FOREWIND

DOGGER BANK
TEESSIDE A & B

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Environmental Statement
Chapter 11
Marine and Coastal Ornithology

Application Reference: 6.11

Cover photograph: Installation of turbine foundations in the North Sea

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1. Introduction

1.1.1. This chapter of the Environmental Statement (ES) describes the existing environment with regard to ornithology and provides an assessment of the potential impacts of Dogger Bank Teesside A & B on ornithology during the construction, operation, and decommissioning phases. Where the potential for significant impacts is identified, mitigation measures and residual impacts are presented.

1.1.2. The chapter is a summary of the baseline description and impact assessment undertaken by the British Trust for Ornithology (BTO). The reader is directed to the BTO technical report (**Appendix 11A Ornithology Technical Report**) for further details of the information presented.

1.1.3. The assessment also considers information from, and refers to, the following:

- **Chapter 12 Marine and Intertidal Ecology**;
- **Chapter 13 Fish and Shellfish Ecology**;
- **Chapter 16 Shipping and Navigation**;
- **Chapter 19 Military Activities**;
- **Chapter 20 Civil Aviation**;
- **Chapter 25 Terrestrial Ecology**;
- **Chapter 29 Noise** (where associated with the onshore works including the landfall); and
- **Habitats Regulations Assessment (HRA) Report**.

2. Guidance and Consultation

2.1. Legislation

2.1.1. Birds are protected under a wide range of national and international legislation as outlined in **Table 2.1**.

Table 2.1 National and international legislation in relation to birds

Legislation	Relevant species	Details
International		
1971 Convention on Wetlands of International Importance (the Ramsar Convention)	All species recorded in the Dogger Bank Zone.	Protects wetland sites and promotes their conservation, encouraging their designation (within the list of Wetlands of International Importance) and outlining compensation.
Convention on International Trade in Endangered Species (CITES) 1975	No species listed within the CITES convention in either Appendix I or II.	Appendix I lists species that are the most endangered and therefore prohibits commercial trade, while Appendix II lists species that are not necessarily now threatened with extinction, but may become so unless trade is closely controlled.
The Bern Convention 1979	No listed species in Appendix II. All bird species not present in Appendix II present on Appendix III, with the exception of herring gull *Larus argentatus*, lesser black-backed gull *Larus fuscus* and great black-backed gull *Larus marinus*).	The Convention conveys special protection to those species that are vulnerable or endangered. Includes Appendix II (strictly protected fauna) and Appendix III (protected fauna. Although an international convention, it is implemented within the UK through the Wildlife and Countryside Act 1981 (with any aspects not implemented via that route brought in by the Habitats Directive).
The OSPAR Convention 1992	Lesser black-backed gull and black-legged kittiwake *Rissa tridactyla*	OSPAR has established a list of threatened and/or declining species in the Northeast Atlantic. These species have been targeted as part of further work on the conservation and protection of marine biodiversity under Annex V of the OSPAR Convention. The list seeks to complement, but not duplicate, the work under the EC Habitats and Birds directives and measures under the Berne Convention, the Bonn Convention. This also defined the Greater North Sea Regional study area.
European Birds Directive (79/409/EEC codified by Directive 2009/147/EC)	Applies to all species of naturally occurring birds in the European territory. All species recorded in the study area are listed in Article 4.	Articles 2 and 3 aim to maintain the populations of all wild bird species across their natural range. Article 4 provides international protection via the designation of Special Protection Areas (SPAs) for sites that support more than 1% of the biogeographic population, significant numbers (Annex I of the Directive) for assemblages of over 20,000 birds.
European Habitats and Species Directive (92/43/EEC)	The project area is located in Dogger Bank cSAC noted for its subtidal habitat.	Designates Special Areas of Conservation (SACs) for sites selected for habitats/species listed in Annexes I and II of the Habitats Directive.

Legislation	Relevant species	Details
National		
The Wildlife and Countryside Act 1981 (as amended)	All British wild birds (excluding game birds).	Consolidates and amends national legislation to implement the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and the Birds Directive in the UK. Provides protection for any wild birds by making it an offence to kill, injure or take any wild bird or their nest/eggs. Also provides designation of Site of Special Scientific Interest (SSSI) and National Nature Reserves (NNR).
UK Biodiversity Action Plan (BAP)	Priority species: Bean goose *Anser fabalis*, barnacle goose *Branta leucopsis*, common pochard *Aythya ferina*, greater scaup *Aythya marila*, great bittern *Botaurus stellaris*, Slavonian grebe *Podiceps auritus*, hen harrier *Circus cyaneus*, golden plover *Pluvialis apricaria*, northern lapwing *Vanellus vanellus*, dunlin *Calidris alpina*, ruff *Philomachus pugnax*, black-tailed godwit *Limosa limosa*, Eurasian curlew *Numenius arquata*, short-eared owl *Asio flammeus*, European nighjar *Caprimulgus europaeus*, common starling *Sturnus vulgaris* herring gull *Larus argentatus*, common scoter *Melanitta nigra*, Arctic skua *Stercorarius parasiticus*.	The UK Governments response to the Convention on Biological Diversity (CBD) which was signed in 1992. This Biodiversity Action Plan describes the UK's biological resources and provides action plans for threatened species and habitats.
The Conservation (Natural Habitats, &c.) Regulations 1994	Seee Habitats Directive and Birds Directive above.	This legislation transposes Habitats and Birds Directives into UK law, thereby enabling the scheduling of and providing protection to SACs and SPAs.
The Countryside and Rights of Way Act 2000	All British wild birds (excluding game birds).	Provided amendments to The Wildlife and Countryside Act 1981. Strengthens the protection of SSSIs and the associated species and increases penalties.
Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended)	See **Table 3.2** for species which are listed as SAC/SPA species.	The Offshore Marine Conservation Regulations 2007 (as amended) apply the Habitats Directive to marine areas within UK jurisdiction, beyond 12 nautical miles, and provide further clarity on the interpretation of "disturbance" in relation to species protected under the Habitats Directive. It thus allows the designations of SACs and SPAs. This enables energy developers to better qualify and, where possible, quantify, the impacts on birds and determine whether the potential disturbance is permissible as part of a consented development.

Legislation	Relevant species	Details
The Conservation of Habitats and Species Regulations 2010	See **Table 3.2** for species which are listed as SAC/SPA species.	In England and Wales, The Conservation of Habitats and Species Regulations 2007 (as amended) consolidate all the various amendments made to the Conservation (Natural Habitats, &c.) Regulations 1994, implementing the requirements of the Habitats Directive into UK law. This updated the legislation with regard to the scheduling and protection of SACs and SPAs.

The European Birds Directive

2.1.2. Special Protection Areas (SPAs) are sites that support populations of birds that are of European importance, and are designated under Council Directive (2009/147/EC) on the conservation of wild birds (the 'Birds Directive'). The Conservation (Natural Habitats, &c.) Regulations 1994, transposed the Habitats Directive into national law, and came into force on 30 October 1994. The Habitats Regulations incorporated all SPAs into the definition of 'European sites' and, consequently, the protections afforded to European sites under the Habitats Directive apply to SPAs designated under the Birds Directive. The Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2007 (the Offshore Habitats Regulations) transpose the Habitats and Birds Directives into national law, covering waters beyond 12 nautical miles.

2.1.3. The Birds Directive is probably the most important wildlife legislation in relation to birds, creating a comprehensive scheme of protection for all wild bird species naturally occurring in the European Union (EU). It also recognises that migratory birds are a shared heritage of the member states and that effective conservation must be done internationally.

2.1.4. This directive bans activities that directly threaten birds, as well as those that result in the destruction of nests or the taking of eggs.

2.1.5. Under Article 12 of the Directive, Member States are required to take the requisite measures to establish a system of strict protection for species in their natural range prohibiting:

- All forms of deliberate capture or killing of specimens of these species in the wild; and
- Deliberate disturbance of these species, particularly during the period of breeding, rearing, hibernation and migration.

2.2. Policy and Guidance

2.2.1. The assessment of potential impacts upon ornithology has been made with a specific reference to the relevant sections within the National Policy Statements (NPS) which serve as the primary decision making documents for projects deemed Nationally Significant Infrastructure Projects (NSIP).

2.2.2. The two NPS documents considered are:

- National Policy Statement for Energy (EN-1) (Department of Energy and Climate Change (DECC), July 2011); and
- National Policy Statement for Renewable Energy Infrastructure (EN-3) (DECC, July 2011).

2.2.3. The particular assessment requirements relevant to ornithology are detailed in **Table 2.2**.

Table 2.2 NPS assessment requirements

NPS requirements	NPS reference	ES reference
Where the development is subject to Environmental Impact Assessment (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 or other species identified as being of principal importance for the conservation of biodiversity.	NPS for Energy EN-1, paragraph 5.3.3.	Due consideration of the designated areas is given in this chapter (Section 3.3, **Table 3.1**).
Biodiversity considerations to which applicants and the IPC should have regard concerning offshore infrastructure include: ….birds.	NPS for Renewable Energy Infrastructure EN-3, 2.6.59.	Due consideration of the effect of the project on ornithology is given in this chapter (Sections 6, 7 and 8).
Assessment of offshore ecology and biodiversity should be undertaken by the applicant for all stages of the lifespan of the proposed offshore wind farm and in accordance with the appropriate policy for offshore wind farm EIAs.	NPS for Renewable Energy Infrastructure EN-3, 2.6.64.	Due consideration of the effect on ornithology of the pre-construction, construction and operation phases is given in this chapter (Sections 4, 6 and 7).
The assessment should include the potential of the scheme to have both positive and negative effects on marine ecology and biodiversity.	NPS for Renewable Energy Infrastructure EN-3, 2.6.67.	Due consideration of the effect of the project on ornithology is given in this chapter (Sections 6, 7 and 8).
The scope, effort and methods required for ornithological surveys should have been discussed with the relevant statutory advisor.	NPS for Renewable Energy Infrastructure EN-3, 2.6.102.	This has been broadly outlined within this chapter, with a detailed rundown available in **Appendix 11AOrnithology Technical Report**.
Relevant data from operational offshore wind farms should be referred to in the applicant's assessment.	NPS for Renewable Energy Infrastructure EN-3, 2.6.103.	Due consideration of the effect of the project on ornithology is given in this chapter (Section 4).
It may be appropriate for assessment to consider collision risk modelling for certain species of birds.	NPS for Renewable Energy Infrastructure EN-3, 2.6.104.	Due consideration of the risk of collision for birds in the wind farm site has been considered in this chapter (Section 7.4).
Applicants are expected to adhere to requirements in respect of FEPA licence requirements (now Marine Licence).	NPS for Renewable Energy Infrastructure EN-3, 2.6.105.	Adherence to licencing is ensured through the survey methodology and throughout the assessment criteria of this chapter.

2.2.4. The principal guidance documents used to inform the assessment of potential impacts on ornithology are as follows:

- Assessing the ornithological effects of wind farms: developing a standard methodology (Percival *et al*. 1999);
- Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index (Garthe & Hüppop 2004);
- Guidelines for ecological impacts assessment in the United Kingdom (Institute of Ecology and Environmental Management (IEEM) 2006);
- Developing field and analytical methods to assess avian collision risk at wind farm (Band *et al*. 2007);
- Developing guidance on ornithological cumulative impact assessment for offshore wind farm developers (King *et al.* 2009);
- A review of assessment methodologies for offshore windfarms (Maclean *et al*. 2009);
- Guidelines for Ecological Impact Assessment in Britain and Ireland: Marine and Coastal (IEEM 2010);
- Using a collision risk model to assess bird collision risks for offshore windfarms (Band 2012);
- A review of flight heights and avoidance rates in relation to offshore wind farms (Cook *et al*. 2012);
- Vulnerability of Scottish seabirds to offshore wind turbines (Furness & Wade 2012);
- Joint Natural England and JNCC Interim Advice Note: Presenting information to inform assessment of the potential magnitude and consequences of displacement of seabirds in relation of Offshore Windfarm Developments (Natural England (NE) & Joint Nature Conservation Committee (JNCC) 2012);
- Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas (Thaxter *et al*. 2012);
- Assessing the risk of offshore wind farm development to migratory birds designated as features of UK Special Protection Areas (and other Annex 1 species) (Wright *et al*. 2012);
- Natural England and JNCC advice on Habitats Regulations Assessment (HRA) screening for seabirds in the breeding season (Natural England (NE) & Joint Nature Conservation Committee (JNCC) 2013a); and
- JNCC and Natural England interim advice on Habitats Regulations Assessment (HRA) screening for seabirds in the non-breeding season (Natural England (NE) & Joint Nature Conservation Committee (JNCC) 2013b).

2.3. Consultation

2.3.1. To inform the ES, Forewind has undertaken a thorough pre-application consultation process, including the following key stages:

- Scoping Report submitted to the Planning Inspectorate(May 2012);
- Scoping Opinion received from the Planning Inspectorate (June 2012);
- First stage of statutory consultation (in accordance with Sections 42 and 47 of the Planning Act 2008) on Preliminary Environmental Information (PEI) 1 (report published May 2012); and
- Second stage of statutory consultation (in accordance with Sections 42, 47 and 48 of the Planning Act 2008) on the draft ES designed to allow for comments before final application to the Planning Inspectorate.

2.3.2. In between the statutory consultation periods, Forewind consulted specific groups of stakeholders on a non-statutory basis to ensure that they had an opportunity to inform and influence the development proposals. Consultation undertaken throughout the pre-application development phase has informed Forewind's design decision making and the information presented in this document. Further information detailing the consultation process is presented in **Chapter 7 Consultation**. A Consultation Report is also provided alongside this ES, as part of the overall planning submission.

2.3.3. A summary of the key consultation and stakeholder engagements carried out by Forewind at key project stages of particular relevance to the impacts on marine and coastal ornithology is presented in **Table 2.3**. The table also includes relevant comments raised during the consultation on the draft ES for Dogger Bank Creyke Beck that have been considered in the preparation of this chapter and the supporting Technical Report (**Appendix 11A**). Full details of all consultations undertaken are presented in Section 1.3 of **Appendix 11A**.

