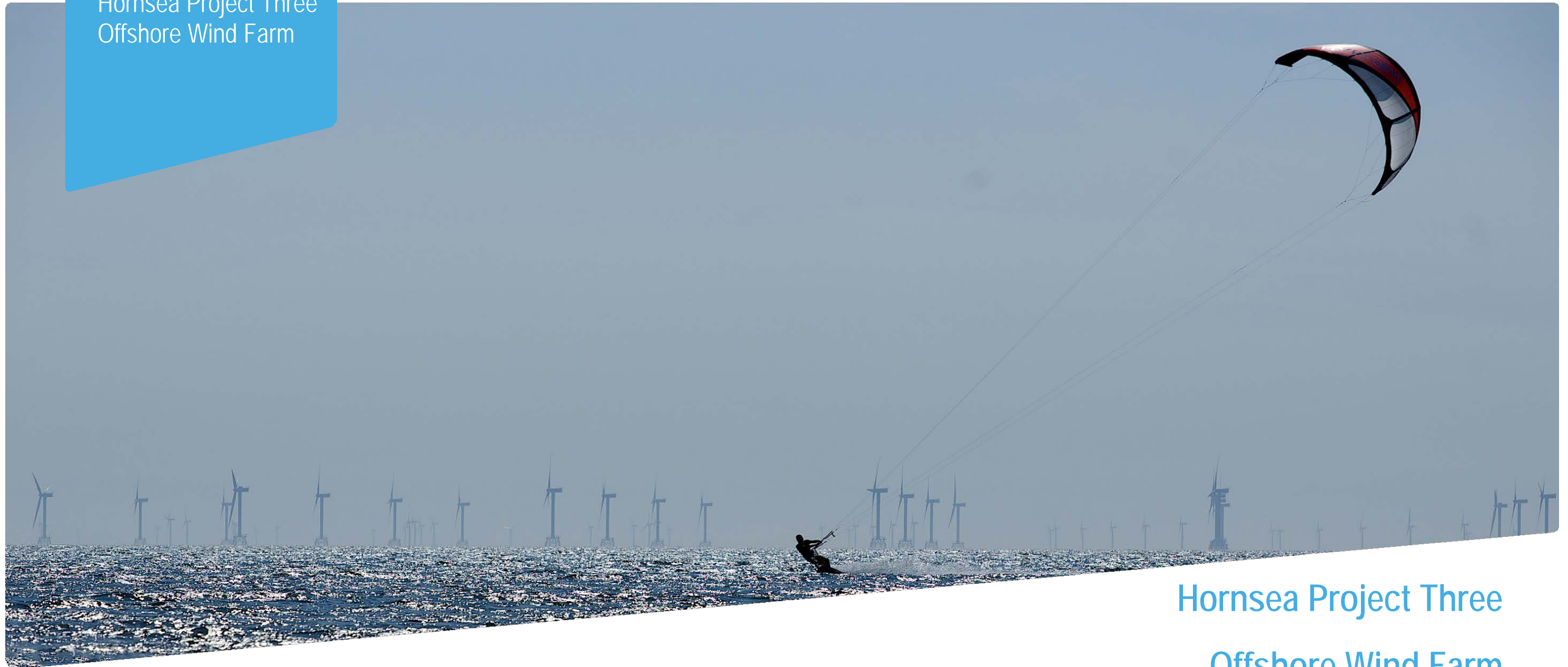


Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three Offshore Wind Farm

Environmental Statement:
Volume 1, Chapter 5 - Environmental Impact Assessment Methodology

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Date: May 2018

Hornsea 3
Offshore Wind Farm

Orsted

Environmental Impact Assessment

Environmental Statement

Volume 1

Chapter 5 – Environmental Impact Assessment Methodology

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5 Howick Place,

London, SW1P 1WG

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Prepared by: RPS

Checked by: Sarah Drljaca

Accepted by: Sophie Banham

Approved by: Stuart Livesey

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Acronyms

Acronym	Description
ADR	Air Defence Radar
CEA	Cumulative Effect Assessment
CFD	Contract for Difference
DCO	Development Consent Order
DECC	Department for Energy and Climate Change
DMRB	Design Manual for Roads and Bridges
EEA	European Economic Area
EIA	Environmental Impact Assessment
HMR	Helicopter Main Route
HRA	Habitats Regulations Assessment
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IEEM	Institute of Ecology and Environmental Management
MoD	Ministry of Defence
NERC	Natural Environment Research Council
NPS	National Policy Statement
NPS EN-1	Overarching National Policy Statement for Energy
NPS EN-3	National Policy Statement for Renewable Energy Infrastructure
NPS EN-5	National Policy Statement for Electricity Networks Infrastructure
NSIP	Nationally Significant Infrastructure Project
NTS	Non-Technical Summary
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
PRoW	Public Right of Way
PSR	Primary Surveillance Radar
RYA	Royal Yachting Association
UNECE	United Nations Economic Commission for Europe

Units

Unit	Description
m	Metre
km	Kilometre

5. Environmental Impact Assessment Methodology

5.1 Introduction

- 5.1.1.1 The Hornsea Three Environmental Impact Assessment (EIA) process uses a systematic, evidence-based approach in order to evaluate and interpret the likely impacts and subsequent effects of the Hornsea Project Three offshore wind farm (hereafter referred to as Hornsea Three) activities upon physical, biological and human receptors. This Environmental Statement has been prepared in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009, as amended (the 2009 EIA Regulations (as amended)).
- 5.1.1.2 Volume 2, chapter 2: Policy and Legislation provides further information on the information that is required to be included in an Environmental Statement.
- 5.1.1.3 This chapter describes the principles of the EIA process and the approach that has been taken to identify and evaluate the likely impacts and, subsequently, evaluate the significance of effects, associated with Hornsea Three.
- 5.1.1.4 Further details on topic-specific methodologies (e.g. methodologies for site-specific surveys) are provided in the relevant Environmental Statement topic chapters.

5.2 Environmental impact assessment legislation and guidance

- 5.2.1.1 The impact assessment methodology employed in this Environmental Statement draws upon legislation, policy and guidance including:
- Council Directive 2011/92/EU of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (the EIA Directive), as amended by Council Directive 2014/52/EU;
 - The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (as amended);
 - Overarching National Policy Statement (NPS) for Energy (EN-1; DECC, 2011a);
 - NPS for Renewable Energy Infrastructure (EN-3; DECC, 2011b);
 - NPS for Electricity Networks Infrastructure (EN-5; DECC, 2011c);
 - Advice Note Seven: Environmental Impact Assessment: Preliminary Environmental Information, Screening and Scoping (PINS, 2015a);
 - Advice Note Nine: Rochdale Envelope (PINS, 2012);
 - Advice Note Twelve: Transboundary Impacts (PINS, 2015b);
 - Advice Note Seventeen: Cumulative Effects Assessment (PINS, 2015c);

- The Design Manual for Roads and Bridges (DMRB) Volume 11: Environmental Assessment (and updates) (Highways Agency *et al.*, 2008);
- A Review of Assessment Methodologies for Offshore Wind Farms (COWRIE METH-08-08) (Maclean *et al.*, 2009);
- 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); and
- Guidelines for Environmental Impact Assessment (IEMA, 2004).

5.2.1.2 On 16 May 2017, The Infrastructure Planning (Environmental Impact Assessment) 2017 Regulations (referred to as 'the 2017 EIA Regulations') entered into force. The transitional measures set out in these regulations provide that the provisions of the 2009 EIA Regulations (as amended) remain applicable to projects for which an application has been submitted or for which a Scoping Opinion has been sought before 16 May 2017. A Scoping Opinion was sought for Hornsea Three in October 2016. Therefore, for the purposes of Hornsea Three, the 2009 EIA Regulations (as amended) remain the relevant regulations. However, as a matter of good practice, the measures required by the 2017 EIA Regulations have been considered where appropriate in this Environmental Statement. Further details regarding the legislative context of the assessments undertaken in this Environmental Statement are provided in volume 1, chapter 2: Policy and Legislation.

5.2.1.3 Where relevant topic-specific guidance and legislation exists, this is discussed within the relevant Environmental Statement chapters (volume 2 and volume 3 of this Environmental Statement).

