



# Hornsea Project Four: Preliminary Environmental Information Report (PEIR)

## Volume 1, Chapter 5: Environmental Impact Assessment Methodology

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## Glossary

Term	Definition
Applicant	Ørsted Hornsea Project Four Ltd
Baseline	The status of the environment now without the development in place.
Code of Construction Practice (CoCP)	A document detailing the overarching principles of construction, contractor protocols, construction-related environmental management measures, pollution prevention measures, the selection of appropriate construction techniques and monitoring processes
Cumulative effects	The combined effect of Hornsea Project Four in combination with the effects from a number of different projects, on the same single receptor/resource.
Cumulative impact	Impacts that result from changes caused by other past, present or reasonably foreseeable actions together with Hornsea Project Four.

Term	Definition
Commitment	A term used interchangeably with mitigation. Commitments are Embedded Mitigation Measures. Commitments are either Primary (Design) or Tertiary (Inherent) and embedded within the assessment at the relevant point in the EIA (e.g. at Scoping or PEIR). The purpose of Commitments is to reduce and/or eliminate Likely Significant Effects (LSE's), in EIA terms.
Design Envelope	A description of the range of possible elements that make up the Hornsea Project Four design options under consideration, as set out in detail in the project description (see <a href="#">Volume 1 Chapter 4</a> ). This envelope is used to define Hornsea Project Four for Environmental Impact Assessment (EIA) purposes when the exact engineering parameters are not yet known. This is also often referred to as the "Rochdale Envelope" approach.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Projects (NSIP).
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
EIA Directive	European Union Directive 85/337/EEC, as amended by Directives 97/11/EC, 2003/35/EC and 2009/31/EC and then codified by <a href="#">Directive 2011/92/EU</a> of 13 December 2011 (as amended in 2014 by <a href="#">Directive 2014/52/EU</a> ).
EIA Regulations	The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Statement.
Environmental Statement	A document reporting the findings of the EIA and produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Hornsea Four	The proposed Hornsea Four offshore wind farm project; the term covers all elements within the Development Consent Order (i.e. both the offshore and onshore components).
Inter Related Effect (or Inter-Relationships)	The likely effects of multiple impacts from the proposed development on one receptor. For example, noise and air quality together could have a greater effect on a residential receptor than each impact considered separately.
Impacts Register	An Excel spreadsheet which identifies all of the potential effects that the project team have identified that could possibly result from the construction, operation and decommissioning of Hornsea Four, relating to each technical topic under consideration in the EIA process
Maximum Design Scenario	The maximum design parameters of each Hornsea Four asset (both on and offshore) considered to be a worst case for any given assessment.
Mitigation	A term used interchangeably with Commitment(s) by Hornsea Four. Mitigation measures (Commitments) are embedded within the assessment at the relevant point in the EIA (e.g. at Scoping or PEIR).
Proportionate EIA	An approach to EIA to reduce un-necessary assessments so that only those which are the focus of the EIA Regulations (i.e. likely significant effects) are

Term	Definition
	discussed in the PEIR and Environmental Statement. Such reports need to reflect the scale and complexity of the assessments undertaken and avoid reporting all environmental work where not relevant.
Planning Inspectorate (PINS)	The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects (NSIPs).
Primary mitigation	Design decisions taken by the project which affect EIA (e.g. no development within 50m of residential property). Primary mitigation is embedded into the design of Hornsea Four and should be considered in the pre-mitigation assessment. Refer to the EIA scoping report for more details.
Receptor	A distinct part of the environment on which effects could occur and can be the subject of specific assessments. Examples of receptors include species (or groups) of animals or plants, people (often categorised further such as 'residential' or those using areas for amenity or recreation), watercourses etc.
Secondary mitigation	Mitigation to reduce impacts to acceptable levels. Secondary mitigation measures are developed and considered to be additional, and typically require additional action post-consent to be implemented. These are only considered in the residual effects assessment (if secondary mitigation is required). Refer to the EIA scoping report for more details.
Scoping	An early part of the EIA process by which the key potential significant impacts of the project are identified, and methodologies identified for how these should be assessed. This process gives the regulator and key consultees opportunity to comment and define the full extent of the final EIA – which can also then be tailored through the consultation process.
Tertiary mitigation	Best practice mitigation that would need to be implemented with or without the EIA. These mitigation measures have a certainty of being implemented and should be considered in the pre-mitigation assessment. This includes plans such as Code of Construction Practice, Construction Logistics Plans, etc. Refer to the EIA scoping report for more details.
Transboundary Impacts	Transboundary effects arise when impacts from the development within one European Economic Area (EEA) state affects the environment of another EEA state(s).

## Acronyms

Acronym	Definition
BRAG	Black, Red, Amber, Green assessment
BSI	British Standards Institute
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CEMP	Construction Environmental Management Plan
CoCP	Code of Construction Practice
CEA	Cumulative Effects Assessment
DMRB	Design Manual for Roads and Bridges
DCO	Development Consent Order
DECC	Department of Energy and Climate Change

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CoCP	Code of Construction Practice
CEA	Cumulative Effects Assessment
DMRB	Design Manual for Roads and Bridges
EEA	European Economic Area
EIA	Environmental Impact Assessment
EP	Evidence Plan
ES	Environmental Statement
EU	European Union
HIA	Health Impact Assessment
IEMA	Institute of Environmental Management and Assessment
HRA	Habitats Regulations Assessment
MDS	Maximum Design Scenario
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
OnSS	Onshore Substation
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
PPG	Planning Practice Guidance
PRoW	Public Right of Way
SoS	Secretary of State
SWMP	Site Waste Management Plan
UK	United Kingdom

## 5.1 Introduction

5.1.1.1 This chapter of the Preliminary Environmental Impact Assessment (PEIR) describes the Environmental Impact Assessment (EIA) methodology followed for the Hornsea Project Four offshore wind farm (hereafter Hornsea Four). Specifically, this chapter describes the approach used to identify, evaluate and mitigate potential likely significant effects (LSE), in EIA terms, using a defined proportionate approach to the assessment process. It also sets out the requirement for EIA and the proposed temporal, spatial and technical scope of the EIA.

## 5.2 Requirement for an EIA

5.2.1.1 EIA is a procedure required under the terms of Directive 2011/92/EU, as amended by Directive 2014/52/EU on the assessment of environmental effects of certain public and private projects. EIA has become a widely used tool for identifying the potential impacts of new developments (Glasson *et al*,1999) and it is intended to provide decision-makers with an understanding of the probable environmental consequences of a proposed project and thereby facilitate the making of more environmentally sound decisions (Bailey and Hobbs, 1990). Further details on the need for EIA is set out in [Volume 1 Chapter 2: Planning and Policy Context](#).

5.2.1.2 Article 1(1) of the Directive (as amended) sets the focus of EIA on the assessment of the environmental effects of those public and private projects “which are likely to have significant effects on the environment”. Article 2(1) of the Directive states that:

*“Member States shall adopt all measures necessary to ensure that, before development consent is given, projects likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location are made subject to a requirement for development consent and an assessment with regard to their effects on the environment.”*

5.2.1.3 Further emphasis is given to treating each case individually, with a focus on significant effects considering evidence and consultations through the provisions contained in Article 3 and Article 8:

*“...in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project...”*

*“The results of consultations and information gathered pursuant to Articles 5 to 7 shall be duly taken into account in the development consent procedure”.*

5.2.1.4 The EIA is being carried out in accordance with the Planning Act 2008 and the Infrastructure Planning (EIA) Regulations 2017 (the EIA Regulations) (see [Chapter 2: Planning and Policy Context](#)). Furthermore, the approach to the EIA and the production of this PEIR closely follows several relevant guidance notes, policy statements, and industry best practice documents as set out in [Table 5.1](#).

Table 5.1: Documents Used to Guide the EIA Methodology

Document
<i>Planning Inspectorate (PINS) Advice Notes</i>
Advice Note Three (version 7): EIA Consultation and Notification (PINS, 2017a)
Advice Note Seven (version 6): Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements (PINS, 2017b)
Advice Note Nine (version 3): Rochdale Envelope (PINS, 2018a)
Advice Note Ten (version 8): Habitat Regulations Assessment relevant to nationally significant infrastructure projects (PINS, 2017c)
Advice Note Eleven (version 4): Working with public bodies in the infrastructure planning process (PINS, November 2017d)
Advice Note Twelve (version 5): Transboundary Impacts and Process (PINS, 2018b)
Advice Note Seventeen (version 1): Cumulative effects assessment relevant to nationally significant infrastructure projects (PINS, 2015)
Advice Note Eighteen (version 1): The Water Framework Directive (PINS, 2017e)
<i>National Policy Statements</i>
Overarching National Policy Statement for Energy (EN-1) (Department of Energy and Climate Change (DECC) 2011a)
National Policy Statement for Renewable Energy Infrastructure EN-3 (DECC, 2011b)
National Policy Statement for Electricity Networks Infrastructure EN-5 (DECC, 2011c)
<i>Industry EIA Guidance Documents</i>
Assessment of the environmental impact of offshore wind-farms (OSPAR Commission, 2008)
Offshore Wind Farms: Guidance Note for Environmental Impact Assessment in Respect of Food and Environment Protection Act 1985 and Coastal Protection Act 1949 requirements (Cefas, 2004)
Cumulative Impact Assessment Guidelines - Guiding Principles For Cumulative Impact Assessment in Offshore Wind Farms (RenewableUK, 2013)
Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Cefas, 2012)
<i>Professional EIA Guidance Documents</i>
Guidelines for Environmental Impact Assessment (IEMA, 2004)
Guide to Shaping Quality Development (IEMA, 2016)
Delivering Proportionate EIA, A Collaborative Strategy for Enhancing UK Environmental Impact Assessment Practice (IEMA, 2017)

5.2.1.5 Each technical assessment also refers to a range of specific guidance documents in order to frame and undertake their assessments and all such guidance is set out as appropriate in **Volume 2, Chapters 1 to 12** (offshore) and **Volume 3, Chapters 1 to 10** (onshore).