2.3.4. **Table 2.3** only includes the key items of consultation that have defined the assessment. A considerable number of comments, issues and concerns raised during consultation have been addressed in meetings with consultees and hence have not resulted in changes to the content of the ES. In these cases, the issue in question has not been captured in **Table 2.3**. A full explanation of how the consultation process has shaped the ES, as well as tables of all responses received during the statutory consultation periods, is provided in the Consultation Report.

Table 2.3 Key consultation and stakeholder issues and outcomes of relevance to marine and coastal ornithology conducted by Forewind throughout the project

Consultee	Concern	Comments	Response
Planning Inspectorate	Scoping Opinion for Proposed Dogger Bank Teesside Offshore Wind Farm	Ornithology – The Planning Inspectorate advises that due to the proximity of several internationally designated sites to Dogger Bank together with the scale of the proposals, the potential impacts on birds should be comprehensively assessed. The Planning Inspectorate refers the applicant to the detailed comments from JNCC/NE regarding ornithology and advises that these comments should be addressed in the assessment or a full explanation provided as to why the recommendations were not considered appropriate.	The assessment of potential impacts to the features of designated sites has been integral to the assessment (presented in Sections 6, 7, 8, 10, and 11). The JNCC/NE comments are noted and responses to these provided below.
	Scoping Opinion for Proposed Dogger Bank Teesside Offshore Wind Farm	Ornithology – The Planning Inspectorate agrees with the applicant that cumulative impacts should be assessed and appropriate mitigation measures identified in the ES.	Both cumulative impacts (presented in Sections 10 and 11) and mitigation measures (presented in Sections 6, 7, 8, 10, and 11) are considered in the assessment.
	Scoping Opinion for Proposed Dogger Bank Teesside Offshore Wind Farm	Noise and vibration levels along the foreshore potentially affecting birds and marine mammals should be assessed.	The issue of noise has been considered in the assessment of disturbance to intertidal birds (presented in Sections 6 and 8).
JNCC / Natural England	Scoping Opinion for Proposed Dogger Bank Teesside Offshore Wind Farm	Existing environment Offshore waters – Whilst Tranche A is well outside the foraging range of many species of relevance to coastal SPA populations during the breeding season, it may be an area of importance to these populations pre and post breeding (and not limited to the migration period as suggested).	The importance of the area to the features of designated sites has been considered for all periods of the year (presented in Sections 6, 7, 8, 10, and 11).

Consultee	Concern	Comments	Response
JNCC / Natural England	Scoping Opinion for Proposed Dogger Bank Teesside Offshore Wind Farm	Existing environment The Crown Estate & Forewind Studies – The data from both studies suggest that auk species (guillemot and razorbill) are of key significance to this site. This emphasises the need to ensure that the current and future survey methodologies are able to calculate robust population estimates for these two species. Table 6.2: We would like clarification if 'peak count' and 'monthly total' are the same? Are these raw counts? Table 6.3: We would like clarification how the 'relative abundance calculated' was calculated?	Details of the methodology used to calculate population estimates have been developed over the course of the work, in consultation with stakeholders. A meeting to discuss the combined boat and aerial survey methodology was held between Forewind Ltd, the surveyors, Gardline Ltd and Hi-Def Surveying Ltd and the Joint Nature Conservation Committee (JNCC) in April 2010. As a result of this, a review of the methodology was instigated, led by the British Trust for Ornithology (BTO). A follow-up meeting was held in November 2010 with stakeholder representation from JNCC and the Royal Society for the Protection of Birds (RSPB). Key topics discussed during this meeting included; i. A review of survey data collection protocols; ii. A review of the survey approach and whether this was sufficient to provide a robust characterisation of the populations of seabirds present in the Zone and tranche areas within this; iii. Identification of the key species for assessment and the likely effects for these species; and iv. A review of potential methodologies for assessing effects on migratory species. The report on this review, which details stakeholder discussion, was completed in April 2011 (Austin *et al*., 2011) and has been provided as supporting evidence in **Appendix 11A Ornithology Technical Report**.
	Scoping Opinion for Proposed Dogger Bank Teesside Offshore Wind Farm	Potential Impacts Disturbance and Displacement – Please note that birds may also respond to the visual cues of WTGs (as well as noise). In terms of disturbance/ displacement of prey species, we encourage a collaborative approach to this assessment, in conjunction with the work on Fish and Shellfish impacts	The effects on fish and shellfish have been considered in the assessment, especially in relation to the potential for habitat loss / changes (presented in Sections 6, 7, 8, 10, and 11).

Consultee	Concern	Comments	Response
JNCC / Natural England	Scoping Opinion for Proposed Dogger Bank Teesside Offshore Wind Farm	Potential Impacts Barrier effects – The barrier effect does not necessarily entail the wind farm being a 'physical obstacle' as such, instead the bird perceives the wind farm area as something to avoid. This avoidance behaviour leads to changes in flight paths, and hence potentially increased energetic requirements. It is questionable if the perception of the wind farm as a barrier would be worsened in high winds or reduced visibility. In fact flocks of waterfowl in the Kalmar Sound, Sweden (Pettersson, 2005) flew nearer to the wind farm before exhibiting avoidance behaviour in poor visibility and night time conditions, than in clear conditions, which may have resulted in less deviation from their intended flight path. However, the energetic consequences of this difference are undetermined. It is acknowledged that weather may have an influence on migration altitude, and that altitude varies considerably both within and between species. For many migrant species there is no existing data on migration altitude, particularly over the sea and as such, we require further evidence to support this assumption.	The assessment of barrier effects has drawn on the methodology of Maclean *et al* (2009) which defines sensitivity based on the tolerance of the species to the increased energetic costs associated with barrier effects (assessment presented in Sections 7, 10, and 11). It is acknowledged that there is no existing data on migration altitude for many migrant species, and thus the precautionary approach outlined in Wright *et al* (2012) on this issue has been followed.
	Scoping Opinion for Proposed Dogger Bank Teesside Offshore Wind Farm	Potential Impacts Collision risk – Whilst body size and wing loading may be factors that contribute to estimating the sensitivity of a species to collision with turbines, other factors may also be relevant (e.g. predator vigilance, foraging technique). Furthermore, the risk of collision is a function of exposure and sensitivity; hence species may be sensitive to collision, but not exposed to this risk doe to avoidance of the wind farm site.	The risk of birds to collision has been assessed through the consideration of avoidance rates. Results for a range of avoidance rate have been presented, with a worst case scenario of 98% avoidance taken through to the impact assessment (assessment presented in Sections 7, 10, and 11). One exception is northern gannet, where 99% avoidance rate has been assumed (see Section 3 for reasoning). The species-specific sensitivity of receptors to collision primarily reflects the tolerance of the species' populations to the mortality associated with collisions and has been considered through two approaches.

Consultee	Concern	Comments	Response
JNCC / Natural England	Scoping Opinion for Proposed Dogger Bank Teesside Offshore Wind Farm	EIA process – JNCC would like to highlight that the initial survey protocol was presented to us, but it is not clear that our recommendations have been taken on board. We are encouraged that Forewind are in consultation with us (and others) regarding the survey methodologies. We acknowledge that the location of the site offers challenging conditions, and are keen to work with Forewind to ensure the surveys are fit for purpose and the data gathered is informative. It is important to recognise that the process is an iterative one, whereas data is gathered adjustments/ amendments to methodologies may be beneficial. It is also important to note that boat and aerial surveys may not be sufficient to provide information on certain ornithological issues, such as migratory/ passage species and connectivity between protected sites and Tranche A. Complimentary survey methods may be necessary to inform these issues (such as tracking, radar etc), and we would welcome early engagement with JNCC and other relevant stakeholders to work towards a suitable approach.	Details of the methodology used to calculate population estimates have been developed over the course of the work, in consultation with stakeholders (see above). Consideration of the potential connectivity between the development area and protected sites has drawn on recent information on the potential foraging ranges of species and specific tracking studies (see Section 3 for details).
	Geographical scope assumptions	Generally the document takes a pragmatic approach to assessment of potential impacts on seabirds. We do have some specific comments and questions, in particular in relation to the proposed approach of assessing displacement and the estimation of associated mortality rates. These are outlined below. In general, we would like to highlight that the level of uncertainty associated with the assumptions made for the assessment and modelling studies should be fully discussed in the EIA, based on the nature of the evidence used and how this evidence was used to determine impact significance.	Details regarding the consideration of displacement and associated mortality rates are provided below. Confidence in predictions has been assessed as recommended by IEEM (2006, 2010) guidelines.

Consultee	Concern	Comments	Response
JNCC / Natural England	Geographical scope assumptions	Following review of the documents, we assume that the presented approach is for EIA only and that a separate Habitats Regulations Assessment document exists or will be produced? Similarly the documents seem to relate exclusively to the offshore component of the development. Will there be parallel documents to support the cable route and landfall impact assessments?	A separate Habitats Regulations Assessment is provided (see **HRA Report**). A baseline characterisation and impact assessment for the cable route and intertidal landfall has been provided in this chapter (presented in Section 4).
	Geographical scope assumptions	Section 2.2 - Any evidence to support the assumption that 100% of birds within the transect strips are usually detected by the aerial surveys should be provided. For example, were lenses etc selected and changed according to conditions? On different days, with different light conditions and sea states, birds may be more or less easily detected in images and videos. The detection rate could also vary between observers. What measures were taken to ensure detection was 100%?	HiDef apply the most rigorous quality assurance across the aerial survey techniques. These compare very well and in many respects far superior to those possible with visual survey methods primarily because there is a permanent video record of the sightings which can be revisited many times by multiple ornithologists. A strict and stringent quality assurance process has been applied on both the detection and identification phases. HiDef's reviewers, who undergo the object detection, have been required to achieve at least 90% detection at the audit stage. Detection rates have been reported on a survey by survey basis ensuring complete transparency. Through the survey program at Dogger Bank and elsewhere detection rates of about 98% have been routinely achieved. These detection efficiencies have persisted in a wide range of survey conditions, including light conditions and sea state. Further evidence that detection is of that order of magnitude comes from comparisons carried out with other data sets, and that the numbers of these birds detected during the surveys 'make sense' come from the scoter comparison survey in Carmarthen Bay (Buckland *et al*. 2011); a survey of mainly scoter, red-throated divers and other species in Liverpool Bay (unpublished JNCC report); and a survey of Scapa Flow in March 2012 (unpublished HiDef report). Furthermore, HiDef has completed two calibration surveys with boat-based surveys.

Consultee	Concern	Comments	Response
JNCC / Natural England	Geographical scope assumptions	Is digital aerial surveying appropriate for assessing numbers of little auk? Digital detection of little auks has been raised as an issue in the past. Is there sufficient evidence to be confident that detection rates are acceptable of this species? With relatively large numbers being recorded on the site during boat based surveys, over 900 observations in some months, analysis of boat data might give more accurate results.	HiDef's survey methods are fully capable of detecting little auks. This capability has been substantially enhanced with the implementation of a new generation of camera technology and analysis software which has delivered 95% detection rate to species on industrial scale trials at Dogger Bank. While little auk numbers may reach 900 during a survey, a proportion of these will not be classed as being 'in transect' because of flux effects of flying birds – abundance estimates and species proportions should always be assessed based upon birds 'in transect' only. HiDef have certainly detected plenty of little auks during the Dogger Bank surveys, but this has been confounded by the large numbers of auks that were not identified to species level. During November 2011, for example, generally a peak period for little auks in the western North Sea, 1,137 auk species were detected and 69 small auks. Of these, 29 were identified to species level, and 23 of these 29 were little auks – approximately equal numbers of these were classed as auk species and small auk. While this doesn't provide conclusive proof that surveys are achieving 90%+ little auk detection, it suggests that surveys did not experience problems with the small auks.
	Geographical scope assumptions	Caution must also be shown towards estimates of other auk species using the methods described if detection of little auks is an issue as the accurate proportioning of auks depends on the assumption of close to 100% detection of auk species. If there is uncertainty regarding little auk detection then further detail should be provided on how auk species population estimates will be addressed.	See above response.

Consultee	Concern	Comments	Response
JNCC / Natural England	Geographical scope assumptions	Section 2.3 - It should be noted that when using this ‘importance’ approach that some species are likely to be incorrectly screened out. Passage migrants, including skuas and terns, waders and wildfowl, may pass through the site once only but with a total passage over a number of days. Thus the peak snapshot on any given day may not reflect the true site importance, as usage may be spread over a longer period. This issue of flux for migrants should be considered when judging site importance.	Consideration has been given to the turnover of passage migrants both in the baseline characterisation and identification of key receptors, and in the assessment of significant impacts (see Methodology in Section 3).
	Geographical scope assumptions	It should also be noted that Skov *et al* (1995) reports data now at least 17 years old and is at a gross scale. For instance, in Skov *et al* (1995) the Outer Thames is estimated to hold 230 red-throated divers when the Outer Thames Estuary SPA is designated for >6,000 birds, based on more recent survey data. It is also compiled from disparate data sources. Whilst it is sensible to base regional comparisons on published data some extra information may be required where later results substantially change the picture.	This is noted.
	Geographical scope assumptions	Section 2.4 - It is not strictly true that the gull estimates include no birds that ‘frequent offshore waters’ as some may do so but roost closer to land. However the point is taken and seems precautionary.	Again this is noted, though the main point is that birds frequenting waters further offshore will not have been included in the survey and the calculation of national population estimates.
	Geographical scope assumptions	Section 2.5 - For SPA populations it is important to present designated population sizes of the qualifying feature. This information can be found on the JNCC website (http://jncc.defra.gov.uk/page-162) or in the case of Scottish SPAs via the Sitelink website (http://gateway.snh.gov.uk/sitelink/index.jsp). For SPAs in England and Wales, if differences exist between the SPA review and the original Natura data form please contact the relevant SNCB (respectively NE and CCW) for guidance.	This guidance has been followed in the baseline characterisation and impact assessment (see Methodology in Section 3 and **Appendix 11A Ornithology Technical Report**).