5.3 Key principles of the Hornsea Three assessment

5.3.1.1 The assessment of each topic (e.g. marine mammals, traffic and transport, shipping and navigation etc.) forms a separate chapter of this Environmental Statement. For each topic chapter, the following components are included:

- Identification of the study area for the topic-specific assessments;
- Description of the planning policy and guidance context;
- Summary of consultation activity, including comments received in the Scoping Opinion and on the Preliminary Environmental Information Report (PEIR);
- Description of the environmental baseline conditions; and
- Presentation of impact assessment, which includes:
 - Identification of the maximum design scenario for each impact assessment;
 - A description of the measures adopted as part of Hornsea Three, including mitigation and design measures which seek to prevent, reduce or offset environmental effects;
 - Identification of likely impacts and assessment of the significance of identified effects, taking into account any mitigation measures adopted as part of Hornsea Three;
 - Identification of any further mitigation measures required in respect of likely significant effects (in addition to those measures adopted as part of Hornsea Three), together with consideration of any residual effects;
 - Identification of any future monitoring required;
 - Assessment of any cumulative effects with other major developments, including those that are proposed, consented and under construction (including, where applicable, those projects, plans or activities that are currently operational that were not operational when baseline data was collected); and
 - Assessment of any transboundary effects (i.e. effects on other European Economic Area (EEA) states).

5.3.1.2 Inter-related effects (i.e. inter-relationships between environmental topic areas) are assessed in a separate chapter in both the offshore volume (volume 2, chapter 12) and the onshore volume (volume 3, chapter 11).

5.3.1.3 The approach to the principal components of the EIA process is described in further detail in the following sections.

5.3.2 Evidence based approach

5.3.2.1 The evidence based approach to EIA involves utilising existing data and information from sufficiently similar or analogous studies to inform baseline understanding and/or impact assessments for a proposed development. In this way, the evidence based approach does not always require new data to be collected, or new modelling studies to be undertaken, in order to characterise the potential impact with sufficient confidence for the purposes of EIA.

5.3.2.2 Hornsea Three is located within the former Hornsea Zone, for which extensive data and knowledge regarding the baseline environment are already available. These data/this knowledge have been acquired through zonal studies and from the surveys and characterisations undertaken for Hornsea Project One and Hornsea Project Two. There is also detailed existing technical work (including modelling and comprehensive assessments) available from Hornsea Project One, Hornsea Project Two and other publicly available desktop data sources (e.g. from other Environmental Statements) that provide a valuable source of evidence to inform the assessment of likely significant environmental effects associated with Hornsea Three. Therefore, where possible, Hornsea Three has maximised the use of these data and assessments in order to:

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

5.3.2.3 It is also important to maximise the use of this existing relevant data and assessments to the extent possible and appropriate to do so, in the context of the offshore wind industry positively responding to government drivers to reduce the cost of offshore wind.

5.3.2.4 Where relevant, each topic chapter of this Environmental Statement (volume 2: chapters 1 to 11 and volume 3: chapters 1 to 10) sets out:

- The data that have been obtained, including the role of the current Hornsea Project One, Hornsea Project Two and zonal datasets, as well as publicly available desktop data sources, in defining the baseline environment for Hornsea Three;
- The role of the Hornsea Project One, Hornsea Project Two and zonal datasets, as well as publicly available desktop data sources (including an explanation as to whether this data is sufficient, appropriate and contemporaneous) in the Hornsea Three impact assessments; and
- Where it is necessary, a description of additional data that have been collected in order to inform the Hornsea Three impact assessment.

5.3.2.5 Where applicable, the topic chapters also provide a full justification for the use of the evidence base to inform the EIA.

5.3.3 Maximum design scenario

- 5.3.3.1 The Hornsea Three EIA has employed a maximum design scenario approach, which reflects the Rochdale Envelope approach. This approach allows for a project to be assessed on the basis of maximum project design parameters in order to provide flexibility, while ensuring all potentially significant effects (positive or adverse) are assessed within the EIA process and reported in the Environmental Statement. Those parameters include a range of potential values. The maximum design scenario approach employed for Hornsea Three is consistent with the Planning Inspectorate's (PINS) Advice Note Nine: Rochdale Envelope (PINS, 2012). Further details of the legislative context of this approach are included in volume 1, chapter 2: Policy and Legislative Context.
- 5.3.3.2 This approach has been taken for the EIA because it is not possible to provide precise final design details of Hornsea Three, or the way it will be built, a number of years ahead of the time it will be constructed. Offshore wind is a constantly evolving industry with a constant focus on cost reduction, therefore improvements in technology and construction methodologies occur frequently and an unnecessarily prescriptive approach could preclude the adoption of new, more cost-effective technology and methods, potentially affecting the viability of a project. Volume 1, chapter 3: Project Description describes the Hornsea Three design and identifies the range of potential parameters for all relevant components.
- 5.3.3.3 For each of the impacts assessed within the topic chapters (volume 2: chapters 1 to 11 and volume 3: chapters 1 to 10), the maximum design scenario is identified from the range of potential options for each parameter within volume 1, chapter 3: Project Description. The maximum design scenario assessed is therefore the scenario which would give rise to the greatest potential impact. For example, where several turbine options are included in the design, then the assessment of Hornsea Three has been based on the turbine type known to have the greatest impact. This may be the turbine type with the largest footprint, the greatest tip height or the largest area of seabed disturbed during construction, depending upon the topic under consideration. By identifying the maximum design scenario for any given impact, it can therefore be concluded that the impact (and therefore the effect) will be no greater for any other design scenario than that assessed for the maximum design scenario. By employing the maximum design scenario approach, the Applicant retains some flexibility in the final design of the offshore wind farm and associated offshore and onshore infrastructure, but within certain maximum parameters, which are assessed in this Environmental Statement.

5.3.4 Measures envisaged to prevent, reduce and where possible offset significant adverse effects

Introduction

- 5.3.4.1 Schedule 4 of the 2009 EIA Regulations (as amended) requires that where significant effects are identified, "a description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment" should be included in the Environmental Statement. A similar requirement is set out in the 2017 EIA Regulations.
- 5.3.4.2 The iterative approach to EIA employed for Hornsea Three and reported in this Environmental Statement, as outlined in Figure 5.1 below, involves a feedback loop during the impact assessment process. A specific impact, and the significance of the resulting effect, is initially assessed and, if this is deemed to be a significant adverse effect in EIA terms, changes are made (where practicable) to relevant project parameters or design in order to avoid, reduce or offset the magnitude of that impact. The assessment is then repeated and the process continues until the EIA practitioner is satisfied that:
- The effect has been reduced to a level that is not significant in EIA terms; or
 - Having regard to other constraints, no further changes may be made to project design parameters in order to reduce the magnitude of impact (and hence significance of effect). In such cases an overall effect that is still significant in EIA terms may be presented in the Environmental Statement.

Measures adopted as part of Hornsea Three

- 5.3.4.3 The iterative approach to the Hornsea Three EIA process, as described in paragraph 5.3.4.2 above, has been used as a means of informing the Hornsea Three project design (through the identification of likely significant effects and development of mitigation measures to address these). The incorporation of such measures within the design of the project demonstrates commitment to implementing the identified measures. These measures have been referred to throughout the Environmental Statement as 'measures adopted as part of Hornsea Three'.
- 5.3.4.4 By employing this approach, the significance of effect presented in the Environmental Statement is representative of the maximum residual effect that Hornsea Three will have, should it be approved and constructed.
- 5.3.4.5 Volume 4, annex 5.1: Enhancement, Mitigation and Monitoring Commitments sets out a summary of the enhancement measures and mitigation commitments, which includes measures adopted as part of Hornsea Three, detailed within the topic chapters of the Environmental Statement. The means of implementation is also specified for each of the commitments.