5.2.1.6 Over time, EIA practice has become more complex and involved with very lengthy Environmental Statements (ESs) being produced which arguably consider every conceivable possible impact rather than focussing on those impacts that are likely to be significant (LSE) as required in the EIA Directive and Regulations. As a result, many EIAs can be unfocussed with key findings inaccessible. As noted by the Institute of Environmental Management and Assessment (IEMA, 2017), delivering *proportionate* EIA is a key issue for both the UK planning and consenting system and developers seeking to progress projects. The Hornsea Four project has taken an early and positive step in embracing the concept of proportionality in

EIA and further details of the approach adopted for this EIA is provided in [Section 5.5](#) of this chapter.

- 5.2.1.7 The EIA process and its preliminary findings are reported within this PEIR, which has been produced to support consultation under Section 42 of the Planning Act 2008. Feedback from this consultation will be taken into consideration and where relevant, will be used to inform the final design and impact assessment of Hornsea Four. The results of the EIA will be reported in a final ES, which will be submitted to PINS along with supplementary documents as part of the Development Consent Order (DCO) application.
- 5.2.1.8 The purpose of the ES (and this PEIR) is to inform the Secretary of State (SoS) (the decision maker), stakeholders, and all interested parties of any likely significant effects that would result from the project during its construction, operation and (where relevant) decommissioning.
- 5.2.1.9 The EIA gives due regard to the requirements of the Habitats and Species Regulations 2017, the Conservation of Offshore Marine Habitats and Species Regulations 2017 and the Marine and Coastal Access Act 2009.

### 5.3 Information for Inclusion in the PEIR

- 5.3.1.1 [Table 5.2](#) summarises the information requirements set out in Schedule 4, Part 1 of the EIA Regulations and where such information can be found within this document. The reader is directed to the original legislation for a full description of the requirements which are only summarised below.

**Table 5.2: EIA Regulations – Information for Inclusion in Environmental Statements**

Schedule 4 Requirement	Where Set Out In This PEIR
A description of the development including: its location; its physical characteristics and land-use requirements during the construction and operational phases; the main characteristics of the operational phase; and an estimate of expected residues and emissions (e.g. water, air, soil, noise, vibration, light, heat, radiation and wastes) produced during the construction and operation phases.	<a href="#">Chapter 4</a> provides a comprehensive description of the project.
A description of the reasonable alternatives studied by the developer, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.	<a href="#">Chapter 3</a> provides a description of the site selection process and the alternatives considered by the Applicant. Included within this chapter are references to the comparative environmental appraisals that have taken place through the project's development to assist in routing and site selection.
A description of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the development.	Each of the technical chapters ( <a href="#">Volume 2, Chapters 1 to 12</a> (offshore) and <a href="#">Volume 3, Chapters 1 to 10</a> (onshore)) includes information characterising the baseline scenario along with a description how this may evolve over the lifetime of the project without any development occurring.

Schedule 4 Requirement	Where Set Out In This PEIR
	<p>A number of technical reports are also included in the PEIR submission often presenting baseline information (for example, collected through survey effort). Such technical reports are provided in <a href="#">Volume 5</a> (offshore) and <a href="#">Volume 6</a> (onshore).</p>
<p>A description of the factors likely to be significantly affected by the development: population, human health, biodiversity, land, soil, water, air, climate, material assets, cultural heritage, and landscape.</p>	<p>This PEIR has been progressed in line with the Scoping Opinion from PINS and subsequent consultations. Following the proportionate approach, the EIA has focussed on significant effects.</p> <p>The technical assessments are provided in <a href="#">Volume 2 Chapters 1 to 12</a> (offshore) and <a href="#">Volume 3 Chapters 1 to 10</a> (onshore). The approach to assessing health effects is set out in <a href="#">Section 5.11.1</a>.</p>
<p>A description of the likely significant effects of the development on the environment covering the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development.</p>	<p>Likely significant effects are set out in each of the technical chapters, <a href="#">Volume 2, Chapters 1 to 12</a> (offshore) and <a href="#">Volume 3, Chapters 1 to 10</a> (onshore).</p> <p>Assessments of cumulative effects, inter-related effects and any transboundary effects (where they have been screened in) are also presented in the technical chapters.</p>
<p>A description of the forecasting methods or evidence, used to identify and assess significant effects, including details of the difficulties encountered and the main uncertainties involved.</p>	<p>Each of the technical chapters contains details of the forecasting methods used along with difficulties and uncertainties.</p> <p>See <a href="#">Volume 2 Chapters 1 to 12</a> (offshore) and <a href="#">Volume 3 Chapters 1 to 10</a> (onshore).</p>
<p>A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements.</p>	<p>Each of the technical chapters contains details of the mitigation measures used to avoid or reduce environmental effects as well as recommendations for any future monitoring. See <a href="#">Volume 2, Chapters 1 to 12</a> (offshore) and <a href="#">Volume 3, Chapters 1 to 10</a> (onshore). Additionally, the Commitments Register holds details of all measures the Applicant has signed up to which will reduce environmental impacts (see <a href="#">Volume 4, Chapter 5, Annex 2</a>).</p>
<p>A description of the expected significant adverse effects deriving from the vulnerability of the development to risks of major accidents and/or disasters.</p>	<p>Commentary on risks from major accidents and/or disasters is provided in this chapter in <a href="#">Section 5.11.2</a>.</p>
<p>A non-technical summary of the information.</p>	<p>A non-technical summary of the PEIR and its findings is provided as a standalone document and similarly, will also be included as part of the final ES.</p>
<p>A reference list detailing the sources used for the descriptions and assessments.</p>	<p>References are provided at the end of all of the PEIR chapters.</p>

## 5.4 The Project Design Envelope and Maximum Design Scenarios

- 5.4.1.1 The Hornsea Four EIA will be based on a project envelope approach, also known as a 'Rochdale Envelope' approach. NPS EN-3 (at paragraph 2.6.43) and PINS Advice Note Nine (PINS, 2018a) recognise that, at the time of submitting an application, offshore wind developers may not know the precise nature and arrangement of turbines, infrastructure and associated infrastructure that make up the proposed development. This is due to several factors such as the evolution of technology, the need for flexibility in key commercial project decisions and the need for more detailed pre-construction engineering surveys which are required before a final design and layout can be determined. It is therefore important that a design envelope approach is used to provide flexibility to maximise the potential for Hornsea Four to proceed and be successful whilst providing sufficient detail to enable a robust EIA to be carried out. A degree of flexibility will, therefore, be built into the Hornsea Four design for the DCO application by applying the design envelope approach, consistent with EN-3 and this PINS advice note.
- 5.4.1.2 To inform the assessments, a range of parameters for each aspect of the project has been defined (the design envelope) with a Maximum Design Scenario (MDS) identified for each potential effect that has been assessed. So, whilst the design envelope is broad enough to encompass the potential variations in design and other aspects of Hornsea Four, the MDS ensures that assessment is based on a likely worst-case approach, specific to the effect being assessed. For each aspect of the project, a range of parameters has been defined and subsequently, the worst-case scenario associated with each parameter dependent on the receptor has been used in each impact assessment. This provides confidence that the EIA process robustly considers the likely worst-case impact of the project on each aspect of the environment, whilst also allowing the project to be optimised and refined at the time of construction noting that this may be several years after the final DCO submission is made. The project design envelope therefore provides the maximum extent of the consent sought. The detailed design of the project can then be developed, refined and procured within this consented envelope prior to construction. The technical chapters contain MDSs for each of the potential effects scoped in to the assessment, and these are also set out against each scoped in effect in the impacts register ([Volume 4, Annex 5.1](#)).
- 5.4.1.3 Such an approach is good practice, as reflected in case law on the 'Rochdale Envelope' principle. Suitably applied in EIA it can help to avoid the need for protracted consenting procedures, whilst giving a comprehensive assessment of the worst likely environmental effects.

## 5.5 A Proportionate Approach to Environmental Assessment

- 5.5.1.1 The UK's professional body for EIA, the Institute of Environment Management and Assessment (IEMA) noted the following in their 2017 report promoting more proportionate EIA (IEMA, 2017):

*"...the drive for improved quality in EIA, combined with the UK's evidence-based and precautionary approach, has led to substantial challenges for the future of practice. The increased complexity of multi-faceted decisions and the wider range of stakeholders who seek transparency and clear audit trails, has further compounded the problems. The combined*

*impact of the above good intentions has often led to individual EIAs being too broadly scoped and their related Environmental Statement (ES) to be overly long and cumbersome."*