Consultee	Concern	Comments	Response
JNCC / Natural England	Geographical scope assumptions	It is also important to present current population estimates. It is likely that up to date population estimates will be available for most SPAs with features demonstrating connectivity with Dogger Bank. Please present current population estimates, and indicate when and where these are derived from.	This guidance has been followed in the baseline characterisation and impact assessment. Apportioning of impacts used the most recent data available. Where available, data for UK sites were taken from the JNCC Seabird Monitoring Programme Online Database (http://jncc.defra.gov.uk/page-4460) for the most recent year (i.e. 2007 to 2011). If no data were available for UK sites from this source for these years, data were obtained from the Seabird 2000 survey (1998-2002) and numbers adjusted using country (Scotland, England) Seabird Monitoring Programme trends (http://jncc.defra.gov.uk/page-3201) to provide a value for 2011. Where data were not available from the Seabird Monitoring Programme more recently than the Seabird 2000 survey, we used the most recent year between 2007 and 2011. More recent population estimates were later supplied directly by Natural England for the Flamborough and Filey Coast pSPA formerly the Flamborough Head and Bempton Cliffs SPA (and component SSSI), and by JNCC for Scottish SPAs, thus superseding the process outlined above for those sites. For non-UK sites, data were taken from citation information available through Natura 2000 (http://natura2000.eea.europa.eu/ and http://www.ramsar.wetlands.org/Database/Searchforsites/tabid/765/Default.aspx [last accessed 31/07/2013]). While up-to-date population estimates were used to best apportion effects, the proportion of the site population estimated to be impacted was also applied to the citation population for information.
	Geographical scope assumptions	For those sites where data are not available assessing recent trends in seabird numbers could provide more accurate population estimates. Data from the Seabird Monitoring Programme will provide information on trends for some relevant species, see http://jncc.defra.gov.uk/page-3201. The data for most of the seabird population estimates cited in Baker *et al* (2006) is derived from Seabird 2000 census, so in some instances may be as much as 14 years old.	This guidance has been followed in the baseline characterisation and impact assessment (see Methodology in Section 3 and **Appendix 11A Ornithology Technical Report**). See also response above.

Consultee	Concern	Comments	Response
JNCC / Natural England	Geographical scope assumptions	If trends are applied to derive more up to date population estimates for UK birds these numbers should then be taken into consideration regarding biogeographic population estimates.	It is over and above this work, and would be against protocol, to propose new biogeographic population estimates. The most up-to-date estimates available have been used, e.g. using Wetlands International (2012) where appropriate.
	Geographical scope assumptions	Section 2.5 - Wetlands International (2006) indicate that correction factors for breeding seabirds account for immature birds bolstering the population post-fledgling. The report states that 'individual numbers usually peak after the breeding season due to first year recruitment and suffer high and variable mortality over the non-breeding season ...' Careful thought should be given to appropriate thresholds at different times of year. When breeding is underway the population threshold may more reasonably be number of pairs x2 (not three), accepting that there is an unknown proportion of non-breeding immature birds also in the population but not accounted for in the population estimate.	Again it would be over and above this work, and against protocol, to propose different biogeographic population estimates for different times of year. However, this point has been taken into particular consideration in the assessment of numbers of migrants likely to pass through the project areas.
	Geographical scope assumptions	Section 2.7 - We would like to stress that there is currently no national population threshold for white-billed diver. It would perhaps be precautionary to adopt a threshold of 50 birds for the non-breeding population of this species, as per SPA guidelines (Stroud *et al*., 2001).	This guidance has been followed (see Methodology in Section 3 and **Appendix 11A Ornithology Technical Report**).
	Geographical scope assumptions	Section 2.11 - Listed components of seabird assemblages (Stage 1.3) should be assessed separately, in the same way as features selected at Stages 1.1 and 1.2. Species listed as components of assemblages are included, in most cases, as their populations meet the 1% national population threshold. Occasionally, listed features do not meet this threshold as their national populations are very large, but are listed as they comprise 10% of the assemblage (Stroud *et al*., 2001).	This guidance has been followed (see Methodology in Section 3 and **Appendix 11A Ornithology Technical Report**).

Consultee	Concern	Comments	Response
JNCC / Natural England	Geographical scope assumptions	Section 2.12 - It is encouraging to see this issue being addressed and we look forward to seeing the outcome of the review. It would be of interest to note any seasonal differences in auk 'availability' that arise due to differences in foraging behaviours at different times of year. If feeding events of gannets are captured would a similar process be used?	The results of this review are presented in Appendix 4 of **Appendix 11A Ornithology Technical Report** and taken into consideration in the assessment of significant impacts.
	Geographical scope assumptions	Section 3.1 - The approach discussed here is sound but note that IEEM (2010) is a more recent reference that is specifically tailored to the marine environment. This should be checked for differences with IEEM (2006) as the later document is more likely to be directly relevant.	This guidance has been followed (see Methodology in Section 3 and **Appendix 11A Ornithology Technical Report**).
	Geographical scope assumptions	Section 3.2 - Again, the approach proposed here is sound, but more information on how sensitivity will be quantified would be welcomed, especially with regard to each of the four factors mentioned (i.e. adaptability, tolerance, recoverability and value). A full explanation of the metrics involved in assessing each of the four factors would also be welcomed. We would also welcome clarification as to how the four mentioned factors will be combined to reach the final conclusion of receptor sensitivity. The magnitude and sensitivity scores which contribute to the final impact assessment should be presented for each of the receptors included in the assessment. Furthermore, it would be useful to present and discuss the level of uncertainty / confidence associated with each significance assessment based on the nature of evidence used and how this evidence was used to determine impact significance.	The assessment methodology has drawn from both the guidance provided by IEEM (2006, 2010) and Maclean *et al.* (2009). Greater detail on the magnitude and sensitivity scores used in the assessment have been provided in the methodology (see Section 4 in **Appendix 11A Ornithology Technical Report**), together with details of the levels of confidence associated with the assessment of different effects and the apportioning of impacts in the methodology.

Consultee	Concern	Comments	Response
JNCC / Natural England	Geographical scope assumptions	Section 3.3 - Some indication of the outcomes that each category triggers when using the matrix would be welcomed, i.e. the proposed mitigation for effects of major, medium and low significance.	Further discussion of mitigation and the relevant levels of significance has been provided.
	Geographical scope assumptions	Section 3.3.1 - The proposed approach is welcomed.	This is noted.
	Geographical scope assumptions	Section 3.3.2 - It is not wholly clear why assessments will be carried out at the 'suite of sites' level, unless this is to contextualise individual site level impacts?	There is no simple definition of region for this assessment. Thus, as well as considering the significance of impacts at the level of individual protection sites, the significance of impacts for the suite as a whole across the Greater North Sea OSPAR region has been considered.
	Geographical scope assumptions	Section 3.3.2 - We would like clarification where population estimates for individual sites will come from. Most seabird SPA population estimates are out of date, and deriving up to date population estimates from sources such as the Seabird Monitoring Programme is problematic. However, data from the Seabird Monitoring Programme also provide trend data, which when applied to numbers from the last complete census in 2000 might give more robust population estimates, especially if regional rather than national trends are available. For more information on this issues please see SPA data report on Marine Scotland Interactive website http://www.scotland.gov.uk/Topics/marine/science/MSInteractive/Themes/SpecialProtectedAreas. Please also see comments for paragraph 2.5.	See above.

Consultee	Concern	Comments	Response
JNCC / Natural England	Geographical scope assumptions	Section 3.3.2 - Although its use is widely accepted, apportioning 1/3 of a population to non-breeding birds is crude. It is a method originally intended for wintering estimates of waders so its application to seabird populations may not be particularly useful. For some species, such as gannets and gulls, where age classes can be identified, boat survey data could inform the apportioning of non-breeding birds in a more accurate and site specific manner. Further, we recommend interrogating the literature to identify species specific non-breeding proportions, or examining the potential of population models to inform the proportion of non-breeders present within a (closed) population.	This suggestion has been followed. For gulls and northern gannet, it was possible to derive estimates of this proportion from boat-survey observations of birds in breeding and juvenile plumages which have been applied in the assessment and in the apportioning of impacts. For other species, it has been assumed that, for species for which the wind farm project is within foraging range of birds from breeding colony protected sites, one third of the total number of birds present during the breeding season will be non-breeders, as this follows the protocol used by, for example, Stroud *et al.* (2004) and Kober *et al.* (2010).
	Geographical scope assumptions	Section 3.3.3 - Is the argument that the presence of non-breeders at the colony means that colony estimates are too low, or that the presence of non-breeders within the wind farm site means the impact will be less? If the latter, non-breeders are an equally important component of the wider population, as impacts to this demographic group may translate to reduced future breeding success, and thus integrity of the protected site, of the colony as a whole.	It has been assumed that a proportion of the birds present in the project areas during the breeding season will be non-breeders. The potential impacts on these birds are apportioned to protected sites surrounding the North Sea in the same manner as for seabirds outwith the breeding season, thus capturing potential impacts on the population as a whole.
	Geographical scope assumptions	Seabird Monitoring Programme (SMP) data can also inform estimates of breeding seabirds away from protected sites, at least in the UK.	This is noted, though the SMP data has not been directly used for this purpose.
	Geographical scope assumptions	Section 3.3.4 - In light of recent tracking projects, does foraging range data exist suggesting connectivity of fulmar to any colonies?	A table showing where studies have shown connectivity for particular species between the sites that they are features of and the Dogger Bank Zone has been developed (see Table 4.6 in Section 4 of **Appendix 11A Ornithology Technical Report**).

Consultee	Concern	Comments	Response
JNCC / Natural England	Geographical scope assumptions	Section 3.3.6 - The zonal approach outlined in Wright *et al* (2012) for predicting the number of migrant birds passing through the site may risk: a) overestimating numbers of birds whose main flux is outwith the windfarm area; and b) underestimating numbers of birds whose main flux is within, or incorporates, the windfarm area. Further development of this model, taking into account methods proposed by APEM, would be welcome.	Though we are in agreement, further development of this work was not considered possible within the timeframe for this project. As noted in Wright *et al.* (2012) there is little evidence to suggest whether or not migration may be concentrated within corridors within overall migration zones, although this is probable for some species. However, it should also be noted that it cannot be assumed that birds fly directly to or from the protected sites that they are features of and adopting such an approach may lead to potential impacts being overlooked.
	Geographical scope assumptions	Section 3.3.9 - Estimates of changes in latitude post-ringing or estimated rate of dispersal may serve to inform which sites birds originate from, depending on time of year and species.	Recently published studies, which inform on the potential breeding origins of birds that use the Dogger Bank Zone in the non-breeding seasons have been considered and are referenced in **Appendix 11A Ornithology Technical Report**.
	Geographical scope assumptions	Table 1 - We recommend using 'biological seasonality' here for all species such as breeding or non-breeding season, as used in Table 2.	This suggestion approach has been followed.
	Geographical scope assumptions	Table 2 - Fuller definition of seasonality would be useful here. Spring passage periods for skuas would be useful, as would defining seasonality of use for species present in the development area during the non-breeding season such as white-billed diver (perhaps using information from Cramp *et al* (1977-1994)). Also, some justification for the seasonal definitions used in the table would be useful.	The seasonal definitions used follow Kober *et al.* (2010) except where the populations indicated by surveys suggest that a longer breeding period should be considered. The seasonal definitions are primarily used so as to be able to differentiate between birds that may occur in the project areas during the breeding season as breeders and non-breeders and hence apportion impacts for these birds appropriately. For this purpose, there is no need to define passage periods, though it is noted that relatively few skuas were recorded during spring compared to autumn.

Consultee	Concern	Comments	Response
JNCC / Natural England	Ecological scope assumptions	Section 1.2 - IEEM (2010) is a more recent reference that is specifically tailored to the marine environment. This should be checked for differences with IEEM (2006) as the later document is more likely to be directly relevant. Maclean *et al* (2009) is also highly relevant.	The assessment methodology draws from both the guidance provided by IEEM (2006, 2010) and Maclean *et al.* (2009). The IEEM approach advocates a detailed characterisation of ecological effects and their potential impacts such that it can be clearly be determined whether or not impacts are likely to be ecologically significant and at what scale. Further marine guidance is supplied in a more recent IEEM document together with a worked example (IEEM 2010). The IEEM guidance provides a more detailed description of the effect (including its spatial extent, its timing and frequency, its duration, whether the effect would be direct or indirect, the reversibility of the impact, whether the impact is positive or negative and the confidence in predictions). Following Maclean *et al.* (2009), the guidance provided by IEEM is combined with a matrix approach to ensure that results are compatible with those throughout the Environmental Statement. We have drawn from Maclean *et al.* (2009) in considering species-specific sensitivities (which reflect adaptability, tolerance and recoverability).
	Ecological scope assumptions	Section 3.1.2 - The approach proposed here is sound, but more information on how sensitivity will be quantified would be welcomed, especially with regard to each of the four factors mentioned (i.e. adaptability, tolerance, recoverability and value). A full explanation of the metrics involved in assessing each of the four factors would also be welcomed.	See above.
	Ecological scope assumptions	Section 3.1.3 - What are the responses triggered by each category of outcome by the matrix?	Impacts of Negligible or Minor significance are considered to be of relatively limited concern, whereas Moderate or Major impacts are considered 'significant' in terms of EIA regulations. Where Moderate or Major residual impacts are determined following the use of realistic worst case scenarios, the potential for other defined scenarios (e.g. for collision risk) to mitigate impacts is discussed.

Consultee	Concern	Comments	Response
JNCC / Natural England	Ecological scope assumptions	Section 3.3.1 - As stated in the report disturbance might also occur throughout the lifespan of the development with maintenance and survey vessel traffic. This should be considered in the assessment.	Disturbance / displacement effects are considered for both the construction / decommissioning and operation periods (see assessment in Sections 6, 7, 8, 10, and 11). Note that disturbance/displacement is not considered as an annual effect (i.e. like collision risk), but as a single habitat loss effect.
	Ecological scope assumptions	Section 3.3.2 - Clarification would be welcomed on the statement 'the distance over which a receptor is displaced and the duration of the displacement will determine the severity'. Besides the distance and duration the severity of displacement should also consider the contrast in habitat quality between the original site and the site the receptor moves to. If the statement is referring to barrier effects however, it makes a bit more sense.	This has been clarified in the methodology text in Section 4 in **Appendix 11A Ornithology Technical Report**.
	Ecological scope assumptions	Section 3.3.6 - It is stated that 'previous EIAs have used precautionary worst case scenarios of 100% displacement and 100% mortality following displacement from the wind farm area, and up to 50% displacement from a surrounding buffer with 100% mortality.' It would be useful to state which previous EIAs have used the stated displacement and mortality rates, and for which species. It would also be helpful to provide justification as to why these rates were used in past EIAs.	Details regarding the consideration of displacement and associated mortality rates are provided below.
	Ecological scope assumptions	Section 3.3.7 - It will be necessary to consider the effect of turnover on the number of individuals likely to be affected, and the relevant population scales. This is a significant issue; if individuals are only likely to be present in an area for a few days then the effect to the individual is decreased, however the proportion of the population affected is increased. This requires further examination when addressing assessment of displacement.	Consideration is given to the turnover especially of passage migrants both in the baseline characterisation and identification of key receptors, and in the assessment of significant impacts.
	Ecological scope assumptions	For HRA it will be necessary to consider the impact of additional mortality as a result of displacement on populations from individual protected sites.	Impacts have been apportioned to protected sites for all key effects where possible (see comments above regarding methodology), see Sections 6, 7, 10, and 11.