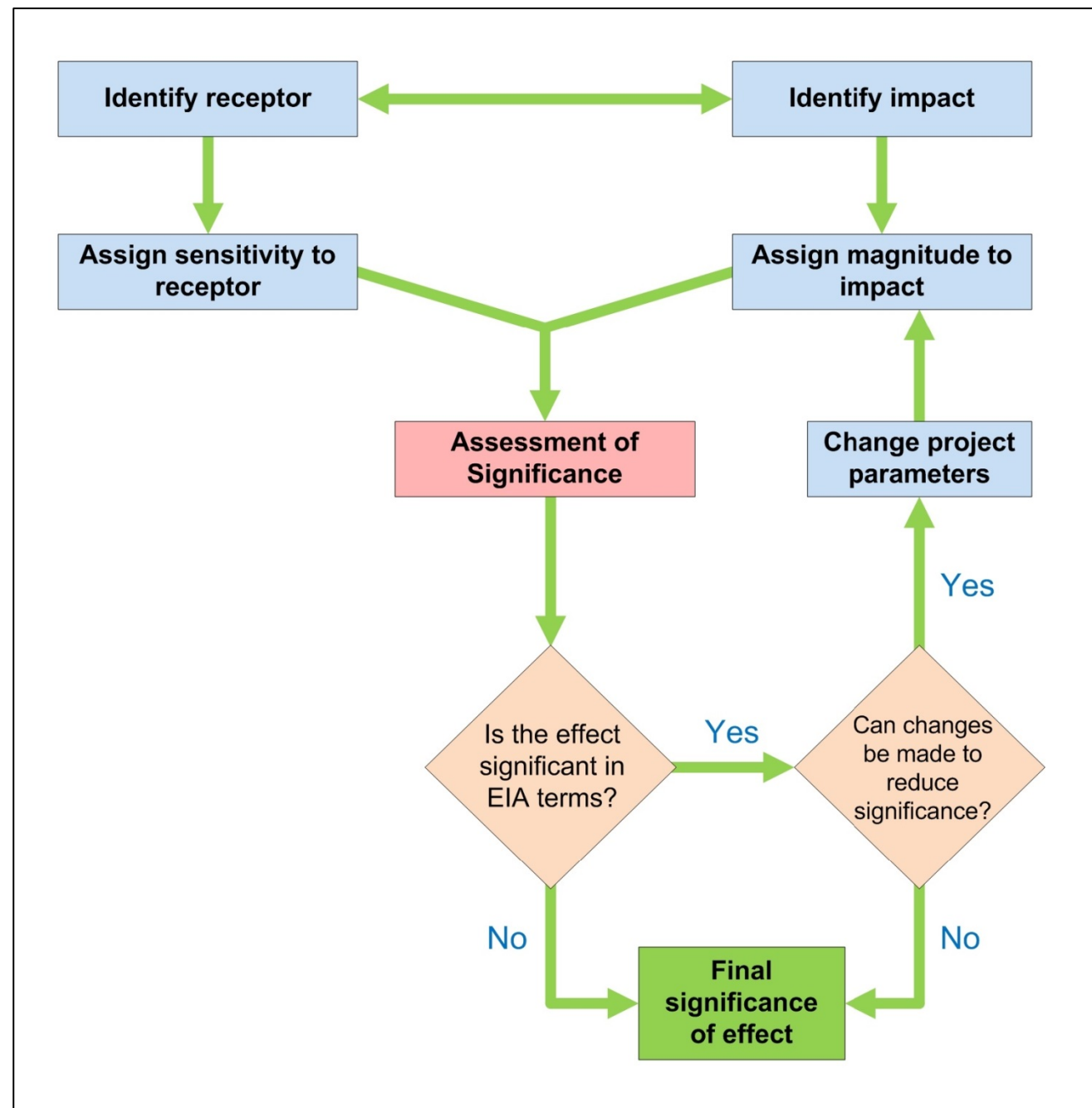


Figure 5.1: Iterative approach to measures adopted as part of the project within the Hornsea Three EIA.

5.3.5 Identification of impacts and the assessment of significance of effects

Impact vs effect

5.3.5.1 Hornsea Three has the potential to create a range of 'impacts' and 'effects' with regard to the physical, biological and human environment. The definitions of impact and effect used in this assessment are drawn from the DMRB (Highways Agency *et al.*, 2008).

5.3.5.2 For this assessment the term 'impact' is used to define a change that is caused by an action. For example, piling of turbine foundations (action) during construction which results in increased levels of subsea noise (impact). Impacts can be classified as direct, indirect, secondary, cumulative and inter-related. They can be either positive or adverse, although the relationship between them is not always straightforward. Definitions for each of these terms are provided in Table 5.1 and are derived from DMRB (Highways Agency *et al.*, 2008) where the term is defined or CIEEM (2016) and DECC (2011a) where no definition is available within the DMRB.

Table 5.1: Definition of direct, indirect, cumulative, inter-related, positive and adverse impacts.

Term	Definition
Direct impact	Occurs as a straightforward consequence of activities undertaken in direct connection to the project (derived from DMRB (Highways Agency <i>et al.</i> , 2008)).
Indirect impact	Occurs as a consequence of a direct impact and may arise via a complex pathway and be experienced at a point in space or time that is removed from the direct impact DMRB (Highways Agency <i>et al.</i> , 2008).
Cumulative impact	Impacts that result from incremental changes caused by other reasonably foreseeable actions alongside the project in question. This includes the impact of all other developments that were not present at the time of data collection (surveys etc.) (derived from DMRB (Highways Agency <i>et al.</i> , 2008)).
Inter-related impacts	Consideration of how the accumulation of, and inter-relationship between effects might affect the environment, economy or community as a whole (DECC, 2011a).
Positive or adverse impacts	An impact can be either 'positive' or 'adverse'. A positive impact is one that improves the quality of the environment and an adverse impact is one that reduces the quality of the environment (CIEEM, 2016).

5.3.5.3 The term 'effect' is used in this assessment to express the consequence of an impact. For example, in the offshore environment the piling of turbine foundations (activity) results in increased levels of subsea noise (impact), with the potential to disturb marine mammals (effect). Or in the onshore environment, the installation of cables using horizontal directional drilling to cross under a road or stream (activity) results in increased levels of noise (impact), and potential disturbance to noise sensitive receptors (i.e. people or ecological receptors) (effect).

5.3.5.4 The 'significance' of each effect is determined by considering the magnitude of the impact alongside the importance, or sensitivity, of the receptor or resource, in accordance with defined significance criteria.

Scope of impact assessment

5.3.5.5 Taking into account the nature, size and location of Hornsea Three (see volume 1, chapter 3: Project Description), the information provided within the Scoping Opinion (see volume 4, annex 5.5: Scoping Report and Scoping Opinion) and other consultation responses provided throughout the EIA process, the following topics have been identified as requiring consideration within this Environmental Statement:

- Offshore
 - Marine processes (volume 2, chapter 1);
 - Benthic ecology (volume 2, chapter 2);
 - Fish and shellfish ecology (volume 2, chapter 3);
 - Marine mammals (volume 2, chapter 4);
 - Offshore ornithology (volume 2, chapter 5);
 - Commercial fisheries (volume 2, chapter 6);
 - Shipping and navigation (volume 2, chapter 7);
 - Aviation, military and communications (volume 2, chapter 8);
 - Marine archaeology (volume 2, chapter 9);
 - Seascape and visual resources (volume 2, chapter 10); and
 - Infrastructure and other users (volume 2, chapter 11).
- Onshore
 - Geology and ground conditions (volume 3, chapter 1);
 - Hydrology and flood risk (volume 3, chapter 2);
 - Ecology and nature conservation (volume 3, chapter 3);
 - Landscape and visual resources (volume 3, chapter 4);
 - Historic environment (volume 3, chapter 5);
 - Land use and recreation (volume 3, chapter 6);
 - Traffic and transport (volume 3, chapter 7);
 - Noise and vibration (volume 3, chapter 8);
 - Air quality (volume 3, chapter 9); and
 - Socio-economics (volume 3, chapter 10).

5.3.5.6 A number of impacts have been scoped out based on the baseline information that has been collected for Hornsea Three and the project description outlined in volume 1, chapter 3: Project Description. Impacts which have been scoped out are outlined in each of the topic chapters (volume 2: chapters 1 to 11 and volume 3: chapters 1 to 10).

Defining magnitude of impact and sensitivity of receptor

Magnitude of impact

5.3.5.7 For each of the impacts assessed in this Environmental Statement, a magnitude has been assigned. In doing so the spatial extent, duration, frequency and reversibility of the impact from the construction, operation and maintenance, or decommissioning phase of Hornsea Three have been considered, where applicable. Each of these terms is defined in Table 5.2 below and is based on the DMRB (Highways Agency *et al.*, 2008) where a suitable definition is apparent or CIEEM (2016) where further definition is required.

Table 5.2: Definition of the spatial extent, duration, frequency and reversibility when defining the magnitude of an impact.

Term	Definition
Spatial extent of the impact	Geographical area over which the impact may occur (CIEEM, 2016).
Duration of the impact	The time over which an impact occurs. An impact may be described as short, medium or long-term ^a and permanent or temporary DMRB (Highways Agency <i>et al.</i> , 2008).
Frequency of the impact	The number of times an impact occurs across the relevant phase/lifetime of a project DMRB (Highways Agency <i>et al.</i> , 2008).
Reversibility of the impact	An irreversible (permanent) impact may occur when recovery is not possible within a reasonable timescale, or there is no reasonable chance of action being taken to reverse it. By contrast, a reversible (temporary) impact is one where recovery is possible naturally in a relatively short time period, or where mitigation measures can be effective at reversing the impact. It is possible for the same activity to cause both irreversible and reversible impacts DMRB (Highways Agency <i>et al.</i> , 2008).
a Topic-specific definitions for these categories are provided in each of the topic chapters (volume 2: chapters 1 to 11 and volume 3: chapters 1 to 10).	

