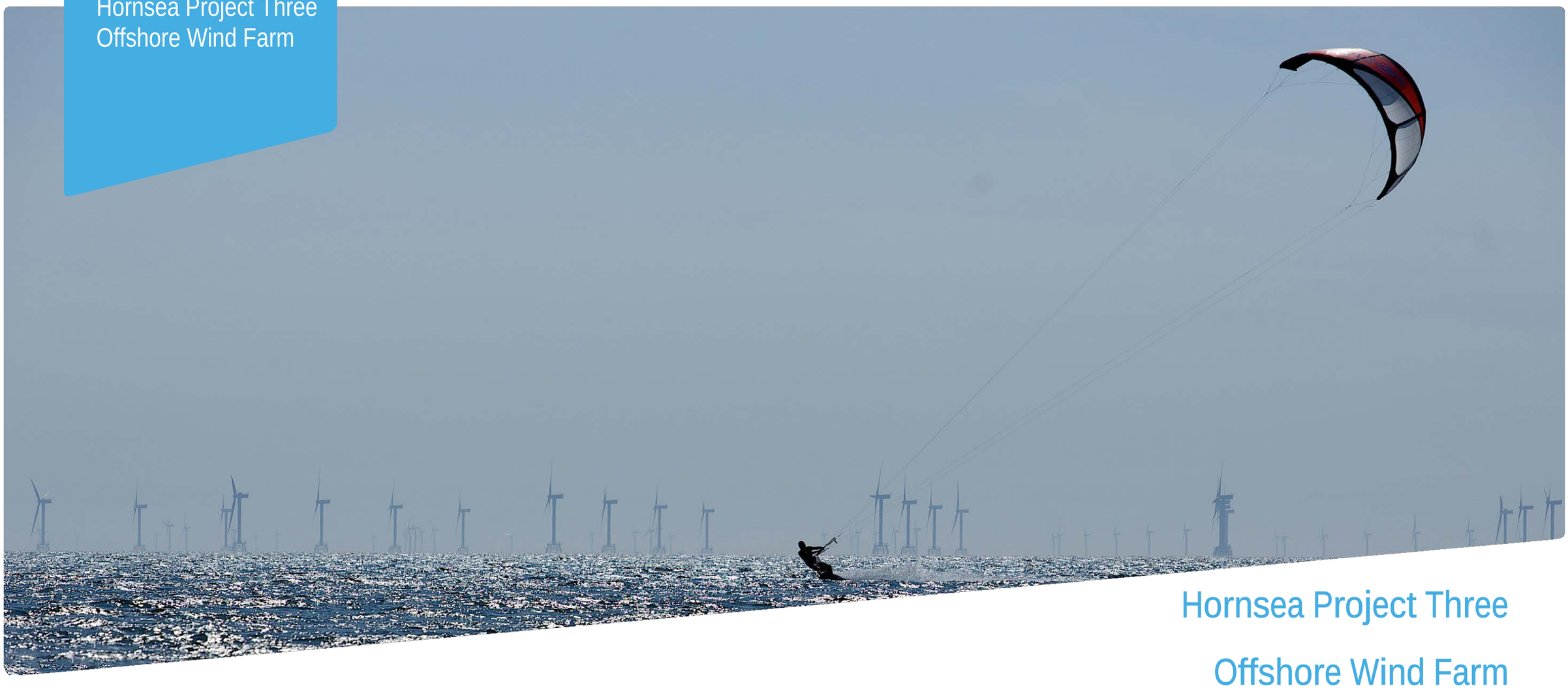
Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three

Offshore Wind Farm

Environmental Statement:
Volume 2, Chapter 11 – Infrastructure and Other Users

PINS Document Reference: A6.2.11
APFP Regulation 5(2)(a)

Date: May 2018

Hornsea 3
Offshore Wind Farm

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Environmental Impact Assessment

Environmental Statement

Volume 2

Chapter 11 – Infrastructure and Other Users

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

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Glossary

Term	Definition
Block	A North Sea acreage sub-division measuring approximately 10 x 20 kms, forming part of a quadrant (e.g. Block 9/13 is the 13th block in Quadrant 9) used by the OGA for delineating licence agreements to the oil and gas industry.
Marine Aggregate	Marine dredged sand and/or gravel.
Option or Prospecting Aggregate Extraction Areas	Aggregate areas that have been identified by prospective dredging companies, agreed with The Crown Estate during the tender process and have been awarded the right to apply for a marine licence.
Seismic Survey	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.

Acronyms

Acronym	Description
AfL	Agreement for Lease
BEIS	Department for Business, Energy & Industrial Strategy
BMAPA	British Marine Aggregates Producers Association
CA	Cruising Association
CCS	Carbon Capture and Storage
Centrica, UK	Centrica North Sea Ltd
Centrica Netherlands	Centrica Production Nederland B.V.
Centrica Resources UK	Centrica Resources Ltd.
CFAR	Constant False Alarm Rate
CPA	Closest Point of Approach
DECC	Department of Energy and Climate Change
DWR	Deep Water Route
Engie E&P	Engie E&P UKCS Ltd.
Engie E&P Netherlands	ENGIE E&P Nederland B.V.
ERRV	Emergency Response and Rescue Vessels

Acronym	Description
ESCA	European Subsea Cables UK Association
Faroe Petroleum	Faroe Petroleum (U.K.) Ltd.
FDP	Field Development Plan
GBF	Gravity Base Foundation
HSE	Health and Safety Executive
ICPC	International Cable Protection Committee
INEOS	INEOS UK SNS Ltd.
IMO	International Maritime Organization
MCA	Maritime and Coastguard Agency
MHWS	Mean High Water Springs
OGA	Oil and Gas Authority
P&A	Plugged and Abandoned
NRA	Navigational Risk Assessment
RCS	Radar Cross Section
REWS	Radar Early Warning System
RYA	Royal Yachting Association
SAS	Surfers Against Sewage
SCUBA	Self-Contained Underwater Breathing Apparatus
Shell	Shell UK Ltd.
Spirit Energy	Spirit Energy Ltd, a new company arising from a Centrica E&P and Bayerngas Norge AS joint venture; part of the Centrica Group.
Spirit Energy North Sea	Spirit Energy North Sea Ltd, formerly Centrica North Sea Ltd; part of the Centrica Group.
Spirit Energy Resources	Spirit Energy Resources Ltd formerly Spirit Norway Ltd, and prior to that Centrica Resources Ltd; part of the Centrica Group.
SSC	Suspended Sediment Concentration
TCE	The Crown Estate
TCPA	Time to Closest Point of Approach
Third Energy	Third Energy Offshore Ltd.
Total, UK	Total E&P UK Ltd.
Total, Netherlands	Total E&P Nederland B.V.
UCG	Underground Coal Gasification
UKCS	UK Continental Shelf
UKHO	United Kingdom Hydrographic Office
UXO	Unexploded Ordnance

Units

Unit	Description
km	kilometre
GW	Gigawatt
m	metre
MW	Megawatt
nm	Nautical Mile

11. Infrastructure and Other Users

11.1 Introduction

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

11.1.1.2 This Environmental Statement chapter considers the impact of Hornsea Three on existing infrastructure and other users within the vicinity of Hornsea Three. The receptors which are considered in this chapter include:

- Recreational sailing and motor cruising;
- Kite surfing, surfing and windsurfing;
- Sea/surf kayaking and canoeing;
- SCUBA diving;
- Recreational fishing;
- Offshore telecommunications cables;
- Carbon capture and storage and natural gas storage;
- Disposal sites;
- Aggregate extraction; and
- Oil and gas operations (including pipelines).

11.1.1.3 This chapter includes information summarised from the technical report included at volume 5, annex 11.1: Radar Early Warning Systems Technical Annex.

11.1.1.4 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 volume 2, chapter 7: Shipping and Navigation. Therefore the following assessment only considers impacts that will potentially affect the undertaking of a marine activity or the operational effectiveness of marine infrastructure in the relevant infrastructure and other users study area.

11.1.1.5 Indirect effects on nearshore recreational receptors through visual amenity are considered in volume 3, chapter 4: Landscape and Visual Resources and volume 3, chapter 10: Socio-economics.

11.1.1.6 Impacts upon oil and gas activities may also arise from modifications to helicopter routes or helicopter access to platforms, and interference with microwave communication links. These impacts are assessed in volume 2, chapter 8: Aviation, Military and Communication.

11.1.1.7 The effects of airborne noise due to activities landward of MLWS for receptors at the coastline is considered in volume 3, chapter 8: Noise and Vibration.

11.2 Purpose of this chapter

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

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

11.2.1.3 In particular, this Environmental Statement chapter:

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

11.3 Study area

11.3.1.1 The infrastructure and other users study area for Hornsea Three includes all infrastructure and other users receptors within an area which has the potential to be affected by Hornsea Three. This includes the Hornsea Three array area and the offshore cable corridor, which comprises the offshore development footprint, and extends out to the areas described in paragraph 11.3.1.2 dependent on the infrastructure and other users receptor.

11.3.1.2 The infrastructure and other users study area varies in scale depending on the particular receptor and has been divided into different areas according to each receptor, as listed below and shown on Figure 11.1:

- Infrastructure and other users study area: Inner (purple) area (within 1 km of the Hornsea Three array area and offshore cable corridor): This area includes the extent of potential direct physical overlap between the Hornsea Three project activities and the following receptors:
    - Recreational receptors (including receptors carrying out fishing, sailing and motor cruising; kite surfing; surfing; windsurfing; sea/surf kayaking and canoeing; and SCUBA diving activities);
    - Cable and pipeline operators;
    - Carbon Capture and Storage (CCS), natural gas storage and underground coal gasification; and
    - Oil and gas operators (licence blocks coincident with or within 1 km of Hornsea Three comprising Hornsea Three array area and Hornsea Three offshore cable corridor).
- Infrastructure and other users study area: marine processes (yellow) area (within 16 km of the Hornsea Three array area and 21.5 km of the Hornsea Three offshore cable corridor): This area is based on modelled data and one tidal ellipse respectively (see volume 1, chapter 1: Marine Processes), for the following receptors:
    - Aggregate extraction and disposal sites.
- Infrastructure and other users study area: REWS (green) area (within 35 km of Hornsea Three array area): This area is based on the maximum range of the Radar Early Warning Systems (REWS) located on oil and gas platforms, for the following receptors:
    - REWS and Closest Point of Approach (CPA) alarms.

11.3.1.3 The cumulative effects assessment considers other projects/plans within the broad infrastructure and other users study area (black area) shown in Figure 11.1, with the exception of other offshore wind farm projects, where the cumulative infrastructure and other users study area extends across the southern North Sea (see Figure 11.14).

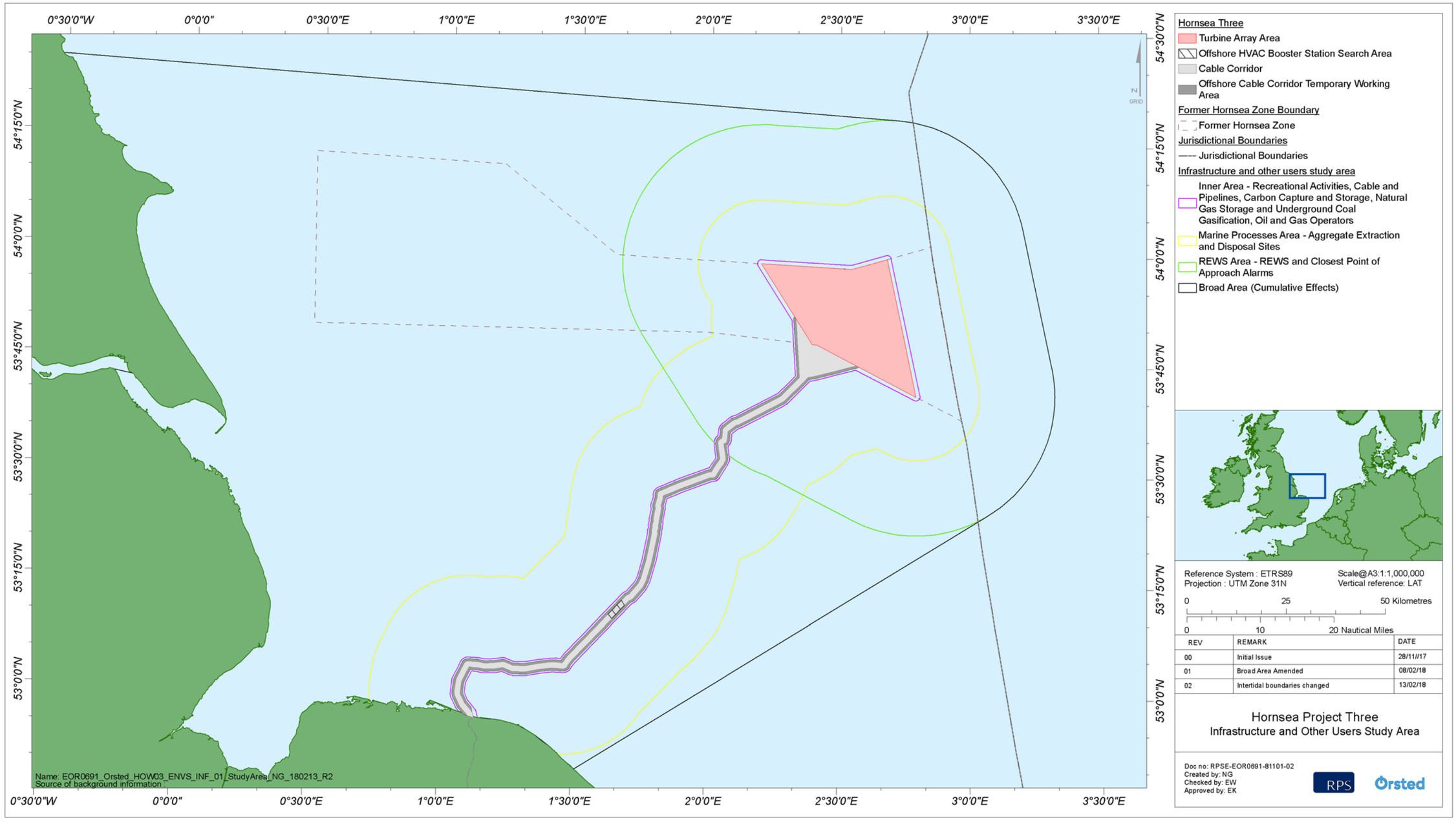

Figure 11.1: Hornsea Three infrastructure and other users study area.

11.4 Planning policy context

11.4.1 National Policy Statements

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

11.4.1.2 NPS EN-3 includes guidance on what matters are to be considered in the assessment. These are summarised in Table 11.1 below.

11.4.1.3 NPS EN-3 also highlights a number of factors relating to the determination of an application and in relation to mitigation. These are summarised in Table 11.1 below.

Table 11.1: Summary of NPS EN-3 provisions relevant to this chapter.

Summary of NPS EN-3 provision	How and where considered in the Environmental Statement
Oil, gas and other offshore Infrastructure and activities	
Paragraph 2.6.179 notes that applicants should undertake an assessment of the potential effect of the proposed development on existing or permitted offshore infrastructure or activities.	The Hornsea Three assessment has considered each of these potential effects and provided an assessment of their likely significance, considering each phase of the development process (i.e. construction, operation and maintenance and decommissioning).
Paragraphs 2.6.180 – 2.6.181 note that applicants should establish stakeholder engagement with interested parties in the offshore sector early in the development phase of the proposed offshore wind farm, with an aim to resolve as many issues as possible prior to the submission of an application. Such stakeholder engagement should continue throughout the life of the development.	Consultation with potentially affected stakeholders has been carried out from the early stages of the project and throughout the pre-application consultation process. Details of this are presented in Table 11.4.
Paragraph 2.6.184 notes that applicants should ensure site selection and site design of the proposed offshore wind farm has been made with a view to avoiding or minimising disruption or economic loss or any adverse effect on safety to other offshore industries.	Hornsea Three has been sited to minimise disruption with other users, where possible. In cases where potential disruption has been identified, Hornsea Three has, where appropriate and feasible, provided mitigation measures to reduce or negate impacts. This is discussed further within section 11.11. See also volume 1, chapter 4: Site Selection and Consideration of Alternatives. See also the consultation undertaken to date and how Hornsea Three has considered it (Table 11.4).

Table 11.2: Summary of NPS EN-3 policy on decision making relevant to this chapter.

Summary of NPS EN-3 policy on decision making (and mitigation)	How and where considered in the Environmental Statement
Oil, gas and other offshore Infrastructure and activities	
Paragraph 2.6.183 notes that where a wind farm potentially affects other offshore infrastructure or activity, a pragmatic approach should be employed by the Secretary of State. The Secretary of State should expect the applicant to minimise negative impacts and reduce risks to as low as reasonably practicable.	The Hornsea Three impact assessment describes the steps that Hornsea Three has taken to avoid or reduce the impact of the development (section 11.11).
Paragraph 2.6.184 notes that the Secretary of State should be satisfied that the site selection and site design of the wind farm has been made with a view to avoiding or minimising disruption or economic loss or any adverse effects on safety to other offshore industries. The Secretary of State should not consent applications which pose unacceptable risks to safety after mitigation measures have been considered.	Hornsea Three has been sited to minimise conflicts with other users, where possible. In cases where conflict has been identified, Hornsea Three has, where appropriate and feasible, proposed mitigation measures to reduce or negate impacts (section 11.11). Mitigation measures for infrastructure and other users receptors are presented in Table 11.27 of this chapter. See also volume 1, chapter 4: Site Selection and Consideration of Alternatives.
Paragraph 2.6.186 notes that where schemes have been carefully designed and the necessary consultation has been undertaken at an early stage, mitigation measures may be found that can negate or reduce effects on other offshore infrastructure or operations to a level sufficient to enable the Secretary of State to grant consent.	
Paragraph 2.6.187 notes in relation to mitigation: that detailed discussions between the applicant and the relevant consultees should have progressed as far as reasonably possible prior to the submission of an application. As such, appropriate mitigation should be included in any application and ideally agreed between relevant parties.	
Paragraph 2.6.188 notes that in some circumstances, the Secretary of State may wish to consider the potential to use requirements involving arbitration as a means of resolving how adverse impacts on other commercial activities will be addressed.	

11.4.2 Other relevant policies

11.4.2.1 The infrastructure assessment has also given consideration to the specific policies set out in the East Inshore and East Offshore Marine Plans (MMO, 2014). Key provisions are set out in Table 11.3 along with details as to how these have been addressed within the assessment.

Table 11.3: East (Inshore and Offshore) Marine Plans polices of relevance to this chapter.

Policy	Key Provisions	How and where considered in the Environmental Statement
Oil and Gas Policy OG1	Proposals within areas with existing oil and gas production should not be authorised except where compatibility with oil and gas production and infrastructure can be satisfactorily demonstrated.	Assessment of effect on oil and gas production is considered in section 11.11. Consultation with oil and gas operators is included in Table 11.4.
Carbon Capture and Storage Policy CCS1	Within defined areas of potential carbon dioxide storage proposals should demonstrate in order of preference: a) that they will not prevent carbon dioxide storage; b) how, if there are adverse impacts on carbon dioxide storage, they will minimise them; c) how, if the adverse impacts cannot be minimised, they will be mitigated; and d) the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts.	CCS is discussed in section 11.7.6.
Dredging and Disposal Policy DD1	Proposals within or adjacent to licensed dredging and disposal areas should demonstrate, in order of preference; a) that they will not adversely impact dredging and disposal activities; b) how, if there are adverse impacts on dredging and disposal, they will minimise these; c) how, if the adverse impacts cannot be minimised they will be mitigated; and d) the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts.	Dredging and disposal sites are discussed in section 11.7.7.
Aggregate Policy AGG3	Within defined areas of high potential aggregate resource, proposals should demonstrate in order of preference: a) that they will not, prevent aggregate extraction; b) how, if there are adverse impacts on aggregate extraction, they will minimise these; c) how, if the adverse impacts cannot be minimised, they will be mitigated; and d) the case for proceeding with the application if it is not possible to minimise or mitigate the adverse impacts.	Aggregate resource areas are outlined in section 11.7.8. The potential effect on aggregate resource is assessed in 11.11.1.23.

11.5 Consultation

11.5.1.1 A summary of the key issues raised during consultation specific to infrastructure and other users is outlined below, together with how these issues have been considered in the production of this Environmental Statement.

11.5.2 Hornsea Project One and Hornsea Project Two consultation

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

11.5.3 Hornsea Three consultation

11.5.3.1 Table 11.4 below summarises the issues raised relevant to infrastructure and other users, which have been identified during consultation activities undertaken to date. Table 11.4 also indicates either how these issues have been addressed within this Environmental Statement or how Hornsea Three has had regard to them. Further information on the consultation activities undertaken for Hornsea Three can be found in the Consultation Report (document reference number A5.1) that accompanies the application for Development Consent.

Table 11.4: Summary of key consultation issues raised during consultation activities undertaken for Hornsea Three relevant to infrastructure and other users.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
19 September 2016	ConocoPhillips pre-application consultation	Advised that the Viking field and Viking Transmission System (which is currently out of service and not gas-filled) are currently being decommissioned. The future of the area depends on late life plans still under discussion. Noted that the Hornsea Three offshore cable corridor scoping area presented a number of issues with regard to pipelines and infrastructure. There may be a temporal overlap between Hornsea Three construction activities and ConocoPhillips decommissioning activities. Discussed requirement for crossing/proximity agreements with pipelines (active or decommissioned and left in situ). Advised that LOGGS is still fully operational, and the infrastructure may well be in place in 2023. Discussed potential effect of Hornsea Three on the REWS protecting the Saturn and Murdoch platforms. Noted that vessel rerouting and alignment with ConocoPhillips platforms was a potential issue.	The Viking platforms were located within 1 km of the offshore cable corridor presented within the Hornsea Three Scoping Report (DONG Energy Power (UK) Ltd, 2016). The Viking platforms are no longer within 1 km of the Hornsea Three offshore cable corridor presented in this Environmental Statement, with the nearest located at 10.4 km from the cable route corridor. Note: Hornsea Three offshore construction is now scheduled to commence in 2022 (see volume 1, chapter 3: Project Description). Further consultation was carried out with oil and gas operators throughout the pre-application period (see rows below). The impact of Hornsea Three offshore cable corridor construction activities on ConocoPhillips assets and infrastructure is assessed in section 11.11. Pipeline crossing and proximity agreements are discussed in paragraph 11.7.15.2. The impact on ConocoPhillips operated REWS is assessed in paragraph 11.11.2.67. The impact on CPA of ConocoPhillips operated platforms is assessed in paragraph 11.11.2.79.
19 September 2016	Centrica Resources UK (now Spirit Energy Resources) pre-application consultation	Centrica advised that production had stopped in the Audrey field and that the two platforms Audrey B (XW) Audrey XW 2 and Audrey 1 WD Audrey A (WD) would be decommissioned, which may be complete by the commencement of Hornsea Three construction. Pipeline proximity and crossing agreements were discussed, which may also be required for decommissioned pipelines left in situ. Advised that the ST-1 platform is shut-in and close to being decommissioned (decommissioning plans have been submitted to BEIS). Advised that the Markham complex is managed from Centrica's Hoofddorp office in the Netherlands. Regarding REWS and CPA, Centrica are conducting studies with Ultra in the east Irish Sea and advised that mitigation included a REWS software update. Centrica confirmed that the REWS feed associated with the Greater Markham Area is managed by the asset as normally there is no ERRV. Discussed the proximity of the Hornsea Three array area and the Chiswick platform (2.69 km), and associated impracticalities regarding helicopter access/egress to/from the Chiswick platform and any future exploration vessels. Discussed the requirement to enter into a confidentiality agreement with regard to Centrica future activities.	The two Audrey platforms were located within the offshore cable corridor presented within the Hornsea Three Scoping Report (DONG Energy Power (UK) Ltd, 2016). The Hornsea Three offshore cable corridor presented in this Environmental Statement no longer intercepts the two platforms. The safety zone around the Audrey 1 WD Audrey A (WD) platform intercepts the 1 km study area around the Hornsea Three offshore cable corridor and is discussed in paragraph 11.7.11.5. Pipeline proximity and crossing agreements are discussed in paragraph 11.7.15.2. The impact on the Centrica operated REWS is discussed in paragraph 11.11.2.67. The impact on CPA to Centrica operated platforms is assessed in paragraph 11.11.2.79. Helicopter access to Centrica's Chiswick platform is discussed in volume 2, chapter 8: Aviation, Military and Communication.
22 September 2016	Wintershall	Potential for interaction between Hornsea Three piling activities and Wintershall seismic survey activity within their licenced acreage to the north of Hornsea Three. Hornsea Three advised that subsea sound would be modelled for construction activities. Advised that well 49/08c-4 is currently suspended and is subject to final abandonment.	Subsea noise resulting from Hornsea Three piling is discussed within volume 4, annex 3.1: Subsea Noise Technical Report. An assessment in relation to seismic survey activities is provided within section 11.11.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
28 September 2016	OGA	The OGA advised that the Hornsea Three offshore cable corridor was unlikely to be a major issue however the Hornsea Three array area was of interest. There is no new or pending legislation regarding licencing or pipelines that Hornsea Three should be aware of, and the OGA are not progressing any primary legislation but environmental legislation was more active. The 29th and 30th licence rounds and out of round bids were discussed. The 29th round only offered those blocks covered by the recent government seismic survey area, and a further mini round was being considered although this did not include blocks within the Hornsea Three array area. The content of the 30th licence round had not yet been decided, but it would include the licences coincident with the Hornsea Three array area. The timing of this round was not confirmed but it could be Q1 2017. The OGA shared their corporate plan for 2016 to 2021 which advises a further seismic programme to be delivered that is not coincident with Hornsea Three. Future plans for end of life oil and gas collaboration (e.g. gas compression) were discussed. The OGA advised they were considering a compression concept but no area had been decided as yet. The OGA advised that there would be a lot of decommissioning activity in the offshore cable corridor, with the Viking field already undergoing decommissioning and ConocoPhillips potentially closing all fields feeding the Theddlethorpe terminal (i.e. LOGGS, Viking and CMS). Fields that feed into these platforms (e.g. Centrica's Audrey field) would then need to cease producing as well.	Offshore oil and gas licence rounds are discussed in paragraph 11.7.9.1. Decommissioning plans are discussed in section 11.7.11. Note: oil and gas platforms were located within the offshore cable corridor presented within the Hornsea Three Scoping Report (DONG Energy Power (UK) Ltd, 2016). There are no platforms located within the Hornsea Three offshore cable corridor presented in this Environmental Statement (see section 11.7.11). Seismic survey activity is discussed in section 11.11.
4 October 2016	INEOS	INEOS advised that the Windermere platform is not producing and will be decommissioned (with wells) prior to 2023. The Topaz subsea well (which does not have a safety zone) is also not producing and will be decommissioned by 2023, with the pipeline likely to remain in situ. Post-decommissioning requirements include one or two surveys but no ongoing monitoring obligations. The Clipper South platform currently ties back to Loggs. A new pipeline is proposed that will either go north to the Clipper platform or west to a Perenco asset. Recently published production profile indicated a P10 profile that extends to 2024. INEOS advised they have no current exploration plans in the southern North Sea.	Note: Hornsea Three offshore construction is now scheduled to commence in 2022 (see volume 1, chapter 3, Project Description). Further consultation was carried out with oil and gas operators through the pre-application period (see rows below). Helicopter access to the Windermere platform and Topaz subsea well is assessed in volume 2, chapter 8: Aviation, Military and Communication. Pipeline crossing and proximity agreements are discussed in paragraph 11.7.15.2. The impact of the Hornsea Three offshore cable corridor on INEOS assets and infrastructure is discussed in section 11.11.
24 October 2016	Shell pre-application consultation	Discussed helicopter access requirements to the Cutter and Carrack platforms, and pipeline crossing and proximity agreements. Shell raised a concern regarding access to the Galleon platform. If a jack-up vessel was needed, this would be jacked up within the 500 m safety zone of the platform. Shell identified that Carrack West is a subsea installation (well head) to the south of Carrack, which has been decommissioned. Shell confirmed that in the short term, no decommissioning activities are planned and there are no plans for any new platforms. Shell had no immediate concerns from an exploration perspective however a confidentiality agreement would be required to discuss future activity.	Helicopter access to the Cutter and Carrack platforms is assessed in volume 2, chapter 8: Aviation, Military and Communication. The impact of the Hornsea Three offshore cable corridor on Shell assets and infrastructure is assessed in section 11.11. Note: the Galleon platform was located within the offshore cable corridor presented within the Hornsea Three Scoping Report (DONG Energy Power (UK) Ltd, 2016). This platform is not located within the Hornsea Three offshore cable corridor presented in this Environmental Statement. Pipeline crossing and proximity agreements are discussed in paragraph 11.7.15.2
10 November 2016	Faroe Petroleum	Discussed future plans for the Schooner A and Ketch platforms, and the likely scenario of the platforms being decommissioned by 2021/2022. Noted that the 9 nm consultation zones surrounding the Schooner and Ketch platforms intercept with the Hornsea Three array area. Faroe advised that little activity occurred in the licenced areas and that any activity would occur within the 500 m safety zones of the Schooner and Ketch platforms. Advised that the suspended exploration well in the licence area would be Plugged and Abandoned (P&A). No seismic survey activity was planned for the licenced acreage. The Schooner and Ketch platforms are NUI's and do not have REWS. When the platforms are manned, a multi-use vessel patrols the platform and safety zone, acting as an ERRV. Noted that timing of decommissioning indicates that CPA is not anticipated to be an issue.	The impact on helicopter access to the Schooner A and Ketch platforms is assessed in volume 2, chapter 8: Aviation, Military and Communication. Potential impacts on activities in the licenced acreage operated by Faroe is assessed in section 11.11 and in regard to helicopter access in volume 2, chapter 8: Aviation, Military and Communication.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
21 November 2016	ConocoPhillips pre-application consultation	ConocoPhillips provided information about their REWS, which is split into two systems, quad 44 and quad 49. Each comprises of a number of radars and AIS which feed information into a field wide collision risk management system which protects the whole field. Interference on one radar would therefore have an effect on the whole field.	The impact on REWS for ConocoPhillips operated platforms is assessed in paragraph 11.11.2.67.
24 November 2016	Petrofac pre-application consultation	Petrofac advised that the Schooner A and Ketch platforms do not have REWS and are not protected by REWS.	Noted.
25 November 2016	PINS Scoping Opinion	Hornsea Three proposed to scope out all airborne noise impacts from activities taking place seaward of MHWS. The Secretary of State agrees that airborne noise seaward of MHWS can be scoped out of the assessment however advises that the Environmental Statement should consider the potential for significant effects from airborne noise due to activities seaward of MHWS for receptors at the coastline.	The impact from airborne noise due to cable installation activities seaward of MHWS for receptors at the coastline (in the vicinity of the landfall) has been assessed in volume 3, chapter 8: Noise and Vibration. Further justification for scoping out airborne noise impacts is provided in Table 11.23.
25 November 2016	PINS Scoping Opinion	Hornsea Three proposed to scope out the displacement of recreational vessels, kite surfing, kayaking, surfing and diving from the Hornsea Three array area. With the exception of recreational vessels, the Secretary of State agrees that these effects can be scoped out. However, the Secretary of State does not agree that the displacement of recreational vessels, kite surfing, kayaking, surfing and diving effects can be scoped out for activities associated with the export cable.	The impact on recreational vessels within the Hornsea Three array area has been assessed in paragraph 11.11.1.3 and paragraph 11.11.2.3. The impact on recreational vessels, kite surfing, kayaking, surfing and diving in the Hornsea Three offshore cable corridor has been assessed in paragraph 11.11.1.3 and paragraph 11.11.2.3. Further justification for scoping out impacts is provided in Table 11.21.
25 November 2016	PINS Scoping Opinion	The Environmental Statement should clearly explain the methodology used to assess effects on recreational craft, pipelines and oil and gas operators and the criteria used to evaluate the significance of those effects.	The EIA methodology for infrastructure and other users is detailed in section 11.9. The criteria used to evaluate the significance of effect are presented in Table 11.26.
25 November 2016	Coal Authority Scoping Response	The Coal Authority has no issues that it would wish to see considered as part of the Environmental Statement for this proposal.	Noted.
25 November 2016	MMO Scoping Response	The MMO agrees with the approach and data sources outlined by Hornsea Three regarding other sea users. Iterative discussions with consultees regarding the requirement and feasibility of any mitigation measures are expected to provide a robust assessment of the proposed development.	Navigation, and associated consultation, is presented in volume 2, chapter 7: Shipping and Navigation. Assessment of effects on other sea users (including recreational vessels and recreational fishing vessels) is presented in section 11.11.
5 December 2016	Centrica Resources UK (now Spirit Energy Resources) pre-application consultation	Centrica discussed the recently acquired licence P2286 covering blocks 49/3, 49/9d and 49/4d in the 28th licence round. Explained they were a drill or drop licence with a well required to be drilled prior to September 2019, prior to the commencement of Hornsea Three construction. Both parties noted that it is currently very difficult to gauge the potential impacts to each party due to the uncertainty surrounding locations of exploration wells and wind farm layouts at the present time. Discussed the requirement for further consultation when the Hornsea Three project would be more advanced and further information would be available to be provided from Centrica.	The potential impact on Centrica operated licences is presented in section 11.11.
7 December 2016	Independent Oil and Gas pre-application consultation	Independent Oil and Gas operates 48/24b which overlaps with the Hornsea Three offshore cable corridor, and has recently acquired the Vulcan satellite fields in the northeast of 48/25 and mid and south 49/21. Current development plans are based around the utilisation of existing infrastructure, including tie-ins to existing export pipelines, with the infrastructure scheduled to be in place prior to 2023. Independent Oil and Gas advised that there will be new wells across all their licenced acreage and at least two gas hubs and subsea tiebacks. The first well will be in licence P1736 (block 48/23a) by mid-2018 with first gas by end 2018.	Note: Hornsea Three offshore construction is now scheduled to commence in 2022 (see volume 1, chapter 3, Project Description). Further consultation was carried out with oil and gas operators through the pre-application period (see rows below). The impact on Independent Oil and Gas licenced acreage is assessed in section 11.11. Pipeline crossing and proximity agreements are discussed in paragraph 11.7.15.2.
8 December 2016	Third Energy pre-application consultation	Third Energy has two prospects within licence block 44/27 (P2284), with all wells to be drilled prior to the start of offshore construction. As there would be no requirement for platforms, no significant issues are anticipated in relation to Hornsea Three at this stage. Discussed the potential extension of life to the Schooner A platform. The Oil and Gas Authority (OGA) is working with oil and gas operators to look at ways of maximising production but it may involve considerable infrastructure change and rerouting of gas.	The impact on helicopter access to Third Energy licenced acreage is assessed in volume 2, chapter 8: Aviation, Military and Communication.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
25 November 2016	Alpha Petroleum	Alpha Petroleum assets within the vicinity of Hornsea Three are the Wenlock platform and the licenced acreage immediately around this platform (49/12b). It is highly likely that the Wenlock platform will be decommissioned before the start of Hornsea Three offshore construction (which at the time of consultation was scheduled for 2023). Wells and platform piles would be cut 3 m below sea bed, while the pipeline tieing back to Indefatigable platform is likely to be abandoned in situ. Due to the timing of the decommissioning of the Wenlock platform it was considered by all parties that there were no potential significant interactions between the two projects.	Licence 49/12b intercepted with the offshore cable corridor presented within the Hornsea Three Scoping Report (DONG Energy Power (UK) Ltd, 2016). The Hornsea Three offshore cable corridor presented in this Environmental Statement no longer intercepts this licence block. Following this consultation and the subsequent refinement of the Hornsea Three offshore cable corridor, there has therefore been no further assessment of Alpha Petroleum assets or infrastructure.
12 December 2016	Centrica Resources UK (now Spirit Energy Resources) pre-application consultation	Centrica confirmed they have a REWS on the J6A platform, which covers the surrounding platforms in the Greater Markham Complex (i.e. Chiswick, Markham ST-1, Windermere and Grove platforms (all NUI)).	The impact on REWS on the J6A platform is assessed in paragraph 11.11.2.67.
20 December 2016	Shell pre-application consultation	Shell advised they do not have REWS on the Cutter and Carrack platforms and that these platforms are protected by radar protection from standby vessels/emergency relief vessels located at the Clipper facilities.	The impact of Hornsea Three on marine radar is considered in volume 2, chapter 7: Shipping and Navigation.
26 January 2017	Faroe Petroleum – email	Faroe advised that Hornsea Three activities do not impinge on their gas fields, as Faroe operations will be completed and decommissioned prior to the start of Hornsea Three construction in 2023.	Note: Hornsea Three offshore construction is now scheduled to commence in 2022 (see volume 1, chapter 3, Project Description). Further consultation was carried out with oil and gas operators through the pre-application period (see rows below). Potential impacts on activities in the licenced acreage operated by Faroe is assessed in section 11.11 and in regard to helicopter access in volume 2, chapter 8: Aviation, Military and Communication.
1 February 2017	Royal Yachting Association (RYA)	The RYA is not too concerned with respect to the Hornsea Three array area on the basis that there is very little recreational activity that far offshore and anyone who is transiting that far offshore would be very experienced and well equipped. The RYA's main concern relates to the cable landfall where the cable comes within the 10 m contour and any resulting reduction in water depth, and also noted that there could be issues where the cable crosses inland waterways. The RYA would not be too concerned with respect to the proposed layouts, and considered the proposed navigation corridor between the Hornsea Three array area, Hornsea Project One and Hornsea Project Two to be more than adequate with respect to use by recreational craft. The RYA does not see the need for operational safety zones for floating offshore wind turbines but respects the use of safety zones during construction as well as for manned structures during operation.	The impact on recreational vessels is assessed in paragraph 11.11.1.3 and paragraph 11.11.2.3. Safety zones are discussed in section 11.10. The impact on onshore recreational activities is assessed in volume 3, chapter 6: Land Use, Agriculture and Recreation. The option for floating foundations has been removed from the Design Envelope.
8 February 2017	Independent Oil and Gas pre-application consultation	Independent Oil and Gas provided an email update of their development plans. The draft Field Development Plan (FDP) was issued to the OGA in December 2016. They will complete subsurface evaluations in April which will provide well location considerations.	The impact on Independent Oil and Gas licenced acreage is assessed in section 11.11.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
23 February 2017	Navigational Risk Assessment (NRA) Hazard Workshop	Concerns were raised in regard to the distance between the Hornsea Three offshore cable corridor and the dredging site currently in production and the impacts of exclusion zones around export cable maintenance vessels on dredging activities. Centrica noted that future oil and gas developments in the area could be impacted by Hornsea Three, with helicopter operations and diving activities (in relation to foundation piling for Hornsea Three) cited as examples of operations that could be impacted. In relation to REWS and Closest Point of Approach, Vroon raised concerns that Emergency Response and Rescue Vessels (ERRVs) may have difficulty monitoring vessel traffic following the construction of Hornsea Three, particularly at the Schooner and Ketch fields. The CA advised that the angle of the proposed navigation corridor between the Hornsea Three array area and Hornsea Project One and Hornsea Project Two is not of great significance to recreational vessels since they would be unlikely to use it for transit, and the presence of a Deep Water Route (DWR) would also not be an issue. The CA advised that the region containing the Hornsea Three array area is the worst in the UK in terms of visibility, however the fog signals typical of offshore wind farm developments would be sufficient and yachts would consider using the array area for transit as large vessels would not consider following. The CA raised concerns that the offshore HVAC booster stations could obstruct vessels transiting along the coast (e.g. to Whitby). The CA commented that in order to qualify for a Royal Yachting Association (RYA) Yachtmaster Ocean certificate a continuous 600 mile passage must be undertaken, and a popular route for undertaking this passage may involve navigating through the Hornsea Three array area and/or offshore HVAC booster stations.	The impact on dredging activity is considered within Table 11.22. The impact on aggregate resource is assessed in paragraph 11.11.1.23. The impact of Hornsea Three on vessel rerouting is assessed in volume 2, chapter 7: Shipping and Navigation. The impact on helicopter operations is assessed in volume 2, chapter 8: Aviation, Military and Communication. The Schooner A and Ketch platforms are not protected by REWS as detailed within section 11.7.15.2. The effect of Hornsea Three on recreational vessels is assessed in paragraph 11.11.1.3 and paragraph 11.11.2.3.
16 March 2017	Engie UK	Engie UK have no concerns with regard to the project at this stage.	Noted.
3 April 2017	Total Netherlands – pre-application consultation meeting	Total Netherlands advised that they had no immediate concerns with regard to the Netherlands licence blocks. Total Netherlands take the lead for the Total UK licence and will respond shortly in this regard.	Noted.
3 April 2017	Total UK – email	Total Netherlands advised that the Total UK licence block 49/10b is part of the Markham complex and is now operated by Centrica.	The baseline environment for oil and gas operations is presented within section 11.7.9.
6 April 2017	Ithaca	The cessation of production at the Anglia A platform has recently been agreed, and the platform is in hydrocarbon safe mode pending the development and approval of decommissioning plans. The Anglia A to LOGGS PP pipelines may be decommissioned in situ or removed. The Ithaca decommissioning programme may overlap with the Hornsea Three construction schedule. Ithaca do not have any current development plans within licence P128 (licence blocks 48/18b and 48/19b). No significant concerns regarding future interactions were raised and the need for proximity and crossing agreements was discussed.	Ithaca assets were located within the offshore cable corridor presented within the Hornsea Three Scoping Report (DONG Energy Power (UK) Ltd, 2016). The Hornsea Three offshore cable corridor presented in this Environmental Statement no longer intercepts the Anglia A platform or licence blocks 48/18b and 48/19b which have also been relinquished during this time period. Pipeline crossing and proximity agreements are discussed in paragraph 11.7.15.2.
19 April 2017	Tampnet – agreement in principle	Both parties agree that if the Hornsea Three project is approved as proposed they will cooperate in order to develop appropriate crossing and proximity agreements which will be finalised once all technical and commercial information is available and maintain ongoing dialogue to ensure future cooperation is maximised.	Noted.
25 April 2017	Blue Transmission – pre-application consultation email	BTSSL is obliged to cooperate with other parties in relation to potential crossings under the terms of its Crown Estate Lease. BTSSL will write to The Crown Estate when necessary indicating consent in relation to the Hornsea Three Lease.	Noted.
20 July 2017	Perenco UK Ltd – Agreement in Principle	Both parties agree that if Hornsea Three is approved as proposed they will: cooperate in order to develop appropriate crossing and proximity agreements which will be finalised once all technical and commercial information is available and maintain ongoing dialogue to ensure future cooperation is maximised.	Noted.
26 July 2017	The Coal Authority – pre-application consultation response to PEIR	The Coal Authority confirms that the proposed development would be located outside the defined coalfield. Accordingly, the Coal Authority has no issues that it would wish to see considered as part of the Environmental Statement for this proposal.	Noted.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
27 July 2017	Shell/Essar pipelines – pre-application consultation response to PEIR	Confirmed that the Shell/Essar Pipelines from the Stanlow complex will not be affected by Hornsea Three.	Noted.
7 August 2017	Mainline pipelines – pre-application consultation response to PEIR.	Mainline Pipelines Ltd. confirmed that their pipelines are not located within 100 miles of Hornsea Three.	Noted.
8 August 2017	INEOS	Both parties agree that if Hornsea Three is approved as proposed they will: cooperate in order to develop appropriate crossing and proximity agreements which will be finalised once all technical and commercial information is available and maintain ongoing dialogue to ensure future cooperation is maximised.	Noted.
25 August 2017	Cruising Association – pre-application consultation response to PEIR.	The CA does not object in principle to Hornsea Three but has the following concerns. Offshore HVAC booster station search area: Yachts and other recreational craft in this area of the North Sea most commonly transit north-south typically within 25 nm of the coast but occasionally much further offshore. CA confirms that survey data reported in volume 2, chapter 7 shows that such traffic is almost nil during winter but that the September survey data rather misses the peak summer season when perhaps double the number of recreational craft surveyed may be typically expected. CA therefore request that the offshore HVAC booster station search area be located as far north-east towards the Hornsea Three array area as possible. CA anticipate that additional standard navigation marks may be needed. Safety Zones: The CA fully support safety zones of 50 m around completed turbine towers and 500 m around maintenance procedures (as indicated by presence of workboats) and accommodation platforms plus 500 m moving zones around cable-layers and similar specialised vessels. Cruising Yacht Routes: CA advise yacht traffic is not heavy however all passages between the Channel/East Coast rivers and the Humber northwards including Scotland, plus those originating from the continent, must cross the Hornsea Three offshore cable corridor somewhere. CA have no data but suggest that may be five to ten per day during the summer period.	The survey data is reported in volume 2, chapter 7: Shipping and Navigation. Recreational vessels are discussed in section 11.7.1 of this chapter. The location of the offshore HVAC booster station search area presented in this Environmental Statement (Figure 11.1) has been refined since the publication of the PEIR. The offshore HVAC booster station search area now occupies the central region of the offshore HVAC booster station search area presented in the PEIR. Volume 1, chapter 4: Site Selection and Consideration of Alternatives presents further justification for this change. The lighting and marking of the offshore HVAC booster stations is presented in Table 11.27. Safety Zones are discussed in Table 11.27. Recreational vessels are discussed in section 11.7.1 of this chapter.
13 September 2017	ConocoPhillips – pre-application consultation response to PEIR.	In regard to ConocoPhillips Collision Risk Management System (CRMS), at present, the impact of displacing shipping is uncertain, however, traffic is likely to increase proximate to their assets. This has a number of significant implications to the existing Marine Operations arrangements including the REWS and Emergency Response and Rescue Vessels (ERRV) used to monitor the approach of errant vessels to ConocoPhillips assets. ConocoPhillips expects Hornsea Three to acknowledge that it will have an obligation to procure a mitigation solution if required, with parties agreeing to work together in good faith and expeditiously to identify the extent of risk to the CRMS, REWS and ERRV and suitable and proportionate mitigation measures to ensure that such systems are not impaired by the construction and operation of Hornsea Three.	REWS on ConocoPhillips assets is assessed in paragraph 11.11.2.67 and the effect of displaced shipping routes on ConocoPhillips CPA is assessed in paragraph 11.11.2.79. The displacement of shipping routes and the effect on ERRV is assessed in volume 2, chapter 7: Shipping and Navigation.
15 September 2017	Statoil – pre-application consultation response to PEIR	Statoil are concerned about the potential cross-over between Sheringham Shoal and Hornsea Three export cables. This must be managed so that Scira's asset integrity, availability and production capacity are maintained. Sheringham Shoal's export cables are owned by Blue Transmission Sheringham Shoal Limited ("Blue Transmission") and it is Scira's expectation that Hornsea Three are in direct dialogue with Blue Transmission to find an acceptable solution for all parties. Due to the expected scale of Hornsea Three, Scira fear potential grid outages or curtailments caused by the construction of Hornsea Three and potential loss of production at Sheringham Shoal. Scira would therefore welcome mitigation measures aiming to minimise or compensate any disruption to Scira's business.	See Blue Transmission below. In regard to potential cable crossing, cable crossing agreements are discussed in Table 11.27. In regard to grid outages Hornsea Three will be connected to an entirely different substation and both parties have entirely separate contractual and regulated agreements with National Grid governing grid access. Curtailment (compensated with the bid/offer mechanism in the market) falls outside the scope of the Environmental Statement.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
20 September 2017	Centrica E&P (now Spirit Energy) – pre-application consultation response to PEIR	REWS: Platform and vessel REWS are highlighted in the PEIR as likely to be impacted by individual and cumulative wind turbine signatures. This would significantly reduce the likelihood of observation and the reaction time available to manage collision risk with platforms or attendant vessels. Possible mitigation measures mentioned in the PEIR need to be further evaluated. Proximity and crossing of assets: Further consultation is required to understand what formal agreements would be required should there be any crossings or proximities to Centrica E&P asset infrastructure and pipelines including the potential need for exclusion zones. Risk assessment methodology: Discussion is needed on the approach and conclusions reached. Centrica E&P has concerns that what is considered intolerable from a safety perspective are incorrectly evaluated as not posing a significant impact. Maximising Economic Recovery: Discussion is needed on impacts of the proposed development on oil and gas companies' legal obligation to take the steps necessary to secure the maximum value of economically recoverable petroleum from the strata beneath UK waters.	Collision risk is assessed in volume 2, chapter 7: Shipping and Navigation. REWS on Centrica E&P operated platforms is assessed in paragraph 11.11.2.67 and designed in mitigation measures are included in Table 11.27. The effect of displaced shipping routes on Centrica E&P assets is discussed in paragraph 11.11.2.79. Pipeline crossings are assessed in paragraph 11.11.1.14.and are to be included in the cooperation agreement being prepared between Hornsea Three and Centrica E&P. Assessments in regard to Centrica E&P operations considering a safety perspective include aviation (discussed in volume 2, chapter 8: Aviation, Military and Communication), shipping (volume 2, chapter: 7 Shipping and Navigation) and REWS (assessed in paragraph 11.11.2.67 of this chapter). A discussion of oil and gas licencing is presented in 11.7.9.2 and a discussion on what information can be included in the assessments presented in the Environmental Statement is presented in section 11.11.1.36.
20 September 2017	Tampnet – pre-application consultation response to PEIR	Tampnet note the proximity of the Hornsea Three array area to the Tampnet cable system and request a face-to-face meeting. A crossing by one or more of the Hornsea Three export cables, and one or more of the array cables, of Tampnet fibre optic cable is in general accepted, pending agreement and acceptance of a suitable crossing design. A Crossing Agreement based on standard industry format will be preferred. Tampnet open to include more than one crossing in a single Agreement if that is preferable. Tampnet goal in Crossing Agreements is to maintain ability to repair cable, and make sure that the crossing happens in a safe way. The placement of wind turbines or substations (or any other infrastructure) in close proximity of the fibre optic cable may be a problem. Fibre optic cables require access for repairs if it is cut or damaged, and a cable repair ship will need some space to perform such a repair. As such Tampnet will request that a safety zone is put in place around the cable, based on an agreed distance.	Crossing and proximity agreements are discussed in paragraph 11.7.15.2. Cable crossings and proximities are assessed in section 11.11.1.14.
20 September 2017	Shell – pre-application consultation response to PEIR	Shell have identified nine Shell pipelines which the proposed Hornsea Three offshore cable corridor will affect. Shell request that each of these pipelines and the pipeline corridor (the area 200 m either side of each pipeline) are avoided in developing final designs and in carrying out any sampling, investigations or works in connection with Hornsea Three and that they are notified of any work within 300 m.	Pipelines are listed in Table 11.16 and pipeline crossing and proximities are assessed in paragraph 11.11.1.14.
December 2017	British Marine Aggregate Producers Association (BMAPA) – Section 42	Supporting information provided for the alternative offshore routes makes no reference to potential interactions with existing marine aggregate interests (licensed/application/optioned), in accordance with Policies AGG1 and AGG2 of the East Inshore/Offshore Marine Plan.	Existing marine aggregate interests are described in section 11.7.8. As described in Table 11.22, restriction of access to marine aggregate extraction sites has been scoped out of the assessment on the basis that there are no marine aggregate extraction sites within the Hornsea Three array area or offshore cable corridor. Any restriction of access would therefore be associated with advisory safety distances around vessels carrying out export cable installation or maintenance activities, which would be temporary, transient and of limited spatial extent compared with the size of the aggregate areas. Marine aggregate policy AGG3 in regard to potential optimal aggregate resource areas is discussed in paragraph 11.7.8.2. The effect on optimal aggregate resource areas has been screened out of the assessment as described in Table 11.22. Potential impacts on aggregate resource are assessed at paragraph 11.11.1.23 and 11.13.2.37.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
1 February 2018	Independent Oil and Gas – pre-application consultation meeting	Independent Oil and Gas provided status updates on the Blythe, Elgood and Vulcan prospects, which would eventually feed into the Thames to Bacton pipeline which is due to be recommissioned. FDPs have been submitted for both phases (not yet approved) and there is an aim to reach first gas by November 2019. The new pipeline connecting the Blythe phase to the Thames to Bacton pipeline would be constructed in Q2 2019. There is likely to be a NUI at the Blythe prospect, with a 500 m exclusion zone, and would connect to the Elgood prospect via a subsea tie back. There is potential for interaction between the Hornsea Three export cable and the pipeline connecting the Blythe prospect to the Thames to Bacton pipeline, and a crossing agreement will be required. It was agreed that this particular crossing point should not pose a major problem for either party. The Harvey prospect overlaps with the Hornsea Three offshore cable corridor and the offshore HVAC booster station search area. An appraisal well is planned to be drilled in 2018 and a FDP could be submitted in Q1 2019 with potential for up to four production wells with production by 2022. A shapefile of the prospect location was requested.	Crossing and proximity agreements are discussed in paragraph 11.7.15.2. Cable crossings and proximities are assessed in section 11.11.1.14. A discussion of oil and gas licencing is presented in 11.7.9.2 and a discussion on what information can be included in the assessments presented in the Environmental Statement is presented in section 11.11.1.36. The proposed appraisal well within the Harvey prospect is located approximately 2.7 km to the west of the Hornsea Three offshore cable corridor (within block 48/24b) and therefore beyond the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple). The proposed well is therefore not considered further within this assessment.
5 February 2018	Independent Oil and Gas – pre-application consultation email	Independent Oil and Gas provided shapefiles of named fields. They are very approximate, based on crude surface delineations of the underlying geological reservoir structures however they provide a good indication of the likely zone of surface activities during the survey, drilling and installation phases. Provided information in regard to location of potential appraisal well at Harvey prospect.	The proposed prospects are shown in Figure 11.6. The proposed appraisal well within the Harvey prospect is located approximately 2.7 km to the west of the Hornsea Three offshore cable corridor (within block 48/24b) and therefore beyond the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple). The proposed well is therefore not considered further within this assessment.

