for analysis. Analysis not usually requested Environment Agency. | | N | | | | | | | | |
| Penta bromodiphenyl ethers. Only measured by CEFAS in certain locations. Analysis not usually requested by Environment Agency. | | N | | | | | | | | |
| Cadmium and its compounds (PHS). | | N | | | | | | | | |
| Fluoranthene. | | N | | | | | | | | |
| Lead and its compounds. | | N | | | | | | | | |
| Mercury and its compounds (PHS). | | N | | | | | | | | |
| Naphthalene. | | N | | | | | | | | |
| Nickel and its compounds | | N | | | | | | | | |
| Polyaromatic hydrocarbons (PHS). (Benzo(a)pyrene) (PHS). (Benzo(b)fluoranthene) (PHS). (Benzo(g,h,i)perylene) (PHS). (Benzo(k)fluoranthene). (Indeno(1,2,3-cd)pyrene). | | N | | | | | | | | |

| Step | Stage Two: Scoping - Step 1 | | Stage Two: Scoping - Step 2 | | Stage Three: Assessment - Step 2 | | Stage Three: Assessment - Step 3 | |
|---|---|---|---|---|---|---|---|---|
| Tributyltin compounds (PHS). | | N | | | | | | |
| ***Protected areas (relevant to dredging and disposal activities)*** | | | | | | | | |
| Areas designated for the protection of economically significant aquatic species (for example shellfish waters). | | N | | | | | | |
| Bodies of water designated as recreational waters (for example bathing waters). | | Y | High | High | To be completed for the PEIR based on the assessments presented in the Benthic Subtidal and Intertidal Ecology PEIR chapter and Marine Processes PEIR chapter. | | | |
| Nutrient-sensitive areas including Nitrate Vulnerable Zones, polluted waters and sensitive Areas. | | N | | | | | | |
| Areas designated for the protection of habitats or species where maintenance or improvement of the status of water is an important factor in their protection, including Natura 2000 sites (for example Special Areas of Conservation or Special Protection Areas). | | Y | The Wash and North Norfolk Coast SAC not meeting water quality objectives.<br>The North Norfolk Coast SAC not meeting water quality objectives.<br>The North Norfolk Coast SPA not meeting water quality objectives. | All sites due to meet Art 4(c) objectives by 2021. | Natura 2000 sites will be considered in full in the separate HRA. | | | |

Table B.4 Final assessment table for cable installation effects on Water Framework Directive (WFD) parameters in Norfolk East coastal water body.

| Step | Stage Three: Assessment | | | Stage Three: Assessment | Stage Three: Assessment – Step 5 | | | | | Stage Three: Assessment – Step 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Decide on level of assessment | | | Aim to improve | Consider options for delivery of assessment | | | | | Confirm and agree scope | |
| | Indicate appropriate scope of assessment based on likelihood of effect on status at water body level | | | All assessments must consider whether any measures can be taken to contribute towards improving water body status in respect of failing quality elements. | Proposed delivery mechanism(s) More than one option may be ticked if appropriate | | | | | Tick when scope of assessment is agreed with statutory consultees (for example MMO) or Environment Agency (if no other assessment mechanism applies) | |
| WFD parameter (quality elements, specific pollutant priority substance, protected area) | No further assessment required | Overview / high level assessment | Detailed assessment | Aim to improve (only applicable if water body is not already at "good status") | Scope in to project EIA | Scope-in to Maintenance Dredging Protocol or appropriate assessment | Scope-in to Project environmental appraisal | WFD specific investigation required | No assessment required | Scope agreed with statutory consultee | Scope agreed with Environment Agency |
| ***Biological elements*** | | | | | | | | | | | |
| Other aquatic flora | | | | | | | | | | | |
| Benthic invertebrate fauna. | | | | | | | | | | | |
| Morphological Conditions | | | | | | | | | | | |
| Intertidal zone structure. | | | | | | | | | | | |
| Tidal Regime | | | | | | | | | | | |
| Dominant currents (relevant to coastal water bodies only). | | | | | | | | | | | |

| Step | Stage Three: Assessment | | | Stage Three: Assessment | Stage Three: Assessment – Step 5 | | | | | Stage Three: Assessment – Step 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Chemical and physico-chemical elements supporting biological elements*** | | | | | | | | | | | |
| Transparency | | | | | | | | | | | |
| ***Protected areas (relevant to dredging and disposal activities)*** | | | | | | | | | | | |
| Bodies of water designated as recreational waters (for example bathing waters). | | | | | | | | | | | |
| Areas designated for the protection of habitats or species where maintenance or improvement of the status of water is an important factor in their protection, including Natura 2000 sites (for example Special Areas of Conservation or Special Protection Areas). | | | | | | | | | | | |