5.3.5.8 The magnitude of the impact is defined within each topic chapter according to the following scale:

- No change;
- Negligible;
- Minor;
- Moderate; and
- Major.

5.3.5.9 An example of the definitions for each of these categories is set out in Table 5.3 below. The table describes both adverse and positive magnitudes of change. These definitions have been adapted from the DMRB (Highways Agency *et al.*, 2008). Topic-specific definitions for each of these categories are provided in each of the topic chapters (volume 2: chapters 1 to 11 and volume 3: chapters 1 to 10). The design of these topic-specific scales draws upon relevant external policy, guidance, standards and other material, including specialist knowledge, which is relevant to that topic.

Table 5.3: Definition of terms relating to the magnitude of impacts.

Magnitude of impact	Description (Highways Agency <i>et al.</i> , 2008)
Major	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (adverse).
	Large scale or major improvement or resource quality; extensive restoration or enhancement; major improvement of attribute quality (positive).
Moderate	Loss of resource, but not adversely affecting integrity of resource; partial loss of/damage to key characteristics, features or elements (adverse).
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (positive).
Minor	Some measurable change in attributes, quality or vulnerability, minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (adverse).
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of adverse impact occurring (positive).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (adverse).
	Very minor benefit to, or positive addition of one or more characteristics, features or elements (positive).
No change	No loss or alteration or characteristics, features or elements; no observable impact in either direction.

Sensitivity of receptor

5.3.5.10 For the purpose of this Environmental Statement, receptors are defined as the physical or biological resource or user group that would be affected by the Hornsea Three impacts. Identification of receptors was informed by available data and baseline studies that have been completed in the preparation of this Environmental Statement.

5.3.5.11 In defining the sensitivity for each receptor, the vulnerability, recoverability and value/importance has been taken into consideration. Each of these terms is defined in Table 5.4 and is used on a basis appropriate to each topic chapter. Where these considerations are not included in the assessment the reason for this is explained within the relevant topic chapter.

Table 5.4: Definition of the vulnerability, recoverability and value/importance when defining the sensitivity of a receptor.

Term	Definition
Vulnerability of the receptor	The degree to which a receptor is susceptible to injury, damage, or harm from an activity (IPCC, 2001).
Recoverability of the receptor	The ability of a receptor to be able to return to a state close to that which existed before an activity or event caused damage (MarLIN, 2012).
Value/importance of the receptor	The importance of the receptor in terms of ecological, social/community and/or economic value (IEEM, 2010).

5.3.5.12 Sensitivity is defined within each topic chapter according to the following scale:

- Negligible;
- Low;
- Medium;
- High; and
- Very high

5.3.5.13 An example of the definitions for each of these categories is set out in Table 5.5. These definitions have been adapted from the DMRB (Highways Agency *et al.*, 2008). Topic-specific definitions for each of these categories are provided in each of the topic chapters (volume 2: chapters 1 to 11 and volume 3: chapters 1 to 10). The value of a receptor for each topic draws upon relevant external guidance and other material, including specialist knowledge, which is relevant to that topic.

Table 5.5: Definition of terms relating to the environmental value (sensitivity of the receptor).

Value (sensitivity of the receptor)	Description (Highways Agency <i>et al.</i> , 2008)
Very High	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale and limited potential for substitution.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution.
Low	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

Evaluation of significance of effect

5.3.5.14 The overall significance of an effect is determined by correlating the magnitude of the impact alongside the sensitivity of receptor. In order to ensure a transparent and consistent approach throughout the Environmental Statement, a matrix approach has been adopted as a guide. There is, however, latitude for professional assessment where deemed appropriate in the application of the matrix. Where the matrix offers a choice of significance levels, professional judgement has been used to determine the most likely outcome. An example of the matrix used to inform the topic-specific methodologies in each topic is set out in Table 5.6. This matrix has been adapted from the DMRB (Highways Agency et al., 2008).

Table 5.6: Matrix used for the assessment of significance of the effect.

		Magnitude of impact				
		No change	Negligible	Minor	Moderate	Major
Sensitivity of receptor	Negligible	Negligible	Negligible	Negligible or minor ^a	Negligible or minor ^a	Minor
	Low	Negligible	Negligible or minor ^a	Negligible or minor ^a	Minor	Minor or moderate ^a
	Medium	Negligible	Negligible or minor ^a	Minor	Moderate	Moderate or major ^a
	High	Negligible	Minor	Minor or moderate ^a	Moderate or major ^a	Major or substantial ^a
	Very high	Negligible	Minor	Moderate or major ^a	Major or substantial ^a	Substantial
	^a The final significance of effect is based upon the expert's professional judgement as to which outcome delineates the most likely effect, with an explanation as to why this is the case.					

5.3.5.15 By cross-referring the magnitude of impact, with the sensitivity of receptor, a significance of effect may be assigned for all project impacts. The significance may be one, or a range of, negligible, minor, moderate, major or substantial. In general, a significance of effect of moderate or greater is considered 'significant' in EIA terms. For each topic chapter, what is considered 'significant' will be clearly defined. Where further mitigation is not possible a residual significant effect may remain.

5.3.5.16 In cases where a range is suggested for the significance of effect, there remains the possibility that this may span the significance threshold (i.e. the range is given as minor to moderate). In such cases the final significance is based upon the expert's professional judgement as to which outcome delineates the most likely effect, with an explanation as to why this is the case.

5.3.5.17 The definitions for each of the significance levels are shown in Table 5.7.

Table 5.7: Definition of significance levels for Hornsea Three.

Significance level	Definition (Highways Agency et al., 2008)
Negligible	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.
Minor	These beneficial or adverse effects are generally, but not exclusively, raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
Moderate	These beneficial or adverse effects have the potential to be important and may influence the decision-making process. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse or beneficial effect on a particular resource or receptor.
Major	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
Substantial	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category. Effects upon human receptors may also be attributed this level of significance.

Further mitigation measures

5.3.5.18 In select cases, further mitigation measures have been outlined after the assessment of significance within the topic chapters (volume 2: chapters 1 to 11 and volume 3: chapters 1 to 10). These select cases are where:

- An effect is considered significant in EIA terms, when already including designed-in mitigation measures; and there are additional mitigation measures that could further reduce the level of effect; and/or
- Mitigation has been proposed but has not yet been confirmed as feasible or deliverable (i.e. awaiting sign-off from regulators, stakeholders etc.) as agreed mitigation, or is as yet unproven (i.e. the mitigation is not yet proven to be effective at reducing the residual significance of effect).

5.3.5.19 Volume 4, annex 5.1: Enhancement, Mitigation and Monitoring Commitments sets out a summary of the enhancement measures and mitigation commitments, which includes further mitigation measures detailed within the topic chapters of the Environmental Statement. The means of implementation is also specified for each of the enhancement measures and mitigation commitments.

Residual effects

- 5.3.5.20 Residual effects are defined as the effects remaining once all further mitigation measures have been taken into consideration. Following the identification of further mitigation measures as described above, the assessment re-evaluates the significance of effect utilising the methodology outlined above in paragraphs 5.3.5.7 to 5.3.5.17.

5.4 Cumulative effect assessment

- 5.4.1.1 This section describes the approach to the Cumulative Effect Assessment (CEA) with regard to the Hornsea Three EIA process. The CEA considers the likely effects arising from Hornsea Three alongside the likely effects of other development activities in the vicinity of Hornsea Three, based on the information available.

- 5.4.1.2 For the purposes of the Hornsea Three EIA process, cumulative effects are defined as those that result from incremental changes caused by other reasonably foreseeable actions alongside the project in question. This includes the impact of other relevant developments that were not present at the time of data collection or survey. In-combination effects are defined as the combined effect of Hornsea Three, with the effects from a number of different projects, on the integrity of European Sites designated for their nature conservation value. In-combination effects are presented separately within the Report to Inform the Appropriate Assessment.

5.4.2 Cumulative effect assessment legislation and guidance

- 5.4.2.1 Cumulative effects are assessed in accordance with the 2009 EIA Regulations (as amended), which stipulate that an Environmental Statement should include: *"A description of the likely significant effects of the development on the environment, which should cover the direct effects and any...cumulative...effects of the development, resulting from: (a) the existence of the development; (b) the use of natural resources; (c) the emission of pollutants, the creation of nuisances and the elimination of waste, and the description by the applicant of the forecasting methods used to assess the effects on the environment"* (Paragraph 20, Part 1, Schedule 4). The requirement to consider cumulative effects remains in place within the 2017 EIA Regulations.