- 5.5.1.2 An unwieldy or disproportionate EIA can make understanding the key environmental impacts of a proposed development difficult and can make the findings inaccessible to decision-makers and the public, adding undue delay.
- 5.5.1.3 Additionally, PINS Advice Note Six: Preparation and Submission of Application Documents (PINS, 2016) encourages applicants to think about the size of documents submitted with duplication and superfluous content discouraged. ESs are welcomed that are proportionate to the scale and complexity of the EIA undertaken although it is appreciated that for Nationally Significant Infrastructure projects (NSIPs) such documents will comprise of several volumes.
- 5.5.1.4 The Applicant took the decision at an early stage to integrate proportionality into the EIA for Hornsea Four developing a strategy for promoting this principle through consideration of four key elements consistent with IEMA's guidance on such matters (IEMA, 2017):
1. Enhancing People: so that those involved in EIA have the skills, knowledge and confidence to avoid an overly precautionary approach.
  2. Improving Scoping: to generate a more consistently focussed approach to this critical activity throughout the EIA process.
  3. Sharing Responsibility: recognising that disproportionate EIA is driven by many factors and that enabling proportionate assessment will require collaborative actions that work towards a shared goal.
  4. Embracing Innovation and Digital: modernising EIA to deliver effective and efficient assessment and reporting that adds value to projects and their interaction with the environment.
- 5.5.1.5 Tangible actions, tools and processes have been developed the key elements of which are set out below:
- route planning and site selection (**Volume 1, Chapter 3**);
  - the impacts register (**Section 5.5.3** and **Volume 4, Annex 5.1**);
  - making best use of the existing evidence base (**Section 5.5.4**);
  - early adoption of mitigation and providing an upfront commitment register (**Section 5.5.5** and **Volume 4, Annex 5.2**); and
  - a two-tiered approach (simple and detailed) to define an appropriate level of assessment (**Section 5.5.6**).
- 5.5.1.6 One key aspect of the approach to scoping is the identification of the likely significant effects (in EIA terms) of Hornsea Four. This assessment of likely significance is supported by a combination of:
- knowledge acquired by the EIA team on baseline conditions available to date;
  - definition of the project;

- national policy and standards;
- the evidence base and experience of similar projects passing through the consenting system;
- topic-specific criteria for impact magnitude, receptor sensitivity to impacts and significance of effect; and
- the professional judgement of experts.

5.5.1.7 In general, a reasonable degree of confidence in the identification of likely significance effects was identified at the scoping stage and further resolution of potential effects has progressed since receipt of the Scoping Opinion (PINS, 2018c). Ongoing discussions on impacts and effects (including the evidential requirements to support such decisions) have been progressed through the Evidence Plan process.

5.5.1.8 Given the various Preliminary Environmental Impact (PEI) deliverables that sit alongside this PEIR, namely: the impacts register; commitment register; and DCO register, the Applicant has produced a "How to Read this PEIR" document which is intended to familiarise the reader with the evolution of proportionality from Scoping to PEIR and beyond to DCO application (see [Volume 4, Annex 1.1](#)). This note has been drafted to assist the reader navigate what is a new approach to delivering proportionate EIA that readers may not be familiar with. For a thorough understanding of all PEI deliverables, their content and how they relate to each other, the reader is urged to read this guidance note in advance of detailed review of the PEI documents.

## 5.5.2 Route Planning and Site Selection

5.5.2.1 Route planning and site selection is described in [Volume 1, Chapter 3](#). In addition to designing a technically feasible project, the site selection process has incorporated some fundamental commitments to avoid or reduce impacts by avoiding sensitive, important or valuable features early in project design and in so doing reduce any adverse impacts of Hornsea Four and contribute to Proportionate EIA and the amount of assessment required. These commitments are all presented in the Commitments Register (see [Volume 4, Annex 5.2](#)).

## 5.5.3 The Impacts Register

5.5.3.1 A cornerstone of the Hornsea Four approach to delivering proportionate EIA is the development of an impacts register. The purpose of the impacts register is to:

- detail all the potential impacts identified for Hornsea Four;
- adopt a systematic approach to the identification of likely significant effects, and to then take this approach forward and develop it further through the various EIA stages: from scoping through PEIR submission to final ES;
- define the baseline data required to inform impact assessment;
- provide a high-level impact assessment (magnitude, sensitivity and significance); detail the level of EIA (referred to as 'tiered approach');
- identify the MDS for each scoped in impact; and
- reference mitigation measures embedded in or committed to in design in line with the Commitments Register (see [Volume 4, Annex 5.2](#)), and those additional mitigation

options identified in the EIA process requiring sign-off by Hornsea Four to reduce effects to acceptable levels.

5.5.3.2 The Impacts Register is an Excel spreadsheet which identifies all the potential effects that the project team have identified that could possibly result from the construction, operation and decommissioning of Hornsea Four, relating to each technical topic under consideration in the EIA process. The register allows the user to sort and filter the impacts and effects that are most relevant to them.

5.5.3.3 Additionally, the impacts register tracks decisions on the potential significance of an effect, e.g. whether PINS agreed with this at scoping stage. Furthermore, post scoping where further data (e.g. baseline) or information (e.g. project description) provide evidence that any potential effects will not be significant, the register is used to direct consultations with key consultees so that such issues are appropriately discussed, and the scope of the EIA evolves through the EIA process. So, whilst the register is a key management tool for the EIA it is also a fundamental aspect of proportionality embedded into Hornsea Four, being a live document updated on an iterative basis throughout the EIA.

5.5.3.4 The Impacts Register is provided as [Volume 4, Annex 5.1](#).

#### **5.5.4 Evidence Base**

5.5.4.1 Hornsea Four is located within the former Hornsea Zone, for which large volumes of existing data and knowledge regarding the baseline environment are available from the previous three Hornsea projects, as well as from other sources. The Hornsea Four EIA maximises the use of these data and related assessments to:

- characterise the baseline environment to inform the EIA where data are suitable to do so;
- scope out certain matters from further assessment where there is a clear evidence basis; and
- where certain matters are scoped in, draw upon the evidence base and previous impact assessment work where appropriate.

5.5.4.2 The Hornsea Four scoping report (Ørsted, 2018) set out and sought agreement on the data gathering that was considered necessary to properly characterise the site and enable a robust EIA. Continued discussions with key stakeholders have taken place to further refine and agree the baseline data requirements for the EIA through the EP process.

5.5.4.3 As part of the pre-application consultation process for certain key topics, the nature of the existing baseline data, its sufficiency for the Hornsea Four EIA and any requirements for further data collection are currently being discussed with the relevant consultees as part of the Evidence Plan (EP) process (see [Volume 1, Chapter 6](#)). The EP process includes establishment of several technical panels which includes key stakeholders. Included within the remit of these groups is the discussion and agreement on the adequacy of the data used, the methods of analysis, and assessment of potential impacts to be applied to each of the

receptors within the EIA and HRA processes. This draws upon relevant guidance, sound science and expert views.

### 5.5.5 Adopted Mitigation and the Commitments Register

5.5.5.1 For each topic the EIA process has systematically identified impacts and effects and has classified mitigation measures in accordance with the IEMA 'Guide to Shaping Quality Development' (IEMA, 2016) definitions, as follows:

- Primary (inherent) mitigation: are measures that form an intrinsic part of the design that are described in the design evolution narrative and included within the project description e.g. reducing development heights to reduce visual impact;
- Secondary (foreseeable) mitigation: those measures that require further activity in order to achieve the anticipated outcome, e.g. development of the optimal reinstatement measures for restoring a disturbed sensitive natural habitat; and
- Tertiary (inexorable): are measures which will be required regardless of the EIA process as they are imposed e.g. as a result of legislative requirements and/or standard industry practices e.g. via a Construction Environmental Management Plan (CEMP), Code of Construction Practice (CoCP) or similar.

5.5.5.2 As advocated in the EIA guidance (IEMA, 2004) it is only necessary to assess potential effects arising from the final design, incorporating all primary and tertiary mitigation (only pre-mitigation effects and residual effects need both be set out where secondary mitigation is required). In this respect the EIA team has considered mitigation measures that Hornsea Four has already committed to adopt in making an initial assessment of the likely significant effects. A number of offshore wind farms and cable connections have been built and are operating in UK waters and many more have passed and are passing through the consenting processes. As a result, effective mitigation measures (usually 'primary' and 'tertiary') for most of the impacts associated with offshore wind developments are well-developed and widely-accepted as part of the project design process.

5.5.5.3 Hornsea Four has developed further mitigation measures (mainly 'secondary') to address certain site and area-specific conditions and sensitivities.

5.5.5.4 Once agreed by Hornsea Four, all mitigation commitments are recorded in the Commitments Register (see [Volume 4, Annex 5.2](#)) maintained as an Excel spreadsheet. Hornsea Four actively encourages stakeholders and communities to propose mitigation commitments. Each proposed commitment is then considered and where appropriate adopted within the Commitments Register. Where a number of similar commitments have been identified they have been combined into a single commitment to avoid duplication. Additionally, where a proposed commitment cannot be included in the project a rationale is stated for making this decision.

5.5.5.5 It should be noted that the Applicant has responded to comments in the Scoping Opinion (PINS, 2018c) that in certain cases that there was insufficient certainty in relation to the effectiveness of some of the commitments at scoping. Specifically, PINS stated, "*...a number of these 'Commitments' are broad in nature, and/or are reliant on site-specific considerations which are not documented. For example, several of the Commitments are caveated with phrases such as 'where practical' and 'where possible'.*" Commitments have been updated in

order to make it more certain that they will be implemented, and therefore more enforceable.

5.5.5.6 Included within the Commitments Register are details on how each of the commitments will be legally secured (i.e. through provisions in the DCO, deemed Marine Licence or other documents such as management plans). Such plans will be agreed by the relevant organisations such as the local authority (East Riding of Yorkshire Council), Natural England, Marine Management Organisation etc. post consent and will become legally enforceable. Where possible, a number of these plans are provided in outline format at PEIR stage. This provides stakeholders with an early opportunity to view and comment on such documentation and provides further clarity on how the commitments within the register will be secured. All such plans are identified in the DCO Application Register, namely:

- Outline Code of Construction Practice;
- Outline Ecological Management Plan;
- Outline Marine Written Scheme of Investigation;
- Outline Marine Mammal Mitigation Protocol; and

5.5.5.7 **Figure 5.1** presents the Commit, Consult, Design ethos followed for Hornsea Four with such commitments integrated in to the project, driving design and minimising adverse environmental effects. This ethos is embedded in the staged approach to route planning and site selection (**Chapter 3**). In addition to designing a technically feasible project, the Applicant therefore aims to avoid or reduce impacts by committing to avoid the most sensitive, important or valuable features early in project design and in so doing reducing the scope of the Hornsea Four EIA and the amount of assessment required.