### Norfolk North coastal water body

B.6.2 A full scoping assessment for all elements identified as scoped in for the Norfolk North coastal water body will be presented in the PEIR according to the draft tables outlined in Table B.5 and Table B.6. These tables have not been completed for the purposes of the Scoping Report and are intended to only provide an indication of the elements which are likely to be taken forward for the fully scoping assessment.

## B.7 References

Environment Agency (2009) Water for life and livelihoods. River Basin Management Plan Anglian River Basin District. Annex B: Water body status and objectives

Environment Agency (2012a). Clearing the waters. Marine dredging and the Water Framework Directive. Stage two: the scoping process.

Environment Agency (2012b). Clearing the waters. Marine dredging and the Water Framework Directive. Stage three: assessment.

Environment Agency (2015). Water for life and livelihoods. Anglian River Basin District. River Basin Management Plan Humber River Basin District. Updated: December 2015.

Table B.5 Scoping and assessment (Steps 1-3) table for cable installation effects on Water Framework Directive (WFD) parameters in Norfolk North coastal water body.

| Step | Stage Two: Scoping - Step 1 | | Stage Two: Scoping - Step 2 | | Stage Three: Assessment - Step 2 | | | | Stage Three: Assessment - Step 3 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Identify issues | | Record current status and 2015 objective | | Indicate likelihood of effect | | | | Indicate data availability | |
| | Tick all potentially-affected quality elements or identify all potentially affected protected area characteristics | | Record current status of quality element (include level of confidence in assessment) | Record 2015 objective | Using existing knowledge and information indicate likelihood of a non-temporary effect on status at water body level | | | | Indicate whether potentially useful data already exist for that quality element | |
| WFD parameter (quality elements, specific pollutant priority substance, protected area) | Tick quality elements highlighted via Screening steps 3–4 | Referring to trigger tables, tick quality elements where potential causal link exists | High/good/moderate/poor/bad for ecological elements or high/ fail for chemical elements or protected area status or not assessed | | None | Unlikely | Likely | Not known | Data exist | Data do not exist |
| ***Biological elements*** | | | | | | | | | | |
| Phytoplankton | | N/A | | | | | | | | |
| Other aquatic flora | | Y | Good | Good | To be completed for the PEIR based on the assessments presented in the Benthic Subtidal and Intertidal Ecology PEIR chapter. | | | | | |
| Benthic invertebrate fauna. | | Y | Good | Good | | | | | | |
| Fish fauna (transitional only) | | N/A | | | | | | | | |
| ***Hydromorphological elements supporting biological elements*** | | | | | | | | | | |
| ***Morphological Conditions*** | | | | | | | | | | |
| Depth variation. | | N | | | | | | | | |
| Bed | | N | | | | | | | | |
| Intertidal zone structure. | | Y | Not assessed. | Not assessed. | To be completed for the PEIR based on the assessments presented in the Marine Processes PEIR chapter. | | | | | |

| Step | Stage Two: Scoping - Step 1 | | Stage Two: Scoping - Step 2 | | Stage Three: Assessment - Step 2 | | | | Stage Three: Assessment - Step 3 | |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Tidal Regime*** | | | | | | | | | | |
| Dominant currents (relevant to coastal water bodies only). | | Y | Not assessed. | Not assessed. | To be completed for the PEIR based on the assessments presented in the Marine Processes PEIR chapter. | | | | | |
| Freshwater flow (relevant to transitional water bodies only). | | N/A | | | | | | | | |
| Wave exposure. | | N | | | | | | | | |
| ***Chemical and physico-chemical elements supporting biological elements*** | | | | | | | | | | |
| Transparency | | Y | Not assessed. | Not assessed. | To be completed for the PEIR based on the assessments presented in the Benthic Subtidal and Intertidal Ecology PEIR chapter and Marine Processes PEIR chapter. | | | | | |
| Thermal conditions. | | N/A | | | | | | | | |
| Oxygenation conditions. | | N | | | | | | | | |
| Salinity. | | N/A | | | | | | | | |
| Nutrient conditions (for example nitrogen). | | N | | | | | | | | |
| ***Specific pollutants*** | | | | | | | | | | |
| Arsenic. | | N | | | | | | | | |
| Chromium. | | N | | | | | | | | |
| Copper. | | N | | | | | | | | |
| Zinc. | | N | | | | | | | | |
| PCBs (congeners to be determined) | | N | | | | | | | | |
| ***Selected priority substances*** | | | | | | | | | | |
| Anthracene (PHS). | | N | | | | | | | | |
| Hexachlorobenzene, Hexachlorobutadiene and | | N | | | | | | | | |

