AQUIND Limited

PEIR CHAPTER 11

Marine Ornithology

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11 MARINE ORNITHOLOGY

11.1 SCOPE OF ASSESSMENT

11.1.1 INTRODUCTION

11.1.1.1 This chapter provides the preliminary information regarding the environmental impacts on marine ornithology as a result of the Proposed Development.

11.1.1.2 This chapter considers information regarding the potential impacts on marine ornithological receptors associated with construction, operation (including repair and maintenance) and decommissioning of the Proposed Development. The potential effects of decommissioning are, in the worst case, considered to be equivalent to the effects associated with construction/installation and are assessed on this basis, though they may potentially be less than those associated with construction/installation depending on the decommissioning activities undertaken, for instance where the marine cable is left in situ.

11.1.1.3 Marine ornithological receptors present seaward of the MLWS are covered in this chapter. Terrestrial and intertidal ornithological receptors present landward of the MLWS are considered separately in Chapter 16 Ecology.

11.1.1.4 This chapter should be read in conjunction with Chapter 8 Intertidal and Benthic Ecology and Chapter 9 Fish and Shellfish which contain relevant information on prey species.

11.1.2 STUDY AREA

11.1.2.1 The Entire Marine Cable Corridor extends from Eastney, UK, to Pourville located on the Normandy coast of Northern France.

Landfall

11.1.2.2 For the purposes of this chapter the Landfall is defined as the HDD exit/entry location off the coast at Eastney, where cables will travel under the intertidal area, and the marine cables come ashore above MHWS as shown in Figure 3.3 in Chapter 3 Description of the Proposed Development.

11.1.2.3 Landfall for the purposes of this chapter also includes the section of HDD works that crosses underneath the north-west corner of Langstone Harbour as shown in Figure 3.9. Any of the onshore HDD works relating to this location is not include in this assessment.

11.1.2.4 For consideration of intertidal birds, a comprehensive description of the baseline methodology (including definition of the study area) and assessment of potential impacts is presented in Chapter 16 Ecology.

Marine Cable Corridor

11.1.2.5 The Marine Cable Corridor encompasses the location of the Landfall and extends from Eastney, from MHWS, out to the UK/France EEZ boundary line (see Figure 3.1. of Chapter 3 Description of the Proposed Development).

11.1.2.6 For marine birds, given their usually highly mobile nature, a study area of 100 km has been assumed, as birds occurring anywhere in this region could reasonably be expected to at least occasionally occur in the Marine Cable Corridor. Species originating from outside this study area are also considered where a clear ecological link could be established with the Proposed Development (Figure 11.1 and Figure 11.2).

11.1.2.7 For the purposes of assessment, this chapter focuses on the Landfall and Marine Cable Corridor within the UK marine area (as this comprises the Proposed Development). Where impacts arise as a result of the combination of the impacts of the Proposed Development and the impacts of projects in the UK marine area and/or other EEA states, these will also be identified and assessed.

11.2 LEGISLATION, POLICY AND GUIDANCE

11.2.1.1 This assessment has taken into account the current legislation, policy and guidance relevant to marine ornithology. These are listed below.

11.2.2 LEGISLATION

International Legislation

- EC Directive 2009/147/EC (codified version of 79/409/EC) on the Conservation of Wild Birds (the 'Birds Directive');
- EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (known as the Habitats Directive);
- The Conservation of Habitats and Species Regulations (2017) (known as the Habitats Regulations) which transpose the Habitats Directive into national law. This legislation covers waters within the 12 nmi limit (known as territorial waters);
- The Conservation of Offshore Marine Habitats and Species Regulations (2017) (known as the Offshore Regulations) which transpose the Habitats Directive into UK law for all offshore activities. This legislation covers UK waters beyond the 12 nmi limit; and
- Ramsar Convention on Wetlands of International Importance (1971).

National Legislation

- Wildlife and Countryside Act (1981);
- Marine and Coastal Access Act (2009); and
- NERC Act (2006).

11.2.3 PLANNING POLICY

National Policy

- EN-1 Overarching NPS for Energy (2011).
  - Para. 5.3.3 states: '*Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity. The applicant should provide environmental information proportionate to the infrastructure where EIA is not required to help the IPC consider thoroughly the potential effects of a proposed project*.'
- UK MPS (2011).
  - The UK MPS is the framework for preparing Marine Plans and taking decisions affecting the marine environment. This policy aims to contribute to the achievement of sustainable development and ensure that development aims to avoid harm to marine ecology and biodiversity through consideration of issues such as impacts of noise, ecological resources and water quality.

Regional Policy

South Inshore and South Offshore Marine Plan (2018) including:

- Objective 10 includes policies to avoid, minimise or mitigate adverse impacts on marine protected areas;
- Objective 12 includes policies to avoid, minimise or mitigate significant adverse impacts on natural habitat and species; and
- Policy S-DIST – 1 requires proposals to avoid, minimise or mitigate significant cumulative adverse disturbance or displacement impacts on highly mobile species.

Local Policy

- The Hampshire Local Biodiversity Action Plan ('LBAP').

11.2.4 GUIDANCE

- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine;
- IEMA (2017) Delivering Proportionate Environmental Impact Assessment (EIA): A Collaborative Strategy for Enhancing UK Environmental Impact Assessment Practice;
- OSPAR (2009) Assessment of the Environmental Impacts of Cables.

11.3 SCOPING OPINION AND CONSULTATION

11.3.1 SCOPING OPINION

11.3.1.1 As detailed within Chapter 1 Introduction, a Scoping Opinion was received by the Applicant from PINS in December 2018. The Scoping Opinion comments from PINS in relation to marine ornithology and how they have been addressed in this chapter of the PEIR are set out below in Table 11.1.

Table 11.1 - Scoping Opinion responses

Consultee	Scoping Opinion Section/ID	Summary of Comment Received	How this has been addressed by the Applicant
PINS	4.6.1	On the basis that there are no Marine Conservation Zones ('MCZs'), recommended, proposed, or designated for ornithological features within the Zone of Influence ('ZoI') from the Proposed Development, the Inspectorate agrees that this matter can be scoped out.	MCZs are not considered further in relation to marine ornithology.
PINS	4.6.2	The Scoping Report identifies that chemical and fuel spills would be unplanned by nature and that pollution prevention measures would be in place to mitigate this. It is currently unclear what these measures would comprise and how they would be secured. In absence of the detail relating to these measures the Inspectorate considers that impacts resulting from exposure to surface hydrocarbons or chemicals from accidental spills should be assessed where significant effects are likely.	Potential impacts arising from exposure to surface hydrocarbons or chemicals from accidental spills have been scoped back in for assessment and are considered in Section 11.6 in relation to marine ornithology.

Consultee	Scoping Opinion Section/ID	Summary of Comment Received	How this has been addressed by the Applicant
PINS	4.6.3	The Inspectorate agrees that given the nature of the Proposed Development and the largely temporary nature of the impacts during construction, barrier effects on intertidal and marine ornithology can be scoped out of the Environmental Statement ('ES').	Potential barrier effects are not considered further in relation to marine ornithology (see Chapter 16 – Ecology for intertidal ornithology).
PINS	4.6.4	The Inspectorate agrees that given the nature of the Proposed Development collision risk to intertidal and marine ornithology can be scoped out of the ES.	Potential collision risk is not considered further in relation to marine ornithology (see Chapter 16 – Ecology for intertidal ornithology).
PINS	4.6.5	The Inspectorate notes the use of a 100 km initial search area for the seabird baseline and the potential for this to be widened where clear ecological links exist. The maximum foraging ranges of seabird species have also been noted in Table 11.1, some of which travel distances greater than 100 km. The ES should clearly present and justify the study area(s) applied to the intertidal and marine ornithology assessment for all receptor types. The ES should also include clear figures showing the	The study area applied to the marine ornithology assessment is presented in Sections 11.1 and 11.5. The location of designated sites considered in the marine ornithology assessment are shown on Figure 11.1 and Figure 11.2. See Chapter 16 – Ecology for intertidal ornithology.

Consultee	Scoping Opinion Section/ID	Summary of Comment Received	How this has been addressed by the Applicant
		location of designated sites considered in the impact assessment in relation to the Proposed Development.	
PINS	4.6.6	Chapter 11 of the Scoping Report implies that the Alderney West Coast and Burhou Islands Ramsar will be considered in the Habitats Regulations Assessment ('HRA') report, alongside the ecological impact assessment. However, Chapter 17 states that effects on this site are unlikely to be significant. The ES should provide a sufficient justification based on objective evidence to support the conclusions made in respect of European sites, both within the UK and in other European Economic Area ('EEA') States/Crown dependencies, where significant effects are likely.	A HRA Report will be submitted as part of the DCO application, in which likely significant effects on the Alderney West Coast and Burhou Islands Ramsar will be considered.
PINS	4.6.7	The Inspectorate notes that intertidal ornithological surveys have been undertaken; however, the Scoping Report contains limited information regarding the survey methodology, including the location of the vantage	See Chapter 16 – Ecology for intertidal ornithology.

Consultee	Scoping Opinion Section/ID	Summary of Comment Received	How this has been addressed by the Applicant
		points. This information should be clearly presented in the ES. It is recommended the Applicant seek to agree the scope and adequacy of these surveys with relevant consultation bodies.	
PINS	4.6.8	The Inspectorate notes the summary numbers of protected bird species and species of conservation concern recorded on or over the landfall site during the wintering bird surveys. The ES should provide the survey results and clearly identify the species considered in the impact assessment.	See Chapter 16 – Ecology for intertidal ornithology.
PINS	4.6.9	The Inspectorate notes that the list of qualifying features for Chichester and Langstone Harbour Special Protection Area ('SPA') is incomplete. The ES and/or information to inform HRA report should correctly identify and consider likely significant effects on all qualifying features of a European site where this is being considered.	Those qualifying features with potential connectivity to the Proposed Development are considered further in relation to marine ornithology in this chapter. A HRA Report will be submitted as part of the DCO application, in which likely significant effects on the Chichester and Langstone Harbour Special Protection Area SPA will be considered.

Consultee	Scoping Opinion Section/ID	Summary of Comment Received	How this has been addressed by the Applicant
PINS	4.6.10	Reference is made to further detail on intertidal ornithology to be included in Chapter 19 (Ecology (with arboriculture)). The ES should avoid duplication but include clear cross-referencing between relevant aspect chapters.	See Chapter 16 – Ecology for intertidal ornithology.
Natural England	Appendix 2, p.225	Government Circular 06/2005 states that Biodiversity Action Plan (BAP) species and habitats '*are capable of being a material consideration…in the making of planning decisions'*. Natural England therefore advises that survey, impact assessment and mitigation proposals for Habitats and Species of Principal Importance should be included in the ES. Consideration should also be given to those species and habitats included in the relevant Local BAP ('LBAP').	Where relevant, consideration has been given to species listed under Section 41 of the Natural Environment and Rural Communities ('NERC') Act (2006) and the Hampshire LBAP.
Natural England	Appendix 2, p.226	Natural England supports the consideration of the following impacts on intertidal and marine ornithology which have been scoped in for further assessment:	Potential impacts arising from disturbance and displacement, and indirect effects as a consequence of prey disturbance and/or habitat loss are considered in Section 11.6 of this chapter for marine ornithology.

Consultee	Scoping Opinion Section/ID	Summary of Comment Received	How this has been addressed by the Applicant
		Disturbance and displacement from installation plant and support vessels; and Indirect effects as a consequence of prey disturbance and/or habitat loss.	See Chapter 16 – Ecology for intertidal ornithology.
Natural England	Appendix 2, p.227	Natural England has noted that the following impacts on intertidal and marine ornithology have been scoped out of further assessment: Exposure to surface hydrocarbons or chemicals due to accidental spills; Barrier effects; and Collision risk	Potential impacts arising from exposure to surface hydrocarbons or chemicals from accidental spills in relation to marine ornithology have been scoped back in for assessment following PINS advice and are considered in Section 11.6 of this chapter. Potential impacts arising from barrier effects and collision are not considered further in relation to marine ornithology. See Chapter 16 – Ecology for intertidal ornithology.
Natural England	Appendix 2, p.226	Paragraph 11.3.16 on page 143: the list of SPA features is incomplete. For the full list please visit our Designated Sites View website.	Those qualifying features with potential connectivity to the Proposed Development are outlined in relation to marine ornithology in Section 11.5 of this chapter. See Chapter 16 – Ecology for intertidal ornithology. A HRA Report will be submitted as part of the DCO application, in which likely significant effects on designated sites will be considered.

Consultee	Scoping Opinion Section/ID	Summary of Comment Received	How this has been addressed by the Applicant
Natural England	Appendix 2, p.228	We recommend the inclusion of a separate section of the ES to address impacts upon European and Ramsar sites entitled 'Information for Habitats Regulations Assessment'	A standalone HRA Report will be submitted as part of the DCO application, in which likely significant effects on designated sites will be considered.
Natural England	Appendix 2, p.228	The ES should include a full assessment of the direct and indirect effects of the proposal on Sites of Special Scientific Interest ('SSSIs') and should identify such mitigation measures as may be required in order to avoid, minimise or reduce any adverse significant effects.	Those notified features with potential connectivity to the Proposed Development are outlined in relation to marine ornithology in Section 11.5 of this chapter and are considered in the impact assessment presented in Section 11.6 where relevant.
Natural England	Appendix 2, p.232	The ES should include an impact assessment to identify, describe and evaluate the effects that are likely to result from the project in combination with other projects and activities that are being, have been or will be carried out.	Potential cumulative impacts on marine ornithology are assessed in Section 11.6 in this chapter following PINS Advice Note 17. Potential in-combination impacts on designated sites will be considered within a HRA Report, to be submitted as part of the DCO application. See Chapter 16 – Ecology for intertidal ornithology.