- 5.4.2.2 The need to consider cumulative effects in planning and decision making is also set out in the NPSs. Specifically, NPS EN-1 states at paragraph 4.2.5 that:

"When considering cumulative effects, the ES [Environmental Statement] should provide information on how the effects of the applicant's proposal would combine and interact with the effects of other development (including projects for which consent has been sought or granted, as well as those already in existence)".

- 5.4.2.3 NPS EN-1 goes on to state at paragraph 4.2.6 that the Secretary of State should consider how the *"accumulation of, and interrelationship between effects might affect the environment, economy or community as a whole, even though they may be acceptable when considered on an individual basis with mitigation measures in place."*

- 5.4.2.4 Hornsea Three is being developed within a period of rapid growth in the offshore wind sector. This rapid development includes development of other Round 3 projects, Round 2 projects, together with Round 1 and 2 extension projects in UK waters. As such, the approach to CEA has, over recent years, become an issue of increasing importance for offshore wind developers. In response, RenewableUK and the Natural Environment Research Council (NERC) have published guidelines on the undertaking of the CEA 'Cumulative Impact Assessment Guidelines' (RenewableUK, 2013) and PINS have published an advice note, 'Advice Note Seventeen: Cumulative Effects Assessment' (PINS, 2015c). The approach to CEA undertaken for Hornsea Three takes into account the principles outlined in the RenewableUK guidelines and PINS Advice Note, together with comments made in response to the Hornsea Three Scoping Report (DONG Energy (now Ørsted), 2016). In addition, the Hornsea Three development has similarities, both in terms of the nature of the development and its location, to that of Hornsea Project One and Hornsea Project Two. Therefore, 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 have also been taken into consideration in the approach to the Hornsea Three CEA.

5.4.3 Approach to cumulative effect assessment

Cumulative effect assessment methodology

- 5.4.3.1 The CEA methodology is divided into two main sections: screening of projects, plans and activities, and assessment, as outlined in Figure 5.2 below. Each of the process components are explained in further detail below, alongside a worked example of the screening process.

Screening of projects, plans and activities

- 5.4.3.2 A fundamental requirement of undertaking CEA is to identify those projects, plans or activities with which Hornsea Three may interact to produce a cumulative impact. These interactions may arise within the construction, operation or decommissioning phases. This process is referred to as 'screening'.

- 5.4.3.3 A specialised process has been developed in order to methodically and transparently screen the large number of projects, plans and activities that may be considered cumulatively alongside Hornsea Three. This involves a stepwise process that considers the level of detail available for projects, plans and activities, as well as the potential for interactions on a conceptual, physical and temporal basis.

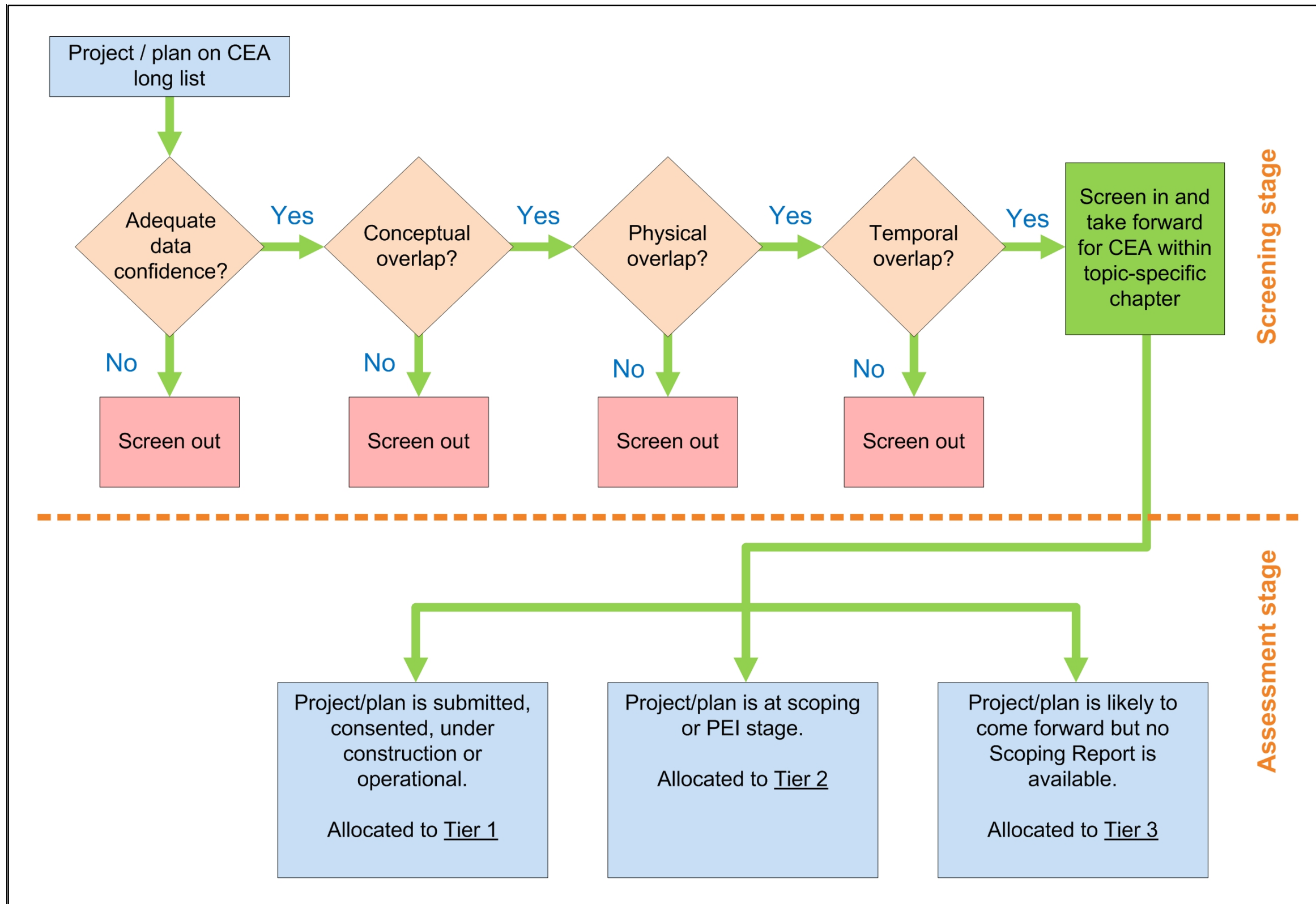


Figure 5.2: Methodology for the screening of potential projects, plans and activities to provide cumulative impacts.

Compiling the CEA long list

- 5.4.3.4 In order to undertake a comprehensive CEA, a long list of relevant projects, plans and activities occurring within a large study area encompassing the entire southern North Sea (offshore) and parts of Norfolk (onshore) was produced. In accordance with PINS Advice Note Seventeen: Cumulative Effects Assessment (PINS, 2015c), the CEA long list includes other major developments (both onshore and offshore), including those which are:
- Under construction;
 - Permitted application(s), but not yet implemented;
 - Submitted application(s) not yet determined;
 - Projects on the National Infrastructure Planning Portal's Programme of Projects;
 - Identified in the relevant development plan (and emerging development plans - with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited; and/or
 - Identified in other plans and programmes (as appropriate), which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.
- 5.4.3.5 For the purposes of the Hornsea Three CEA, the relevant project parameters for the projects, plans and activities considered cumulatively have been drawn from Environmental Statements or other similarly detailed planning documents (e.g. marine licence applications, planning applications and field development plans for oil and gas). Changes made post-consent to the projects, plans and activities have not generally been included in the CEA long list or assessed within the topic chapters due to the uncertainty surrounding whether these are ultimately implemented or not. However, where greater certainty does exist (for example, in the case of Hornsea Project One and Hornsea Project Two), key changes post-consent have been taken into account.
- 5.4.3.6 The CEA long list for Hornsea Three is included in volume 4, annex 5.2: Cumulative Effects Screening Matrix. All projects, plans and activities on the CEA long list are shown in volume 4, annex 5.3: Location of Cumulative Projects, Plans and Activities.