| Step | Stage Two: Scoping - Step 1 | | Stage Two: Scoping - Step 2 | | Stage Three: Assessment - Step 2 | | | | Stage Three: Assessment - Step 3 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Hexachlorocyclohexane. These substances are not measured by CEFAS. Research may be required to demonstrate the need for analysis. Analysis not usually requested Environment Agency. | | N | | | | | | | | |
| Penta bromodiphenyl ethers. Only measured by CEFAS in certain locations. Analysis not usually requested by Environment Agency. | | N | | | | | | | | |
| Cadmium and its compounds (PHS). | | N | | | | | | | | |
| Fluoranthene. | | N | | | | | | | | |
| Lead and its compounds. | | N | | | | | | | | |
| Mercury and its compounds (PHS). | | N | | | | | | | | |
| Naphthalene. | | N | | | | | | | | |
| Nickel and its compounds | | N | | | | | | | | |
| Polyaromatic hydrocarbons (PHS).<br>• (Benzo(a)pyrene) (PHS).<br>•(Benzo(b)fluoranthene) (PHS).<br>•(Benzo(g,h,i)perylene) (PHS).<br>•(Benzo(k)fluoranthene).<br>•(Indeno(1,2,3-cd)pyrene). | | N | | | | | | | | |
| Tributyltin compounds (PHS). | | N | | | | | | | | |

| Step | Stage Two: Scoping - Step 1 | | Stage Two: Scoping - Step 2 | | Stage Three: Assessment - Step 2 | | | | Stage Three: Assessment - Step 3 | |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Protected areas (relevant to dredging and disposal activities)*** | | | | | | | | | | |
| Areas designated for the protection of economically significant aquatic species (for example shellfish waters). | | N | | | | | | | | |
| Bodies of water designated as recreational waters (for example bathing waters). | | N | | | | | | | | |
| Nutrient-sensitive areas including Nitrate Vulnerable Zones, polluted waters and sensitive Areas. | | N | | | | | | | | |
| Areas designated for the protection of habitats or species where maintenance or improvement of the status of water is an important factor in their protection, including Natura 2000 sites (for example Special Areas of Conservation or Special Protection Areas). | | Y | The Wash and North Norfolk Coast SAC not meeting water quality objectives.<br>The North Norfolk Coast SAC not meeting water quality objectives.<br>The North Norfolk Coast SPA not meeting water quality objectives. | All sites due to meet Art 4(c) objectives by 2021. | Natura 2000 sites will be considered in full in the separate HRA. | | | | | |

Table B.6 Final assessment table for cable installation effects on Water Framework Directive (WFD) parameters in Norfolk North coastal water body.

| Step | Stage Three: Assessment | | | Stage Three: Assessment | Stage Three: Assessment – Step 5 | | | | | Stage Three: Assessment – Step 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Decide on level of assessment | | | Aim to improve | Consider options for delivery of assessment | | | | | Confirm and agree scope | |
| | Indicate appropriate scope of assessment based on likelihood of effect on status at water body level | | | All assessments must consider whether any measures can be taken to contribute towards improving water body status in respect of failing quality elements. | Proposed delivery mechanism(s) More than one option may be ticked if appropriate | | | | | Tick when scope of assessment is agreed with statutory consultee (for example MMO) or Environment Agency (if no other assessment mechanism applies) | |
| WFD parameter (quality elements, specific pollutant priority substance, protected area) | No further assessment required | Overview / high level assessment | Detailed assessment | Aim to improve (only applicable if water body is not already at "good status") | Scope in to project EIA | Scope-in to Maintenance Dredging Protocol or appropriate assessment | Scope-in to Project environmental appraisal | WFD specific investigation required | No assessment required | Scope agreed with statutory consultee | Scope agreed with Environment Agency |
| ***Biological elements*** | | | | | | | | | | | |
| Other aquatic flora | | | | | | | | | | | |
| Benthic invertebrate fauna. | | | | | | | | | | | |
| Morphological Conditions | | | | | | | | | | | |
| Intertidal zone structure. | | | | | | | | | | | |
| Tidal Regime | | | | | | | | | | | |
| Dominant currents (relevant to coastal water bodies only). | | | | | | | | | | | |