**Figure 5.1: Commit, Consult, Design Ethos**

## 5.5.6 Tiered Approach to Assessments

5.5.6.1 Implementing the proportionate approach begins with including all reasonably predicted environmental effects within the impact register. Once included the effects are then

separated into one of three categories which are then tested in through the EIA process and open to change through consultation:

- Effects that are judged to be not significant and which have been scoped out of further assessment in the EIA, either through the Scoping Opinion (PINS, 2018c) or through the subsequent EP process. No commentary is provided in the technical chapters of this PEIR on such effects to ensure effort is directed at likely significant effects only. However, all effects identified at scoping stage (including those scoped out) are presented in the impacts register (see [Volume 4, Annex 5.1](#));
- Likely significant effects that the Applicant proposes be addressed through a 'simple assessment' approach where they are confident such an approach is enough to confidently assess significance; and
- Likely significant effects that the Applicant proposes be addressed through a 'detailed assessment' approach.

5.5.6.2 One of the core concepts above is the difference between effects where a 'simple' approach has been used to identify the significance of the impact verses effects where a 'detailed' approach has been adopted. This concept, which has previously been adopted in the Design Manual for Roads and Bridges (Highways England, 2009), provides further proportionality within the assessments, focussing effort on those effects which are more complex. The use of a simple approach does not infer a lower level of evidence or robustness in the decision to categorise an effect as significant or not.

5.5.6.3 No fixed or firm view exists on the differences between these two types of assessment within the EIA community. For some technical disciplines there will be an obvious distinction between simple and detailed assessment approaches with well understood methods ratcheting up in complexity. However, distinction between approaches is not always clear, can be subjective and ultimately a matter of professional judgement. Non-prescriptive guidance on what characterises both types of assessment is provided in [Table 5.3](#).

**Table 5.3: Characteristics of Simple and Detailed Assessments**

Characteristics of a Simple Assessment	Characteristics of a Complex Assessment
Used to determine the impact of a source-pathway-receptor process where there is high certainty of its existence, how it operates and realistic lack of alternatives.	Used to determine the impact of a complex process with multiple linkages, outcomes and alternatives where greater uncertainty exists in environmental variables, processes and outcomes.
A simple assessment is based on the assembly of data and information that is readily available or, possibly through simple non-intrusive site survey (e.g. walkover) to confirm conclusions of desk-based studies.	Detailed assessments may require intrusive or lengthy data gathering campaigns or sampling of the environment.
Qualitative assessments or less detailed quantitative approaches (e.g. simple spreadsheet modelling) are likely to be used.	Quantitative modelling techniques, or finely argued qualitative cases, may be applied which are not readily available through simple spreadsheet or single-calculation approaches.
Simple assessments can be applied where the outputs sufficiently establish confidently that the	The objective is to gain an in-depth appreciation of the beneficial and adverse environmental consequences of the

Characteristics of a Simple Assessment	Characteristics of a Complex Assessment
forecast environmental effect would not be a fundamental issue in the decision-making process.	project and to inform project decisions, since they are expected to be key issues in whether the project proceeds in its proposed configuration. Relevant stakeholder and statutory environmental body consultations on likely significant effects are important early in the project development process.
Detailing of the assessment in the reporting document can be restricted to a small number of paragraphs, tables and figures.	Detailing of the assessment in the reporting documentation will consist of a number of logically set out paragraphs, table and figures that may show and discuss complex details. A technical report may accompany such an assessment containing further, even more detailed workings.

## 5.6 Technical, Spatial and Temporal Scopes

### 5.6.1 The Technical Scope

5.6.1.1 The technical scope of the EIA is set through the scoping process, notably the Scoping Opinion (PINS, 2018c) and subsequent consultations (see [Chapter 6](#)). Evolution of the scope through the EIA process is ongoing as further information becomes available through site survey, a more defined project description or commitments identified and incorporated to implement mitigation.

### 5.6.2 The Spatial Scope

5.6.2.1 In general terms, the spatial, or geographical, scope of each technical assessment takes into account the following factors:

- the physical extent of the proposed works, as defined by the project design envelope;
- the nature of the baseline environment and the way the impacts are likely to be propagated (e.g. through defining source-pathway-receptor approaches); and
- the pattern of governmental administrative boundaries, which provide the planning and policy context for the project.

5.6.2.2 For example, any potential effects on buried archaeology would tend to be confined to those areas physically disturbed by the works, whilst the effects of noise or visual intrusion could potentially be experienced at some distance from the works.

5.6.2.3 Appropriate study areas have been considered for each environmental topic by the specialists undertaking that assessment, and in agreement with the relevant consultees. Each technical chapter includes commentary on defining the study area.

### 5.6.3 The Temporal Scope

5.6.3.1 The temporal scope of the assessment generally refers to the time periods over which impacts may be experienced which may be permanent, temporary, long term or short term. This has been established for each technical discipline, and where appropriate through

discussion with the relevant statutory consultees. Terms used to qualify the duration of an impact or effects will tend to be specific to the topic being considered.

5.6.3.2 Where there is a direct cause-effect relationship relating to a specific project phases it is important to understand what these are, and the project programme is set out in [Volume 1 Chapter 4](#). In summary the high-level project durations are:

- Construction: Whole project maximum duration of 4 years 6 months (54 months), but variable between differing components;
- Operation: 35 years; and
- Decommissioning: No programme to be created until nearer end of the life of the project.

## 5.7 The EIA Process

5.7.1.1 EIA is a systematic, iterative and prescribed process which moves through a number of stages from scoping through to production of the final ES (and beyond if monitoring and compliance is included). The process is framed by statutory requirements as well as the pertaining planning and policy context (see [Volume 1, Chapter 2](#)). Furthermore, consideration of best, good and advised EIA practice (see [Table 5.1](#)) and adoption of a Proportionate EIA approach (see [Section 5.5](#)) has guided the specific approach followed by Hornsea Four.

5.7.1.2 The key elements of the EIA process and the identification of significant effects are described in the following sections with the overall approach to EIA set out in [Figure 5.2](#). While [Figure 5.2](#) provides a general framework for identifying impacts and assessing the significance of their effect(s), in practice the approaches and criteria applied across different environmental and socioeconomic topics vary.

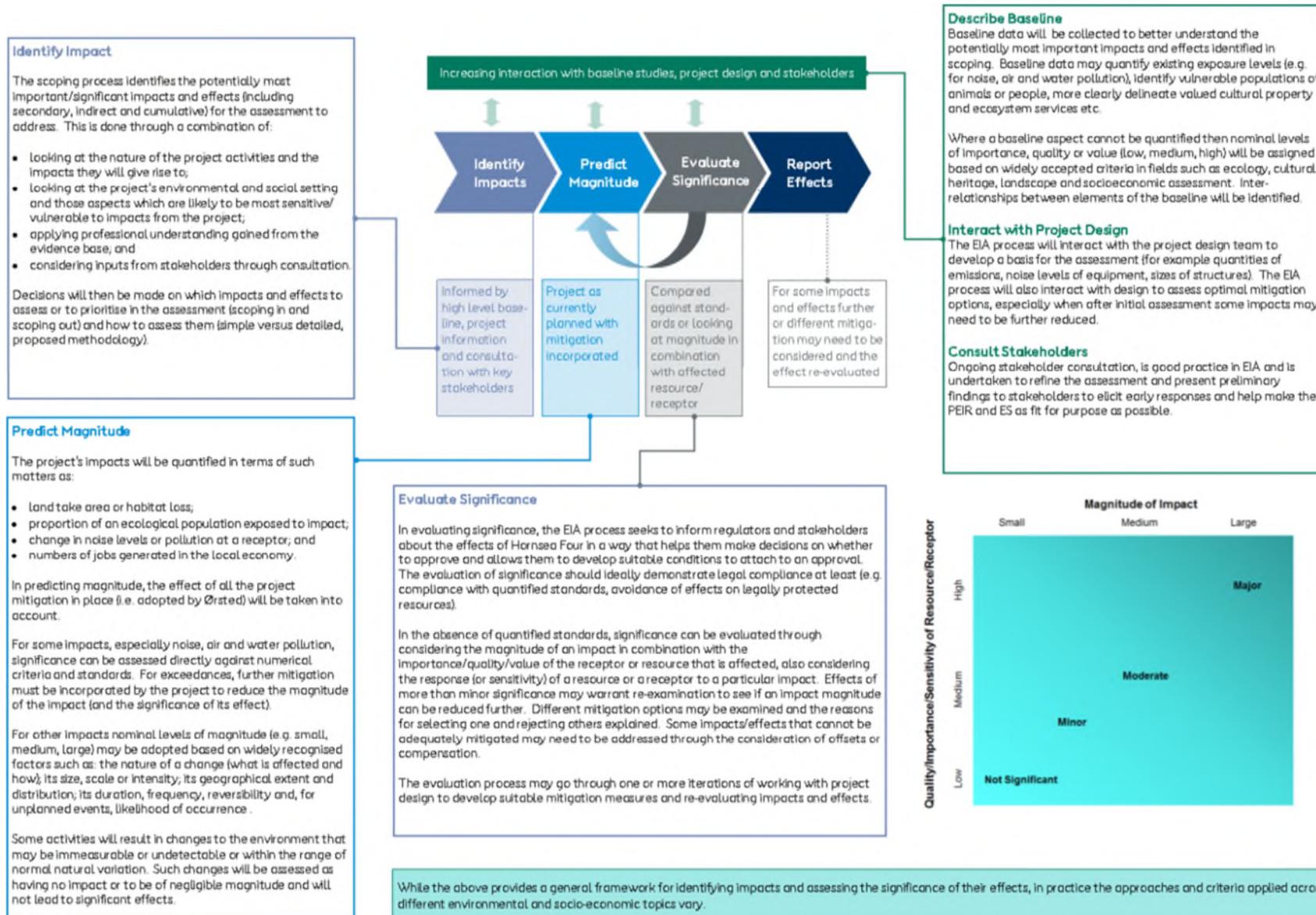


Figure 5.2: General Approach to EIA

## 5.7.2 Concept, Feasibility and Site Selection

5.7.2.1 Whilst not strictly a stage in the EIA process the conceptual, feasibility and early stage site selection work ([Volume 1, Chapter 3](#)) all included the environment as a key consideration, alongside engineering and cost considerations. The history of the site within the former Hornsea Zone means that there have been many years' work studying the offshore area and identifying wider scheme requirements to connect to the National Grid. The commitments to avoid sensitive locations and assessment of scheme components using, for example Black, Red, Amber, Green (BRAG) criteria, are all early stage impact assessments to resolve Hornsea Four down to its current description and configuration.