11.3.2 CONSULTATION

11.3.2.1 Consultation is a key part of the DCO application process. Further consultation will be undertaken after views have been sought on the PEIR, including as part of further pre-application engagement and following submission of the DCO application. A summary of the consultation undertaken with Natural England for the marine ornithology assessment to date is detailed in Table 11.2 below.

Table 11.2 - Natural England consultation responses

Date (Method of Consultation)	Discussion	Summary of Outcome of Discussions
Consultation on Horizontal Directional Drilling ('HDD') methods in Langstone Harbour (teleconference and emails_16/07/2018)	Natural England agrees that HDD is a preferred method for this type of construction as it can reduce environmental impacts in some cases. Natural England recognised that Langstone Harbour possesses the full suite of designations and as such, features such as those (but not limited to) below will need to be given consideration: - Grasslands - Lagoons - Strandline communities - Saltmarsh - Seagrass - Mudflats - Native Oyster - Overwintering birds (noise and visual impacts) If the HDD entry and exit holes are anywhere near the marine environment that may directly affect the marine environment then Natural England would generally require survey work to be undertaken. However, as the HDD compound and exit and entry holes will be above MHWS (and as pollution prevention measures should be in place in the HDD	Langstone Harbour designations will be considered as part of the DCO application. See Chapter 16 – Ecology for intertidal ornithology. Baseline wintering bird surveys have been undertaken in the intertidal region to inform the intertidal ornithology assessment.

Date (Method of Consultation)	Discussion	Summary of Outcome of Discussions
	compound above MHWS) then Natural England has advised that it would not be proportionate to ask for surveys, but that consideration to the designated features/habitats of Langstone Harbour can be undertaken by desk based assessment using datasets available in the public domain.	

11.3.2.2 Full details of project consultation undertaken to date and planned future consultation for all disciplines is presented within Chapter 5 - Consultation.

11.4 METHODS OF ASSESSMENT

11.4.1.1 The assessment methodology used for marine ornithology will follow that recommended by CIEEM for marine and coastal developments (CIEEM, 2018). These guidelines set out the process for assessment through the following stages:

- Describing the ornithological baseline within the study area;
- Identifying Important Ornithological Features ('IOFs'): these are the species of highest ornithological importance present in the study area;
- Determining the nature conservation importance of the IOFs present within the study area that may be affected by the Proposed Development;
- Identifying and characterising the potential impacts on these IOFs, based on the nature of the construction, operation, maintenance and decommissioning activities associated with the Proposed Development;
- Determining the magnitude of the impacts including consideration of the sensitivity of the ornithological feature and the duration and reversibility of the effect;
- Determining the significance of the impacts based on the interaction between the effect magnitude/duration, the likelihood of the effect occurring and the nature conservation importance of the IOF. In addition, the sensitivity of the feature affected is also considered for potential ornithological impacts;
- Identifying the counter effect of any embedded mitigation measures to be undertaken, plus any further mitigation measures that may be implemented in order to address significant adverse effects;
- Determining the residual impact significance after the effects of mitigation have been considered; and
- Assessing cumulative effects (with mitigation where applicable).

11.4.2 EVALUATING FEATURES

11.4.2.1 The assessment process involves identifying IOFs. These ornithological features and their importance are determined by the criteria defined in Table 11.3. These criteria are intended as a guide and are not definitive.

Table 11.3 - Approach to valuing ornithological features

Level of Importance	Example of IOF
International	A species listed as a qualifying feature of an internationally designated site (e.g. SPA or Ramsar)
	Species populations present with sufficient conservation importance to meet criteria for SPA selection
National	A species listed as a notified feature of a nationally designated site (e.g. SSSI).
	Species populations present with sufficient conservation importance to meet criteria for SSSI selection.
Regional	A species occurring within SPAs, Ramsar sites and SSSIs, but not crucial to the integrity of the site.
	Species populations present falling short of SSSI selection criteria but with sufficient conservation importance to likely meet criteria for selection as a local site.
Local	All species described above but which are present very infrequently or in very low numbers.
	Other species of conservation concern, including species included on the UK Bird of Conservation Concern ('BoCC') Red and Amber Lists (Eaton *et al*., 2015).
Negligible	All other species that are widespread and common and which are not present in locally important (or greater) numbers and which are considered to be of low conservation concern (e.g. UK BoCC Green List species; Eaton *et al*., 2015).

11.4.2.2 The assessment of ornithological features identified in the baseline considers the importance of the Proposed Development for the species under consideration. To illustrate the rationale of this approach, whilst roseate tern (*Sterna dougallii*) may be considered to be a species of international conservation importance using the criteria in Table 11.3, by virtue of being an Annex I species, the importance of a development site to this species is considered limited if only a single sighting of one bird over-flying the Proposed Development has been identified in the baseline.

11.4.2.3 As such, while the importance of the species is taken into account, in order to assess the nature conservation importance of the Proposed Development the number of individuals of that species using it, and the nature and level of this use, is also taken into account. An assessment is then made of the importance of the Proposed Development to the species in question.

11.4.3 CHARACTERISING POTENTIAL EFFECTS

11.4.3.1 Effects on IOFs are judged in terms of magnitude and duration (Regini, 2000).

11.4.3.2 Magnitude refers to the size of an impact and is determined on a quantitative basis where possible. This may relate to the area of habitat lost to the development footprint in the case of a habitat feature or predicted loss of individuals in the case of a population of a particular species of bird. Magnitude is assessed within six levels, as detailed in Table 11.4 (including effects referred to as 'beneficial').

Table 11.4 - Criteria used to determine the magnitude of impacts

Impact Magnitude	Description
Very highly adverse	Total or almost complete loss of an ornithological feature resulting in a permanent adverse effect on the integrity of this feature. The conservation status of the ornithological feature would be affected.
Highly adverse	Result in large-scale, permanent changes in an ornithological feature, and likely to change its ecological integrity. These impacts are therefore likely to result in overall changes in the conservation status of the feature.
Moderately adverse	Include moderate-scale long-term changes in an ornithological feature, or larger-scale temporary changes, but the integrity of the feature is not likely to be affected. This may mean that there are temporary changes in the conservation status, but these are reversible and unlikely to be permanent.
Minor adverse	Include impacts that are small in magnitude, have small-scale temporary changes, and where integrity is not affected. These impacts are unlikely to result in overall changes in the conservation status of an ornithological feature.
Negligible	No perceptible change in the ornithological feature.
Beneficial	The changes in the ornithological feature are considered to be beneficial to its integrity or nature conservation status.

11.4.3.3 Duration is defined as the time for which the impact is expected to last before recovery, i.e. a return to baseline conditions. This is summarised in Table 11.5 below.

Table 11.5 - Criteria used for describing duration

Duration	Description
Permanent	Effects continuing indefinitely beyond the span of one human generation (taken as approximately 25 years), except where there is likely to be substantial improvement after this period (e.g. the restoration of ground after removal of a development. Such exceptions are termed “very long-term effects”)
Temporary	Long term (15 - 25 years or longer - see above) Medium term (5 – 15 years) Short term (up to 5 years)

11.4.3.4 Knowledge of how rapidly the population or performance of a species is likely to recover following loss or disturbance (e.g. by individuals being recruited from other populations elsewhere) is used to assess duration, where such information is available.

11.4.3.5 In addition to magnitude and duration, birds are assessed with consideration to their behavioural sensitivity and ability to recover from temporary adverse conditions. Behavioural sensitivity is determined subjectively based on the species’ ecology and behaviour, using the broad criteria set out in Table 11.6. The judgement takes account of information available on the responses of birds to various stimuli (e.g. predators, noise and disturbance by humans).

11.4.3.6 Behavioural sensitivity can differ between similar species and between different populations of the same species. Thus, the behavioural responses of birds are likely to vary with both the nature and context of the stimulus and the experience of the individual bird. Sensitivity also depends on the activity of the bird, for example, a species is likely to be less tolerant of disturbance whilst breeding than at other times. In addition, individual birds of the same species will differ in their tolerance depending on the level of human disturbance that they regularly experience in a particular area, and have become habituated to (e.g. individuals that forage in proximity to an area with high human population and activity levels are likely to have a greater tolerance than those that occupy remote locations with little or no human presence).

Table 11.6 - Behavioural sensitivity for birds

Duration	Description
High	Species or populations occupying habitats remote from human activities, or that exhibit strong and long-lasting (guide: > 20 minutes) reactions to disturbance events.
Moderate	Species or populations that appear to be warily tolerant of human activities or exhibit short-term reactions (guide: 5-20 minutes) to disturbance events.
Low	Species or populations occupying areas subject to frequent human activity and exhibiting mild and brief reaction (including flushing behaviour) to disturbance events.

11.4.4 DETERMINING SIGNIFICANCE

11.4.4.1 Having followed the process of attributing an importance to an ornithological feature, determining its sensitivity, and characterising potential effects, the significance of the effect is then determined. The CIEEM guidelines (2018) use only two categories to classify effects: “significant” or “not significant”. The significance of an effect is determined by considering the importance of the ornithological feature and the magnitude of the effect and applying professional judgement as to whether the integrity of the feature will be affected. This concept can be applied to both designated sites (for example, an SPA) and to defined populations (for example, a breeding herring gull (*Larus argentatus*) population).

11.4.4.2 The term integrity is used here in accordance with the definition adopted by the Office of the Deputy Prime Minister (‘ODPM’) Circular 06/2005 on Biodiversity and Geological Conservation whereby designated site integrity refers to “…*coherence of ecological structure and function…that enables it to sustain the habitat, complex of habitats and/or levels of populations of species for which it was classified*”. Integrity therefore, refers to the maintenance of the conservation status of a population of a species at a specific location or geographical scale.

11.4.4.3 Effects are more likely to be considered significant where they affect ornithological features of higher conservation importance or where the magnitude of the effect is high. Effects not considered to be significant would be those where the integrity of the feature is not threatened, effects on features of lower conservation importance, or where the magnitude of the effect is low.

11.4.4.4 In this assessment, an effect that threatens the integrity of an ornithological feature is considered to be significant. Effects that do not threaten the integrity of a feature are considered as not significant. Alongside the criteria described above, professional judgement is applied in determining the significance of a potential effect.

11.4.4.5 Embedded mitigation and, where appropriate, additional mitigation measures will be identified and described where they will avoid, reduce and/ or compensate for potentially significant effects. This includes avoidance through the design process. It is also good practice to propose mitigation measures to reduce negative effects that are not significant.

11.4.4.6 The significance of residual effects on receptors after the effects of mitigation have been considered can then be determined, along with any monitoring requirements.

11.4.4.7 Note that a matrix system has not been used in determining significance. CIEEM (2018) avoid and discourage the use of this approach. This guidance seeks to determine whether an effect is either significant or not significant by looking at the integrity of the wider population. The CIEEM guidance does not advocate the allocation of degrees of significance, but instead concentrates upon the effect that any impact may have upon the integrity of an affected population.

11.4.4.8 Therefore, if an impact is considered to be of a scale that is unlikely to exert an effect upon the population integrity, it is considered to be not significant. The assessment includes potential impacts on each ornithological feature determined as 'important' from all phases of the Proposed Development (e.g. construction, operation, repair/maintenance and decommissioning) and considers direct, indirect, secondary and cumulative impacts and whether the impacts and their effects are short, medium, long-term, permanent, temporary, reversible, irreversible, beneficial and/or adverse.

11.4.5 LIMITATIONS

11.4.5.1 This chapter provides preliminary information as it relates to the Proposed Development to date and to data currently available at this point of the assessment process.

11.4.5.2 The information presented within Chapter 3 Description of the Proposed Development presents the most recent emerging information on the most likely construction methods for the Proposed Development. As the design and construction methods for the Proposed Development were still evolving at the time of writing of this chapter, not all of the proposed construction methods have been assessed. Accordingly, assessments within this chapter do not consider the following methods described in Chapter 3 Description of the Proposed Development;

- Use of flotation pits to enable installation vessels to approach closer to shore;
- Grounding of installation vessels on the seabed at low tide;
- Use of a TSHD vessel to create the trench for pre-lay installation; and
- Sheet piling at the HDD onshore exit/entry points.

11.4.5.3 In addition, whilst there is currently insufficient information on predicted suspended sediment levels to inform a full assessment, qualitative assessments have been undertaken for Chapter 8 Intertidal and Benthic Ecology and Chapter 9 Fish and Shellfish. Based on current existing data and preliminary information these chapters conclude that potential impacts on benthic habitats and species, and fish and shellfish are not expected to be significant.

11.4.5.4 The information contained herein is intended to inform consultation responses at this stage. A more detailed assessment of potentially significant impacts as a result of the final design and construction methods of the Proposed Development on identified sensitive receptors will be undertaken at subsequent stages to inform the ES.

11.4.5.5 A HRA Report will also be produced and presented as part of the final application. The HRA will follow the stepwise process outlined in PINS Advice Note 10 - Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects.

11.5 BASELINE ENVIRONMENT

11.5.1.1 This section presents the baseline results for the Landfall and Marine Cable Corridor in relation to the Proposed Development.

Desk-Based Review

11.5.1.2 It is considered that given the nature of the Proposed Development and construction works, that a proportionate assessment is undertaken following CIEEM (2018)[1], and that desk-based review will be sufficient. Current information on aspects of seabird and inshore waterfowl presence and ecology (such as foraging ranges and behaviour) has been collated to determine the likely key species within the Marine Cable Corridor requiring assessment. A variety of data sources were examined in order to characterise the baseline for marine ornithology and inform the assessment. Those considered most relevant to the Proposed Development are listed in Table 11.7 below.