Consultee	Concern	Comments	Response
JNCC / Natural England	Ecological scope assumptions	Section 3.3.8 - It should be noted that, while informative, radar studies only inform behaviour of birds in flight.	This is noted.
	Ecological scope assumptions	Section 3.3.9 - We welcome this approach.	This is noted.
	Ecological scope assumptions	Section 3.3.10 - Vulnerability is a product of sensitivity and exposure; parts of this and subsequent sections may be better worded using the term sensitivity.	This has been clarified in the methodology text in Section 4 in **Appendix 11A Ornithology Technical Report**.
	Ecological scope assumptions	Again we note that 'avoidance rates' refer to birds in flight.	This has been clarified in the methodology text in Section 4 in **Appendix 11A Ornithology Technical Report**.
	Ecological scope assumptions	Sensitive receptors will include those that are displaced into areas of suitable habitat but already occupied at comparatively high densities by other birds. Density-dependent effects may then come into play, potentially leading to deleterious impacts on the displaced population, and/or the wider population now at higher density.	This is agreed. There is a lack of empirical evidence regarding the mortality consequences as a result of displacement from offshore wind farms. Consequently, the determination of mortality rates draws from assessments of species sensitivities to habitat loss, which may be viewed as a proxy for the proportion of the species' population that might be expected to die following displacement. Mortality rates for different species taken forward are derived from the scores for sensitivity to habitat loss as given by Furness & Wade (2012) – see Section 4 in **Appendix 11A Ornithology Technical Report**. Given the uncertainty in displacement and mortality rates, as proposed by NE/JNCC (2012), we also present tabulated summaries for each species of the numbers of birds estimated to be displaced that are then estimated to die based on a range of alternative displacement and mortality rates from 0 to 100%.

Consultee	Concern	Comments	Response
JNCC / Natural England	Ecological scope assumptions	Section 3.3.11/Table 2 - Appendix C provides a summary of the evidence sources that have been referred to in order to inform displacement rates. However, there is limited information here to support the application of the displacement / mortality figures. References to empirical studies are limited to two offshore wind farm cases (Petersen *et al*., 2006; Krijgsveld *et al*., 2011), neither of which is in the UK.	The determination of appropriate displacement rates now draws from a wider review of the literature and recent monitoring studies (see Appendix 4 in **Appendix 11A Ornithology Technical Report**), assessments of species' sensitivity to disturbance and recent guidance from NE/JNCC (2012) – see review in Appendix 4 and Section 4 in **Appendix 11A Ornithology Technical Report**. There is a lack of empirical evidence regarding the mortality consequences as a result of displacement from offshore wind farms. Consequently, the determination of mortality rates draws from assessments of species sensitivities to habitat loss, which may be viewed as a proxy for the proportion of the species' population that might be expected to die following displacement. Mortality rates for different species taken forward are derived from the scores for sensitivity to habitat loss as given by Furness & Wade (2012) – see Section 4 in **Appendix 11A Ornithology Technical Report**. Given the uncertainty in displacement and mortality rates, as proposed by NE/JNCC (2012), tabulated summaries are presented for each species of the numbers of birds estimated to be displaced that are then estimated to die based on a range of alternative displacement and mortality rates from 0 to 100%. Furthermore, following earlier consultation a study (see **Appendix 11C Designated Sites Screened In**) reviewed any additional information that may be used to inform the likely mortality rate, particularly for auk species. This review has been used to determine the final mortality rates used in the assessment as outlined in **Section 3**.
	Ecological scope assumptions	In most cases, where species are known to be sensitive to displacement, a truly precautionary rate will be 100%, however, as noted in Section 3.3.12, JNCC recommend modelling a range of displacement rates.	See above response.

Consultee	Concern	Comments	Response
JNCC / Natural England	Ecological scope assumptions	The basis for assigning mortality rates requires further expansion. We would welcome further engagement with Forewind on this particular issue and the range of displacement rates to be included in the modelling.	See above response.
	Ecological scope assumptions	Tables 1-3 - Why use 90% displacement for these species instead of the precautionary 100%? Also, why use the same for species for which there are no data (i.e. skuas) where 100% would be more precautionary? Divers: Assessments of offshore wind farm developments in the Thames Estuary have assumed 94-100% displacement of (red-throated) divers (e.g. Kentish Flats extension http://infrastructure.planningportal.gov.uk/projects/south-east/kentish-flats-extension/?ipcsection=app). We do not therefore agree that 90% is precautionary, and advise that 100% displacement should be used. The authors themselves state that divers 'may completely avoid wind farms post-construction up to up to 4 km'. Mortality figures also are not consistent with assessments elsewhere. Auks, seaducks and gannets: There is insufficient evidence presented to suggest that a figure of 90% displacement for these species is precautionary. Terns: 90% displacement of terns is inconsistent with experience at other UK OWFs, where issues tend to revolve around collision risk to birds continuing to forage within the wind farm footprint. Kittiwake and other gulls: Given the acknowledged potential attractive effects of some wind farms to gulls, it is hard to follow how a displacement value of 25% has been arrived at. Collision risk would seem to be more of an issue.	See above response.

Consultee	Concern	Comments	Response
JNCC / Natural England	Ecological scope assumptions	Does the suggested approach of deriving displacement and mortality rates considers the possibility that birds may become accustomed to the site, and as such displacement rates might decrease over time? Also, as demonstrated at Horns Rev, it might be the case that a population leaves the area and then returns, apparently independent of any activity or development. If there is evidence that this occurs for certain species, presumably this should be reflected by reducing the likely mortality that will occur (when considered as a mean over the lifespan of the project). If no clear evidence exists then this should not be included in assigning mortality rates.	See above for consideration of displacement and mortality rates. While there may be the potential for species to habituate to this effect, the evidence base for this is limited (see review in Appendix 4 in **Appendix 11A Ornithology Technical Report**) and for the purposes of this assessment a worst case scenario assumed that displacement will occur at the same level throughout the lifetime of the projects.
	Ecological scope assumptions	Section 3.3.14 - Is there any evidence that mortality from displacement is higher in the breeding season? In the non-breeding season, birds might be stressed for other reasons (e.g. temperature) and there could be differences in prey availability and abundance. Furthermore, energy expenditure when travelling further to alternative food resources might counteract the increased ability to range more widely, competition may increase for some species due to immigration, or the population will comprise first winter birds probably experiencing already high levels of mortality. In the breeding season, adults may be expected to abandon nests if stressed due to displacement (i.e. productivity may change but survival might not). It seems a very large assumption to predict up to 50% less mortality in the non-breeding season based solely on ability to range. This needs to be based on sound evidence.	See above for consideration of displacement and mortality rates. No differentiation is made between the breeding season and non-breeding season in this respect.

Consultee	Concern	Comments	Response
JNCC / Natural England	Ecological scope assumptions	Section 3.3.19 - As outlined above, the zonal approach outlined in Wright *et al* (2012) for predicting the number of migrant birds passing through the site may risk: a) overestimating numbers of birds whose main flux is outwith the windfarm area; and b) underestimating numbers of birds whose main flux is within (or incorporates) the windfarm area. Further development of this model, taking into account methods proposed by APEM, would be welcome.	See above response.
	Ecological scope assumptions	Section 3.3.20 - Are there no barrier effects on far-ranging species such as kittiwake, gannet and fulmar? This needs further consideration / justification. Speakman *et al* (2009) identified energetic impacts of wind farms during foraging / commuting flights, and if as suggested Dogger Bank is within foraging range of breeding colonies then this impact will perhaps be the greater.	The Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B, and Dogger Bank Teesside C & D are in potential foraging range for a number of seabird species for the sites that they are breeding features of and barrier effects are considered for each of these (assessment presented in Sections 7, 10, and 11).
	Ecological scope assumptions	Section 3.3.23 -Turnover needs to be considered.	Consideration is given to the turnover especially of passage migrants both in the baseline characterisation and identification of key receptors, and in the assessment of significant impacts.
	Ecological scope assumptions	Section 3.3.24 - Further information on why using the modelling data is preferable (option iii) is required.	This has been clarified in the methodology text in Section 4 in **Appendix 11A Ornithology Technical Report**.
	Ecological scope assumptions	Section 3.3.25 - The use of the SOSS modelled bird flight heights should be compared with the flight heights determined from the site-specific boat surveys, and, if available, digital aerial surveys. Any discrepancies between the modelled and site specific flight heights should be provided and the use of the modelled heights over the site specific data justified. As recommended in Cook *et al* (2011): 'For collision risk modelling, it is recommended that consideration should be given to results using both the site-specific and the modelled flight height data presented here.'	Option 3 from Band (2012) has been used in assessing flight heights for the assessment of collision risk and to clarify the justification for this in the methodology. However, results for the other options are presented in **Appendix 11A Ornithology Technical Report** as recommended by the guidance along with an indication of differences where they exist in the assessment.

Consultee	Concern	Comments	Response
JNCC / Natural England	Ecological scope assumptions	Section 3.3.26 - Please clarify the statement ‘However, we express caution in this approach since there can be no simultaneous effect of both collision and displacement as they are not mutually exclusive.’ At a population level, for some species they are not mutually exclusive, i.e. the same population could experience impacts arising from both displacement (reduced productivity/increased mortality) and collision (increased mortality).	This has been amended in the methodology text in Section 4 in **Appendix 11A Ornithology Technical Report**.
	Ecological scope assumptions	Section 3.3.26 - We encourage the use of valid empirical data, suitably analysed to inform the selection of appropriate avoidance rates; however, if data is lacking, as acknowledged, the default avoidance rate should be 98% (as per SNH guidance).	This is noted. We have assumed a worst case scenario for the assessment of collision risk using a 98% avoidance rate, though results are also present for scenarios using rates of 99% and 99.5% for comparison (see Methodology in Section 3 and **Appendix 11A Ornithology Technical Report**).
	Ecological scope assumptions	Section 3.3.31 - Will additional mortality due to increased collisions of attracted birds be taken into account?	The potential for attraction is considered in assessing the significance of collision risk (see Methodology in Section 3 and **Appendix 11A Ornithology Technical Report**).
	Ecological scope assumptions	Section 3.4 - When establishing appropriate cumulate scales for birds during the breeding season, foraging ranges should be used to inform which projects/plans should be included.	This guidance is followed (see comments above regarding apportioning of impacts) (see Methodology in Section 3 and **Appendix 11A Ornithology Technical Report**).
	HRA Screening (for Creyke Beck projects)	APPORTIONING EFFECTS TO BREEDING COLONIES As promised, here is more information on Natural England’s advice to the Examining Authority in relation to the Galloper case, including apportioning of effect to breeding colonies. http://infrastructure.planningportal.gov.uk/projects/eastern/galloper-offshore-wind-farm/?ipcsection=hearings Click through to ‘Showing 51 to 60 of 108 entries’ and then ‘121029 EN010003 NE Written Summary of Biodiversity Hearing Submissions’. This is the summary of the Galloper Hearing, and pages 16 – 24 deal with the approach to apportioning.	While these comments were received in relation to the HRA screening for the Dogger Bank Creyke Beck projects, this is also of pertinence for Dogger Bank Teesside. This point is noted, though warrants further discussion and agreement. As is noted in the evidence supplied in relation to the Galloper case, the decline in density with distance from a breeding colony is likely to be most pronounced in near-shore foragers. It should thus be noted that the Dogger Bank Creyke Beck A & B, Dogger Bank Teesside A & B and Dogger Bank Teesside C & D are beyond the breeding season foraging range of several species. Further, the projects are only in the foraging range of a relatively few breeding colonies in most instances (and in some cases only one or two sites).

Consultee	Concern	Comments	Response
JNCC / Natural England	HRA Screening (for Creyke Beck projects)	APPROACH TO MIGRANT WATERBIRDS ASSOCIATED WITH UK SPAs This represents NE / JNCC's best advice at this time, and should be considered interim; we plan to draw together an advice note on this topic in due course, but recognising the urgent need to advice Forewind on this case we offer the following: NE & JNCC advocate the use of the SOSS migration modelling tool (Wright *et al*., 2012), or suitable alternative (e.g. APEM (2012)) to assess the effects of OWF developments on protected migrant waterbirds. Features of all SPAs in Great Britain that Wright *et al* (2012) predict to pass through a corridor containing the OWF footprint should initially be screened in to assessment.	While these comments were received in relation to the HRA screening for the Creyke Beck projects, this is also of pertinence for Dogger Bank Teesside. As proposed, the methodology of Wright *et al.* (2012) has been followed, and features of all SPAs in Great Britain that Wright *et al.* (2012) predict to pass through a corridor containing the OWF footprint screened in.