## 5.7.3 Consultation and Evidence Plan Process

5.7.3.1 Pre-application consultation is a key part of the EIA process, helping to identify key issues that need addressing, scoping out others where it is agreed that they are not significant and establishing dialogue and agreements on specific methodologies for assessment, evidence bases etc.

5.7.3.2 This consultation process is prescribed as part of the Planning Act 2008 and as part of the process a Scoping Report (Ørsted, 2018) was submitted to PINS in October 2018. A formal response from PINS (on behalf of the Secretary of State) was received in November 2018 (PINS, 2018c).

5.7.3.3 To ensure key stakeholders are consulted on a regular and formalised basis an Evidence Plan (EP) process has been adopted. This process aims to gain agreement with key stakeholders on the data and information to be included in the ES that will be drafted to support the application Development Consent Order (DCO). The process additionally facilitates wider understanding of project decisions, ways of workings and improves flow of information to and from the project.

5.7.3.4 Due to its importance a more detailed description of the consultation process (including EP process, landowner, public and community aspects) is set out in [Volume 1, Chapter 6](#).

## 5.7.4 Characterisation of the Existing Environment (The Baseline)

5.7.4.1 Characterisation of the existing environment has been undertaken to determine the baseline conditions in the area covered by the project and relevant surrounding study areas. This characterisation includes usage of readily available information from desktop study, and where it is relevant through site specific survey. The available data is reviewed to ensure it is robust and allows the required level of assessment in order to determine the significance of any potential effect with sufficient confidence.

5.7.4.2 The specific approach to establishing a robust baseline (upon which impacts can be assessed) is set out within each relevant chapter of this PEIR ([Volume 2, Chapters 1 to 12](#) (offshore) and [Volume 3, Chapters 1 to 10](#) (onshore)). This approach is based on feedback from the Scoping Opinion (PINS, 2018c), and through the EP process (incorporating topic specific technical panels) as described in [Volume 1, Chapter 6](#). Where through discussion with regulators and technical groups further data is required, the scope and scale of surveys

has been agreed prior to such survey work being carried out where at all possible. New data has and will be gathered for this EIA on a consultative basis.

5.7.4.3 Schedule 4, paragraph 3, of the EIA Regulations require that an outline of the likely evolution of the baseline, in the absence of the development (as far as this can be assessed 'with reasonable effort' based on available information and scientific knowledge) is provided. Each technical assessment sets out the anticipated evolution of the baseline that is predicted to occur over the time that Hornsea Four will be built/operated (35 years). This reflects changes in the baseline that might be expected from natural changes (e.g. natural changes in habitat condition etc.) or other built development.

5.7.4.4 Limitations with the data collected to inform the baseline are provided in each technical assessment chapter, setting out clearly where either the data itself, or any subsequent subjective evaluation may introduce error. An explanation on how data limitations were managed or commentary on confidence levels is included. Key data limitations with the baseline data and their ability to materially influence the outcome of the EIA are noted and commented on.

## **5.7.5 Identification of Receptors**

5.7.5.1 Elements of the environment which are potentially subject to variation (i.e. receptors) due to environmental changes brought about by Hornsea Four are identified on a subject by subject basis. Each technical assessment defines the study area that is covered for that topic, providing justification of the area selected to incorporate potential significant effects, which include direct and indirect effects.

5.7.5.2 Receptors may be placed in to groups if there are multiple numbers of very similar receptors with assessments made on the worst-case basis (e.g. using the receptor in closest proximity to Hornsea Four where distance is a key factor affecting significance e.g. when assessing noise impacts from construction activity).

## **5.7.6 Impacts, Effects, Mitigation and Significance**

5.7.6.1 Taking account of the IEMA EIA Quality Mark Article<sup>1</sup>, 'Impacts' are defined as the physical (or chemical) changes that will be caused by Hornsea Four activities. 'Effects' are defined as the consequences of these impacts to biological populations, ecosystems and humans (including their physical and cultural assets).

5.7.6.2 For many technical topics the likely significance of an effect is established by combining the magnitude of an impact with the sensitivity of the receiving environmental resource or receptor to that impact (noting that sensitivity is not considered as an inherent characteristic but how something specifically responds to an external factor). The importance or value of a resource or receptor is also considered.

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<sup>1</sup> <https://transform.iema.net/article/impacts-and-effects-do-we-really-understand-difference>

5.7.6.3 As set out in various widely used methodologies (e.g. Design Manual for Roads and Bridges (DMRB) (Highways England, 2009) and PD 6900:2015 Environmental impact assessment for offshore renewable energy projects – Guide (BSI, 2015), most technical topics will assess the likely significance of an effects as follows.

- The level of effect will be determined by considering the magnitude of an impact together with the importance and value of an affected resource or receptor and its sensitivity to the impact (see [Figure 5.3](#)).
- A level of effect of moderate or more will be considered a 'significant' effect for the purposes of the EIA. A level of effect of minor or less will be considered 'not significant'.

		Magnitude of Impact/Degree of Change			
		Negligible	Minor	Moderate	Major
Value, Importance, Sensitivity	Low	Not Significant	Not Significant or Minor (Not Significant)	Minor (Not Significant)	Minor (Not Significant) or Moderate (Significant)
	Medium	Not Significant	Minor (Not Significant)	Moderate (Significant)	Moderate (Significant) or Major (Significant)
	High	Not Significant	Minor (Not Significant) or Moderate (Significant)	Moderate (Significant) or Major (Significant)	Major (Significant) or Substantial (Significant)
	Very High	Not Significant	Moderate (Significant) or Major (Significant)	Major (Significant) or Substantial (Significant)	Substantial (Significant)

**Figure 5.3: Deriving the Level of Significance of an Impact**

5.7.6.4 The matrix used is based on the DMRB methodology as modified in the Hornsea Three ES (Ørsted, 2018). Further modifications have been introduced in the interest of proportionate assessment and in accordance with guidance presented in BSI (2015) such that:

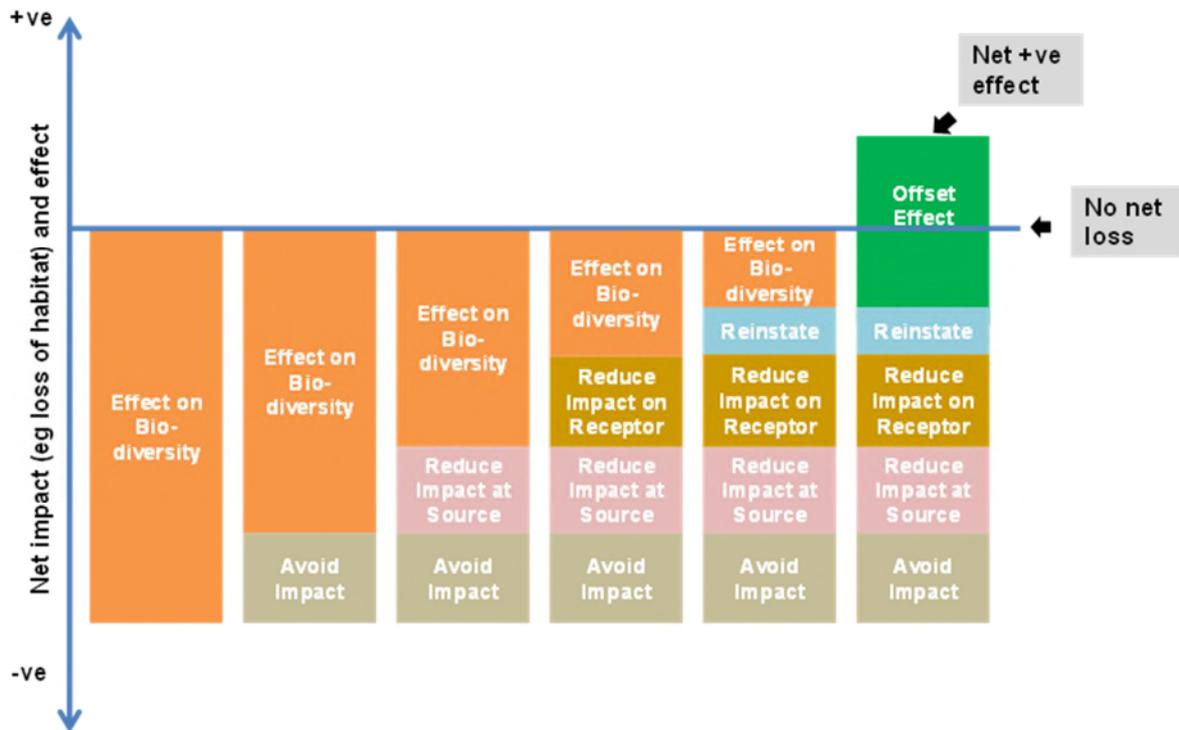
- a magnitude of impact of 'no change' is not assessed since it will always lead to a not significant effect;
- a negligible magnitude impact is not considered further since it will always lead to a not significant effect; and
- resources and receptors of negligible importance, value or sensitivity are not considered further since any magnitude of impact on them would not lead to a significant effect.