[1] CIEEM (2018) state that the level of the Ecological Impact Assessment ('EcIA') required should be "*proportionate to the scale of the development and the complexity of its potential impacts*".

Table 11.7 – Data source

Organisation	Data Type	Details
South Coast Regional Environmental Characterisation ('REC')	James *et al.*, (2010) drew on a range of published information to characterise the seabird community present in the South Coast REC. The South Coast REC encompasses the Proposed Development.	Data sources included at-sea aerial surveys in the central Channel carried out in winter (October–March) 2007/2008 and summer (May–August) 2008 (WWT, 2009).
Rampion OWF	Environmental Statement Section 11 – Marine Ornithology (RSK, 2012). Rampion OWF is located 13 km off the coast of Sussex, to the east of the Proposed Development.	Baseline boat-based surveys were undertaken over an area of 1,076 km^2 around the OWF, whilst aerial surveys were also undertaken over a similar geographic area, covering some 1,100 km^2. Boat-based surveys were undertaken on a monthly basis between March 2010–February 2012, with aerial surveys undertaken on a monthly basis between August 2010 and August 2011.
Navitus Bay Wind Park	Environmental Statement Chapter 12 – Offshore Ornithology (Navitus Bay Wind Park, 2014). Baseline Offshore Ornithological Assessment for the Navitus Bay Wind Park project (APEM, 2013). The proposed Navitus Bay Wind Park was located 14 km off the coast of Dorset (south-west of the Isle of	Baseline boat-based surveys were undertaken over 24 months (December 2009–November 2011) with additional boat-based surveys in spring and autumn of 2011 for migrants. Aerial surveys were undertaken between November 2009–February 2010, and January–March 2011.

Organisation	Data Type	Details
	Wight) west of the Proposed Development.	
L'Agence Française pour la Biodiversité ('AFB')	The SAMM (Aerial Monitoring of Marine Megafauna) Campaign (Pettex *et al*., 2014; Pettex *et al*., 2017).	All French territorial waters were surveyed using a visual aerial survey method during two survey campaigns: winter 2011/12 and summer 2012. The raw data were modelled to create density surface maps.
JNCC	Seabird 2000 Census (Mitchell *et al.*, 2004).	Seabird 2000 was the third complete census of the entire breeding seabird population of Britain and Ireland. An update to this is census is currently ongoing with the results not yet publicly available.
	European Seabirds at Sea ('ESAS') Database (Stone *et al*., 1995).	Major atlas presents a comprehensive assessment of seabirds in north-west European waters and comes from a collaboration between several countries. Data were collected from 1979 to 1994 and have been used to describe the seasonal distribution and abundance of over 50 species of seabird.
	JNCC Coastal Directories Project: Region 8 Sussex: Rye Bay to Chichester Harbour (Barne *et al*., 1998) and Region 9: Southern England: Hayling Island to Lyme Regis (Barne *et al*., 1996).	The JNCC's Coastal Directories project, collated extensive baseline environmental and human use information, including fisheries, for the coastal and nearshore marine zone of the whole of the UK.
	JNCC Reports No. 431 and No. 461 (Kober *et al*., 2010; Kober *et al*., 2012).	Between January 2007 and October 2011 the JNCC undertook a series of analyses to inform the identification of possible marine SPAs in the UK based on data in the ESAS database.

Organisation	Data Type	Details
Natural England	Technical Information Notes ('TINs'): Species Information for Marine Special Protection Area Consultations (Natural England, TIN 135, 136, 138 and 139).	Information and guidance notes on scientific and technical issues, including practical advice.
	Designated Sites View website.	Site- and species-based conservation advice and advice on operations.
British Trust for Ornithology ('BTO')	Wetland Bird Survey ('WeBS') peak count data for the Portsmouth region (Frost *et al*., 2018).	WeBS is the principal scheme for monitoring wintering waterbird populations in the UK.
Wakefield *et al*., (2013); Warwick-Evans *et al*., (2016)	Tracking data from gannets breeding on Les Etacs, Alderney	Tracking data has been gathered over a number of years at this colony (Les Etacs: 2011-2015) and are summarised in peer-reviewed papers.

11.5.1.3 The marine bird communities characterised for Rampion OWF and Navitus Bay Wind Park, in addition to those characterised for the South Coast REC, are considered to be broadly representative of the bird community present within the Proposed Development.

11.5.2 DESIGNATED SITES

11.5.2.1 SPAs are sites of international nature conservation importance designated under the EC Birds Directive, which afford statutory protection for both bird species and their habitats. SPAs are usually comprised of one or more constituent SSSIs. In addition, Ramsar sites are Wetlands of International Importance, whose boundaries are often the same as those of SPAs.

11.5.2.2 Six international statutory sites designated for ornithological features were identified as having potential connectivity to the Proposed Development during scoping (Figure 11.1). Connectivity was established using maximum foraging range values (representing a worst-case scenario) published in Thaxter *et al*., (2012). Table11.8 provides an overview of these sites and their qualifying features for the purposes of identifying IOFs.

11.5.2.3 A detailed description of all relevant SPAs and proposed SPAs ('pSPA') and the species contributing to their designation will be provided in an HRA Report, which will include any relevant sites outside the UK.

Table 11.8 - SPAs/pSPAs and Ramsars designated for marine ornithology with connectivity to the Proposed Development

Designated Site	Distance from Proposed Development (minimum) (km)	Species*	Population (number of breeding pairs)*
Solent and Dorset Coast pSPA	0**	Sandwich tern (*Thalasseus sandvicensis*)	441
		Common tern (*Sterna hirundo*)	492
		Little tern (*Sternula albifrons*)	63
Chichester and Langstone Harbours SPA/Ramsar	0.1	Little tern	49
		Common tern	126
		Sandwich tern	93
		Red-breasted merganser (*Mergus serrator*)	206 individuals***
Portsmouth Harbour SPA/Ramsar	4.9	Red-breasted merganser	100 individuals†
Solent and Southampton Water SPA/Ramsar	6.6	Little tern	49
		Sandwich tern	231

Designated Site	Distance from Proposed Development (minimum) (km)	Species*	Population (number of breeding pairs)*
		Common tern	267
		Roseate tern (*Sterna dougallii*)‡	2
		Mediterranean gull (*Larus melanocephalus*)	2
Pagham Harbour SPA/Ramsar	9.5	Little tern	14
		Common tern	149
Alderney West Coast and Burhou Islands Ramsar	142.1	Gannet (*Morus bassanus*)	5,950
		Storm petrel (*Hydrobates pelagicus*)	100
		Lesser black-backed gull (*Larus fuscus*)	273
		Puffin (*Fratercula arctica*)	180

*Only those designated features with potential connectivity to the Proposed Development are shown. Connectivity was established using maximum foraging range values from Thaxter *et al.*, (2012).
**The Proposed Development passes through the Solent and Dorset Coast pSPA.
***Five year mean peak (1982/83-1986/87) at classification.
†Five year mean peak (1986/87 to 1990/91) at classification.
‡ Roseate tern no longer breed in this SPA (Holling *et al.*, 2018).

11.5.2.4 In addition, seven SSSIs notified for breeding seabirds and inshore wintering waterfowl were also identified as having potential connectivity to the Proposed Development during scoping (Figure 11.2). These sites, together with their notified features, are outlined in Table 11.9.

Table 11.9 - SSSIs designated for marine ornithology with connectivity to the Proposed Development

SSSI	Distance from Proposed Development (minimum) (km)	Species
Langstone Harbour	0.1	Little tern
		Common tern
		Sandwich tern
		Red-breasted merganser
Chichester Harbour	4.4	Little tern
		Common tern
		Sandwich tern
North Solent	18.7	Sandwich tern
		Common tern
		Black-headed gull (*Chroicocephalus ridibundus*)
Newtown Harbour	24.1	Sandwich tern
		Common tern
		Black-headed gull
Hurst Castle to Lymington River Estuary	29.2	Sandwich tern
		Common tern
		Black-headed gull
Brighton to Newhaven Cliffs	35.8	Kittiwake (*Rissa tridactyla*)
		Fulmar (*Fulmarus glacialis*)
		Herring gull

SSSI	Distance from Proposed Development (minimum) (km)	Species
Seaford to Beachy Head	40.7	Fulmar

11.5.3 MARINE ORNITHOLOGY BASELINE

11.5.3.1 Overall abundance of seabirds and inshore wintering waterfowl in UK waters within the Channel is relatively low (Wakefield *et al*., 2017), with numbers not reaching the necessary thresholds to qualify for marine SPA designation under the Birds Directive (Kober *et al*., 2010, 2012). However, species diversity is high and the Channel is an important area during migration with an estimated 1 to 1.3 million seabirds flying through the Strait of Dover during spring and autumn (Steinen *et al*., 2007). Furthermore, whilst there is little suitable habitat for cliff-nesting seabirds in the study area surrounding the Marine Cable Corridor, there are a number of nationally and internationally important tern and gull colonies present on the sand and shingle beaches, saltmarshes and offshore islets of the southern English coastline. A number of nationally important estuarine and coastal wintering sites are also present for inshore wintering waterfowl.

11.5.3.2 The following sections utilise the data sources identified in Table11.7 to characterise the baseline environment for key species.

Seaducks

11.5.3.3 Seaduck species including common scoter (*Melanitta nigra*; Schedule 1; BoCC Red List; NERC Species of Principal Importance) and eider (*Somateria mollissima*; BoCC Amber List) are known to be present in the South Coast REC (James *et al*., 2010). These species feed on shellfish on the seabed, and are thus dependent on benthic habitats for food. Both common scoter and eider show a strong preference for sandy substrates and shallow waters, so estuary mouths and large bays with sandbanks and shallows are preferred by large flocks (Natural England, 2012).

11.5.3.4 Whilst common eider are present along the UK coastline year-round, common scoter migrate south-west through the Channel in autumn after moulting in the Baltic and eastern North Sea, returning northward in the spring (Wernham *et al*., 2002).

11.5.3.5 Barne *et al*, (1998) state that common scoters are most abundant off Rye Harbour during the winter.

11.5.3.6 James *et al*., (2010) state that only a small number of seaduck observations were recorded during aerial surveys undertaken in 2007 and 2008, although these species may have been underestimated during surveys.

11.5.3.7 Surveys undertaken more recently for the Rampion OWF recorded a peak of 73 common scoters during boat-based surveys, and 210 using aerial surveys (RSK 2012).

11.5.3.8 An estimated 1,564 common scoters were considered to pass through the Navitus Bay Wind Park during spring and autumn, based on the outputs of a migration modelling tool (Navitus Bay Wind Park, 2014), with a significant easterly movement in April (Natural England, 2012).

Divers, grebes and mergansers

11.5.3.9 Divers, grebes and mergansers were reported to be present in the South Coast REC during winter 2007-2008 (James *et al*., 2010) and may therefore occur in the Marine Cable Corridor.

11.5.3.10 Great northern diver (*Gavia immer*; BoCC Amber List), black-throated diver (*Gavia arctica*; BoCC Amber List) and red-throated diver (*Gavia stellata*) all occur in inshore waters of the Channel during the winter, albeit in relatively low abundance. These species are all listed on Annex I of the Birds Directive and Schedule 1 of the Wildlife and Countryside Act (1981). Within the South Coast REC, the majority of diver records were off the east of Brighton (James *et al*., 2010). Relatively low numbers were recorded, with 171 noted in winter and two birds recorded during summer 2008.

11.5.3.11 Low numbers of diver species were also recorded during baseline surveys undertaken for proposed offshore wind farms. A peak of 91 red-throated divers was recorded during boat-based surveys undertaken for the Rampion OWF in 2010-12, with seven recorded during aerial surveys. At Navitus Bay Wind Park, a single black-throated diver was recorded during a boat-based survey in December 2009.

11.5.3.12 Grebe species (including great crested grebe (*Podiceps cristatus*), black-necked grebe (*Podiceps nigricollis*; Schedule 1; BoCC Amber List), red-necked grebe (*Podiceps grisegena*; BoCC Red List) and Slavonian grebe (*Podiceps auritus*; Annex I; Schedule 1; BoCC Red List)) and red-breasted merganser species are also present in inshore waters of the Channel during the non-breeding season.

11.5.3.13 In particular, there is an over-wintering population of Slavonian grebe which utilises the Sussex coast, with nationally important numbers wintering in Pagham Harbour (20-25 individuals; Barne *et al*., 1998), and there are known black-necked grebe wintering sites in Langstone Harbour and Poole Harbour (Barne *et al*., 1996; RSPB, 2009). Nationally important numbers of red-breasted merganser are known to winter at Chichester, Langstone and Portsmouth Harbours. Frost *et al*., (2018) state that a five year mean peak of 87 red-breasted merganser (2012/13-2016/17) has also been present at Portsmouth Harbour, with numbers peaking in February.

11.5.3.14 Neither RSK (2012) nor Navitus Bay Wind Park (2014) report grebe species as having been recorded during baseline surveys. Two red-breasted mergansers were recorded during baseline surveys at Navitus Bay Wind Park; one in April 2011 and one in November 2011, with none reported at Rampion OWF.

Fulmar, shearwaters and petrels

11.5.3.15 These fully marine birds spend the majority of their existence at sea feeding on fish and crustacea (pelagic zooplankton), in addition to scavenging fishery discards.

11.5.3.16 Three species were recorded in aerial surveys of the South Coast REC (James *et al*., 2010): fulmar (BoCC Amber List), Manx shearwater (*Puffinus puffinus*; BoCC Amber List) and storm petrel (Annex I; BoCC Amber List). However, baseline surveys undertaken for Navitus Bay Wind Park and Rampion OWF also reported low numbers of Balearic shearwater (*Puffinus mauretanicus*; Annex I; BoCC Red List; NERC Species of Principal Importance) passing through the region during migration (e.g. a peak of four birds during autumn at Navitus Bay; Navitus Bay Wind Park, 2014).