Consultee	Concern	Comments	Response
JNCC / Natural England	HRA Screening (for Creyke Beck projects)	APPROACH TO MIGRANT WATERBIRDS continued To avoid addition errors in estimating SPA populations, the wintering estimate of the species in question (Musgrove *et al*., 2012) should be used. The migratory proportion of the wintering population should first be estimated, and then multiplied by the proportion of the species thought to be within the SPA network (Stroud *et al*., 2001) to give the abundance of 'SPA birds' migrating through the corridor. A similar approach can be taken for migrant breeding birds, using estimates in Musgrove *et al* (2013). [Note that knowledge of changes in wintering waterbird distribution, e.g. from WeBS reports, may be useful to inform the current relevance of Stroud *et al* (2001); for instance, birds may be known to have declined or increased at certain sites, potentially shifting the balance of birds within and without protected sites]. If it is justified to use a sub-section of the SPA network, this should be clearly explained. The number of migrants and proportion of birds associated with protected sites will need to be adjusted accordingly. The value predicted to result in mortality from collision (using appropriate models and parameters) should be expressed as a proportion of the SPA total estimate. As we do not recommend any weighting to specific SPAs, except where this is justified and explained clearly, the effect will be felt at the same level across the network. The exception to this is if there is known difference in migratory routes, where the SPA network may be divided into smaller sub-sections, or if there are any SPAs which appear to be at greater risk – perhaps those in greatest proximity to the OWF. In this instance it may be appropriate to model migration at the individual SPA level.	The proportion of the population within the SPA network has not been estimated, instead the risk to migrants based on the entire UK or GB or GB & Ireland population as appropriate has been calculated. This will give exactly the same answer as the method suggested in terms of the proportion of the population at risk (which can be applied to each SPA as suggested), but the absolute numbers will be slightly higher than they would had the populations been multiplied by the proportion of the species thought to be within the SPA network. This method is therefore more precautionary than that recommended. This method is preferable as using the proportion of the population thought to be within the SPA network (as suggested by NE) will underestimate the numbers of 'SPA birds' affected due to turnover which is known to occur in most migratory species as individual birds move through SPAs. The value predicted to result in mortality from collision has been expressed as a proportion of the UK or GB or GB & Ireland population as appropriate (as described above).

Consultee	Concern	Comments	Response
JNCC / Natural England	HRA Screening (for Creyke Beck projects)	APPROACH TO MIGRANT WATERBIRDS continued The exercise should be repeated for all OWFs lying within the corridor established by Wright *et al* (2012), to establish cumulative effect. Once the proportion of birds interacting is understood, this can be scaled to SPA abundance, and this value can be fed into the Band (2012) collision risk model.	Cumulative collision risk for migrants has been calculated for the Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D within the Dogger Bank Zone. Cumulative assessment has been undertaken at the scale of the wider North Sea region, although following the overall Forewind Cumulative Impact Assessment, only projects and plans for which there is medium to high confidence data and project information have been included. In the case of the assessment of cumulative collision risk for migrants, figures are available for only a small proportion of those species likely to cross the overall suite of wind farm projects in the North Sea region, for which assessment is now possible through the work of Wright *et al.* (2012). Furthermore, the numbers of other projects for which estimates are provided for migrants are very few, and thus the sites for which data are available only represent a very small proportion of the overall suite in the North Sea region. For those species whose migration zones overlap with Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, indicative figures of the percentages of these migration zones that overlap with the overall suite of wind farm projects considered in the cumulative assessment in the North Sea region have been shown.

Consultee	Concern	Comments	Response
JNCC / Natural England	HRA Screening (for Creyke Beck projects)	Where the exercise reveals a specific indication that non-trivial numbers of birds are predicted to interact with OWFs, it may be appropriate to consider further the impacts at individual SPAs, by re-analysis of model output to focus on migration routes of birds arriving at a single point location (SPA) from across a wide front.	This has not been done because there are no species for which non-trivial numbers of birds are predicted to interact. However, the method suggested is not considered to be appropriate because many migratory species will not migrate direct to SPAs but will instead migrate to the UK then move along the coast to the relevant SPAs. In cases where there is a wind farm very close to a particular SPA, if the wind farm is very close to the coast but slightly offset from the SPA in question, it is quite likely that using this method could significantly underestimate the numbers of birds likely to pass through the wind farm. Therefore, it is not considered appropriate to treat birds migrating to SPAs as migrating to/from a single geographical point. A diagram is provided below (see Figure A3.1 in **Appendix 11A Ornithology Technical Report**) to illustrate how this could happen – in this example no SPA birds would be predicted to pass through a wind farm very close to the SPA; this is unrealistic, some inevitably would. Models need to allow for birds moving along the coast.
RSPB	Geographical scope assumptions	Suggest you compare with SMP data to assess whether applying the 3x pairs or nests to derive number of individuals is appropriate for all species, thinking for example Arctic Tern which has undergone substantial decline.	The SMP approach is used to determine the breeding size of a colony when not all adult birds may be present at the time of survey. The assumption that the overall number of individuals in the population is three times the number of pairs/nests follows Stroud *et al.* (2004), Wetlands International (2006) and Kober *et al.* (2010). Nevertheless, where possible, site-specific data on the numbers of adults and birds in non-adult plumage has been considered in apportioning impacts determined for the wind farm projects to protected sites.

Consultee	Concern	Comments	Response
RSPB	Geographical scope assumptions	The proposed approach is acceptable and overcomes the reservations associated with how the simple matrix approach is often applied i.e. rather formulaic “tick-box” rather than using it to assist in risk assessment. Did you consider the approach proposed by Maclean *et al* (2009), with a view to applying any of its recommendations? Providing a measure of confidence in the site-level predictions is a useful adjunct to the assessment procedure.	The assessment methodology draws from both the guidance provided by IEEM (2006, 2010) and Maclean *et al.* (2009). The IEEM approach advocates a detailed characterisation of ecological effects and their potential impacts such that it can be clearly be determined whether or not impacts are likely to be ecologically significant and at what scale. Further marine guidance is supplied in a more recent IEEM document together with a worked example (IEEM 2010). The IEEM guidance provides a more detailed description of the effect (including its spatial extent, its timing and frequency, its duration, whether the effect would be direct or indirect, the reversibility of the impact, whether the impact is positive or negative and the confidence in predictions). Following Maclean *et al.* (2009), the guidance provided by IEEM is combined with a matrix approach to ensure that results are compatible with those throughout the Environmental Statement. Particular reference to Maclean *et al.* (2009) has been drawn in considering species-specific sensitivities (which reflect adaptability, tolerance and recoverability)
	Geographical scope assumptions	For reference, we have now produced kernel densities for gannets from the tracking data for Bempton. Where available, 95% kernel estimates encompass the area of active use and our preliminary analysis has indicated relatively little variation between 2010 and 2011 in these values, although the 50% and 75% kernels are larger in 2011. The progress report should be available soon; it is with DECC. We will be undertaking a third season of satellite tracking, and incorporating these data in a comparative analysis of the three years’ data.	This report is referenced in the consideration of the potential connectivity between the development area and protected sites.

Consultee	Concern	Comments	Response
RSPB	Geographical scope assumptions	Emerging tracking data from Bass Rock (e.g. Kubetzki *et al*., 2009, Fort *et al*., 2012) and Bempton are starting to shed light on post-breeding movements for gannet. Two particular points emerge from these studies. Firstly, there are individually different strategies which are similar for Bass and Bempton. Some individuals remain in the North Sea, some take a northward route around the north of Scotland and then south along the west coast of Ireland before continuing south, and some reach the Mediterranean and/or NW Africa. This brings them into contact/close proximity with many different proposed wind farms, raising considerations of spatial extent for assessment of cumulative effects for this receptor. Secondly, the results from tracking gannets indicate there is a difference in areas used in the early post-breeding period and into the winter.	These papers are referenced in the consideration of the potential connectivity between the development area and protected sites.
	Geographical scope assumptions	Your proposed weighting is a pragmatic approach, unless there is other/published information, that provides a better measure, so for example see Frederiksen *et al* (2012) analysis of data from multiple kittiwake colonies; Kubetzki *et al* (2009) and Fort *et al* (2012) for gannet, as mentioned above.	These papers are referenced in the consideration of the potential connectivity between the development area and protected sites. Greater confidence is given to the apportioning of impacts where published information exists.
	Ecological scope assumptions	It would be helpful to include authorship on these reports, in particular this helps with identifying the Part 1 Burton & Thaxter (2012) report.	The geographical scope assumptions and ecological scope assumptions are provided at the end of **Appendix 11A Ornithology Technical Report**, though it should be noted that these are documents and the final methodologies have been developed on the basis of the comments received.

Consultee	Concern	Comments	Response
RSPB	Ecological scope assumptions	See also Petersen *et al* (2006). Also see Pearce-Higgins *et al.* (2012) indicating greater impacts during construction which persist post-construction for several species of upland breeding bird – whilst this study applies to onshore wind farms, it presents interesting and possibly wider-reaching implications. Behavioural Displacement should also mention that boat traffic in the area will increase during operation through maintenance and repair visits. This used to amount to five visits per turbine per year (two maintenance visits and three unscheduled repair visits. I mention this in case later they suggest that birds will habituate to turbines.	Although this is an onshore reference, this point is noted. The effects of disturbance during construction have been considered separately to that of disturbance / displacement during operation.
	Ecological scope assumptions	It will be difficult to assign proportions of populations to individual SPAs.	The point here related to how impacts would be related to a wider national and biogeographic context. A methodology for apportioning impacts to protected sites has been outlined.
	Ecological scope assumptions	Presumably, you have checked the SEA for any survey data in the area surrounding the Dogger Bank R3 zone?	The SEA provides limited further information on the bird populations in the Dogger Bank Zone which is referenced in the baseline, along with other sources of information.
	Ecological scope assumptions	Caution re different requirements and pressures for breeding and non-breeding (migration/winter) birds. Note also that Furness & Wade (2012) have produced an updated sensitivity assessment for Marine Scotland and that, whilst the focus is primarily Scotland, this report covers more species relevant to the UK than covered by Garthe & Hüppop.	The determination of species sensitivities draws from a number of sources, including Maclean *et al.* (2009) (which itself draws from Garthe & Hüppop (2004)) and Furness & Wade (2012).

Consultee	Concern	Comments	Response
RSPB	Ecological scope assumptions	Interesting that your take-home message from Krijgsveld *et al* (2011) for terns differs from mine, so I went back to the report and there is some apparent contradiction. They comment that terns were regularly seen within OWEZ flying and foraging during migration (too far from breeding colonies to see breeding birds), but c. 60% outside wind farm. Visual observations did not indicate strong avoidance, they attribute the high % at the edge of the wind farm to the high fish resource (p176). It would be worth seeking further clarification from Bureau Waardenburg.	There is indeed some apparent contradiction in the Krijgsveld *et al.* (2011) report and clarification has been sought on this issue by the BTO in the recent SOSS-02 work, and this has informed the assessment of displacement rates here.
	Ecological scope assumptions	Does the modelled flight height data (3.3.26, iii) take account of seasonal variation? By this we mean are there biases in the source data and hence in the modelled data that need to be addressed?	Modelled flight height data do not directly take account of seasonality, although the SOSS-02 work suggested that flight heights did not differ with distance from the coast (and thus with distance from breeding colonies). Collision risk has been assessed on a monthly basis and to produce seasonal estimates of collision mortality such impacts on protected sites can be apportioned differentially between the breeding season and other months.

Consultee	Concern	Comments	Response
RSPB	Ecological scope assumptions	Displacement and mortality rates require justification. The information presented here does not provide quantitative justification. Where information is available to support more realistic receptor- specific values, this is likely to be more acceptable.	The rates used in the work have been re-reviewed and greater support provided for the final rates chosen. The determination of appropriate displacement rates draws from a review of the literature and recent monitoring studies (see Appendix 4 in **Appendix 11A Ornithology Technical Report**), assessments of species' sensitivity to disturbance and recent guidance from NE/JNCC (2012) – see review in Appendix 4 and Section 4 in **Appendix 11A Ornithology Technical Report**. There is a lack of empirical evidence regarding the mortality consequences as a result of displacement from offshore wind farms. Consequently, the determination of mortality rates has been drawn from assessments of species sensitivities to habitat loss, which may be viewed as a proxy for the proportion of the species' population that might be expected to die following displacement. Mortality rates for different species taken forward are derived from the scores for sensitivity to habitat loss as given by Furness & Wade (2012) – see Section 4 in **Appendix 11A Ornithology Technical Report**. Given the uncertainty in displacement and mortality rates, as proposed by NE/JNCC (2012), tabulated summaries for each species of the numbers of birds estimated to be displaced that are then estimated to die based on a range of alternative displacement and mortality rates from 0 to 100% have been presented. Furthermore, following consultation on the draft Environmental Statement for Dogger Bank Creyke Beck, a study was commissioned by Forewind to review any additional information that may be used to inform the likely mortality rate, particularly for auk species. This additional review, conducted by MacArthur Green Limited, can be found at **Appendix 11C Designated Sites Screened In** and has been utilised to determine the final mortality rates used in the assessment as outlined in Section 3.

Consultee	Concern	Comments	Response
RSPB	Ecological scope assumptions	I do not see the justification in the information presented in Appendix C for the quantified % displacement / attraction / mortality figures you suggest here. This is a key component of your proposed assessment methodology, so understanding your logic and agreeing the approach are fundamental. This applies to Tables 1 & 2 as well.	See above responses.
	Ecological scope assumptions	Caution re applying higher avoidance rates (than 98%) for species/groups that show greater displacement. Collision and displacement are not mutually exclusive other than there cannot be a simultaneous risk, but there may be seasonal/age/condition variation in vulnerability to collision/displacement – see e.g. Dahl *et al.* (2012), although another onshore study (of white-tailed eagles), this study clearly indicates this point.	A 98% avoidance rate is used as a worst case scenario for all species in the impact assessment with the exception of Northen Gannet where justification is detailed in paragraph 4.3.82 in **Appendix 11A Ornithology Technical Report**, although results for a range of avoidance rates are also presented for comparison at the start of each respective section within the supporting Technical Report (see Tables 5.3, 5.10, 5.17, and 6.3 in **Appendix 11A Ornithology Technical Report**).
	Ecological scope assumptions	Keep abreast of the RUK/NERC project to develop guiding principles for cumulative impact assessment.	This is noted, although the study in question was on-going at the time of preparation of this document (https://ke.services.nerc.ac.uk/Marine/Members/Lists/MREKEP%20funded%20proposals/DispForm.aspx?ID=9).
	Ecological scope assumptions	Displacement may have consequences for breeding productivity and survival and so the implications for population trajectory may be just as valid as for collision, albeit more subtle than the direct mortality associated with collision, especially removal of adults given that adult survival is the key parameter in several population models developed for seabirds, e.g. gannet (WWT/Macarthur Green/RPS for SOSS-04).	This is a valid point, but not one that it is possible to take into account in a quantitative manner at the present time. A recent Scottish government funded project has begun to explore the population-level consequences of displacement through impacts on the fitness (survival, fecundity) of seabirds (McDonald *et al.* (2012).