11.6 Methodology to inform the baseline

11.6.1 Desktop study

11.6.1.1 Information on infrastructure and other users within the infrastructure and other users study area was collected through a detailed desktop review of existing studies and datasets and through consultation. Data sources are summarised at Table 11.5 below.

Table 11.5: Summary of key data sources.

Topic	Data Source
Recreational activities	UK Atlas of Recreational Boating (RYA) SeaSearch Finstrokes Young 2003 and 2004
Recreational fishing	Defra (2013) Sea Angling 2012 – a survey of recreational sea angling activity and economic value in England, November 2013 Offshore Energy SEA (2009)
Offshore wind farms	The Crown Estate (TCE) Charts Offshore Wind Projects TCE Wind Farm Export Cable Routes Seabed Agreement
Offshore cables	SeaZone Solutions Ltd Kingfisher Information Service – Cable Awareness (KIS-ORCA) TCE Wind Farm Export Cable Routes Seabed Agreement Electrics, Telecommunications Cables in the North Sea (Emodnet)
Disposal sites	SeaZone Solution Ltd Cefas 2016 Licenced Disposal Sites for all of UK
Marine aggregate extraction	TCE Marine Aggregate Agreements BMAPA dredger reports Rijkswaterstaat (Ministry of Infrastructure and the Environment) East (Inshore and Offshore) Marine Plans
Carbon capture and storage	TCE East (Inshore and Offshore) Marine Plans
Natural gas storage	TCE
Oil and gas assets	UK Oil and Gas Data/CDA/nlog Consultation with oil and gas operators

11.6.2 Site Specific Surveys

11.6.2.1 No site specific surveys have been undertaken to inform the EIA for infrastructure and other users. The baseline characterisation is sufficient in order to inform the infrastructure and other users chapter.

11.7 Baseline environment

11.7.1 Recreational sailing and motor cruising

11.7.1.1 This section provides an overview of recreational sailing and motor cruising activity within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple). It should be noted that recreational sailing and motor cruising is considered in the Navigational Risk Assessment (NRA) (volume 5, annex 7.1) as a specific vessel size category, and the infrastructure and other users chapter considers receptors undertaking recreational sailing and motor cruising as an activity only.

11.7.1.2 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.

11.7.1.3 Recreational sailing usually takes place in the vicinity of established sailing clubs. However, boats can also be launched and sailed wherever access to launch is permitted and therefore the activity is not always associated with a specific club.

Hornsea Three array area

11.7.1.4 Due to the distance of the Hornsea Three array area from the UK coast (approximately 121 km/65 nm at its nearest point), any sailing would be likely to only consist of occasional offshore cruising and racing. The RYA atlas of recreational boating does not identify any activity in the vicinity of the Hornsea Three array area. This does not preclude the presence of cruising or racing within the Hornsea Three array area, but does indicate that the overall usage is low (and occasional). The RYA also noted during consultation that there is very little recreational activity as far offshore as the Hornsea Three array area, with any activity likely to be limited to very experienced and well-equipped sailors (Table 11.4).

11.7.1.5 The maritime traffic surveys carried out in June/July 2016 to inform the NRA (see volume 5, annex 7.1) recorded recreational vessel tracks passing through the Hornsea Three array area. The majority of recreational traffic intersecting the site however was recorded on 28 and 29 June when the 500 nm North Sea Race was taking place, and this is not considered to be representative of baseline levels of recreational usage.

Hornsea Three offshore cable corridor

11.7.1.6 The East Anglia and Humber coasts are recognised as popular UK sailing areas with several RYA clubs and marinas (DECC, 2009). Figure 11.2 presents data from the RYA atlas of recreational boating. There are a number of sailing clubs along the North Norfolk coastline, with Blakeney sailing club being the nearest to the Hornsea Three offshore cable corridor. There is low to medium recreational vessel activity in the nearshore area of the Hornsea Three offshore cable corridor, with a number of offshore routes fanning out from the coastal area which are likely to intersect the Hornsea Three offshore cable corridor. The Hornsea Three offshore cable corridor also crosses a general boating area, which runs parallel to the coast.

11.7.1.7 The maritime traffic surveys carried out in September 2016 to inform the NRA (see volume 5, annex 7.1: Navigational Risk Assessment) recorded recreational vessel tracks crossing the Hornsea Three offshore cable corridor, including the offshore HVAC booster station search area, although activity was very limited.

11.7.2 Other recreational activities

Hornsea Three offshore cable corridor

11.7.2.1 This section provides an overview of other recreational activities within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple). Kite surfing, surfing and wind surfing all occur almost entirely in coastal waters, usually within 1 nm of the shore. Kite surfing, surfing and wind surfing all have the potential to occur within the nearshore and inshore sections of the Hornsea Three offshore cable corridor.

11.7.2.2 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. Kayaking and canoeing have the potential to occur within the nearshore and inshore sections of the Hornsea Three offshore cable corridor.

11.7.2.3 There are several SCUBA diving sites within the nearshore and inshore sections of the Hornsea Three offshore cable corridor (Figure 11.2), including sites associated with ship wrecks (e.g. the SS Rosalie (Finstrokes, 2017), Weybourne cliffs, Salthouse shore and survey activity (Seasearch, 2017).

11.7.3 Recreational fishing

11.7.3.1 This section provides an overview of recreational fishing activity within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple) (i.e. fishing for pleasure rather than commercial reasons). It should be noted that recreational fishing vessels are considered in the NRA (volume 5, annex 7.1: Navigational Risk Assessment) as a specific vessel size category, and the infrastructure and other users chapter considers receptors undertaking recreational fishing as an activity only.

11.7.3.2 The 2012 Sea Angling survey estimated that there are 884,000 sea anglers in England, with almost four million days of sea angling recorded over the survey year (Defra, 2013). Shore fishing was the most common type of sea angling (almost 3 million angler-days) compared with private/rented boats (1 million) and charter boats (0.1 million). It is generally considered that the area within 1 nm of the shoreline is of prime importance to anglers (Offshore Energy SEA, 2009).

Hornsea Three array area

11.7.3.3 Due to the distance of the Hornsea Three array area from the UK coastline (approximately 121 km/65 nm at its nearest point), recreational fishing vessel activity is likely to be limited. No recreational fishing vessels were identified in the vicinity of the Hornsea Three array area during the maritime traffic surveys (see volume 5, annex 7.1: Navigational Risk Assessment).

Hornsea Three offshore cable corridor

11.7.3.4 The principal ports and angling locations in the eastern region are Southend, Burnham-on-Crouch, Bradwell Marina and Lowestoft for boat angling, with 26 charter boats, and Canvey, Clacton-on-Sea, Aldeburgh, Lowestoft and Cromer for shore angling (Offshore Energy SEA, 2009). A number of areas within proximity to the offshore cable corridor landfall are also listed by British Sea Fishing as venues for shore fishing, including Blakeney (7.4 km) and Sheringham (4.8 km) (British Sea Fishing, 2017).

11.7.3.5 No recreational fishing vessels were identified in the vicinity of the Hornsea Three offshore cable corridor during the maritime traffic surveys (see volume 5, annex 7.1: Navigational Risk Assessment).

11.7.4 Offshore wind farms

11.7.4.1 This section provides an overview of offshore wind farm activity within the infrastructure and other users study area (southern North Sea). Offshore wind farms are shown in Figure 11.3. The closest offshore wind farms are Hornsea Project One (7 km from the Hornsea Three array area; 7 km from the Hornsea Three offshore cable corridor) and Hornsea Project Two (7 km from the Hornsea Three array area; 18 km from the Hornsea Three offshore cable corridor) (both under construction).

11.7.4.2 The Dudgeon offshore wind farm (operational) is located 87 km from the Hornsea Three array area and 11 km from the Hornsea Three offshore cable corridor. Sheringham Shoal (operational) is located 109 km from the Hornsea Three array area and 7 km from the Hornsea Three offshore cable corridor. There are a number of other proposed offshore wind farm sites across the southern North Sea (see Figure 11.3).

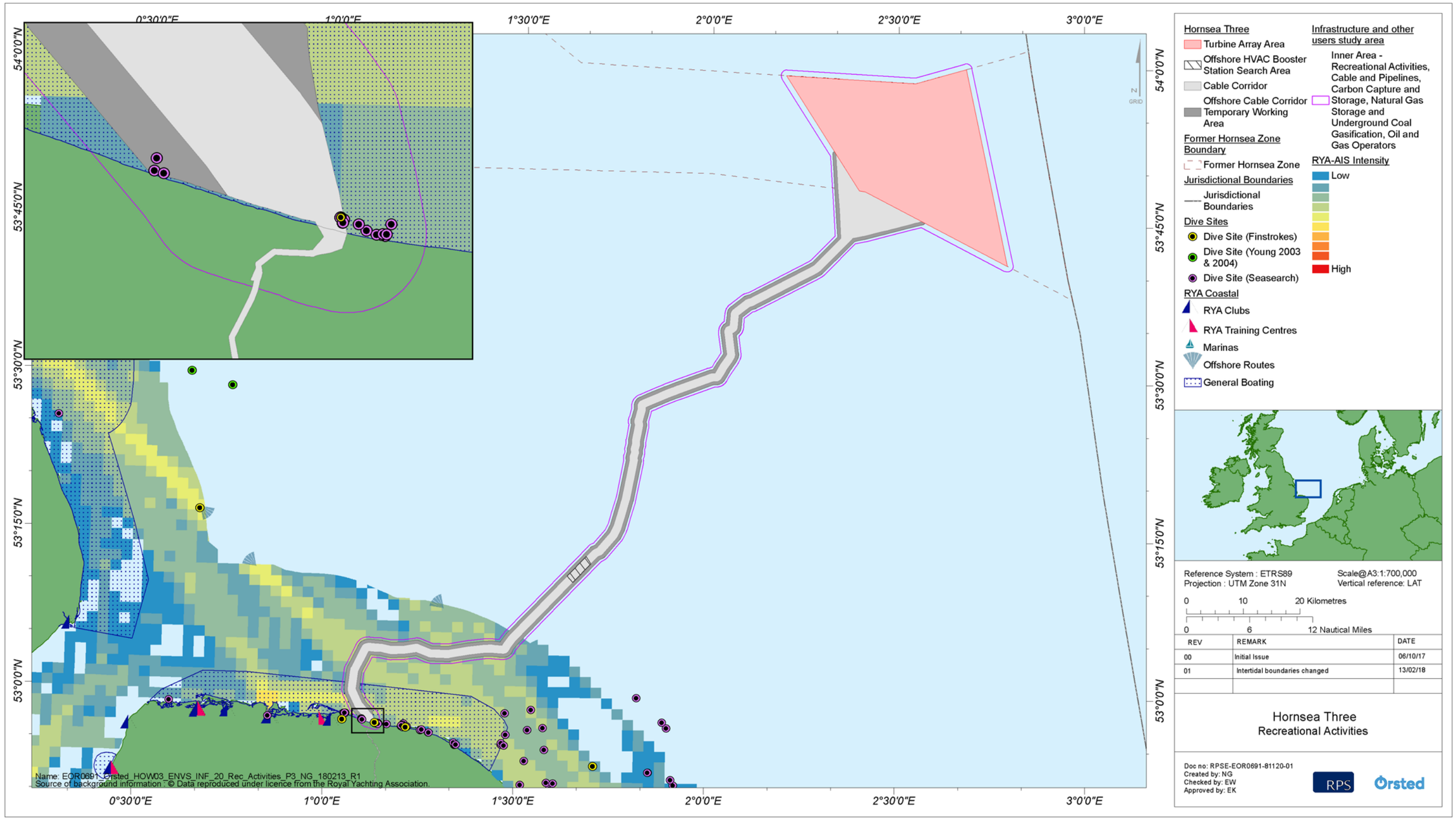

Figure 11.2: Recreational sailing activities and SCUBA diving sites in the vicinity of Hornsea Three.

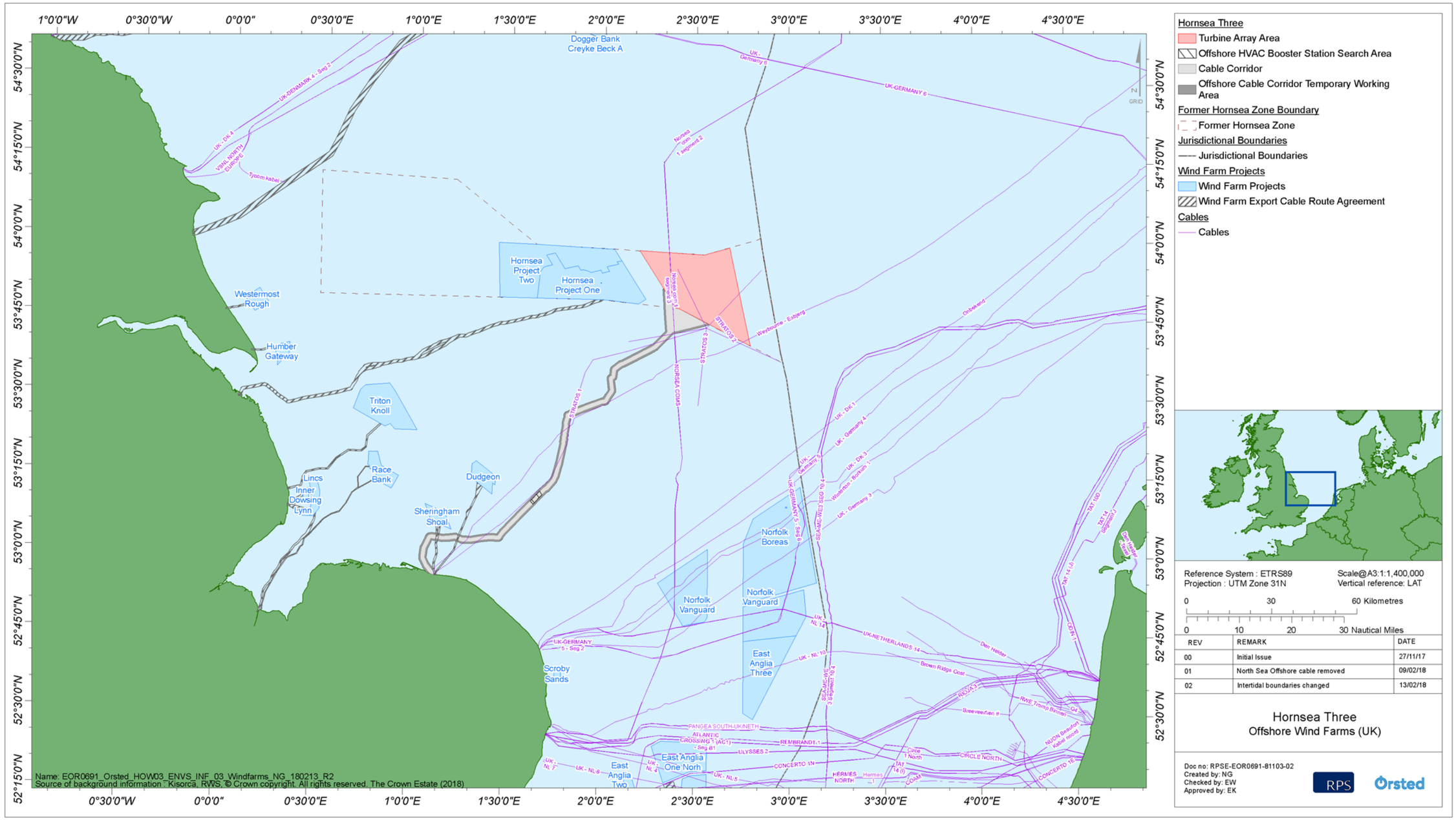

Figure 11.3: Offshore wind farms and offshore cables in the vicinity of Hornsea Three.

11.7.5 Cables

11.7.5.1 This section provides an overview of cables within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple) for cable and pipeline operators. Cables are shown in Figure 11.3. There is one active telecoms cable, Norsea com 1 segment 3 operated by Tampnet, which crosses north-south across the Hornsea Three array area. There are two out of service cables crossing the Hornsea Three array area, one route with two branches (Stratos 1 and Stratos 2) and one route Weybourne to Esbjerg. There are no other cables within 1 km of the Hornsea Three array area.

11.7.5.2 There is one active telecoms cable (Norsea com 1 segment 3 operated by Tampnet), and two out of service telecoms cables (Stratos/North Sea Offshore and Weybourne to Esbjerg) crossing the Hornsea Three offshore cable corridor, with Stratos/North Sea Offshore and Weybourne to Esbjerg making landfall in the area of the Hornsea Three landfall. In the landfall location, the Hornsea Three offshore cable corridor also crosses the export cables for the Dudgeon and Sheringham Shoal offshore wind farms.

11.7.5.3 Where the Hornsea Three cables (either array, interconnector or export cables) will be required to cross an active cable, it is intended that commercial crossing agreements 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 template will be used for any cable crossings.

11.7.6 Carbon capture and storage, natural gas storage and underground coal gasification

11.7.6.1 This section provides an overview of CCS, natural gas storage and underground coal gasification activity within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple) for CCS, natural gas storage and underground coal gasification.

11.7.6.2 Carbon Capture and Storage is regarded as a potential abatement technology for limiting the impact of climate change. There are no proposed CCS developments within the Hornsea Three array area or offshore cable corridor, or within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple). The nearest CCS development is a CCS storage area located 61.2 km from the Hornsea Three array area. The East Inshore and East Offshore Marine Plans identify potential areas for expansion of the industry including in saline aquifers and active and inactive hydrocarbon fields. These areas are identified on Figure 11.4. The Hornsea Three array area marginally overlaps the edge of four potential development areas. The Hornsea Three offshore cable corridor crosses five potential areas. The potential areas are within the saline aquifer in the Bunter Sandstone Formation (MMO, 2014) under cap rock at a depth of greater than 800 m (British Geological Survey, 2010). Hornsea Three only has a marginal overlap with these areas and does not penetrate to this depth and hence is not considered to preclude future development of these areas. In the event that the potential development areas overlapping with Hornsea Three are brought forward, consultation will take place between both parties to discuss planned activities in order to minimise disruption to either party's operations and to maximise coexistence.

11.7.6.3 There are no proposed natural gas storage sites within the Hornsea Three array area or offshore cable corridor, or within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple). The nearest natural gas storage site is the proposed Deborah Gas Storage Site operated by ENI, located 84 km from the Hornsea Three array area and 10 km from the offshore cable corridor (see Figure 11.4).

11.7.6.4 There is an underground coal gasification (UCG) site located 12.3 km to the southeast of the nearshore section of the Hornsea Three offshore cable corridor (Figure 11.4). The Coal Authority granted a conditional UCG licence for the East Anglia Offshore Area which ran from 2009 to 2013 and has now expired. There has been no indication provided by the Coal Authority whether this licence will be renewed.

11.7.6.5 As there are no active or proposed CCS, natural gas storage or UCG sites within the relevant infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple) and as Hornsea Three would not preclude any activity in the CCS development areas (see paragraph 11.7.6.2) assessment of effects on these receptors have been screened out.

11.7.7 Disposal sites

11.7.7.1 This section provides an overview of disposal sites within the infrastructure and other users study area (see Figure 11.1, Marine Processes Area, denoted in Yellow) for aggregate extraction and disposal sites. Only marine sediment dredged from dock sites and navigation channels and small amounts of fish waste are permitted to be disposed of at sea, with industrial waste banned since 1992 and sewage sludge since 1998 (Cefas, 2009). In 2007 the UK granted 101 permits for the disposal of dredged material and no permits for other types of waste (DECC, 2011c). Disposal sites are shown in Figure 11.4. There are no disposal sites within the Hornsea Three array area or offshore cable corridor. The nearest open disposal site to the Hornsea Three array area is the Hornsea Project One array area disposal site at a distance of 7.3 km to the west, with the nearest site to the Hornsea Three offshore cable corridor also being the Hornsea Project One array area disposal site, located 6.2 km from the Hornsea Three offshore cable corridor.

11.7.7.2 The presence of munitions on the UK Continental Shelf (UKCS) is a historical legacy presenting a remaining risk to users of the marine environment (DECC, 2011c). The UK Offshore Energy SEA does not report any chemical munitions disposal sites in the vicinity of the former Hornsea Zone (DECC, 2011c). Between 2004 and 2008, the UK reported 703 munitions encounters, with the highest density of encounters reported in the southern North Sea between the UK and the Netherlands, and with no clear relationship between the locations of known munitions dumpsites and the encounters (DECC, 2011c). An Unexploded Ordnance (UXO) survey will be required as part of pre-construction works for the Hornsea Three array area and offshore cable corridor which will be used to determine any ad-hoc ordnance disposal (see volume 1, chapter 3, Project Description).

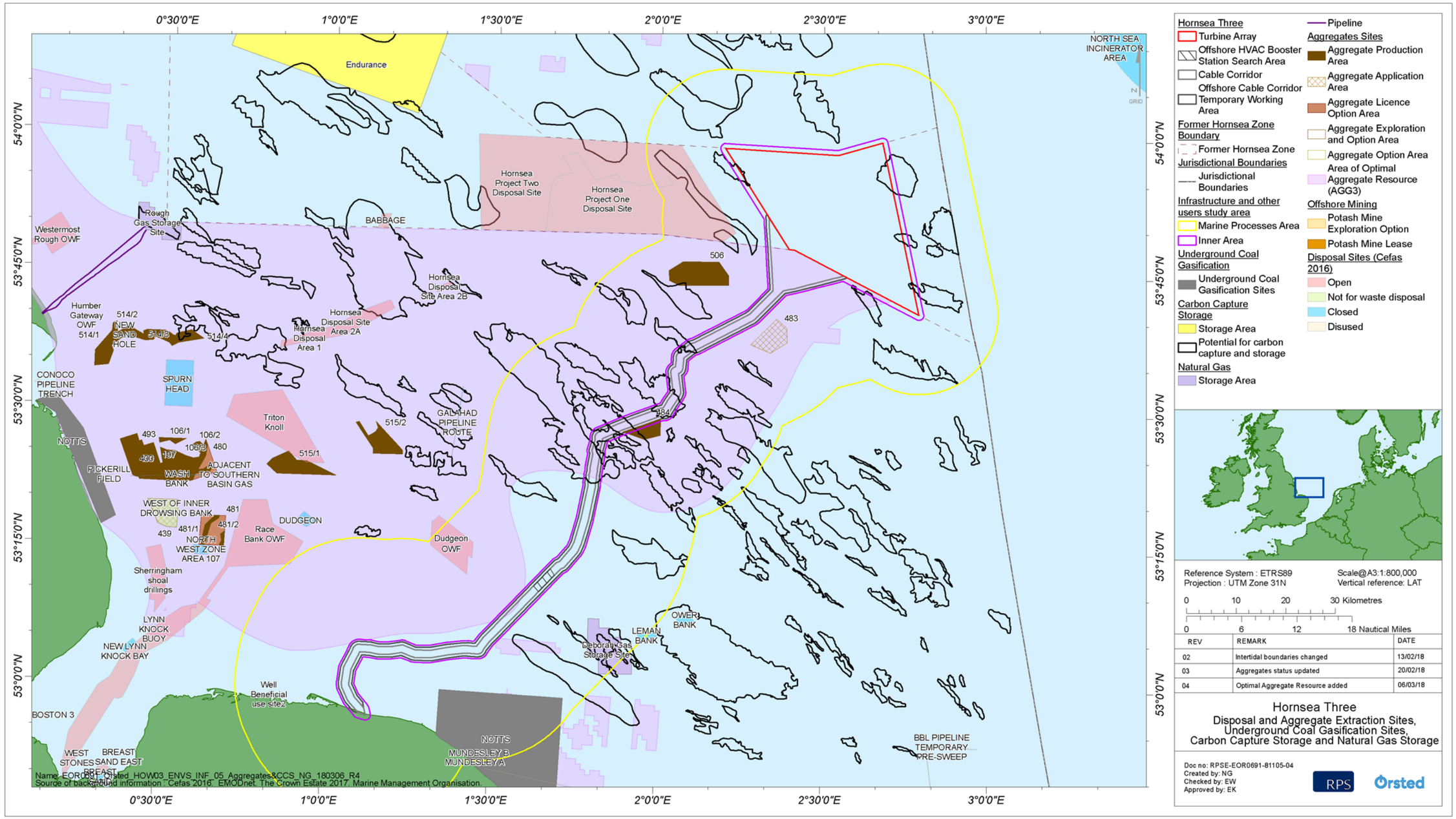

Figure 11.4: Disposal and Aggregate Extraction Sites, CCS, Natural Gas Storage and Underground Coal Gasification sites in the vicinity of Hornsea Three.

11.7.8 Marine aggregate extraction

11.7.8.1 This section provides an overview of aggregate extraction sites within the infrastructure and other users study area (see Figure 11.1, Marine Processes Area, denoted in Yellow). There are currently no aggregate extraction sites within the Hornsea Three array area (Figure 11.4). Sites located within 16 km of the Hornsea Three array area (i.e. within the infrastructure and other users study area (see Figure 11.1, Marine Processes Area, denoted in Yellow) based on modelled data, see section 11.3) are listed in Table 11.6. There are four sites located within 21.5 km of the Hornsea Three offshore cable corridor (i.e. within the infrastructure and other users study area (see Figure 11.1, Marine Processes Area, denoted in Yellow) based on one tidal ellipse (the path followed by a water particle in one complete tidal cycle) (see section 11.3)) as listed in Table 11.7. Dredger routes are considered within volume 2, chapter 7: Shipping and Navigation.

11.7.8.2 Marine aggregates are an important national aggregate source. Marine aggregate extraction can only occur where commercially viable deposits of sand and gravel occur, the distribution of which is dependent on the spatially discrete areas where they were formed by geological processes. Areas of high resource potential have been identified in The East Inshore and East Offshore Marine Plans. These areas are identified on Figure 11.4 (area of optimal aggregate resource AGG3). The Hornsea Three array area is adjacent to but outside of this area. The Hornsea Three offshore cable corridor crosses through a large area which has been identified as an optimal aggregate resource area. The marine plans advise that estimates of the new spatial footprint required to meet projected demand for marine aggregates indicate that less than 5% of the total potential extraction area shown in the marine plans would be needed for aggregate production (MMO 2014). The actual percentage area that the Hornsea Three offshore cable corridor footprint is relative to the area of optimal aggregate resource that it crosses is 1.5%. This demonstrates that the overall Hornsea Three footprint relative to the available aggregate in that location is de minimis.

11.7.8.3 As the Hornsea Three array does not overlap an area of optimal aggregate resource, and as the Hornsea Three offshore cable corridor only occupies an area of 1.5% of the optimal aggregate resource, Hornsea Three is considered not to preclude any potential future aggregate extraction from this area and therefore the effect of Hornsea Three on potential use of the optimal aggregate resource area has been screened out of further consideration within the assessment.

Table 11.6: Marine aggregate areas within 16 km of the Hornsea Three array area.

Area Name	Company	Area Number	Area (km²)	Distance to array area (km)
Humber 5	DEME Building Materials Ltd	483	28.2	14.0
Humber 4 and 7	DEME Building Materials Ltd	506	51.1	13.3

Table 11.7: Marine aggregate areas within 21.5 km of the Hornsea Three offshore cable corridor.

Area Name	Company	Area Number	Area (km²)	Distance to offshore cable corridor (km)
Humber 5	DEME Building Materials Ltd	483	28.2	1.9
Humber 4 and 7	DEME Building Materials Ltd	506	51.1	7.5
Humber 3	DEME Building Materials Ltd	484	17.2	13.2

11.7.9 Oil and gas operations

11.7.9.1 This section provides an overview of oil and gas activity within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple) for oil and gas operators.

11.7.9.2 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 30th licence round, with blocks offered on 25 July 2017 and awards likely to be announced in Quarter 2 of 2018.

11.7.9.3 The main type of offshore licence is the Innovative Licence (OGA, 2017c). This is a new licence introduced by the OGA for the 29th licence round which replaces the traditional Seaward Production Licence. The Innovative 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 initial term is variable and runs for a maximum of nine years. The initial term is subdivided into three phases. Phase A is a period for carrying out geotechnical studies and geophysical data reprocessing; Phase B is a period for undertaking seismic surveys and acquiring other geophysical data; and Phase C is for drilling. There is a mandatory requirement to relinquish 50% of the licence block after the initial term. The second term is for field development and lasts four years and the third term, for production, is for 18 years. Longer terms may apply in certain areas. The traditional licence terms still apply to licences gained prior to the 29th licence round for which the initial term is four years, which can then be renewed for a further four years with a third term of 18 years. Exclusive rights may also include retained rights within an existing licenced acreage.

11.7.9.4 Figure 11.5, Table 11.8 and Table 11.10 present the licenced blocks coincident with the Hornsea Three array area and offshore cable corridor. There are currently nine licenced blocks coincident with the Hornsea Three array area operated by Spirit Energy North Sea Ltd (formerly Centrica North Sea Ltd) and Spirit Energy Resources Ltd (formerly Centrica Resources Ltd), INEOS and Shell. There are eight unlicensed blocks coincident with the Hornsea Three array area. There are an additional three blocks (49/1a operated by INEOS, 49/10a operated by Spirit Energy Resources and 49/10e unlicensed) within 1 km of the Hornsea Three array area (see Table 11.9). All of the unlicensed acreage has been offered in the 30th licence round.

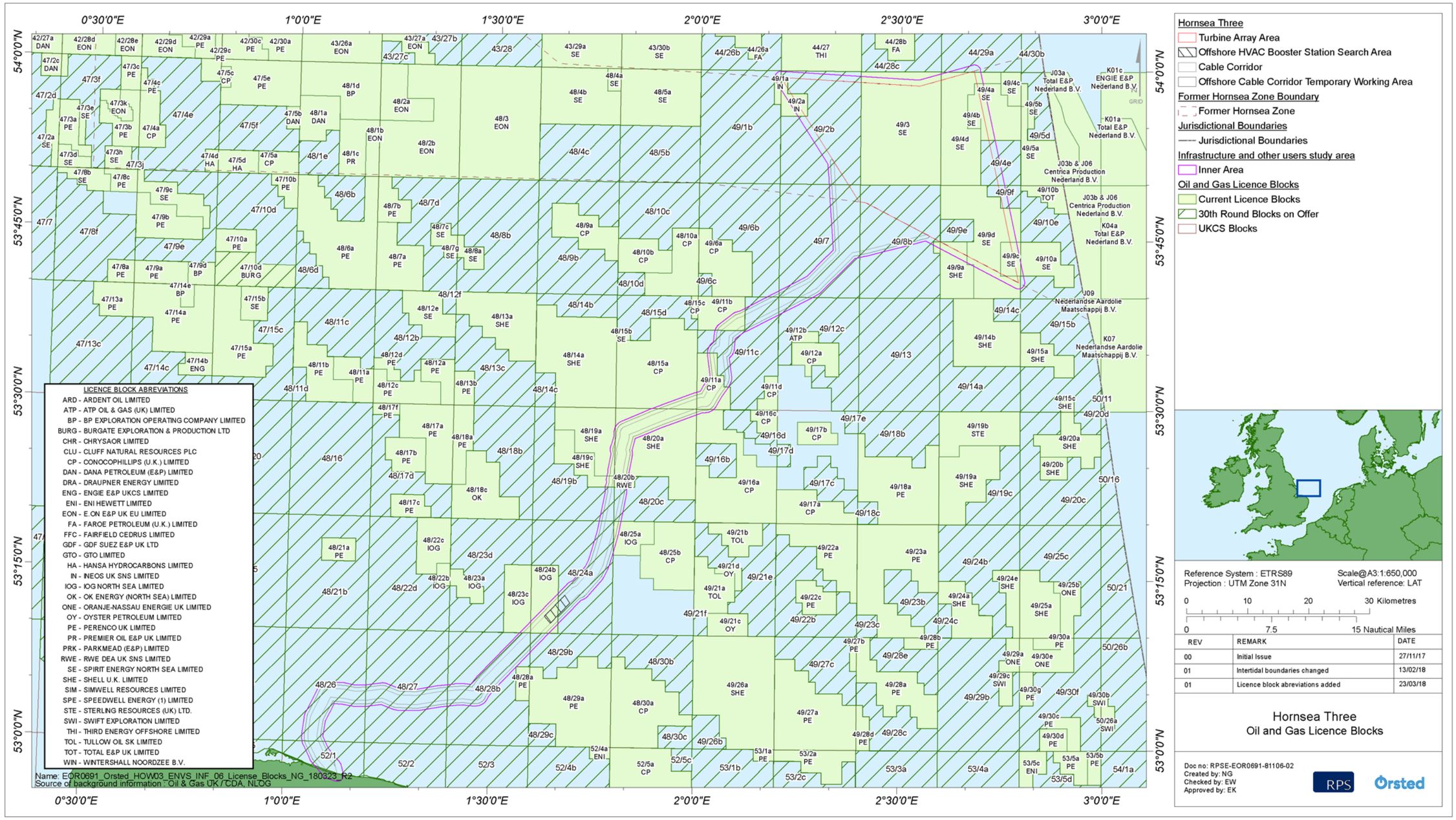

Figure 11.5: Oil and gas licence blocks in the vicinity of Hornsea Three.

Table 11.8: Licence blocks coincident with the Hornsea Three array area.

Block	Licence	Type	Status	Licence Terms			Operator
				1st Term end date	2nd Term end date	Licence expiry date	
44/29a	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
49/1b	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
49/2b	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
49/2a	P1013	Production	Not producing – to be decommissioned	22/12/2004	22/12/2016	22/12/2034	INEOS
49/3	P2286	Production	Extant	31/08/2019	31/08/2023	31/08/2041	Spirit Energy Resources
49/4a	P468	Production	Extant	10/05/1989	10/05/2019	10/05/2019	Spirit Energy North Sea
49/4b	P1186	Production	Extant	30/11/2008	30/11/2012	30/11/2030	Spirit Energy North Sea
49/4d	P2286	Production	Extant	31/08/2019	31/08/2023	31/08/2041	Spirit Energy Resources
49/4e	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
49/7	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
49/8a	P523	Production	Extant	13/06/1991	N/A	13/06/2021	Shell
49/8b	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
49/9a	P132	Production	Extant	13/06/1991	N/A	13/06/2021	Shell
49/9c	P901	Production	Extant	20/09/2000	20/09/2012	20/09/2030	Spirit Energy Resources
49/9d	P2286	Production	Extant	31/08/2019	31/08/2023	31/08/2041	Spirit Energy Resources
49/9e	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
49/9f	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed

Table 11.9: Licence blocks within 1 km of the Hornsea Three array area.

Block	Licence	Type	Status	Licence Terms			Operator
				1st Term end date	2nd Term end date	Licence expiry date	
49/1a	P520	Production	Extant	13/06/1991	N/A	13/06/2021	INEOS
49/10a	P83	Production	Extant	1971	N/A	N/A	Spirit Energy Resources
49/10e	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed

Table 11.10: Licence blocks coincident with the Hornsea Three offshore cable corridor.

Block	Licence	Type	Status	Licence Terms			Operator
				1st Term end date	2nd Term end date	Licence expiry date	
48/19a	P8	Production	Extant	17/09/1970	N/A	N/A	Shell
48/19b	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
48/19c	P465	Production	Extant	10/05/1989	10/05/2019	10/05/2019	Shell
48/20a	P8	Production	Extant	17/09/1970	N/A	N/A	Shell
48/20b	P1909	Production	Extant	31/01/2016	31/01/2020	31/01/2038	INEOS
48/20c	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
48/23c	P2085	Production	Extant	19/12/2017	19/12/2021	19/12/2039	Independent Oil and Gas Plc
48/24a HVAC	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
48/24b HVAC	P2085	Production	Extant	19/12/2017	19/12/2021	19/12/2039	Independent Oil and Gas Plc
48/25a	P2342	Production	Extant	31/07/2019	31/07/2037	31/07/2037	Independent Oil and Gas Plc
48/26	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
48/27	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
48/28b	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
48/29b	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
49/2b	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
49/6b	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
49/7	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
49/8b	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
49/11a	P28	Production	Extant	17/09/1970	N/A	N/A	ConocoPhillips
49/11b	P130	Production	Extant	31/12/1977	31/12/2017	31/12/2017	ConocoPhillips
49/11c	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
49/12c	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed
48/15a	P130	Production	Extant	31/12/1977	31/12/2017	31/12/2017	ConocoPhillips
52/1	N/A	N/A	N/A	N/A	N/A	N/A	Unlicensed

11.7.9.5 There are currently ten licenced blocks coincident with the Hornsea Three offshore cable corridor, operated by Shell, INEOS, Independent Oil and Gas and ConocoPhillips, with one of these blocks (48/24b operated by Independent Oil and Gas) coinciding with the offshore HVAC booster station search area. There are 14 unlicensed blocks within the Hornsea Three offshore cable corridor, with one of these blocks (48/24a) coinciding with the offshore HVAC booster station search area. There is one additional licenced block (49/16a licenced to ConocoPhillips) within 1 km of the Hornsea Three offshore cable corridor (Table 11.11). All of the unlicensed acreage has been offered in the 30th licence round.

Table 11.11: Currently Licenced blocks within 1 km of the Hornsea Three offshore cable corridor.

Block	Licence	Type	Status	Licence Terms			Operator
				1st Term end date	2nd Term end date	Licence expiry date	
49/16a	P33	Production	Extant	17/09/1970	N/A	N/A	ConocoPhillips

11.7.9.6 Unlicensed blocks 49/2b, 49/7 and 49/8b overlap with both the Hornsea Three array area and the offshore cable corridor (Table 11.8 and Table 11.10).

11.7.10 Hydrocarbon fields

11.7.10.1 This section provides an overview of hydrocarbon fields within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple). 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 there is still potential for discoveries. There is a strong drive by the OGA to increase exploration and a competition was launched prior to the 29th licensing round to stimulate exploration activity, with seismic data from the Government-funded seismic surveys of the Rockall Basin and Mid North Sea High areas being made available free of charge for the first time. These areas are outside the Hornsea Three development area.

11.7.10.2 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 11.6 presents the known gas fields that intersect with the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple). There are four gas fields coincident with the Hornsea Three array area, operated by INEOS, Spirit Energy North Sea and Spirit Energy Resources, namely Windermere, Chiswick, Grove and Topaz (Table 11.12).

11.7.10.3 There are four known gas fields within the offshore cable corridor (Table 11.13), operated by Shell, INEOS and Spirit Energy North Sea. There is one potential area, the Harvey prospect, operated by Independent Oil and Gas which is shown as a potential, approximate area on Figure 11.6.

Table 11.12: Gas fields located within the Hornsea Three array area.

Field Name	Status	Discovery Date	Discovery Well	Production Date	Operator	Licence
Grove	Producing	01/09/1971	49/10-1	01/05/2007	Spirit Energy Resources	P83,P901
Chiswick	Producing	01/10/1984	49/04-1	01/09/2007	Spirit Energy North Sea	P468,P1186
Topaz	Producing	01/08/1987	49/01-3	01/11/2009	INEOS	P520,P847,P1013
Windermere	Producing	01/12/1989	49/09b-2	01/04/1997	INEOS	P524,P1146

Table 11.13: Gas fields located within the Hornsea Three offshore cable corridor.