11.5.3.17 Fulmar have been observed across the South Coast REC year-round, with a high concentration observed to the east of Portsmouth (James *et al*., 2010). Numerous fulmar nesting sites are present along the coastline in the region, with nationally important numbers breeding between Brighton and Beachy Head (WWT, 2009). Both Manx shearwater and storm petrel breed at colonies further north, passing through the Channel during migration.

Gannet

11.5.3.18 Gannet (BoCC Amber List) are present in the Channel year-round. Baseline surveys undertaken for Navitus Bay Wind Park found that gannet were one of those most frequently recorded species during baseline surveys, with the highest numbers recorded during the breeding season (Navitus Bay Wind Park, 2014), consistent with other surveys (e.g. James *et al*., 2010; RSK, 2012). Pettex *et al*., (2014, 2017) also identified large numbers of gannets in the Eastern Channel during winter, particularly in the Strait of Dover.

11.5.3.19 Most gannets recorded during baseline surveys undertaken for OWFs in the region recorded gannets in flight. This is to be expected as gannets are a wide-ranging aerial foraging species spending much of their time on the wing.

11.5.3.20 Multi-colony tracking data show that breeding adult gannets present in the vicinity of the Marine Cable Corridor are most likely to originate from the colony at Les Etacs, Alderney, which is included within the Alderney West Coast and Burhou Islands Ramsar site (Wakefield *et al*., 2013; Warwick-Evans *et al*., 2016).

Shags and cormorants

11.5.3.21 Cormorants (*Phalacrocorax carbo*) are a fairly common coastal resident within Dorset, Hampshire and the Isle of Wight, whilst shags (*Phalacrocorax aristotelis*; BoCC Red List) are a fairly common coastal resident in Dorset, but scarce elsewhere in the region (APEM, 2013).

11.5.3.22 Low densities of both cormorants (0.01-0.09 birds/km) and shags (0.01-0.49 birds/km^2) were recorded by Stone *et al*., (1995) in coastal areas to the west of the Isle of Wight around Poole Harbour and around the Solent throughout much of the year. Langstone and Poole Harbours are both important wintering sites for cormorant (Barne *et al*., 1996) and Frost *et al*., (2018) report a five-year mean peak of 66 cormorants in Portsmouth Harbour, with the highest numbers recorded in October.

11.5.3.23 Rampion OWF recorded a peak of seven cormorants across its baseline survey campaign (RSK, 2012), whilst Navitus Bay Wind Park recorded a single cormorant during a boat-based survey in November 2011, and no shags (Navitus Bay Wind Park, 2014).

11.5.3.24 Cormorants are known to breed at two locations within the South Coast REC (James *et al*., 2010): at the Needles on the western tip of the Isle of Wight, and at Studland Cliffs along the Purbeck Coast (Barne *et al*., 1996; Lake *et al*., 2011). Small numbers of shag also breed along the Purbeck Coast (Lake *et al*., 2011) but are otherwise largely absent from the region.

Skuas

11.5.3.25 Four species of skua are known to pass through the Channel during spring and autumn migration: great skua (*Stercorarius skua*; BoCC Amber List), Arctic skua (*Stercorarius parasiticus*; BoCC Red List), pomarine skua (*Stercorarius pomarinus*) and long-tailed skua (*Stercorarius longicaudus*). These species feed on fish and offal, and often kleptoparasitise prey catches of other seabird species.

11.5.3.26 James *et al*., (2010) report that limited numbers of skuas were recorded during aerial survey campaigns in 2007-2008 within the South Coast REC. Thus, the area was not considered to represent a significant resource for these species.

11.5.3.27 Indeed, aerial surveys conducted across the Channel as part of the SAMM campaigns showed that the encounter rate for great skua was highest closer to the French coastline as well the south-western tip of the UK off the Cornish coast (Pettex *et al*., 2014, 2017).

11.5.3.28 Boat-based surveys undertaken for Rampion OWF in 2010-2012 recorded 148 great skuas, 53 pomarine skuas and 10 Arctic skuas passing through the survey area. An estimated 1,114 Arctic skuas and 713 great skuas were considered to pass through the Navitus Bay Wind Park during spring and autumn, based on the outputs of a migration modelling tool (Navitus Bay Wind Park, 2014).

Terns

11.5.3.29 Sandwich tern (BoCC Amber List), Arctic tern (BoCC Amber List), common tern (BoCC Amber List), roseate tern (Schedule 1; BoCC Red List; NERC Species of Principal Importance; Hampshire LBAP) and little tern (Schedule 1; BoCC Amber List; Hampshire LBAP) are all migratory species listed on Annex I of the Bird Directive which arrive in the UK between from April to August to breed on sand and shingle beaches, saltmarshes and offshore islets within the South Coast REC (James *et al*., 2010). Internationally important breeding colonies are present at Chichester, Langstone, Pagham and Newtown Harbours, and at North Solent, Hurst Point to Pitts Deep and Lymington to Pylewell (Mitchell *et al*., 2004).

11.5.3.30 Many of these species feed on small fish, crustacea, worms and molluscs present in estuaries and other shallow, inshore waters. They are active flyers and as such their use of any one feeding patch or prey concentration may be limited, particularly since they tend to carry only single prey items back to their nest site (Perrow *et al*., 2006). These species may therefore be present within the Marine Cable Corridor.

11.5.3.31 James *et al*., (2010) report a total of 358 tern observations from aerial surveys undertaken in summer 2008. Tern records peaked in May during baseline boat-based surveys undertaken for Rampion OWF (RSK, 2012), with Sandwich terns (n=40), Arctic terns (n=180) and common terns (n=172) all recorded to species level, and a further 2,287 terns recorded as 'Arctic/common'. No roseate terns were recorded which may reflect relatively low breeding numbers in comparison to the other tern species. Furthermore, little tern were not recorded which may reflect their inshore feeding distribution (with a mean-max foraging range of 11 km; Thaxter *et al*., 2012).

Gulls

11.5.3.32 Herring gull (BoCC Red List; NERC Species of Principal Importance), great black-backed gull (*Larus marinus*; BoCC Amber List), lesser black-backed gull, kittiwake (BoCC Red List), Mediterranean gull (Annex I; Schedule 1; BoCC Amber List; Hampshire LBAP), common gull (*Larus canus*; BoCC Amber List) and black-headed gull (BoCC Amber List) area all present in the vicinity of the Marine Cable Corridor (James *et al*., 2010). Small numbers of little gull (*Hydrocoloeus minutus*) and yellow-legged gull (*Larus michahellis*) have also been recorded during baseline surveys for Rampion OWF and Navitus Bay Wind Park (RSK, 2012; Navitus Bay Wind Park, 2014). Within Portsmouth Harbour, Frost *et al.*, (2018) report five-year mean peaks for black-headed gull (2,431), Mediterranean gull (five), common gull (192), lesser-black-backed gull (five), herring gull (170) and great black-backed gull (30).

11.5.3.33 Gulls were the most abundant and widely distributed seabird group present within the South Coast REC during aerial surveys undertaken in 2007-2008, with 14,835 individuals recorded during winter and 6,294 recorded during the summer (James *et al.*, 2010). More recent boat-based surveys undertaken for Rampion OWF recorded a total of 34,551 gulls across all surveys. Of those gulls identified to species level, herring gull was the most abundant (RSK, 2012).

11.5.3.34 Mediterranean gulls breed in internationally important numbers at Newtown Harbour, North Solent and between Hurst and Lymington, with nationally important numbers of black-headed gulls also present at these colonies. There are no major cliff sites with important seabird colonies in the vicinity of the Marine Cable Corridor (Stroud *et al.*, 1990), with the nearest colony located at the cliffs between Brighton and Newhaven. Nationally important numbers of kittiwake and herring gull breed at this colony.

11.5.3.35 Many gull species are present in the Channel year-round. For species such as little gull and kittiwake, numbers increase during the winter as birds breeding at more northerly colonies move southwards (Pettex *et al.*, 2017). Given their wide distribution and opportunistic feeding habits, it is likely that a range of gull species will utilise the Marine Cable Corridor throughout the year.

Auks

11.5.3.36 Three species of auk have been recorded in the South Coast REC: guillemot (BoCC Amber List), razorbill (BoCC Amber List) and puffin (BoCC Red List) (James *et al.*, 2010). The south coast of England has relatively few cliff based colonies of auks due to a lack of suitable habitat. However, small numbers of guillemots, razorbills and puffins breed along the Purbeck Cliffs (Barne *et al.*, 1996; Lake *et al.*, 2011).

11.5.3.37 James *et al.*, (2010) notes that the South Coast REC represents a more significant resource during the winter months, evident in the relatively high number of auks observed at this time of year (RSK, 2012; Navitus Bay Wind Park, 2014; Pettex *et al*., 2017).

11.5.3.38 Of the three auk species present in the region, guillemot are most abundant. Numbers of guillemots peaked in late spring during baseline surveys for Navitus Bay Wind Park and Rampion OWF as birds moved through the area on passage to more northerly breeding colonies (Navitus Bay Wind Park, 2014).

11.5.3.39 Auk species, particularly guillemot, are therefore likely to be present in the Marine Cable Corridor year-round, but most abundant during the non-breeding season.

11.5.4 FUTURE BASELINE

11.5.4.1 Baseline data have been obtained from the collation of existing information. The existing baseline is informed by data that are ‘current’ and a future baseline is informed by an extrapolation of the currently available data by reference to policy and plans, other proposal applications and expert judgement.

11.5.4.2 In the absence of the Proposed Development, numbers of marine birds occurring within the study area over the operational period of the project, would likely reflect changes in populations resulting from climatic factors (such as temperature change and subsequent impacts on species' ranges), or anthropogenic activities such as changes in fishing activities indirectly affecting marine bird communities. Furthermore, baseline conditions within the study area may also change in relation to other projects/plans which may be implemented during this timeframe. Baseline conditions are therefore not static and are likely to exhibit some degree of change over time, with or without the Proposed Development in place.

11.5.4.3 Therefore, potential impacts have been assessed in the context of the envelope of change that might occur over the operational period of the Proposed Development. Consideration of other projects/plans is undertaken through cumulative effects assessment in Section 11.6 and in doing so, their ability to modify the existing baseline is also considered.

11.6 IMPACT ASSESSMENT

11.6.1.1 Table11.10 identifies any mitigation measures that are embedded within the project design that have the potential to reduce potential impacts on marine ornithology

Table 11.10 - Embedded mitigation measures in respect of marine ornithology

Development Phase	Embedded mitigation
Construction	Strict navigational protocols will be in place to avoid vessel collisions. Best practice in terms of waste management and spill response will be followed, potentially secured through a Marine Pollution Contingency Plan within the Environmental Management Plan.

11.6.1.2 Table 11.11 summarises the potential impacts scoped in for marine ornithology during construction, operation (including repair and maintenance) and decommissioning of the Proposed Development. This assessment considers the methods described within Chapter 3 Description of the Proposed Development except those activities listed in Section 11.4.5.

Table 11.11 - Potential impacts on marine ornithology

Potential Impact	Reason
Disturbance and displacement from	Disturbance impacts can manifest through the deterrence of birds from using suitable or preferred habitat. During works (installation,

Potential Impact	Reason
construction plant and support vessels	repair/maintenance or decommissioning) on the marine cables, noise and visual disturbance has the potential to arise as a result of the presence of vessels and construction activity.
Indirect effects as a consequence of prey disturbance and/or habitat loss	Potential impacts of construction (installation, repair/maintenance or decommissioning) on habitats, benthic organisms, fish and shellfish species. The physical presence of cable components during operation, in addition to ongoing repair/maintenance activities may affect the availability of prey species.
Exposure to surface hydrocarbons or chemicals due to accidental spills	In the event of an unplanned release of hydrocarbon fuel from vessels, seabirds and inshore wintering waterfowl on the water may become contaminated with hydrocarbons.

11.6.2 CONSTRUCTION

11.6.2.1 Habitat loss due to construction and installation of the marine cables and changes to physical processes may lead to changes in habitat available for birds and their prey species. Potential effects of installation on benthic organisms and fish species are presented in Chapter 8 Intertidal and Benthic Ecology and Chapter 9 Fish and Shellfish. The conclusions of the assessments of impacts on these receptors have been used to assess the potential (indirect) effects upon the foraging behaviour of bird species.

11.6.2.2 Disturbance impacts can manifest through the deterrence of birds from using suitable or preferred habitat. During the construction phase, both noise and visual disturbance has the potential to arise as a result of the presence of vessels and cable installation activity. Different species show differing sensitivities to disturbance. Assessment of disturbance sensitivity has been based upon: species abundance within the Marine Cable Corridor, their estimated sensitivities to vessel presence (Garthe & Hüppop, 2004; Bradbury *et al*., 2014), whether their distribution over the wider area is localised or widespread, their reliance on specific habitat types and any published information on habituation.

11.6.2.3 With the presence of construction vessels (and associated installation plant), there may be potential for accidental spillage, ranging from small spillages of lubricant oil, to the potential grounding or collision of vessels, resulting in the release of the entire fuel load. Oil spills have the potential to significantly affect marine birds through direct oiling, over both short- and long-term timescales (e.g. Moreno *et al*., 2013). However, routine embedded mitigation measures of standard best practice in terms of waste management, pollution prevention measures and strict navigational protocols will make the likelihood of these events occurring highly unlikely and therefore not significant (Table 11.10). CIEEM guidelines (CIEEM, 2018) state the emphasis in EcIA should be on "significant effects rather than all ecological effects". As such, potential impacts arising from accidental hydrocarbon and chemical spills are scoped out from further assessment.