Consultee	Concern	Comments	Response
Relevant comments raised with respect to the Dogger Bank Creyke Beck draft ES that have been considered and addressed			
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	In general, the draft ornithological chapter and associated documents provide a thorough assessment of ornithological issues and take an appropriately precautionary approach to potential impacts. However, we are not convinced that the right balance has always been struck between the levels of information in the draft ES and the Technical Appendix: there are occasions where it is difficult to assess the conclusions of the draft ES without extensive cross-referencing with the Technical Appendix. Please see our more detailed comments on this issue below. Please note that due to the quantity of technical information presented, it has not always been possible to determine if some of the issues that are raised below have already been addressed elsewhere within the documents. Therefore, in addition to the more detailed issues raised below, we suggest that greater cross-referencing between sections along with a greater use of summary tables would be beneficial, particularly for numerical data e.g. Assessment Sections and Appendices 6 and 7.	This chapter has included more detail on the technical issues and approaches (see Section 3) and in presenting the results of the assessment in greater detail (see Sections 6 to 10). This is now considered to provide a balanced level of information for both interested parties as well as the public to understand the potential impacts, and further cross-referencing to specific locations within the supporting **Appendix 11A Ornithology Technical Report** has been undertaken if further detail is required. However, it should be noted that there is extensive detail in **Appendix 11A Ornithology Technical Report** which cannot all be presented within the chapter particularly if it relates to contextual explanations.
	Consultation on Dogger Bank Creyke Beck draft ES	Whilst JNCC and Natural England agree largely with the approach taken by Forewind in separating the technical details from Summary Chapter 11 and presenting them in a Technical Appendix, we believe that Chapter 11 has been oversimplified in the process. This makes it exceptionally challenging to clearly gain an overall impression of any potential issues for this proposal. Chapter 11 should provide sufficient tabulated numerical information to inform assessments at site, national and biogeographic population scales.	As noted above, further detail has been included throughout this chapter (particularly Section 3) in order to summarise the essence of the technical appendix, along with the addition of additional numerical information in the assessment sections (Sections 6 to 10).

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	The Technical Appendix would also benefit from additional tabulation of numerical data. The results of the overall impacts on individual species to any of the effects should be presented in tabular format instead of the current presentation which separates the impacts into different tables and spread throughout the text. For example, the Technical Appendix presents tabulated information with multiple avoidance rates but does not distinguish seasons, however, within the text summary for each species a number has been provided for each season for each year.	Within **Appendix 11A Ornithology Technical Report** summary header tables of results for collision and displacement is now provided at the start of each species account in the assessment sections (Sections 5 to 7 in **Appendix 11A Ornithology Technical Report**). The effects of habitat loss or alteration and barrier effects are assessed in a qualitative or semi-quantitative manner and hence results are given in the text only. Further information has also been added to existing tables (e.g. on seasonal collision risk estimates) to provide clearer tabulation of the numerical data, and is presented in Sections 6 to 10.
	Consultation on Dogger Bank Creyke Beck draft ES	Additionally, whilst it is helpful to see data presented on month-by-month and year-by-year basis (as it clearly highlights inter-annual differences), JNCC request that the baseline species population estimates are presented as a mean of two years (2010 & 2011), in addition to individual years (which could perhaps be presented in an Appendix). The purpose of collecting more than one year's data is to account for year on year variability, by not then presenting this data in a collated format (for example, monthly, breeding and non-breeding season peak means), easier assessment of the potential impacts in later chapters has been hindered. Furthermore, for comparative purposes the Dogger Bank baseline population estimates need to be presented in a similar format to the ESAS data set to enable easier, less-time consuming 'ground-truthing' of the data.	Mean monthly population estimates for the project areas have been added to the tables where relevant within Section 4, as well asSection 3 in **Appendix 11A Ornithology Technical Report**. For ease of comparison with previous ESAS data, annual mean values have also been presented. Monthly values could also be compared to data from Skov *et al*. (1995), as presented in **Table 3.8**. However, for ground-truthing purposes it should be noted that the ESAS estimates are based on far less intensive surveys of the study area and are at least 10 years out of date.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	Assessment should be carried out based on mean seasonal figures (but see NE/JNCC guidance on Displacement for specific advice on displacement mean of peaks). If, as appears to be the case here, assessment is carried out based on only one of the two years of data collection, then this needs to be clearly, and consistently stated in the assessment sections. If the higher of the two years has been used, then a precautionary approach will have been taken, however this is not in line with the approach taken by the majority of OWF sites, or advised by JNCC/Natural England. Unless there is a clear justification, we query whether this level of precaution is required, for the purposes of EIA at least.	Assessment has been based on mean figures across the two years throughout as suggested, see Sections 6 to 10.
	Consultation on Dogger Bank Creyke Beck draft ES	Perhaps as a result of the impact-by-impact approach taken to assessing ornithology impacts in the draft ES and AA report, neither document quantitatively considers multiple impacts on a single receptor. This has the potential to result in under-estimation of impacts. For example, black-legged kittiwake is assessed as experiencing impacts due to construction displacement, operational displacement, collision mortality and barrier effects (none of which are necessarily mutually exclusive) yet the potential combination of these impacts is only considered qualitatively (TA: Table 5.21). Whilst JNCC and Natural England appreciate this may need to include a qualitative element, where numbers of birds predicted to be affected by an impact is provided, these numbers should be presented (both in terms of % population, and changes to baseline mortality rates). This issue is relevant to both the consideration of impacts at the SPA and National levels.	Further consideration of the multiple impacts from different effects on key receptors is provided in the summary section of **Appendix 11A Ornithology Technical Report**.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	Finally, at any stage where assessment results are provided, a clear explanation must be provided alongside regarding what an impact has been assessed against e.g. population size, year, buffer distance etc.	In order to prevent extensive repetition, the assessment parameters for each type of impact are presented in Section 3. All results presented in Sections 6 onwards are therefore based on these methods and the parameters.
	Consultation on Dogger Bank Creyke Beck draft ES	In the case of mortality, the use of the metric '% of total population affected' is not sufficient. It is preferable to contextualise the effect via considering the percent change to baseline mortality (using appropriate survival rates). EU guidance (EU Guidance document on hunting under Council Directive 79/409/EEC on the conservation of wild birds "The Birds Directive") suggests that a good basis for concluding additional mortality is not significant would be a less than 1% increase in background mortality, though in the case of some declining populations, this may not be sufficiently precautionary.	The assessment of the impact of the effect of collision in terms of the potential increase in background annual adult mortality is provided for all species at all spatial scales throughout Sections 6 to 10. With respect to thresholds, it is felt that the application of the thresholds proposed for the assessment of magnitude in relation to the size of a reference population to the percentage increase in background mortality is inappropriate, not least because there is the potential for an increase in background mortality of over 100%. In order that there is consistency in the outcomes of the assessments of significance of the effect of collision based on consideration of the proportion of the population impacted or the percentage increase in background mortality, an alternative classification of magnitude is thus proposed for the latter. With respect to displacement, it should be re-iterated that the mortality rates considered here represent the proportion of those birds predicted to be displaced that might be expected to be lost to the population in the long-term. No attempt is made to assess this effect in relation to changes in background annual mortality that would be required to bring the population to the new lower equilibrium, as a number of uncertainties are likely to determine how long this will take to happen and thus the changes in annual mortality required.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	We welcome the use of Natural England/JNCC's joint interim advice note on seabird displacement ("Presenting information to inform assessment of the potential magnitude and consequences of displacement of seabirds in relation of Offshore Windfarm Developments") in the draft ES, and the provision of displacement matrices in Appendix 10 of the Ornithology Technical Report. JNCC and Natural England seek clarification regarding whether the Appendix 10 matrices incorporate the different displacement rates proposed for two bands around the OWF within the draft ES have been populated, given that the draft ES applies different displacement rates for two bands around the proposal when considering the impacts of the proposal. Our interim advice note does not distinguish for different rates of displacement across the OWF and buffer, so it would be useful to know how these different displacement rates have affected the matrices.	Yes, the values in the matrices represent the total displacement across the project area and buffers and incorporate the different displacement rates for the two bands around the project area. The methods are specifically stated in Section 4.3 in **Appendix 11A Ornithology Technical Report**, however, an additional insertion has also been made in Appendix 10 of **Appendix 11A Ornithology Technical Report** to clarify this point.
	Consultation on Dogger Bank Creyke Beck draft ES	We also note that the Tables only shade in a single value on the basis of these figures. As recommended in the interim advice note, we recommend that a range of potential values are shaded to foreground the levels of uncertainty being dealt with: cells which are considered to represent the more realistic scenarios should be colour coded with increasing intensity.	Given the uncertainty regarding displacement and mortality rates, it is felt imprudent to give any further level of confidence to any particular range of values for displacement rates. As per JNCC/NE guidance, predicted impacts of displacement, for each project and species, based on a range of displacement and mortality rates are provided in Appendix 10 of **Appendix 11A Ornithology Technical Report**. For mortality rates, cells have been highlighted as per the relevant guidance, wth light green for higher confidence and dark green for most confidence (see Appendix 10 of **Appendix 11A Ornithology Technical Report**). Note however that for auks, while a negligible or zero value for mortality may be concluded from **Appendix 11C Designated Sites Screened In**, precaution has been retained by using a 5% value.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	We note that Forewind are undertaking a review of OWF monitoring to determine whether the displacement rates brought forward in the draft ES and associated documents are appropriate. We look forward to discussing the review once it has been conducted. Regarding northern gannet, as set out in our interim guidance note this species has shown macro-avoidance responses to OWFs and therefore should not be considered as of low sensitivity to displacement. The proposed review could usefully identify an evidence-based displacement figure for this species (which seems likely to be closer to 75%).	For northern gannet, evidence suggests that although the species might not be highly sensitive to disturbance in general (e.g. ship and helicopter traffic) the species may show strong macro-avoidance of offshore wind farms (Krijgsveld *et al*. 2010, 2011). Hence, following the recent NE/JNCC (2012) guidance, a 75% displacement rate for this species has been applied (see Section 3).
	Consultation on Dogger Bank Creyke Beck draft ES	This review could also usefully assess the timing of OWF monitoring to see whether there is any evidence to support the assumption that construction phase displacement can be assessed as 50% of operational displacement. JNCC and Natural England have some reservations with this assumption, as some potential displacement variables such as boat traffic will not progress evenly from 0 to 100% during the construction phase. It would be helpful if the predicted levels of boat traffic at different stages of construction could be quantified to see whether they provide any further justification for the 50% figure.	The number of trips required per turbine will be the same and thus it is believed probable that the boat traffic associated with construction will be relatively even across the period. In light of the uncertainty of the exact construction plan that will be applied and the potential variables within this that could occur dependant on a large number of factors, it was felt that the application of 50% most accurately applies the ramp up of construction activities and operational wind turbines from nothing at day 1 of construction to fully operational on the final day of construction.
	Consultation on Dogger Bank Creyke Beck draft ES	TA:179-180. We seek an explanation as to why previous JNCC/Natural England's advice to Dogger Bank Creyke Beck (19th September 2012), concerning the use of a 25% displacement rate for gulls and kittiwakes, when collision risk is more likely to be a problem, has been ignored.	With respect to gulls, while some studies suggest that avoidance may occur, the relative evidence for either displacement or attraction is weak, and there is considerable variability in the apparent displacement / attraction rates noted by the review provided in Appendix 4. Hence, following this advice, a 0% displacement rate for these species (see Section 3).

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	In the absence of empirical data, the use of Furness & Wade (2012) and Maclean *et al*. (2009) to derive displacement mortality rates from species-specific sensitivity appears to be a pragmatic approach. However, in the context of a large number of OWFs being proposed in the North Sea, JNCC and Natural England are somewhat concerned that those species with Very Low sensitivity to displacement effects are automatically assigned a mortality figure of 0% i.e. no potential impact at all. A more precautionary figure is likely to be more appropriate for those species where attraction into OWF has not been observed, particularly for northern gannet given the observed rates of macro-avoidance.	Following revisions after the Draft ES, and a subsequent independent review of displacement mortality (Furness 2013), all gulls, skuas, and fulmar, are considered as having no impact for displacement (i.e. 0%), and have therefore have been scoped out of the assessment for disturbance/displacement (see Section 3). For gannet, mortality at the project level is also considered as zero but as also noted here, and in Furness (2013), the cumulative impact of multiple sites for species with very high habitat flexibility warrants a precautionary approach, hence gannet is assigned a mortality rate of 5% following displacement. Auks are also assigned a mortality of 5% following the review (see Section 3 or Secton 4.3 in **Appendix 11A Ornithology Technical Report**).
	Consultation on Dogger Bank Creyke Beck draft ES	Regarding cumulative impacts, JNCC and Natural England fully appreciate the difficulty of assessing cumulative displacement effects given the different ways that OWF ES have presented data on displacement effects, and the limited level of apportioning to designated sites. This will hopefully improve once our interim guidance note is more widely adopted. In the meantime, we hope to work with Forewind and other OWF developers to develop a realistic approach to the quantification and assessment of displacement, including in-combination effects. The latter might include consideration of the scale impacts on habitat availability in the wider North Sea. We would welcome further engagement on this subject during the final pre-application period.	This is noted. The review carried out in (see **Appendix 11C Designated Sites Screened In**) for displacement and mortality has assessed habitat availability in the North Sea and covers these points in detail, which is in turn reflected in the assessment (see Section 3 for approach).