Field Name	Status	Discovery Date	Discovery Well	Production Date	Operator	Licence
Galleon	Producing	01/03/1985	48/20a-3A	01/10/1994	Shell	P8,P130
Audrey	Producing	01/03/1976	49/11a-1	01/10/1998	Spirit Energy North Sea	P28,P130
Skiff	Producing	01/09/1995	48/20a-7	01/10/2000	Shell	P8
Clipper South	Producing	01/03/1983	48/19a-3	01/08/2012	INEOS	P8,P465

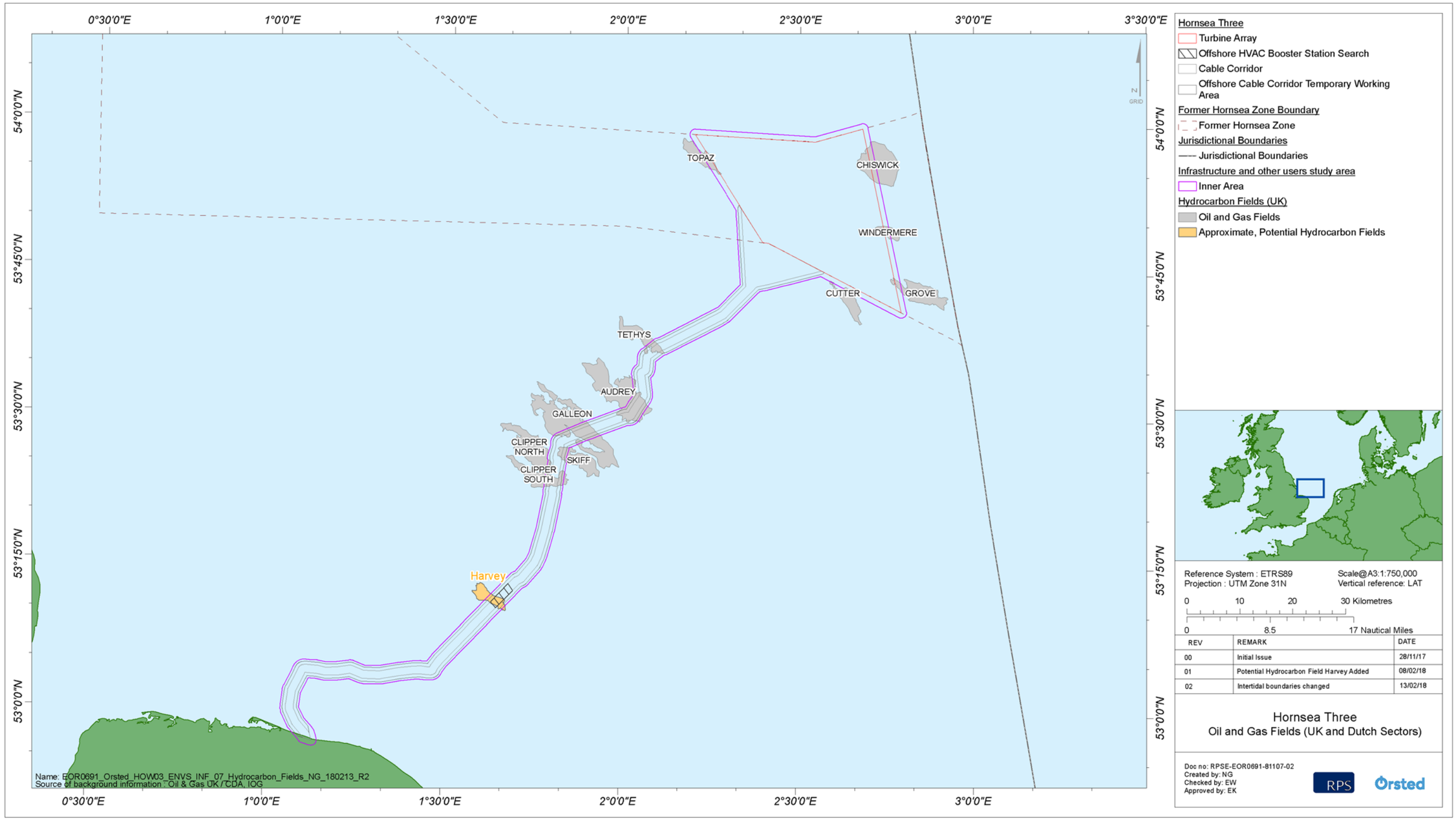

Figure 11.6: Hydrocarbon fields contiguous with Hornsea Three.

11.7.11 Surface structures

11.7.11.1 This section provides an overview of surface structures within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple). Oil and gas related surface structures include permanent and temporary structures. Permanent infrastructure includes gas platforms while temporary structures include drilling rigs and vessels. Gas platforms are protected by a 500 m safety zone.

11.7.11.2 Figure 11.7 presents the current gas platforms located in proximity to the Hornsea Three array area. There are no platforms located within the Hornsea Three array area or within 1 km of the Hornsea Three array area. Platforms with helidecks that are located within 9 nm of the Hornsea Three array area include the Schooner A, Ketch, Chiswick, ST-1, J6A/J6A-CT, Grove, Windermere and Carrack QA platforms. Effects on helicopter access to these platforms are assessed in volume 2, chapter 8: Aviation, Military and Communication.

11.7.11.3 There are no platforms located within the Hornsea Three offshore cable corridor or offshore HVAC booster station search area. There is one active gas platform, Clipper South operated by INEOS, located within 1 km of the Hornsea Three offshore cable corridor.

11.7.11.4 Consultation has advised that a number of structures and associated infrastructure within the southern North Sea are scheduled to be decommissioned in the near future (Table 11.4). This information has been combined with data from the OGA in regard to submitted and/or approved decommissioning plans where available to provide an indicative decommissioning scenario in Table 11.14. Only platforms within the licence blocks located within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple) are shown (i.e. platforms within licence blocks adjacent to or within 1 km of Hornsea Three). The indicative position outlined in Table 11.14 below represents the best understanding at the time of writing.

11.7.11.5 These platforms (with the exception of the safety zone around the Audrey 1 WD Audrey A (WD) platform) are all located outside the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple), therefore decommissioning activities associated with these platforms are not considered further within this chapter. The safety zone of the Audrey 1 WD Audrey A (WD) platform, at a distance of 1.3 km from the Hornsea Three offshore cable corridor, intersects with the 1 km infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple), however decommissioning activities associated with this platform are anticipated to be complete prior to the start of offshore construction of Hornsea Three and are therefore not considered further within this chapter. Effects on helicopter access to relevant platforms during decommissioning activities are considered in volume 2, chapter 8: Aviation, Military and Communication and effects on navigation are considered in volume 2, chapter 7: Shipping and Navigation.

Table 11.14: Platforms to be decommissioned (indicative).

Platform	Block	Operator	Consultation	OGA Data (OGA, 2017a)	Timescales
Audrey B (XW) Audrey XW 2	48/15a (coincident with offshore cable corridor)	Spirit Energy North Sea	Likely to be decommissioned prior to Hornsea Three construction phase.	N/A	Prior to 2023[a].
Audrey 1 WD Audrey A (WD)	49/11a (coincident with offshore cable corridor)				
Viscount VO platform, Vampire OD platform	49/16a (within 1 km of offshore cable corridor).	ConocoPhillips	Currently being decommissioned, due to be complete by 2021.	Decommissioning programmes for Viscount VO and Vampire OD and associated pipelines approved in 2017. Removal to shore of topsides and jackets for recycling/disposal. Pipelines to be decommissioned in situ.	2016 - 2021(ConocoPhillips, 2017).
Windermere	49/9f (coincident with Hornsea Three array area)	INEOS	Very likely to be decommissioned (with wells) prior to 2023[a].	N/A	Prior to 2023[a].

a Note: Hornsea Three offshore construction is now scheduled to commence in 2022 (see volume 1, chapter 3: Project Description).

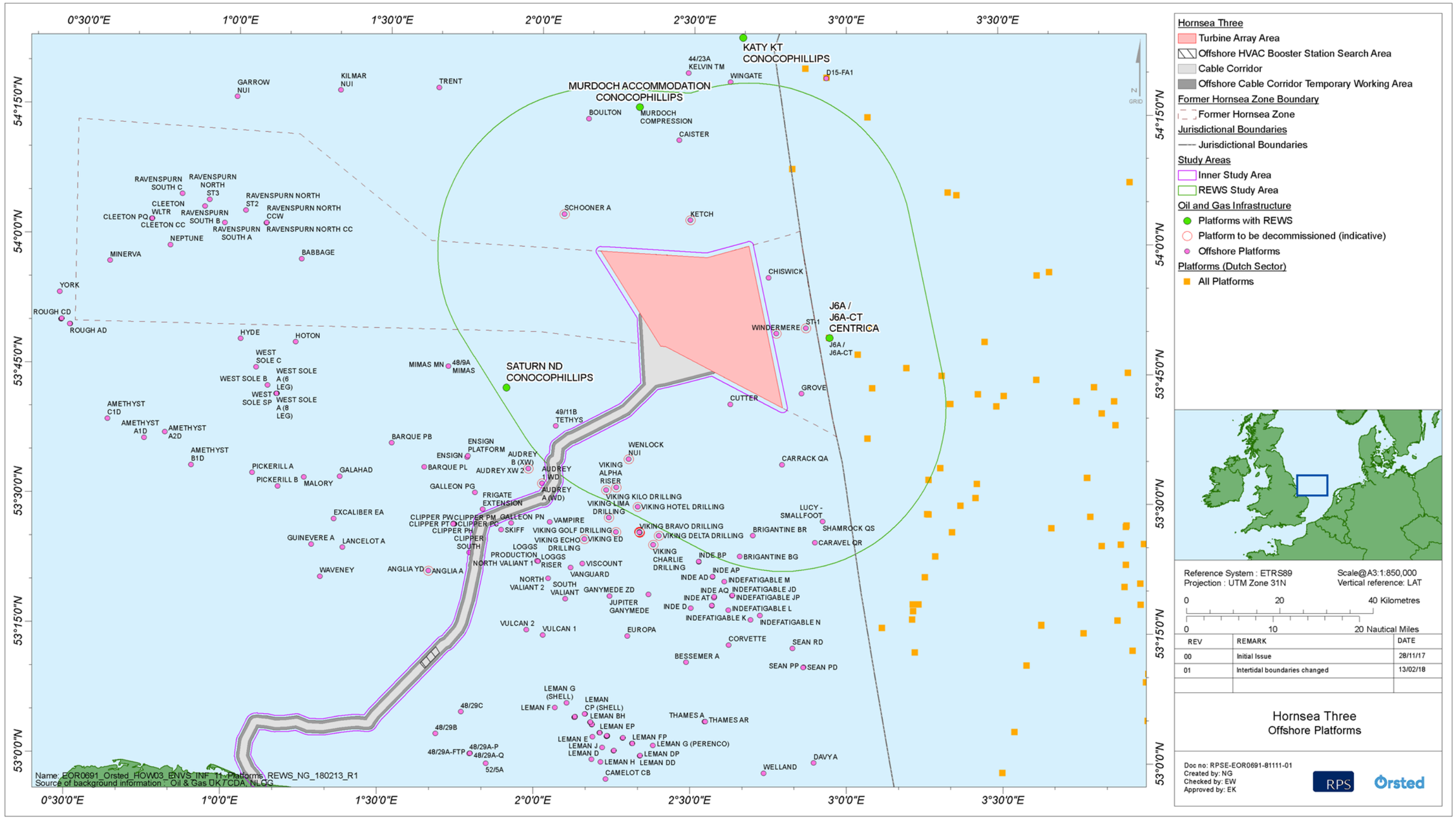

Figure 11.7: Platforms located in the vicinity of Hornsea Three.

11.7.12 Subsea structures

11.7.12.1 This section provides an overview of subsea structures within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple). Subsea structures (excluding wells) include protective structures, pipe junctions, manifolds, wellheads, trees and valves, and are usually protected by a 500 m safety zone. Subsea structures are shown in Figure 11.8. There are no subsea structures within the Hornsea Three array area or within 1 km of the Hornsea Three array area. There are no active subsea structures within the Hornsea Three offshore cable corridor or within 1 km of the offshore cable corridor.

11.7.12.2 Subsea structures may require long term access by a mobile rig or vessel which is discussed in volume 2, chapter 8: Aviation, Military and Communication.

11.7.13 Wells

11.7.13.1 This section provides an overview of wells within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple). Wells are classified into four categories:

- Completed: when a well is completed it is ready for production (or injection);
- Drilling: wells in the process of being drilled (with drilling lasting several months);
- Plugged and abandoned (P&A): where a well has become non-productive or non-viable. The standard requirement is to remove the well head and cut and remove the casings 10 feet below the seabed (Oil and Gas UK, 2015b). The well is plugged with cement plugs and salvage of all recoverable equipment is undertaken; and
- Suspended: 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.

11.7.13.2 Completed, drilling and suspended wells are relevant to the assessment of Hornsea Three as they typically have a 500 m safety zone (completed and drilling wells) and/or may require long term access via helicopter to a mobile rig or vessel (completed and suspended wells). Helicopter access is discussed in volume 2, chapter 8: Aviation, Military and Communication. P&A wells do not have safety zones and will not be revisited and therefore are not considered further within this chapter.

11.7.13.3 There are no completed or drilling wells within the Hornsea Three array area and consultation has advised that well 49/08c-4 formerly operated by Wintershall is P&A. There is one suspended well within 1 km of the Hornsea Three array area (Figure 11.8). There are no completed, drilling or suspended wells within the Hornsea Three offshore cable corridor (Figure 11.8) however there are four completed wells within 1 km of the Hornsea Three offshore cable corridor.

11.7.14 Drilling and the placement of infrastructure

11.7.14.1 Agreements for Lease (AfL) have been granted by The Crown Estate for the Hornsea Three array area. Under the terms of the AfL, Hornsea Three has been granted certain rights which have taken effect from the date at which the AfL was granted. In the event an oil or gas operator wishes to drill within the AfL areas (or to drill outwith the AfL areas but in a location that requires some use of part of the AfL areas, such as a 500 m safety zone) they must obtain approval from the Secretary of State for those works.

11.7.14.2 Each AfL provides that following a request from the Secretary of State in order to allow oil or gas works to proceed, the Commissioners (of The Crown Estate) are entitled to terminate the relevant part of the AfL area that is required for the relevant works.

11.7.14.3 The 2011 ministerial statement entitled “Crown Estate Leases for Offshore Renewables Projects: Oil and Gas Clause”, and DECC guidance to give effect to this policy (DECC, 2014), state that prior to the Secretary of State confirming that the oil or gas works may proceed and requesting that the Commissioners terminate the relevant part of the AfL area, the two parties must agree an appropriate level of compensation between them for the disruption. Failing that, there is a route available to obtain an independent third party valuation based on ensuring that the wind operator is in no worse position than they would have been had the overlap not arisen. The oil or gas developer may make an application to the Secretary of State asking the Secretary of State to appoint an independent valuer and request that The Crown Estate determine a lease or agreement for lease if: 1) determination of an offshore renewable lease or agreement for lease is necessary in order for the oil or gas development to go ahead; and 2) the parties are unable to reach agreement on compensation. Only if these two conditions are satisfied will the Secretary of State consider ruling for determination of the AfL.

11.7.14.4 To this extent a 1 km restricted zone from either side of the AfL area has been considered as a maximum design scenario in the assessments to follow in section 11.11 and section 11.12. While neither the OGA nor the HSE stipulate a minimum separation distance that a well can be drilled from seabed infrastructure, this is based on the potential for 500 m safety zones to be applied for around oil and gas infrastructure and 500 m safety zones to be applied for around the Hornsea Three infrastructure (during the construction phase and/or operational and maintenance phase). It does not take into account the potential for 1,000 m advisory safety distances as these will be temporary and are not statutory.

11.7.14.5 In the event new platforms or subsea infrastructure are proposed, the operator would need to take into consideration any infrastructure within 9 nm of the proposed platform/subsea infrastructure in relation to helicopter access requirements (see volume 2, chapter 8: Aviation, Military and Communication).

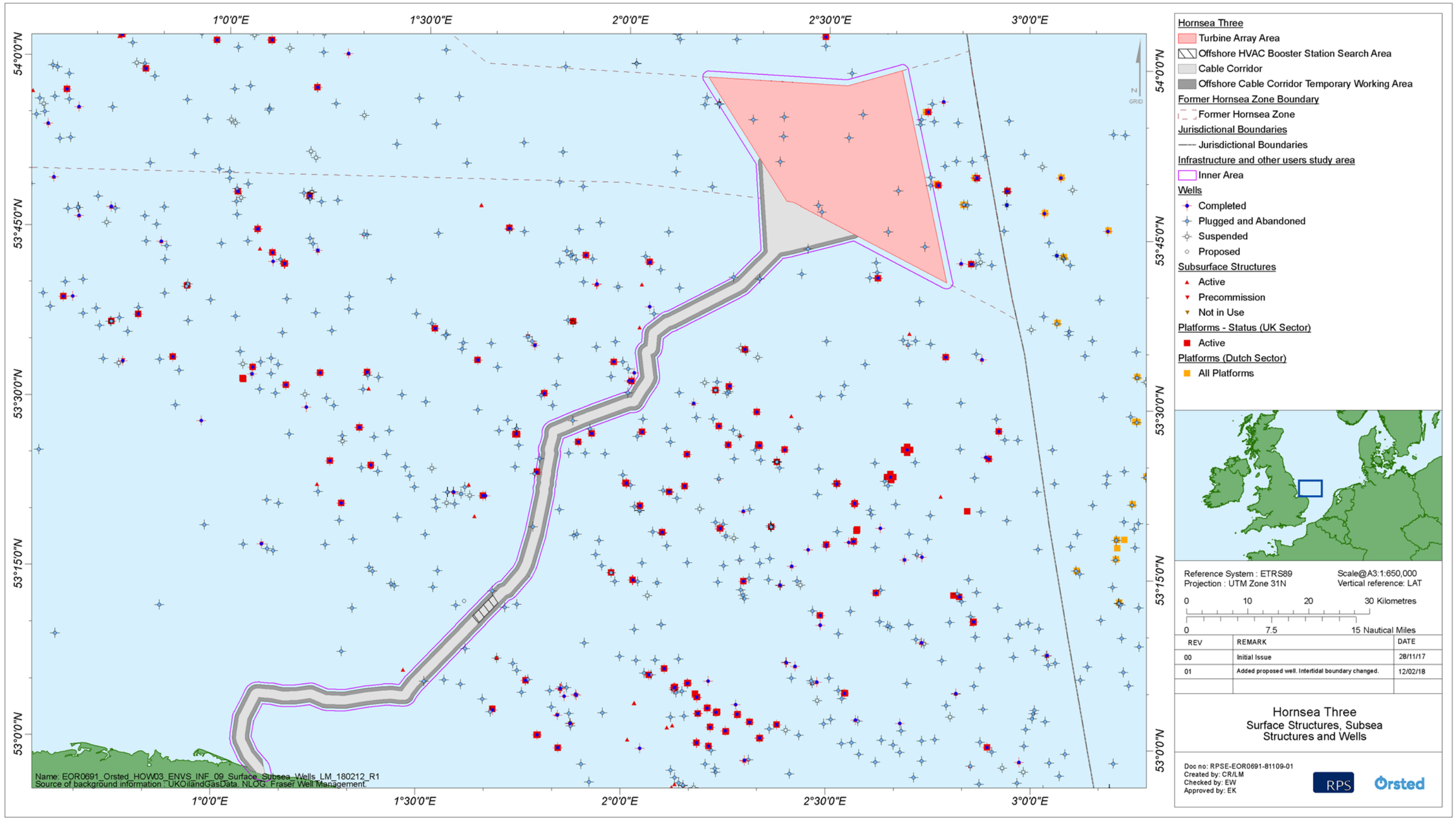

Figure 11.8: Surface, subsea structures and wells in the vicinity of Hornsea Three.

11.7.15 Pipelines

11.7.15.1 There are no pipelines located within the Hornsea Three array area or within 500 m of the Hornsea Three array area, however the Topaz to Schooner gas export and methanol umbilical pipelines are located within 1 km of the Hornsea Three array area. There are 27 active pipelines which intersect the Hornsea Three offshore cable corridor, and a further two active pipelines within 1 km of the Hornsea Three offshore cable corridor. Pipeline crossings are listed in Table 11.15. The two additional pipelines located within 1 km of the offshore cable corridor are listed in Table 11.16.

Table 11.15: Pipeline crossings within the Hornsea Three offshore cable corridor.

Crossing ID	Platform Source/Destination	Fluid	Operator
OID_8	SHEARWATER TO BACTON (SEAL)	Gas	Shell
OID_9	BACTON TO LANCELOT	Chemical	Perenco
OID_10	LANCELOT TO BACTON	Gas	Perenco
OID_13	ESMOND TO BACTON	Gas	Perenco
OID_14	CLIPPER PT TO BACTON	Gas	Shell
OID_15	BACTON TO CLIPPER PT	Chemical	Shell
OID_19	LOGGS PP TO ANGLIA YD GAS LINE	Gas	Ithaca
OID_20	LOGGS PP TO ANGLIA YD MEOH LINE	Methanol	Ithaca
OID_21	LOGGS PP TO THEDDLETHORPE MEOH LINE	Methanol	ConocoPhillips
OID_22	LOGGS PP TO THEDDLETHORPE GAS LINE	Gas	ConocoPhillips
OID_23	LOGGS TO CLIPPER SOUTH METHANOL PIPELINE	Methanol	INEOS
OID_24	CLIPPER SOUTH TO LOGGS GAS PIPELINE	Gas	INEOS
OID_26	Viking AR to Theddlethorpe Gas Line	Gas	ConocoPhillips
OID_27	Viking AR to Theddlethorpe Meoh Line	Methanol	ConocoPhillips
OID_28	Clipper PM to Skiff	Chemical	Shell
OID_29	Skiff to Clipper PM	Gas	Shell
OID_30	Galleon PN to Clipper PM	Gas	Shell
OID_31	Clipper PM to Galleon PN Meg	Chemical	Shell
OID_32	Clipper PM to Galleon PN Elec	Unknown	Shell
OID_36	Audrey WD to Loggs PP Meoh Line	Methanol	Spirit Energy
OID_37	Audrey WD to Loggs PP Gas Line	Gas	Spirit Energy
OID_38	Audrey XW to Alison KX	Unknown	ConocoPhillips
OID_39	Saturn ND to Loggs PR	Gas	ConocoPhillips
OID_40	Loggs PR to Saturn ND	Methanol	ConocoPhillips
OID_41	Ann XM to Loggs PR	Gas	Spirit Energy
OID_42	Carrack QA to Clipper PR	Unknown	Shell
OID_43	Clipper PR to Carrack QA	Unknown	Shell

Table 11.16: Pipelines within 1 km of the Hornsea Three offshore cable corridor.

Pipeline reference	Platform Source/Destination	Fluid	Operator
PL2838	ENSIGN NPAI TO AUDREY WD GAS EXPORT	Gas	Spirit Energy
PL2839	AUDREY TO ENSIGN METHANOL LINE	Methanol	Spirit Energy

11.7.15.2 Where the Hornsea Three export cables will be required to cross an active pipeline, it is intended that commercial crossing agreements 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 template will be used for the pipeline crossings. Where the Hornsea Three export cables are located 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 11.9.

11.7.16 Services associated with the oil and gas industry

11.7.16.1 The following services are associated with the oil and gas industry:

- Helicopters: the oil and gas industry relies on helicopters for personnel transfer and emergency evacuation. Helicopter and associated aviation considerations are addressed separately in volume 2, chapter 8: Aviation, Military and Communication;
- Vessels: the oil and gas industry requires supply or support vessels for its operations. Vessel access to oil and gas platforms and subsea infrastructure is considered within paragraph 11.11.2.88. Vessels and associated navigational considerations are addressed separately in volume 2, chapter 7: Shipping and Navigation;
- REWS: A variety of early warning systems are used to prevent vessel collision with an offshore oil and gas platform, including REWS. This system utilises radar mounted on the platform to detect and track vessels and provide collision warning when vessels are in breach of defined Closest Point of Approach (CPA) and Time to Closest Point of Approach (TCPA) parameters. When they reach a certain threshold an alarm is triggered. This value is set in accordance with the platform operator's own performance standards and typically consists of an amber alert and a red alarm indicating when vessel intervention or emergency procedures are required. The REWS radar does not work in isolation, but together with other radar and AIS data provides a field wide collision risk management system which protects the whole field. The REWS on one platform (and sometimes combined with the REWS on another platform) therefore protects a range of platforms. The REWS located within 60 km of the Hornsea Three array area are shown in Table 11.17 and Figure 11.7 together with the platforms that the REWS protect. Typically, the detection limit for a 100 m^2 radar cross section (RCS) target vessel is 30 km (16 nm) however this may vary depending on factors such as weather conditions. REWS systems which may be within line of sight of the Hornsea Three array area (considered to be a distance out to 35 km) include the J6A platform REWS operated by Spirit Energy and the Saturn and Murdoch platform REWS operated by ConocoPhillips. An assessment was carried out on the potential impact of Hornsea Three on the J6A platform REWS (Spirit Energy) and the Saturn platform REWS (ConocoPhillips) systems and is presented in paragraph 11.11.2.67. As the Murdoch platform REWS (ConocoPhillips) system has an overlapping coverage with the ConocoPhillips operated Katy platform REWS, considered to be outside the line of sight of the Hornsea Three array area, the Murdoch platform REWS was not considered within this assessment; 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 potential for subsea noise generated from piling activities to interfere with the seismic acoustic signal is addressed in paragraph 11.11.1.84

Table 11.17: Installations equipped with REWS within 60 km of the Hornsea Three array area.

Name of Platform	Other platforms protected by the REWS	Operator	Distance to Hornsea Three array area	
			nm	km
J6A	J6A	Spirit Energy	6.9	12.8
	Chiswick		1.5	2.7
	Markham ST-1		4.5	8.3
	Grove		2.4	4.5
	Windermere	INEOS	1.0	1.8
Murdoch	Murdoch	ConocoPhillips	16.9	31.3
	Katy		24.1	44.7
	Munro		26.8	49.7
	Boulton		15.3	28.3
	Caister		13.3	24.6
	Kelvin		21.1	39.1
Katy	As for the Murdoch REWS		24.1	44.7
Saturn	Saturn		17.7	32.7
	Tethys		15.3	28.4
	Mimas		22.1	40.9
	Viking KD		17.9	33.1
	Vulcan 2 UR		36.4	67.4
	Vampire OD		24.1	44.7
LOGGS	Input from Saturn REWS		28.8	53.3
Viking Bravo	Input from Saturn REWS		20.5	38
Europa EZ	Input from Saturn REWS		31.8	58.9

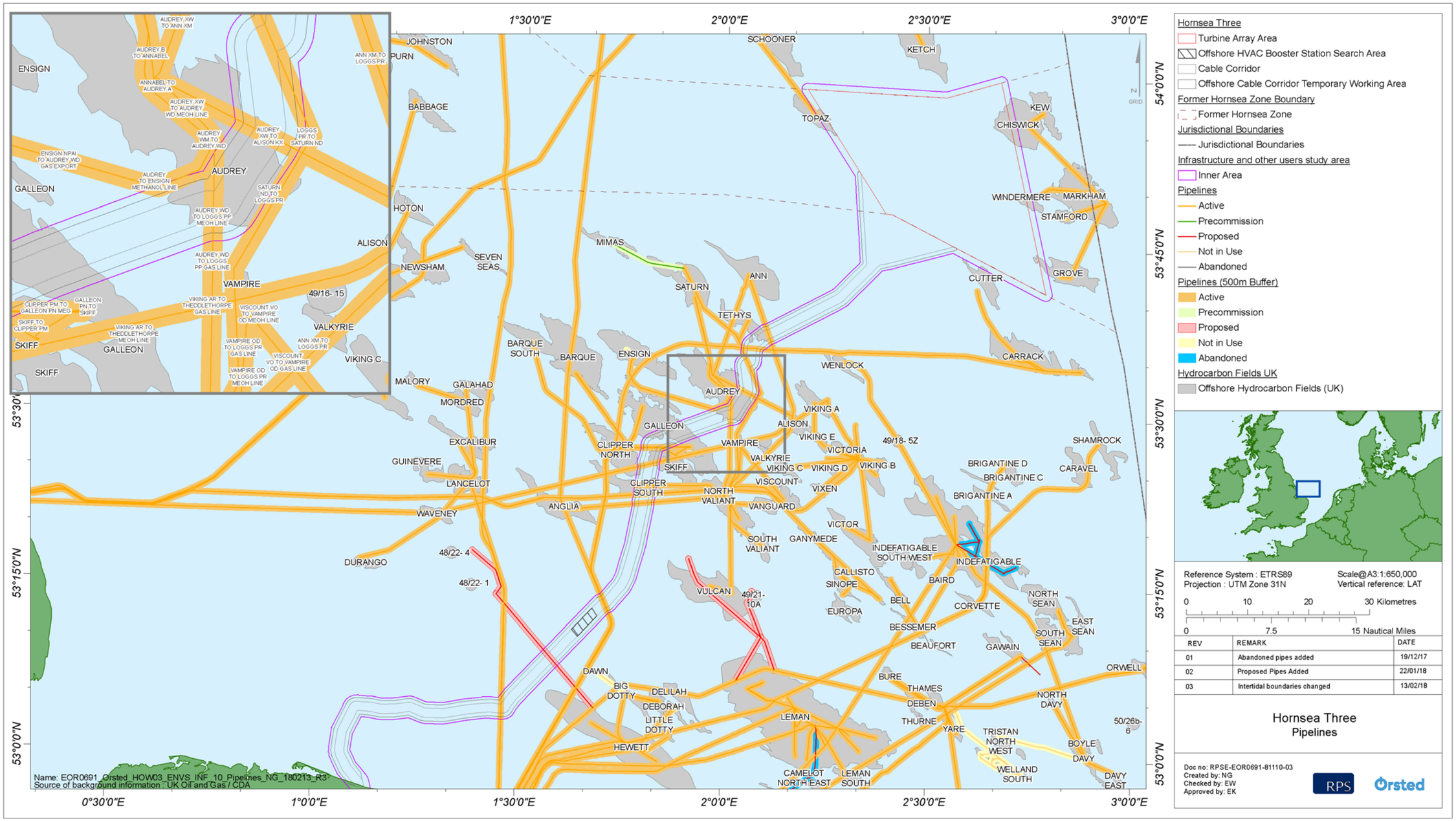

Figure 11.9: Pipelines located in the vicinity of Hornsea Three.

11.7.17 Future baseline scenario

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

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

11.7.17.3 The future baseline scenario for recreational activities is considered unlikely to change substantially from that presented in section 11.6.2.1 above, in the absence of Hornsea Three. The future baseline scenario for offshore cables, CCS, natural gas storage and underground coal gasification and marine aggregates is subject to gradual change as new projects/sites are identified. The future baseline scenario for oil and gas activities and associated development (including platforms, wells and pipelines) is considered to be subject to the greatest degree of change, which will depend upon currently unknown outcomes of, for example, acquisitions, exploration and development, and decommissioning.

11.7.17.4 In 2016 the OGA reported a continued decline in oil and gas production in the UKCS (continuing a gradual decline seen since the year 2000) (OGA, 2016b). While this decline is predicted to continue they report a range of possible outcomes because the future rate of production is dependent on such a large number of different and unknown factors, including the level of investment and the success of further exploration. Operators continue to find it difficult to predict production accurately as older fields mature and their reliability reduces. A significant share of future oil and gas production is expected to come from new fields and major projects in existing fields. With the recent dramatic fall in oil prices the projections are even less certain than normal. It is probably a reasonable assumption therefore that oil and gas activity will continue to decline. The potential for future activity within oil and gas licence blocks is however taken into account within this chapter.

11.7.18 Data limitations

11.7.18.1 The data sources used in this chapter are detailed in Table 11.5 above. The data used are the most up to date publicly available information which can be obtained from the applicable data sources as cited, and data that have been provided through consultation as detailed in section 11.6 above. The data are therefore limited by what is available and by what has been made available, at the time of writing the Environmental Statement.

11.7.18.2 Given the scale of consultation undertaken on behalf of the former Hornsea Zone in general (i.e. for Hornsea Project One, Hornsea Project Two and for Hornsea Three), it is considered that the data employed in the assessment are of a robust nature and are sufficient for the purposes of the impact assessment presented.

11.8 Key parameters for assessment

11.8.1 Maximum design scenario

11.8.1.1 The maximum design scenarios identified in Table 11.18, Table 11.19 and Table 11.20 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the details provided in the project description (volume 1, chapter 3: Project Description). Effects of greater significance are not predicted to arise should any other development scenario, based on details within the project Design Envelope (e.g. different turbine layout), to that assessed here be taken forward in the final design scheme.

11.8.1.2 Receptor groups have been divided into the following categories for ease of reference:

- Recreational users and recreational fishing;
- Aggregate extraction, cables and pipelines; and
- Oil and gas operations.

11.8.2 Impacts scoped out of the assessment

11.8.2.1 On the basis of the baseline environment and the project description outlined in volume 1, chapter 3: Project Description, a number of impacts are proposed to be scoped out of the assessment for infrastructure and other users. These impacts are outlined, together with a justification for scoping them out, in Table 11.21, Table 11.22 and Table 11.23.

Table 11.18: Maximum design scenario considered for the assessment of potential impacts on infrastructure and other users: recreational users and recreational fishing.

Potential impact	Maximum design scenario	Justification
Construction phase		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.	Total area of 1,182.2 km² (696 km² Hornsea Three array area + 301.2 km² Hornsea Three offshore cable corridor + 185 km² temporary working area) comprising: *Hornsea Three array area:* • Up to 300 wind turbines; • Up to 12 offshore transformer substations; • Up to four offshore HVDC substations; • Up to three offshore accommodation platforms; • Up to 830 km of array cables; • Up to 225 km of interconnector cables; • Up to 168 km of export cables (up to six trenches of 28 km length) within the Hornsea Three array area; • 500 m safety zones will be applied for around wind turbines and offshore platforms under construction; • Advisory safety distances of 1,000 m will be recommended around vessels undertaking construction activities; and Hornsea Three array area construction duration: up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of construction. Pre-construction activities will occur one to two years prior to the start of the eight year construction. The construction activities will occur over the following durations within the eight year construction period: • Foundation installation: up to 2.5 years; • Cable installation: up to 2.5 years; and • Substations and platforms: up to 38 months (two months per structure). *Hornsea Three offshore cable corridor:* • Up to six subsea HVAC booster stations on the seabed with piled foundations (50 m length x 50 m width x 15 m height above seabed); • Up to six export cable trenches, each up to 163 km in length (from Hornsea Three array area to Hornsea Three intertidal area); • 500 m safety zones will be applied for around offshore platforms under construction; • Advisory safety distances of 1,000 m will be recommended around vessels undertaking construction activities; Hornsea Three offshore cable corridor construction duration: up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of construction. Pre-construction activities will occur one to two years prior to the start of the eight year construction. The construction activities will occur over the following durations within the eight year construction period: • Subtidal cable installation: up to three years; • Intertidal cable installation: up to 24 months; and • Substations: up to 12 months (two months per substation).	The maximum amount of infrastructure within the Hornsea Three array area and offshore cable corridor leading to the longest construction period and the greatest area of displacement due to infrastructure, safety zones and advisory safety distances. Note: whilst the maximum design scenario presented for the Hornsea Three array area and the offshore cable corridor (in regard to the maximum number of substations) could not both occur simultaneously, this enables an assessment of the maximum design scenario for each location.

Potential impact	Maximum design scenario	Justification
Operation phase		

Hornsea Three infrastructure, safety zones and advisory safety distances associated with infrastructure and maintenance activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.	Total area of 997.2 km² (696 km² Hornsea Three array area + 301.2 km² Hornsea Three offshore cable corridor) for an anticipated design life of 35 years, comprising:
	
	Hornsea Three array area:
	
	• Up to 300 wind turbines;
	• Up to 12 offshore transformer substations;
	• Up to four offshore HVDC substations;
	• Up to three offshore accommodation platforms;
	• Up to 830 km of array cables;
	• Up to 225 km of interconnector cables;
	• Up to 168 km of export cables (up to six cables of 28 km length) within the Hornsea Three array area;
	• 500 m safety zones will be applied for around manned offshore platforms;
	• Maintenance activities within the Hornsea Three array area, consisting of:
	  o Offshore substation component exchange, painting and removal of organic build-up;
	  o Wind turbine component exchange, painting, organic waste removal, ladder replacement and anode replacement; and
	  o Array, interconnector and export cable with the Hornsea Three array area remedial burial and repairs.
	• 500 m safety zones will be applied for around wind turbines and offshore platforms undergoing major maintenance; and
	• Advisory safety distances of 1,000 m will be recommended around vessels undertaking major maintenance activities.
	
	Hornsea Three offshore cable corridor:
	
	• Up to four offshore HVAC booster stations
	• Up to six export cables, each up to 163 km in length (from Hornsea Three array area to landfall);
	• 500 m safety zones will be applied for around manned offshore platforms;
	• Maintenance activities within the Hornsea Three cable corridor, consisting of:
	  o Offshore substation component exchange, painting, removal of organic build-up, replacement of anodes and j-tube replacement; and
	  o Export cable with the Hornsea Three offshore cable corridor remedial burial and repairs.
	• Advisory safety distances of 1,000 m will be recommended around vessels during major maintenance activities.
		Parameters which lead to the greatest area of displacement due to infrastructure, safety zones and advisory safety distances. The above surface offshore HVAC booster stations represent the maximum design scenario (rather than subsea HVAC booster stations) due to the potential for operational safety zones.
		
		Note: whilst the maximum design scenario presented for the Hornsea Three array area and the offshore cable corridor (in regard to the maximum number of substations) could not both occur simultaneously, this enables an assessment of the maximum design scenario for each location.

Potential impact	Maximum design scenario	Justification
Decommissioning phase		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.	Total area of 997.2 km² (696 km² Hornsea Three array area + 301.2 km² Hornsea Three offshore cable corridor area) comprising: *Hornsea Three array area:* • Up to 300 wind turbines; • Up to 12 offshore transformer substations; • Up to four offshore HVDC substations; • Up to three offshore accommodation platforms; • Up to 830 km of array cables; • Up to 225 km of interconnector cables; • Up to 168 km of export cables (up to six trenches of 28 km length) within the Hornsea Three array area; • 500 m safety zones will be applied for around wind turbines and offshore platforms undergoing decommissioning; • Advisory safety distances of 1,000 m will be recommended around vessels undertaking decommissioning activities; and • Maximum decommissioning duration for the Hornsea Three array area: up to eight years (based on construction timeframes). *Hornsea Three offshore cable corridor:* • Up to six subsea HVAC booster stations on the seabed with piled foundations • Up to six export cables, each up to 163 km in length (from Hornsea Three array area to the Hornsea Three intertidal area); • 500 m safety zones will be applied for around offshore platforms undergoing decommissioning; • Advisory safety distances of 1,000 m will be recommended around vessels undertaking decommissioning activities; • Maximum decommissioning duration for the six subsea HVAC booster stations: up to 12 months (based on construction timeframes); and • Maximum decommissioning duration for the export cables: up to eight years (based on construction timeframes).	The greatest amount of infrastructure within the Hornsea Three array area and offshore cable corridor leading to the greatest area of displacement due to infrastructure, safety zones and advisory safety distances. Note: whilst the maximum design scenario presented for the Hornsea Three array area and the offshore cable corridor (in regard to the maximum number of substations) could not both occur simultaneously, this enables an assessment of the maximum design scenario for each location.

Table 11.19: Maximum design scenario considered for the assessment of potential impacts on infrastructure and other users: aggregate extraction, cables and pipelines.

Potential impact	Maximum design scenario	Justification
Construction phase		
Installation of Hornsea Three infrastructure may affect existing cables and pipelines or restrict access to cables and pipelines.	Total area of 1,182.2 km^2 (696 km^2 Hornsea Three array area + 301.2 km^2 Hornsea Three offshore cable corridor area + 185 km^2 temporary working area) comprising: <u>Hornsea Three array area:</u> • Up to 300 wind turbines; • Up to 12 offshore transformer substations; • Up to four offshore HVDC substations; • Up to three offshore accommodation platforms; • Up to 830 km of array cables; • Up to 225 km of interconnector cables; • Up to 168 km of export cables (up to six trenches of 28 km length) within the Hornsea Three array area: • 500 m safety zones will be applied for around wind turbines and offshore platforms under construction; • Advisory safety distances of 1,000 m will be recommended around vessels undertaking construction activities; and Hornsea Three array area construction duration: up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of construction. Pre-construction activities will occur one to two years prior to the start of the eight year construction. The construction activities will occur over the following durations within the eight year construction period: • Foundation installation: up to 2.5 years; • Cable installation: up to 2.5 years; and • Substations and platforms: up to 38 months (two months per structure). <u>Offshore cable corridor:</u> • Up to six subsea HVAC booster stations; • Up to 978 km of export cable (up to six trenches of 163 km length); • 500 m safety zones will be applied for around offshore platforms under construction. • Advisory safety distances of 1,000 m will be recommended around vessels undertaking construction activities. Hornsea Three offshore cable corridor construction duration: up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of construction. Pre-construction activities will occur one to two years prior to the start of the eight year construction. The construction activities will occur over the following durations within the eight year construction period: • Cable installation: up to three years; and • Substations: up to 12 months (two months per substation).	The maximum amount of infrastructure and associated safety zones and advisory safety distances leading to the crossing of the greatest number of existing pipelines and cables and the greatest sea area potentially affected. Note: whilst the maximum design scenario presented for the Hornsea Three array area and the offshore cable corridor (in regard to the maximum number of substations) could not both occur simultaneously, this enables an assessment of the maximum design scenario for each location.

Potential impact	Maximum design scenario	Justification
Installation of 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.	The maximum design scenario for potential increases in suspended sediment concentrations and deposition arising from Hornsea Three during construction are presented in full in volume 2, chapter 1, Marine Processes. A summary of this maximum design scenario is presented below. Total area of 1,182.2 km^2 (696 km^2 Hornsea Three array area + 301.2 km^2 Hornsea Three offshore cable corridor area + 185 km^2 temporary working area) comprising: <u>Hornsea Three array area</u>: Hornsea Three array area construction duration: up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of construction. Pre-construction activities will occur one to two years prior to the start of the eight year construction. The construction activities will occur over the following durations within the eight year construction period: • Foundation installation: up to 2.5 years; • Cable installation: up to 2.5 years; and • Substations and platforms: up to 38 months (two months per structure). *Foundation installation* Total sediment volume of up to 581,611 m^3, comprising: • Up to 113,104 m^3 from the installation of the largest turbine with monopile foundations (up to 160 monopiles); • Up to 253,338 m^3 from the installation of the offshore High Voltage Alternating Current (HVAC) collector substations with piled jacket foundations (up to 12 foundations); • Up to 193,962 m^3 from the installation of the offshore High Voltage Direct Current (HVDC) converter substations with piled jacket foundations (up to four foundations); and • Up to 21,207 m^3 from the installation of offshore accommodation platforms with monopile foundations (up to three monopiles); *Array cables* • Up to 4,980,000 m^3 from the installation of 830 km of cable installed by mass flow excavator; and • Up to 71,150 m^3 from sand wave clearance by dredging or mass flow excavation within the Hornsea Three array area (based on the Hornsea Three array area geophysical survey data combined with cable installation design specifications). *Interconnector cables* • Up to 1,350,000 m^3 from the installation of 225 km of cable installed by mass flow excavator. <u>Hornsea Three offshore cable corridor:</u> Hornsea Three offshore cable corridor construction duration: up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of construction. Pre-construction activities will occur one to two years prior to the start of the eight year construction. The construction activities will occur over the following durations within the eight year construction period: • Cable installation: up to three years; and • Substations: up to 12 months (two months per substation). *Export Cable Installation* • Up to 6,876,000 m^3 from the installation of 1,146 km of cable; and • Up to 979,090 m^3 from sandwave clearance via either a dredger or mass flow excavator within the Hornsea Three offshore cable corridor (based on the Hornsea Three offshore cable corridor geophysical survey data combined with cable installation design specifications);	Whilst a maximum design scenario is provided for this potential impact involving installation activities across the whole Hornsea Three array area and offshore cable corridor, it is noted that not all installation activities have the potential to interact with aggregate extraction sites in the vicinity of Hornsea Three as some of these activities are located at too great a distance for interaction to occur. Only Hornsea Three activities in close proximity to aggregate extraction sites have any potential for interaction. In terms of foundation installation, drilling for foundation installation has been selected as the maximum design scenario as this releases finer grained sediment which has the potential to deposit over a wider area, leading to the greatest potential to impact on aggregate resource. In the case of cables (both within the Hornsea Three array area and along the Hornsea Three offshore cable corridor), the greatest number and length of cables and greatest target burial depth have been assessed. Further details of the maximum design scenario (in terms of, for example, volumes of material disturbed and released, release rates etc.) for each foundation type and the cable route are provided in volume 2, chapter 1, Marine Processes.

Potential impact	Maximum design scenario	Justification
Operation phase		
Safety zones around Hornsea Three infrastructure and advisory safety distances associated with maintenance activities, may lead to a temporary loss of access to existing cables and pipelines for repair or maintenance.	Total area of 997.2 km² (696 km² Hornsea Three array area + 301.2 km² Hornsea Three offshore cable corridor area), for an anticipated design life of 35 years, comprising: <u>Hornsea Three array area</u>*:* • Up to 300 wind turbines; • Up to 12 offshore transformer substations; • Up to four offshore HVDC substations; • Up to three offshore accommodation platforms; • Up to 830 km of array cables; • Up to 225 km of interconnector cables; • Up to 168 km of export cables (up to six cables of 28 km length) within the Hornsea Three array area; • 500 m safety zones will be applied for around manned offshore platforms; • Maintenance activities within the Hornsea Three array area, consisting of: o Offshore substation component exchange, painting and removal of organic build-up; o Wind turbine component exchange, painting, organic waste removal, ladder replacement and anode replacement; and o Array, interconnector and export cable with the Hornsea Three array area remedial burial and repairs. • 500 m safety zones will be applied for around wind turbines and offshore platforms undergoing major maintenance; and • Advisory safety distances of 1,000 m will be recommended around vessels undertaking major maintenance activities. <u>Hornsea Three offshore cable corridor:</u> • Up to four offshore HVAC booster stations; • Up to six export cables of up to 163 km in length (from Hornsea Three array area to the Hornsea Three intertidal area); • 500 m safety zones will be applied for around manned offshore platforms; • Maintenance activities within the Hornsea Three offshore cable corridor, consisting of: o Offshore substation component exchange, painting, removal of organic build-up, replacement of anodes and j-tube replacement; and o Export cable with the Hornsea Three offshore cable corridor remedial burial and repairs. • Advisory safety distances of 1,000 m will be recommended around vessels during major maintenance activities.	Parameters which lead to the greatest area affected by infrastructure, safety zones and advisory safety distances. Above surface offshore HVAC booster stations represent the maximum design scenario (rather than subsea HVAC booster stations) due to the potential for operational safety zones. Note: whilst the maximum design scenario presented for the Hornsea Three array area and the offshore cable corridor (in regard to the maximum number of substations) could not both occur simultaneously, this enables an assessment of the maximum design scenario for each location.