11.6.3 OPERATION (AND REPAIR/MAINTENANCE)

11.6.3.1 The physical presence of cable components during operation, in addition to ongoing repair and maintenance activities may affect the availability of prey species. Potential effects of operation and maintenance on benthic organisms and fish species are presented in Chapter 8 Benthic Ecology and Chapter 9 Fish and Shellfish. Again, the conclusions of the assessments of impacts on these receptors have been used to assess the potential (indirect) effects upon the foraging behaviour of bird species.

11.6.3.2 Noise and visual disturbance during operation may be initiated by vessel presence and other repair/maintenance activities to the cable components. Bird species density, distribution and behavioural data have been used to inform likely population densities across the Marine Cable Corridor in different seasons.

11.6.4 DECOMMISSIONING

11.6.4.1 After the operational life of the Proposed Development, it is most likely the inert and inactive marine cables will be left in place. This is regular practice for subsea cables, as the environmental effect and financial cost of removing the cable often outweigh the benefits of removal. There is considered no potential for impact on marine birds from leaving the inert marine cables in place.

11.6.4.2 The Crown Estate currently supports removal where practicable. In the event that cables are retrieved, decommissioning will be undertaken in line with industry best practice, and any effects are considered to be similar (although likely lower) to those predicted for installation activities undertaken during construction. As such, predicted effects from decommissioning the Proposed Development are not assessed individually in the following paragraphs for each feature and impact.

11.6.5 WORST CASE DESIGN ENVELOPE

Table11.12 gives the worst-case design parameters considered for marine ornithology during construction, operation (including repair and maintenance) and decommissioning of the Proposed Development.

Table 11.12 – Worst case scenario definition

Potential Impact	Design Envelope Scenario Assessed
Construction	
Disturbance and displacement from construction plant and support vessels	An indicative number of 4,160 vessel movements over a 36-month period, on a 24/7 basis. Based on post lay burial as a worst case (1,650 movements), potential seabed preparation (300 movements) and landfall/HDD works (2,210 movements) occurring simultaneously.
Indirect effects as a consequence of prey disturbance and/or habitat disturbance	A maximum of four (two bundled pairs) marine cables which will run from the landfall at Eastney Beach to the limit of UK territorial waters. Maximum length for each cable is approximately 109 km. Each cable installed in a separate trench (maximum of two trenches). Maximum area for Marine Cable Corridor within UK marine area (i.e. Proposed Development) approximately 57 km^2 (as Marine Cable Corridor is 500 m wide for 8.6 km and 520 m wide for 101.4 km). Subtidal area of seabed disturbed across Marine Cable Corridor is approximately 3.3 km^2. This is based on 7.9 km of Marine Cable Corridor being dredged to a width of 150 m (1.2 km^2), 19.9 km of an 80 m swathe for boulder clearance (1.29 km^2) and assumes a worst case of the remaining 82 km of the Marine Cable Corridor disturbed through 2 x 4.5 m width of mechanical trenching (0.74 km^2) and anchor spreads (0.046 km^2). HDD works will likely occur in areas that will have already been subject to some level of disturbance. However, if required, HDD entry/exit pits may be necessary to position the drill casing and protect the HDD end cap whilst minimising impacts on navigation depth. These will be location specific, however the worst case assumes a single pit (rather than 4 discrete pits) approximately 60 m x 15 m (900 m^2). Temporary HDD mattressing (0.0009 km^2) which will likely occur over the area of the pit. Up to two jack up barges will be used for the HDD works. Typical jack-up barge will possess four legs, each leg approximately 1.4 m diameter. Temporary casing support frame comprising two

Potential Impact	Design Envelope Scenario Assessed
	trestles spaced 12 m apart at each location. Each trestle has a footprint of 3 m^2 Seabed preparation, HDD and cable installation works will take place over 36 months.
Operation (including repair/maintenance)	
Disturbance and displacement from construction plant and support vessels	A small number of vessel movements associated with maintenance to identify if the cables become exposed over time, with appropriate remedial action. During operation, it is assumed that an indicative worst-case failure rate of the marine cables would require one repair every 10-12 years.
Indirect effects as a consequence of prey disturbance and/or habitat loss	Total area of original habitat loss is 0.39 km^2 due to non-burial protection. This maximum footprint also allows a 10% rock placement non-burial contingency, in case predicted burial depths are not met during construction and/or if further non- burial protection is required during maintenance/repair activities during operation. Based on worst case non-burial protection for rock placement (0.38 km^2) and cable crossing protection (0.007 km^2) and HDD mattressing (0.0009 km^2).

11.6.6 FEATURE ASSESSMENT

11.6.6.1 On the basis of the baseline described in Section 11.5, a number of IOFs have been identified. All such features are listed in Table11.13.

Table 11.13 – Summary of IOFs

Level of Importance	IOF	Rationale
International	Sandwich tern, common tern, little tern, Mediterranean gull, gannet	Species listed as qualifying features of an internationally designated site (e.g. SPA or Ramsar) within the study area.
National	Roseate tern, European storm petrel, puffin, lesser-black-backed gull	Species listed as qualifying features of a designated site (e.g. SPA or Ramsar) within the study area, but not present in the study area in numbers

Level of Importance	IOF	Rationale
		crucial to the integrity of the site.
	Red-breasted merganser, black-headed gull, kittiwake, fulmar, herring gull	Species listed as notified features of a nationally designated site (e.g. SSSI) within the study area.
	Slavonian grebe	Species populations present with sufficient conservation importance to meet criteria for SSSI selection.
Regional	Common scoter, black-necked grebe	Species that are not a qualifying feature of any designated site within the study area, but that are afforded special protection (Schedule 1 and Annex I species) and are present in numbers that can be considered to be of importance in a regional context.
	Guillemot, razorbill	Species that are not a qualifying feature of any designated site within the study area, but that are of medium/high conservation concern (e.g. i.e. LBAP species and/or species on the BoCC Red/Amber List) and are present in numbers that can be considered to be of importance in a regional context.
Local	Great northern diver, black-throated diver, red-throated diver, Balearic shearwater, Arctic tern	Species that are afforded special protection (Schedule 1 and Annex I species) but are not a qualifying feature of any designated site within the study area and were only recorded infrequently.
	Eider, red-necked grebe, great skua, Arctic skua, common gull, great black-	Species that are considered to be of medium/high conservation concern (i.e. LBAP species and/or species

Level of Importance	IOF	Rationale
	backed gull, Manx shearwater, shag	on the BoCC Red/Amber List) that are not a qualifying feature of any designated site within the study area and are not present in regionally important numbers.
Negligible	Great crested grebe, pomarine skua, long-tailed skua, little gull, yellow-legged gull, cormorant	Species of low conservation concern (i.e. species on the UK BoCC Green Lists that are not LBAP species nor afforded any special protection) and that are not a designated feature of any designated site within the study area.

11.6.6.2 CIEEM guidelines (CIEEM 2018) state the emphasis in EcIA should be on "significant effects rather than all ecological effects". Therefore, IOFs of local importance or lower (see Table11-13) are not considered further in this assessment. Significant effects on these species are not predicted given their infrequent occurrence in the study area and/or low conservation status.

11.6.6.3 IOFs considered to be of regional importance or above (see Table11-13**Error! Reference source not found.**) have been discussed individually in the following subsections.

Common scoter

11.6.6.4 Common scoter migrate south-west through the Channel in autumn after moulting in the Baltic and eastern North Sea, returning northward in the spring (Wernham *et al*., 2002). Barne *et al*., (1998) state that common scoters are most abundant off Rye Harbour during the winter, approximately 84.4 km to the east of the Proposed Development.

11.6.6.5 Common scoters are consistently scored as being of high sensitivity to disturbance from vessel traffic (Garthe & Hüppop, 2004; Bradbury *et al*., 2014). However, given the large distances over which this species migrates, and given the distance between the Marine Cable Corridor and the possible aggregation of birds occurring off Rye Harbour it is unlikely that significant numbers of common scoters utilise the Marine Cable Corridor for foraging and roosting. As such, no potential for impact on common scoter is predicted from any development phase of the Proposed Development.

Red-breasted merganser

11.6.6.6 Red-breasted merganser feed and roost on the water in both Chichester and Langstone Harbours between October and March (Natural England, 2018), in relatively close proximity to the Proposed Development. They dive and swim to forage on fish and aquatic invertebrates in the water column (Natural England 2018). In Chichester Harbour, they favour deep-water areas such as Thorney Deeps, south of Pilsey Island, and north Hayling/Sweare Deep. In Langstone Harbour, they favour the deeper waters to the east of Farlington Marshes and towards Langstone Bridge (Natural England, 2018).

11.6.6.7 Red-breasted merganser spend their entire time on the water, roosting at night with other diving seaducks, either in the mid-channel in Portsmouth Harbour or other shallow coastal waters in the Solent. Red-breasted merganser also raft in Portsmouth Harbour for shelter during times of stormy weather (Natural England, 2018).

Potential Disturbance/Displacement Effects

11.6.6.8 Red-breasted merganser are considered to be of moderate sensitivity to disturbance from vessel traffic (Bradbury *et al*., 2014). Therefore, the presence of construction vessels associated with HDDworks in Langstone Harbour may disturb red-breasted merganser roosting in the deeper waters to the east of Farlington Marshes and towards Langstone Bridge. Furthermore, given the proximity of a number of red-breasted merganser wintering sites to the Proposed Development, construction and repair/maintenance works may displace wintering red-breasted mergansers from favoured foraging habitat through both visual disturbance and unpredictable noise events.

11.6.6.9 HDD works in Langstone Harbour will occur >4 km from the closest wintering site at Farlington Marshes. Noise and visual disturbance associated with these works is unlikely to be noticeable above baseline levels of disturbance within Langstone Harbour. Whilst considered unlikely, should red-breasted merganser be temporarily disturbed from their wintering sites within Langstone Harbour, other equivalent foraging and roosting sites are present in Chichester Harbour and Portsmouth Harbour.

11.6.6.10 Therefore, potential disturbance/displacement effects are likely to be short term, of minor adverse magnitude and not significant.

Potential Indirect Effects of Habitat Disturbance and Loss

11.6.6.11 No direct loss of habitat used for roosting or loafing is predicted.

11.6.6.12 However, red-breasted mergansers are effectively top predators of benthos, fish and shellfish populations and are considered to be of moderate sensitivity to habitat disturbance (Bradbury *et al*., 2014). If the habitat (and therefore the prey species) is lost, and there is no opportunity for the prey species to recolonise any new habitat created, the area is effectively devoid of any potential food source for the birds which will result in effective habitat loss.

11.6.6.13 As detailed in Chapter 3 Description of Proposed Development, Chapter 8 Intertidal and Benthic Ecology and Chapter 9 Fish and Shellfish, where the marine cables cross Langstone Harbour, HDD will be used. Therefore, prey receptors in Langstone Harbour will not be affected by habitat disturbance.

11.6.6.14 Temporary increases in suspended sediment during construction and repair/maintenance works could potentially affect benthos, fish and shellfish in the vicinity of the Proposed Development. However, as detailed in Chapter 8 Intertidal and Benthic Ecology and Chapter 9 Fish and Shellfish, where the cable corridor crosses Langstone Harbour, HDD will be used. The exit point is expected to be onshore, thus an increase in suspended sediment and smothering is not predicted to affect prey species in Langstone Harbour.

11.6.6.15 The permanent loss of fish, shellfish and benthic habitat as a result of cable non-burial protection is not predicted to significantly affect prey species since these measures will be limited in spatial extent (Chapter 8 Intertidal and Benthic Ecology and Chapter 9 Fish and Shellfish).

11.6.6.16 Outside of Langstone Harbour, there are alternative areas of equivalent foraging habitat outside of the Marine Cable Corridor. Therefore, potential indirect effects of habitat disturbance and loss are predicted to be short term, of minor adverse magnitude and not significant.

Potential Prey Effects

11.6.6.17 Red-breasted mergansers are visual foragers and are likely to be affected by an increase in turbidity which can make it harder to see prey. They are considered to be moderately sensitive to habitat disturbance and therefore potential effects on prey (Bradbury *et al*., 2014). Activities associated with construction and maintenance works have the potential to release sediment during cable burial and associated works. However, since HDD will be used within Langstone Harbour, with an onshore exit point, the volume of suspended material is considered to be negligible. Outside of Langstone Harbour, the volume of suspended material is likely to peak above storm levels, but be back within comparable background concentrations within days. Chapter 9 Fish and Shellfish highlights that most fish and shellfish are able to tolerate a degree of suspended sediment owing to frequent exposure to storm induced fluctuations in sediment concentrations.

11.6.6.18 As such, the potential for impact from reduced prey availability resulting from increased turbidity is considered to be short term, of minor adverse magnitude and not significant.

Slavonian grebe and Black-necked grebe

11.6.6.19 Slavonian grebes are amongst the most marine of the grebe species outside the breeding season. Little is known of the precise migration behaviour and routes of Slavonian grebes. However, the main arrival of wintering birds from their northerly breeding sites into English waters takes place between September and November. Numbers peak between December and mid-February and then decline as birds return northwards back to their breeding grounds.

11.6.6.20 Slavonian grebe pursuit dive from the sea surface up to depths of 20 m, in addition to dabbling for food items. They primarily catch fish and crustaceans during the winter. Nationally important numbers winter in Pagham Harbour (20-25 individuals; Barne *et al*., 1998), approximately 9.5 km from the Proposed Development.