| Step | Stage Three: Assessment | | | Stage Three: Assessment | Stage Three: Assessment – Step 5 | | | | | Stage Three: Assessment – Step 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Chemical and physico-chemical elements supporting biological elements*** | | | | | | | | | | | |
| Transparency | | | | | | | | | | | |
| ***Protected areas (relevant to dredging and disposal activities)*** | | | | | | | | | | | |
| Areas designated for the protection of habitats or species where maintenance or improvement of the status of water is an important factor in their protection, including Natura 2000 sites (for example Special Areas of Conservation or Special Protection Areas). | | | | | | | | | | | |

# Appendix C Marine Conservation Zone Screening

## C.1 Introduction

C.1.1 Section 126 of the MCAA 2009 created the MMO to be the marine licence decision making authority, and to have control over MCZs. The MCZ assessment process is outlined in guidelines issued by the MMO in 'Marine conservation zones and marine licensing' (MMO, 2013).

C.1.2 The MMO guidance (MMO, 2013) provides information on the two staged approach for undertaking a MCZ assessment. Initially a screening exercise is undertaken to identify MCZs which may potentially be impacted. If an application is screened in it is then considered under a two-staged assessment process, specifically a 'Stage 1 Assessment' followed by a 'Stage 2 Assessment'. Further detail on these stages is provided below.

C.1.3 Guidance for developers (Royal Haskoning, 2015) also states that:

*"Any plan or project that is likely to impact on a designated MCZ, or a MCZ currently being considered for designation.... must go through an assessment process to address the potential environmental impacts on the designated interest of the site."*

C.1.4 It was highlighted by Natural England during a meeting on 12 July 2016 that a MCZ Assessment will be required for Hornsea Three. Natural England also confirmed that they anticipate that this would be presented as a separate document within the Hornsea Three EIA.

C.1.5 This report therefore provides a summary of the approach to the MCZ assessment that is proposed for Hornsea Three and which will be presented, in full, in the PEIR. This report also presents the results of a preliminary initial screening of designated MCZs which it is proposed are carried forward for consideration in the Stage 1 assessment in the PEIR.

## C.2 Methodology

C.2.1 On the basis that the features for which MCZs are designated/recommended for designation are almost exclusively benthic habitats and species it is proposed that the most appropriate approach would be to have a standalone MCZ assessment as an appendix to the Benthic Subtidal and Intertidal Ecology chapter of the PEIR/final Environmental Statement.

C.2.2 The following sections outline the proposed approach to the Hornsea Three MCZ assessment.

### Screening

C.2.3 Initially, a screening of designated MCZs which are to be carried forward for consideration in a Stage 1 assessment will be carried out. The Screening stage will consider the proximity of Hornsea Three to proposed or designated MCZs, along with the likelihood that Hornsea Three could impact on the features within the site. According to the MMO (2013) guidance, Section 126 of the MCAA will apply if:

- The licensable activity is taking place within or near an area being put forward or already designated as an MCZ; and
- The activity is capable of affecting (other than insignificantly) either (i) the protected features of an MCZ; or (ii) any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant.

C.2.4 It is proposed that, in order to determine the 'nearness' of the activities associated with Hornsea Three, the same screening criteria is used for the MCZ assessment as is proposed for the HRA screening as follows:

- Based on the evidence base from Project One and Project Two suspended sediment dispersal of up to 2 mg/l is predicted to extend out to 16 km from the Hornsea Three array area. This distance will therefore be used for the screening of MCZs around the Hornsea Three array area (see Figure C.1); and
- The distance out to one (mean) spring tidal excursion from the Hornsea Three offshore ECR corridor search area will be used for screening for the screening of MCZs around the Hornsea Three offshore ECR corridor (see Figure C.1).

C.2.5 In determining 'insignificance', the MMO (2013) guidance states that this should take into account the likelihood of an activity causing an effect, the magnitude of the effect should it occur, and the potential risk any such effect may cause on either the protected features of an MCZ or any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant. It is proposed that this will be determined for Hornsea Three through the assessments made in the Benthic Subtidal and Intertidal Ecology Environmental Statement chapter.