5.7.6.5 For some topics, significance is established by simply comparing the magnitude of an impact with a quantified standard. In this instance the quantified standard is in turn based on a level at which recognised effects are triggered (e.g. sleep disturbance for noise). Topic specific

methodologies that will be followed during the EIA are included in in each chapter with assessments carried out by suitably qualified technical experts.

- 5.7.6.6 The generic methodology set out above is overarching guidance to enable a more consistent approach and more comparative results within the impact assessment. However, EIA remains an expert judgement based on science, expertise and experience.
- 5.7.6.7 Mitigation measures are developed to avoid, minimise, reduce or remedy (e.g. reinstate or restore) any negative effects identified, and to create or enhance positive effects such as environmental and social benefits. These are applied based on a hierarchy illustrated in [Figure 5.4](#). In this context, mitigation measures are taken to include design measures (primary mitigation) and construction practices, as well as management actions (both secondary and tertiary mitigation). In some instances, mitigation alone may not be sufficient to reduce an impact or effect to a not significant level and other measures such as offsets (which can also deliver enhancement) are then considered (an example of secondary mitigation). The Commitments Register identifies which type of mitigation is associated with which commitment (see [Volume 4, Annex 5.2](#)).
- 5.7.6.8 Once mitigation measures are agreed they become commitments of Hornsea Four. However, it is good practice to consider mitigation measures iteratively with design in the form of a hierarchy where avoidance is the primary objective and offset is a last resort. Although an offset may provide enhancement, enhancement is different, typically adding something positive in accordance with local or national policy. Enhancement is not mitigation.
- 5.7.6.9 Residual effects, once mitigation measures have been applied, are classified as not significant or still significant (albeit reduced), as appropriate. The degree of significance attributed to residual effects is related to the weight the EIA team considers should be given to them in making decisions on Hornsea Four and, where appropriate, the application of DCO requirements and other conditions.
- 5.7.6.10 Effects of moderate significance or above are considered important to decision making, warranting careful attention to ensure conditions regarding mitigation and monitoring employ the most appropriate (technically feasible and cost-effective) measures.
- 5.7.6.11 Effects of minor significance or less are or may be brought to the attention/ of decisionmakers but will typically be identified as warranting little if any weight in the decision; mitigation will typically be achieved using normal good practice, e.g. for construction. Some topic guidance designates effects of minor significance as being 'not significant' in the context of the EIA Regulations. In order to deliver a proportionate EIA this approach has been adopted for Hornsea Four.
- 5.7.6.12 Where concerns remain over the significance of residual effects and there is no scope to reduce the significance of the effect through practicable mitigation measures aimed directly

at the impact then the EIA will consider and present ways to offset the effect using the mitigation hierarchy, as shown in the example provided in [Figure 5.4](#).



**Figure 5.4: Mitigation Hierarchy**

5.7.6.13 For effects that are initially assessed to be of major significance a design change (primary mitigation) is usually implemented to avoid, minimise or reduce these, followed by a reassessment of significance. For effects initially assessed to be of moderate significance, specific mitigation measures such as engineering controls or construction methods (secondary and tertiary mitigation) are usually considered to reduce the impacts and their effects to levels as low as reasonably practicable. This approach considers the technical and financial feasibility of mitigation measures. Effects assessed to be of minor significance are usually managed through the implementation of management plans, good industry practice, operational plans and procedures.

5.7.6.14 EIA is intended to ensure that decisions on projects are made in full knowledge of their likely effects on the environment and society. The residual effects and their significance reported in the PEIR and ES will be based on Hornsea Four as planned and designed fully inclusive of all proposed mitigation.

5.7.6.15 The mitigation measures developed during the EIA process (secondary mitigation), as well as standard industry practice measures (tertiary mitigation), will be fully committed to by the Applicant as integral aspects of Hornsea Four. The Commitments Register (see [Volume 4, Annex 5.2](#)) identifies whether mitigation is primary, secondary or tertiary.

5.7.6.16 Predictions of impacts and their effects on resources and receptors can be uncertain. Predictions can be made using varying means ranging from qualitative assessment and

expert judgement (including reference to the evidence base) through to quantitative techniques (e.g. modelling). The accuracy of predictions depends on the methods used and the quality of the input data for Hornsea Four and the environment. Where an assumption has been made, the nature of any uncertainty which stems from it will be presented.

5.7.6.17 Where uncertainty affects the assessment of effects, a conservative (i.e. reasonable worst case) approach to assessing the likely residual effects will be adopted with mitigation measures developed accordingly.

5.7.6.18 To verify predictions and to address areas of uncertainty, monitoring will be proposed as a key aspect of environmental management for the construction and operation of Hornsea Four. Where agreed, such monitoring will also be included in the Commitments Register.

## 5.8 Inter-relationships (or Inter Related Effects)

5.8.1.1 Potential inter-related effects are assessed through consideration of all effects on a receptor through an assessment of the scope of all effects on that receptor to interact, whether spatially or temporally, to result in inter-related effects on a receptor. The approach identifies where potential interactions may occur, resulting in an inter-related effect on a specific receptor, and where knock-on effects may occur to other receptors.

5.8.1.2 An initial consideration of inter-related effects was submitted as Annex J to the Scoping Report (Ørsted, 2018), where it was noted that the screening would be updated following scoping into the PEIR and ES.

5.8.1.3 Inter-related effects can be divided into two categories, described below:

- **Project-lifetime effects:** Assessment of the scope for effects that occur throughout more than one project phase (i.e. construction, operation and decommissioning) to interact to potentially create an effect of greater significance than if assessed just within individual project phases. For example, increases to suspended sediment concentrations from activities across all three of the project phases stated above may combine to create an additive effect of greater significance than these impacts considered alone in each discrete project phase.
- **Receptor-led effects:** Assessment of the scope for all effects to interact (spatially and temporally) to create an effect on a receptor of greater significance than when the effects are considered in isolation. For example, effects due to increased noise and poorer air quality during the construction phase together could have an effect of greater significance on a residential receptor than each impact considered in isolation. The receptor-led effects assessment also considers whether a project lifetime inter-related effect is predicted for that impact.

5.8.1.4 The inter-related effects assessment thereby incorporates the findings of the individual assessment chapters to describe potential additional effects that may be of greater significance when compared to individual effects acting on a single receptor (or group). If there are additional effects, these are considered additively and qualitatively using expert

judgement. The proposed approach is summarised in the following steps. For each EIA topic chapter:

- Identification of relevant receptors from assessments undertaken for individual EIA technical topics. This involves high-level description of the potential to produce inter-related effects on the topic area being assessed.
- Identification of the impact source and pathways that could affect that receptor and where those pathways are described and assessed. This involves cross referencing to other chapters and the impacts assessed within them relevant to the inter-related effects assessment for that topic. For project-lifetime effects, it is also determined whether there is potential for inter-related effects from the same impact across multiple project phases.
- Production of an inter-related effects assessment within the technical chapter, tabulating potential inter-related effects (both project-lifetime and receptor-led effects) and providing the relevant assessment narrative.

5.8.1.5 Effects that represent no change to the baseline (i.e. no impact) are unlikely to have inter-related effects when combined with other impacts and can be scoped out of the inter-related effects assessment. However, where impacts that have an impact significance of negligible or higher, interactions of greater significance than the impacts in isolation may occur. These are then considered through expert judgement.

5.8.1.6 In relation to project-lifetime effects, those that only occur over one project phase (e.g. just the construction phase) have no potential to interact with impacts of the same nature over multiple project phases and can therefore be scoped out of assessment. Effects that may be seen in the construction and decommissioning phases (but not the operational phase) are considered to be isolated and therefore recovery between these two phases is expected. It is not considered that there is the potential for inter-related effects where this situation arises, however expert judgement is applied on a case-by-case basis.

5.8.1.7 It should be noted that some elements of the impact assessment inherently consider inter-related effects. For example: the effects on fish and shellfish ecology have knock-on effects for both marine mammals and offshore ornithology in terms of potential loss of prey resource. Where these potential inter-related effects are identified as being inherently considered in the impact assessment, this is described within the individual topic chapters.

5.8.1.8 The inter-related effects relating to each technical assessment are provided in the relevant technical chapters (see [Volume 2, Chapters 1 to 12](#) (offshore) and [Volume 3, Chapters 1 to 10](#) (onshore)).

5.8.1.9 It is important to note that the inter-related effects assessment considers only effects produced by Hornsea Four, and not those from other projects (these will be considered within the cumulative effects assessment (CEA)).

## 5.9 Cumulative Effects Assessment

5.9.1.1 Cumulative effects can be defined as effects upon a single receptor from Hornsea Four when considered alongside other proposed and reasonably foreseeable projects and developments. This includes all projects that result in a comparative effect that is not

intrinsically considered as part of the existing environment. This definition is consistent with PINS interpretations and applied consistently throughout this PEIR.