11.6.6.21 The black-necked grebe is a scarce wintering bird in the UK, and is thus considered to be of conservation concern (Schedule 1; BoCC Amber List). Wintering birds inhabit coastal waters and larger inland waters. Black-necked grebe pursuit dive and dabble from the sea surface to catch fish and crustaceans during the winter.

Black-necked grebe are known to winter in Langstone and Poole Harbours (Barne *et al*., 1996; Frost *et al*., 2018). Within Langstone Harbour, a five year mean peak of 15 birds has been recorded, with a five year mean peak of nine birds recorded at Poole Harbour (2012/13-2016/17; Frost *et al*., 2018). Numbers peaked in February and November, respectively.

Potential Disturbance/Displacement Effects

11.6.6.22 Given the proximity of the Slavonian grebe wintering site at Pagham Habour to the Proposed Development, it is likely that this species may utilise the Proposed Development to forage.

11.6.6.23 The presence of construction vessels associated with HDD works may disturb black-necked grebe wintering in Langstone Harbour. However, given that the wintering site at Poole Harbour is located 63.7 km from the Proposed Development, black-necked grebe present at this site are not predicted to be impacted by construction and repair/maintenance works.

11.6.6.24 The presence of construction and maintenance vessels and associated activities may displace Slavonian and black-necked grebes from favoured foraging habitat through both visual disturbance and unpredictable noise events.

11.6.6.25 Whilst it is anticipated that as a worst-case, there may be up to *c.*4,200 vessel movements over the course of construction works (see Chapter 3 Description of the Proposed Development), these will occur intermittently over a relatively short time frame between Q1 2021 and Q4 2023. Installation vessels will have a rolling exclusion zone of up to 700 m. Whilst there may be a number of vessels present during each stage of construction, it is likely that each vessel will only be present in any one area of the rolling exclusion zone for very short durations (hours to days). Furthermore, vessel traffic levels in the Channel and Solent are already high (see Chapter 13 – Shipping, Navigation and Other Marine Users) and both species of grebe continue to utilise areas such as Langstone and Pagham Harbour despite this. As such, birds that use the Marine Cable Corridor to forage are expected to be habituated to such levels of disturbance.

11.6.6.26 During operation, it is assumed that an indicative worst-case failure rate of the marine cables would require one repair every 10-12 years. If required, it is likely that repairs would be undertaken by a single vessel, over a short timeframe (weeks to months). Thus, the potential for disturbance/displacement effects during operation and maintenance will be less than during construction.

11.6.6.27 Both Slavonian and black-necked grebes are consistently scored as being of moderate sensitivity to vessel traffic (Garthe & Hüppop, 2004; Bradbury *et al*., 2014). However, given the large distances over which these species migrate, it is likely that any grebes present in the vicinity of construction or maintenance vessels will move to equivalent foraging habitat during the relatively short-time frame during which the temporary works will occur. Therefore, potential disturbance/displacement effects are likely to be short term, of minor adverse magnitude and not significant.

Potential Indirect Effects of Habitat Disturbance and Loss

11.6.6.28 No direct loss of habitat used for roosting or loafing is predicted.

11.6.6.29 However, Slavonian and black-necked grebes are effectively top predators of fish and shellfish populations and are considered to be of moderate sensitivity to habitat disturbance (Bradbury *et al*., 2014). If the habitat (and therefore the prey species) is lost, and there is no opportunity for the prey species to recolonise any new habitat created, the area is effectively devoid of any potential food source for the birds which will result in effective habitat loss.

11.6.6.30 As detailed in the worst-case design envelope (and in Chapter 8 Intertidal and Benthic Ecology and Chapter 9 Fish and Shellfish, the area of disturbed habitat for route preparation is anticipated to be a maximum of 3.3 km^2. Due to the relatively small spatial extent of the affected area, temporary nature of the works and recoverability of many species, temporary habitat disturbance to prey species is predicted to be not significant.

11.6.6.31 Temporary increases in suspended sediment during construction and maintenance works could potentially affect benthos, fish and shellfish in the vicinity of the Marine Cable Corridor. However, as detailed in Chapter 8 Intertidal and Benthic Ecology and Chapter 9 Fish and Shellfish, it is anticipated that the volume of suspended material during dredge disposal (considered as the worst-case scenario for sediment release during construction and maintenance) is likely to peak above storm levels, but be back within comparable background concentrations within days. Given that most of these species are able to tolerate a degree of suspended sediment owing to frequent exposure to storm induced fluctuations in sediment concentrations, the predicted increase in suspended sediment is predicted to be not significant.

11.6.6.32 The permanent loss of fish, shellfish and benthic habitat as a result of cable non-burial protection is not predicted to significantly affect prey species since these measures will be limited in spatial extent (Chapter 8 Intertidal and Benthic Ecology and Chapter 9 Fish and Shellfish).

11.6.6.33 Whilst there may be highly localised loss of Slavonian and black-necked grebe foraging habitat, there are alternative areas of equivalent foraging habitat elsewhere in the immediate vicinity of the Proposed Development. As such potential indirect effects of habitat disturbance and loss are considered to be short term, of minor adverse magnitude and not significant.

Potential Prey Effects

11.6.6.34 Slavonian and black-necked grebes are visual foragers and are likely to be affected by an increase in turbidity which can make it harder to see prey. They are considered to be moderately sensitive to habitat disturbance and therefore potential effects on prey (Bradbury *et al*., 2014). Activities associated with construction and maintenance works have the potential to release sediment during cable burial and associated works such as dredging and disposal, route clearance and rock placement. The volume of suspended material is likely to peak above storm levels, but will revert back to within comparable background concentrations within days.

11.6.6.35 As such, the potential for impact from reduced prey availability resulting from increased turbidity is considered to be short term, of minor adverse magnitude and not significant.

Fulmar

11.6.6.36 Fulmars mainly nest on ledges on steep cliffs or crags, but can use spaces on exposed building sides, low banks or even the ground. The closest breeding colony is located on the cliffs between Brighton and Newhaven, *c.*36 km from the Proposed Development, with nationally important numbers also present on the cliffs between Seaford and Beachy Head, *c.*41 km from the Proposed Development. Fulmars disperse offshore after the breeding season, although they remain widespread in UK waters, with many attending colonies year-round. Young birds disperse most widely, throughout North Atlantic and European Arctic waters.

11.6.6.37 They are opportunistic feeders and use their strong sense of smell to locate foraging opportunities. They can quickly form large flocks over concentrations of food, feeding on planktonic crustaceans, squid and small fish. They also scavenge discards from fishing vessels. Fulmars have a large foraging range, with birds departing colonies for up to 5 days out to a maximum of 580 km (mean-max = 400 ± 245.8 km; Thaxter *et al*., 2012).

11.6.6.38 Given their wide-ranging foraging behaviour, low sensitivity to disturbance (Garthe & Hüppop, 2004; Bradbury *et al*., 2014) and plasticity in diet, no potential for impact on fulmar is predicted from any development phase of the Proposed Development.

Storm petrel

11.6.6.39 Storm petrels nest colonially on remote offshore islands, using burrows and crevices under rocks on boulder beaches and scree and stone walls and ruined stone buildings. As such, the closest colony is located in the Channel Islands on Alderney, *c.* 142 km from the Proposed Development. They range widely to forage during the breeding season, over 65 km (Thaxter *et al*., 2012), feeding on small fish and zooplankton gleaned from the sea surface. Inshore they are known to feed on intertidal crustaceans.

11.6.6.40 Storm-petrels are highly pelagic, wintering off the coasts of western and southern Africa, and returning to land only to breed. Birds breeding at more northerly colonies therefore pass through the Channel during migration.

11.6.6.41 Given their large foraging range, dispersed distribution during the winter, and low sensitivity to vessel traffic (Garthe & Hüppop, 2004; Bradbury *et al*., 2014), no potential for impact on storm petrel is predicted from any development phase of the Proposed Development.

Gannet

11.6.6.42 Gannets can return to breeding colonies as early as January with levels of attendance generally increasing until April, when the first eggs are laid. The closest breeding colony is located in the Channel Islands, 142 km from the Proposed Development, where some 5,000 breeding pairs are located on Les Etacs and Ortac, Alderney (Warwick-Evans *et al.*, 2016). Tracking work by Wakefield *et al*., (2013) demonstrated that these breeding birds forage over a wide area (maximum = 590 km, mean-max = 229.4 ± 124.3 km; Thaxter *et al*., 2012) including across the Proposed Development.

11.6.6.43 Gannets feed by plunge-diving into the sea from heights of between 10-40 m either singly or in groups. They also sometimes swim with their heads immersed and dive for food from the sea surface. They prey on mid-sized schooling fish and squid, as well as fishery discards. Gannets are wide-ranging throughout the year, with large numbers passing through the Channel during the non-breeding season, to winter as far as west Africa.

11.6.6.44 Given the distance to the nearest breeding colony, together with their extremely wide-ranging foraging behaviour and reliance on highly mobile schooling fish and squid as prey throughout the year, no potential for impact on gannet is predicted from any development phase of the Proposed Development.

Little tern, Sandwich tern and Common tern

11.6.6.45 Little terns arrive in the UK from April to breed, and generally stay until the end of September. They nest in simple shallow ‘scrapes’ on bare sand and shingle (Natural England, 2012a). In Langstone and Chichester Harbours, the closest breeding colony to the Proposed Development, little terns nest on Bakers Island, Pilsey Island, the north Stakes Islands, the Oysterbeds islets and on manmade rafts (Natural England, 2018).

11.6.6.46 Little terns forage alone in shallow water often within 1 km of their breeding colony (out to a maximum of 11 km; Thaxter *et al*., 2012) for small fish, crustaceans, and insects. Little terns take food from near the surface of the water by plunge diving, often following hovering, or by ‘contact dipping’, where only the bill enters the water and the bird remains in flight throughout (Natural England, 2018).

11.6.6.47 From March onwards, Sandwich terns return to UK waters to breed. They nest colonially in high densities on the ground, on shingle spits, ridges and islets (Natural England, 2012b). In Chichester and Langstone Harbours, the closest breeding colony to the Proposed Development, they breed on the South Stakes islands, the Oysterbeds islets and the Royal Society for the Protection of Birds (‘RSPB’) islands of Hayling Island. From July, onwards they start to gather in large flocks to depart in September (Natural England, 2012b).

11.6.6.48 Prey species are more varied than that of the other terns, including sandeels, herring and sprats, as well as crustaceans and small squid. Sandwich terns forage alone or in small flocks out to a maximum of 54 km from the colony (mean-max = 49.0 ± 7.1 km; Thaxter *et al*., 2012). Individuals take prey from near the surface of the water by plunge-diving to a depth of 2 m (Natural England, 2012). Foraging behaviour is seen throughout the harbours with a stronger tendency to feed at the harbour mouths. At high tide in Langstone Harbour, they form groups to forage south of South Binness Island (Natural England, 2018).

11.6.6.49 Common terns arrive in the UK from April onwards to breed, and generally stay until the end of September. They nest in simple shallow 'scrapes' on sand, shingle or within low vegetation (Natural England, 2012c). In Langstone and Chichester Harbours, the closest breeding colony to the Proposed Development, common terns nest on the Stake Islands, the Oysterbeds islets, the RSPB Islands and on floating manmade rafts (Natural England, 2018).

11.6.6.50 Common terns forage alone or in small flocks out to a maximum of 30 km from the colony (mean-max = 15.2 ± 11.2 km; Thaxter *et al*., 2012). Prey species include small fish and crustaceans, terrestrial insects and occasionally squid. They take food from near the surface of the water by plunge diving to a depth of 1-2 m, often following hovering. Prey might also be gathered by 'contact dipping': where only the bill enters the water and the bird remains in flight throughout (Natural England, 2012).

Potential Disturbance/Displacement Effects

11.6.6.51 Potential disturbance to nesting terns at their breeding colonies is considered fully in relation to the landfall.

11.6.6.52 Given the proximity of tern breeding colonies to the Proposed Development, it is likely that little, Sandwich and common terns utilise the Marine Cable Corridor to forage. This is reflected in the proposed marine extension to these designated breeding colonies (Solent and Dorset Coast pSPA), through which the Proposed Development passes.

11.6.6.53 The presence of construction and repair/maintenance vessels and associated activities may displace breeding terns from favoured foraging habitat through both visual disturbance and unpredictable noise events, particularly in relation to HDD works in Langstone Harbour.

11.6.6.54 Whilst it is anticipated that there may be up to *c.*4,200 vessel movements over the course of cable installation works (see Chapter 3 Description of the Proposed Development), it is anticipated that these will occur intermittently over a relatively short time frame between Q1 2021 and Q4 2023. Installation vessels will have a rolling exclusion zone of up to 700 m. Whilst there may be a number of vessels present during each stage of installation, it is likely that each vessel will only be present in any one area of the rolling exclusion zone for very short durations (hours to days). Furthermore, vessel traffic levels in the Channel and Solent are already high (see Chapter 13 Shipping, Navigation and Other Marine Users). As such, birds that use the Marine Cable Corridor to forage are expected to be habituated to such levels of disturbance.

11.6.6.55 During operation, it is assumed that an indicative worst-case failure rate of the marine cables would require one repair every 10-12 years. If required, it is likely that repairs would be undertaken by a single vessel, over a short timeframe (weeks to months). Thus, the potential for disturbance/displacement effects during operation and maintenance will be less than during construction activities.

11.6.6.56 Little terns are scored as being of moderate sensitivity to disturbance from vessel traffic, whilst Sandwich and common terns are considered to be of low sensitivity (Garthe & Hüppop, 2004; Bradbury *et al*., 2014). All three species are known to forage within Chichester and Langstone Harbours (Natural England, 2016; Natural England, 2018), demonstrating that they forage in areas in which visual and noise disturbance occurs.