### *Preliminary screening for Hornsea Three*

C.2.6 The MMO (2013) guidance states: "*MCZ sites and features identified as possible candidates for designation in future tranches will be NOT be subject to the MCZ assessment process*." This advice would therefore exclude rMCZs that are currently (October 2016), being considered for inclusion in Tranche 3 (i.e. with formal consultation scheduled for 2017 and possible designation in 2018). However, it is understood that East Anglia THREE offshore wind farm was requested to complete an MCZ assessment to cover an rMCZ. On this basis, Hornsea Three intends to screen both designated MCZ and rMCZs, which coincide with the Hornsea Three array area and offshore ECR corridor search area, into the Stage 1 Assessment on the basis that the construction, operation and maintenance and decommissioning of Hornsea Three have the potential to directly and indirectly affect benthic interest features of these sites:

- Cromer Shoal Chalk Beds MCZ - which is partially within the landward end of the Hornsea Three offshore ECR corridor search area (see Figure C.1);
- Markham's Triangle rMCZ - which is partially within the Hornsea Three array area (see Figure C.1); and
- Wash Approach rMCZ – which is within one (mean) spring tidal excursion from the Hornsea Three offshore ECR corridor search area.

#### *Cromer Shoal Chalk Beds MCZ*

C.2.7 The Cromer Shoal Chalk Beds MCZ is located at the landward end of the Hornsea Three offshore ECR corridor search area (Figure C.1) and was designated in January 2016. The site begins just west of Weybourne and ends at Happisborough, extending around 10 km out to sea and covering an area of 321 km$^2$. The following information is taken from the Defra overview document for the site (Defra, 2016).

C.2.8 The site protects seaweed-dominated infralittoral rock. These rocks in shallow water are an important habitat, providing a home for a variety of small creatures which shelter and feed amongst seaweeds (Defra, 2016).