- 5.9.1.2 The approach for cumulative impacts is based upon the PINS Advice Note Seventeen: Cumulative Effects Assessment (PINS, 2015). The approach to the CEA is intended to be specific to Hornsea Four and takes account of the extensive available knowledge of the environment and other activities around Hornsea Four. The potential for, and scope of, cumulative effects are discussed in the EP process with key stakeholders.
- 5.9.1.3 The approach to cumulative assessment for Hornsea Four also takes into account the Cumulative Impacts Assessment Guidelines (RenewableUK, 2013) and PINS Advice Note Nine: Rochdale Envelope (PINS, 2018a).
- 5.9.1.4 More specific details of how the approach has been applied to Hornsea Four is provided in [Volume 4, Annex 5.3](#) (offshore) and [Volume 4, Annex 5.5](#) (onshore). Each of the technical assessment chapters include a section on CEA, providing subject specific assessments which incorporate the foreseeable projects and developments that have passed through the identification process and are listed in [Volume 4, Annex 5.4](#) (offshore) and [Volume 4, Annex 5.7](#) (onshore).

## 5.10 Transboundary Impacts

- 5.10.1.1 Transboundary effects arise when impacts from the development within one European Economic Area (EEA) state affects the environment of another EEA state(s). The need to consider such transboundary effects has been embodied by the United Nations Economic Commission for Europe Convention on EIA in a Transboundary Context (commonly referred to as the 'Espoo Convention'). The Convention requires that assessments are extended across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary effects. [Table 5.4](#) identifies the approximate distances of Hornsea Four from the Exclusive Economic Zone (EEZ) boundaries of other EEA states that share a maritime border with the UK.

**Table 5.4: Summary of approximate distance to nearest EEZ (median line) of other EEA states**

EEA state	Distance from Hornsea Four to the nearest marine boundary (km)
The Netherlands	84
Germany	222
Belgium	243
Denmark	235
Norway	247
France	271
Iceland	1,153
Republic of Ireland	333

- 5.10.1.2 The Espoo Convention has been implemented in the UK for the purposes of NSIPs by the Infrastructure Planning (EIA) Regulations 2017. Regulation 32 sets out a prescribed process of consultation and notification.
- 5.10.1.3 In addition, PINS Advice Note Twelve: Transboundary Impacts and Processes (PINS, 2018b) sets out the procedures for a consultation in association with an application for a DCO where such a development may have significant transboundary effects. It recommends that the developer undertakes independent consultation with other EEA states that may be affected to speed up the consultation process and reduce the risk to the development of a lack of time to consider transboundary impacts at a later stage, which could lead to consent refusal. It is suggested that all relevant environmental bodies within the identified EEA states and any relevant interest groups should be consulted as appropriate.
- 5.10.1.4 Where consultation is required and undertaken by the developer, they are recommended to collate the names and contact details for the relevant EEA states and share the information with PINS and the SoS. All consultation will be recorded within the Consultation Report submitted with the final application alongside the ES.
- 5.10.1.5 A transboundary screening process has been carried out and presented as Annex J of the Scoping Report (Ørsted, 2018) and this has confirmed that only certain offshore (marine) technical aspects could result in such effects, namely: fish and shellfish ecology; marine mammals; ornithology; commercial fisheries; shipping and navigation; and aviation and radar. Each of these technical assessment chapters includes a short section of such potential transboundary effects.

## 5.11 Other EIA Matters

### 5.11.1 Human Health

- 5.11.1.1 Under the EIA Regulations (Regulation 5(2) and paragraph 4 of Schedule 4) the EIA must identify, describe and assess, the direct and indirect significant effects of a proposed development (including any operational effects if appropriate) on several factors including human health.
- 5.11.1.2 Following best practice, health impact assessment typically takes the World Health Organization's (WHO) definition, which states that health is:
- "a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity"*
- 5.11.1.3 A healthy community is defined as one that "is a good place to grow up and grow old in. It is one which supports healthy behaviours and supports reductions in health inequalities." (Ministry of Housing, Communities and Local Government (HCLG), 2017).
- 5.11.1.4 Hornsea Four includes both offshore and onshore construction elements, with operational wind turbines and other structures located offshore, as well as an onshore substation visible during operation. As such the main areas in which the project will interact with human health determinants is in relation to noise ([Volume 4, Chapter 8](#)), air quality ([Volume 4, Chapter 9](#)), and visual aspects ([Volume 4, Chapter 4](#)) as well as traffic generation during construction

(Volume 4, Chapter 7). Exposure to electro-magnetic radiation is also a consideration for human health. However, all aspects of Hornsea Four will be designed in accordance with strict industry codes that make provision for the protection of human health from electro-magnetic radiation (see Volume 4, Annex 4.3: EMF Compliance Statement). Hornsea Four will also provide opportunities for employment and economic benefits.

5.11.1.5 Human health is addressed in this PEIR through assessments and information provided in a two chapters where specific potential effects on human health have been assessed directly:

- Volume 3, Chapter 1 Geology and Ground Conditions; and
- Volume 3, Chapter 9 Air Quality and Health.

5.11.1.6 Such assessments will be taken further and incorporated in to a Health Impact Assessment (HIA) in the final Environmental Statement.

### Policy Considerations

5.11.1.7 Health is specifically identified as an issue to be considered by DCO applications in The Overarching National Policy Statement (NPS) for Energy (EN-1) (DECC, 2011a), stating:

*"Energy production has the potential to impact on the health and well-being ("health") of the population. Access to energy is clearly beneficial to society and to our health as a whole. However, the production, distribution and use of energy may have negative impacts on some people's health."*

*"[...]*

*where the proposed project has an effect on human beings, the ES should assess these effects for each element of the project, identifying any adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate. The impacts of more than one development may affect people simultaneously, so the applicant and the IPC should consider the cumulative impact on health."*

5.11.1.8 NPS EN-1 also states that new energy infrastructure may "affect the composition, size and proximity of the local population, and in doing so have indirect health impacts, for example if it in some way affects access to key public services, transport or the use of open space for recreation and physical activity."

5.11.1.9 It is noted in NPS EN-1 that the "aspects of energy infrastructure which are most likely to have a significantly detrimental impact on health are subject to separate regulation (for example for air pollution) which will constitute effective mitigation of them, so that it is unlikely that health concerns will either constitute a reason to refuse consents or require specific mitigation under the Planning Act 2008. However, the IPC will want to take account of health concerns when setting requirements relating to a range of impacts such as noise."

5.11.1.10 The National Planning Policy Framework (NPPF) was updated in February 2019 and acknowledges the importance of considering health impacts during the planning process. Section 8 of the NPPF refers to 'Promoting healthy and safe communities'. Paragraph 180 states that planning policies and decisions should ensure that new developments are be appropriately located, taking into account "the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential

sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and
- c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.”

5.11.1.11 The East Riding Local Plan 2012 – 2029 Strategy Document was adopted in April 2016 (ERYC, 2016) with health only directly referenced in regard to encouragement of the health sector (Policy ECI: Supporting the growth and diversification of the East Riding economy).

5.11.1.12 The East Riding Health and Wellbeing Strategy (ERYC, 2019) identifies the following priorities:

- Children and Young People in the East Riding enjoying good health and wellbeing;
- Working age adults reducing their risk of ill health;
- East Riding residents achieve healthy, independent ageing; and
- Health inequalities in East Riding are reduced.

5.11.1.13 Planning Practice Guidance (PPG) includes guidance on the importance of the role of health and wellbeing in planning as the built and natural environments are major determinants of health and wellbeing (Ministry of Housing, Communities and Local Government (HCLG), 2017). A range of issues that could be considered throughout the decision-making process in respect to health are identified in the PPG. The most relevant issue in relation to Hornsea Four is:

*“potential pollution and other environmental hazards, which might lead to an adverse impact on human health, are accounted for in the consideration of new development proposals”.*

#### Proposed Impact Assessment Methodology

5.11.1.14 A HIA will be provided as an annex of the final ES submitted to support the DCO application. This is a change to the proposed approach set out in the Scoping Report (Ørsted, 2018) which stated that health would be covered within the air quality chapter. However, specific assessment of issues in relation to health will be included within technical chapters if such issues as scoped in to the assessment, with the HIA drawing on such assessments.

5.11.1.15 The HIA methodology will be guided by the draft Strategy Document Health Impact Assessment produced by ERYC (ERYC, 2014), The Rapid Health Impact Assessment Tool (London Healthy Urban Development Unit (HUDU), 2017a), and the Healthy Urban Planning Checklist (London HUDU, 2017b). The Rapid Health Impact Assessment Tool is partly based on the WHO Healthy Urban Planning publication (Barton & Tsourou, 2000).

## *Scoping*

5.11.1.16 Several specific comments in relation to human health were made in the Scoping Opinion (PINS, 2018c) including the potential for electro-magnetic radiation to be set out (along with associated mitigation), and the need to assess impacts from the exposure of workers to contamination during the construction phase.

5.11.1.17 Additionally, comments from Public Health England were received who based their comments around four themes (access, traffic and transport, socio-economic, and land use) with the additional comment to, “ensure adequate consultation with local communities and the local public health / health care system during the development of the Environmental Statement (to mitigate distress and the impacts on mental health and wellbeing)”. The HIA will take in to account all such comments (as well as those received on this PEIR).

## *Study Area and Population*

5.11.1.18 The HIA study area will allow for the assessment of receptors which are likely to be significantly affected or benefitted by Hornsea Four. The HIA study area is therefore dependent on the study areas of other topics in this PEIR, notably: air quality; noise and vibration; geology and ground conditions; land use and agriculture; landscape and visual; traffic and transport; and socio-economics. Baseline health and community profiles will be presented to establish details on the current health issues within the study area population. The HIA will utilise a number of desk-based data including the following:

- East Riding Health and Wellbeing Strategy 2019-2022 (ERYC, 2019);
- East Riding of Yorkshire: Local Authority Health Profile 2018 (Public Health England, 2018a); and
- Yorkshire and the Humber County: Local Authority Health Profile 2018. (Public Health England, 2018b)

5.11.1.19 Additional data sources utilised by the topic specific assessments will also be used.

## *Determinants of Health*

5.11.1.20 Based on The Healthy Urban Planning Checklist (London HUDU, 2017b), [Table 5.5](#) sets out what elements of human health will be covered in the HIA, what the main relevant policy documents are for each aspect of health, and what technical topic will be cross-referenced as part of the HIA. Commentary is also made on issues where no significant health effects are likely and, in compliance with a proportional approach, no assessment will be included in the HIA.