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	A5.3. It should be clarified that the application of correction factors are only necessary for aerial-based surveys. Boat-based surveys, as slower moving, are unlikely to miss a large proportion of birds underwater, as they re-surface in the time taken for the boat to pass and the observer to record their presence in a survey.	Correction factors are applied to final population estimates that are produced from the numbers recorded by aerial surveys. Data from boat surveys are used solely to inform on the likely species of birds not identified by the aerial surveys.
	Consultation on Dogger Bank Creyke Beck draft ES	A5.5. Although this methodology follows similar attempts made elsewhere, further discussions are required in order to explain the thinking behind it. Our understanding is that, at any given time a realistic figure for the number of birds using the project area is needed. In other words, the birds that may be present in the area at the time of the survey that are not observed need quantifying. This does not mean the total time spent underwater on leaving the colony needs quantifying. This would lead to an under-estimate of birds, as a high proportion of an individual's foraging trip would be spent in transit to foraging sites (which by their very nature, are not within the project site). Any birds observed within the project area can be assumed to be foraging (unless they display specific behaviour to the contrary - e.g. rafting). It would seem simplest to obtain rates for percentage of time underwater when foraging and multiply the count by this factor. In our opinion, if something other than this is attempted, we believe that a greater explanation of the theoretics behind such an approach will be merited.	The baseline population estimates were derived from a model that combined information on birds recorded on the water and in flight. The underwater correction was therefore applied to the overall population estimates (separate estimates of birds on the water only were not produced). The time underwater was consequently considered as a proportion of the species' overall time budget including time spent flying. It was not possible to also separate out birds that were foraging from those just resting on the surface in the modelling, hence use of a proportion of "time underwater when foraging", i.e. the "dive-pause ratio" (Thaxter *et al*. 2010) was also not possible. Application of this ratio to the baseline population estimates would have lead to an overestimate. With regard to transit time between the colony and foraging locations at sea, only a small proportion of the foraging trip for guillemots and razorbills is flight (Thaxter *et al*. 2009, 2010). We also note that there was no direct tracking information available that would have informed the time allocation proportions of birds in the Dogger Bank Zone. Therefore, the methodology applied (and detailed in Section 4 of **Appendix 11A Ornithology Technical Report**) is considered to most accurately reflect the number of birds underwater during survey and hence give the most realistic correction for population estimates.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	A5.9. We would suggest that, whilst many studies do not provide sufficient detail on time spent underwater, such data may be available and held by the authors. Authors could be approached for pers. comm. information not necessarily published in the study, but which may still be provided on request. We agree with the conclusion that "*Sea-surface pauses between dives are a related function of diving activity, but nonetheless should not strictly be included when correcting for birds missed from surveys at sea.*"	The available information in the literature has been reviewed as is standard practice in meta-analysis, but given the constraints of programme and the wide number of individual authors who would have to be contacted, it has not been possible to undertake the wider review of datasets within the scope of this work.
	Consultation on Dogger Bank Creyke Beck draft ES	We believe that further thinking and explanation are needed to determine the appropriateness of the current correction factor; why does time spent underwater need to be converted into a temporal metric (i.e. a percentage of 24 hours) rather than simply a percentage of time spent foraging?	Time spent underwater per 24 hours has been presented in line with how foraging information was presented in the literature – this also includes time spent at the nest (as stated in the relevant text). The final correction factor uses "% underwater / feeding trip" therefore excluding time spent at the nest. The correction factor does not need converting to 24 hours.
	Consultation on Dogger Bank Creyke Beck draft ES	A5.15. Any application of this calculation (i.e. time spent underwater as a percentage of foraging trip) to site-based abundance estimates, automatically incorporates some component of transit time. As birds are being attached to estimates for the project site only (as opposed to all birds available within the 'transit area') this will automatically lead to an under-estimation of the percentage time spent underwater, when calculated relative to the abundance of birds in the project site (as per our comments above).	This point is covered in the comment above under A5.5.
	Consultation on draft ES	A5.20. Clear presentation of the formula is required so that it will be possible to review what the calculations were applied to i.e. Was the time spent underwater multiplied by the total at-sea abundance estimates and then were the two added together?	A formula has now been inserted in Section 4 in **Appendix 11A Ornithology Technical Report**.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on draft ES	JNCC and Natural England note that the 'Proportion at CRH' values provided in Table 4.15 of the ornithological differ from the '% at PCH' values given in Cook et al (2012). We assume that the Cook et al spreadsheet has been used to calculate alternative values due to the proposed turbines having a different rotor swept area from the 20m – 150m standard used in the main table of figures– but seek confirmation of whether this is the case.	A footnote in Table 4.15 in **Appendix 11A Ornithology Technical Report** has been updated to reflect the fact that the worst case scenario is 6MW with a minimum clearance of 26m above highest astronomic tide.
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	A5.19. We note the following differences and suggestions regarding the final figures suggested for percentage of time spent underwater: Common guillemot - we calculate this to be 23.75% of time spent underwater per trip (excluding flight time) (based only on Thaxter *et al*. 2010). Assuming birds fly direct to foraging location, this represents percentage time spent underwater versus time on the surface (including surface pauses). Clearly this should only be applied to abundance estimates from aerial surveys (excluding birds in flight). Razorbill - We calculate this to be 17.4%, omitting time in flight (based on Thaxter *et al*. 2010). Potentially some issues with rounding up/down of decimal places, lifting figures directly from Table 1 in Thaxter *et al*. (2010). Atlantic puffin – We suggest this value is recalculated based on our comments on the other auk figures above. White-billed diver - This seems very high. Polach & Ciach (2007) present dive data for Red-throated divers (RTD) and Black-throated divers (BTD). It should be noted that time spent underwater differed considerably between adults and immatures. If we just consider adult birds, their study presents data on time spent 'diving' (which appears to be different from time spent underwater - i.e. includes surface pauses).	The recalculation of estimates in Thaxter *et al*. 2010 removing flight time is not applicable to the combined in-air and on-sea estimates given reasons stated above. Whilst we note the comments for divers, there are several imperfections in using any single figures from this study, nonetheless, the use of 69% would be precautionary but is very similar to the value already used in this report and will not change the final impact assessment for white-billed diver.