Screening of the CEA long list

- 5.4.3.7 All projects, plans and activities listed in the CEA long list were then individually screened, based on the level of detail available for project, plans and activities, as well as the potential for interactions on a conceptual, physical and temporal basis, with specific reference to each topic of the Environmental Statement. Those that are 'screened in' were then carried forward into the CEA of the relevant topic chapters of the Environmental Statement.
- 5.4.3.8 Further details on the screening process are outlined in the following sections.

Data confidence

- 5.4.3.9 This step aims to screen projects, plans and activities based upon the level of detail available within their specific assessment. The premise here is that projects, plans and activities with a low level of detail in their assessment cannot meaningfully contribute to a CEA and, as such, are screened out. The application of this screening step is consistent with Guiding Principle 7 of the RenewableUK Cumulative Impact Assessment Guidelines (RenewableUK, 2013).
- 5.4.3.10 Decisions upon whether to screen a project, plan or activity in or out at this stage are taken on a topic by topic basis. This allows certain projects, plans and activities to be screened in for certain topics where sufficient detail is present, while the same project, plan or activity may be screened out for another topic.
- 5.4.3.11 In order to categorise data confidence for the purposes of this Environmental Statement, a three-point scale has been employed (Table 5.8). This scale aims to provide a transparent basis upon which projects, plans and activities may be screened in or out at this step.
- 5.4.3.12 For the purposes of screening, projects with high or medium data confidence have been automatically screened in to the CEA. Projects, plans and activities with low data confidence have been screened out of the assessment. This category includes projects, plans and activities that the Hornsea Three EIA team is aware may take place in the future, but have no information on how the plan or project will be executed and therefore cannot be considered within the CEA.
- 5.4.3.13 In line with the RenewableUK Cumulative Impact Assessment Guidelines for offshore wind farms (RenewableUK, 2013), the cumulative assessment of other North Sea Round 3 developments has taken an approach that attempts to incorporate an appropriate level of pragmatism. This is demonstrated in the confidence levels applied to various developments, particularly those that are known but currently lack detailed project application documentation, such as Norfolk Boreas, which is at the scoping stage only. These projects have been considered for CEA only in those chapters where it is considered that the Scoping Reports contain sufficient detail with which to undertake a meaningful assessment. Due to the lack of specific information in the public domain about these projects, and how and when (or if) they will be built, it is not always possible to undertake a meaningful CEA for these projects and therefore in some chapters they are excluded from the Hornsea Three CEA.

5.4.3.14 This issue also arises with projects which are further developed. For example, in the case of the Norfolk Vanguard project, which is being promoted by Vattenfall, this has been included in the CEA (Tier 3 development) for Hornsea Three. The application for development consent is expected in June 2018 and therefore the pre-application stage is running almost concurrently with Hornsea Three. At the time of writing it has not always been the case that the data necessary for Hornsea Three to undertake a CEA taking into account Norfolk Vanguard (and vice versa) has been publicly available (typically that presented in the PEIR for the project). However, Orsted and Vattenfall are in regular dialogue and have been for some time. Orsted and Vattenfall will continue to work closely together, and with statutory consultees, to ensure the CEA is as accurate as it can be. If necessary Hornsea Three will update the CEA within its Environmental Statement to take into account any new data which has been made available following the submission of the Norfolk Vanguard application to the Secretary of State. This approach complies with the relevant EIA Regulations and is consistent with that taken for other applications, where relevant environmental information has become available after the point of application submission.

Conceptual overlap

5.4.3.15 For a cumulative effect to occur it must be established that a cumulative impact has the potential to directly or indirectly affect the receptor(s) in question. In EIA terms, this is described as an impact-receptor-pathway, and is hereafter referred to as a conceptual overlap. An example of a conceptual overlap can be seen where increased suspended sediment concentrations from a nearby project and from Hornsea Three (impact) affect the same population of fish and shellfish (receptor). Conversely, a conceptual overlap cannot be demonstrated between activities such as the operation of a subsea pipeline and aircraft navigation. It is in cases such as this second example where projects, plans and activities are screened out at this stage.

5.4.3.16 Each project, plan and activity on the CEA long list has been considered on a topic by topic basis in order to evaluate the potential for conceptual overlaps to exist. Projects, plans and activities that clearly do not have such an overlap are screened out of the assessment. In cases where a conceptual overlap is not clear-cut, the project, plan and activity in question has been screened into the CEA in order to maintain the project's adherence to the maximum design scenario approach. These projects are then further considered in the relevant topic chapters.

Table 5.8: Criteria for the allocation of data confidence.

Data confidence	Criteria
High	<ul style="list-style-type: none"> Projects, plans and activities with an Environmental Statement or other equivalently detailed planning document, containing sufficient topic-specific detail for an adequately detailed CEA to be undertaken on a quantitative or semi-quantitative manner; Peer reviewed and/or industry standard third party quantitative, semi-quantitative or qualitative data; or Detailed project parameters for other Ørsted projects and third party project details published in the public domain and confirmed as being accurate by the Hornsea Three developer.
Medium	<ul style="list-style-type: none"> Projects, plans and activities with a draft or final Environmental Statement or other equivalently detailed planning document, containing a moderate level of detail that still allows a CEA to be undertaken on a qualitative basis; Third party data supplied to or obtained by Hornsea Three that has not been subject to peer review and cannot be quality controlled by Hornsea Three; or Peer reviewed and grey literature that is considered relevant, but either old, and hence potentially not as representative of the current situation, or of insufficient detail in order to accurately inform assessment in its own right (e.g. European Seabirds at Sea data).
Low	<ul style="list-style-type: none"> Projects, plans and activities with a lack of robust information and where details of implementation are scarce or likely to change before any potential consent/approval; Projects, plans and activities that may be developed in future, but for which no specific information is currently available (e.g. future Round 3 projects that have not yet been identified or have very little detailed information published).

Physical overlap

5.4.3.17 The ability for impacts arising from Hornsea Three to overlap with those from other projects, plans and activities has been assessed on a receptor basis for each topic. This means that, in most examples, an overlap of the physical extents of the impacts arising from the two (or more) projects, plans and activities must be established for a cumulative impact to arise. For example, for a cumulative sedimentation impact to be established between Hornsea Three and another project, it must be established that the extent of sediment release from both projects has the potential to overlap and may affect a receptor at a single physical place. Exceptions to this exist for certain mobile receptors that may move between, and be subject to, two or more separate physical extents of impact from two or more projects. For example, marine mammals may be affected by noise impacts from Hornsea Three, as well as those from other projects whose noise impact extents do not directly overlap with those from Hornsea Three, such as development within the Dogger Bank Zone. Furthermore, individual receptors from the same population may be subject to physically separate impacts occurring at the same time while the population is separated, leading to an effect upon the population as a whole. Where relevant, these potential eventualities have been noted in the relevant chapter and included in the CEA.

5.4.3.18 Screening on the basis of physical extent has been carried out for all topics in line with the maximum potential impact (and hence physical extent) that may arise from Hornsea Three, in line with the maximum design scenario approach. A listing of the parameters used for screening of physical extent for CEA purposes is identified in each topic chapter of the Environmental Statement (volume 2: chapters 1 to 11 and volume 3: chapters 1 to 10).

5.4.3.19 For the purposes of the Hornsea Three CEA, all projects, plans and activities which do not have a physical overlap of impacts for a given EIA topic with those of Hornsea Three have been screened out. This approach is consistent with Guiding Principle 5 of the RenewableUK Cumulative Impact Assessment Guidelines (RenewableUK, 2013).

Temporal overlap

5.4.3.20 In order for a cumulative effect to arise from two or more projects, a temporal overlap of impacts arising from each must be established. Some impacts are active only during certain phases of development, such as piling noise during construction. Such a consideration is particularly important for receptors such as marine mammals, where the overlap of impacts during construction, such as noise from the piling activities of several large offshore developments, may be important. The anticipated construction periods for projects, plans and activities within the CEA long list have been obtained from their relevant planning documents (e.g. Scoping Reports, PEIRs, Environmental Statements etc.), as well as through consultation with proponents and general industry knowledge. The details provided represent the current understanding of programmes of development though it is recognised that these programmes may be subject to change.

5.4.3.21 Overlap of the Hornsea Three decommissioning period with other projects, plans and activities has not been considered within this Environmental Statement due to the extremely long time horizons involved and the uncertainty inherent in such predictions.

5.4.3.22 For the purposes of the Hornsea Three CEA, all projects, plans and activities that were built and operational at the time of Hornsea Three data collection (field surveys etc.) have been screened out of the relevant EIA topic CEA. This is because the effects of these projects have already been captured within Hornsea Three specific surveys, and hence their effects have already been accounted for within the baseline assessment. The exclusion of built and operational projects that were in place at the time of data collection/survey in this way avoids the double-counting that would occur if projects were to be included within both the baseline and the CEA.