Potential impact	Maximum design scenario	Justification
Decommissioning phase		
Removal of Hornsea Three infrastructure may affect existing cables and pipelines or restrict access to cables and pipelines.	Total area of 1,182.2 km^2 (696 km^2 Hornsea Three array area + 301.2 km^2 Hornsea Three offshore cable corridor + 185 km^2 temporary working area) comprising: Hornsea Three array area*:* • Up to 300 wind turbines; • Up to 12 offshore transformer substations; • Up to four offshore HVDC substations; • Up to three offshore accommodation platforms; • Up to 830 km of array cables to be decommissioned; • Up to 225 km of interconnector cables to be decommissioned; • Up to 168 km of export cables (up to six trenches of 28 km length) within the Hornsea Three array area; • Cable protection to be left in situ; • 500 m safety zones will be applied for around wind turbines and offshore platforms undergoing decommissioning; • Advisory safety distances of 1,000 m will be recommended around vessels undertaking decommissioning activities; and • Maximum decommissioning duration for the Hornsea Three array area: up to eight years based on construction timeframes. Hornsea Three offshore cable corridor*:* • Up to six subsea HVAC booster stations; • Up to 978 km of export cable (up to six trenches of 163 km length); • Cable protection to be left in situ; • 500 m safety zones will be applied for around offshore platforms undergoing decommissioning. • Advisory safety distances of 1,000 m will be recommended around vessels undertaking decommissioning activities. • Maximum decommissioning duration for the six subsea HVAC booster stations: up to 12 months (based on construction timeframes). • Maximum decommissioning (removal) duration for export cables: up to eight years (based on construction timeframes).	The maximum amount of infrastructure and associated safety zones and advisory safety distances leading to the crossing of the greatest number of existing cables and pipelines and the greatest sea area potentially affected. Note: whilst the maximum design scenario presented for the Hornsea Three array area and the offshore cable corridor (in regard to the maximum number of substations) could not both occur simultaneously, this enables an assessment of the maximum design scenario for each location.
Removal of 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.	The maximum design scenario for potential increases in suspended sediment concentrations and deposition arising from Hornsea Three during decommissioning are presented in full in volume 2, chapter 1, Marine Processes. A summary of this maximum design scenario is presented below. Total area of 1,182.2 km^2 (696 km^2 Hornsea Three array area + 301.2 km^2 Hornsea Three offshore cable corridor + 185 km^2 temporary working area) comprising: Hornsea Three array area*:* • Cutting off jacket foundations below the seabed surface will result in the greatest sea bed disturbance for a piled foundation scenario; • Removal of gravity base foundations will also result in local sea bed disturbance; • Removal of array, interconnector or export cables within the Hornsea Three array area; and • Maximum decommissioning duration for the Hornsea Three array area: up to eight years based on construction timeframes. Hornsea Three offshore cable corridor*:* • Cutting off jacket foundations below the seabed surface; • Removal of gravity base foundations; • Removal of export cables; and • Maximum decommissioning (removal) duration for export cables: up to eight years (based on construction timeframes).	When cutting off jacket foundations below the seabed surface, the greatest disturbance results from the greatest number of foundations. When removing gravity base foundations, the greatest disturbance results from the greatest number of foundations. When removing export, array, platform interconnector or offshore accommodation platform cables, only limited lengths are likely to be removed, from locations to be agreed at a later date. Note: Removal of jacket foundations and gravity base structure could not occur across the entire array area. Both options have been included here to ensure the maximum design scenario has been assessed.

Table 11.20: Maximum design scenario considered for the assessment of potential impacts on infrastructure and other users: oil and gas operations.

Potential impact	Maximum design scenario	Justification
Construction phase		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with the Hornsea Three array area may restrict potential seismic survey activity.	• Total area of 696 km² for Hornsea Three array area comprising: o Up to 300 wind turbines; o Up to 12 offshore transformer substations; o Up to four offshore HVDC substations; o Up to three offshore accommodation platforms; o Up to 830 km of array cables; o Up to 225 km of interconnector cables; and o Up to 168 km of export cables (up to six trenches of 28 km length) within the Hornsea Three array area. • 500 m safety zones will be applied for around wind turbines and offshore platforms under construction; • Advisory safety distances of 1,000 m will be recommended around vessels undertaking construction activities; and Hornsea Three array area construction duration: up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of construction. Pre-construction activities will occur one to two years prior to the start of the eight year construction. The construction activities will occur over the following durations within the eight year construction period: • Foundation installation: up to 2.5 years; • Cable installation: up to 2.5 years; and • Substations and platforms: up to 38 months (two months per structure).	Parameters that represent the largest area over which seismic survey activities may be restricted, and over the longest construction period. It should be noted construction will progress across the site over time to the full build out scenario presented. As the spatial programme is not known however the assessment considers the construction to start in any area that is applicable to the assessment as the maximum design scenario.
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances.	• Total area of 696 km² for Hornsea Three array area comprising: o Up to 300 wind turbines; o Up to 12 offshore transformer substations; o Up to four offshore HVDC substations; o Up to three offshore accommodation platforms; o Up to 830 km of array cables; o Up to 225 km of interconnector cables; and o Up to 168 km of export cables (up to six trenches of 28 km length) within the Hornsea Three array area. • 500 m safety zones will be applied for around wind turbines and offshore platforms under construction; • Advisory safety distances of 1,000 m will be recommended around vessels undertaking construction activities; and Hornsea Three array area construction duration: up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of construction. Pre-construction activities will occur one to two years prior to the start of the eight year construction. The construction activities will occur over the following durations within the eight year construction period: • Foundation installation: up to 2.5 years; • Cable installation: up to 2.5 years; and • Substations and platforms: up to 38 months (two months per structure).	Parameters that represent the largest area over which drilling activity or the siting of infrastructure would potentially be restricted, and over the longest construction period. It should be noted construction will progress across the site over time to the full build out scenario presented. As the spatial programme is not known however the assessment considers the construction to start in any area that is applicable to the assessment as the maximum design scenario.

Potential impact	Maximum design scenario	Justification
Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor may restrict potential seismic survey activity.	• Total area of 486.2 km² of Hornsea Three offshore cable corridor (301.2 km² offshore cable corridor + 185 km² temporary working area) comprising: o Up to six subsea HVAC booster stations (50 m length by 50 m width by 15 m height above seabed); and o Up to six export cables of up to 163 km in length (from the Hornsea Three array area to the Hornsea Three intertidal area). • 500 m safety zones will be applied for around offshore platforms under construction; • Advisory safety distances of 1,000 m will be recommended around vessels undertaking construction activities; Hornsea Three offshore cable corridor construction duration: up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of construction. Pre-construction activities will occur one to two years prior to the start of the eight year construction. The construction activities will occur over the following durations within the eight year construction period: • Cable installation: up to three years; and • Substations: up to 12 months (two months per substation).	Parameters that create the greatest disruption to seismic survey activities in terms of area affected and duration.
Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor.	• Total area of 486.2 km² of Hornsea Three offshore cable corridor (301.2 km² offshore cable corridor + 185 km² temporary working area) comprising: o Up to six subsea HVAC booster stations (50 m length by 50 m width by 15 m height above seabed); and o Up to six export cables of up to 163 km in length (from the Hornsea Three array area to the Hornsea Three intertidal area). • 500 m safety zones will be applied for around offshore platforms under construction; • Advisory safety distances of 1,000 m will be recommended around vessels undertaking construction activities; Hornsea Three offshore cable corridor construction duration: up to eight years over two phases. A gap of up to three years will occur between an activity finishing in the first phase and starting in the second phase of construction. Pre-construction activities will occur one to two years prior to the start of the eight year construction. The construction activities will occur over the following durations within the eight year construction period: • Cable installation: up to three years; and • Substations: up to 12 months (two months per substation).	Parameters that create the greatest disruption to drilling and the siting of infrastructure in terms of area affected and duration.
The piling of wind turbine and substation foundations will generate underwater noise that may acoustically interfere with seismic survey operations.	*Maximum design scenario – Spatial extent: monopile foundations with concurrent piling* Up to 319 monopiles (300 turbine foundations and 19 foundations for other infrastructure and platform foundations) • Piling of up to 300 monopile foundations; • Piling of up to 19 monopile foundations for substations and platforms including: o Three offshore accommodation platforms; o Twelve offshore transformer substations; and o Four offshore HVAC booster stations (on the Hornsea Three offshore cable route corridor). Maximum hammer energies defined as follows: • Absolute maximum hammer energy of up to 5,000 kJ (maximum that installation machinery is capable of); • Average maximum of 3,500 kJ (highest energy likely to be reached during piling events); and • Average hammer energy of 2,000 kJ (average hammer energy likely to be reached during piling). Maximum four hours piling duration per monopile (including 30 minute soft start) within a 24 hour period; Maximum total duration of actual piling is 1,276 hours (four x 319). Piling within Hornsea Three array area could occur as single vessel scenario or two concurrent vessels (at opposite ends of the site) although maximum design spatial scenario is for concurrent piling. Concurrent piling will occur only within the Hornsea Three array area and not within the Hornsea Three offshore cable corridor. Assumed that one monopile could be installed in each 24 hour period for single piling or up to two monopiles installed for concurrent piling, plus a 20% contingency allowance. Maximum number of days on which piling could occur is 319 days (i.e. average of one day per monopile foundation). Foundation installation could occur over 2.5 years in up to two phases with a gap of up to three years between phases. This includes foundation installation for the offshore HVAC booster substations within the Hornsea Three offshore cable corridor which is expected to occur within an eight month piling phase.	The spatial maximum design scenario equates to the greatest area of effect from subsea noise at any one time during piling. Volume 4, annex 3.1: Subsea Noise predicted the greatest area of effect was for 5,000 kJ hammer. The monopile foundation for the HVAC transmission option results in the maximum design scenario spatially. Two vessels piling concurrently at maximum spacing would result in the largest area of impact at any one time.

Potential impact	Maximum design scenario	Justification
	Maximum design scenario – Temporal duration: jacket foundations with single piling Up to 1,848 pin piles (1,200 for turbine foundations and 648 for other infrastructure and platform foundations). • Piling of up to 300 jacket foundations (four piles per foundation, each pin pile 4 m diameter), with up to 1,200 piles (300 x four) in total; • Piling of up to 19 jacket foundations, up to 4 m diameter, for substations and platforms including: o Three offshore accommodation platforms, with up to 72 piles (three x 24 piles per foundation) in total; o Twelve offshore transformer substations, with up to 288 piles (12 x 24 piles per foundation) in total; and o Four offshore HVDC converter substations, with up to 288 piles (four x 72 piles per foundation) in total. Maximum hammer energies defined as follows: • Absolute maximum hammer energy of up to 2,500 kJ (maximum that installation machinery is capable of); • Most likely maximum of 1,750 kJ (highest energy likely to be reached during piling events); and • Average hammer energy of 1,250 kJ (average hammer energy likely to be reached during piling). Maximum four hours piling duration per pile (including 30 minute soft start); Maximum total piling duration 7,392 hours of piling (four x 1,848). Piling could occur as single vessel scenario or two concurrent vessels (at opposite ends of the site) although maximum design temporal scenario is for single piling. Assuming that four pin piles could be installed per day, plus 20% contingency, the total number of days when jacket piling is likely to occur is 554 days. Foundation installation could occur over 2.5 years in up to two phases with a gap of up to three years between phases.	The temporal maximum design scenario represents the longest duration of effects from subsea noise. This scenario assumes piled foundations again but this time for jackets as this could result in a longer duration of piling per foundation. The pin pile foundation for the HVDC transmission option results in the maximum design scenario temporally. Scenario assumes longest duration of piling per pile (4 hours) and number of days piling is estimated assuming four pin piles for jacket foundations installed per day, although realistically there is potential to install up to eight piles in one day. Single vessel piling is assumed as this would prolong the total number of days on which piling could occur over the three years piling phase (although noting that the piling phase itself has not actually increased under this scenario).
Operation phase		
The presence of infrastructure within the Hornsea Three array area may restrict potential seismic survey activity.	• Total area of 696 km² of Hornsea Three array area comprising: o Up to 300 wind turbines; o Up to 12 offshore transformer substations; o Up to four offshore HVDC substations; o Up to three offshore accommodation platforms; o Up to 830 km of array cables; o Up to 225 km of interconnector cables; and o Up to 168 km of export cables (up to six cables of 28 km length) within the Hornsea Three array area. • 500 m safety zones will be applied for around manned offshore platforms; • Maintenance activities within the Hornsea Three array area, consisting of: o Offshore substation component exchange, painting and removal of organic build-up; o Wind turbine component exchange, painting, organic waste removal, ladder replacement and anode replacement; and o Array, interconnector and export cable with the Hornsea Three array area remedial burial and repairs. • 500 m safety zones will be applied for around wind turbines and offshore platforms undergoing major maintenance; • Advisory safety distances of 1,000 m will be recommended around vessels undertaking major maintenance activities; and • Anticipated design life of wind farm 35 years.	Parameters that create the greatest disruption to seismic survey activities in terms of area affected and duration.

Potential impact	Maximum design scenario	Justification
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances.	• Total area of 696 km^2 of Hornsea Three array area comprising: o Up to 300 wind turbines; o Up to 12 offshore transformer substations; o Up to four offshore HVDC substations; o Up to three offshore accommodation platforms; o Up to 830 km of array cables; o Up to 225 km of interconnector cables; and o Up to 168 km of export cables (up to six cables of 28 km length) within the Hornsea Three array area. • 500 m safety zones will be applied for around manned offshore platforms; • Maintenance activities within the Hornsea Three array area, consisting of: o Offshore substation component exchange, painting and removal of organic build-up; o Wind turbine component exchange, painting, organic waste removal, ladder replacement and anode replacement; and o Array, interconnector and export cable with the Hornsea Three array area remedial burial and repairs. • 500 m safety zones will be applied for around wind turbines and offshore platforms undergoing major maintenance; • Advisory safety distances of 1,000 m will be recommended around vessels undertaking major maintenance activities; and • Anticipated design life of wind farm 35 years.	Largest area over which drilling activity or the siting of infrastructure would potentially be restricted.
Safety zones around the offshore HVAC booster stations and advisory safety distances associated with maintenance activities underway along the offshore cable corridor may restrict potential seismic survey activity.	• Total area of 301.2 km^2 of Hornsea Three offshore cable corridor comprising: o Up to four offshore HVAC booster stations (90 m length by 90 m width by 90 m total height); and o Up to six export cables of up to 163 km in length (from the Hornsea Three array area to the Hornsea Three intertidal area). • 500 m safety zones will be applied for around manned offshore platforms; • Maintenance activities within the Hornsea Three cable corridor, consisting of: o Offshore substation component exchange, painting, removal of organic build-up, replacement of anodes and j-tube replacement; and o Export cable with the Hornsea Three offshore cable corridor remedial burial and repairs. • Advisory safety distances of 1,000 m will be recommended around vessels during major maintenance activities; and • Anticipated design life of wind farm 35 years.	Parameters that create the greatest disruption to seismic survey activities in terms of area affected and duration. Offshore HVAC booster stations represent the maximum design scenario (rather than subsea HVAC booster stations) due to the potential for operational safety zones.
Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor.	• Total area of 301.2 km^2 of Hornsea Three offshore cable corridor comprising: o Up to four offshore HVAC booster stations (90 m length by 90 m width by 90 m total height); and o Up to six export cables of up to 163 km in length (from the Hornsea Three array area to the Hornsea Three intertidal area). • 500 m safety zones will be applied for around manned offshore platforms. • Maintenance activities within the Hornsea Three cable corridor, consisting of: o Offshore substation component exchange, painting, removal of organic build-up, replacement of anodes and j-tube replacement; and o Export cable with the Hornsea Three offshore cable corridor remedial burial and repairs. • Advisory safety distances of 1,000 m will be recommended around vessels during major maintenance activities. • Anticipated design life of wind farm 35 years.	Parameters that create the greatest disruption to drilling and the siting of infrastructure in terms of area affected and duration.

Potential impact	Maximum design scenario	Justification
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.	• Total area of 696 km² of Hornsea Three array area comprising: o Up to 300 wind turbines (monopile foundation); o Up to 19 offshore platforms. Modelled dimensions (justification and alternative modelling discussed in volume 5, annex 11.1: Radar Early Warning Systems Technical Annex): • Layout A (an indicative layout with maximum number of turbines); • Turbine parameters (generic turbine geometry scaled to achieve the approximate dimensions of the proposed Hornsea Three turbines, with the maximum design scenario being the maximum number of turbines in the Hornsea Three array area); • Offshore platforms. Anticipated design life of wind farm 35 years.	Parameters that create the greatest number of turbines with the greatest radar cross section.
The presence of new wind turbines in previously open sea areas will deviate vessels which may cause a change in CPA and TCPA alarms on oil and gas platforms protected by REWS.	• Total area of 696 km² of Hornsea Three array area comprising: o Up to 300 wind turbines (monopile foundation); o Up to 19 offshore platforms. • Anticipated design life of wind farm 35 years.	Parameters that create the greatest disruption to vessel access in terms of area affected and duration.
Wind turbines and associated infrastructure will form a physical obstruction and may disrupt vessel access to oil and gas platforms and subsea infrastructure.	Anticipated design life of wind farm 35 years. *Hornsea Three array area:* • Up to 300 wind turbines; • Up to 12 offshore transformer substations; • Up to four offshore HVDC substations; • Up to three offshore accommodation platforms; • 500 m safety zones will be applied for around manned offshore platforms; • Maintenance activities within the Hornsea Three array area, consisting of: o Offshore substation component exchange, painting and removal of organic build-up; o Wind turbine component exchange, painting, organic waste removal, ladder replacement and anode replacement; and o Array, interconnector and export cable with the Hornsea Three array area remedial burial and repairs. • 500 m safety zones will be applied for around wind turbines and offshore platforms undergoing major maintenance; and • Advisory safety distances of 1,000 m will be recommended around vessels undertaking major maintenance activities. *Hornsea Three offshore cable corridor:* • Up to four offshore HVAC booster stations (90 m length by 90 m width by 90 m total height); • Up to six export cables of up to 163 km in length (from the Hornsea Three array area to the Hornsea Three intertidal area); • 500 m safety zones will be applied for around manned offshore platforms; • Maintenance activities within the Hornsea Three cable corridor, consisting of: o Offshore substation component exchange, painting, removal of organic build-up, replacement of anodes and j-tube replacement; and o Export cable with the Hornsea Three offshore cable corridor remedial burial and repairs. • Advisory safety distances of 1,000 m will be recommended around vessels during major maintenance activities.	Parameters that create the greatest disruption to vessel access in terms of area affected and duration. Note: whilst the maximum design scenario presented for the Hornsea Three array and the offshore cable corridor (in regard to the maximum number of substations) could not both occur simultaneously, this enables an assessment of the maximum design scenario for each location.

Potential impact	Maximum design scenario	Justification
Decommissioning phase		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with decommissioning of the Hornsea Three array area may restrict potential seismic survey activity.	• Total area of 696 km² Hornsea Three array area comprising: o Up to 300 wind turbines; o Up to 12 offshore transformer substations; o Up to four offshore HVDC substations; o Up to three offshore accommodation platforms. o Up to 830 km of array cables; o Up to 225 km of interconnector cables; and o Up to 168 km of export cables (up to six cables of 28 km length) within the Hornsea Three array area. • 500 m safety zones will be applied for around wind turbines and offshore platforms undergoing decommissioning; • Advisory safety distances of 1,000 m will be recommended around vessels undertaking decommissioning activities; and • Maximum decommissioning duration for the Hornsea Three array area: up to eight years (based on construction timeframes).	Parameters that represent the largest area over which seismic survey activities may be restricted, and over the longest duration.
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances.	• Total area of 696 km² of Hornsea Three array area comprising: o Up to 300 wind turbines; o Up to 12 offshore transformer substations; o Up to four offshore HVDC substations; o Up to three offshore accommodation platforms; o Up to 830 km of array cables; o Up to 225 km of interconnector cables; and o Up to 168 km of export cables (up to six cables of 28 km length) within the Hornsea Three array area. • 500 m safety zones will be applied for around wind turbines and offshore platforms undergoing decommissioning; • Advisory safety distances of 1,000 m will be recommended around vessels undertaking decommissioning activities; and • Maximum decommissioning duration for the Hornsea Three array area: up to eight years (based on construction timeframes).	Parameters that represent the largest area over which drilling activity or the siting of infrastructure would be restricted, and over the longest duration.
Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor may restrict potential seismic survey activity.	• Total area of 486.2 km² of Hornsea Three offshore cable corridor (301.2 km² offshore cable corridor + 185 km² temporary working area) comprising: o Up to six offshore HVAC booster stations (50 m length by 50 m width by 15 m height above seabed); and o Up to six export cables of up to 163 km in length (from the Hornsea Three array area to the Hornsea Three intertidal area). • 500 m safety zones will be applied for around offshore platforms undergoing decommissioning; • Advisory safety distances of 1,000 m will be recommended around vessels undertaking decommissioning activities; • Maximum decommissioning (removal) duration for the six subsea HVAC booster stations: up to 12 months (based on construction timeframes); and • Maximum decommissioning (removal) duration for export cables: up to eight years (based on construction timeframes).	Parameters that create the greatest disruption to seismic survey activities in terms of area affected and duration.
Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor.	• Total area of 486.2 km² of Hornsea Three offshore cable corridor (301.2 km² offshore cable corridor + 185 km² temporary working area) comprising: o Up to six offshore HVAC booster stations (50 m length by 50 m width by 15 m height above seabed); and o Up to six export cables of up to 163 km in length (from the Hornsea Three array area to the Hornsea Three intertidal area). • Cable protection shall be left in situ; • 500 m safety zones will be applied for around offshore platforms undergoing decommissioning; • Advisory safety distances of 1,000 m will be recommended around vessels undertaking decommissioning activities; • Maximum decommissioning (removal) duration for the six subsea HVAC booster stations: up to 12 months (based on construction timeframes); and • Maximum decommissioning (removal) duration for export cables: up to eight years (based on construction timeframes).	Parameters that create the greatest disruption to drilling and the siting of infrastructure in terms of area affected and duration.

Table 11.21: Impacts scoped out of the assessment for infrastructure and other users: recreational users and recreational fishing.

Potential impact	Justification
Construction phase	
Safety zones and advisory safety distances associated with activities within the Hornsea Three array area may displace kite surfing, kayaking, surfing and diving activities resulting in a loss of recreational resource.	Due to the distance offshore of the Hornsea Three array area (approximately 65 nm at closest point), kite surfing, surfing, windsurfing, sea/surf kayaking, canoeing and SCUBA activities are considered extremely unlikely to take place in this area. This was agreed by PINS in their scoping opinion (PINS, 2016).
Hornsea Three construction activities may result in wave effects resulting in a change to the surfing waves and surf breaks recreational resource.	Due to the distance offshore of the Hornsea Three array area (approximately 65 nm at the closest point) and the marine processes wave assessment (see volume 2, chapter 1: Marine Processes) which has identified no significant wave effects from Hornsea Three during the operation (considered as the maximum design scenario as reflects the maximum build out of Hornsea Three), any effect on nearshore waves or surf breaks are considered extremely unlikely to take place in this area.
Hornsea Three construction activities may result in sediment plumes which may overlap with diving sites.	There are no SCUBA diving sites highlighted within the Hornsea Three array area or along the majority of the offshore cable corridor, with the exception of at the cable landfall location (Figure 11.2). Volume 2, chapter 1: Marine Processes provides an assessment of the potential for Hornsea Three construction activities to cause elevations in suspended sediment concentrations. The predicted spatial extent of sediment plumes from construction within the Hornsea Three array area do not overlap with any SCUBA diving sites. Whilst the predicted elevations in suspended sediments associated with the construction activities along the offshore cable corridor may overlap with some inshore SCUBA diving sites, this will occur over a very short duration, and any deposition arising from the activities in the vicinity of these sites will be of a very low magnitude (see volume 2, chapter 1: Marine Processes). Due to the very low impact magnitude, impacts upon recreational diving have been scoped out of this assessment.
Operation phase	
The physical presence of the Hornsea Three array area and safety zones and advisory safety distances associated with infrastructure and maintenance activities may displace kite surfing, kayaking, surfing and diving activities resulting in a loss of recreational resource.	Due to the distance offshore of the Hornsea Three array area (approximately 65 nm at closest point), kite surfing, surfing, windsurfing, sea/surf kayaking, canoeing and SCUBA activities are considered extremely unlikely to take place in this area. This was agreed by PINS in their scoping opinion (PINS, 2016).
The physical presence of Hornsea Three may result in wave effects resulting in a change to the surfing waves and surf breaks recreational resource.	Due to the distance offshore of the Hornsea Three array area (approximately 65 nm at the closest point) and the marine processes wave assessment (see volume 2, chapter 1: Marine Processes) which has identified no significant wave effects from Hornsea Three operation, any effect on nearshore waves or surf breaks are considered extremely unlikely to take place in this area.
Decommissioning phase	
Safety zones and advisory safety distances associated with activities within the Hornsea Three array area may displace kite surfing, kayaking, surfing and diving activities resulting in a loss of recreational resource.	Due to the distance offshore of the Hornsea Three array area (approximately 65 nm at closest point), kite surfing, surfing, windsurfing, sea/surf kayaking, canoeing and SCUBA activities are considered extremely unlikely to take place in this area. This was agreed by PINS in their scoping opinion (PINS, 2016).

Table 11.22: Impacts scoped out of the assessment for infrastructure and other users: aggregate extraction, marine disposal sites, cables and pipelines.

Potential impact	Justification
Construction, operation and decommissioning phases	
Impact on access to marine aggregate extraction areas	Restriction of access to marine aggregate extraction sites has been scoped out of the assessment on the basis that there are no marine aggregate extraction sites within the Hornsea Three array area or offshore cable corridor. Any restriction of access would therefore be associated with advisory safety distances around vessels carrying out export cable installation or maintenance activities, which would be temporary, transient and of limited spatial extent compared with the size of the aggregate areas.
Impact on optimal aggregate resource areas	The Hornsea Three array area does not overlap any optima aggregate resource areas. The Hornsea Three offshore cable corridor crosses an optimal aggregate resource area but the footprint of the Hornsea Three offshore cable corridor is only 1.5% of the optimal aggregate resource area. The overall footprint of Hornsea Three relative to the available aggregate in that location is therefore considered to be de minimis. As such, impact on optimal aggregate resource areas have been scoped out of the assessment.
Impact on marine disposal sites	There are no marine disposal sites within the Hornsea Three array area or the offshore cable corridor. The nearest sites are those associated with Hornsea Project One and Hornsea Project Two. The assessment completed in volume 2, chapter 1: Marine Processes concludes that the deposition of sediment to the seabed, at measurable thicknesses, due to Hornsea Three construction activities will be localised and would not extend to these disposal sites. In addition, volume 2, chapter 1: Marine Processes concludes that the operational presence of Hornsea Three will not alter regional sediment transport pathways. As such, there is not anticipated to be any physical impact on these sites and so disposal sites have been scoped out of the assessment.
Impact on cables and pipelines from scour and sediment mobilisation resulting from Hornsea Three	Impacts upon cables and pipelines may arise as a result of physical impacts upon marine processes arising from Hornsea Three resulting in scour and sediment mobilisation. An assessment has been completed in volume 2, chapter 1: Marine Processes of the changes to physical process regimes predicted to occur as a result of the construction, operation and decommissioning of Hornsea Three. This included an assessment of changes to the tidal regime (e.g. tidal flows) and concluded that changes to current speeds resulting from the operational presence of Hornsea Three will be limited to within the Hornsea Three array area and a narrow region just outside the boundary. As such, indirect impacts on surrounding infrastructure (e.g. cables and pipelines) due to predicted changes to physical process are not anticipated to occur. In addition, a first-order estimate has been performed of the scour potential due to the presence of the turbine foundation structures in the Hornsea Three array area. The results of this scour assessment are presented in chapter 1: Marine Processes. From this assessment, it is not anticipated that scour associated with individual turbine foundation structures will impact upon surrounding infrastructure, such as cables and pipelines, therefore this impact has been scoped out of the assessment.

Table 11.23: Impacts scoped out of the assessment for infrastructure and other users: airborne noise.

Potential impact	Justification
Construction phase	
Piling activities will generate construction noise that may exceed guideline levels for commercial fishing vessels and commercial shipping traffic	The assessment for Hornsea Project Two concluded that potential airborne noise effects from piling were negligible for receptors on board 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 on board commercial fishing vessels and commercial ships has therefore been scoped out of this assessment. This was agreed by the Secretary of State in the Hornsea Three Scoping Opinion (PINS, 2016).
Piling activities will generate construction noise that may exceed guideline levels for manned gas platforms	The assessment for Hornsea Project Two concluded that potential airborne noise effects from piling were negligible for receptors on board gas platforms. The nearest manned gas platform to Hornsea Three (Schooner A platform) is located at a greater distance from the Hornsea Three project boundary compared with Hornsea Project Two. The effect of airborne noise from piling on receptors on board gas platforms has therefore been scoped out of this assessment. This was agreed by the Secretary of State in the Hornsea Three Scoping Opinion (PINS, 2016).
Piling activities will generate construction noise that may exceed guideline levels for residential onshore receptors and leisure and recreational receptors	The assessment for Hornsea 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. This was agreed by the Secretary of State in the Hornsea Three Scoping Opinion (PINS, 2016).
Operation phase	
Airborne noise may exceed guideline levels for commercial fishing vessels and commercial shipping traffic	The assessment for Hornsea Project Two concluded that potential operational noise effects were negligible for receptors on board 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 on board commercial fishing vessels and commercial shipping traffic has therefore been scoped out of this assessment. This was agreed by the Secretary of State in the Hornsea Three Scoping Opinion (PINS, 2016).
Airborne noise may exceed guideline values for offshore accommodation platforms	The assessment for Hornsea Project Two concluded that potential operational noise effects were negligible for receptors on board gas accommodation platforms. The nearest gas platform with accommodation to Hornsea Three (Schooner A platform) is located at a greater distance from the Hornsea Three project boundary compared with Hornsea Project Two. The effect of operational noise for receptors on board gas accommodation platforms has therefore been scoped out of this assessment. This was agreed by the Secretary of State in the Hornsea Three Scoping Opinion (PINS, 2016).
Airborne noise may exceed guideline levels for residential onshore receptors and leisure and recreational receptors	The assessment for Hornsea 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. This was agreed by the Secretary of State in the Hornsea Three Scoping Opinion (PINS, 2016).
Decommissioning phase	
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 on board commercial fishing vessels and commercial ships has therefore been scoped out of this assessment. This was agreed by the Secretary of State in the Hornsea Three Scoping Opinion (PINS, 2016).
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 on board gas accommodation platforms has therefore been scoped out of this assessment. This was agreed by the Secretary of State in the Hornsea Three Scoping Opinion (PINS, 2016).
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. This was agreed by the Secretary of State in the Hornsea Three Scoping Opinion (PINS, 2016).

11.9 Impact assessment methodology

11.9.1 Overview

11.9.1.1 The infrastructure and other users EIA has followed the methodology set out in volume 1, chapter 5: Environmental Impact Assessment Methodology. Specific to the infrastructure and other users EIA, the following guidance documents/references have also been considered:

- The RYA's Position on Offshore Renewable Energy Developments: Paper 1 (of 4) – 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, March 2016);
- The International Cable Protection Committee (ICPC) recommendations:
    - 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).
- Oil and Gas Licencing Rounds (OGA, 2016a);
- Oil and Gas UK, Pipeline Crossing Agreement and Proximity Agreement Pack (Oil and Gas UK, 2015a); and
- TCE Guidance: Offshore wind farms and electricity export cables – crossing agreements (TCE, 2012).

11.9.2 Impact assessment criteria

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

11.9.2.2 The criteria for defining sensitivity in this chapter are outlined in Table 11.24 below.

Table 11.24: Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition used in this chapter
Very High	Receptor or the activities of the receptor is of critical importance to the local, regional or national economy and/or the receptor or the activities of the receptor is highly vulnerable to impacts that may arise from the project and/or recoverability is long term or not possible.
High	Receptor or the activities of the receptor is of high value to the local, regional or national economy and/or the receptor or the activities of the receptor is generally vulnerable to impacts that may arise from the project and/or recoverability is slow and/or costly.
Medium	Receptor or the activities of the receptor is of moderate value to the local, regional or national economy and/or the receptor or the activities of the receptor is somewhat vulnerable to impacts that may arise from the project and/or has moderate to high levels of recoverability.
Low (or lower)	Receptor or the activities of the receptor is of low value to the local, regional or national economy and/or the receptor or the activities of the receptor is not generally vulnerable to impacts that may arise from the project and/or has high recoverability.
Negligible	Receptor or the activities of the receptor is of negligible value to the local, regional or national economy and/or the receptor or the activities of the receptor is not vulnerable to impacts that may arise from the project and/or has high recoverability.

11.9.2.3 The criteria for defining magnitude in this chapter are outlined in Table 11.25 below.

Table 11.25: Definition of terms relating to the magnitude of an impact.

Magnitude of impact	Definition used in this chapter
Major	Total loss of ability to carry on activities and/or impact is of extended physical extent and/or long term duration (i.e. total life of project) and/or frequency of repetition is continuous and/or effect is not reversible for project) (Adverse).
Moderate	Loss or alteration to significant portions of key components of current activity and/or physical extent of impact is moderate and/or medium term duration (i.e. operational period) and /or frequency of repetition is medium to continuous and/or effect is not reversible for project phase (Adverse).
Minor	Minor shift away from baseline, leading to a reduction in level of activity that may be undertaken and/or physical extent of impact is low and/or short to medium term duration (i.e. construction period) and /or frequency of repetition is low to continuous and/or effect is not reversible for project phase (Adverse).
Negligible	Very slight change from baseline condition and/or physical extent of impact is negligible and/or short term duration (i.e. less than two years) and/or frequency of repetition is negligible to continuous and/or effect is reversible (Adverse).
No change	No change from baseline conditions.

11.9.2.4 The significance of the effect upon infrastructure and other users is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 11.26. Where a range of significance of effect is presented in Table 11.26, the final assessment for each effect is based upon expert judgement.

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

Table 11.26: Matrix used for the assessment of the significance of the effect.

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

Oil and gas assessments with uncertainty associated with future activities

11.9.2.6 Assessments have been undertaken to consider the potential impacts of Hornsea Three on oil and gas activity. For certain impacts, these assessments can be complicated by the fact that future oil and gas plans have varying degrees of certainty associated with them. The approach outlined below has been taken for these impacts (both in isolation and within the cumulative assessment) to reflect the uncertainty.

11.9.2.7 Initially, consideration has been given to the oil and gas licence blocks within the infrastructure and other users study area (see Figure 11.1, Inner Area, denoted in purple). An assessment has then been undertaken for those licenced oil and gas blocks in which the licence terms temporally overlap with the construction and/or operation and maintenance and/or decommissioning phases of Hornsea Three (see section 11.7.9), and:

- The licence operator has the appropriate licences and consents needed to undertake the specific activity which is being assessed; and/or
- There is sufficient information in the public domain (available either through consultation or publicly available documents) regarding the future activity for an assessment to be undertaken.

11.9.2.8 Licenced blocks where the licence terms extend beyond the start of the offshore construction date of Hornsea Three (i.e. 2022 and beyond, meaning a temporal overlap exists) but for which the criteria listed above are not met (i.e. a licence operator does not hold the appropriate licences and consents needed to undertake a specific activity, and/or there is insufficient information available either through consultation or in the public domain to undertake an assessment), have been considered within the assessment, although no conclusion has been reached on the magnitude of the impact or the sensitivity of receptor. This is because there is no temporal and/or spatial information currently available on any future activities and no conceptual overlap can therefore be identified between Hornsea Three and the activity being assessed.

11.9.2.9 Oil and gas blocks which are currently unlicensed have not been considered in the EIA on the basis of no information (and therefore low data confidence) on future potential activities. Blocks which are currently licenced, although the terms of the licence expire prior to the offshore construction phase (i.e. prior to 2022) and/or operation and maintenance phase, and/or decommissioning phase of Hornsea Three (see section 11.7.9), have not been considered on the basis of no temporal overlap.

11.10 Measures adopted as part of Hornsea Three

11.10.1.1 As part of the project design process, a number of designed-in measures have been proposed to reduce the potential for impacts on infrastructure and other users (see Table 11.27). As there is a commitment to implementing these measures, they are considered inherently part of the design of Hornsea Three and have therefore been considered in the assessment presented in section 11.11 below (i.e. the determination of magnitude and therefore significance assumes implementation of these measures). These measures are considered standard industry practice for this type of development.

Table 11.27: Designed-in measures adopted as part of Hornsea Three.

Measures adopted as part of Hornsea Three	Justification
A cable crossing agreement will be established with relevant cable operators. This agreement will include the ability of a cable operator to access their cable during construction if required. If such works are required to occur simultaneously, consultation with the cable operator will be undertaken.	To reduce potential conflict at cable crossing locations. Such agreements would likely be based on the templates (OP115) provided by Oil and Gas UK (Oil and Gas UK, 2015a).
The crossing or laying of marine export cables from Hornsea Three over or adjacent to existing or future pipelines will be subject to pipeline crossing/proximity agreements between Hornsea Three and the pipeline operators, prior to the start of the construction phase.	To reduce potential conflict at pipeline crossing locations.
Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licensees.	To promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.
Hornsea Three intends to apply for a standard 500 m safety zone (as per the 2007 Safety Zone regulations cited in the justification column), around each of the wind turbines, offshore transformer substations, offshore HVDC converter stations, accommodation platforms and the offshore HVAC booster stations whilst construction/decommissioning works are ongoing. Safety zones of 50 m may be sought for incomplete structures where construction/decommissioning activity may be temporarily paused (and therefore the 500 m safety zone has lapsed). During the operational phase a 500 m safety zone shall also be applied for around manned offshore platforms, and around wind turbines and offshore platforms undergoing major maintenance.	Safety zones are established in the interests of safety to infrastructure and other users receptors, in accordance with The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007.
1,000 m advisory safety distances will be recommended around vessels undertaking construction, major maintenance and decommissioning activities.	Advisory safety distances are recommended in the interests of safety to other marine users, particularly navigational safety.
Promulgation of information including regular Notices to Mariners, navigational aids and marine charting updates will be utilised. Information and notices will also be posted at the landfall location.	To ensure other marine users are aware of wind farm operations.
At the time of decommissioning, Hornsea Three shall consult with BEIS and any other relevant bodies to determine whether safety zones will be required for the decommissioning of Hornsea Three.	Safety zones are established in the interests of safety to infrastructure and other users receptors, in accordance with The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007.
It is a condition of the Hornsea Project Two Development Consent Order (DCO) to mitigate any adverse impacts from Hornsea Project Two on the Saturn REWS to ensure the safety of the Saturn, Mimas and Tethys platforms. Schedule 1, Part 3, requirement 25 of the Hornsea Project Two DCO requires that construction of any Hornsea Project Two wind turbine may not commence until the Secretary of State, having consulted with ConocoPhillips, is satisfied that appropriate mitigation will be implemented and maintained for the life of Hornsea Project Two. This mitigation is currently being progressed by Hornsea Project Two, and although it is not currently in place, it is assumed to be a designed-in measure adopted as part of Hornsea Three. This is because Hornsea Project Two will be constructed in advance of Hornsea Three and therefore this mitigation will be in place prior to the start of construction of Hornsea Three.	There is very little effect on the REWS located on the Saturn platform from the Hornsea Three turbines due to their distance from the platform. As such, the mitigation measures described for Hornsea Project Two shall reduce the potential for any cumulative effect to arise with Hornsea Three on the ConocoPhillips operated REWS located on the Saturn platform.
Mitigation measures shall be put in place to reduce the effect of Hornsea Three on the REWS on the J6A platform. The mitigation measures will be based on the mitigation measures identified for Hornsea Project Two for the Saturn platform (see row above) and developed in consultation with Spirit Energy.	The mitigation shall ensure that the effect of Hornsea Three on the REWS on the J6A platform is reduced to a level that is not significant in EIA terms.

11.11 Assessment of significance

11.11.1 Construction phase

11.11.1.1 The impacts of the offshore construction of Hornsea Three have been assessed on infrastructure and other users. The potential impacts arising from the construction of Hornsea Three are listed in Table 11.18, Table 11.19 and Table 11.20 along with the maximum design scenario against which each construction phase impact has been assessed.

11.11.1.2 A description of the potential effect on infrastructure and other users receptors caused by each identified impact is given below. The receptors have been divided into categories, as per Table 11.18, Table 11.19 and Table 11.20, for ease of reference.

Recreational users and recreational fishing

Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.

Magnitude of impact

11.11.1.3 The installation of infrastructure and the presence of safety zones and advisory safety distances during the construction phase may result in the displacement of recreational craft and recreational fishing vessels from the Hornsea Three array area and along the offshore cable corridor.

11.11.1.4 The spatial extent of the Hornsea Three array area is small in the context of the available sailing area in the southern North Sea, covering approximately 696 km^2, with the potential for safety zones and advisory safety distances to extend up to 500 m and 1,000 m respectively beyond this area. The impact of safety zones and advisory safety distances is mostly reversible as once each structure has been installed and commissioned these will be removed. The exception is for manned offshore platforms, where 500 m safety zones will be applied for throughout the operational phase. Construction of the Hornsea Three array area could take up to eight years over two phases (with a gap of up to three years between an activity finishing in the first phase and starting in the second phase of construction). The level of recreational activity within the Hornsea Three array area is low, and recreational fishing activity is likely to be limited, giving a very low frequency of impact.

11.11.1.5 The offshore cable corridor extends 163 km from the Hornsea Three array area to the Hornsea Three intertidal area. Up to six export cables will be installed by up to nine vessels and up to 15 support vessels at different stages over a period of up to eight years (installation of the export cables themselves will occur over a duration of three years, however the cables could be installed in two phases with a gap of three years between phases). In addition, up to six subsea HVAC booster stations may be installed within the offshore HVAC booster station search area. The spatial extent of the impact will be relatively small, with the potential for localised displacement of recreational craft from the individual 1,000 m advisory safety distances around each cable installation vessel and 500 m safety zones around the subsea HVAC booster stations. There is low to medium recreational vessel activity in the nearshore area of the Hornsea Three offshore cable corridor and a number of offshore routes which may intersect the offshore cable corridor.

11.11.1.6 Works to install the export cables within the Hornsea Three intertidal area may take place over a period of up to 24 months (Table 11.18). There is a general boating area crossing the inshore section of the Hornsea Three offshore cable corridor. Boat angling and shore angling also takes place, particularly within 1 nm of the shoreline. There is the potential for temporary loss of recreational resource during nearshore/inshore and intertidal cable installation activities.

11.11.1.7 For the Hornsea Three array area the impact is predicted to be of local spatial extent, short to medium term duration, continuous (but of low occurrence) and low reversibility.

11.11.1.8 For the offshore HVAC booster station search area the impact is predicted to be of very local spatial extent, short to medium term duration, continuous and low reversibility.

11.11.1.9 For the offshore cable corridor the impact is predicted to be of local spatial extent, short to medium term duration, intermittent and high reversibility.

11.11.1.10 It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of the receptor

11.11.1.11 Recreational vessels are able to alter their route, dependent on the target destination. There are also a variety of boat angling and shore angling locations along the eastern region such that alternatives are available during installation works at the cable landfall. Notices to Mariners will be promulgated regularly during the construction phase, advising of the location and nature of construction works, and information and notices will be posted at the landfall location, ensuring that recreational activities can be planned accordingly.

11.11.1.12 The receptor is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

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

Aggregate extraction, cables and pipelines

Installation of Hornsea Three infrastructure may affect existing cables and pipelines or restrict access to cables and pipelines.

Magnitude of impact

11.11.1.14 There are no pipelines located within the Hornsea Three array area or within 500 m of the Hornsea Three array area, however the Topaz well to Schooner platform pipelines operated by INEOS are located within 1 km of the Hornsea Three array area. There are 27 active pipelines which intersect the Hornsea Three offshore cable corridor, operated by Shell, Perenco, Ithaca, ConocoPhillips, INEOS and Spirit Energy, and a further two pipelines within 1 km of the offshore cable corridor, operated by Spirit Energy.

11.11.1.15 There is one active telecoms cable (Norsea com 1 segment 3 operated by Tampnet) and two out of service cables (Stratos and Weybourne to Esbjerg) crossing the Hornsea Three array area. There is one active telecoms cable (Norsea com 1 segment 3) and two out of service telecoms cables (Stratos/North Sea Offshore and Weybourne to Esbjerg) crossing the Hornsea Three offshore cable corridor, with Stratos/North Sea Offshore and Weybourne to Esbjerg making landfall in the area of the Hornsea Three intertidal area. The near shore section of the Hornsea Three offshore cable corridor also crosses the export cables for the Dudgeon and Sheringham Shoal offshore wind farms.

11.11.1.16 Hornsea Three infrastructure and the presence of safety zones and advisory safety distances may restrict access to existing cables and pipelines within the Hornsea Three array area (cables) and along the offshore cable corridor (cables and pipelines).

11.11.1.17 Pipeline crossing and proximity agreements will be established with relevant pipeline operator and/or owner (as appropriate), to minimise the potential for any impact on existing lines in accordance with recognised industry best practice, with discussions between the relevant operators and Hornsea Three already underway. The crossing agreement will ensure that all parties have agreed on the methods to be employed and that the risks have been managed to acceptable standards. Where the cable is located within 500 m of a pipeline, it is intended that a proximity agreement will be entered into between the pipeline operator and Hornsea Three, to establish the responsibilities and obligations of both parties. Cable crossing and proximity agreements will similarly be established with the relevant cable operator and/or owner (as appropriate). It is also intended that similar pipeline or cable crossing and proximity agreements will be put in place for all future pipelines and cables where required, prior to their installation. There is one proposed pipeline (gas flowline), Blythe NUI to PL370, that crosses the offshore cable corridor (Independent Oil and Gas, 2017), as shown on Figure 11.9. This proposed pipeline is due to be installed in 2019 prior to offshore construction of Hornsea Three. Hornsea Three will therefore continue to consult with the operator of this proposed pipeline, Independent Oil and Gas, to establish pipeline crossing agreements as required.

11.11.1.18 Crossing agreements will include the ability of a cable/pipeline operator to access their infrastructure during Hornsea Three construction as far as practical, though exclusion will be required as identified in paragraph 11.11.1.16 above. The crossing agreements would ensure close communication and planning between both parties to ensure disruption of activities is minimised.

11.11.1.19 The impact is predicted to be of local spatial extent, short to medium term duration, continuous (Hornsea Three array area)/intermittent (offshore cable corridor) and low reversibility (Hornsea Three array area)/high reversibility (offshore cable corridor). It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of the receptor

11.11.1.20 Restriction of access to an active pipeline or cable for inspection and maintenance activities could be critical to the operator of that cable/pipeline. Pipeline and cable crossings are common across the UKCS (see Figure 11.9 and Kingfisher Information Service – Offshore Renewable & Cable Awareness, 2017), and there are established mechanisms for controlling the level of impact to both parties, in the form of the commercial agreements referred to in paragraph 11.11.1.17 above.

11.11.1.21 The operators of active pipelines and cables are deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be high.

Significance of the effect

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

Installation of 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.

11.11.1.23 The installation of the Hornsea Three wind turbine and offshore platform foundations and cables has the potential to increase suspended sediment concentration (SSC) within the water column and also to deposit disturbed sediments on the surrounding seabed. This in turn has the potential to impact on adjacent aggregate extraction areas, through the potential deposition of sediment within the licenced areas. The potential change to the physical environment from the Hornsea Three related construction activities referred to above are presented in volume 2, chapter 1: Marine Processes, and are assessed below in terms of aggregate extraction areas as a receptor.

11.11.1.24 Aggregate extraction licences are shown in Figure 11.4, with their distances from the Hornsea Three array area and offshore cable corridor presented in Table 11.6 and Table 11.7 respectively. The closest licence to the Hornsea Three array area is 4 km away, with two further licence areas located 13.3 km and 14 km away. One aggregate extraction site lies directly adjacent to the offshore cable corridor and another site is 1.9 km away. Two further licensed sites are located 7.5 km and 13.2 km away.