11.6.6.57 Therefore, potential disturbance/displacement effects on little tern are likely to be short term, of minor adverse magnitude and not significant.

11.6.6.58 For Sandwich and common terns, potential disturbance/displacement effects are considered to be short term, of negligible magnitude and not significant.

Potential Indirect Effects of Habitat Disturbance and Loss

11.6.6.59 No direct loss of habitat used for breeding or loafing is predicted.

11.6.6.60 However, terns are effectively top predators of benthos, fish and shellfish populations and are considered likely to be of moderate sensitivity to habitat disturbance (Garthe & Hüppop, 2004; Bradbury *et al*., 2014). If the habitat (and therefore the prey species) is lost, and there is no opportunity for the prey species to recolonise any new habitat created, the area is effectively devoid of any potential food source for the birds which will result in effective habitat loss.

11.6.6.61 As detailed in the worst-case design envelope (Table 11.12) and in Chapter 8 Intertidal and Benthic Ecology and Chapter 9 Fish and Shellfish, the area of disturbed habitat for route preparation is anticipated to be a maximum of 3.3 km^2. Due to the relatively small spatial extent of the affected area, temporary nature of the works and recoverability of many species, temporary habitat disturbance to prey species is predicted to be not significant.

11.6.6.62 Temporary increases in suspended sediment during construction and maintenance could potentially affect benthos, fish and shellfish in the vicinity of the Proposed Development. However, as detailed in Chapter 8 Intertidal and Benthic Ecology and Chapter 9 Fish and Shellfish, it is anticipated that the volume of suspended material during dredge disposal (considered as the worst-case scenario for sediment release during construction and maintenance) is likely to peak above storm levels, but will revert back to within comparable background concentrations within days. Given that most of these species are able to tolerate a degree of suspended sediment owing to frequent exposure to storm induced fluctuations in sediment concentrations, the predicted increase in suspended sediment is predicted to be not significant.

11.6.6.63 The permanent loss of fish, shellfish and benthic habitat as a result of cable non-burial protection is not predicted to significantly affect prey species since these measures will be limited in spatial extent (Chapter 8 Intertidal and Benthic Ecology and Chapter 9 Fish and Shellfish).

11.6.6.64 Whilst there may be highly localised loss of tern foraging habitat, there are alternative areas of equivalent foraging habitat elsewhere in the immediate vicinity of the Proposed Development. Given the more restricted foraging range of little tern compared to Sandwich and common terns, potential indirect effects of habitat disturbance and loss are considered to be short term, of minor adverse magnitude and not significant.

11.6.6.65 Potential indirect effects of habitat disturbance and loss on Sandwich and common terns are considered to be short term, of negligible magnitude and not significant.

Potential Prey Effects

11.6.6.66 Tern species are visual foragers and are likely to be affected by an increase in turbidity which can make it harder to see prey. They are considered likely to be moderately sensitive to habitat disturbance and therefore potential effects on prey (Garthe & Hüppop, 2004; Bradbury *et al*., 2014). Activities associated with construction and maintenance works have the potential to release sediment during cable burial and associated works such as dredging and disposal, route clearance and rock placement. The increased concentrations of suspended material is likely to peak above storm levels, but will revert back to within comparable background concentrations within days.

11.6.6.67 Given the more restricted foraging range of little tern compared to Sandwich and common terns, the potential for impact from reduced prey availability resulting from increased turbidity is considered to be short term, of minor adverse magnitude and not significant.

11.6.6.68 Potential impacts from reduced prey availability on Sandwich and common terns are considered to be short term, of negligible magnitude and not significant.

Roseate tern

11.6.6.69 Roseate terns generally arrive in the UK from May to August to breed and prefer to nest on small shingle islands among or below vegetation (Natural England, 2012d). They tend to nest colonially with other species of tern, usually common (Natural England, 2012d).

11.6.6.70 Roseate terns feed in shallow coastal waters, out to a maximum of 30 km from the colony (mean-max = 16.6 ± 11.6 km; Thaxter *et al*., 2012). They prey mainly on small fish and crustacea, as well as worms and molluscs in shallow waters overlying the sediment (Natural England, 2012d).

11.6.6.71 Given that only a single individual has been recorded in Southampton Water during the last five years (last recorded in 2011; Frost *et al*., 2018) it is considered that roseate tern will not be present within the Marine Cable Corridor and therefore no potential for impact is predicted from any development phase of the Proposed Development.

Kittiwake

11.6.6.72 Kittiwakes return to UK colonies from March, with young birds mostly fledging from July. The closest breeding colony is located on the cliffs between Brighton and Newhaven, *c.*36 km from the Proposed Development. They disperse widely after the breeding season, becoming highly nomadic, and often feeding and roosting several hundred kilometres from land. The majority remain within 500 km of colony, but some individuals, particularly immature birds, may wander as far as Greenland and North Africa to winter.

11.6.6.73 Kittiwakes are surface-feeders, taking prey through dipping into the water and undertaking shallow plunge-dives, out to a maximum of 120 km from the breeding colony (mean-max = 60.0 ± 23.3 km; Thaxter *et al*., 2012). They generally feed on small shoaling fish, particularly sandeel, but also herring and sprat. During the breeding season kittiwakes can also forage on intertidal crustaceans and molluscs. They are also known to scavenge discards from fishing vessels.

11.6.6.74 Given their wide-ranging foraging behaviour, low sensitivity to vessel traffic (Garthe & Hüppop, 2004; Bradbury *et al*., 2014), and reliance on highly mobile shoaling fish, no potential for impact on kittiwake is predicted from any development phase of the Proposed Development.

Black-headed gull and Mediterranean gull

11.6.6.75 The black-headed gull is the most widely distributed seabird breeding in the UK, with similar numbers breeding inland as on the coast. The majority of the breeding population are resident throughout the year, with numbers being greatly bolstered during the winter months by birds from northern and eastern Europe, especially in the east and southeast of England.

11.6.6.76 Black-headed gulls forage in both terrestrial environments and in shallow coastal waters, particularly close to their breeding sites, out to a maximum of 40 km from the colony (mean-max = 25.5 ± 20.5 km; Thaxter *et al*., 2012). They are opportunistic foragers, feeding on invertebrates, small fish, seeds and carrion.

11.6.6.77 Mediterranean gulls generally arrive in the UK from May to August to breed, and prefer to nest colonially in short to medium swards of vegetation, and sometimes on vegetated shingle islands, particularly with black-headed gulls (Natural England, 2018). Important breeding areas within the site include Newtown Harbour, Hurst Castle to Lymington River Estuary, and the North Solent (Natural England, 2018).

11.6.6.78 Mediterranean gulls forage in shallow coastal waters, particularly close to their breeding sites, out to a maximum of 20 km from the colony (Thaxter *et al*., 2012). They prey on invertebrates and small fish (Natural England, 2018). They also feed in arable fields, and intertidal areas along the coastline (Natural England, 2018). Mediterranean gulls also feed on black-headed gull eggs and chicks, and have more recently been predating intensively on common tern eggs, and opportunistically on Sandwich tern eggs (Natural England, 2018).

Potential Disturbance/Displacement Effects

11.6.6.79 No disturbance to nesting black-headed or Mediterranean gulls at their breeding colonies is predicted from works associated with the Proposed Development.

11.6.6.80 However, given the proximity of the breeding colonies to the Proposed Development, it is likely that these species utilise the shallow, coastal waters of the Marine Cable Corridor to forage.

11.6.6.81 The presence of construction and repair/maintenance vessels and associated activities may displace black-headed and Mediterranean gulls from favoured foraging habitat through both visual disturbance and unpredictable noise events, particularly in relation to HDD works off the coast of Eastney and within Langstone Harbour.

11.6.6.82 Whilst it is anticipated that there may be up to *c.*4,200 vessel movements over the course of the construction stage (see Chapter 3 Description of the Proposed Development), it is anticipated that these will occur intermittently over a relatively short time frame between Q1 2021 and Q4 2023. Installation vessels will have a rolling exclusion zone of up to 700 m. Whilst there may be a number of vessels present during each stage of installation, it is likely that each vessel will only be present in any one area of the rolling exclusion zone for very short durations (hours to days). Furthermore, vessel traffic levels in the Channel and Solent are already high (see Chapter 13 Shipping, Navigation and Other Marine Users). As such, birds that use the Marine Cable Corridor to forage are expected to be habituated to such levels of disturbance.

11.6.6.83 During HDD works off the coast of Eastney (at landfall), two jack-up vessels may be present for a maximum of 43 weeks, with a total of 2,210 vessel movements predicted over this period, which is unlikely to be noticeable above baseline levels of disturbance from ongoing traffic within the area.

11.6.6.84 During operation, it is assumed that an indicative worst-case failure rate of the marine cables would require one repair every 10-12 years. If required, it is likely that repairs would be undertaken by a single vessel, over a short timeframe (weeks to months). Thus, the potential for disturbance/displacement effects during operation and maintenance will be less than during construction.

11.6.6.85 Gull species are consistently scored as being amongst the least sensitive species to disturbance from vessel traffic (Garthe & Hüppop, 2004; Bradbury *et al.*, 2014). Indeed, both black-headed and Mediterranean gulls forage in a variety of habitats where anthropogenic activities occur (Natural England, 2016; Natural England, 2018), demonstrating a level of tolerance to visual and noise disturbance. Therefore, potential disturbance/displacement effects are likely to be short-term, of negligible magnitude and not significant for both species.

Potential Indirect Effects of Habitat Disturbance and Loss

11.6.6.86 No direct loss of habitat used for breeding, roosting or loafing is predicted.

11.6.6.87 However, black-headed and Mediterranean gulls are effectively top predators of fish and invertebrate populations. If the habitat (and therefore the prey species) is lost, and there is no opportunity for the prey species to recolonise any new habitat created, the area is effectively devoid of any potential food source for the birds which will result in effective habitat loss.

11.6.6.88 As detailed in the worst-case design envelope (Table 11.12) and in Chapter 8 Intertidal and Benthic Ecology and Chapter 9 Fish and Shellfish, the area of disturbed habitat for route preparation is anticipated to be a maximum of 3.3 km^2. Due to the relatively small spatial extent of the affected area, temporary nature of the works and recoverability of many species, temporary habitat disturbance to prey species is predicted to be not significant.

11.6.6.89 Temporary increases in suspended sediment during construction and maintenance could potentially affect benthos, fish and shellfish in the vicinity of the Proposed Development. However, as detailed in Chapter 8 Intertidal and Benthic Ecology and Chapter 9 Fish and Shellfish, it is anticipated that the volume of suspended material during dredge disposal (considered as the worst-case scenario for sediment release during construction and maintenance) will be localised and is likely to peak above storm levels, but will revert back to within comparable background concentrations within days. Given that most of these species are able to tolerate a degree of suspended sediment owing to frequent exposure to storm induced fluctuations in sediment concentrations, the predicted increase in suspended sediment is predicted to be not significant.

11.6.6.90 The permanent loss of fish, shellfish and benthic habitat as a result of cable non-burial protection is not predicted to significantly affect prey species since these measures will be limited in spatial extent (Chapter 8 Intertidal and Benthic Ecology and Chapter 9 Fish and Shellfish).

11.6.6.91 Given the wide range of prey items taken by black-headed and Mediterranean gulls, it is considered that the Proposed Development is unlikely to be a key foraging resource for these species. As such, the temporary loss of this small foraging area is considered to be short term, of negligible magnitude and not significant for both black-headed and Mediterranean gull.

Potential Prey Effects

11.6.6.92 Black-headed and Mediterranean gulls are visual foragers and are likely to be affected by an increase in turbidity which can make it harder to see prey. Activities associated with construction and maintenance works have the potential to release sediment during cable burial and associated works such as dredging and disposal, route clearance and rock placement. The volume of suspended material is considered to be localised and is likely to peak above storm levels, but be back within comparable background concentrations within days. Furthermore, given the plasticity shown by both gull species in their foraging behaviour, it is likely that alternative feeding habitat is available elsewhere in the vicinity of the Proposed Development.

11.6.6.93 As such, the potential for impact from reduced prey availability resulting from increased turbidity is considered to be short term, of negligible magnitude and not significant for both species.

Lesser black-backed gull and Herring gull

11.6.6.94 Lesser black-backed gulls begin to return to breeding colonies in February, with most individuals having left by July, remaining largely resident in the UK year-round. The closest coastal colony hosting significant numbers of lesser black-backed gulls is located in the Channel Islands on Alderney, c. 142 km from the Proposed Development. However, it is likely that lesser black-backed gulls also breed in urban environments in proximity to the Proposed Development. In winter, numbers in the UK increase as there is an influx of birds from other locations in Europe (Wernham *et al.*, 2002).

11.6.6.95 Herring gulls breed between May and July, remaining largely resident in the UK year-round. The closest coastal breeding colony is located on the cliffs between Brighton and Newhaven, *c.*36 km from the Proposed Development. However, it is likely that herring gulls also nest in urban areas in the vicinity of the Proposed Development as well. Ringing data suggests that birds disperse away from colonies after breeding but the majority of individuals tend not to make long distance migrations and some birds remain local to the area. During winter there is an influx of herring gulls from other locations in Europe (Wernham *et al.*, 2002).

11.6.6.96 Both herring gulls and lesser black-backed gulls utilise terrestrial, intertidal and marine habitats for foraging, taking a wide variety of prey species including invertebrates, small fish and carrion (including fishery discards). The maximum foraging distance recorded for herring gull during the breeding season is 92 km (61.1 ± 44 km; Thaxter *et al.*, 2012), whilst lesser black-backed gulls forage more widely

11.6.6.97 Given their wide-ranging foraging behaviour, low sensitivity to vessel traffic (Garthe & Hüppop, 2004; Bradbury *et al*., 2014) and plasticity in foraging habitat, no potential for impact on lesser black-backed or herring gulls is predicted from any development phase of the Proposed Development.