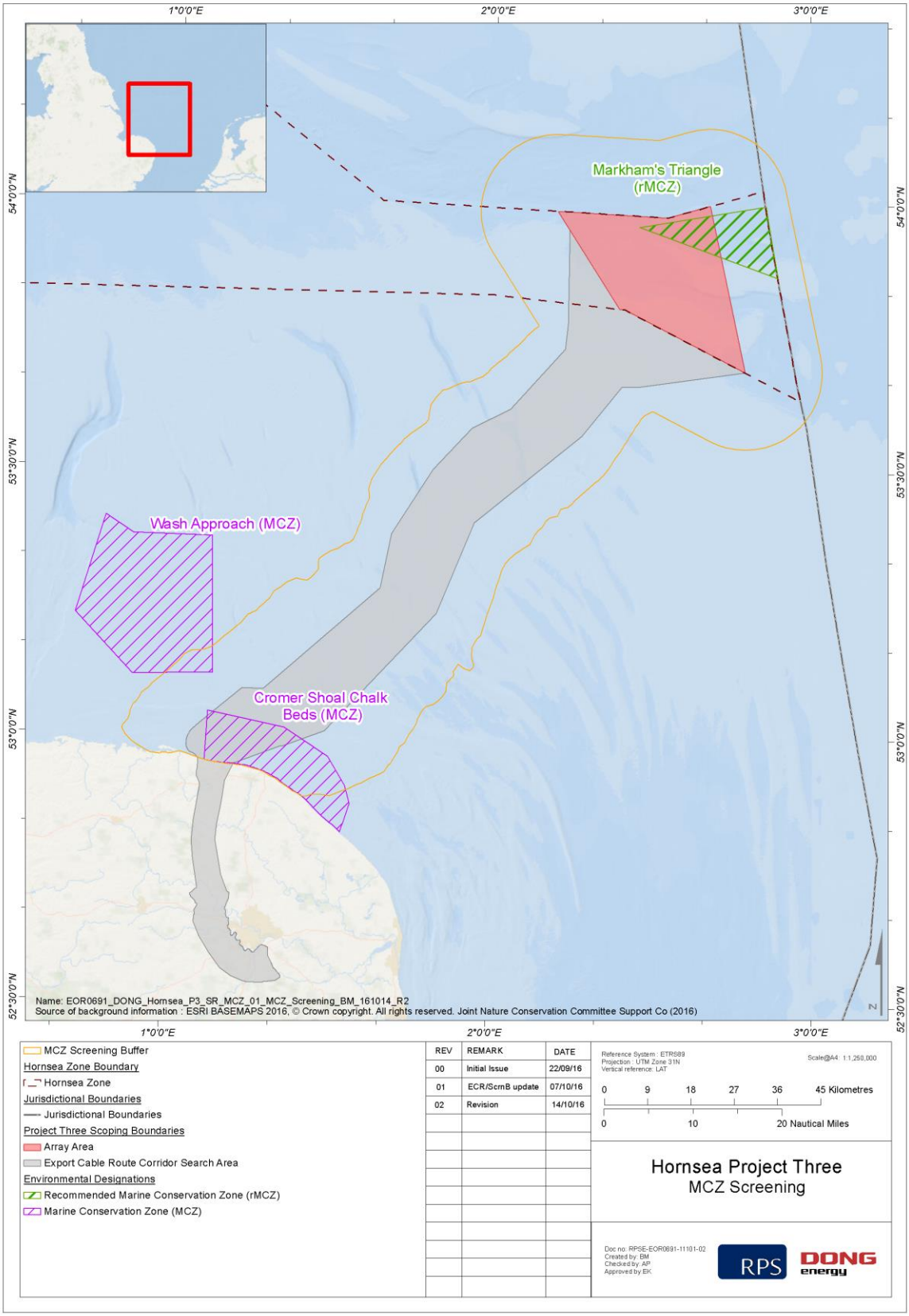


Figure C.1 Proposed Marine Conservation Zone (MCZ) screening boundaries for the Hornsea Three array area and offshore ECR corridor.

C.2.9 Within a wider area that is predominantly sandy, the chalk beds provide stable surfaces for seaweeds and static animals to settle on and grow. The beds are nursery areas for juvenile species as well as being important in the food chain for animals such as the fish, tompot blenny *Parablennius gattorugine* and the small-spotted catshark *Scyliorhinus canicula*. The chalk beds are home to lobsters and crabs which settle within the crevices and holes. The area supports the small-scale crab and lobster fishery vital to the character and economy of the area. Other common species include sea squirts, hermit crabs and pipefish, a relative of the seahorse.

C.2.10 The designated features of the Cromer Shoal Chalk Beds MCZ and their conservation objectives or general management approach (GMA)[13] are outlined in Table C.1.

Table C.1 Sites proposed to be screened into the Hornsea Three Marine Conservation Zone (MCZ) assessment, their designated features and conservation objectives/general management approach.

| Site name | Protected features/proposed protection features | Type of feature | General management approach |
|---|---|---|---|
| **Cromer Shoal Chalk Beds MCZ** | Moderate energy infralittoral rock | Broadscale marine habitat | Maintain in favourable condition |
| | High energy infralittoral rock | Broadscale marine habitat | Maintain in favourable condition |
| | Moderate energy circalittoral rock | Broadscale marine habitat | Maintain in favourable condition |
| | High energy circalittoral rock | Broadscale marine habitat | Maintain in favourable condition |
| | Subtidal chalk | Marine Habitat | Maintain in favourable condition |
| | Subtidal coarse sediment | Broadscale marine habitat | Maintain in favourable condition |
| | Subtidal mixed sediments | Broadscale marine habitat | Maintain in favourable condition |
| | Subtidal sand | Broadscale marine habitat | Maintain in favourable condition |
| | Peat and clay exposures | Marine Habitat | Maintain in favourable condition |
| | North Norfolk Coast (subtidal) | Feature of geological interest | Maintain in favourable condition |
| **Markham's Triangle rMCZ** | Subtidal coarse sediment | Broadscale marine habitat | Recover |
| | Subtidal sand | Broadscale marine habitat | Recover |
| **Wash Approach rMCZ** | Subtidal mixed sediments | Broadscale marine habitat | Maintain |
| | Subtidal sand | Broadscale marine habitat | Maintain |
| | Subtidal sands and gravels | Habitat feature of conservation importance | Maintain |

[13] Generally, each MCZ has one conservation objective. The objective applies to all of the features being protected. The objective is that each of the features being protected be in favourable condition. To achieve this objective, the general management approach (GMA) required for a feature in an MCZ will either be for it to be maintained in a favourable condition (if it is currently in this state), or for it to be recovered to a favourable condition (if it is currently in a damaged state) and then to be maintained in a favourable condition. Note previously GMA was referred to as the conservation objective. Change to GMA introduced in 2014.