Magnitude of impact

11.11.1.25 Volume 2, chapter 1: Marine Processes considers potential elevations in SSC and deposition to the sea bed as a result of a number of activities proposed to occur both within the Hornsea Three array area and offshore cable corridor. More specifically these activities are: drilling for foundation installation, sea bed preparation for gravity base installation, sandwave clearance prior to cable installation and cable installation itself.

11.11.1.26 In terms of drilling for foundation installation, deposition of sandy deposits arising from this activity are predicted to be concentrated in an area of the order of 200 to 700 m downstream and upstream from individual foundation locations and tens to hundreds of metres wide. Such deposits are predicted to be tens of centimetres to 1 m in depth (coarser sediments will be deposited to greater depths, but more localised to the turbines than that described above for sandy sediments). Fine grained material will be dispersed widely in the surrounding region and is not expected to settle to a measurable thickness.

11.11.1.27 In terms of cable installation within the Hornsea Three array area, the volumes of material being displaced and deposited locally are relatively limited (up to 6 m^3 per metre of cable burial). This also limits the thickness of any resulting deposition. Any such deposition would also be expected to be localised and as such would not be expected to interact with the aggregate extraction areas in proximity to the offshore cable corridor. For sandwave clearance prior to cable installation, the majority of sediment would be deposited locally. Finer grained material may enter into suspension and be advected away from the point of release up to distances of several tens of kilometres. However, at this distance concentrations would be very low and within natural variability. Deposition of sediments to a thickness that is measurable is likely to remain limited.

11.11.1.28 Along the Hornsea Three offshore cable corridor, foundation installation may also be required for the offshore HVAC booster stations. An assessment is made of the potential deposition of sediments due to this activity within volume 2, chapter 1: Marine Processes. However, it is noted here that there are no aggregate extraction sites in close proximity to the offshore HVAC booster station search area. For cable installation along the Hornsea Three offshore cable corridor, deposition is predicted to be the same as that described above for the same activity in the Hornsea Three array area (i.e. localised to the point of cable burial and limited in thickness due to the limited amount of material displaced).

11.11.1.29 In terms of sandwave clearance along the Hornsea Three offshore cable corridor, such operations may result in up to 979,090 m^3 of sediment being displaced. However, it is noted that this equates to the total volume of material displaced along the entire Hornsea Three offshore cable corridor and not just those sections of the corridor in proximity to aggregate extraction sites. The precise locations of sandwave clearance along the Hornsea Three offshore cable corridor are not currently known, although it is likely that only a small proportion of the above total volume would occur in areas near aggregate extraction licences, given the linear nature of the offshore cable corridor and the fact that the licences are discrete locations along this route. The Hornsea Three offshore cable corridor is characterised by the presence of sands and gravels. These coarse grained sediments are predicted to settle out of suspension in close proximity to the release location. It is anticipated that any deposited sediments would be subject to redistribution under the prevailing coastal processes. Whilst resulting thicknesses of sediment accumulation may be relatively large, these would be confined to within tens to a few hundreds of metres.

11.11.1.30 The above referenced assessments provide predictions regarding the potential for increased sediment deposition due to construction activities, both within the Hornsea Three array area and along the offshore cable corridor.

11.11.1.31 The impact of deposition on aggregate resources is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.

Sensitivity of the receptor

11.11.1.32 Dredging operators are adaptable as they are able, to some extent, to screen out unwanted fine sediment load.

11.11.1.33 The dredging operator is deemed to be of medium vulnerability, moderate recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be medium.

Significance of the effect

11.11.1.34 Overall, the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be negligible. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

Oil and gas operations

Hornsea Three infrastructure, safety zones and advisory safety distances associated with the Hornsea Three array area may restrict potential seismic survey activity.

11.11.1.35 The installation and presence of Hornsea Three infrastructure, with a minimum separation distance of 1,000 m, and the presence of safety zones and advisory safety distances will exclude conventional towed streamer seismic survey vessels from the Hornsea Three array area throughout the construction period. The Hornsea Three array area overlaps with nine licenced blocks and eight unlicensed blocks (Table 11.8 and paragraph 11.7.9.3). Seismic surveys within these blocks are anticipated to be restricted to varying extents. Other more recent methods of seismic survey include the use of ocean bottom cables and the use of fixed vertical cables. Both methods provide an opportunity to work in a much more congested field. The ocean bottom cables can be used when there is sea surface congestion (i.e. wind turbines, platforms) and the vertical cables can be used when the sea floor is congested (i.e. with cables or pipelines).

11.11.1.36 The assessment of this potential impact is complicated by the fact that future oil and gas plans have varying degrees of certainty associated with them (for example whether or not seismic survey activity will be undertaken within the block). For this reason, as noted in paragraphs 11.9.2.6 to 11.9.2.9 above) the assessment has only been able to consider those licenced blocks with potential for spatial interactions, which are licenced beyond the start of Hornsea Three operation and maintenance phase (i.e. assumed to be 2030 based on the maximum offshore construction duration of eight years) and:

- The licence operator has the appropriate licences and consents needed to undertake the specific activity which is being assessed; and/or
- There is sufficient information in the public domain (available either through consultation or publicly available documents) regarding the future activity for an assessment to be undertaken.

Magnitude of impact

11.11.1.37 The area of overlap between the relevant licence block and the Hornsea Three array area is presented in Table 11.28. For assessment purposes, and based on professional judgement, the area of overlap has been deemed to be major where it is 100% of the total block area, moderate where the overlap is 50% or more, minor where the overlap is 10% or more, and negligible where the overlap is less than 10%. It should be noted that when licences reach the end of their first term it is a requirement for the operator to relinquish 50% of the area. For those licence blocks that this applies to the percentage of the block that overlaps with the Hornsea Three array area may therefore decrease (i.e. if the area to be relinquished is within the Hornsea Three array area with remaining area outside the Hornsea Three array area) or increase (i.e. if the area to be relinquished is outside the Hornsea Three array area with remaining area within the Hornsea Three array area) prior to the start of offshore construction. These licences have been identified in Table 11.28.

11.11.1.38 Spirit Energy Resources has four licence blocks, Spirit Energy North Sea has one licence block and INEOS has one licence block which are all coincident with the Hornsea Three array area and will be licenced after the start of offshore construction of Hornsea Three and are therefore potentially affected by Hornsea Three (see Table 11.28). The safety zones and advisory safety distances implemented during the Hornsea Three construction phase will increase the area of overlap (e.g. for infrastructure under construction on the edge of the array area boundary). There is one additional currently licenced block (49/10a) operated by Spirit Energy Resources within 1 km of the Hornsea Three array area (1 %) and which is anticipated to be licenced beyond the start of offshore construction of Hornsea Three (no expiry date cited). The maximum offshore construction duration for the Hornsea Three array area will be a period of up to eight years over two phases (with a gap of up to three years between phases). This is a relatively long period in comparison to a licence agreement, which is generally four years for the first term of the traditional Seaward Production Licence and up to nine years for the initial phase of an Innovative Licence. A typical survey period is six months and therefore there is the potential for surveys to take place within parts of the licensed blocks where construction activity has not yet commenced. However, as infrastructure is installed, the area available for seismic surveys will be restricted. The licences of the blocks affected will all last for the duration of the construction period as shown in Table 11.28.

11.11.1.39 The impact is predicted to be of local spatial extent, relatively long term duration relative to a licence period, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be major for licence block 49/4b (currently operated by Spirit Energy North Sea); moderate for 49/3, 49/4d, 49/9c and 49/9d (currently operated by Spirit Energy Resources); and minor for 49/2a (currently operated by INEOS) and negligible for 49/10a (currently operated by Spirit Energy Resources).

Sensitivity of the receptor

11.11.1.40 The sensitivity of the receptor depends on the future seismic survey requirements of the operators of each potentially affected block. Information on each block and the assessed sensitivity is summarised in Table 11.28 below.

11.11.1.41 The sensitivity of the licence operator has been assessed as low for Spirit Energy Resources and Spirit Energy North Sea on the basis of publicly available licence data information and consultation advice. The more recently acquired licence (P2286) covering blocks 49/3, 49/4d and 49/9d will have almost run to the end of the second term (2023) at the start of offshore construction of Hornsea Three (2022). This licence is therefore unlikely to require further seismic surveys which will temporally overlap with Hornsea Three construction. However, in the event localised infrastructure surveys are required, there is potential flexibility with regards to the timing of certain activities within the more general construction period and build out of Hornsea Three such that these could likely be accommodated providing there is sufficient pro-active communication to inform both parties. As no locations for any new infrastructure is presently known this however cannot be assessed. Block 49/9c (licence P901) operated by Spirit Energy Resources and block 49/4b (licence P1186) and 49/10a (licence P83) operated by Spirit Energy North Sea, will be well into the third term of the licence (or will have significantly progressed in the case of licence P83), at the start of offshore construction of Hornsea Three and are therefore unlikely to require any seismic surveys.

11.11.1.42 The sensitivity of the licence operator has been assessed as low for INEOS on the basis of consultation with this operator who has advised that they currently have no exploration plans/concerns in licence block 49/2a (P1013).

11.11.1.43 It should be noted that in the event presently unlicensed blocks are licenced the sensitivity will increase as seismic survey activity may be required. Any future operator of the unlicensed blocks should be aware of Hornsea Three and will have taken potential coexistence into consideration.

11.11.1.44 A small proportion of known hydrocarbon fields intersect with the Hornsea Three array area (Figure 11.6) however it is understood that with improved seismic technology new fields are still being discovered within the North Sea.

11.11.1.45 In all instances, consultation with the operators of the blocks in proximity to the Hornsea Three array area has aimed to address any future operational issues and establish a line of communication to ensure coexistence between both activities can be achieved with minimal disruption.

11.11.1.46 The licensed operator is deemed to be of low vulnerability, medium recoverability and high value. The sensitivity of the licence operator is therefore, considered to be low.

Significance of the effect

11.11.1.47 Overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be major (licence block 49/4b); moderate (49/3, 49/4d, 49/9c and 49/9d); and minor (49/2a). The effect will, therefore, be of **minor** adverse significance (licence blocks 49/3, 49/4d, 49/9c, 49/9d currently operated by Spirit Energy Resources and 49/4b currently operated by Spirit Energy North Sea) which is not significant in EIA terms; and **negligible** significance (licence block 49/2a currently operated by INEOS and 49/10a currently operated by Spirit Energy Resources) which is not significant in EIA terms.

Table 11.28: Area of overlap of each licence block with the Hornsea Three array area and sensitivity of each licence operator in relation to reduction in seismic survey area and drilling restrictions.

Block	Licence expiry	Operator	Area of overlap (%) [a]	Licence data/Consultation		Sensitivity	
				Construction phase	Operation phase	Seismic survey	Drilling
49/3[a]	2041	Spirit Energy Resources	89.3 (moderate)	Block 49/3, 49/4d and 49/9d (licence P2286) will have almost run to the end of second term are therefore unlikely to require further seismic surveys. Block 49/9c (Licence P901) and 49/4b (licence P1186) will be well into the third term of licence and therefore unlikely to require seismic surveys.	Block 49/3, 49/4d and 49/9d (licence P2286) will be well into third term of licence and are therefore unlikely to require further seismic surveys. Block 49/9c (Licence P901) and 49/4b (licence P1186) will be valid for only one year during operation phase.	Low	Low
49/4d[a]	2041		90.4 (moderate)				
49/9c[a]	2030		63.6 (moderate)				
49/9d[a]	2041		65.8 (moderate)				
49/4b	2030	Spirit Energy North Sea	100 (major)				
49/2a	2034	INEOS	33.9 (minor)	INEOS advised that they have no current exploration plans in the southern North Sea.		Low	Low

a It should be noted that these licence blocks will be required to relinquish 50% of the area at the end of the first term which will occur prior to the start of offshore construction. The percentage overlap with Hornsea Three may therefore change.

Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances.

11.11.1.48 Drilling and the placement of infrastructure associated with gas field development or natural gas storage and CCS projects may be restricted (but not prohibited) within the Hornsea Three array area and may be restricted from within 1 km of the Hornsea Three array area during the Hornsea Three construction phase (based on the potential for 500 m safety zones to be applied for around any oil and gas infrastructure and the potential for 500 m safety zones to extend beyond the Hornsea Three array area). There may be further, temporary restrictions from any 1,000 m advisory safety distances associated with construction vessels which may extend beyond the array area.

11.11.1.49 In the event that new oil and gas platforms or subsea structures are proposed, the restricted area may need to be extended further considering helicopter access requirements (see volume 2, chapter 8: Aviation, Military and Communication and volume 2, chapter 12: Inter-related Effects (Offshore)).

11.11.1.50 For the purposes of this assessment (and all relevant assessments within this chapter), well abandonment has been considered to be equivalent to drilling activities and oil and gas infrastructure decommissioning activities have been assumed to be the reverse of oil and gas infrastructure installation activities, in terms of impact magnitude and sensitivity (e.g. the requirement for a rig or vessel and associated safety zones).

11.11.1.51 As discussed in paragraph 11.11.1.36 only those blocks which are licenced beyond the start of Hornsea Three offshore construction and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

Magnitude of impact

11.11.1.52 The area of overlap between the relevant licence block and the Hornsea Three array area is presented in Table 11.28 and described in paragraph 11.11.1.37. Spirit Energy Resources has four licence blocks, Spirit Energy North Sea has one licence block and INEOS has one licence block, all of which are coincident with the Hornsea Three array area and which will be licenced after the start of offshore construction of Hornsea Three and are therefore potentially affected by Hornsea Three (see Table 11.28). The safety zones and advisory safety distances implemented during the Hornsea Three construction phase will slightly increase the area of overlap (e.g. for infrastructure under construction on the edge of the Hornsea Three array area boundary). The potential for a restriction on activities within 1 km or more of the Hornsea Three array area for the reasons described in paragraph 11.11.1.48 above will increase the area of overlap however any additional restrictions from advisory safety distances will be temporary. There is one additional currently licenced block (49/10a) operated by Spirit Energy Resources which is within 1 km of the Hornsea Three array area (1% overlap) and is anticipated to be licenced beyond the start of offshore construction of Hornsea Three (no expiry date cited).

11.11.1.53 Construction of the Hornsea Three array area will take place over a period of up to eight years over two phases (with a gap of up to three years between phases). This is a relatively long period in comparison to a licence agreement as detailed in paragraph 11.11.1.38. Drilling activity may take place during an approximate three month period. Drilling may be able to proceed prior to construction or during the construction period depending on the required location. Due to the relatively small area that is required by a drill rig and the ability of an operator to directionally drill if required (providing this commences at a location outside the restricted zone), drilling activity may be able to take place in the remaining areas of the licence blocks not affected by the Hornsea Three array area throughout the construction phase. Drilling may also take place between 500 m and 1 km from the Hornsea Three array area in the event that no safety zones are required in this location.

11.11.1.54 The licences of the blocks affected will all last for the duration of the construction period as shown in Table 11.28.

11.11.1.55 The impact is predicted to be of local spatial extent, relatively long term duration relative to a licence period, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be major for licence block 49/4b (currently operated by Spirit Energy North Sea); moderate for 49/3, 49/4d, 49/9c and 49/9d (currently operated by Spirit Energy Resources); minor for 49/2a (currently operated by INEOS) and negligible for 49/10a (currently operated by Spirit Energy Resources).

Sensitivity of the receptor

11.11.1.56 The sensitivity of the receptor depends on the area of their licenced acreage affected and the future plans of the licence operator in relation to potential exploitation of hydrocarbons. Information on each block and the assessed sensitivity is summarised in Table 11.28.

11.11.1.57 In all instances, consultation with the operators of the blocks in proximity to the Hornsea Three array area has aimed to address any future operational issues and establish a line of communication to ensure coexistence between both activities can be achieved with minimal disruption.

11.11.1.58 The sensitivity of the licence operator has been assessed as low for Spirit Energy Resources and Spirit Energy North Sea on the basis of publicly available licence data information and consultation advice. The more recently acquired licence (P2286) operated by Spirit Energy Resources covering blocks 49/3, 49/4d and 49/9d will have run to the end of second term at the start of offshore construction of Hornsea Three. Block 49/9c (licence P901), 49/10a (licence P83) operated by Spirit Energy Resources and 49/4b (licence P1186) operated by Spirit Energy North Sea, will be well into the third term of the licence (or will have significantly progressed in the case of licence P83) at the start of offshore construction of Hornsea Three. Exploration and appraisal drilling requirements should therefore be completed by this date. No specific well locations or field development programmes are publicly available at the present time and cannot therefore be assessed.

11.11.1.59 The sensitivity of the licence operator has been assessed as low for INEOS on the basis of consultation with this operator who has advised that they currently have no exploration plans/concerns in licence block 49/2a (P1013).

11.11.1.60 The licensed operator is deemed to be of low vulnerability, medium recoverability and high value and details of the activity are not in the public domain and have not been advised through consultation. The sensitivity of the licence operator is therefore, considered to be low.

Significance of the effect

11.11.1.61 Overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be major (licence block 49/4b); moderate (49/3, 49/4d, 49/9c and 49/9d); minor (49/2a); and negligible (49/10a). The effect will, therefore, be of **minor** adverse significance (licence blocks 49/3, 49/4d, 49/9c, 49/9d currently operated by Spirit Energy Resources and 49/4b currently operated by Spirit Energy North Sea) which is not significant in EIA terms; and **negligible** significance (licence block 49/2a currently operated by INEOS and 49/10a currently operated by Spirit Energy Resources) which is not significant in EIA terms.

Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor may restrict potential seismic survey activity.

11.11.1.62 As discussed in paragraph 11.11.1.36 only those blocks that are licenced beyond the start of Hornsea Three offshore construction and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

11.11.1.63 Safety zones around the subsea HVAC booster stations and advisory safety distances around cable installation vessels carrying out activities along the Hornsea Three offshore cable corridor will exclude conventional towed streamer seismic survey vessels throughout the construction period.

Magnitude of impact

11.11.1.64 The area of overlap between the relevant licence block and the Hornsea Three offshore cable corridor and offshore HVAC booster station search area is presented in Table 11.29. As noted in section 11.7.9, there is one additional licenced block (49/16a) operated by ConocoPhillips within 1 km of the offshore cable corridor (0.9% overlap). For assessment purposes, and based on professional judgement, the area of overlap has been deemed to be major where it is 100% of the total block area, moderate where the overlap is 50% or more, minor where the overlap is 10% or more, and negligible where the overlap is less than 10%.

Table 11.29: Area of overlap of each licence block with offshore cable corridor/offshore HVAC booster station search area and sensitivity of each licence operator in relation to reduction in seismic survey area and drilling restrictions.

Block	Licence expiry date	Operator	Area of overlap with offshore cable corridor (%) [a]	Area of overlap with offshore HVAC booster station search area (%)	Sensitivity	
					Seismic survey	Drilling
48/19a	No date given	Shell	0.2 (negligible)	N/A	Low	Low
48/20a	No date given		15.8 (minor)	N/A	Low	Low
48/20b	2038	INEOS	37 (minor)	N/A	Low	Low
48/23c[a]	2039	Independent Oil and Gas	0.15 (negligible)	N/A	Low	Low
48/24b[a]	2039		16.8 (minor)	7.5 (negligible)		
48/25a[a]	2037		0.20 (negligible)	N/A		
49/11a	No date given	ConocoPhillips	27.6 (minor)	N/A	Low	Low

a It should be noted that these licence blocks will be required to relinquish 50% of the area at the end of the first term which will occur prior to the start of offshore construction. The percentage overlap with Hornsea Three may therefore change.

11.11.1.65 The magnitude of impact for operators with licenced blocks along the offshore cable corridor and within 1 km of the offshore cable corridor (and not within the offshore HVAC booster station search area) will reduce potential seismic survey activity in an area of relatively small spatial extent and for a relatively short duration from the presence of individual 1,000 m advisory safety distances around cable installation vessels (which may be working together in close proximity) as they move along the Hornsea Three offshore cable corridor. The impact will be intermittent, with up to six cable installation events along the Hornsea Three offshore cable corridor. The installation of export cables will occur over a duration of three years (installation could occur over two phases with a gap of up to three years between phases, over a total duration of eight years). Cable installation activity will be transient, with installation progress typically 1.5 km to 5 km per day.

11.11.1.66 Up to six subsea HVAC booster stations may be installed within the offshore HVAC booster station search area with associated 500 m safety zones implemented during the construction phase. Assuming, as a maximum design scenario, that the six subsea HVAC booster stations are located in close proximity and spaced up to 1 km apart so that their 500 m safety zones are contiguous, the combined area of the safety zones could be up to 4.74 km^2. These safety zones will be in place for the duration of the construction of the subsea HVAC booster stations (up to 12 months based on two months per structure). There is one licenced block within the offshore HVAC booster search area, currently operated by Independent Oil and Gas. This block has a negligible level of overlap with the offshore HVAC booster station search area (see Table 11.29). Assuming, as a maximum design scenario, that the six subsea HVAC booster stations are located fully within a single licence block, the magnitude of impact will restrict potential seismic survey activity in an area of relatively small spatial extent compared with the total area of the licence block from the presence of the combined safety zones.

11.11.1.67 The licences of the blocks affected will all last for the duration of the construction period as shown in Table 11.29.

11.11.1.68 The impact is predicted to be of local spatial extent, short term duration (offshore cable corridor)/long term duration (offshore HVAC booster station search area), intermittent (offshore cable corridor)/continuous (offshore HVAC booster station search area) and high (offshore cable corridor)/low (offshore HVAC booster station search area) reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor (licence blocks 48/20a, 48/20b, 48/24b and 49/11a) and negligible (48/19a, 48/23c, 48/25a and 49/16a).

Sensitivity of the receptor

11.11.1.69 The sensitivity of the receptor depends on the information provided through consultation with the operator of the licence block. Information on each block and the assessed sensitivity is summarised in Table 11.29. As noted above, the impact will affect a relatively small proportion of the licence blocks. Consultation with Shell, INEOS and ConocoPhillips did not identify any planned seismic survey activity within the offshore cable corridor during the Hornsea Three offshore construction period (see Table 11.4). Consultation with Independent Oil and Gas identified that they plan to develop the Harvey prospect. While they have not identified the requirement for a large seismic survey, localised seismic data acquisition may be required around wells and infrastructure.

11.11.1.70 The promulgation of information through Notices to Mariners combined with ongoing consultation will enable the operators to plan surveys taking into account the timing of Hornsea Three construction activities. Sufficient information exchange between parties and continued consultation will be in place to avoid conflicting interactions. Any future operator of the unlicensed blocks will be aware of the Hornsea Three project and will have taken potential coexistence into consideration.

11.11.1.71 The operators of the affected licenced blocks are deemed to be of low vulnerability, medium recoverability and high value and details of the activity is not in the public domain and has not been advised through consultation. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

11.11.1.72 Overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor (licence blocks 48/20a, 48/20b, 48/24b and 49/11a) and negligible (48/19a, 48/23c, 48/25a and 49/16a). The effect will, therefore, be of **minor** adverse significance (licence blocks 48/20a currently operated by Shell, 48/20b currently operated by INEOS, 48/24b currently operated by Independent Oil and Gas and 49/11a currently operated by ConocoPhillips), which is not significant in EIA terms and **negligible** significance (licence blocks 48/19a currently operated by Shell, 48/23c and 48/25a currently operated by Independent Oil and Gas and 49/16a currently operated by ConocoPhillips), which is not significant in EIA terms.

Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor.

11.11.1.73 Drilling activities have the potential to be restricted within the offshore cable corridor during the Hornsea Three construction phase from the presence of installation activities and newly installed cables. Drilling may also be restricted from within 1 km from either side of the offshore cable corridor (based on the potential for 500 m safety zones to be applied for around any oil and gas infrastructure and the potential for 500 m safety zones to extend beyond the offshore cable corridor from Hornsea Three construction activities within the offshore HVAC booster station search area). There may be further, temporary restrictions from any 1,000 m advisory safety distances associated with construction vessels working along the offshore cable route. The subsea HVAC booster stations if required will be located within the restricted area along the offshore cable corridor, therefore they are not assessed separately in this assessment. It should be noted that pipelines would be able to be installed across this area subject to crossing and proximity agreements being put in place.

11.11.1.74 As discussed in paragraph 11.11.1.36 only those blocks which are licenced beyond the start of Hornsea Three offshore construction and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

Magnitude of impact

11.11.1.75 The area of overlap between the relevant licence block and the Hornsea Three offshore cable corridor is presented in Table 11.29 and described in paragraph 11.11.1.64. There is the potential for further restrictions from any safety zones or temporary advisory safety distances that may extend beyond the offshore cable corridor boundary. There is one additional licenced block (49/16a) within 1 km of the Hornsea Three cable route corridor (0.9 % overlap) which is currently operated by ConocoPhillips).

11.11.1.76 The magnitude of impact for operators with licenced blocks along the Hornsea Three offshore cable corridor will be limited to a restriction on drilling and the placement of infrastructure within an area of relatively small spatial extent in relation to the total licence block area. There may be up to six cable installation events along the Hornsea Three offshore cable corridor over a total export cable installation period of up to eight years (installation of the export cables themselves will occur over a duration of three years, however the cable could be installed in two phases with a gap of up to three years between phases). Any additional restrictions from advisory safety distances will be temporary, however the overall impact will be of long term duration due to the presence of installed cables.

11.11.1.77 The licences of the blocks affected will all last for the duration of the construction period as shown in Table 11.29.

11.11.1.78 The impact is predicted to be of local spatial extent, long term duration relative to a licence period, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor (licence blocks 48/20a, 48/20b, 48/24b and 49/11a) and negligible (48/19a, 48/23c, 48/25a and 49/16a).

Sensitivity of the receptor

11.11.1.79 The sensitivity of the receptor depends on the information provided through consultation with the operator of the licence block. Information on each block and the assessed sensitivity is summarised in Table 11.29. As noted above, the impact will affect a relatively small proportion of the licence blocks. Consultation with the operators of the affected licence blocks (Shell, INEOS, Independent Oil and Gas and ConocoPhillips) did not identify any plans for the development of new infrastructure within the offshore cable corridor during the Hornsea Three offshore construction period (see Table 11.4).

11.11.1.80 Drilling may still take place between 500 m and 1 km from the offshore cable corridor provided that no permanent safety zones will be applied for by the oil and gas operator. Drilling may also still take place by means of directional drilling, providing this commences at a location outside the restricted area.

11.11.1.81 There is the potential to coexist through ongoing consultation and promulgation of information. Sufficient information exchange between parties and continued consultation will be in place to avoid conflicting interactions. Any future operator of the unlicensed blocks will be aware of the Hornsea Three project and will have taken potential coexistence into consideration.

11.11.1.82 The operators of the affected licenced blocks are deemed to be of low vulnerability, medium recoverability and high value and details of the activity is not in the public domain and has not been advised through consultation. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

11.11.1.83 Overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor (licence blocks 48/20a, 48/20b, 48/24b and 49/11a); and negligible (49/19a, 48/23c, 48/25a and 49/16a). The effect will, therefore, be of **minor** adverse significance (licence block 48/20a currently operated by Shell, 48/20b currently operated by INEOS, 48/24b currently operated by Independent Oil and Gas and 49/11a currently operated by ConocoPhillips), which is not significant in EIA terms, and **negligible** significance (licence blocks 48/19a currently operated by Shell, 48/23c and 48/25a currently operated by Independent Oil and Gas and 49/16a currently operated by ConocoPhillips), which is not significant in EIA terms.

The piling of wind turbine and substation foundations will generate underwater noise that may acoustically interfere with seismic survey operations.

Magnitude of impact

11.11.1.84 During conventional towed streamer seismic surveys, air guns produce a source noise which is reflected back off the seabed and picked up by acoustic recorders at the sea surface. The peak source level is around 230 dB over a range of frequencies but the <100 Hz range is of interest to the survey. The sound repetition is every 1 to 60 seconds. The duration of a survey may last up to six months depending on the extent required moving over a tracked area. Firing duration will be continual subject to operational requirements. Underwater noise from piling activities will produce similar sound pressure and frequencies. Piling noise will occur at a much greater repetition, for a short period at each fixed location, and for a much longer overall duration.

11.11.1.85 Due to these different temporal and spatial requirements the two activities have the potential to be able to occur concurrently. In addition, the potential for any interference will dissipate with distance from the piling activity. Blocks immediately adjacent to the Hornsea Three array area (and the offshore HVAC booster station search area) have the potential to be affected. Foundation installation could occur over 2.5 years in up to two phases with a gap of up to three years between phases (see Table 11.20).

11.11.1.86 The impact is predicted to be of regional spatial extent, short to medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be moderate.

Sensitivity of the receptor

11.11.1.87 The sensitivity of the licence operator carrying out seismic survey activity will be dependent on the survey activity coinciding temporally and spatially with the noise source and having similar acoustic frequency. The actual techniques that will be used, in particular the ability for live or post-processing of seismic data to filter out acoustic interference, will reduce the sensitivity. The operator will also be provided with sufficient information on Hornsea Three construction activities through promulgation of Notices to Mariners and continued consultation in order that seismic survey activity can be planned to avoid the construction noise temporally and spatially.

11.11.1.88 The licence operator is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

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

Future monitoring

11.11.1.90 No infrastructure and other users monitoring to test the predictions made within the construction phase impact assessment is considered necessary.

11.11.2 Operational and maintenance phase

11.11.2.1 The impacts of the offshore operation and maintenance of Hornsea Three have been assessed on infrastructure and other users. The potential impacts arising from the operation and maintenance of Hornsea Three are listed in Table 11.18, Table 11.19 and Table 11.20 along with the maximum design scenario against which each operation and maintenance phase impact has been assessed.

11.11.2.2 A description of the potential effect on infrastructure and other users receptors caused by each identified impact is given below. The receptors have been divided into categories, as per Table 11.18, Table 11.19 and Table 11.20, for ease of reference.

Recreational users and recreational fishing

Hornsea Three infrastructure, safety zones and advisory safety distances associated with infrastructure and maintenance activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.

11.11.2.3 During the operational and maintenance phase of Hornsea Three, recreational craft and recreational fishing vessels may be displaced, either because of the physical presence of the wind turbines and associated infrastructure or due to the presence of safety zones and advisory safety distances. This is a continuation of the construction phase impact (section 11.11.1).

Magnitude of impact

11.11.2.4 The presence of infrastructure may result in the displacement of recreational craft and recreational fishing vessels from the Hornsea Three array area. In addition, there is the potential for up to 19 operational safety zones associated with the accommodation platforms and offshore substations within the Hornsea Three array area. Further safety zones and/or advisory safety distances will be required periodically within the Hornsea Three array area around structures undergoing maintenance or around vessels carrying out maintenance activities. Along the offshore cable corridor, there is the potential for up to four operational safety zones associated with the offshore HVAC booster stations, and advisory safety distances will be recommended around vessels during any export cable maintenance activities, which may result in the displacement of recreational craft and recreational fishing vessels.

11.11.2.5 The spatial extent of the impact is small in the context of the available sailing area in the southern North Sea as described in paragraph 11.11.1.4. The impact of safety zones around manned platforms will also be small and safety zones/advisory safety distances associated with maintenance activities will be temporary. The level of recreational activity within the Hornsea Three array area is low as described in paragraph 11.11.1.4, and there is low to medium recreational vessel activity in nearshore areas of the Hornsea Three offshore cable corridor, with boating and angling also taking place closer to shore as described in paragraph 11.11.1.5.

11.11.2.6 The impact is predicted to be of local spatial extent, short term (offshore cable corridor)/long term duration (Hornsea Three array area and offshore HVAC booster stations), continuous (Hornsea Three array area and offshore HVAC booster stations)/intermittent (offshore cable corridor) and low reversibility (Hornsea Three array area and offshore HVAC booster stations)/high reversibility (offshore cable corridor). It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.

Sensitivity of the receptor

11.11.2.7 Recreational vessels are able to alter their route, dependent on the target destination. There are also a variety of boat angling and shore angling locations along the eastern region such that alternatives are available during any maintenance works at the cable landfall. Notices to Mariners will be promulgated as required during the operational and maintenance phase, advising of the location and nature of maintenance works, and information and notices will be posted at the landfall location, ensuring that recreational activities can be planned accordingly.

11.11.2.8 The receptor is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

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

Aggregate extraction, cables and pipelines

Safety zones around Hornsea Three infrastructure and advisory safety distances associated with maintenance activities, may lead to a temporary loss of access to existing cables and pipelines for repair or maintenance.

Magnitude of impact

11.11.2.10 As described in paragraph 11.11.1.14, the Topaz well to Schooner platform pipelines are located within 1 km of the Hornsea Three array area and there are 27 active pipelines which intersect the Hornsea Three offshore cable corridor, with a further two pipelines within 1 km of the Hornsea Three offshore cable corridor. There is one active cable and two out of service cables crossing the Hornsea Three array area and offshore cable corridor, and the Hornsea Three offshore cable corridor also crosses the export cables for the Dudgeon and Sheringham Shoal offshore wind farms.

11.11.2.11 The operational safety zones associated with the Hornsea Three infrastructure and the temporary safety zones and advisory safety distances associated with maintenance activities, may restrict access to existing cables and pipelines within the Hornsea Three array area (cables) and along the offshore cable corridor (cables and pipelines). Loss of access to cables and pipelines associated with any temporary safety zones/advisory safety distances is considered to be limited in extent and infrequent. Loss of access to cables and pipelines associated with the presence of structures would be considered in the crossing/proximity agreements to the extent that such a scenario would not be an impediment to operations.

11.11.2.12 Crossing and proximity agreements will be established with relevant pipeline and cable operators, to minimise the potential for any impact in accordance with recognized industry best practice, with discussions between the relevant operators and Hornsea Three already underway. These agreements will ensure close communication and planning between both parties to ensure disruption of activities is minimised. It is also intended that similar pipeline or cable crossing and proximity agreements will be put in place for all future pipelines and cables where required, prior to their installation.

11.11.2.13 The impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of the receptor

11.11.2.14 Maintenance activities associated with Hornsea Three will be publicised well in advance via Notices to Mariners. The terms of the crossing and proximity agreements will ensure communication between both parties and that loss of access is minimised.

11.11.2.15 The operators of existing pipelines and cables are deemed to be of low vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be low. In the unlikely event that the temporary restriction of access occurs concurrently with an emergency event (pipeline or cable) the effect will be more critical, however owing to the nature of the emergency, emergency response will be prioritised to ensure no significant adverse impact occurs on safety and the environment.

Significance of the effect

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

Oil and gas operations

The presence of infrastructure within the Hornsea Three array area may restrict potential seismic survey activity.

11.11.2.17 Hornsea Three infrastructure, at a minimum spacing of 1,000 m, and the presence of operational safety zones and safety zones/advisory safety distances associated with maintenance activities, will exclude conventional towed streamer seismic survey vessels from the Hornsea Three array area.

11.11.2.18 As discussed in paragraph 11.11.1.36 only those blocks that are licenced beyond the start of the Hornsea Three operational phase (2030) and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

11.11.2.19 The Hornsea Three array area overlaps with six licenced blocks (Table 11.28) in which seismic surveys are anticipated to be restricted to varying extents.

Magnitude of impact

11.11.2.20 With the potential for 300 wind turbines with a minimum separation distance of 1,000 m to be present within the Hornsea Three array area, in addition to the potential for up to 19 operational safety zones around offshore platforms, and further safety zones/advisory safety distances around maintenance activities, the area available for seismic surveys will be restricted. Owing to the size of the seismic arrays used for conventional towed streamer seismic surveys, conventional towed streamer seismic exploration within the Hornsea Three array area is not anticipated to be possible. Modern seismic survey techniques employing ocean bottom cables or vertical cables may also be restricted.

11.11.2.21 The area of overlap between the relevant licence block and the Hornsea Three array area is presented in Table 11.28 and described in paragraph 11.11.1.37. Spirit Energy Resources has four licence blocks, Spirit Energy North Sea has one licence block and INEOS has one licence block, all of which are coincident with the Hornsea Three array area and which will be licenced after the start of operation of Hornsea Three and are therefore potentially affected by Hornsea Three (see Table 11.28). Any safety zones or advisory safety distances extending beyond the Hornsea Three array area will increase the area of overlap. There is one additional currently licenced block (49/10a) operated by Spirit Energy Resources within 1 km of the Hornsea Three array area (Table 11.9) and which may be licenced after the start of operation of Hornsea Three (no expiry date cited).

11.11.2.22 The licence expiry dates are shown in Table 11.28 which will affect the duration and magnitude of the potential impact. The licences of two blocks (49/9c and 49/4b) expire in 2030, resulting in a short duration of overlap with the Hornsea Three operational phase (one year). The licence expiry date for block 49/2a is 2034, resulting in a relatively moderate duration of overlap (five years). The licences of three blocks (49/3, 49/4d and 49/9d) expire in 2041, resulting in a relatively long term duration of overlap (12 years).

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

11.11.2.24 The magnitude is therefore, considered to be moderate for licence block 49/4b (currently operated by Spirit Energy North Sea), 49/3, 49/4d and 49/9d (currently operated by Spirit Energy Resources); minor for 49/9c (currently operated by Spirit Energy Resources) and 49/2a (currently operated by INEOS); and negligible for 49/10a (currently operated by Spirit Energy Resources).

Sensitivity of the receptor

11.11.2.25 The sensitivity of the receptor depends on their future exploration plans. Information on each block and the assessed sensitivity is summarised in Table 11.28.

11.11.2.26 The sensitivity of the licence operator has been assessed as low for Spirit Energy Resources and Spirit Energy North Sea on the basis of publicly available licence data information and consultation advice. The licence P2286 operated by Spirit Energy Resources covering blocks 49/3, 49/4d and 49/9d will be in the third term by the operational phase of Hornsea Three. As seismic surveys are generally carried out in the first and second terms of a licence, with the third term for production activities (see section 11.7.9), further seismic surveys are unlikely to be required within these blocks during the Hornsea Three operational phase. As no locations for any new infrastructure is presently publicly available no assessment can be made on any localised infrastructure survey requirements. Blocks 49/9c (licence P901) and 49/10a (licence P83) operated by Spirit Energy Resources and block 49/4b (licence P1186) operated by Spirit Energy North Sea will be well into the third term of the licence (or will have significantly progressed in the case of licence P83) at the start of the operation phase of Hornsea Three and therefore seismic surveys are similarly unlikely to be required.

11.11.2.27 The sensitivity of the licence operator is assumed to be low for INEOS (block 49/2a) on the basis of consultation which has advised that they currently have no exploration plans/concerns. Any future operator of the unlicensed blocks will be aware of Hornsea Three and will have taken potential coexistence into consideration.

11.11.2.28 In all instances, consultation with the operators of the blocks in proximity to the Hornsea Three array area has aimed to address any future operational issues and establish a line of communication to ensure coexistence between both activities can be achieved with minimal disruption.

11.11.2.29 The licensed operator is deemed to be of low vulnerability, medium recoverability and high value and details of the activity is not in the public domain and has not been advised through consultation. The sensitivity of the licence operator is therefore, considered to be low.

Significance of the effect

11.11.2.30 Overall, the sensitivity of the receptor is considered to be low and the magnitude is considered to be moderate for licence blocks 49/4b, 49/3, 49/4d, and 49/9d; minor for 49/9c and 49/2a; and negligible for 49/10a. The effect will, therefore, be of **minor** adverse significance (licence blocks 49/3, 49/4d and 49/9d currently operated by Spirit Energy Resources and 49/4b currently operated by Spirit Energy North Sea), which is not significant in EIA terms; and **negligible** significance (licence block 49/9c and 49/10a currently operated by Spirit Energy Resources and 49/2a currently operated by INEOS) which is not significant in EIA terms.

Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances.

11.11.2.31 Drilling and the placement of infrastructure associated with gas field development or natural gas storage and CCS projects may be restricted (but not prohibited) within the Hornsea Three array area due to the presence of infrastructure at a minimum separation distance of 1,000 m, and may be restricted from within 1 km of the Hornsea Three array area (based on the potential for 500 m safety zones to be applied for around any oil and gas infrastructure and the potential for 500 m safety zones to extend beyond the Hornsea Three array area) during the operational and maintenance phase. There may be further, temporary restrictions from any 1,000 m advisory safety distances associated with maintenance vessels which may extend beyond the array area.

11.11.2.32 In the event that new oil and gas platforms or subsea structures are proposed, the restricted area would need to be extended further considering helicopter access requirements (see volume 2, chapter 8: Aviation, Military and Communication and volume 2, chapter 12: Inter-related Effects (Offshore)).

11.11.2.33 As described in paragraph 11.11.1.50, for the purposes of this assessment, well abandonment has been considered to be equivalent to drilling activities and oil and gas infrastructure decommissioning activities have been assumed to be the reverse of oil and gas infrastructure installation activities, in terms of impact magnitude and sensitivity.

11.11.2.34 As discussed in paragraph 11.11.1.36 only those blocks that are licenced beyond the start of the Hornsea Three operational phase (2030) and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

Magnitude of impact

11.11.2.35 With the potential for 300 wind turbines to be present within the Hornsea Three array area, and array cables, in addition to the potential for up to 19 operational safety zones around offshore platforms, and further safety zones/advisory safety distances around maintenance activities, drilling and the placement of infrastructure will be greatly restricted within the Hornsea Three array area. There may be further, temporary restrictions from any 1,000 m advisory safety distances associated with maintenance vessels which may extend beyond the array area.

11.11.2.36 As the minimum spacing between turbines is 1,000 m which is equal to the area required for a single well safety zone, there is the potential that a well could be drilled. Drilling is further restricted however by the drill rig or vessel being able to access the location within the array area which will be very much dependent on the ultimate configuration of the wind turbines and array cables. It is possible to directionally drill if required (providing this commences at a location outside the restricted zone) and it may be possible to drill at a distance of between 500 m and 1 km from the Hornsea Three array area in the event that no permanent safety zones are required. Such activities would be subject to consultation and agreement between both interested parties.

11.11.2.37 The area of overlap between the relevant licence block and the Hornsea Three array area is presented in Table 11.28 and described in paragraph 11.11.1.37. Spirit Energy Resources has four licence blocks, Spirit Energy North Sea has one licence block and INEOS has one licence block, all of which are coincident with the Hornsea Three array area and which will be licenced after the start of operation of Hornsea Three and are therefore potentially affected by Hornsea Three (see Table 11.28). The potential for a restriction on activities within 1 km or more of the Hornsea Three array area for the reasons described above will increase the area of overlap however any additional restrictions from advisory safety distances will be temporary. There is one additional currently licenced block (49/10a) operated by Spirit Energy Resources which is within 1 km of the Hornsea Three array area (1% overlap) and is anticipated to be licenced beyond the start of operation of Hornsea Three (no expiry date cited).

11.11.2.38 The licence expiry dates are shown in Table 11.28 which will affect the duration and magnitude of the potential impact. The licences of two blocks (49/9c and 49/4b) expire in 2030, resulting in a very short duration of overlap with the Hornsea Three operational phase. The licence expiry date for block 49/2a is 2034, again resulting in a short duration of overlap. The licences of three blocks (49/3, 49/4d and 49/9d) expire in 2041, resulting in a medium term duration of overlap.

11.11.2.39 The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be moderate for licence block 49/4b (currently operated by Spirit Energy North Sea), 49/3, 49/4d and 49/9d (currently operated by Spirit Energy Resources); minor for 49/9c (currently operated by Spirit Energy Resources) and 49/2a (currently operated by INEOS); and negligible for 49/10a (currently operated by Spirit Energy Resources).

Sensitivity of the receptor

11.11.2.40 The sensitivity of the receptor depends on the area of their licenced acreage affected and the future plans of the licence operator in relation to potential exploitation of hydrocarbons. Information on each block and the assessed sensitivity is summarised in Table 11.28.

11.11.2.41 In all instances, consultation with the operators of the blocks in proximity to the Hornsea Three array area has aimed to address any future operational issues and establish a line of communication to ensure coexistence between both activities can be achieved with minimal disruption. Any future operator of the unlicensed blocks will be aware of Hornsea Three and will have taken potential coexistence into consideration.

11.11.2.42 The sensitivity of the licence operator has been assessed as low for Spirit Energy Resources and Spirit Energy North Sea on the basis of publicly available licence data information and consultation advice. The licences will be in the third term by the operational phase of Hornsea Three. As no locations for any new wells or infrastructure is presently publicly available no assessment can be made on any specific drilling requirements.

11.11.2.43 The sensitivity of the licence operator is assumed to be low for INEOS on the basis of consultation which has advised that they currently have no exploration plans/concerns.

11.11.2.44 The licence operator is deemed to be of low vulnerability, medium recoverability and high value and details of the activity is not in the public domain and has not been advised through consultation. The sensitivity of the licence operator is therefore, considered to be low.

Significance of the effect

11.11.2.45 Overall, the sensitivity of the receptor is considered to be low and the magnitude is considered to be moderate for licence blocks 49/4b, 49/3, 49/4d and 49/9d; minor for 49/9c and 49/2a; and negligible for 49/10a. The effect will, therefore, be of **minor** adverse significance (licence blocks 49/3, 49/4d and 49/9d currently operated by Spirit Energy Resources and 49/4b currently operated by Spirit Energy North Sea), which is not significant in EIA terms; and **negligible** adverse significance (licence block 49/9c and 49/10a currently operated by Spirit Energy Resources and 49/2a currently operated by INEOS), which is not significant in EIA terms.

Safety zones around the offshore HVAC booster stations and advisory safety distances associated with maintenance activities underway along the offshore cable corridor may restrict potential seismic survey activity.

11.11.2.46 As discussed in paragraph 11.11.1.36 only those blocks that are licenced beyond the start of the Hornsea Three operational phase and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

11.11.2.47 Safety zones around the offshore HVAC booster stations and advisory safety distances around cable maintenance vessels carrying out activities along the offshore cable corridor will exclude conventional towed streamer seismic survey vessels from the area.

Magnitude of impact

11.11.2.48 The area of overlap between the relevant licence block and the Hornsea Three offshore cable corridor is presented in Table 11.29 and described in paragraph 11.11.1.64. The magnitude of impact for operators with licenced blocks along the Hornsea Three offshore cable corridor and within 1 km of the Hornsea Three offshore cable corridor (and not within the offshore HVAC booster station search area) will restrict potential seismic survey area in an area of relatively small spatial extent and for a relatively short duration from the presence of individual 1,000 m advisory safety distances around cable maintenance vessels (which may be working together in close proximity) as they move along the offshore cable corridor. The impact will be infrequent and temporary. Due to the transient and infrequent nature of any cable maintenance activity, the magnitude of impact is considered to be negligible.

11.11.2.49 There is the potential for up to four offshore HVAC booster stations within the offshore HVAC booster station search area, with the potential for operational safety zones around each structure. Assuming, as a maximum design scenario, that the four offshore HVAC booster stations are located in close proximity and spaced up to 1 km apart so that their 500 m safety zones are contiguous, the combined area of the safety zones could be up to 3.16 km^2. There is one licenced block within the offshore HVAC booster station search area, currently operated by Independent Oil and Gas. This block has a negligible level of overlap with the offshore HVAC booster station search area (see Table 11.29). Assuming, as a maximum design scenario, that the four offshore HVAC booster stations are located fully within a single licence block, the magnitude of impact will restrict potential seismic survey area in an area of relatively small spatial extent compared with the total area of the licence block, and over a long term duration.