Puffin, Razorbill and Guillemot

11.6.6.98 Puffins arrive at their coastal breeding colonies in March and April, departing by mid-August. The south coast of England has relatively few cliff based colonies of auks due to a lack of suitable habitat. However, small numbers of puffins breed along the Purbeck Cliffs (Barne *et al*., 1996; Lake *et al*., 2011). The closest coastal colony hosting significant numbers of puffins is located in the Channel Islands on Alderney, *c.* 142 km from the Proposed Development. Over winter puffins inhabit open sea with few, if any, present in waters.

11.6.6.99 Puffins predate upon small schooling fish such as sandeels up to a maximum of 200 km from the breeding colony (mean-max = 105.4 ± 46.0 km; Thaxter *et al*., 2012). The main foraging method used by puffins is pursuit-diving from the sea surface, diving up to 60 m to catch prey.

11.6.6.100 The south coast of England has relatively few cliff-based colonies of auks due to a lack of suitable habitat. As a consequence, only small numbers of razorbills and guillemots breed within foraging range of the Proposed Development along the Purbeck Cliffs (Barne *et al*., 1996; Lake *et al*., 2011). Adults and dependent young of both species disperse offshore from colonies in July-August. Over winter, guillemots are widely dispersed in the North Sea and north-east Atlantic, with large numbers passing through the Channel during migration. Razorbills are also widely distributed in European seas, but with a somewhat more inshore distribution in UK waters compared to puffins and guillemots.

11.6.6.101 As for puffins, both razorbills and guillemots predate upon small schooling fish such as sandeels, with razorbills foraging up to a maximum of 95 km from the breeding colony (mean-max = 48.5 ± 35.0 km; Thaxter *et al*., 2012) and guillemots foraging up to a maximum of 135 km from the breeding colony (mean-max = 84.2 ± 50.1 km; Thaxter *et al*., 2012). Prey are caught by pursuit-diving from the sea surface, (razorbill: up to 140 m; guillemot: up to 50 m).

11.6.6.102 Whilst all three species of auk are scored at being of moderate sensitivity to vessel traffic (Garthe & Hüppop, 2004; Bradbury *et al*., 2014), no potential for impact is predicted from any development phase of the Proposed Development, given their extremely large foraging range and winter distribution relative to the area of impact.

11.6.7 CUMULATIVE EFFECTS ASSESSMENT

11.6.7.1 Cumulative impacts on marine ornithology may arise from the interaction of effects from the construction, operation and decommissioning of the Proposed Development, in addition to effects from other planned or consented projects in wider region.

11.6.7.2 A list of projects within the wider region that have the potential to have a cumulative effect on marine ornithology have been assessed and is presented within Appendix 11.1 Marine Ornithology Cumulative Assessment Matrix.

11.6.7.3 Monitoring of a number of marine activities has shown that potential effects of disturbance/displacement are both site- and species-specific (Schwemmer *et al.*, 2011; Dierschke *et al.*, 2016). Disturbance/displacement has been shown to occur up to *c.*6 km from the source for sensitive species (with the exception of red-throated diver; see Mendel *et al.*, 2018). Potential effects of habitat disturbance, habitat loss and prey effects are expected to be more localised (i.e. < 6 km). As such, a ZoI of 10 km has been adopted on a precautionary basis for the marine ornithology cumulative assessment.

11.6.7.4 As detailed in Chapter 28 Cumulative Effects, the CEA is to be undertaken with regards to PINS Advice Note seventeen – Cumulative Effects Assessment (PINS, 2015). The list of projects within the vicinity of the Proposed Development that have the potential to give rise to cumulative effects on marine ornithology is presented in Appendix 11.1. The list of projects was refined for marine ornithology as follows:

- First, a spatial assessment was conducted. Any project identified in the long list of cumulative projects falling within the ZoI for marine ornithology (10 km) was screened in for further consideration;
- A temporal, scale and nature-based assessment was conducted for those projects where a potential spatial overlap was identified.
- Any projects identified with in the shortlist and considered likely to affect the marine ornithology baseline, and/or likely to result in significant effects due to their scale and nature were progressed to a detailed cumulative assessment.

11.6.7.5 Of the initial long listed projects presented in Appendix 11.1, 65 were considered to have spatial and temporal overlap with the Proposed Development and were progressed to Stage 2 (as per PINS Advice Note 17; see Appendix 11.1).

11.6.7.6 However, of those projects progressing to Stage 2, 21 were marine licences for dredging activities which all utilise the same disposal site (Nab Tower (WI060)). Dredging activities for these licences occurred outwith the ZoI, but the disposal site is located within the ZoI (resulting in 44 of the 73 projects in the long list being progressed to the Stage 2 shortlist).

11.6.7.7 Notwithstanding this, due to the lack of likely significant effects from the scale and nature of the projects shortlisted, none were progressed to detailed cumulative effects assessment (i.e. progressed to Stage 3 and 4 as defined by PINS Advice Note Seventeen) for marine ornithology (see Appendix 11.1).

11.6.8 TRANSBOUNDARY IMPACTS

11.6.8.1 The possibility for transboundary effects exists where the impacts of the Proposed Development extend beyond the UK marine area, either in isolation or cumulatively. No significant effects on IOFs in UK waters have been identified as a result of the Proposed Development.

11.6.8.2 While there is potential for any sediment plume arising to extend into French waters, transboundary impacts are not considered to have the potential to be significant. Therefore, it is considered that there will be no significant transboundary effects resulting from the Proposed Development.

11.6.8.3 However, potential impacts on any internationally designated sites will be considered as part of the HRA process.

11.7 PROPOSED MITIGATION

11.7.1.1 At this stage, the approach to assessment in this chapter assumes that mitigation measures embedded into the design (e.g. routing the cable to avoid constraints, use of appropriate construction techniques, pollution prevention measures) or which constitute industry standard environmental plans and best practice will be in place. As the final design evolves further detail on embedded mitigation measures will be provided and the assessment within the ES will reflect all the embedded and proposed mitigation measures.

11.7.1.2 Given that no significant effects were predicted for marine ornithology, no further mitigation measures are proposed other than the embedded mitigation outlined in Table 11.10.

11.8 RESIDUAL EFFECTS

11.8.1.1 Embedded mitigation has been included within the assessment, and no further mitigation requirements have been identified.

11.8.1.2 The assessment has therefore identified no significant residual effects resulting from the Proposed Development, either alone or cumulatively, for any IOF, with effects predicted to be short term and of minor adverse magnitude at most.

Table 11.14 - Summary of effects on seabirds and inshore wintering waterfowl

IOF	Impact	Significance	Mitigation	Significance of Residual Effects
Common scoter	Disturbance and displacement	No potential for impact	None	N/A
	Indirect habitat disturbance/loss	No potential for impact	None	N/A
	Prey effects	No potential for impact	None	N/A
Red-breasted merganser	Disturbance and displacement	Minor adverse, not significant	None	Not significant
	Indirect habitat disturbance/loss	Minor adverse, not significant	None	Not significant
	Prey effects	Minor adverse, not significant	None	Not significant
Slavonian grebe	Disturbance and displacement	Minor adverse, not significant	None	Not significant
	Indirect habitat disturbance/loss	Minor adverse, not significant	None	Not significant
	Prey effects	Minor adverse, not significant	None	Not significant
Black-necked grebe	Disturbance and displacement	Minor adverse, not significant	None	Not significant
	Indirect habitat disturbance/loss	Minor adverse, not significant	None	Not significant
	Prey effects	Minor adverse, not significant	None	Not significant
Fulmar	Disturbance and displacement	No potential for impact	None	N/A
	Indirect habitat disturbance/loss	No potential for impact	None	N/A
	Prey effects	No potential for impact	None	N/A
Storm petrel	Disturbance and displacement	No potential for impact	None	N/A
	Indirect habitat disturbance/loss	No potential for impact	None	N/A
	Prey effects	No potential for impact	None	N/A

IOF	Impact	Significance	Mitigation	Significance of Residual Effects
Gannet	Disturbance and displacement	No potential for impact	None	N/A
	Indirect habitat disturbance/loss	No potential for impact	None	N/A
	Prey effects	No potential for impact	None	N/A
Little tern	Disturbance and displacement	Minor adverse, not significant	None	Not significant
	Indirect habitat disturbance/loss	Minor adverse, not significant	None	Not significant
	Prey effects	Minor adverse, not significant	None	Not significant
Sandwich tern	Disturbance and displacement	Negligible, not significant	None	Not significant
	Indirect habitat disturbance/loss	Negligible, not significant	None	Not significant
	Prey effects	Negligible, not significant	None	Not significant
Common tern	Disturbance and displacement	Negligible, not significant	None	Not significant
	Indirect habitat disturbance/loss	Negligible, not significant	None	Not significant
	Prey effects	Negligible, not significant	None	Not significant
Roseate tern	Disturbance and displacement	No potential for impact	None	N/A
	Indirect habitat disturbance/loss	No potential for impact	None	N/A
	Prey effects	No potential for impact	None	N/A
Kittiwake	Disturbance and displacement	No potential for impact	None	N/A
	Indirect habitat disturbance/loss	No potential for impact	None	N/A
	Prey effects	No potential for impact	None	N/A
	Disturbance and displacement	Negligible, not significant	None	Not significant

IOF	Impact	Significance	Mitigation	Significance of Residual Effects
Black-headed gull	Indirect habitat disturbance/loss	Negligible, not significant	None	Not significant
	Prey effects	Negligible, not significant	None	Not significant
Mediterranean gull	Disturbance and displacement	Negligible, not significant	None	Not significant
	Indirect habitat disturbance/loss	Negligible, not significant	None	Not significant
	Prey effects	Negligible, not significant	None	Not significant
Lesser black-backed gull	Disturbance and displacement	No potential for impact	None	N/A
	Indirect habitat disturbance/loss	No potential for impact	None	N/A
	Prey effects	No potential for impact	None	N/A
Herring gull	Disturbance and displacement	No potential for impact	None	N/A
	Indirect habitat disturbance/loss	No potential for impact	None	N/A
	Prey effects	No potential for impact	None	N/A
Puffin	Disturbance and displacement	No potential for impact	None	N/A
	Indirect habitat disturbance/loss	No potential for impact	None	N/A
	Prey effects	No potential for impact	None	N/A
Razorbill	Disturbance and displacement	No potential for impact	None	N/A
	Indirect habitat disturbance/loss	No potential for impact	None	N/A
	Prey effects	No potential for impact	None	N/A
Guillemot	Disturbance and displacement	No potential for impact	None	N/A
	Indirect habitat disturbance/loss	No potential for impact	None	N/A

IOF	Impact	Significance	Mitigation	Significance of Residual Effects
	Prey effects	No potential for impact	None	N/A

11.9 SUMMARY AND CONCLUSIONS

BASELINE

11.9.1.1 Overall abundance of seabirds and inshore wintering waterfowl in UK waters within the Channel is relatively low (Wakefield *et al.*, 2017). However, species diversity is high and the Channel is an important area during migration (Steinen *et al.*, 2007).

11.9.1.2 Whilst there is little suitable habitat for cliff-nesting seabirds in the region surrounding the Proposed Development, there are a number of nationally and internationally important tern and gull colonies present on the sand and shingle beaches, saltmarshes and offshore islets of the southern English coastline. A number of nationally important estuarine and coastal wintering sites are also present for inshore wintering waterfowl.

ASSESSMENT

11.9.1.3 Potential effects to marine ornithology resulting from disturbance and displacement from construction plant and support vessels, in addition to indirect effects as a consequence of prey disturbance and/or habitat loss were assessed.

11.9.1.4 No significant effects were predicted for marine ornithology, with minor impacts predicted at most, due to the short-term and localised nature of predicted effects compared to species abundance and distribution in the vicinity of the Proposed Development.

11.9.1.5 Of the initial list of projects considered as part of the cumulative effects assessment (presented in Appendix 11.1), 65 projects were shortlisted and considered to have a potential spatial overlap with the Proposed Development. However, due to the timing, scale and nature of these shortlisted projects, none were considered to have the potential to produce significant cumulative impacts or required for detailed cumulative effects assessment (i.e. Stage 3 and Stage 4 of PINS Advice Note Seventeen) for marine ornithology.

11.9.1.6 Potential transboundary effects were not predicted to be significant for marine ornithology. However, likely significant effects on any internationally designated sites will be considered as part of the ongoing HRA process for the DCO application.

MITIGATION

11.9.1.7 Industry standard and best practice embedded mitigation measures were assumed within the assessment, and no further mitigation requirements were identified given that no significant effects were predicted.

RESIDUAL EFFECTS

11.9.1.8 Taking into consideration embedded mitigation within the assessment, no further mitigation requirements were identified. Therefore, no residual effects were identified.

CONCLUSION

11.9.1.9 The potential for the Proposed Development (as described in Chapter 3 Description of the Proposed Development and accounting for activities excluded from assessment in Section 11.4.5) to have detrimental impacts on marine ornithology was considered to be, at most, minor, short-term, and not significant.

11.10 ASSESSMENTS AND SURVEYS STILL TO BE UNDERTAKEN

11.10.1.1 It is considered that given the nature of the Proposed Development, that a proportionate assessment is undertaken through the use of desk-based review. As such, no baseline surveys have been undertaken with respect to marine ornithology.

11.10.1.2 The further work and next steps to be completed for the ES include:

- Further consultation as required;
- Undertaking a HRA for marine ornithology features; and
- Updating the information presented above to reflect the final design parameters and should any relevant new literature or guidance become available.

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