**Table 5.5: HIA Assessment Framework**

Planning Issue	Potential Effects	Relevant Policy Documents	Relevant Technical Chapters
<b>Healthy Urban Planning Checklist Theme: Healthy Housing</b>			
Housing Design	This theme will be “scoped out” of the HIA as housing is not a component of Hornsea Four and there is no scope for significant effects on such matters due to the nature, location and scale of development.		
Accessible Housing			
Healthy Living			
Housing Mix and Affordability			
<b>Healthy Urban Planning Checklist Theme: Active Travel</b>			
Promoting Walking and Cycling	Effects of Public Rights of Way (PRoW) causing changes in accessing the footpath, cycleway and bridleway network.  Effects from increased traffic on safety/accidents, severance/connectivity may arise during construction.	NPPF (MHCLG, 2019)  East Riding Local Plan (ERYC, 2018)	<b>Volume 3, Chapter 6 Land Use and Agriculture</b>  <b>Volume 3, Chapter 7, Traffic and Transport</b>
Safety			
Connectivity			
Minimising Car Use			
<b>Healthy Urban Planning Checklist Theme: Healthy Environment</b>			
Construction	Construction of the onshore aspects of Hornsea Four have the potential to cause impacts on wellbeing through stress and disturbance.	NPS EN-1 (DECC, 2011a)  NPS EN-3 (DECC, 2011b)	Construction is considered as a phase of the project and is therefore considered in all technical assessments.
Air Quality	Onshore construction works have the potential to impact air quality from the generation of construction dust and traffic emissions.  An air quality assessment set out in this PEIR. Embedded within this is an assessment of predicted pollutants against air quality Objectives. No breaches of any such Objectives are forecast. As such, adverse health effects are not anticipated to arise as a result of Hornsea Four with regard to air quality.  The HIA will summarise the outputs of this exercise for completeness.	NPS EN-5 (DECC, 2011)  NPPF (MHCLG, 2019)  East Riding Local Plan (ERYC, 2018)	<b>Volume 3, Chapter 9 Air Quality and Health</b>
Noise	Onshore construction phase noise effects have the potential to affect health as does operational noise from the OnSS.  Adverse effect levels and commitments to reduce received noise at receptors are set out in the noise and vibration chapter. These will inform the HIA.		<b>Volume 3, Chapter 8 Noise and Vibration.</b>
Contaminated Land (and Water)	Contaminated land disturbed during construction could result in health effects		<b>Volume 3, Chapter 1 Geology and Ground Conditions.</b>

Planning Issue	Potential Effects	Relevant Policy Documents	Relevant Technical Chapters
	through ingestion, inhalation or contact with liberated contamination.  Pollution of surface or groundwater bodies which are subsequently used as a potable source could result in health effects.		
Open Space	Effects on open and play space could result if such areas were directly affected by Hornsea Four. No such areas have been identified and this element will be scoped out of any HIA.		<b>Volume 3, Chapter 6 Land Use and Agriculture</b>
Play Space			
Biodiversity	The construction both onshore and offshore has the potential to disturb terrestrial and marine species respectively.  No health effects from such interactions are considered likely and this issue will be scoped out of the HIA.		<b>Volume 3, Chapter 3 Ecology and nature Conservation</b>  <b>Volume 2, Chapter 2 Benthic and Intertidal Ecology</b>  <b>Volume 2, Chapter 3 Fish and Shellfish Ecology</b>  <b>Volume 2, Chapter 4 Marine Mammals</b>
Local Food Growing	East Yorkshire is a predominantly agricultural area and food health could be compromised by contaminated soils or water.  There is no significant mechanism for pollution of marine waters affecting commercially exploitable fish or shellfish. Accidental pollution impacts are scoped out of the fish and shellfish assessment and issues relating to impacts on the food chain arising from marine species will therefore be scoped out of the HIA.		<b>Volume 3, Chapter 6 Land Use and Agriculture</b>  <b>Volume 3, Chapter 1 Geology and Ground Conditions.</b>  <b>Volume 2, Chapter 3 Fish and Shellfish Ecology</b>
Flood Risk	Potential health and well-being impacts could arise from any flooding. However, the Flood Risk Assessment does not identify any significant flood risk from Hornsea Four and this issue will therefore be scoped out of the HIA.		<b>Volume 3 Chapter 2 Hydrology and Flood Risk.</b>  A Flood Risk Assessment is provided in <b>Volume 6, Annex 2.2: Onshore Infrastructure Flood Risk Assessment.</b>
Overheating	There is no mechanism for overheating to occur due to Hornsea Four and will be scoped out of the HIA.		N/A
<b>Healthy Urban Planning Checklist Theme: Vibrant Neighbourhoods</b>			
Healthcare Services	Hornsea Four will have no effect on healthcare, education or social infrastructure, or any significant ability to impact on them. These issues will be scoped out of the HIA.	NPPF (MHCLG, 2019)	N/A
Education			N/A
Access to Social Infrastructure		East Riding Local Plan (ERYC, 2018)	N/A

Planning Issue	Potential Effects	Relevant Policy Documents	Relevant Technical Chapters
Local Employment and Healthy Workplaces	Major beneficial impacts are predicted in relation to enabling residents of the Humber area to access employment opportunities through construction activities, dependant on the selection of the construction port.		Volume 3, Chapter 10 Socio-economics Onshore Infrastructure
Access to Local Food Shops	Hornsea Four will have no significant effect on local retail and will be scoped out of the HIA.		
Public Buildings and Spaces	Hornsea four will not directly affect any public buildings. Construction activity on Fraisthorpe Beach will temporarily exclude access here. Such a restriction is not considered significant considering the wider beach resources of the east Yorkshire coast. Provision of diversions to PRow during construction will mitigate access issues to the coast, and this issue will be scoped out of the HIA.		Volume 3, Chapter 6 Land Use and Agriculture

## 5.11.2 Major Accidents and / or Disasters

5.11.2.1 Regulation 5 (4) of the EIA Regulations requires the EIA to consider:

*“expected significant effects arising from the vulnerability of the proposed development to major accidents or disasters that are relevant to that development.”*

5.11.2.2 The EIA Regulations go on to say in Paragraph 8 of Schedule 4 the ES should include:

*“A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to EU legislation such as Directive 2012/18/EU of the European Parliament and of the Council or Council Directive 2009/71/Euratom or UK environmental assessments may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.”*

5.11.2.3 The Hornsea Four project will not include any large inventories of hazardous material that could be released in the event of a natural disaster affecting the project.

5.11.2.4 The main areas of vulnerability for the development stem from its marine operating conditions (but for which it will be designed in the first place), coastal erosion at the landfall and flood risk (lowest level) at the substation. However, the likelihood of a natural disaster for any these components leading to consequential significant environmental effects is negligible.

5.11.2.5 However, relevant aspects of the EIA will examine risks to Hornsea Four and potential consequential risks to the environment and people. In this PEIR the two aspects relating to major accidents or disasters which could affect Hornsea Four, with knock on effects to environmental receptors that have been assessed are navigational risk (see [Volume 5, Annex 8.1](#)) and flood risk (see [Volume 6, Annex 2.2](#)). A standalone chapter on the topic of major accidents and/or disasters is not proposed in the PEIR.

## 5.12 Environmental Management

5.12.1.1 In addition to the specific mitigation measures identified for each of the environmental topics, Hornsea Four will conform to general environmental management practices. Under the Construction (Design and Management) Regulations 2015, Hornsea Four's Construction Environment Management Plan (CEMP) or Code of Construction Practice (CoCP) will include general environmental and health and safety considerations.

5.12.1.2 It is no longer a formal requirement for developers to produce a Site Waste Management Plan (SWMP). Nevertheless, it is recognised that construction, operation and demolition stages all have the potential to create waste and the Applicant is committed to providing a SWMP (Commitment 65). The Applicant will adopt good construction and management practices to ensure waste is minimised as far as possible and that the storage, transport and eventual disposal of waste have no significant environmental effects. Management and collection of the waste streams will be carried out under the requirements of the UK waste regulatory regime. The project description (see [Volume 1 Chapter 4](#)) sets out the waste management measures that Hornsea Four will adopt during construction, operation and decommissioning (in principle only for the latter) to avoid any significant adverse effects on the environment or people from the handling and disposal of waste.

## 5.13 Competent Experts

5.13.1.1 The Applicant is being supported in the undertaking of the Hornsea Four EIA by a number of organisations experienced in assessing the environmental impacts from offshore wind farms in UK waters:

- Royal HaskoningDHV: EIA co-ordination and onshore assessments;
- GoBe Consultants: Offshore assessments and Habitats Regulations Assessment (HRA); and
- Pinsent Masons: Legal Aspects

5.13.1.2 In all cases the assessments have been led by a technical author who is a specialist professional, often a recognised expert in their field and/or a chartered member of a relevant professional body and has significant experience in the preparation of impact assessments. The lead author takes responsibility for the quality and veracity of the data gathered; the assessment methodology to be undertaken, the impact assessments made and any proposed mitigation measures. The lead author is usually supported by a team of consultants and their work is subject to both technical and consistency review by a lead author and the EIA core team.

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