11.11.2.50 The licence expiry dates are shown in Table 11.29 which will affect the duration and magnitude of the potential impact. The licence expiry dates for blocks 48/20b, 48/23c, 48/24b and 48/25a range between 2037 and 2039, resulting in a relatively long duration of overlap with the Hornsea Three operational phase (up to 10 years) and the licence expiry dates for blocks 48/19a, 48/20, 49/11a and 49/16a are not given.

11.11.2.51 The impact is predicted to be of local spatial extent, short term (offshore cable corridor)/long term (offshore HVAC booster station search area) duration, intermittent (offshore cable corridor)/continuous (offshore HVAC booster station search area) and high (offshore cable corridor)/low (offshore HVAC booster station search area) reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor for licence blocks 48/20a, 48/20b, 48/24b and 49/11a and negligible for licence blocks 48/19a, 48/23c, 48/25a and 49/16a.

Sensitivity of the receptor

11.11.2.52 Seismic activities will be able to continue along the length of the offshore cable corridor when maintenance activities are not taking place, with the exception of at the locations of the offshore HVAC booster stations.

11.11.2.53 The sensitivity of the receptor depends on the information provided through consultation with the operator of the licence block. Information on each block and the assessed sensitivity is summarised in Table 11.29. As noted above, the impact will affect a relatively small proportion of the licenced blocks and/or will occur over a limited duration. All licences associated with the affected licence blocks will be in the third term, or will have progressed significantly, by the operational phase of Hornsea Three. As seismic surveys are generally carried out in the first and second terms of a licence, with the third term for production activities (see section 11.7.9), further seismic surveys are unlikely to be required within these blocks during the Hornsea Three operational phase. Consultation with Independent Oil and Gas has advised that they are looking to develop the Harvey prospect and therefore localised seismic data acquisition may be required. Specific locations for any seismic activity is not known at this stage however field development is likely to be carried out prior to the operation and maintenance phase of Hornsea Three. Consultation with the operators of the affected licence blocks (Shell, INEOS, Independent Oil and Gas and ConocoPhillips) did not identify any long term future plans for seismic survey activity within the offshore cable corridor during the Hornsea Three operational and maintenance phase (see Table 11.4).

11.11.2.54 The promulgation of information through Notices to Mariners combined with ongoing consultation will enable the operators to plan surveys taking into account the presence of Hornsea Three. Sufficient information exchange between parties and continued consultation will be in place to avoid conflicting interactions. Any future operator of the unlicensed blocks will be aware of the Hornsea Three project and will have taken potential coexistence into consideration.

11.11.2.55 The operators of the affected licenced blocks are deemed to be of low vulnerability, medium recoverability and high value and details of the activity is not in the public domain and has not been advised through consultation. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

11.11.2.56 Overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor for licence blocks 48/20a, 48/20b, 48/24b and 49/11a and negligible for 48/19a, 48/23c, 48/25a and 49/16a. The effect will, therefore, be of **minor** adverse significance for 48/20a (currently operated by Shell), 48/20b (currently operated by INEOS) 48/24b (currently operated by Independent Oil and Gas) and 49/11a (currently operated by ConocoPhillips), which is not significant in EIA terms, and **negligible** significance for 48/19a (currently operated by Shell) 48/23c and 48/25a (currently operated by Independent Oil and Gas) and 49/16a currently operated by ConocoPhillips), which is not significant in EIA terms.

Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor.

11.11.2.57 Drilling activities may be restricted within the offshore cable corridor during the Hornsea Three operational and maintenance phase from the presence of up to six export cables installed across the corridor. Drilling may also be restricted within 1 km from either side of the offshore cable corridor (based on the potential for 500 m safety zones to be applied for around any oil and gas infrastructure and the potential for 500 m safety zones to extend beyond the offshore cable corridor from Hornsea Three infrastructure within the offshore HVAC booster station search area). There may be further, temporary restrictions from any 1,000 m advisory safety distances associated with maintenance vessels working along the offshore cable route. The four offshore HVAC booster stations if required will be located within the restricted area along the offshore cable corridor, therefore they are not assessed separately in this assessment. It should be noted that pipelines would be able to be installed across this area subject to crossing and proximity agreements being put in place.

11.11.2.58 As discussed in paragraph 11.11.1.36 only those blocks that are licenced beyond the start of the Hornsea Three operational phase (2030) and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

Magnitude of impact

11.11.2.59 The area of overlap between the relevant licence block and the Hornsea Three offshore cable corridor is presented in Table 11.29 and described in paragraph 11.11.1.64. There is the potential for further restrictions from any 500 m safety zones or 1,000 m advisory safety distances that may extend beyond the offshore cable corridor boundary. However such further restrictions will be either highly localised or temporary and infrequent. There is one additional licenced block (49/16a) within 1 km of the offshore cable corridor (0.9% overlap).

11.11.2.60 The magnitude of impact for operators with licenced blocks along the offshore cable corridor will be limited to a restriction on drilling and the placement of infrastructure within an area of relatively small spatial extent in relation to the total licence block area. The licence expiry dates (Table 11.29) for blocks 48/20b, 48/23c, 48/24b and 48/25a range between 2037 and 2039, resulting in a relatively long term duration of overlap with the Hornsea Three operational phase (up to 10 years) and the licence expiry dates for blocks 48/19a, 48/20a, 49/11a and 49/16a are not given.

11.11.2.61 The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor (licence blocks 48/19a, 48/20b, 48/24b and 49/11a) and negligible (48/19a, 48/23c, 48/25a and 49/16a).

Sensitivity of the receptor

11.11.2.62 The sensitivity of the receptor depends on the information provided through consultation with the operator of the licence block. Information on each block and the assessed sensitivity is summarised in Table 11.29. All licences associated with the affected licence blocks will be in the third term, or considerably advanced, by the operational phase of Hornsea Three. Consultation with the operators of the affected licence blocks (Shell, INEOS, Independent Oil and Gas and ConocoPhillips) did not identify any plans for new wells or the development of new infrastructure within the Hornsea Three offshore cable corridor during the Hornsea Three operational and maintenance phase (see Table 11.4). As no locations for any new wells or infrastructure is presently publicly available no assessment can be made on any specific drilling requirements.

11.11.2.63 Drilling may still take place between 500 m to 1 km from the Hornsea Three offshore cable corridor provided that no permanent safety zones will be applied for by the oil and gas operator. Drilling may also still take place by means of directional drilling, providing this commences at a location outside the restricted area.

11.11.2.64 There is the potential to coexist through ongoing consultation and promulgation of information. Sufficient information exchange between parties and continued consultation will be in place to avoid conflicting interactions. Any future operator of the unlicensed blocks will be aware of the Hornsea Three project and will have taken potential coexistence into consideration.

11.11.2.65 The operators of the affected licence blocks are deemed to be of low vulnerability, medium recoverability and high value and details of the activity is not in the public domain and has not been advised through consultation. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

11.11.2.66 Overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor (licence blocks 48/20a, 48/20b,48/24b and 49/11a) and negligible (48/19a, 48/23c,48/25a and 49/16a). The effect will, therefore, be of **minor** adverse significance (licence blocks 48/19a currently operated by Shell, 48/20b currently operated by INEOS, 48/24b currently operated by Independent Oil and Gas and 49/11a currently operated by ConocoPhillips), which is not significant in EIA terms, and **negligible** significance (licence blocks 48/19a currently operated by Shell, 48/23c and 48/25a currently operated by Independent Oil and Gas and 49/16a currently operated by ConocoPhillips), which is not significant in EIA terms.

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.

11.11.2.67 The physical presence of wind turbines and associated offshore structures has the potential to interfere with the performance of REWS, through effects such as high radar returns, shadowing (effectively a shadow is cast by the wind turbines which creates a region where the radar beam is unable to fully illuminate an object), increased number of detections and false alarm/track generation. This system is sometimes used by oil and gas operators as an integral part of their anti-collision safety systems for their offshore platforms (see section 11.7.15.2).

11.11.2.68 Platforms with REWS potentially within operational range of the Hornsea Three array area have been identified (see Table 11.17). The REWS on the J6A platform (operated by Spirit Energy) is located 6.9 nm from the Hornsea Three array area and is therefore within the approximate detection range for a 100 m^2 target (16 nm). The J6A platform REWS also provides coverage and protection to the Chiswick, Markham ST-1, Windermere and Grove platforms (see Table 11.17). It should be noted that consultation with Spirit Energy and INEOS (see Table 11.4) has advised that the Markham ST-1 and Windermere platforms are expected to be decommissioned prior to the offshore construction of Hornsea Three. These platforms have however been included in the assessment as the decommissioning plans have not yet been approved by BEIS.

11.11.2.69 The REWS on the Murdoch and Saturn platforms (operated by ConocoPhillips), located 16.9 nm and 17.7 nm from the Hornsea Three array area respectively, are potentially within the approximate detection range for a 100 m^2 RCS target. Since the Murdoch platform REWS has an overlapping coverage with the Katy platform REWS (also operated by ConocoPhillips), the Murdoch platform REWS was not considered within this assessment. The Saturn platform REWS also provides coverage and protection to the Tethys, Mimas, Viking KD, Vulcan 2 UR and Vampire OD platforms operated by ConocoPhillips. The Vulcan UR and Vampire OD platforms are scheduled to be decommissioned prior to offshore construction of Hornsea Three.

11.11.2.70 Radar modelling was carried out on the effect of Hornsea Three on the J6A and Saturn platform REWS. This is presented in volume 5, annex 11.1: Radar Early Warning Systems Technical Annex and the results are discussed for each platform in turn below.

Magnitude of impact

11.11.2.71 The layout and returns modelling results for the J6A platform REWS indicate that the close proximity of this platform, in addition to the Windermere, Chiswick, Grove, Markham ST-1 and J6A platforms (which are also protected by the J6A platform REWS), to the Hornsea Three array area may raise potential concerns when considering the detection and tracking of vessels travelling through the Hornsea Three array area. If the REWS is unable to detect and track a vessel within the wind farm it may cause the REWS to issue delayed TCPA alarms when a vessel is approaching any of these platforms, resulting in insufficient response times to deal with potential collision threats.

11.11.2.72 To further assess the ability of the J6A platform REWS to detect a vessel within the Hornsea Three array area, a constant false alarm rate (CFAR) threshold over the detection region was modelled. The radar returns from a small test vessel (100 m^2 RCS) was then modelled. The vessel has high returns at close ranges, which then reduces with range up to approximately 16 nm (30 km). The returns from the test vessel were then compared against the CFAR detection threshold to establish the detection regions. If the vessel returns are above the CFAR threshold, then the vessel is detected and if the returns are below the threshold the target is assumed be undetected within that region. Figure 11.10 shows the detection plot from the J6A platform REWS for the test vessel over the Hornsea Three array area. Dark areas within the plot denote regions where the vessels will not be detected. The results show that the raised threshold levels caused by the presence of turbines will inherently cause detection loss of vessels travelling through the Hornsea Three array area. This effect, in combination with potential shadowing effects, may cause the REWS to lose tracks of the vessels and fail in raising TCPA alarms in a timely manner.

11.11.2.73 The results also show that at close ranges the REWS easily detects the test vessel as the returns are above the detection threshold. Once the vessel is travelling within the Hornsea Three array area, the raised threshold over the cells around each turbine can cause loss of detection. A larger size test vessel (1,000 m^2 RCS) was not modelled as the results would be similar for the 100 m^2 RCS test vessel.

11.11.2.74 The layout and returns modelling and CFAR modelling was also undertaken for the Saturn platform REWS. A small test vessel of 100 m^2 RCS was modelled. The results indicate that the range of detection is 16 nm, therefore the Hornsea Three array area will not have an impact on the REWS for a 100 m^2 RCS test vessel due to the distance of the REWS from the nearest turbine 17.7 nm (32.7 nm).

11.11.2.75 As the smaller test vessel could not be detected, a larger test vessel of 1,000 m^2 RCS was also modelled. This represents a 1,000 GT vessel. The modelling indicates that the typical radar detection range for a 1,000 m^2 RCS target is approximately 26.6 nm (48 km). When considering the CFAR threshold over the Hornsea Three array area, the detection of the 1,000 m^2 RCS target test vessel is shown in Figure 11.11. The results show that for a larger vessel the Hornsea Three array area is unlikely to affect the performance of the REWS on the Saturn platform. There will be some detection loss at the edges of the Hornsea Three array area; however, this is sufficiently far to uphold the integrity of the TCPA alarms.

11.11.2.76 Designed in mitigation as described in Table 11.27 shall be put in place in order to reduce the level of effect of Hornsea Three on the J6A platform REWS. The impact is predicted to be of local spatial extent, medium term duration, continuous and not reversible for the project phase. It is predicted that the impact will affect the receptor directly. The physical extent of the impact, considering the designed in mitigation measures, is considered to be low for the J6A platform REWS, operated by Spirit Energy, and negligible for the Saturn platform REWS, operated by ConocoPhillips. The magnitude is therefore, considered to be low for Spirit Energy and negligible for ConocoPhillips.

Sensitivity of the receptor

11.11.2.77 REWS, where installed, play a fundamental part of an operator's anti-collision safety systems on their platform. The platform operator is deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be high.

Significance of Effect

11.11.2.78 Overall, the sensitivity of the receptor is considered to be high and the magnitude is deemed to be low for the J6A platform REWS (Spirit Energy) and negligible for the Saturn platform REWS (ConocoPhillips). The effect will, therefore, be of **minor** adverse significance for the J6A platform REWS (Spirit Energy), which is not significant in EIA terms, and **negligible** significance for the Saturn platform REWS (ConocoPhillips), which is not significant in EIA terms.

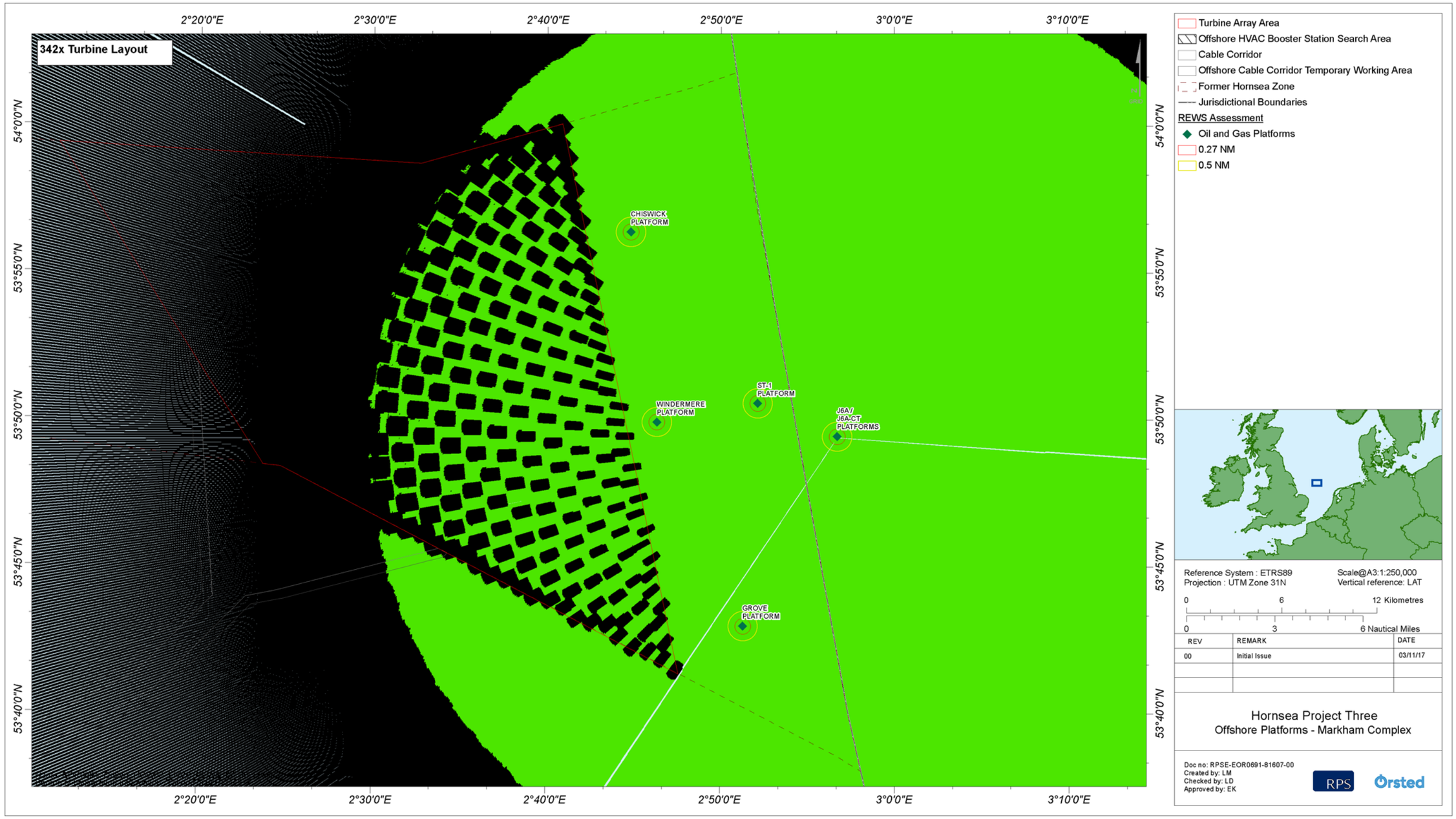

Figure 11.10: J6A platform REWS detection plot showing loss regions for a 100 m² RCS target test vessel (300 turbines).

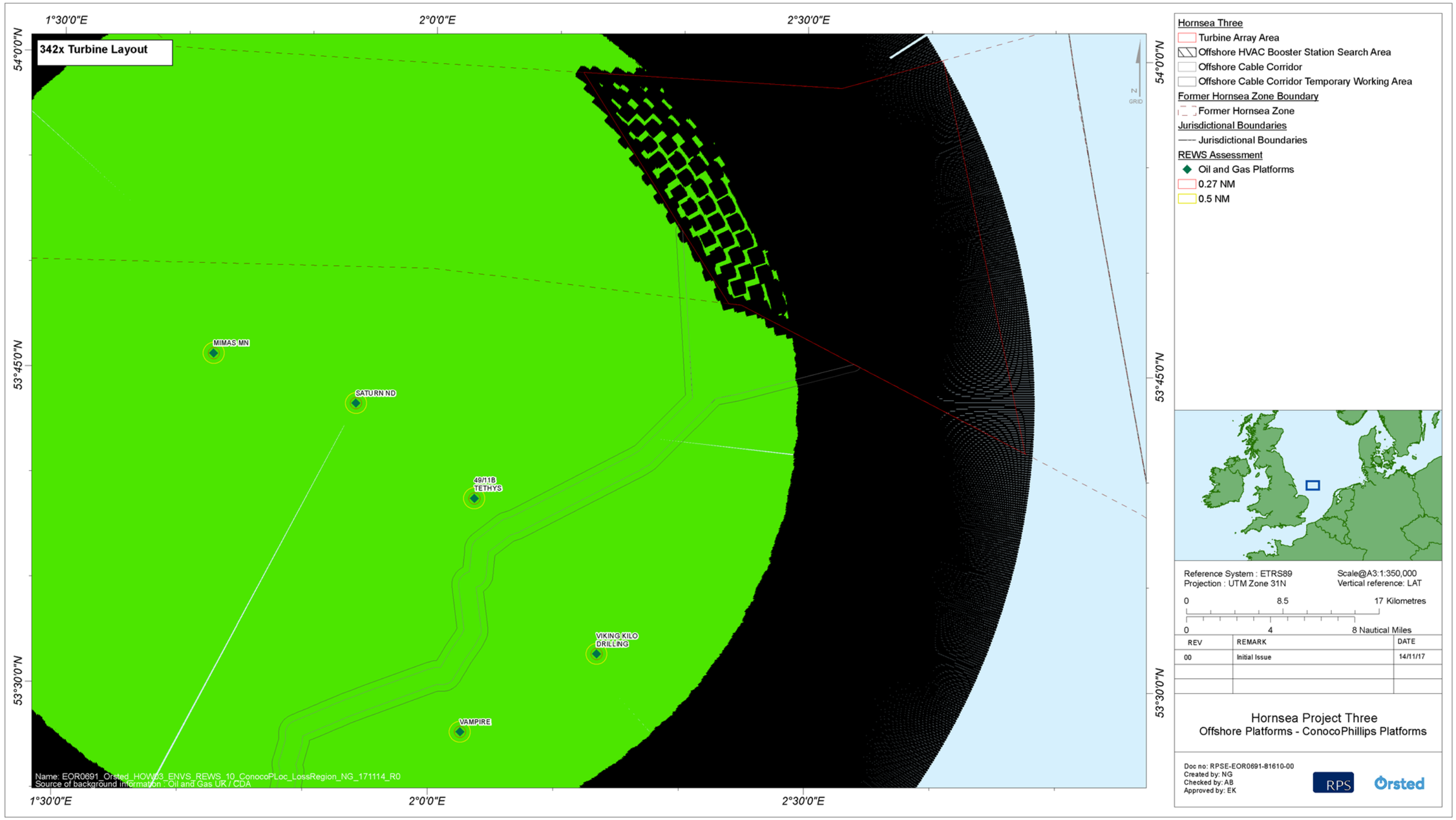

Figure 11.11: Saturn platform REWS detection plot showing loss regions for a large 1,000 m² RCS target over the Hornsea Project Three array area (342 turbines).

The presence of new wind turbines in previously open sea areas will deviate vessels which may cause a change in CPA and TCPA alarms on oil and gas platforms protected by REWS.

11.11.2.79 Existing shipping lanes may be altered by the physical presence of the Hornsea Three array area which may result in vessels being rerouted nearer the platforms protected by the REWS. This may cause a change in the CPA/TCPA alarm rates at these platforms. An alarm will trigger a set of operational safety procedures to protect the platform integrity and personnel on board, ranging from making direct platform to vessel communication, interception by an ERRV vessel, or abandonment of the platform.

11.11.2.80 The REWS uses the radar returns to monitor and track vessels within the detection region and alert the operator when a proximity violation or a collision threat is detected. The REWS uses a defined set of rules to identify a breach of the CPA and TCPA parameters. Typically, an Amber alarm is raised if a vessel is within CPA of 0.5 nm and a Red alarm is triggered if the CPA of a vessel is 0.27 nm or less. The Red TCPA alarms are raised for vessels that are on a collision vector 25 minutes away and an Amber alarm is raised for vessels that are 35 minutes away. To avoid alarms due to temporary vector breach of the TCPA while vessels are turning, TCPA alarms are only triggered if the vessel's vector remains in breach of the TCPA condition for a set number of radar rotations (typically 10 radar rotations).

11.11.2.81 This assessment considers the effect of rerouted shipping lanes on the Mimas, Saturn and Tethys platforms, which are protected by the REWS located on the Saturn platform (currently operated by ConocoPhillips). Other platforms with REWS in the vicinity of Hornsea Three have not been included in the assessment as the predicted shipping lanes are expected to either remain unchanged or move further away from these platforms (see volume 5, annex 11.1: Radar Early Warning Systems Technical Annex).

11.11.2.82 It should be noted that this impact has been assessed considering route deviations due to Hornsea Three in isolation (i.e. ignoring deviations due to Hornsea Project One and Hornsea Project Two). The predicted route deviations were provided by Anatec, following a review of vessel movements in the region and are presented in volume 5, annex 11.1: Radar Early Warning Systems Technical Annex. This situation is not considered likely to arise as the Hornsea Project One and Hornsea Project Two wind farms have been consented and construction will start on both projects prior to Hornsea Three. For this reason, the cumulative assessment presented in section 11.13 is considered the likely scenario.

Magnitude of Impact

11.11.2.83 A statistical model was run to estimate the likelihood of CPA/TCPA alarms being triggered considering 1,000 vessel paths along each predicted route deviation due to Hornsea Three in isolation (see paragraph 11.11.2.81) in both forward and reverse directions, for the base case (Figure 11.12) and for the rerouted traffic due to the physical presence of Hornsea Three (Figure 11.13). In order to avoid false alarms due to temporary vector breach of the TCPA while vessels are turning the models were set to only issue a TCPA alarm if the vessel continues to breach the TCPA rules for more than 10 radar rotations. This is considered a typical figure for REWS; however, different REWS configurations may have different settings which may alter the alarm probabilities slightly. Further details of the parameters used in the model are presented in volume 5, annex 11.1: Radar Early Warning Systems Technical Annex.

11.11.2.84 The results of the modelling are presented in Table 11.30 for the base case and for the rerouted traffic due to the presence of Hornsea Three, for the CPA and TCPA alarms at the Mimas, Saturn and Tethys platforms.

11.11.2.85 It should be noted that as the routes are generated in a random manner (based on the mean and standard deviation of each route), the results of the statistical analysis may vary slightly depending on the normal distribution around the mean line of each route. Therefore, a change of less than 5% can be assumed to fall within the error margins of the predicted data and the statistical approach used within the models.

11.11.2.86 The modelling results indicate that many of the routes will see a reduction in the probability of alarms due to the displacement of traffic away from the platforms (shown in green in Table 11.30). Some routes will see a small increase in the probability of alarms, while Route 1 and Route 9 will see a greater increase in alarms (shown in red in Table 11.30). For Route 1, the traffic vector is directed towards Mimas causing an increase in red alarms of 3.6% and amber alarms of 26.2% in the forward direction. Route 9 was not assessed in the base case due to its location, which is sufficiently far away from the platforms. However, with the presence of the Hornsea Three array area, Route 9 traffic will be passing closer to both the Saturn and Tethys platforms causing an increase of 19% red alarms and 47% amber alarms (forward direction) and 7.4% red alarms and 27.2% amber alarms (reverse direction).

11.11.2.87 Considering the number of vessels which use each route, the percentage change in alarms (from the base case) has been converted into the potential change in alarms (from the base case) per day for each route (see Table 11.30). The range in the change of alarms per day for each route for the red alarms is -0.22 to +0.1 (forward direction) and -0.83 to +0.04 (reverse direction) and for the amber alarms is -0.59 to +0.66 (forward direction) and -0.99 to +0.14 (reverse direction). There is a reduction in the total number of alarms in all scenarios as shown below:

- Total change in amber alarms (forward direction) = -0.41 alarms/day;
- Total change in amber alarms (reverse direction) = -2.44 alarms/day.
- Total change in red alarms (forward direction) = -0.183 alarms/day; and
- Total change in red alarms (reverse direction) = -1.33 alarms/day.

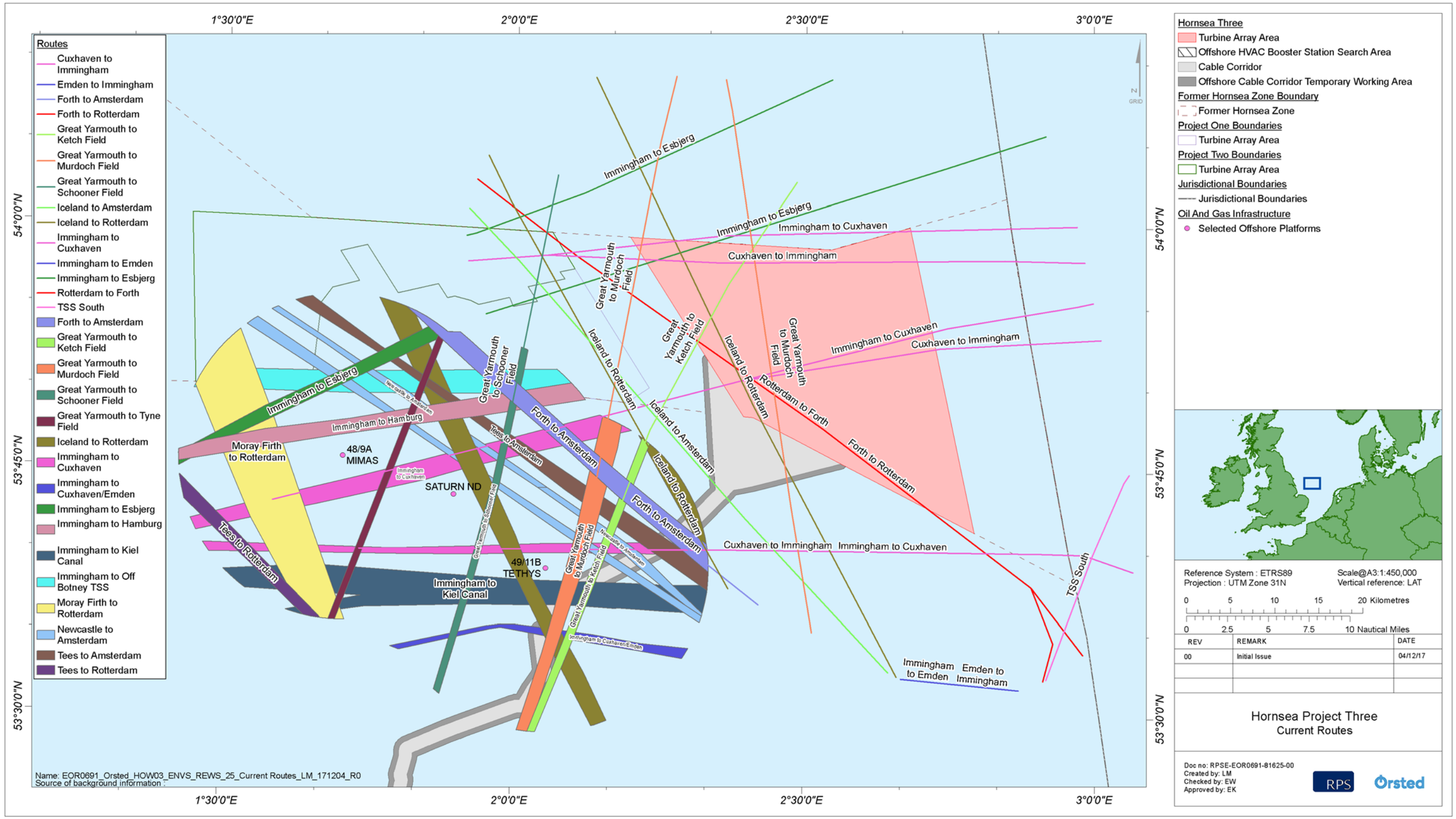

Figure 11.12: Existing shipping routes around the Mimas, Tethys and Saturn platforms.

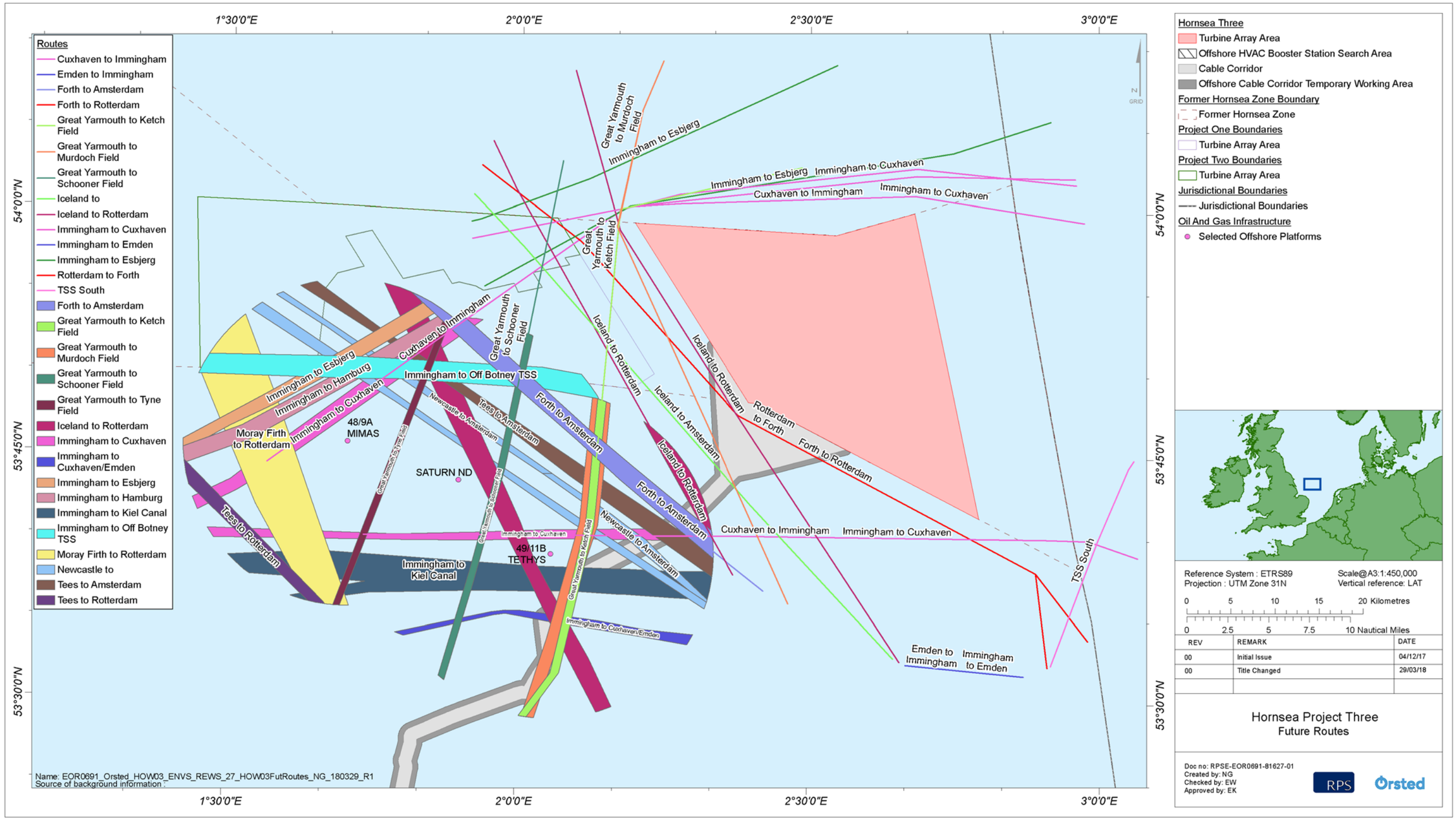

Figure 11.13: Predicted shipping routes due to the physical presence of Hornsea Three.

Table 11.30: Existing routes and alarm rates based on 1,000 runs in both the forwards and backwards direction for the base case and considering the physical presence of Hornsea Three.

Route Number	Route Name	Number of vessels /day	Base case				Rerouted traffic due to Hornsea Three							
			Forward Direction		Reverse Direction		Forward Direction				Reverse Direction			
			Percentage of red alarms	Percentage of amber alarms	Percentage of red alarms	Percentage of amber alarms	Percentage change in red alarms	Change in number of red alarms/day	Percentage change in amber alarms	Change in number of amber alarms/ day	Percentage change in red alarms	Change in number of red alarms/day	Percentage change in amber alarms	Change in number of amber alarms/day
1	Immingham to Cuxhaven	2.5	0.4	15.6	2.4	12.8	3.6	0.09	26.2	0.66	-2.4	-0.06	-12.6	-0.32
2	Immingham to Cuxhaven	1.5	0.4	25.2	0.8	2.8	0.2	0.003	-5.2	-0.08	-0.2	-0.001	0.4	0.001
3	Newcastle to Amsterdam	1	12.2	37.8	82.8	99	-12.2	-0.12	-37.8	-0.38	-82.8	-0.83	-99	-0.99
4	Newcastle to Amsterdam	1	1.8	13	1.2	29	-1.8	-0.018	-13	-0.13	-1.2	-0.02	-29	-0.29
5	Moray Firth to Rotterdam	0.5	0	0	0	0	1	0.005	2.6	0.013	0	0	0	0
6	Immingham to Cuxhaven/Emden	0.5	0	0	0	0	0	0	0	0	0	0	0	0
7	Tees to Amsterdam	0.33	8	30.6	16.8	44.6	-8	-0.03	-29.6	-0.1	-16.8	-0.06	-44.6	-0.15
8	Immingham to Esbjerg	1					0	0	0	0	0	0	0	0
9	Iceland to Rotterdam	0.5					19	0.1	47	0.24	7.4	0.04	27.2	0.14
10	Immingham to Hamburg	0.5	7	23.4	0.6	6.6	-6.8	-0.03	-22.8	-0.11	-0.6	-0.003	-6.6	-0.03
11	Immingham to Off Botney TSS	0.5	0.2	0.6	0	2.4	0	0	0	0	0	0	-2.4	-0.012
12	Immingham to Kiel Canal	0.75	6.2	10.2	3.4	6.8	1.6	0.012	5.4	0.04	-0.8	-0.006	0	0
12	Immingham to Kiel Canal North	0.5					3.4	0.017	7.2	0.04	0	0	0	0
12	Immingham to Kiel Canal South	0.25	12.2	26	0	0	2.6	0.007	3	0.008	0	0	0	0
13	Great Yarmouth to Schooner Field	0[a]	0.2	1.2	0	0	0	0	0	0	0	0	0	0
14	Great Yarmouth to Murdoch Field	0[a]					1.2	0.001	2.8	0.003	0	0	0	0
15	Great Yarmouth to Ketch Field	0[a]	0	0	0	0	0	0	0	0	0	0	0	0
16	Great Yarmouth to Tyne Field	0[a]	0	10.8	0	0	0	0	-10.8	-0.02	0	0	0	0
17	Forth to Amsterdam	1	21.8	58.8	39	79.2	-21.8	-0.22	-58.8	-0.59	-39	-0.39	-79.2	-0.79
19	Tees to Rotterdam	1	0	0	0	0	0	0	0	0	0	0	0	0
Total change in alarms/day								-0.183		-0.41		-1.33		-2.44

a The number of vessels is fractional: Route 13: 2 vessels per 3 days; Route 14: 1 vessel per 10 days; Route 15: 1 vessel per 5 days; and Route 16: 1 vessel per 5 days.

11.11.2.88 The impact is predicted to be of local spatial extent, medium term duration, intermittent and not reversible for the project phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.

Sensitivity

11.11.2.89 The CPA and TCPA alarms form an integral part of the REWS, which, when installed, plays a fundamental part of an operator's anti-collision safety systems on their platform. The platform operator is deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be high.

Significance of the effect

11.11.2.90 Overall, it is predicted that the sensitivity of the receptor is considered to be high and the magnitude is deemed to be negligible. The effect will, therefore, be of minor adverse significance, which is not significant in EIA terms.

Wind turbines and associated infrastructure will form a physical obstruction and may disrupt vessel access to oil and gas platforms and subsea infrastructure.

11.11.2.91 This impact considers vessel access to oil and gas platforms and subsea infrastructure only. An assessment of restrictions to helicopter access to existing or new oil and gas platforms or subsea structures is provided in volume 2, chapter 8: Aviation, Military and Communication. An assessment on route deviations to vessels is provided in volume 2, chapter 7: Shipping and Navigation.

Magnitude of impact

11.11.2.92 With the potential for 300 wind turbines at a minimum separation distance of 1,000 m to be present within the Hornsea Three array area, in addition to the potential for up to 19 operational safety zones around offshore platforms within the Hornsea Three array area and an additional four operational safety zones within the offshore HVAC booster station search area, and further safety zones/advisory safety distances around maintenance activities within the Hornsea Three array area and along the offshore cable corridor, there is the potential for disruption of vessel access to oil and gas platforms and subsea infrastructure.

11.11.2.93 There are no existing platforms or subsea structures (that are not wells) within the Hornsea Three array area or within 1 km of the Hornsea Three array area. There are no platforms or active subsea structures (that are not wells) located within the Hornsea Three offshore cable corridor or offshore HVAC booster station search area, however there is one active gas platform, Clipper South operated by INEOS, located within 1 km of the Hornsea Three offshore cable corridor. In relation to wells, there are no wells within the Hornsea Three array area however there is one suspended well within 1 km of the Hornsea Three array area (operated by INEOS). There are no wells within the Hornsea Three offshore cable corridor, however there are four completed wells within 1 km of the Hornsea Three offshore cable corridor (operated by INEOS).

11.11.2.94 The Clipper South platform is located 813 m from the Hornsea Three offshore cable corridor, and outside the offshore HVAC booster search area. The 500 m safety zone around this platform is therefore 313 m from the offshore cable corridor and may overlap with any advisory safety distances around maintenance vessels working infrequently along the offshore cable corridor. This overlap is not considered to disrupt vessel access to the Clipper South platform due to the advisory nature of the safety distance and the close communication which will be established between both parties to ensure that activities can be coordinated.

11.11.2.95 There is potential for vessel access to the suspended well within 1 km of the Hornsea Three array area to be very slightly disrupted by the presence of any operational safety zones or safety zones/advisory safety distances associated with maintenance activities.

11.11.2.96 The four completed wells within 1 km of the Hornsea Three offshore cable corridor are located in a single position within the Clipper South field operated by INEOS, approximately 800 m from the Hornsea Three offshore cable corridor and approximately 21 km to the north of the offshore HVAC booster station search area. Completed wells are typically subject to a 500 m safety zone. Any overlap between these safety zones and any advisory safety distances around maintenance vessels working infrequently along the offshore cable corridor is not considered to disrupt vessel access to these wells due to the advisory nature of the safety distance and the close communication which will be established between both parties to ensure that activities can be coordinated.

11.11.2.97 Any plans for new infrastructure will be developed by operators with an awareness of the presence of Hornsea Three. In the event that new infrastructure is planned in close proximity, consultation will take place between Hornsea Three and the relevant oil and gas operator to establish close communication. Whilst this is not a legislative requirement the OGA interactive maps show the locations of wind farm developments.

11.11.2.98 The impact is predicted to be of local spatial extent, short term (offshore cable corridor)/long term (Hornsea Three array area and offshore HVAC booster station search area) duration, intermittent (offshore cable corridor)/continuous (Hornsea Three array area and offshore HVAC booster station search area) and high (offshore cable corridor)/low (Hornsea Three array area and offshore HVAC booster station search area) reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of the receptor

11.11.2.99 The sensitivity of the receptor depends on the information provided through consultation with the operator. Consultation with INEOS advised that the Topaz suspended well head within 1 km of the Hornsea Three array area is likely to be decommissioned prior to Hornsea Three offshore construction, and that they do not have any current exploration plans within the southern North Sea (see Table 11.4). End of field life for the Clipper South field is expected in 2024 (DEA UK SNS Ltd, 2015), prior to Hornsea Three operation, as also indicated by INEOS during consultation (see Table 11.4).

11.11.2.100 Therefore, there is unlikely to be potential for disruption to vessel access to existing infrastructure. Close communication will be established between Hornsea Three and the relevant operators in the vicinity of the Hornsea Three array area and offshore cable corridor to ensure that future activities can be coordinated. Any future operator of the unlicensed blocks will be aware of the Hornsea Three project and will have taken potential coexistence into consideration.

11.11.2.101 The oil and gas operator is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

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

Future monitoring

11.11.2.103 No infrastructure and other users monitoring to test the predictions made within the operation and maintenance phase impact assessment is considered necessary.

11.11.3 Decommissioning phase

11.11.3.1 The impacts of the offshore decommissioning of Hornsea Three have been assessed on infrastructure and other users. The potential effects arising from the decommissioning of Hornsea Three are listed in Table 11.18, Table 11.19 and Table 11.20 along with the maximum design scenario against which each decommissioning phase impact has been assessed.

11.11.3.2 A description of the potential effect on infrastructure and other users receptors caused by each identified impact is given below. The receptors have been divided into categories, as per Table 11.18, Table 11.19 and Table 11.20, for ease of reference.

Recreational users and recreational fishing

Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.

11.11.3.3 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **negligible**, which is not significant in EIA terms (see paragraph 11.11.1.13).

Aggregate extraction, cables and pipelines

Removal of Hornsea Three infrastructure may affect existing cables and pipelines or restrict access to cables and pipelines.

11.11.3.4 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor** adverse, which is not significant in EIA terms (see paragraph 11.11.1.22).

Removal of 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.

11.11.3.5 The potential changes to the physical environment due to decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **negligible**, which is not significant in EIA terms (see paragraph 11.11.1.34).

Oil and gas operations

Hornsea Three infrastructure, safety zones and advisory safety distances associated with decommissioning of the Hornsea Three array area may restrict potential seismic survey activity.

11.11.3.6 As discussed in paragraph 11.11.1.36 only those blocks that are licenced beyond the start of the Hornsea Three decommissioning phase and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

11.11.3.7 Only one currently licenced block within the Hornsea Three array area may still be licenced by the time of Hornsea Three decommissioning (49/10a). The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore negligible, which is not significant in EIA terms (see paragraph 11.11.1.47).

Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances.

11.11.3.8 As discussed in paragraph 11.11.1.36 only those blocks that are licenced beyond the start of the Hornsea Three decommissioning phase and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

11.11.3.9 Only one currently licenced block within the Hornsea Three array area may still be licenced by the time of Hornsea Three decommissioning (49/10a). The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **negligible**, which is not significant in EIA terms (see paragraph 11.11.1.61).

Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor may restrict potential seismic survey activity.

11.11.3.10 As discussed in paragraph 11.11.1.36 only those blocks that are licenced beyond the start of the Hornsea Three decommissioning phase and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

11.11.3.11 Four currently licenced blocks along the Hornsea Three offshore cable corridor may still be licenced by the time of Hornsea Three decommissioning (48/19a, 48/20a, 49/11a and 49/16a). The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor** adverse for licence block 48/20a currently operated by Shell and 49/11a currently operated by ConocoPhillips, and **negligible** for licence block 48/19a currently operated by Shell and 49/16a currently operated by ConocoPhillips, which is not significant in EIA terms (see paragraph 11.11.1.72).

Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor.

11.11.3.12 As discussed in paragraph 11.11.1.36 only those blocks that are licenced beyond the start of the Hornsea Three decommissioning phase and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

11.11.3.13 Four currently licenced blocks along the Hornsea Three offshore cable corridor may still be licenced by the time of Hornsea Three decommissioning (48/19a, 48/20a, 49/11a and 49/16a). The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor** adverse for licence block 48/20a currently operated by Shell and 49/11a currently operated by ConocoPhillips, and **negligible** for licence block 48/19a currently operated by Shell and 49/16a currently operated by ConocoPhillips, which is not significant in EIA terms (see paragraph 11.11.1.83).

Future monitoring

11.11.3.14 No infrastructure and other users monitoring to test the predictions made within the decommissioning phase impact assessment is considered necessary.

11.12 Cumulative Effect Assessment methodology

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

11.12.1.1 The Cumulative Effect Assessment (CEA) takes into account the impact associated with Hornsea Three together with other projects and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise undertaken as part of the 'CEA long list' of projects (see annex 4.5: Cumulative Effects Screening Matrix and Location of Schemes). Each project on the CEA long list has been considered on a case by case basis for scoping in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

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

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

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

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

11.12.1.4 The specific projects scoped into this CEA and the Tiers into which they have been allocated, are outlined in Table 11.31.

11.12.2 Maximum design scenario

11.12.2.1 The maximum design scenarios identified in Table 11.32, Table 11.33 and Table 11.34 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. The cumulative impact presented and assessed in this section has been selected from the details provided in the Hornsea Three project description (volume 1, chapter 3: Project Description), as well as the information available on other projects and plans, in order to inform a 'maximum design scenario'. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the project Design Envelope (e.g. different turbine layout), to that assessed here be taken forward in the final design scheme.