Hypothetical example of screening process

5.4.3.23 In order to illustrate the stages of the CEA screening process, an example is provided below for a hypothetical marine aggregate extraction project that is consented (but not yet operational) for a location in the vicinity of Hornsea Three. In this example the potential for the hypothetical marine aggregate extraction project to contribute to a cumulative impact alongside Hornsea Three is considered, with particular reference to impacts upon benthic intertidal and subtidal ecology.

5.4.3.24 **Data confidence:** An Environmental Statement must be produced for all marine aggregate extraction projects, which provides detailed information in the public domain for this hypothetical project. Upon examination of the detail in the Environmental Statement relevant to benthic ecology it is deemed that the information present is sufficient for a quantitative CEA and as such data confidence for this project is deemed to be 'high'. The project passes this stage of screening for the benthic intertidal and subtidal ecology topic.

5.4.3.25 **Conceptual overlap:** For a project to pass this step it must be established that it has the potential to contribute to an impact that also arises from Hornsea Three in isolation. In this case, the loss or disruption to benthic habitat may be considered as a common impact between both Hornsea Three and the marine aggregate extraction project. As such a conceptual overlap (cumulative impact-receptor pathway) exists and the project passes this stage of screening for the benthic intertidal and subtidal ecology topic.

5.4.3.26 **Physical overlap:** For the purposes of the benthic ecology assessment the maximum additive long term habitat loss is calculated within a 50 km buffer of Hornsea Three. Our hypothetical marine aggregate extraction project exists within this radius and as such a physical overlap between the potential effect and the receptor exists. The project passes this stage of screening for the benthic intertidal and subtidal ecology topic.

5.4.3.27 **Temporal overlap:** Our hypothetical marine aggregate extraction project is active and operational during the construction of Hornsea Three and, as such, there is the potential for impacts to temporally overlap. The project passes this stage of screening for the benthic intertidal and subtidal ecology topic.

5.4.3.28 **Screen in:** As the hypothetical marine aggregate project has passed all of the above stages, it is therefore screened in and would be taken forward for further consideration within the CEA section of the topic chapter (in this case benthic intertidal and subtidal ecology).

Assessment stage

List of screened in projects, plans and activities

5.4.3.29 Upon the completion of the screening stage described above, a list of all projects, plans and activities screened in for assessment was produced. This list is specific to each topic of the EIA process (although a number of projects, plans or activities will be relevant to several topics) and presents all projects, plans and activities considered in each topic chapter's CEA. The list also includes a summary of relevant detail of each of the projects, plans and activities relevant to the CEA and is included within each topic chapter of the Environmental Statement (volume 2: chapters 1 to 11 and volume 3: chapters 1 to 10).

Implementing the Hornsea Three cumulative effect assessment

- 5.4.3.30 The Hornsea Three CEA has been undertaken for the Environmental Statement and is presented within each topic chapter (volume 2: chapters 1 to 11 and volume 3: chapters 1 to 10). The CEA is presented in a separate section of the topic chapters to the impact assessment of Hornsea Three alone.
- 5.4.3.31 For the Hornsea Three CEA a tiered approach has been adopted. This approach is intended to provide a framework to assist the decision maker in placing relative weight upon the potential for each project, plan and activity assessed cumulatively to ultimately be realised, based upon the project, plan and activity's current stage of maturity. The allocation of each project, plan and activity into tiers is not affected by the screening process but is merely a categorisation applied to all projects, plans and activities that have been screened in for assessment.
- 5.4.3.32 The tiered approach uses the following categorisations:
- 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 were 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 in 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.
- 5.4.3.33 The tiered approach is consistent with the Renewable UK Cumulative Impact Assessment Guidelines, specifically Guiding Principle 4 and Guiding Principle 7 (Renewable UK, 2013) and PINS Advice Note Seventeen (PINS, 2015c).

- 5.4.3.34 All projects, plans and activities that have been screened in via the previously described screening process have been allocated into one of the above Tiers and assessed for cumulative impact. In general, a CEA has been undertaken for Tier 1 and Tier 2 where possible. Where possible, a Tier 3 CEA has also been undertaken, however this has generally been undertaken at a very high level due to the availability of information and the data confidence associated with this information. This approach is in accordance with PINS Advice Note Seventeen (PINS, 2015c).
- 5.4.3.35 It is noted that offshore wind farms seek consent for a maximum design scenario and the 'as built' offshore wind farm will be selected from the range of consented scenarios. In addition, the maximum design scenario quoted in the application (and the associated Environmental Statement) are often refined during the determination period of the application. For example, it is noted that the Applicant for Hornsea Project One considered a maximum of turbines 332 turbines within the Environmental Statement, but has gained consent for 240 turbines. In addition, it is now known that Hornsea Project One 'as built' will consist of 174 turbines. Similarly, Hornsea Project Two has gained consent for an overall maximum number of turbines of 300, as opposed to 360 considered in the Environmental Statement and the as built number of turbines is likely to be less than this. A similar pattern of reduction in the project envelope from that assessed in the Environmental Statement, to the consented envelope and the 'as built' project is also seen across other offshore wind farms. 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 Environmental Statement has been undertaken on the basis of information presented in the Environmental Statements for the other projects, plans and activities.
- 5.4.3.36 Where practicable, the CEA methodology follows the outline of the Hornsea Three alone impact assessment methodology as specified in section 5.3.5 above. This approach is employed in order to maintain consistency throughout the chapter and to allow relevant comparisons to be made. This approach however differs between topic chapters according to several factors, such as the nature of the topic, the cumulative projects, plans and activities included for that topic, the data available for each project, plan and activity, and the specific practicalities around undertaking CEA for that discipline. As such while all topics have, in the first instance, aimed to undertake a full quantitative assessment, this has not been possible throughout and in select cases the assessment presented employs a mix of qualitative and quantitative, or wholly qualitative assessment.
- 5.4.3.37 The significance of effect for each cumulative effect is presented independently for each Tier. The only exception to this is where certain topic chapters have assessed Tier 3 only on the basis that this Tier shows no significant effect (and therefore it follows that Tier 1 and Tier 2 also show no significant effect), or where no relevant Tier 1 or Tier 2 projects have been screened in.
- 5.4.3.38 Further detail on the methodologies implemented for the CEA may be found in the relevant sections of the Environmental Statement topic chapters.

5.5 Transboundary effects

5.5.1 Transboundary effects legislation and guidance

5.5.1.1 Transboundary effects arise when development within one European Economic Area (EEA) state affects the environment of another EEA state(s).

5.5.1.2 The need to consider such transboundary effects has been embodied by the United Nations Economic Commission for Europe (UNECE) Convention on EIA in a Transboundary Context, adopted in 1991 in the Finnish city of Espoo and commonly referred to as the 'Espoo Convention'. The Convention requires that assessments are extended across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary impacts.

5.5.1.3 The Espoo Convention has been implemented by the EIA Directive and transposed into UK law under the 2009 EIA Regulations (as amended). Regulation 24 of the 2009 EIA Regulations (as amended) requires that where the Secretary of State is of a view that an EIA application may have significant effect(s) upon the environment of another EEA state, or the Secretary of State receives a request for involvement from another EEA member state, it must undertake a prescribed process of consultation and notification.

5.5.1.4 PINS Advice Note 12: Transboundary Impacts (PINS, 2015b), sets out the procedures for consultation in association with an application for a DCO, where such development may have significant transboundary effects. The note sets out the roles of PINS (on behalf of the Secretary of State), UK Government departments and Applicants. In respect of the latter, Applicants are advised to:

- Undertake consultation with specific EEA states where they believe there may be significant effects on the environment of that state;
- Consider consulting with environmental bodies within that state and with relevant interest groups;
- Undertake any such consultation at an early stage (developers are advised that this may help to avoid any delays at the examination stage or even refusal due to lack of time to fully consider transboundary issues);
- Where necessary, collate the names and contact details for relevant EEA states, working with other developers, to help to ensure consistency of approach and to save time and effort (the Advice Note includes a list of contacts for some member states);
- Share such contact details with PINS;
- Identify the possible significant transboundary effects (as part of the scoping process), or why it is considered that there would not be any significant effects on another EEA State (the Advice Note advises the use of a screening matrix as a way of presenting this information); and
- Send a draft application and PEIR to the relevant EEA state(s) and any identified environmental bodies within that state as soon as these are sufficiently detailed to enable meaningful comments to be made to developers about the potential significant effects and the proposed mitigation measures.