*Markham's Triangle rMCZ*

C.2.11 Markham's Triangle rMCZ is located 137 km from the Humberside coastline, partially within the northeastern section of the Hornsea Three array Area (Figure C.1), with depth ranges between 30-50 m deep. The recommended site encompasses a total surface area of 200 km$^2$. The seabed is composed of two broad-scale habitats that are put forward for recommendation, subtidal coarse sediment and subtidal sand; other features present include very small areas of rock, mixed sediments and larger areas of subtidal sands and gravels. The features proposed for designation in the Markham's Triangle rMCZ and their conservation objectives are outlined in Table C.1.

*Wash Approach rMCZ*

C.2.12 The Wash Approach rMCZ is located 25 km off the Lincolnshire coast, at the entrance of the Wash, and approximately 10 km to the west of the Hornsea Three offshore ECR corridor search area (Figure C.1). This rMCZ therefore lies within the one (mean) spring tidal excursion screening buffer for the Hornsea Three offshore ECR corridor. The recommended site encompasses a total surface area of 725 km$^2$. The seabed is composed of two broad-scale habitats that are put forward for recommendation, subtidal mixed sediment and subtidal sand. A single habitat feature of conservation importance is also recommended for designation Subtidal sands and gravels. The features proposed for designation in the Wash Approach rMCZ and their conservation objectives are outlined in Table C.1.

## C.3 Stage 1 assessment

C.3.1 The Stage 1 Assessment which will be presented in the PEIR, will consider the extent of the potential impact of Hornsea Three, on the MCZ(s)/rMCZ(s) screened in to the assessment, in more detail.

C.3.2 At this stage the conservation objectives for the MCZ features will need to be considered. The conservation objectives for MCZ features are high level criteria describing the desired condition of the MCZ features. There are two objectives for features within an MCZ:

- Whether the features are in the desired favourable condition and need to be maintained in this condition; or
- Whether the features are not in the desired favourable condition and need to be recovered to that condition.

C.3.3 The Hornsea Three Stage 1 MCZ assessment will therefore consider whether Hornsea Three could potentially affect these objectives for each of the MCZs/rMCZs screened into the assessment. An assessment will be made of whether Hornsea Three could potentially impact the site so that the features are no longer in favourable condition, or prevent the features from recovering to a favourable condition.

C.3.4 The Stage 1 MCZ Assessment will also consider whether Hornsea Three will interfere with the MMO's ability to exercise its function to further the conservation objectives of MCZs.

C.3.5 It is anticipated that the MMO will use information supplied by the applicant with the licence application, advice from the SNCBs and any other relevant information to determine whether (as set out in MMO guidance):

- There is no significant risk of the activity hindering the achievement of the conservation objectives stated for the MCZ; and

- The MMO can exercise its functions to further the conservation objectives stated for the MCZ.

C.3.6 If neither of the criteria above can be met, the Stage 1 assessment then considers whether:

- There is no other means of proceeding with the act which would create a substantially lower risk of hindering the achievement of the conservation objectives stated for the MCZ. This should include proceeding with it (a) in another manner, or (b) at another location.

C.3.7 If mitigation to reduce the impacts to an acceptable level cannot be secured, and there are no other alternative locations, then a Stage 2 assessment will be required.

## C.4 Stage 2 assessment

C.4.1 The Stage 2 MCZ Assessment considers the socio-economic impact of the plan or project together with the risk of environmental damage. There are two parts to the Stage 2 assessment process:

- Does the public benefit in proceeding with the project clearly outweigh the risk of damage to the environment that will be created by proceeding with it? If so,
- Can the applicant satisfy that they can secure, or undertake arrangements to secure, measures of equivalent environmental benefit for the damage the project will have on the MCZ features?

C.4.2 Guidance from the MMO on what constitutes measures of equivalent environmental benefit states that measures can be based on those considered appropriate when securing compensatory habitat for projects deemed to have an adverse effect on internationally designated sites under the Habitats Directive.

## C.5 References

Department for Environment, Food and Rural Affairs (Defra) (2016). Cromer Shoal Chalk Beds Marine Conservation Zone: Factsheet. 17 January 2016.

Marine Management Organisation (2013). Marine conservation zones and marine licensing. April 2013. Available at: www.gov.uk/government/uploads/system/uploads/attachment_data/file/410273/Marine_conservation_zones_and_marine_licensing.pdf.

Royal Haskoning DHV (2015) Marine Conservation Zone Assessments. Capability Statement. June 2015.