11.12.2.2 There are no projects/plans which could interact cumulatively with Hornsea Three during the operation phase for the following impacts on oil and gas receptors, therefore these impacts have been scoped out of the assessment:

- Safety zones around the offshore HVAC booster stations and advisory safety distances associated with maintenance activities underway along the offshore cable corridor, alongside other plans/projects, may restrict potential seismic survey activity; and
- Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor, alongside other plans/projects.

11.12.2.3 Similarly, there are no projects/plans which could interact cumulatively with Hornsea Three during the decommissioning phase for impacts on oil and gas receptors therefore these impacts have been scoped out of the assessment.

Table 11.31: List of other projects and plans considered within the CEA.

Tier	Phase	Project/Plan	Distance from Hornsea Three array area	Distance from Hornsea Three offshore cable corridor	Details	Date of Construction (if applicable)	Overlap of construction phase with Hornsea Three construction phase	Overlap of operation phase with Hornsea Three operation phase
1	*Offshore wind farms*							
	Under construction	Galloper	195 km	79 km	140 turbines consented, of which 56 turbines to be constructed.	2017 to 2018	No	Yes
		Hornsea Project One	7 km	7 km	332 turbines assessed in the Environmental Statement (although 240 turbines actually consented), of which 174 turbines to be constructed.	2017 to 2019	No	Yes
		Hornsea Project Two	7 km	18 km	360 turbines assessed in the Environmental Statement (although 300 turbines actually consented).	2020 to 2022	Yes	Yes
	Consented	East Anglia One	152 km	106 km	240 turbines consented, of which 102 turbines to be constructed.	2017 to 2019	No	Yes
		Triton Knoll	100 km	44 km	288 turbines consented, of which 90 to be constructed.	2017 to 2021	No	Yes
	Cables and pipelines							
	Active (to be decommissioned)	PL496	39 km	0 km (crosses Hornsea Three offshore cable corridor)	20 inch gas – coated steel pipeline, partially trenched, operated by Spirit Energy	2020 to 2023	Yes (decommissioning phase)	No
		PL497	39 km	0 km (crosses Hornsea Three offshore cable corridor)	3 inch methanol - coated steel pipeline, partially trenched, operated by Spirit Energy	2020 to 2023	Yes (decommissioning phase)	No
		PL724	38.6 km	1.3 km	3 inch methanol – coated steel pipeline, trenched and buried, operated by Spirit Energy	2020 to 2023	Yes (decommissioning phase)	No
	Out of use (to be decommissioned)	PL723	38.6 km	1.3 km	14 inch rigid steel pipeline, trenched and buried, operated by Spirit Energy	2020 to 2023	Yes (decommissioning phase)	No
		PL575	39 km	1.3 km	8 inch gas – coated steel pipeline, trenched and buried, operated by Spirit Energy	2020 to 2023	Yes (decommissioning phase)	No
		PL576	39 km	1.3 km	4 inch umbilical pipeline (hydraulic hoses and cables), trenched and buried, operated by Spirit Energy	2020 to 2023	Yes (decommissioning phase)	No
2	*Aggregate extraction*							
	Application	Humber 5 - 483	14 km	2 km	Aggregate Application Area operated by DEME Building Materials Ltd	N/A	N/A	Yes
		Inner Dowsing - 439	131 km	48 km	Aggregate Application Area operated by Hanson Aggregates Marine Ltd	N/A	N/A	Yes
	Option	106 East - 480	120 km	52 km	Aggregate Option and Production Area operated by Hanson Aggregates Marine Ltd	N/A	N/A (operational to 2023)	No

Tier	Phase	Project/Plan	Distance from Hornsea Three array area	Distance from Hornsea Three offshore cable corridor	Details	Date of Construction (if applicable)	Overlap of construction phase with Hornsea Three construction phase	Overlap of operation phase with Hornsea Three operation phase
		Inner Dowsing - 481	125 km	38 km	Aggregate Licence Option Area operated by Tarmac Marine Ltd/Van Oord Ltd	N/A	N/A	Yes
	Offshore wind farms							
	Consented	Dogger Bank Creyke Beck A	76 km	91 km	300 turbines assessed in the Environmental Statement (although 200 turbines actually consented).	2021 to 2024	Yes	Yes
		Dogger Bank Creyke Beck B	99 km	115 km	300 turbines assessed in the Environmental Statement (although 200 turbines actually consented).	2021 to 2024	Yes	Yes
		Dogger Bank Teesside A	107 km	123 km	200 turbines assessed in the Environmental Statement and consented.	2023 to 2026	Yes	Yes
		Dogger Bank Teesside B (now Sofia Offshore Wind Farm)	95 km	108 km	200 turbines assessed in the Environmental Statement and consented.	2023 to 2026	Yes	Yes
		East Anglia Three	103 km	87 km	172 turbines assessed in the Environmental Statement and consented.	2019 to 2022	Yes	Yes
	Cables and pipelines							
	Proposed	Viking Link Interconnector	13 km	18 km	High voltage (up to 500 kV) Direct Current (DC) electricity interconnector.	2019-2022	Yes	Yes
3	*Aggregate extraction*							
	Concept	Bacton Sand Engine	124 km	23 km	Sandscaping – 1.5 million cubic meters of sand along the coast to protect a 5 km stretch of the U.K.'s east coast. The volume of sand to be used will come from existing licensed dredging areas.	2019	No	Yes
	Offshore wind farms							
	Pre-consent application	East Anglia One North	141 km	90 km	Seeking consent for up to 67 turbines.	2021 to 2022	Yes	Yes
	Pre-consent application	East Anglia Two	158 km	94 km	Seeking consent for up to 75 turbines.	2023 to 2025	Yes	Yes
	Pre-consent application	Norfolk Boreas	53 km	64 km	Seeking consent for up to 257 turbines.	2024 to 2029	Yes	Yes
	Pre-planning application	Norfolk Vanguard	73 km	51 km	Seeking consent for up to 257 turbines.	2020 to 2026	Yes	Yes

Table 11.32: Maximum design scenario considered for the assessment of potential cumulative impacts on infrastructure and other users: recreational users and recreational fishing.

Potential impact	Maximum design scenario	Justification
Construction phase		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor, alongside other plans/projects, may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.	Tier 1 • Hornsea Project One and Hornsea Project Two; • Galloper; • East Anglia One and Triton Knoll; • Pipeline decommissioning activities listed in Table 11.31. Tier 2 • Aggregate application/option areas (483, 439, 480, 481); • Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A, Dogger Bank Teesside B (now Sofia Offshore Wind Farm) and East Anglia Three; • Viking Link Interconnector. Tier 3 • Bacton Sand Engine; • East Anglia One North, East Anglia Two, Norfolk Boreas, Norfolk Vanguard.	Outcome of the CEA will be greatest when the activities of other projects/plans occur within the same recreational area creating the greatest area that will be restricted at any one time for any single receptor. Activities associated with existing operational offshore wind farms are considered to be part of the baseline and are therefore not assessed. Oil and gas activities within existing licenced areas (with the exception of decommissioning activities) are considered to be part of the baseline and are therefore not assessed. Operational activities associated with cables and pipelines (e.g. cable repair activities) are not assessed on the basis that such activities are likely to be of limited spatial extent, infrequent, temporary and short term.
Operation phase		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with infrastructure and maintenance activities within the Hornsea Three array area and along the offshore cable corridor, alongside other plans/projects, may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.	Tier 1 • Hornsea Project One and Hornsea Project Two; • Galloper; • East Anglia One and Triton Knoll. Tier 2 • Aggregate application/option areas (483, 439, 480, 481); • Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A, Dogger Bank Teesside B (now Sofia Offshore Wind Farm) and East Anglia Three. Tier 3 • East Anglia One North, East Anglia Two, Norfolk Boreas, Norfolk Vanguard.	As above for construction phase. Decommissioning activities are only assessed where they overlap with the Hornsea Three operational phase. Operational activities associated with cables and pipelines (e.g. cable repair activities) are not assessed on the basis that such activities are likely to be of limited spatial extent, infrequent, temporary and short term.
Decommissioning phase		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor, alongside other plans/projects, may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.	As above for construction phase.	As above for construction phase.

Table 11.33: Maximum design scenario considered for the assessment of potential cumulative impacts on infrastructure and other users: aggregate extraction, cables and pipelines.

Potential impact	Maximum design scenario	Justification
Construction phase		
Installation of Hornsea Three infrastructure, alongside other plans/projects, may affect existing cables and pipelines or restrict access to cables and pipelines.	Tier 1 • Hornsea Project One and Hornsea Project Two; • Pipeline decommissioning activities listed in Table 11.31. Tier 2 • No Tier 2 projects/plans identified. Tier 3 • No Tier 3 projects/plans identified.	Outcome of the CEA will be greatest when the activities of adjacent projects/plans occur concurrently with those at Hornsea Three. Scenarios leading to the greatest restricted areas. Operational activities associated with cables and pipelines (e.g. cable repair activities) are not assessed on the basis that such activities are likely to be of limited spatial extent, infrequent, temporary and short term.
Installation of Hornsea Three infrastructure, alongside other plans/projects, has the potential to lead to increased suspended sediment concentrations and deposition, which could cause a change in aggregate resource in aggregate extraction areas.	Tier 1 • Hornsea Project Two. Tier 2 • Aggregate application/option areas (483). Tier 3 • No Tier 3 projects/plans identified.	Outcome of the CEA will be greatest with the maximum potential for interaction of increase in suspended sediment concentrations within 16 km of the array area (based on modelled data) and 21.5 km of the offshore cable corridor (based on one tidal excursion) as this includes the maximum area of potential overlap for suspended sediments. Operational activities associated with cables and pipelines (e.g. cable repair activities) are not assessed on the basis that such activities are likely to be of limited spatial extent, infrequent, temporary and short term.
Operation phase		
Safety zones around Hornsea Three infrastructure and advisory safety distances associated with maintenance activities, alongside other plans/projects, may lead to a temporary loss of access to existing cables and pipelines for repair or maintenance.	Tier 1 • Hornsea Project One and Hornsea Project Two. Tier 2 • No Tier 2 projects/plans identified. Tier 3 • No Tier 3 projects/plans identified.	As above for construction phase.
Decommissioning phase		
Removal of Hornsea Three infrastructure, alongside other plans/projects, may affect existing cables and pipelines or restrict access to cables and pipelines.	As above for construction phase.	As above for construction phase.
Removal of Hornsea Three infrastructure, alongside other plans/projects, 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 construction phase.	As above for construction phase.

Table 11.34: Maximum design scenario considered for the assessment of potential cumulative impacts on infrastructure and other users: oil and gas operations.

Potential impact	Maximum design scenario	Justification
Construction phase		
Hornsea Three infrastructure, safety zones and advisory safety distances associated with the Hornsea Three array area, alongside other plans/projects, may restrict potential seismic survey activity.	Tier 1 • Hornsea Project One and Hornsea Project Two. Tier 2 • No Tier 2 projects/plans identified. Tier 3 • No Tier 3 projects/plans identified.	Outcome of the CEA will be greatest when considered with scenarios that reduce the space available in those licence blocks identified as being affected by Hornsea Three. Operational activities associated with cables and pipelines (e.g. cable repair activities) are not assessed on the basis that such activities are likely to be of limited spatial extent, infrequent, temporary and short term.
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances, alongside other plans/projects.	Tier 1 • Hornsea Project One and Hornsea Project Two. Tier 2 • No Tier 2 projects/plans identified. Tier 3 • No Tier 3 projects/plans identified.	Outcome of the CEA will be greatest when considered with scenarios that represent the largest area from which drilling would be restricted in those licence blocks identified as being affected by Hornsea Three. Operational activities associated with cables and pipelines (e.g. cable repair activities) are not assessed on the basis that such activities are likely to be of limited spatial extent, infrequent, temporary and short term.
Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor, alongside other plans/projects, may restrict potential seismic survey activity.	Tier 1 • Pipeline decommissioning activities listed in Table 11.31. Tier 2 • No Tier 2 projects/plans identified. Tier 3 • No Tier 3 projects/plans identified.	Outcome of the CEA will be greatest when considered with scenarios that reduce the space available in those licence blocks identified as being affected by Hornsea Three. Operational activities associated with cables and pipelines (e.g. cable repair activities) are not assessed on the basis that such activities are likely to be of limited spatial extent, infrequent, temporary and short term.
Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor, alongside other plans/projects.	Tier 1 • Pipeline decommissioning activities listed in Table 11.31. Tier 2 • No Tier 2 projects/plans identified. Tier 3 • No Tier 3 projects/plans identified.	Outcome of the CEA will be greatest when considered with scenarios that represent the largest area from which drilling would be restricted in those licence blocks identified as being affected by Hornsea Three. Operational activities associated with cables and pipelines (e.g. cable repair activities) are not assessed on the basis that such activities are likely to be of limited spatial extent, infrequent, temporary and short term.
The piling of wind turbine and substation foundations, alongside other plans/projects, will generate underwater noise that may acoustically interfere with seismic survey operations.	Tier 1 • Hornsea Project Two. Tier 2 • Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A, Dogger Bank Teesside B (now Sofia Offshore Wind Farm) and East Anglia Three. Tier 3 • East Anglia One North, East Anglia Two, Norfolk Boreas, Norfolk Vanguard.	Outcome of the CEA will be greatest when considered with other projects/plans which would generate sufficient underwater noise levels of the same frequency that could overlap with the area already affected by Hornsea Three. Scenarios that would increase interference on same seismic surveys.

Potential impact	Maximum design scenario	Justification
Operation phase		
The presence of infrastructure within the Hornsea Three array area, alongside other plans/projects, may restrict potential seismic survey activity.	Tier 1 • Hornsea Project One and Hornsea Project Two. Tier 2 • No Tier 2 projects/plans identified. Tier 3 • No Tier 3 projects/plans identified.	Outcome of the CEA will be greatest when considered with scenarios that reduce the space available in those licence blocks identified as being affected by Hornsea Three. Operational activities associated with cables and pipelines (e.g. cable repair activities) are not assessed on the basis that such activities are likely to be of limited spatial extent, infrequent, temporary and short term.
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances, alongside other plans/projects.	Tier 1 • Hornsea Project One and Hornsea Project Two. Tier 2 • No Tier 2 projects/plans identified. Tier 3 • No Tier 3 projects/plans identified.	Outcome of the CEA will be greatest when considered with scenarios that represent the largest area from which drilling would be restricted in those licence blocks identified as being affected by Hornsea Three. Operational activities associated with cables and pipelines (e.g. cable repair activities) are not assessed on the basis that such activities are likely to be of limited spatial extent, infrequent, temporary and short term.
The presence of new wind turbines in previously open sea areas, alongside other plans/projects, may cause interference with the performance of the REWS located on oil and gas platforms.	Tier 1 • No Tier 1 projects/plans identified. Tier 2 • No Tier 2 projects/plans identified. Tier 3 • No Tier 3 projects/plans identified.	Outcome of the CEA will be greatest when considered with scenarios that create the greatest potential disturbance to radar already affected by Hornsea Three. Radar modelling was carried out on the cumulative effect of Hornsea Three together with other relevant projects/plans. For REWS, relevant projects/plans include other offshore wind farms within operational range of the same REWS affected by Hornsea Three. The cumulative radar modelling is presented in volume 5, annex 11.1: Radar Early Warning Systems Technical Annex. There are no projects that have the potential to affect the REWS on the J6A platform and so there is no cumulative impact on this system.
The presence of new wind turbines in previously open sea areas, alongside other plans/projects, will deviate vessels which may cause a change in CPA and TCPA alarms on oil and gas platforms protected by REWS.	Tier 1 • Hornsea Project One and Hornsea Project Two. Tier 2 • No Tier 2 projects/plans identified. Tier 3 • No Tier 3 projects/plans identified.	Outcome of the CEA will be greatest when considered with scenarios that create the greatest potential disturbance to shipping routes already affected by Hornsea Three.
Wind turbines and associated infrastructure, alongside other plans/projects, may disrupt vessel access to oil and gas platforms and subsea infrastructure.	Tier 1 • Hornsea Project One and Hornsea Project Two. Tier 2 • No Tier 2 projects/plans identified. Tier 3 • No Tier 3 projects/plans identified.	Outcome of the CEA will be greatest when considered with other projects/plans that create the greatest disruption in terms of area affected and duration. Operational activities associated with cables and pipelines (e.g. cable repair activities) are not assessed on the basis that such activities are likely to be of limited spatial extent, infrequent, temporary and short term.

11.13 Cumulative Effect Assessment

11.13.1.1 A description of the significance of cumulative effects upon infrastructure and other users receptors arising from each identified impact is given below.

11.13.2 Construction phase

Recreational users and recreational fishing

Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor, alongside other plans/projects, may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.

11.13.2.1 The construction of Hornsea Three has the potential to affect recreational activities. Additional projects/plans in the vicinity of Hornsea Three will further restrict the area available for recreational activities (see Figure 11.14).

Tier 1

Magnitude of impact

11.13.2.2 The installation and presence of Hornsea Three infrastructure and associated safety zones and advisory safety distances, together with the construction of Hornsea Project Two and the presence of Hornsea Project One, Galloper, East Anglia One and Triton Knoll and pipeline decommissioning activities in the vicinity (Figure 11.14), may further result in the displacement of recreational craft and recreational fishing vessels.

11.13.2.3 The Hornsea Project One offshore wind farm will be operational prior to the Hornsea Three offshore construction phase (Table 11.31). Construction of Hornsea Project Two may overlap with the Hornsea Three offshore construction phase by one year (Table 11.31). Recreational vessels displaced by construction activities within the Hornsea Three array area may also be displaced by the presence and/or construction of these projects, which are located 7 km from the Hornsea Three array area at the closest point. Recreational vessels traversing along the eastern coast of the UK displaced by installation activities along the Hornsea Three offshore cable corridor and offshore HVAC booster station search area may also be displaced along the respective export cable corridors for Hornsea Project One and Hornsea Project Two due to the potential presence of operational safety zones associated with any offshore substations positioned along the cable routes and/or Hornsea Project Two installation activities.

11.13.2.4 The Galloper, East Anglia One and Triton Knoll offshore wind farms are scheduled to be operational prior to the Hornsea Three offshore construction phase. Recreational vessels traversing along the eastern coast of the UK displaced by installation activities along the Hornsea Three offshore cable corridor and offshore HVAC booster station search area may also be displaced along the respective export cable corridors for these projects due to the potential presence of safety zones associated with any offshore substations positioned along the cable routes (where applicable).

11.13.2.5 Other activities in the area, including pipeline decommissioning activities will add to the cumulative impact through increased vessel movements in the area.

11.13.2.6 The spatial extent of any impact will be small in the context of the available sailing area in the southern North Sea. The likelihood of there being a cumulative effect on recreational vessels in offshore areas is low, given the low level of recreational activity anticipated within offshore areas and likely limited recreational fishing activity. The likelihood of there being a cumulative effect on recreational vessels in nearshore and inshore areas is also low, as although recreational activity is greater, activity is likely to be more localised to those areas.

11.13.2.7 The impact is predicted to be of regional spatial extent, short to medium term duration, intermittent (Hornsea Three offshore cable corridor)/continuous (Hornsea Three array area and offshore HVAC booster station search area) and low (Hornsea Three array area and offshore HVAC booster station search area)/high (Hornsea Three offshore cable corridor) reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of receptor

11.13.2.8 Recreational vessels are able to alter their route, dependent on the target destination. Notices to Mariners will be promulgated regularly during the construction phase, advising of the location and nature of construction works, and information and notices will be posted at the landfall location, ensuring that recreational activities can be planned accordingly.

11.13.2.9 The receptor is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

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

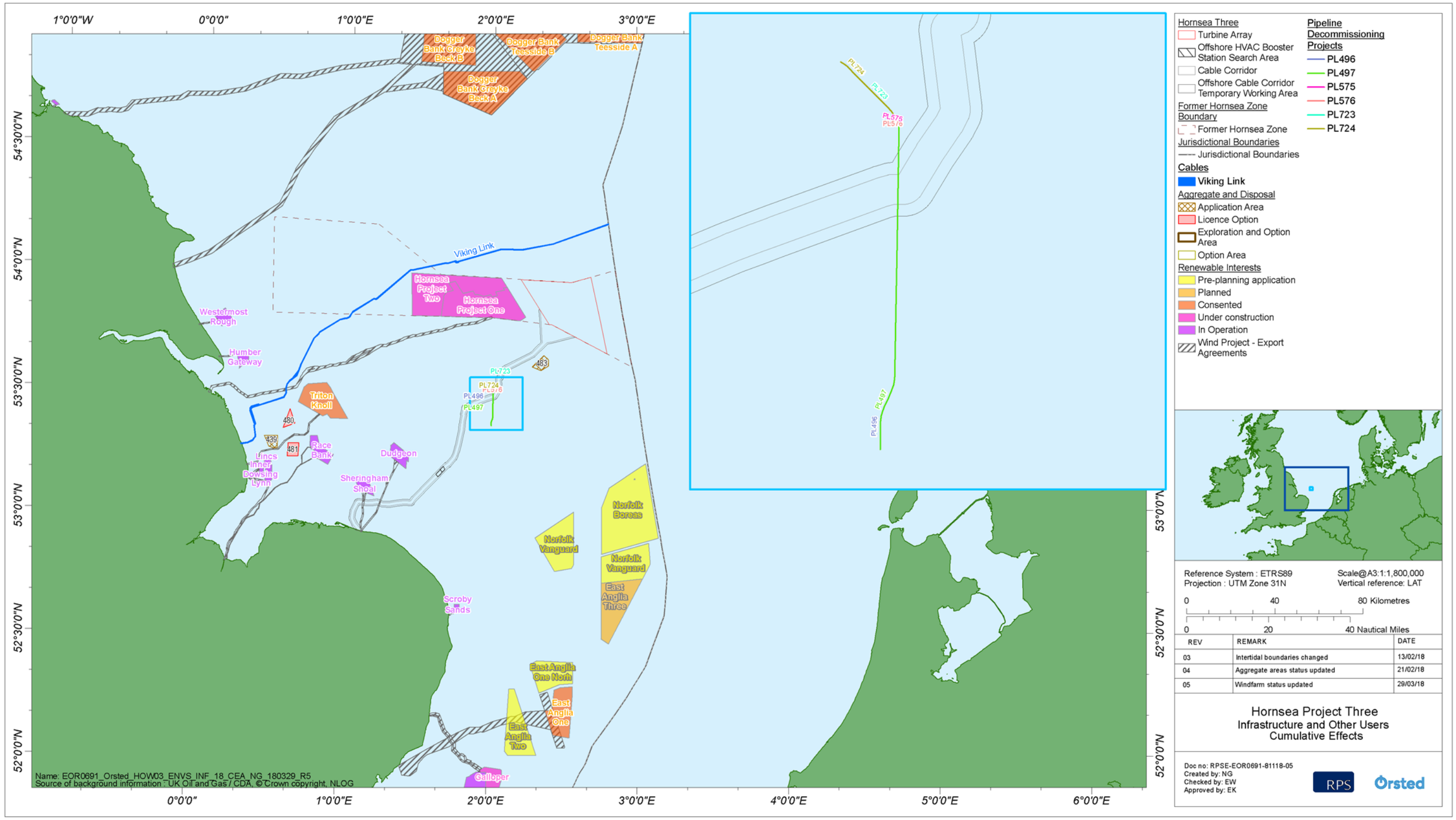

Figure 11.14: Other projects/plans in the vicinity of Hornsea Three screened into the cumulative assessment.

Tier 2

Magnitude of impact

11.13.2.11 In addition to the Tier 1 projects/plans considered above, the installation and presence of Hornsea Three infrastructure and associated safety zones and advisory safety distances, together with the activities associated with the aggregate option/application areas, the construction of Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A, Dogger Bank Teesside B (now Sofia Offshore Wind Farm) and East Anglia Three projects, and the installation of the proposed Viking Link Interconnector cable (Figure 11.14), may further result in the displacement of recreational craft and recreational fishing vessels.

11.13.2.12 Construction of the Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A, Dogger Bank Teesside B (now Sofia Offshore Wind Farm) and East Anglia Three projects has the potential to overlap with the offshore construction phase of Hornsea Three. Recreational vessels traversing along the eastern coast of the UK may intersect with installation activities associated with each of these projects, in addition to installation activities along the Hornsea Three offshore cable corridor, and therefore there is the potential for these vessels to be displaced a number of times, depending on the final construction schedules.

11.13.2.13 Other activities in the area, including new aggregate extraction areas and installation activities associated with the proposed Viking Link Interconnector cable, will add to the cumulative impact through increased vessel movements in the area.

11.13.2.14 The spatial extent of any impact will be small in the context of the available sailing area in the southern North Sea. The likelihood of there being a cumulative effect on recreational vessels in offshore areas is low, given the low level of recreational activity anticipated within offshore areas and likely limited recreational fishing activity. The likelihood of there being a cumulative effect on recreational vessels in nearshore and inshore areas is also low, as although recreational activity is greater, activity is likely to be more localised to those areas.

11.13.2.15 The impact is predicted to be of regional spatial extent, short to medium term duration, intermittent (Hornsea Three offshore cable corridor)/continuous (Hornsea Three array area and offshore HVAC booster station search area) and low (Hornsea Three array area and offshore HVAC booster station search area)/high (Hornsea Three offshore cable corridor) reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of receptor

11.13.2.16 Recreational vessels are able to alter their route, dependent on the target destination. Notices to Mariners will be promulgated regularly during the construction phase, advising of the location and nature of construction works, and information and notices will be posted at the landfall location, ensuring that recreational activities can be planned accordingly.

11.13.2.17 The receptor is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

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

Tier 3

11.13.2.19 In addition to the Tier 1 and Tier 2 projects/plans considered above, the East Anglia One North, East Anglia Two, Norfolk Boreas and Norfolk Vanguard offshore wind farms and the Bacton Sand Engine sandscaping project may further result in the displacement of recreational craft and recreational fishing vessels.

11.13.2.20 Construction phases of the East Anglia One North, East Anglia Two, Norfolk Boreas and Norfolk Vanguard projects have the potential to overlap with the offshore construction phase of Hornsea Three. Recreational vessels displaced by construction activities within the Hornsea Three array area may also be displaced by activities associated with the construction and subsequent operation of these wind farm sites. Recreational vessels traversing along the eastern coast of the UK displaced by installation activities along the Hornsea Three offshore cable corridor and offshore HVAC booster station search area may also be displaced along the export cable corridors for these sites during any construction activities and due to the potential presence of safety zones associated with any offshore substations positioned along the cable routes.

11.13.2.21 The Bacton Sand Engine project is a proposal to reinforce sea defences at the Bacton Gas Terminal, Bacton and Walcott villages. The scheme involves 'sandscaping' the shoreline using high volumes of sand (North Norfolk District Council, 2017). The area in which sand will be deposited is located approximately 23 km south of the Hornsea Three offshore cable corridor landfall location. On the basis that the construction timeframes for the Bacton Sand Engine and Hornsea Three projects do not overlap, there is no potential for cumulative effects on recreational vessels in nearshore and inshore areas.

11.13.2.22 The spatial extent of any impact will be small in the context of the available sailing area in the southern North Sea. The likelihood of there being a cumulative effect on recreational vessels in offshore areas is low, given the low level of recreational activity anticipated within offshore areas and likely limited recreational fishing activity. The likelihood of there being a cumulative effect from offshore wind farm activities on recreational vessels in nearshore and inshore areas is also low, as although recreational activity is greater, activity is likely to be more localised to those areas and there is no potential for a cumulative effect together with the Bacton Sand Engine project based on current construction schedules.

11.13.2.23 The impact is predicted to be of regional spatial extent, short to medium term duration, intermittent (Hornsea Three offshore cable corridor)/continuous (Hornsea Three array area and offshore HVAC booster station search area) and low (Hornsea Three array area and offshore HVAC booster station search area)/high (Hornsea Three offshore cable corridor) reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of receptor

11.13.2.24 Recreational vessels are able to alter their route, dependent on the target destination. Notices to Mariners will be promulgated regularly during the construction phase, advising of the location and nature of construction works, and information and notices will be posted at the landfall location, ensuring that recreational activities can be planned accordingly.

11.13.2.25 The receptor is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

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

Aggregate extraction, cables and pipelines

Installation of Hornsea Three infrastructure, alongside other plans/projects, may affect existing cables and pipelines or restrict access to cables and pipelines.

Tier 1

Magnitude of impact

11.13.2.27 Cables and pipelines crossed by Hornsea Three are discussed in section 11.7.5 and section 11.7.15. Cumulative impacts on existing cables and pipelines are only likely to arise if other crossings or activities are within the same section of those cables and pipelines.

11.13.2.28 Decommissioning activities associated with pipelines PL496, PL497, PL724, PL723, PL575 and PL576 may overlap with Hornsea Three offshore construction activities by two years (Table 11.31). These form a group of pipelines operated by Spirit Energy. Two of these pipelines cross the Hornsea Three offshore cable corridor (Figure 11.14) with the remaining pipelines located 1.3 km from the Hornsea Three offshore cable corridor. There are several other existing pipelines located in proximity to the Hornsea Three offshore cable corridor and the pipelines to be decommissioned (Figure 11.9), such that there is potential for a cumulative impact on these existing pipelines in terms of access restrictions. Given that construction/decommissioning activities along these linear projects may overlap by only two years, with the pipeline decommissioning activities scheduled to commence two years prior to Hornsea Three offshore construction, it is considered unlikely that Hornsea Three cable installation activities would coincide spatially with decommissioning activities.

11.13.2.29 The Topaz well to Schooner platform pipelines are located within a proposed navigation corridor between the Hornsea Three array area and Hornsea Project One/Hornsea Project Two. The presence of Hornsea Three, together with Hornsea Project One and Project Two, may therefore result in an indirect impact on access to this pipeline due to the presence of shipping traffic (see volume 2, chapter 7: Shipping and Navigation). The pipeline is located toward the northern entrance of the corridor.

11.13.2.30 The impact is predicted to be of local spatial extent, short term duration (pipelines along Hornsea Three offshore cable corridor)/short to medium term duration (Topaz to Schooner pipeline), intermittent (pipelines along Hornsea Three offshore cable corridor)/continuous (Topaz to Schooner pipeline) and high (pipelines along Hornsea Three offshore cable corridor)/low (Topaz to Schooner pipeline) reversibility. It is predicted that the impact will affect the receptor directly (pipelines along Hornsea Three offshore cable corridor)/indirectly (Topaz to Schooner pipeline). The magnitude is therefore, considered to be minor.

Sensitivity of receptor

11.13.2.31 For existing pipelines, a restriction on access in the event of an emergency could be critical to the operator of that pipeline.

11.13.2.32 Consultation with INEOS has advised that the Topaz suspended well head is not producing and is likely to be decommissioned prior to Hornsea Three offshore construction, with the pipeline likely to remain in situ (see Table 11.4). Therefore, it is unlikely that access to this pipeline will be required during the Hornsea Three offshore construction phase, although there may be a requirement for post-decommissioning surveys within this area.

11.13.2.33 The receptor is deemed to be of low vulnerability, high recoverability and high value (pipelines along Hornsea Three offshore cable corridor)/low value (Topaz to Schooner pipeline). The sensitivity of the receptor is therefore, considered to be high (pipelines along Hornsea Three offshore cable corridor)/negligible (Topaz to Schooner pipeline).

Significance of the effect

11.13.2.34 Overall, the sensitivity of the receptor is considered to be high (pipelines along Hornsea Three offshore cable corridor)/negligible (Topaz to Schooner pipeline) and the magnitude is deemed to be minor. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Tier 2

11.13.2.35 No Tier 2 projects have been identified.

Tier 3

11.13.2.36 No Tier 3 projects have been identified.

Installation of Hornsea Three infrastructure, alongside other plans/projects, has the potential to lead to increased suspended sediment concentrations and deposition, which could cause a change in aggregate resource in aggregate extraction areas.

Tier 1

11.13.2.37 No Tier 1 projects have been identified.

Tier 2

Magnitude of impact

11.13.2.38 Aggregate application area Humber 5 (483) has been screened into the assessment on the basis that it is within the area over which there is potential for an overlap in SSC arising from Hornsea Three during the construction phase. This area has been defined as 16 km from the array area (based on modelled data) and 21.5 km from the offshore cable corridor (based on the spatial extent of one tidal excursion).

11.13.2.39 Chapter 1: Marine Processes provides an assessment of potential for cumulative effects between Hornsea Three construction activities and these aggregate extraction operations. This assessment concludes that should construction activities (such as cable and foundation installation) associated with Hornsea Three occur at the same time as dredgers were operating along the western margin of the Humber 5 aggregate area, it is possible that any fine sediment plumes from the respective activities would be additive. However, the assessment found that higher concentration plumes would not be expected to persist for much longer than a few hours. In addition, the potential for material dispersed during cable laying activities within the Hornsea Three offshore cable corridor to deposit within existing aggregate dredging areas is considered to be low.

11.13.2.40 Based on the assessment referred to above, the interaction of plumes from the construction of Hornsea Three and the aggregate extraction site screened into the assessment is considered to be short term and highly localised, with limited potential for this interaction to impact upon the resource within one of the existing aggregate extraction sites. The magnitude of this impact is no change.

Sensitivity of receptor

11.13.2.41 Dredging operators are adaptable as they are able, to some extent, to screen out unwanted fine sediment load.

11.13.2.42 The dredging operator is deemed to be of medium vulnerability, moderate recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be medium.

Significance of the effect

11.13.2.43 Overall, it is predicted that the sensitivity of the receptor is considered to be medium and the magnitude is deemed to be no change. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

Tier 3

11.13.2.44 No Tier 3 projects have been identified.

Oil and gas operations

Hornsea Three infrastructure, safety zones and advisory safety distances associated with the Hornsea Three array area, alongside other plans/projects, may restrict potential seismic survey activity.

11.13.2.45 Hornsea Three infrastructure, safety zones and advisory safety distances will restrict conventional towed streamer seismic exploration activities, and potentially other more recent methods for seismic survey, in the licence blocks which overlap with the Hornsea Three array area. Cumulative impacts will arise when a particular licence block that is already affected by Hornsea Three is also affected by another project/plan.

11.13.2.46 As discussed in paragraph 11.11.1.36 only those blocks which are licenced beyond the start of Hornsea Three offshore construction and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

Tier 1

Magnitude of impact

11.13.2.47 The Hornsea Three array area is located 7 km to the east of the Hornsea Project One and Hornsea Project Two offshore wind farm sites at the closest point. The Hornsea Project One offshore wind farm will be operational prior to the Hornsea Three offshore construction phase, and construction of Hornsea Project Two may overlap with the Hornsea Three offshore construction phase by one year (Table 11.31). There are no currently licenced blocks coinciding with the Hornsea Three array area, Hornsea Project One and/or Hornsea Project Two (Figure 11.15).

11.13.2.48 The presence of the Hornsea Three array area also has the potential to result in indirect impacts on operators through the creation of the proposed navigation corridor, which may result in restrictions on seismic survey activity. INEOS has a currently licenced block (49/2a) that will be licenced beyond the start date of Hornsea Three offshore construction and which overlaps with the Hornsea Three array area and the proposed navigation corridor (Figure 11.15). Block 49/2a overlaps with the Hornsea Three array area by approximately 33.9% of the total block area, with the remaining area within the proposed navigation corridor. Seismic surveys within the southern part of licenced block 44/26a (Faroe) located at the northern entrance of the navigation corridor, may also be restricted to the extent that the proposed navigation corridor extends into this block however this licence is anticipated to expire prior to the start of offshore construction for Hornsea Three.

11.13.2.49 It is anticipated that the proposed navigation corridor will be available for use by transiting vessels during the Hornsea Three construction phase (see volume 5, annex 7.1: Navigational Risk Assessment). The Maritime and Coastguard Agency (MCA) are not currently considering the inclusion of a routeing measure (i.e. an International Maritime Organization (IMO) Deep Water Route) within the proposed navigation corridor (see volume 5, annex 7.1: Navigational Risk Assessment). However, in the event that an IMO routing measure is established, there may be restrictions on seismic survey activities within the navigation corridor.

11.13.2.50 The impact is predicted to be of local spatial extent, relatively long term duration relative to a licence period, continuous and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be moderate.

Sensitivity of the receptor

11.13.2.51 The sensitivity of the receptor depends on the area of their licenced acreage affected and the future exploration plans of the licence operator. Information on the relevant block and the assessed sensitivity is summarised in Table 11.35 below.

Table 11.35: Sensitivity of licence operator potentially cumulatively affected in relation to reduction in seismic survey area.

Block	Operator	Licence expiry date	Area of overlap with Hornsea Three array area (%)	Area of overlap with Tier 1 projects (%)	Overlap with proposed navigation corridor	Consultation	Sensitivity
49/2a	INEOS	2034	33.9	N/A	Yes	INEOS advised that they have no current exploration plans in the southern North Sea.	Low

11.13.2.52 The sensitivity of the licence operator is low for INEOS on the basis of consultation which has advised that they currently have no exploration plans in this area. Any future operator of the unlicensed blocks will be aware of Hornsea Three and will have taken potential coexistence into consideration.

11.13.2.53 The licence operator is deemed to be of low vulnerability, medium recoverability and high value and details of the activity is not in the public domain and has not been advised through consultation. The sensitivity of the licence operator is therefore, considered to be low.

Significance of the effect

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

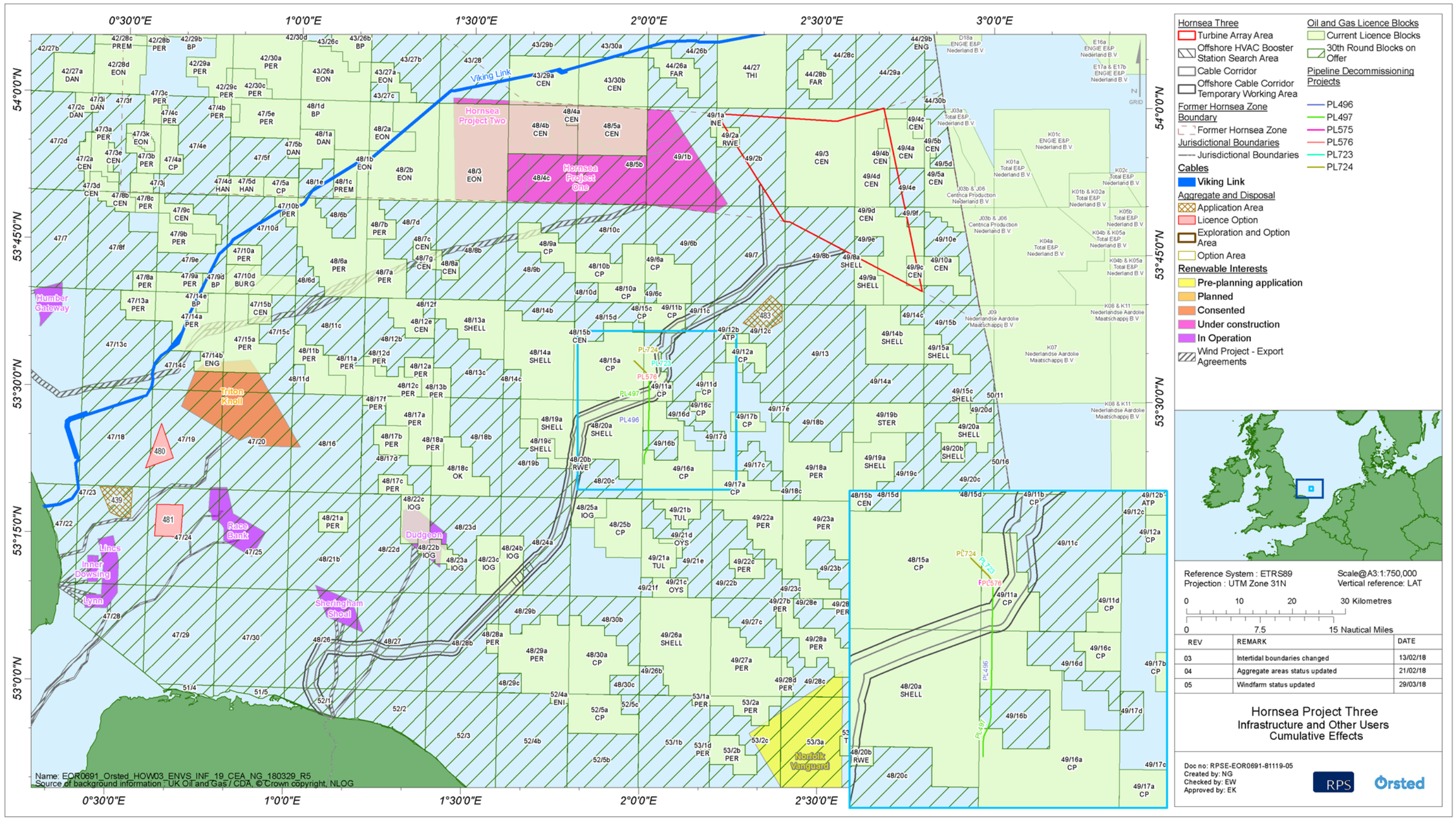

Figure 11.15: Other projects/plans screened into the cumulative assessment and oil and gas licence blocks.

Tier 2

11.13.2.55 No Tier 2 projects have been identified.

Tier 3

11.13.2.56 No Tier 3 projects have been identified.

Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances, alongside other plans/projects.

11.13.2.57 Drilling and the placement of infrastructure may be restricted (but not prohibited) within the Hornsea Three array area and from within 1 km of the Hornsea Three array area during the Hornsea Three construction phase. Cumulative impacts will arise when a particular licence block that is already affected by Hornsea Three is also affected by another project/plan.

11.13.2.58 In the event that new oil and gas platforms or subsea structures are proposed, the cumulative restricted area may need to be extended further considering helicopter access requirements (see volume 2, chapter 8: Aviation, Military and Communication and volume 2, chapter 12: Inter-related Effects (Offshore)).

11.13.2.59 As discussed in paragraph 11.11.1.36 only those blocks which are licenced beyond the start of Hornsea Three offshore construction and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

Tier 1

Magnitude of impact

11.13.2.60 The Hornsea Three array area is located 7 km to the east of the Hornsea Project One and Hornsea Project Two offshore wind farm sites at the closest point. The Hornsea Project One offshore wind farm will be operational prior to the Hornsea Three offshore construction phase, and construction of Hornsea Project Two may overlap with the Hornsea Three offshore construction phase by one year (Table 11.31). There are no currently licenced blocks that coincide with the Hornsea Three array area, Hornsea Project One and/or Hornsea Project Two (Figure 11.15).

11.13.2.61 The presence of the Hornsea Three array area has the potential to result in indirect impacts on operators through the creation of the navigation corridor. INEOS has one currently licenced block (49/2a) which will be licenced at the start of offshore construction of Hornsea Three which overlaps with the Hornsea Three array area and the navigation corridor (Figure 11.15).

11.13.2.62 Drilling activities within the southern part of licenced block 44/26a (Faroe) located at the northern entrance of the proposed navigation corridor, may also be restricted however this licence is anticipated to expire prior to the start of Hornsea Three offshore construction.

11.13.2.63 In the event that an IMO routing measure is established by MCA (see paragraph 11.13.2.49), drilling will be restricted. Any proposed drilling activity and associated placement of infrastructure would be subject to a navigational risk assessment for prior approval by the MCA, which would take account of Hornsea Three and other Tier 1 projects.

11.13.2.64 The impact is predicted to be of local spatial extent, relatively long term duration relative to a licence period, continuous and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be moderate.

Sensitivity of the receptor

11.13.2.65 The sensitivity of the receptor depends on the area of their licenced acreage affected and the future plans of the licence operator in relation to potential exploitation of hydrocarbons. Information on the relevant block and the assessed sensitivity is summarised in Table 11.36.

Table 11.36: Sensitivity of each licence operator potentially cumulatively affected in relation to drilling restrictions.

Block	Operator	Licence expiry date	Area of overlap with Hornsea Three array area (%)	Area of overlap with Tier 1 projects (%)	Overlap with proposed navigation corridor	Consultation	Sensitivity
49/2a	INEOS	2034	33.9	N/A	Yes	INEOS advised that they have no current exploration plans in the southern North Sea.	Low

11.13.2.66 In all instances, consultation with the operators of the blocks in proximity to the Hornsea Three array area has aimed to address any future operational issues and establish a line of communication to ensure coexistence between both activities can be achieved with minimal disruption. Any future operator of the unlicensed blocks will be aware of Hornsea Three and will have taken potential coexistence into consideration.

11.13.2.67 The licence operator is deemed to be of low vulnerability, medium recoverability and high value and details of the activity is not in the public domain and has not been advised through consultation. The sensitivity of the licence operator is therefore, considered to be low.

Significance of the effect

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

Tier 2

11.13.2.69 No Tier 2 projects have been identified.

Tier 3

11.13.2.70 No Tier 3 projects have been identified.

Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor, alongside other plans/projects, may restrict potential seismic survey activity.

11.13.2.71 Safety zones around the subsea HVAC booster stations and advisory safety distances around cable installation vessels carrying out activities along the offshore cable corridor will exclude seismic exploration activities in the licence blocks which overlap with the Hornsea Three offshore cable corridor. Cumulative impacts will arise when a particular licence block that is already affected by Hornsea Three is also affected by another project/plan.

11.13.2.72 As discussed in paragraph 11.11.1.36 only those blocks which are licenced beyond the start of Hornsea Three offshore construction and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

Tier 1

Magnitude of impact

11.13.2.73 Decommissioning activities associated with pipelines PL496, PL497, PL724, PL723, PL575 and PL576 may overlap with Hornsea Three offshore construction activities by two years (Table 11.31). These form a group of pipelines operated by Spirit Energy. Two of these pipelines cross the Hornsea Three offshore cable corridor (Figure 11.14) with the remaining pipelines located 1.3 km from the Hornsea Three offshore cable corridor. Licence blocks 48/15a, 49/11a and 49/16a, currently operated by ConocoPhillips, overlap with both the Hornsea Three offshore cable corridor and the pipelines to be decommissioned (Figure 11.15), such that there is potential for a cumulative impact on seismic survey activity within these blocks. The licences for two of these blocks (49/11a and 49/16a) may be extant during the Hornsea Three offshore construction phase (Table 11.10) and therefore are considered for assessment.

11.13.2.74 Given that construction/decommissioning activities along these linear projects may overlap by only two years, with the pipeline decommissioning activities scheduled to commence two years prior to Hornsea Three offshore construction, it is considered unlikely that Hornsea Three cable installation activities would coincide spatially with decommissioning activities. Any cumulative spatial restrictions would be small in the context of the total block area available for 49/16a, which only overlaps with the temporary working area associated with the Hornsea Three offshore cable corridor, however a larger proportion of block 49/11a may be cumulatively affected by Tier 1 project activities.

11.13.2.75 The impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor (49/11a)/negligible (49/16a).

Sensitivity of the receptor

11.13.2.76 The sensitivity of the receptor depends on the area of their licenced acreage affected and the future plans of the licence operator in relation to potential exploitation of hydrocarbons. As noted above, the impact will affect a relatively small proportion of licence block 49/16a although a larger proportion of block 49/11a may be affected. Consultation with the operator of the affected licence blocks (ConocoPhillips) did not identify any planned seismic survey activity within the offshore cable corridor during the Hornsea Three offshore construction period (see Table 11.4).