5.5.1.5 The Advice Note states at paragraph 5.2.2.1 that: *"The Planning Inspectorate will identify the EEA States to be notified under Regulation 24 primarily on the basis of the type of NSIP, its location, and the nature of the receiving environment ... The Planning Inspectorate will exercise reasonable discretion to determine likely significant effects in another EEA State, based in part upon the information supplied by the applicant. In exercising this discretion and identifying that an NSIP is 'likely to have significant effects' on other EEA States, this should be taken as meaning that in the view of the Secretary of State there is a possibility or real risk, embodying a precautionary approach, that the development will have an effect, and not that a development will definitely have an effect"*.

5.5.1.6 The Advice Note sets out the procedure for screening, consulting and assessing transboundary issues. This involves the following broad steps, split into two stages:

Stage 1 (Pre-application)

- Applicant carries out consultation with EEA State(s) (as necessary);
- Applicant notifies PINS of EIA potentially requiring transboundary assessment;
- Applicant prepares initial matrix to identify potential significant effects on other EEA State(s);
- PINS undertakes transboundary screening for potential significant effects;
- PINS notifies other relevant EEA State(s), including London Gazette notice; and
- Other EEA State(s) notify PINS of wish to participate in consultation.

Stage 2 (Submission/ Post-Submission)

- Applicant submits application, including translated Non-technical Summary (NTS);
- PINS undertakes consultation with other relevant EEA State(s);
- Other EEA State(s) consult with their public and provide comments to PINS; and
- Consultation responses are taken account of by PINS in decision making process.

5.5.2 Approach to assessment of transboundary effects

Transboundary screening

5.5.2.1 The Applicant has notified PINS of the potential for transboundary impacts arising from Hornsea Three through the request for a Scoping Opinion. The identification and screening of transboundary impacts was presented in the Hornsea Three Scoping Report (DONG Energy (now Ørsted), 2016). A Transboundary Screening note was subsequently produced by PINS on the basis of the Hornsea Three Scoping Report. This document was published and disseminated to relevant EEA states by PINS in July 2017.

5.5.2.2 An update to the transboundary screening work undertaken at the scoping and PEIR stages is presented in volume 4, annex 5.4: Transboundary Impacts Screening Note of this Environmental Statement. This transboundary screening considers up to date project information, the transboundary screening undertaken by PINS, consultation responses from EEA states and the outcomes of the EIA.

5.5.2.3 Volume 4, annex 5.4: Transboundary Impacts Screening Note has identified that the following receptors may experience transboundary impacts from the proposed Hornsea Three:

- Fish and shellfish ecology (volume 2, chapter 3);
- Marine mammals (volume 2, chapter 4);
- Offshore ornithology (volume 2, chapter 5);
- Commercial fisheries (volume 2, chapter 6);
- Shipping and navigation (volume 2, chapter 7); and
- Socio-economics (volume 3, chapter 10).

Transboundary assessment

5.5.2.4 The assessment of transboundary effects for each receptor group is included in the relevant topic chapters of the Environmental Statement, taking into account the inter-relationships between effects. These assessments are based upon the screening undertaken by Hornsea Three and PINS (see above), though depart in certain instances where project information has developed or matured in the meantime, or consultation responses have provided further detail or direction. Please see specific topic chapters for further detail.

5.6 Inter-related effects

5.6.1 Inter-related effects guidance

5.6.1.1 The 2009 EIA Regulations (as amended) (Schedule 4 Part 1) require consideration of the inter-relationships between topics that may lead to environmental effects. For example, the separate impacts of noise and habitat loss may have an effect upon a single receptor such as marine mammals. The need to undertake such an assessment is emphasised in PINS' Scoping Opinion for Hornsea Three (PINS, 2016) which states that "*the Environmental Statement should not be a series of disparate reports*" and stressed the importance of considering inter-relationships between factors and cumulative impacts.

5.6.1.2 The approach presented in this Environmental Statement has been developed with specific regard to PINS Rochdale Envelope Advice Note (Advice Note Nine) (PINS, 2012) which states:

"Inter-relationships consider impacts of the proposals on the same receptor. These occur where a number of separate impacts, (e.g. noise and air quality), affect a single receptor such as fauna."

5.6.2 Approach to assessment of inter-related effects

5.6.2.1 The assessment of potential inter-related effects has been carried out concurrently considering two levels of potential effect:

- **Project lifetime effects:** effects that occur throughout more than one phase of the project (construction, operational and decommissioning) interacting to potentially create a more significant effect upon a receptor than if just assessed in isolation in a single phase; and
- **Receptor-led effects:** effects that interact spatially and/or temporally resulting in inter-related effects upon a single receptor. For example, the effect upon benthic habitat loss or disturbance may be greater when multiple sources of impact interact or combine to produce a different or greater effect upon this receptor than when single sources of impact are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

5.6.2.2 These elements are assessed separately within the offshore and onshore inter-related effects chapters, as described in the following paragraphs.

5.6.2.3 The assessment of inter-related effects within the Hornsea Three EIA process has been undertaken with specific reference to the potential for such effects to arise in relation to key receptors or receptor groups. A descriptive assessment is included outlining the potential for individual effects to combine, incorporating qualitative and, where reasonably possible, quantitative assessments, to potentially create additional effects that may be of greater significance than the individual effects acting in isolation.

5.6.2.4 The term 'receptor group' is used to highlight the fact that the proposed approach to inter-relationships assessment will, in the main, not assess every individual receptor assessed at the EIA stage, but rather potentially sensitive groups of receptors. The 'receptor groups' assessed include:

- Adjacent coastlines (physical processes assessment including wave regime, tidal regime, seabed sediment regime and seabed morphology);
- Benthic, subtidal and intertidal ecology;
- Fish and shellfish;
- Marine mammals;
- Sensitive ornithological receptors;
- Seascape and visual impact;
- Marine archaeology;
- Commercial fisheries;
- Infrastructure and other marine users;
- People living in dwellings within 350 m of construction activities (e.g. cable route, construction compounds, soil storage areas, cable crossings using trenchless technologies, access roads) and within 1 km of the onshore HVDC converter/HVAC substation and onshore HVAC booster station operational site(s);

- People using Public Rights of Way (PRoWs; and other linear routes such as the permissive path along the sea defences) within 350 m of construction activities (e.g. cable route, compounds, cable crossings using trenchless technologies, building construction side accesses and haul roads) and within 1 km of the onshore HVDC converter/HVAC substation and onshore HVAC booster station operational site(s); and
 - Non-seabird migrants with the potential to be affected by collision risk and other effects offshore and disturbance and displacement impacts within the intertidal and onshore area. The species in question are grey plover, knot, bar-tailed godwit, black tailed godwit, dunlin, golden plover, brent goose, Bewick's swan, shelduck, taiga bean goose and wigeon.
- 5.6.2.5 These receptor groups are further explained in the relevant inter-related effects chapters (volume 2, chapter 12: Inter-related Effects (Offshore) and volume 3, chapter 11: Inter-related Effects (Onshore).
- 5.6.2.6 In listing potential 'receptor groups', it should be recognised that for certain groups, the inter-related effects assessment will still need to be carried out on a specific receptor case. An example of this is marine mammals, whereby grouping species such as seals and harbour porpoises into a 'receptor group' may not be a valid approach, due to the differing sensitivities of both these species.
- 5.6.2.7 The approach for assessing the potential inter-related effects on each 'receptor group' follows the key steps below:
- Review of the Environmental Statement topic chapters undertaken to identify receptor groups requiring assessment and the likely effects on each receptor group;
 - Assessment undertaken on how individual effects may combine to create inter-related effects on each receptor group for:
 - During construction, operational and decommissioning phases (i.e. 'project lifetime effects'); and
 - Multiple effects on a single receptor (i.e. 'receptor-led effects').
- 5.6.2.8 Where the significance of an effect within the topic-specific assessment has been identified as 'no effect across all stages of the project', the assumption has been made that these effects can not contribute to any inter-related effects. In determining the boundaries of the inter-related assessment, these effects are omitted from the inter-related effects assessment due to there being no effect from Hornsea Three over the life time of the project.
- 5.6.2.9 It is important to note that the inter-relationships assessment considers only effects produced by Hornsea Three and not those from other projects (which are considered within the CEA).
- 5.6.2.10 Further detail on the approach and methodology for the inter-related effects assessment is available in the Inter-related Effects chapters of this Environmental Statement (volume 2, chapter 12 and volume 3, chapter 11).

5.7 References

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