11.13.2.77 The operator of the affected licenced blocks is deemed to be of low vulnerability, medium recoverability and high value and details of the activity is not in the public domain and has not been advised through consultation. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

11.13.2.78 Overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor (49/11a)/negligible (49/16a). The effect will, therefore, be of **minor** adverse (49/11a)/**negligible** (49/16a) significance, which is not significant in EIA terms.

Tier 2

11.13.2.79 No Tier 2 projects have been identified.

Tier 3

11.13.2.80 No Tier 3 projects have been identified.

Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor, alongside other plans/projects.

11.13.2.81 As discussed in paragraph 11.11.1.36 only those blocks which are licenced beyond the start of Hornsea Three offshore construction and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

Tier 1

Magnitude of impact

11.13.2.82 Licence blocks 48/15a, 49/11a and 49/16a, currently operated by ConocoPhillips, overlap with both the Hornsea Three offshore cable corridor and the pipelines to be decommissioned as described in paragraph 11.13.2.73, such that there is potential for a cumulative impact on drilling activity within these blocks. The licences for two of these blocks (49/11a and 49/16a) may be extant during the Hornsea Three offshore construction phase (Table 11.10) and therefore are considered for assessment.

11.13.2.83 Given that construction/decommissioning activities along these linear projects may overlap by only two years, with the pipeline decommissioning activities scheduled to commence two years prior to Hornsea Three offshore construction, it is considered unlikely that Hornsea Three cable installation activities would coincide spatially with decommissioning activities. Any cumulative spatial restrictions would be small in the context of the total block area available for 49/16a, which only overlaps with the temporary working area associated with the Hornsea Three offshore cable corridor, however a larger proportion of block 49/11a may be cumulatively affected by Tier 1 project activities.

11.13.2.84 The impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor (49/11a)/negligible (49/16a).

Sensitivity of the receptor

11.13.2.85 The sensitivity of the receptor depends on the area of their licenced acreage affected and the future plans of the licence operator in relation to potential exploitation of hydrocarbons. As noted above, the impact will affect a relatively small proportion of licence block 49/16a although a larger proportion of block 49/11a may be affected. Consultation with the operator of the affected licence blocks (ConocoPhillips) did not identify any plans for the development of new infrastructure within the offshore cable corridor during the Hornsea Three offshore construction period (see Table 11.4).

11.13.2.86 The operator of the affected licenced blocks is deemed to be of low vulnerability, medium recoverability and high value and details of the activity is not in the public domain and has not been advised through consultation. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

11.13.2.87 Overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be minor (49/11a)/negligible (49/16a). The effect will, therefore, be of **minor** adverse (49/11a)/**negligible** (49/16a) significance, which is not significant in EIA terms.

Tier 2

11.13.2.88 No Tier 2 projects have been identified.

Tier 3

11.13.2.89 No Tier 3 projects have been identified.

The piling of wind turbine and substation foundations, alongside other plans/projects, will generate underwater noise that may acoustically interfere with seismic survey operations.

Tier 1

Magnitude of impact

11.13.2.90 There is potential for the Hornsea Three offshore construction phase to overlap with the construction phase for Hornsea Project Two, and therefore potential for concurrent piling activity. As described in paragraph 11.11.1.84, underwater noise from piling and seismic survey activities will produce similar sound pressure and frequencies, however due to different temporal and spatial requirements the two activities have the potential to be able to occur concurrently.

11.13.2.91 The impact is predicted to be of regional spatial extent, short to medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be moderate.

Sensitivity of receptor

11.13.2.92 The sensitivity of the oil and gas operator to the potential impact will be dependent on their survey activity coinciding temporally and spatially with the noise source and having similar acoustic frequency. The actual techniques that will be used, in particular the ability for live or post-processing of seismic data to filter out acoustic interference, will reduce the sensitivity of the operator. The operator will also be provided with sufficient information in order that seismic survey activity can be planned to avoid the construction noise temporally and spatially if necessary.

11.13.2.93 The oil and gas operator is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

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

Tier 2

Magnitude of impact

11.13.2.95 There is potential for the Hornsea Three offshore construction phase to overlap with the construction phases for the Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A, Dogger Bank Teesside B (now Sofia Offshore Wind Farm) and East Anglia Three projects, and therefore potential for concurrent piling activity. As described in paragraph 11.11.1.84, underwater noise from piling and seismic survey activities will produce similar sound pressure and frequencies, however due to different temporal and spatial requirements the two activities have the potential to be able to occur concurrently.

11.13.2.96 The impact is predicted to be of regional spatial extent, short to medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be moderate.

Sensitivity of receptor

11.13.2.97 The sensitivity of the oil and gas operator to the potential impact will be dependent on their survey activity coinciding temporally and spatially with the noise source and having similar acoustic frequency. The actual techniques that will be used, in particular the ability for live or post-processing of seismic data to filter out acoustic interference, will reduce the sensitivity of the operator. The operator will also be provided with sufficient information in order that seismic survey activity can be planned to avoid the construction noise temporally and spatially if necessary.

11.13.2.98 The oil and gas operator is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

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

Tier 3

Magnitude of impact

11.13.2.100 There is potential for the Hornsea Three offshore construction phase to overlap with the construction phases for East Anglia One North, East Anglia Two, Norfolk Boreas and Norfolk Vanguard (Table 11.31), and therefore potential for concurrent piling activity. As described in paragraph 11.11.1.84, underwater noise from piling and seismic survey activities will produce similar sound pressure and frequencies, however due to different temporal and spatial requirements the two activities have the potential to be able to occur concurrently.

11.13.2.101 The impact is predicted to be of regional spatial extent, short to medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be moderate.

Sensitivity of receptor

11.13.2.102 The sensitivity of the oil and gas operator to the potential impact will be dependent on their survey activity coinciding temporally and spatially with the noise source and having similar acoustic frequency. The actual techniques that will be used, in particular the ability for live or post-processing of seismic data to filter out acoustic interference, will reduce the sensitivity of the operator. The operator will also be provided with sufficient information in order that seismic survey activity can be planned to avoid the construction noise temporally and spatially if necessary.

11.13.2.103 The oil and gas operator is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

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

Future monitoring

11.13.2.105 No infrastructure and other users monitoring to test the predictions made within the construction phase impact assessment is considered necessary.

11.13.3 Operation and maintenance phase

Recreational users and recreational fishing

Hornsea Three infrastructure, safety zones and advisory safety distances associated with infrastructure and maintenance activities within the Hornsea Three array area and along the offshore cable corridor, alongside other plans/projects, may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.

11.13.3.1 During the operational and maintenance phase of Hornsea Three, recreational craft and recreational fishing vessels may be displaced from the Hornsea Three array area and along the offshore cable corridor by the physical presence of infrastructure, safety zones and advisory safety distances. Other projects/plans in the region may further reduce the available recreational resource.

Tier 1

Magnitude of impact

11.13.3.2 The presence of Hornsea Three infrastructure and associated safety zones and advisory safety distances, together with the presence of Hornsea Project One, Hornsea Project Two, Galloper, East Anglia One and Triton Knoll, may further result in the displacement of recreational craft and recreational fishing vessels.

11.13.3.3 Recreational vessels displaced by the Hornsea Three array area may also be displaced by the presence of these projects. Recreational vessels traversing along the eastern coast of the UK displaced by operational safety zones associated with the offshore HVAC booster stations may also be displaced by the potential presence of operational safety zones associated with any offshore substations positioned along the cable routes of these projects (where applicable).

11.13.3.4 The spatial extent of any impact will be small in the context of the available sailing area in the southern North Sea. The likelihood of there being a cumulative effect on recreational vessels in offshore areas is low, given the low level of recreational activity anticipated within offshore areas and likely limited recreational fishing activity. The likelihood of there being a cumulative effect on recreational vessels in nearshore and inshore areas is also low, as although recreational activity is greater, such activity is likely to be more localised to those areas and therefore recreational receptors are unlikely to pass multiple project locations.

11.13.3.5 The impact is predicted to be of regional spatial extent, long term duration, continuous (Hornsea Three array area and offshore HVAC booster station search area) and low (Hornsea Three array area and offshore HVAC booster station search area) reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of receptor

11.13.3.6 Recreational vessels are able to alter their route, dependent on the target destination. Notices to Mariners will be promulgated during the operational and maintenance phase, advising of the location and nature of maintenance works, and information and notices will be posted at the landfall location as appropriate, ensuring that recreational activities can be planned accordingly.

11.13.3.7 The receptor is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

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

Tier 2

Magnitude of impact

11.13.3.9 In addition to the Tier 1 projects/plans considered above, the presence of Hornsea Three infrastructure and associated safety zones and advisory safety distances, together with the activities associated with the aggregate option/application areas and the presence of the Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A, Dogger Bank Teesside B (now Sofia Offshore Wind Farm) and East Anglia Three projects (Figure 11.14), may further result in the displacement of recreational craft and recreational fishing vessels.

11.13.3.10 Recreational vessels displaced by Hornsea Three may also be displaced by the Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside A, Dogger Bank Teesside B (now Sofia Offshore Wind Farm) and East Anglia Three offshore wind farms. Other activities in the area, including new aggregate extraction areas, will add to the cumulative impact through increased vessel movements in the area.

11.13.3.11 The spatial extent of any impact will be small in the context of the available sailing area in the southern North Sea and the baseline level and nature of recreational activity, as described in paragraph 11.13.3.4.

11.13.3.12 The impact is predicted to be of regional spatial extent, long term duration, continuous (Hornsea Three array area and offshore HVAC booster station search area) and low (Hornsea Three array area and offshore HVAC booster station search area) reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of receptor

11.13.3.13 Recreational vessels are able to alter their route, dependent on the target destination. Notices to Mariners will be promulgated during the operational and maintenance phase, advising of the location and nature of maintenance works, and information and notices will be posted at the landfall location as appropriate, ensuring that recreational activities can be planned accordingly.

11.13.3.14 The receptor is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

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

Tier 3

11.13.3.16 In addition to the Tier 1 and Tier 2 projects/plans considered above, the East Anglia One North, East Anglia Two, Norfolk Boreas and Norfolk Vanguard projects may further result in the displacement of recreational craft and recreational fishing vessels. The Bacton Sand Engine project will be completed prior to Hornsea Three operation such that cumulative effects are not anticipated.

11.13.3.17 The spatial extent of any impact will be small in the context of the available sailing area in the southern North Sea and the baseline level and nature of recreational activity, as described in paragraph 11.13.3.4.

11.13.3.18 The impact is predicted to be of regional spatial extent, long term duration, continuous (Hornsea Three array area and offshore HVAC booster station search area) and low (Hornsea Three array area and offshore HVAC booster station search area) reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of receptor

11.13.3.19 Recreational vessels are able to alter their route, dependent on the target destination. Notices to Mariners will be promulgated during the operational and maintenance phase, advising of the location and nature of maintenance works, and information and notices will be posted at the landfall location, ensuring that recreational activities can be planned accordingly.

11.13.3.20 The receptor is deemed to be of low vulnerability, high recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

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

Aggregate extraction, cables and pipelines

Safety zones around Hornsea Three infrastructure and advisory safety distances associated with maintenance activities, alongside other plans/projects, may lead to a temporary loss of access to existing cables and pipelines for repair or maintenance.

Tier 1

Magnitude of impact

11.13.3.22 Cables and pipelines crossed by Hornsea Three are discussed in section 11.7.5 and section 11.7.15. As described in paragraph 11.13.2.27, cumulative impacts are only likely to arise if other crossings or activities are within the same section of those cables and pipelines.

11.13.3.23 The Topaz to Schooner pipelines are located within a proposed navigation corridor between the Hornsea Three array area and Hornsea Project One/Hornsea Project Two. The presence of Hornsea Three, together with Hornsea Project One and Project Two, may therefore result in an indirect impact on access to this pipeline due to the presence of shipping traffic (see chapter 7: Shipping and Navigation). The pipeline is located toward the northern entrance of the corridor. As noted in paragraph 11.13.2.49, in the event of any IMO routing measures this may lead to restrictions on other activities within the navigation corridor.

11.13.3.24 The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be minor.

Sensitivity of receptor

11.13.3.25 Consultation with INEOS has advised that the Topaz suspended well head is likely to be decommissioned prior to Hornsea Three offshore construction, with the pipeline likely to remain in situ (see Table 11.4). Therefore, it is unlikely that access to this pipeline will be required during the Hornsea Three operational and maintenance phase, although there may be a requirement for post-decommissioning surveys within this area.

11.13.3.26 The receptor is deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be negligible.

Significance of the effect

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

Tier 2

11.13.3.28 No Tier 2 projects have been identified.

Tier 3

11.13.3.29 No Tier 3 projects have been identified.

Oil and gas operations

The presence of infrastructure within the Hornsea Three array area, alongside other plans/projects, may restrict potential seismic survey activity.

11.13.3.30 The presence of infrastructure within the Hornsea Three array area will restrict conventional towed streamer seismic exploration activities, and potentially other more recent methods for seismic survey, in the licence blocks which overlap with the Hornsea Three array area. Cumulative impacts will arise when a particular licence block that is already affected by Hornsea Three is also affected by another project/plan.

11.13.3.31 As discussed in paragraph 11.11.1.36 only those blocks which are licenced beyond the start of the Hornsea Three operational phase and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

Tier 1

Magnitude of impact

11.13.3.32 The presence of the Hornsea Three array area has the potential to result in indirect impacts on operators through the creation of the navigation corridor (see volume 2, chapter 7: Shipping and Navigation), which may result in restrictions on seismic survey activity. INEOS has one currently licenced block (49/2a) which will be licenced at the start of the Hornsea Three operational phase, which overlaps with the Hornsea Three array area and the navigation corridor (Figure 11.15). As noted in paragraph 11.13.2.49, in the event of any IMO routing measures this may lead to restrictions on other activities within the navigation corridor.

11.13.3.33 The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be moderate for licenced block 49/2a currently operated by INEOS.

Sensitivity of receptor

11.13.3.34 The sensitivity of the licence operator, as the receptor, is low for INEOS on the basis of consultation which has advised that they currently have no exploration plans (Table 11.4). Any future operator of the unlicensed blocks will be aware of Hornsea Three and will have taken potential coexistence into consideration.

11.13.3.35 The licence operator is deemed to be of low vulnerability, medium recoverability and high value and details of the activity is not in the public domain and has not been advised through consultation. The sensitivity of the licence operator is therefore, considered to be low.

Significance of the effect

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

Tier 2

11.13.3.37 No Tier 2 projects have been identified.

Tier 3

11.13.3.38 No Tier 3 projects have been identified.

Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances, alongside other plans/projects.

11.13.3.39 Drilling and the placement of infrastructure may be restricted (but not prohibited) within the Hornsea Three array area and from within 1 km of the Hornsea Three array area during the Hornsea Three operational and maintenance phase. Cumulative impacts will arise when a particular licence block that is already affected by Hornsea Three is also affected by another project/plan.

11.13.3.40 In the event that new oil and gas platforms or subsea structures are proposed, the cumulative restricted area may need to be extended further considering helicopter access requirements (see volume 2, chapter 8: Aviation, Military and Communication and volume 2, chapter 12: Inter-related Effects (Offshore)).

11.13.3.41 As discussed in paragraph 11.11.1.36 only those blocks which are licenced beyond the start of the Hornsea Three operational phase and in which the future operations have a degree of both temporal and spatial certainty have been taken forward into the assessment.

Tier 1

Magnitude of impact

11.13.3.42 The presence of the Hornsea Three array area has the potential to result in indirect impacts on operators through the creation of the proposed navigation corridor (see volume 2, chapter 7: Shipping and Navigation). INEOS has one currently licenced block (49/2a) which will be licenced at the start of the operational phase of Hornsea Three which overlaps with the Hornsea Three array area and the navigation corridor (Figure 11.15). In the event that an IMO routing measure is established by MCA for the corridor (see paragraph 11.13.2.49), drilling will be restricted in this area. Any proposed drilling activity and associated placement of infrastructure would be subject to a navigational risk assessment for prior approval by the MCA, which would take account of Hornsea Three and other Tier 1 projects.

11.13.3.43 The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be major.

Sensitivity of the receptor

11.13.3.44 The sensitivity of the licence operator, INEOS, is low on the basis of consultation which has advised that they have no exploration plans or limited levels of activity within this area (Table 11.36). Any future operator of the unlicensed blocks will be aware of Hornsea Three and will have taken potential coexistence into consideration.

11.13.3.45 In all instances, consultation with the operators of the blocks in proximity to the Hornsea Three array area has aimed to address any future operational issues and establish a line of communication to ensure coexistence between both activities can be achieved with minimal disruption.

11.13.3.46 The licence operator is deemed to be of low vulnerability, medium recoverability and high value and details of the activity is not in the public domain and has not been advised through consultation. The sensitivity of the licence operator is therefore, considered to be low.

Significance of the effect

11.13.3.47 Overall, the sensitivity of the receptor is considered to be low and the magnitude is deemed to be major for licensed block 49/2a currently operated by INEOS. The effect will, therefore, be of minor adverse significance, which is not significant in EIA terms.

Tier 2

11.13.3.48 No Tier 2 projects have been identified.

Tier 3

11.13.3.49 No Tier 3 projects have been identified.

The presence of new wind turbines in previously open sea areas, alongside other plans/projects, may cause interference with the performance of the REWS located on oil and gas platforms.

11.13.3.50 The physical presence of wind turbines and associated offshore structures has the potential to interfere with the performance of the REWS (see paragraph 11.11.2.67). This system is sometimes used by oil and gas operators as an integral part of their anti-collision safety systems for their offshore platforms (see section 11.7.15.2).

11.13.3.51 Platforms with REWS potentially within operational range of the Hornsea Three array area have been identified (see Table 11.17). This includes the REWS systems on the J6A platform operated by Spirit Energy (see paragraph 11.11.2.68) and on the Murdoch and Saturn platforms operated by ConocoPhillips (see paragraph 11.11.2.69). As discussed in paragraph 11.11.2.69, the Murdoch platform REWS was not considered within this assessment.

11.13.3.52 Radar modelling was carried out on the cumulative effect of Hornsea Three together with other relevant projects/plans. For REWS, relevant projects/plans include other offshore wind farms within operational range of the same REWS affected by Hornsea Three. The cumulative radar modelling is presented in volume 5, annex 11.1: Radar Early Warning Systems Technical Annex. There are no projects that have the potential to affect the REWS on the J6A platform and so there is no cumulative impact on this system.

11.13.3.53 The potential for any cumulative effect on the Saturn REWS has not been assessed on the basis that Hornsea Three was considered to have a negligible effect on the Saturn platform REWS and in consideration of the designed in mitigation measures (see paragraph 11.11.2.78 and Table 11.27).

Tier 1

11.13.3.54 No Tier 1 projects have been identified.

Tier 2

11.13.3.55 No Tier 2 projects have been identified.

Tier 3

11.13.3.56 No Tier 3 projects have been identified.

The presence of new wind turbines in previously open sea areas, alongside other plans/projects, will deviate vessels which may cause a change in CPA and TCPA alarms on oil and gas platforms protected by REWS.

11.13.3.57 Existing shipping lanes will be altered by the physical presence of Hornsea Three and other projects which may result in vessels being rerouted nearer the platforms protected by the REWS. This may cause an increase in the CPA/TCPA alarm rates at these platforms (see paragraph 11.11.2.79). An alarm will trigger a set of operational safety procedures to protect the platform integrity and personnel on board, ranging from making direct platform to vessel communication, interception by an ERRV vessel, or abandonment of the platform.

11.13.3.58 This assessment considers the effect of rerouted shipping lanes on the Mimas, Saturn and Tethys platforms, which are protected by the REWS located on the Saturn Platform (currently operated by ConocoPhillips). Other platforms with REWS in the vicinity of Hornsea Three have not been included in the assessment as the predicted rerouted shipping lanes are expected to either remain unchanged or move further away from these platforms (see volume 5, annex 11.1: Radar Early Warning Systems Technical Annex).

Tier 1

Magnitude of Impact

11.13.3.59 Other Tier 1 projects which have the potential to result in changes to the traffic rerouting around Hornsea Three include Hornsea Project One and Hornsea Project Two. A statistical model was run to estimate the likelihood of CPA/TCPA alarms being triggered considering 1,000 vessel paths along each route in both forward and reverse directions, for the base case (Figure 11.12) and for the rerouted traffic due to the physical presence of Hornsea Three, Hornsea Project One and Hornsea Project Two (Figure 11.16). In order to avoid false alarms due to temporary vector breach of the TCPA while vessels are turning the models were set to only issue a TCPA alarm if the vessel continues to breach the TCPA rules for more than 10 radar rotations. This is considered a typical figure for REWS; however, different REWS configurations may have different settings which may alter the alarm probabilities slightly. Further details of the parameters used in the model are presented in volume 5, annex 11.1: Radar Early Warning Systems Technical Annex.

11.13.3.60 The results of the modelling is presented in Table 11.37 for the base case and for the rerouted traffic due to the presence of Hornsea Three, Hornsea Project One and Hornsea Project Two, for the CPA and TCPA alarms at the Mimas, Saturn and Tethys platforms. It should be noted that as the routes are generated in a random manner (based on the mean and standard deviation of each route), the results of the statistical analysis may vary slightly depending on the normal distribution around the mean line of each route. Therefore, a change of less than 5% can be assumed to fall within the error margins of the predicted data and the statistical approach used within the models and is therefore not considered statistically significant.

11.13.3.61 The modelling results indicate that many of the routes will see a reduction in the probability of alarms due to the displacement of traffic away from the platforms (shown in green in Table 11.37) however this decrease is in all instances less than 5% which is not considered statistically significant (see paragraph 11.13.3.61). Some routes see an increase in alarms (shown in red in Table 11.37) but again this increase is in all instances less than 5%.

11.13.3.62 The CPA and TCPA alarm rates can therefore be considered to be fairly consistent with the base case when considering displacement due to Hornsea Three, Hornsea Project One and Hornsea Project Two.

11.13.3.63 The impact is predicted to be of local spatial extent, medium term duration, intermittent and not reversible for the project phase. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.

Sensitivity

11.13.3.64 The CPA and TCPA alarms form an integral part of the REWS, which, when installed, plays a fundamental part of an operator's anti-collision safety systems on their platform. The platform operator is deemed to be of medium vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be high.

Significance of the effect

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

Tier 2

11.13.3.66 No Tier 2 projects have been identified.

Tier 3

11.13.3.67 No Tier 3 projects have been identified.

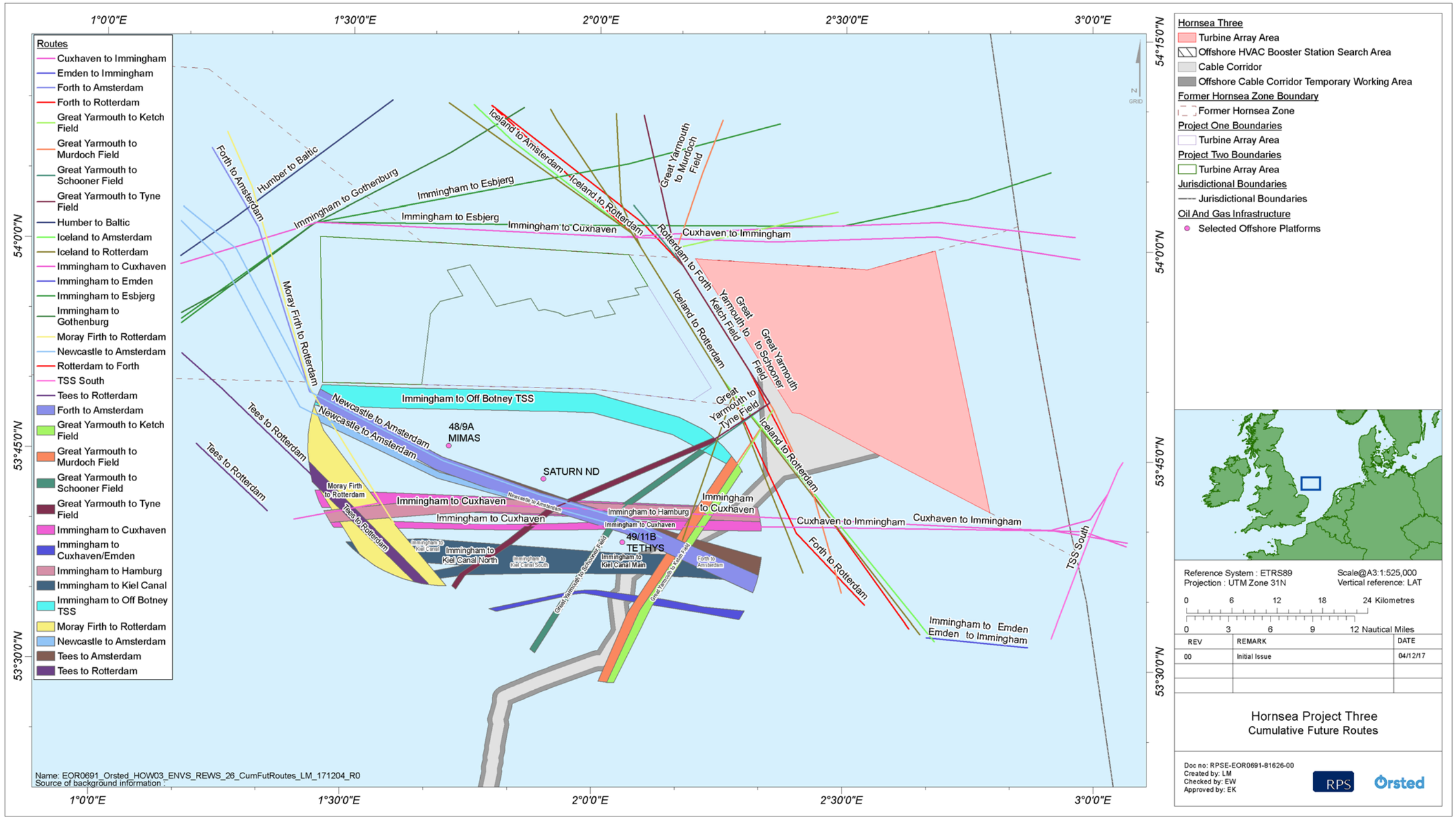

Figure 11.16: Predicted shipping routes considering the physical presence of Hornsea Three, Hornsea Project One and Hornsea Project Two.

Table 11.37: Existing routes and alarm rates based on 1,000 runs in both the forwards and backwards direction for the base case and considering the physical presence of Hornsea Three, Hornsea Project One and Hornsea Project Two.

Route Number	Route Name	Number of vessel / day	Base case				Hornsea Three and Hornsea Project One and Hornsea Project Two			
			Forward Direction		Reverse Direction		Forward Direction		Reverse Direction	
			% Red Alarms	% Amber Alarms	% Red Alarms	% Amber Alarms	% Change in Red Alarms	% Change in Amber Alarms	% Change in Red Alarms	% Change in Amber Alarms
1	Immingham to Cuxhaven	2.5	0.4	15.6	2.4	12.8	0.8	3.6	-0.6	-3.2
2	Immingham to Cuxhaven	1.5	0.4	25.2	0.8	2.8	-0.2	-3	0.2	1.2
3	Newcastle to Amsterdam	1	12.2	37.8	82.8	99	-1.8	3.2	-2.8	0.4
4	Newcastle to Amsterdam	1	1.8	13	1.2	29	0	-0.8	0.6	4.8
5	Moray Firth to Rotterdam	0.5	0	0	0	0	0	0	0	0
6	Immingham to Cuxhaven/Emden	0.5	0	0	0	0	0	0	0	0
7	Tees to Amsterdam	0.33	8	30.6	16.8	44.6	1.8	-1	-1.7	-1.5
10	Immingham to Hamburg	0.5	7	23.4	0.6	6.6	-1	-0.8	-0.4	-6
11	Immingham to Off Botney TSS	0.5	0.2	0.6	0	2.4	0.4	1	0	-0.8
12	Immingham to Kiel Canal	0.75	6.2	10.2	3.4	6.8	0.2	1.2	-1	-1
12	Immingham to Kiel Canal South	0.25	12.2	26	0	0	2.6	3.4	0	0
13	Great Yarmouth to Schooner Field	0	0.2	1.2	0	0	0.4	1.8	0	0
15	Great Yarmouth to Ketch Field	0	0	0	0	0	0	0	0	0
16	Great Yarmouth to Tyne Field	0	0	10.8	0	0	0	2.2	0	0
17	Forth to Amsterdam	1	21.8	58.8	39	79.2	1	2.6	2.4	1.6
19	Tees to Rotterdam	1	0	0	0	0	0	0	0	0

Wind turbines and associated infrastructure, alongside other plans/projects, may disrupt vessel access to oil and gas platforms and subsea infrastructure.

11.13.3.68 This impact considers vessel access to oil and gas platforms and subsea infrastructure. Cumulative impacts will arise when existing infrastructure already affected by Hornsea Three is also affected by another project/plan. A cumulative effect assessment of disruption to helicopter access to existing or new oil and gas platforms or subsea structures is provided in volume 2, chapter 8: Aviation, Military and Communication. A cumulative assessment on route deviations to vessels is provided in volume 2, chapter 7: Shipping and Navigation.

Tier 1

Magnitude of impact

11.13.3.69 The Clipper South platform operated by INEOS is located within 1 km of the Hornsea Three offshore cable corridor. There are no Tier 1 projects located in close proximity to this platform such that cumulative impacts on access are not anticipated. There is one suspended well (Topaz, INEOS) located both within 1 km of the Hornsea Three array area and within the proposed navigation corridor. There is potential for an indirect cumulative effect on vessel access to the Topaz well due to the presence of the proposed navigation corridor between the Hornsea Three array area and Hornsea Project One/Hornsea Project Two, and the presence of shipping traffic. As noted in paragraph 11.13.2.49, in the event of any IMO routing measures, this may lead to restrictions on other activities within the navigation corridor.

11.13.3.70 There are four completed wells within 1 km of the Hornsea Three offshore cable corridor, located in the Clipper South field operated by INEOS. There are no Tier 1 projects located in close proximity to these wells such that cumulative impacts are not anticipated.

11.13.3.71 The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be minor.

Sensitivity of receptor

11.13.3.72 The sensitivity of the receptor varies depending on the information provided through consultation with the operator of the block. Consultation with INEOS has advised that the Topaz suspended well head is likely to be decommissioned prior to Hornsea Three offshore construction, and that they do not have any current exploration plans within the southern North Sea (see Table 11.4). Therefore, there is unlikely to be potential for cumulative disruption to vessel access to existing infrastructure.

11.13.3.73 Close communication will be established between Hornsea Three and the relevant operators in the vicinity of the Hornsea Three array area and offshore cable corridor to ensure that future activities can be coordinated. Any future operator of the unlicensed blocks will be aware of the Hornsea Three project and will have taken potential coexistence into consideration.

11.13.3.74 The oil and gas operator is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

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

Tier 2

11.13.3.76 No Tier 2 projects have been identified.

Tier 3

11.13.3.77 No Tier 3 projects have been identified.

Future monitoring

11.13.3.78 No infrastructure and other users monitoring to test the predictions made within the operation and maintenance phase impact assessment is considered necessary.

11.13.4 Decommissioning phase

Recreational users and recreational fishing

Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor, alongside other plans/projects, may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource.

11.13.4.1 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor** adverse, which is not significant in EIA terms (see paragraphs 11.13.2.10, 11.13.2.18 and 11.13.2.26).

Aggregate extraction, cables and pipelines

Removal of Hornsea Three infrastructure, alongside other plans/projects, may affect existing cables and pipelines or restrict access to cables and pipelines.

11.13.4.2 The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor** adverse, which is not significant in EIA terms (see paragraph 11.13.2.34).

Removal of Hornsea Three infrastructure, alongside other plans/projects, has the potential to lead to increased suspended sediment concentrations and deposition, which could cause a change in aggregate resource in aggregate extraction areas.

11.13.4.3 The potential changes to the physical environment due to decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **negligible**, which is not significant in EIA terms (see paragraph 11.13.2.38).

Future monitoring

11.13.4.4 No infrastructure and other users monitoring to test the predictions made within the construction phase impact assessment is considered necessary.

11.14 Transboundary effects

11.14.1.1 A screening of transboundary impacts has been carried out and is presented in volume 1, annex 5.3: Transboundary Impacts Screening. This screening exercise identified that there was potential for significant transboundary effects with regard to infrastructure and other users from Hornsea Three upon the interests of other EEA States.

11.14.1.2 Potential transboundary impacts that have been identified relate to the following impact:

- 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.

11.14.1.3 This impact is assessed within paragraph 11.11.2.67. The significance of effect will be **minor** adverse for the J6A platform REWS operated by Spirit Energy, which is not significant in EIA terms. The J6A platform is located within Dutch territorial waters (Figure 11.7).

11.15 Inter-related effects

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

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the project (construction, operational and maintenance, and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three key project stages (e.g. subsea noise effects from piling, operational turbines, vessels and decommissioning); and
- Receptor led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on infrastructure and other users, such as a restriction in potential seismic survey activity, restrictions on drilling and the placement of infrastructure and disruption of vessel access to infrastructure, may interact to produce a different, or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

11.15.1.2 A description of the likely inter-related effects arising from Hornsea Three on infrastructure and other users is provided in volume 2, chapter 12: Inter-Related Effects (Offshore).

11.16 Conclusion and summary

11.16.1.1 Information on infrastructure and other users within the Hornsea Three infrastructure and other users study area was collected through a detailed desktop review of existing datasets and through consultation as detailed in Table 11.4. No site specific surveys were undertaken to inform the assessments. Modelling techniques developed at the University of Manchester were used to model and predict the impact of wind turbines and associated offshore structures on REWS. This information was combined with AIS route data provided by Anatec to undertake the CPA and TCPA assessments (see volume 5, annex 11.1: Radar Early Warning Systems Technical Report).

11.16.1.2 Consultation has taken place with infrastructure and other users receptors, as presented in section 11.5. The assessment methodology applied in this chapter has been discussed through the consultation process (Table 11.4).

11.16.1.3 Table 11.38, Table 11.39 and Table 11.40 provide a summary of the potential impact, mitigation measures and residual effects in respect to recreational users and recreational fishing, aggregate extraction, cables and pipelines, and oil and gas operations, respectively.

11.16.1.4 Impacts assessed during the construction phase include the displacement of recreational craft and recreational fishing vessels leading to a loss of recreational activity, restricted access to cables and pipelines, increased suspended sediment concentrations and deposition resulting in a change in aggregate resource, restriction on seismic survey, drilling and the placement of infrastructure, and underwater noise that may acoustically interfere with seismic survey operations. Overall it is concluded that there will be no significant effects arising from Hornsea Three during the construction phase.

11.16.1.5 Impacts assessed during the operation and maintenance phase include the displacement of recreational craft and recreational fishing vessels leading to a loss of recreational activity, restricted access to cables and pipelines, restriction on seismic survey, drilling and the placement of infrastructure, interference with the performance of the REWS located on oil and gas platforms, deviation of vessels leading to a change in CPA and TCPA alarms on oil and gas platforms protected by REWS, and disruption of vessel access to oil and gas platforms and subsea infrastructure. Overall it is concluded that there will be no significant effects arising from Hornsea Three during the operation and maintenance phase.

11.16.1.6 Impacts assessed during the decommissioning phase include the displacement of recreational craft and recreational fishing vessels leading to a loss of recreational activity, restricted access to cables and pipelines, increased suspended sediment concentrations and deposition resulting in a change in aggregate resource, and restriction on seismic survey, drilling and the placement of infrastructure. Overall it is concluded that there will be no significant effects arising from Hornsea Three during the decommissioning phase.

11.16.1.7 Impacts assessed during the construction, operation and maintenance and decommissioning phase for Hornsea Three, considered alongside other projects and plans, include the displacement of recreational craft and recreational fishing vessels leading to a loss of recreational activity, restricted access to cables and pipelines, increased suspended sediment concentrations and deposition resulting in a change in aggregate resource, restriction on seismic survey, drilling and the placement of infrastructure, underwater noise that may acoustically interfere with seismic survey operations, interference with the performance of the REWS located on oil and gas platforms, deviation of vessels leading to a change in CPA and TCPA alarms on oil and gas platforms protected by REWS, and disruption of vessel access to oil and gas platforms and subsea infrastructure. Overall it is concluded that there will be no significant cumulative effects from Hornsea Three alongside other projects/plans.

11.16.1.8 Potential transboundary impacts have been identified in regard to effects of Hornsea Three in isolation on the J6A platform REWS operated by Spirit Energy, which is not significant in EIA terms, as discussed in section 11.14 above.

Table 11.38: Summary of potential environment effects, mitigation and monitoring: recreational users and recreational fishing.

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Construction phase							
Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource	Promulgation of Information through Notices to Mariners	Minor	Low	**Negligible** (not significant in EIA terms)	None	N/A	None
Operation phase							
Hornsea Three infrastructure, safety zones and advisory safety distances associated with infrastructure and maintenance activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource	Promulgation of Information through Notices to Mariners	Negligible	Low	**Negligible** (not significant in EIA terms)	None	N/A	None
Decommissioning phase							
Hornsea Three infrastructure, safety zones and advisory safety distances associated with activities within the Hornsea Three array area and along the offshore cable corridor may displace recreational craft and recreational fishing vessels resulting in a loss of recreational resource	Promulgation of Information through Notices to Mariners	Minor	Low	**Negligible** (not significant in EIA terms)	None	N/A	None

Table 11.39: Summary of potential environment effects, mitigation and monitoring: aggregate extraction, cables and pipelines.

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Construction phase							
Installation of Hornsea Three infrastructure may affect existing cables and pipelines or restrict access to cables and pipelines	Cable/pipeline crossing and proximity agreements will be established with relevant operators	Minor	High	**Minor** adverse (not significant in EIA terms)	None	N/A	None
Installation of 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	N/A	Negligible	Medium	**Negligible**	None	N/A	None
Operation phase							
Safety zones around Hornsea Three infrastructure and advisory safety distances associated with maintenance activities, may lead to a temporary loss of access to existing cables and pipelines for repair or maintenance	Cable/pipeline crossing and proximity agreements will be established with relevant operators	Minor	Low	**Minor** adverse (not significant in EIA terms)	None	N/A	None
Decommissioning phase							
Removal of Hornsea Three infrastructure may affect existing cables and pipelines or restrict access to cables and pipelines	Cable/pipeline crossing and proximity agreements will be established with relevant operators	Minor	High	**Minor** adverse (not significant in EIA terms)	None	N/A	None
Removal of 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	N/A	Negligible	Medium	**Negligible**	None	N/A	None

Table 11.40: Summary of potential environment effects, mitigation and monitoring: oil and gas operations.

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Construction phase							
Hornsea Three infrastructure, safety zones and advisory safety distances associated with the Hornsea Three array area may restrict potential seismic survey activity	Promulgation of information through Notices to Mariners. Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licencees, in order to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.	Major (49/4b currently operated by Spirit Energy North Sea); Moderate (49/3, 49/4d, 49/9c and 49/9d currently operated by Spirit Energy Resources); Minor (49/2a currently operated by INEOS); Negligible (49/10a) currently operated by Spirit Energy Resources.	Low	**Minor** adverse (49/3, 49/4d, 49/9c and 49/9d currently operated by Spirit Energy Resources and 49/4b currently operated by Spirit Energy North Sea) (not significant in EIA terms); and **Negligible** (49/2a currently operated by INEOS) and 49/10a currently operated by Spirit Energy Resources) (not significant in EIA terms).	None	N/A	None
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances	Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licencees, in order to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.	Major (49/4b currently operated by Spirit Energy North Sea); Moderate (49/3, 49/4d, 49/9c and 49/9d currently operated by Spirit Energy Resources); Minor (49/2a currently operated by INEOS); Negligible (49/10a) currently operated by Spirit Energy Resources.	Low	**Minor** adverse (49/3, 49/4d, 49/9c and 49/9d currently operated by Spirit Energy Resources and 49/4b currently operated by Spirit North Sea) (not significant in EIA terms); and **Negligible** (49/2a currently operated by INEOS and 49/10a currently operated by Spirit Energy Resources) (not significant in EIA terms).	None	N/A	None

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor may restrict potential seismic survey activity	Promulgation of information through Notices to Mariners. Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licencees, in order to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.	Minor (48/20a operated by Shell, 48/20b operated by INEOS and 48/24b operated by Independent Oil and Gas and 49/11a operated by ConocoPhillips); and Negligible (48/19a operated by Shell, 48/23c and 48/25a operated by Independent Oil and Gas and 49/16a operated by ConocoPhillips).	Low	**Minor** adverse (48/20a operated by Shell, 48/20b operated by INEOS and 48/24b operated by Independent Oil and Gas and 49/11a operated by ConocoPhillips) (not significant in EIA terms); and **Negligible** (48/19a operated by Shell, 48/23c and 48/25a operated by Independent Oil and Gas and 49/16a operated by ConocoPhillips) (not significant in EIA terms).	None	N/A	None
Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor	Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licencees, in order to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.						
The piling of wind turbine and substation foundations will generate underwater noise that may acoustically interfere with seismic survey operations	Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licencees, in order to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.	Moderate	Low	**Minor** adverse (not significant in EIA terms)	None	N/A	None

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Operation phase							
The presence of infrastructure within the Hornsea Three array area may restrict potential seismic survey activity	Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licencees, in order to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.	Moderate (49/4b currently operated by Spirit Energy North Sea and 49/3, 49/4d and 49/9d currently operated by Spirit Energy Resources); Minor (49/9c currently operated by Spirit Energy Resources and 49/2a currently operated by INEOS); and Negligible (49/10a currently operated by Spirit Energy Resources).	Low	**Minor** adverse (49/3, 49/4d and 49/9d currently operated by Spirit Energy Resources and 49/4b currently operated by Spirit Energy North Sea) (not significant in EIA terms); and **Negligible** (49/9c and 49/10a currently operated by Spirit Energy Resources and 49/2a currently operated by INEOS) (not significant in EIA terms).	None	N/A	None
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances	Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licencees, in order to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.	Moderate (49/4b currently operated by Spirit Energy North Sea and 49/3, 49/4d and 49/9d currently operated by Spirit Energy Resources); Minor (49/9c currently operated by Spirit Energy Resources and 49/2a currently operated by INEOS); and Negligible (49/10a currently operated by Spirit Energy Resources).	Low	**Minor** adverse (49/3, 49/4d and 49/9d currently operated by Spirit Energy Resources and 49/4b currently operated by Spirit Energy North Sea) (not significant in EIA terms); and **Negligible** (49/9c and 49/10a currently operated by Spirit Energy Resources and 49/2a currently operated by INEOS) (not significant in EIA terms).	None	N/A	None
Safety zones around the offshore HVAC booster stations and advisory safety distances associated with maintenance activities underway along the offshore cable corridor may restrict potential seismic survey activity	Promulgation of information through Notices to Mariners. Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licencees, in order to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.	Minor (48/20a currently operated by Shell, 48/24b currently operated by Independent Oil and Gas, 48/20b currently operated by INEOS and 49/11a currently operated by ConocoPhillips); and Negligible (48/19a currently operated by Shell, 48/23c and 48/25a currently operated by Independent Oil and Gas and 49/16a currently operated by ConocoPhillips).	Low	**Minor** adverse (48/20a currently operated by Shell, 48/24b currently operated by Independent Oil and Gas, 48/20b currently operated by INEOS and 49/11a currently operated by ConocoPhillips) (not significant in EIA terms); and **Negligible** (48/19a currently operated by Shell, 48/23c and 48/25a currently operated by Independent Oil and Gas and 49/16a currently operated by ConocoPhillips).	None	N/A	None

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor	Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licencees, in order to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.	Minor (48/20a currently operated by Shell, 48/24b currently operated by Independent Oil and Gas, 48/20b currently operated by INEOS and 49/11a currently operated by ConocoPhillips); and Negligible (48/19a currently operated by Shell, 48/23c and 48/25a currently operated by Independent Oil and Gas and 49/16a currently operated by ConocoPhillips).	Low	**Minor** adverse (48/20a currently operated by Shell, 48/24b currently operated by Independent Oil and Gas, 48/20b currently operated by INEOS and 49/11a currently operated by ConocoPhillips) (not significant in EIA terms); and **Negligible** (48/19a currently operated by Shell, 48/23c and 48/25a currently operated by Independent Oil and Gas and 49/16a currently operated by ConocoPhillips).	None	N/A	None
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	Measures shall be put in place to reduce the effect of Hornsea Three on the REWS on the J6A platform. The mitigation measures will be based on the mitigation measures identified for Hornsea Project Two on the Saturn platform and developed in consultation with Spirit Energy.	Minor (J6A platform REWS, operated by Spirit Energy); Negligible (Saturn REWS, operated by ConocoPhillips).	High	**Minor** (J6A platform REWS operated by Spirit Energy) (not significant in EIA terms); Negligible (Saturn platform REWS operated by ConocoPhillips) (not significant in EIA terms).	None	N/A	None
The presence of new wind turbines in previously open sea areas will deviate vessels which may cause a change in CPA and TCPA alarms on oil and gas platforms protected by REWS.	-	Negligible	High	**Minor** adverse (not significant in EIA terms).	None	N/A	None
Wind turbines and associated infrastructure will form a physical obstruction and may disrupt vessel access to oil and gas platforms and subsea infrastructure	Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licencees, in order to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.	Minor	Low	**Minor** adverse (not significant in EIA terms)	None	N/A	None

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Decommissioning phase							
Hornsea Three infrastructure, safety zones and advisory safety distances associated with decommissioning of the Hornsea Three array area may restrict potential seismic survey activity	Promulgation of information through Notices to Mariners. Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licencees, in order to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.	Negligible (49/10a) currently operated by Spirit Energy Resources.	Low	**Negligible** (49/10a currently operated by Spirit Energy Resources) (not significant in EIA terms).	None	N/A	None
Drilling and the placement of infrastructure has the potential to be restricted within the Hornsea Three array area and within 1 km from the boundary of the array area by the presence of infrastructure, safety zones and advisory safety distances	Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licencees, in order to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.						

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Safety zones around the offshore HVAC booster stations and advisory safety distances associated with activities underway along the offshore cable corridor may restrict potential seismic survey activity	Promulgation of information through Notices to Mariners. Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licencees, in order to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.	Minor (48/20a operated by Shell, and 49/11a operated by ConocoPhillips); and Negligible (48/19a operated by Shell, and 49/16a operated by ConocoPhillips).	Low	**Minor** adverse (48/20a operated by Shell, and 49/11a operated by ConocoPhillips) (not significant in EIA terms); and **Negligible** (48/19a operated by Shell, and 49/16a operated by ConocoPhillips) (not significant in EIA terms).	None	N/A	None
Drilling and the placement of infrastructure has the potential to be restricted within the offshore cable corridor and within 1 km from the boundary of the offshore cable corridor	Hornsea Three will continue to consult with current oil and gas operators and licensees and will consider representations if approached by future oil and gas operators and licencees, in order to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.						

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