Consultee	Concern	Comments	Response
		Calculating time spent on the surface as a proportion of overall time spent diving in this study produced estimates for RTD of 69% and BTD of 52%.	
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	We also note that using Option 1 of the Band model produces significantly higher rates of collision when compared with Option 3 (Option 1 is a magnitude higher in many cases). We also note that the observed PCH for northern gannet and black-legged kittiwake are at the upper limits of the range of values derived from Cook *et al*. Given the discrepancy between the outputs from the two options, JNCC and Natural England consider that there is potentially significant uncertainty regarding the CRM values used in the ES and HRA. We believe that presentation of both Option 1 and Option 3 within the impact assessment will be required. Provision of results in this format will subsequently aid the cumulative impact assessment and is discussed further below.	Justification for the use of Option 3 is presented in Section 4.3 in **Appendix 11A Ornithology Technical Report**. Option 3 allows variation in turbine design (i.e. in their size and height above sea level) to be more accurately incorporated into the assessment of collision risk. Furthermore, collision risk is not spread evenly within the rotor swept area as is assumed by Options 1 & 2. Using Option 3 allows this to be taken into account.
	Consultation on Dogger Bank Creyke Beck draft ES	It should be noted that Option 3 is based on modelled data collected largely from inshore wind farms, there is uncertainty regarding whether flight height distributions can be extrapolated to offshore sites such as Dogger Bank. Furthermore, the input data for the modelled distributions derives from boat-based data only. While we accept that this was the best available data for this process, consideration should be given to detectability issues, as birds higher (further) from the observer may be more likely to be missed, yet are not distance corrected. This is an issue for any boat-based data set, but the effect this has on flight heights, when modelled to simulate flight height distributions with the rotor swept area (option 3) may be of greater significance. It would be informative if this could be considered and addressed within the report.	Additional discussion has been added in this section. Whilst Option 3 is based on modelled data largely collected from onshore wind farms, it also incorporates data from Dogger Bank. Analyses of the modelled distributions suggested that distance to shore did not exert a strong influence on the recorded flight heights of birds (see Cook *et al*. 2012). Additionally, the proportions of birds within the band collected during boat-based surveys were within the 95% Confidence Intervals of the modelled distribution. To minimise the probability of missing birds, data were limited to those collected during snapshot counts 300m either side of the boat. Whilst it is recognised that there is a potential to miss birds flying at greater altitudes, this is an equal issue with all boat-based survey data.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	JNCC and Natural England understand that the digital aerial data collection method employed by Forewind enables calculation of flight heights. We suggest that it would be informative to produce a flight height distribution from this data to compare with that of the modelled data presented in Cook *et al*.	The data on flight heights potentially available through the HiDef aerial surveys has much potential, though at the present time, it was felt that further evaluation of the accuracy and precision of the data was probably required before it might be confidently used. In addition, it would also take considerable extra time to revisit the data collected from 2010 to apply the methodology to calculate flight heights for the survey period as this was only developed towards the end of the data collection.
	Consultation on Dogger Bank Creyke Beck draft ES	JNCC and Natural England would welcome provision of the completed Band model CRM spreadsheets in an Appendix to the ornithology technical report so these can be reviewed with respect to the final ES.	This information can be supplied as spreadsheets on request.
	Consultation on Dogger Bank Creyke Beck draft ES	JNCC and Natural England note the omission of a number of consented or proposed OWF within the North Sea from the list of projects screened in to the cumulative impact assessment (CIA). Please see our detailed comments below: judging from Appendix 8 of Appendix 11a, this appears in part to be due to the screening out of projects beyond the foraging range of seabird colony SPAs, whereas cumulative impacts need also to be considered with respect to impacts on seabirds outside of the breeding season, which would bring more remote OWF within the North Sea into scope. If, in some cases other projects have been excluded due to apparent unavailability of data, further attempts to obtain this data should be made and where problems continue to persist then further advice should be sought from JNCC and Natural England.	Further projects have been included in the CIA list in Appendix 8 of **Appendix 11A Ornithology Technical Report** following the publication of recent reports. Cumulative impacts are considered for projects beyond the foraging range of seabird colony SPAs, and have been used to inform assessment at national and biogeographic scales. However, it is exceptional to find other examples where impacts out of the breeding season have been apportioned back to protected sites.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	More generally, JNCC and Natural England advise careful checking of recent publically-available documentation from other OWF in order to identify as comprehensive a set of figures from these as is possible. We fully recognise the difficulty of carrying out cumulative impact assessments on the basis of data which is either not comparable or altogether lacking. Nevertheless, what information is available in the draft ES and AA report already indicates potentially significant cumulative impacts on a number of species at the designated site scale. We also note discrepancies between cumulative figures presented within this ES and figures presented within other North Sea OWFs (e.g. see East Anglia ES). Again, we would welcome further engagement on this subject during the final pre-application period.	Forewind's intention is to provide a meaningful cumulative assessment to inform the stakeholders and decision makers in relation to the project in question. To this end, Forewind have undertaken a thorough screening process to identify projects where confidence in project and environmental data is high enough to allow an assessment to take place. However, whilst Forewind are also aware of other Round 3 projects which are coming forwards, these have had to be screened out due to the low confidence in project and environmental data meaning that any CIA would not result in a conclusion which could be used to inform the decision for Dogger Bank Teesside A & B However, figures for Hornsea Project One and East Anglia ONE have now been used (see Section 10). A further discrepancy relates to the collision value for lesser black-backed gull at Greater Gabbard.
	Consultation on Dogger Bank Creyke Beck draft ES	JNCC further note that cumulative impacts, within the ES and Technical Appendix should be assessed and presented in terms of the significance to a range of population levels – regional, national and biogeographic. Instead, assessments are made against SPA populations, these are primarily relevant to the HRA report.	Cumulative impacts, as with those at the project levels, are assessed against a range of population levels (protected site, national and biogeographic) as presented in Section 10.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	The CIA should also incorporate the impacts of operational OWF, due to the potential for existing projects to have ongoing effects (yet to be reflected in the baseline) on long-lived but slow-to-mature seabird populations. In addition, projects that can reasonably be foreseen to come forward during the lifespan of Dogger Bank Creyke Beck should feature in the CIA, although we appreciate that limited seabird data regarding these projects is currently available. Nevertheless, there is a real need to produce a realistic worst-case scenario of potential cumulative impacts over the lifetime of the project, even if impact assessment of future projects is qualitative.	Following the Forewind CIA strategy as previously consulted on with stakeholders including JNCC and NE, it is not considered appropriate to include operational wind farms within the cumulative impact assessment. This is only the case where a project has been operational for the full period over which the baseline data was collected. Where a project was under construction at the start of the surveys and where data allows, projects have been included in the CIA. Whilst the point is noted that impacts of operational wind farms may not yet be being experienced there is no way to tell whether this is the case or whether in fact the contrary is true and the full impacts are already being experienced. Further, for these projects it is often the case that the assessment in the ES is based on a worst case design which has not, in reality, been implemented therefore the impacts predicted in the ES for that project would in fact be lesser in scale. The inclusion of all existing operational projects would give unrealistic results which are worse than the realistic worst case scenario and may inaccurately assume that impacts for these projects are not already being experienced at the relevant species or site level. As a result, Forewind have not included operational projects in the CIA and feel that to add these impacts to those outlined in the CIA would present an unrealistic worst case scenario which risks overestimating impacts on receptors.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	In relation to CIA of collision risk, we reiterate our request above concerning the provision of Option 1 results for assessment. As most other offshore wind farm sites to date have utilised either Option 1 or Option 2, it would not be appropriate to undertake a CIA using Option 3 in Dogger Bank and Option 1/Option 2 from others as Option 3 figures in Dogger Bank are of a magnitude smaller than when using Option 1.	Full results based on the use of Option 1 of the Band model are provided in Appendix 7 of **Appendix 11A Ornithology Technical Report** for comparative purposes. No attempt was made to standardise estimates using the same assumptions as presented in this assessment, as, based on the information presented on other assessments, although this would have likely reduced the numbers of birds impacted, this would only have been possible in some cases. The assumptions used in deriving displacement and collision risk estimates in other assessments are highlighted in tabulated summaries where these differ from those used in this assessment. Given the greater understanding and refinement that Option 3 provides in predicting collision impacts using the Band model it is evident that the use of Option 1 for Dogger Bank would greatly overestimate impacts. Therefore, inclusion of Option 3 numbers for Dogger Bank Teesside A & B with Option 1 from sites elsewhere, represents a more realistic case reflecting current opinion for Dogger Bank, whilst retaining precaution in the CIA.
	Consultation on Dogger Bank Creyke Beck draft ES	As with other sections, the CIA within the Technical Appendix would benefit from results per species being presented in a tabular format. Furthermore, the tables presented (Table 6.8, 6.9, 6.0) should provide totals for each species, per season/year. Additive effects should also be summed where numbers are available, as per our comments above.	Tabulated information is presented for the key effects of collision and displacement in Tables within Secton 10, which include totals inclusive of values for the Dogger Bank Teesside A & B and other projects.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	Despite the difficulties that a CIA on barrier effect may present, an attempt at assessing the likely cumulative effect should be undertaken.	There is considerable uncertainty regarding the assessment of barrier effects posed by offshore wind farms and it is considered to be unfeasible (as described in Section 3) because of: i. The difficulties in assessing the magnitude of the potential impacts of this effect; ii. The complexities in the numbers of potential projects affecting birds foraging from different colonies (see Appendix 8 of **Appendix 11A Ornithology Technical Report**); and iii. The potential cumulative impacts of barrier effects from multiple wind farms are not likely to be additive (King *et al*. 2009), and thus are problematic to quantify. Likewise, no attempt was made to assess in a quantified manner the cumulative impact of the potential barrier effects posed by the Dogger Bank Teesside A & B and all other wind farm projects within the North Sea on the 47 species' populations of terrestrial or waterbird migrants that are UK SPA features whose migration zones (defined by Wright *et al*. 2012) overlap with the Dogger Bank Teesside A & B areas.
	Consultation on Dogger Bank Creyke Beck draft ES	We note that concerns over the CIA approach, CRM and presentation of impacts need to be addressed, and request that species data is presented in an alternative format (i.e. percentage increase of baseline mortality at relevant population scales).	This is presented in the numerical tables within Section 7 and 10.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	Based on the data provided, JNCC have initial concerns regarding the following species at both National and possibly Biogeographic population levels: • Gannet – cumulatively with other plans and projects at North Sea level (collision). • Black-legged kittiwake - cumulatively with other plans and projects at North Sea level (collision). • Lesser black-backed gull - cumulatively with other plans and projects at North Sea level (collision). • Great black-backed gull - cumulatively with other plans and projects at North Sea level (collision). • Common guillemot – cumulatively with other plans and projects at North Sea level (displacement). • Razorbill – cumulatively with other plans and projects at North Sea level (displacement).	This is noted.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	6.3.40. We note that the additional mortality of 5,572 birds per year to a national population of 437092 individuals, for a long lived species is a significant increase in baseline mortality. Taking baseline mortality as 8.1% (Wanless *et al*. 2006), then the natural mortality for this population would equal 3540 per year. The additional mortality of 5572 birds is over 150% increase in baseline mortality at a national level (and a 50% increase at a biogeographic level). These are way and beyond acceptable levels of additional mortality. In this response, JNCC have not presented similar calculations for the other listed species, but this should be presented in the final ES. We request the same is presented for both Creyke Beck projects alone and cumulatively with Teeside and all other relevant wind farms. As noted above, results should be tabulated; there is an overreliance on text-based presentation of results. We acknowledge that, there is a level of uncertainty regarding the confidence of cumulative assessments, and would welcome further engagement with Forewind on this subject.	Consideration of the impact of the effect of collision in terms of the potential increase in background annual adult mortality is provided for all species at all spatial scales in the numerical tables within Section 7 and 10.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	In a number of migrant seabird species accounts (e.g. skuas), the issue of turnover is acknowledged. In the absence of any attempt to quantify turnover, the population estimates provided are likely to significantly underestimate the number of migrant seabirds either transiting the OWF or 'stopping over' for short periods, particularly if peak periods of movement have been missed. This in turn is likely to lead to an underestimation of the significance of the OWF at the regional or national scales, and therefore which species have been scoped in for further assessment. Whilst arctic and great skuas have already been scoped into CRM, adequately quantifying turnover for species such as pomarine skua and little gull may increase the significance levels of these populations and thereby justify more detailed assessment of these species. Whilst JNCC and Natural England appreciate that the potential migratory seabird population for a given area of sea is difficult to quantify, without further exploration of alternative methods we question whether the approach taken is sufficiently robust for EIA purposes. We advise that Forewind review the approach taken to this issue in other OWF ESs, for example East Anglia One. Whilst acknowledging the limitations of this method for OWFs further offshore, there is potential merit in the use of a simple theoretical model of migratory movements to quantify turnover. Furthermore, the APEM migration model has also been used by other OWF developers to produce outputs for migrating seabirds which can then be used in CRM. We would be pleased to explore potential approaches to producing realistic population estimates and associated assessments for migratory seabirds that use or transit Dogger Bank Creyke Beck.	The approach taken to this issue in other OWF ESs, including East Anglia ONE has been reviewed. The method used for great skua makes a precautionary assumption that the entire flyway population of this species would pass through the North Sea/Strait of Dover, and that most (90%) birds are within 60km of the coast (a zone that includes East Anglia ONE). Because of the much greater distance of Dogger Bank Teesside A & B from the coast, such an assumption is both inappropriate and would not be precautionary. It is also noted that the East Anglia ONE assessment uses a number of precautionary assumptions, and there is concern that the application of this method for this project will present an unrealistic final figure. The proportion of the national and biogeographic populations of great skua likely to migrate through the North Sea is highly uncertain and recent research, for example, has indicated that several breeding populations are likely to take an alternate route to their wintering quarters that spread across the Atlantic (Magnusdottir *et al*. 2012). Even great uncertainty exists regarding the migratory routes and wintering quarters of Arctic skua. For species such as pomarine skua and little gull, there is insufficient knowledge of migratory routes and wintering quarters to be able to make any kind of sensible assumptions about numbers passing through the North Sea to conduct an assessment such as that carried out for great skua (but not for either of these species) in the East Anglia ONE ES. Consequently, a qualitative assessment has been undertaken that acknowledges turnover but does not attempt to quantify it, as due to the lack of data this would only result in misleading estimates which would be inaccurate, and which would imply a level of precision that the data cannot support.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	TA: 2.1.3 and 2.1.5. JNCC seek clarity regarding the number of surveyors and their roles whilst undertaking boat-based surveys as text within the ES appears to contradict itself. JNCC and Natural England note that data collected during boat-based surveys were also undertaken in sea state 5 or under. Given the ESAS methodology states that surveys should be carried out in conditions less than sea state 5, it would be worth clarifying the proportion of surveys carried out in sea state 5, and if this proportion is significant, assess the implications of this for the accuracy of the survey results in the final.	This has been amended. Data were collected in sea-state 5, this accounted for ~14% of the data. However, as stated in Section 2.3 in **Appendix 11A Ornithology Technical Report**, sea-state was included as a covariate in the distance model when analysing boat-based data. Consequently, decreased detection probability in sea-state 5 will have been accounted for in the model based population estimates.
	Consultation on Dogger Bank Creyke Beck draft ES	TA: 2.1.6. JNCC seek an explanation as to how the amendment to the recorded flight height bands during the data collection was accounted for during analysis. Furthermore, we query how a surveyor can have no confidence in a flight height band and wonder on how many occasions this occurred and how this data was then handled during analysis.	The population estimates derived in this assessment did not require information regarding the flight heights of birds, simply whether a bird was in flight. With respect to the site-specific flight height information used in generating alternative collision risk estimates using Option 1 of the Band (2012) model, analyses did not consider data from the earliest surveys when confidence in the assessment of flight height bands was lowest. As indicated in Section 2.1 in **Appendix 11A Ornithology Technical Report**, confidence in the accuracy of assessment of flight heights will decrease the further from the vessel and reference masts that the flying bird are observed.
	Consultation on Dogger Bank Creyke Beck draft ES	TA: 2.2.2 and Table 2.1. JNCC are unclear how a variable percentage agreement can be provided for more than 20% of the boat based surveys considering only 20% of the data were purported to be quality checked.	Clarification has been added to Section 2.2 in **Appendix 11A Ornithology Technical Report**.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	TA 2.3 We request further explanation of how separate abundance and/or density estimates for birds in flight and birds on the water can be derived from the modelled data? This has implications for both collision risk modelling, and availability correction for diving birds.	Baseline population estimates were derived from a model that combined information on birds recorded on the water and in flight. However, it was possible to generate separate estimates of birds in flight only for use in collision risk analyses. As the underwater correction was applied to the overall population estimates (and separate estimates of birds on the water only were not produced), the time underwater was considered as a proportion of the species' overall time budget including time spent flying.
	Consultation on Dogger Bank Creyke Beck draft ES	TA: 2.3.1. JNCC could find no evidence as to how this decreased detection rate has been accounted for in the assessment of impacts. Please can Forewind provide further information.	Detection probabilities were included in the modelling of boat-based data to account for potential missed birds. These data were used to inform on the identities of birds that were unidentified during the aerial surveys on which the population estimates were based. See "model description" in **Appendix 11A Ornithology Technical Report**, specifically "detectability model", for more information.
	Consultation on Dogger Bank Creyke Beck draft ES	TA: 2.3.2. JNCC note that a number of covariates included may be correlated, could an explanation be provided as to if and how this is accounted for within the modelling procedure? Could Forewind expand on why the first two bands were pooled for all species?	It is noted that some covariates were correlated but not above the 0.7 threshold as is generally used in multivariate analysis of this kind. It was observed that distance to shore and distance to coast were particularly correlated for some species, and so distance to colony only was included for some species.
	Consultation on Dogger Bank Creyke Beck draft ES	TA 2.3.11. JNCC query the minimum sample size required to conduct the GAM based modelling procedure. We note that both Arctic and Great Skua were recorded in very small numbers during the surveys, yet were both modelled.	Consideration was given as to the model fit in determining whether this approach was used in generating population estimates. The weakest model was produced for Arctic skua and this is reflected in the confidence limits (see tabulated results in **Appendix 11A Ornithology Technical Report**).
	Consultation on Dogger Bank Creyke Beck draft ES	TA: 2.3.17. At present it is not clear to JNCC how the population estimates for less numerous birds were derived. We seek a more detailed explanation of which data were used, i.e. were boat and aerial data combined or were data from just one of these methodologies used?	Described in Section 3 to clarify these points, and detailed in **Appendix 11A Ornithology Technical Report**.
	Consultation on Dogger Bank Creyke Beck draft ES	TA: 2.7.1. Please note the Avian Population Estimates Panel (APEP) work in Baker 2006, has been superseded by Musgrove 2013.	Population estimates have been updated (see Sections 3 and 4).

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	C11: 3.2.5. JNCC and Natural England note that surveys have continued until spring 2012. Data from surveys beyond 2011 must also be presented and used in the final ES.	Data from January 2010 to June 2012 has been used (see Sections 3 and 4).
	Consultation on Dogger Bank Creyke Beck draft ES	C11: 3.2.13. An updated AEWA report was produced in 2012, Natural England recommend that this is used to review the population estimates used.	Population estimates have been updated (see Section 3).
	Consultation on Dogger Bank Creyke Beck draft ES	C11: Table 3.7. As noted in JNCC / Natural England's interim advice note on displacement, whilst generally of low sensitivity to disturbance, northern gannet has been identified as showing significant macro-avoidance rates to OWF. Therefore we recommend that northern gannet is assessed as of medium or even high sensitivity to displacement.	For northern gannet, evidence suggests that although the species might not be highly sensitive to disturbance in general (e.g. ship and helicopter traffic) the species may show strong macro-avoidance of offshore wind farms (Krijgsveld *et al*. 2010, 2011). Hence, following the recent NE/JNCC (2012) guidance, a 75% displacement rate for this species has been applied (see Section 3).
	Consultation on Dogger Bank Creyke Beck draft ES	C11: 3.3.15. We seek clarity regarding the percentage displaced figure/s used across the OWF and 4km buffer for diver species. Does the percentage of birds predicted to be displaced decrease in buffer zones beyond the OWF, as per other species, or does it remain constant?	A single precautionary displacement rate has been used for white-billed diver in the project areas and buffer zones due to the small numbers observed and the high sensitivity of this species to this effect.
	Consultation on Dogger Bank Creyke Beck draft ES	C11: Table 3.8. Please note that near 100% displacement and mortality rates equivalent to near 100% of displaced birds have been and continue to be assumed for red-throated diver in OWF casework relating to the Outer Thames Estuary SPA.	As per JNCC/NE guidance, predicted impacts of displacement, for each project and species, based on a range of displacement and mortality rates are provided in Appendix 10 of **Appendix 11A Ornithology Technical Report**. A 100% displacement rate is used for white-billed diver given the likelihood that the species will respond to disturbance in a similar manner as to other diver species. However, there is a lack of evidence to suggest a realistic mortality rate for this or other species.
	Consultation on Dogger Bank Creyke Beck draft ES	C11: 3.3.19/3.3.21. JNCC and Natural England seek clarification as to whether birds flying below PCH were screened out with regards to barrier effects? If these birds were screened out, an ecological justification for this would be appreciated. Low-flying species seem likely to also undertake macro-avoidance of OWF.	No, this is not the case. All flying birds within the wind farm project areas were considered.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	C11: 3.3.26/Table 3.10. JNCC and Natural England question whether the magnitude definitions used here are appropriate. It should not be assumed for example that an increase of say 4.5% (i.e. <5%) in background mortality is not significant. Any such assumptions require further justification.	It is felt that the application of the thresholds proposed for the assessment of magnitude in relation to the size of a reference population to the percentage increase in background mortality is inappropriate, not least because there is the potential for an increase in background mortality of over 100%. In order that there is consistency in the outcomes of the assessments of significance of the effect of collision based on consideration of the proportion of the population impacted or the percentage increase in background mortality, an alternative classification of magnitude has been used for the latter.
	Consultation on Dogger Bank Creyke Beck draft ES	C11: Table 6.2/Table 10.4 – The Durham Coast SSSI is notified for its breeding seabird assemblage, which includes black-legged kittiwake. It is unclear to Natural England why this SSSI is not included in these tables.	This SSSI is included (see Sections 6 to 10), with population data for black-legged kittiwake taken from the Seabird Monitoring Programme database.
	Consultation on Dogger Bank Creyke Beck draft ES	TA: 10.1.13. JNCC and Natural England believe that a broader range of OWFs should be screened into the CIA, including installed projects and those already envisaged for the future (e.g. potential Round 3 projects). Please see our comments above and regarding the draft AA report.	See response above regarding operational wind farms. In addition, please note the Forewind CIA Strategy which can be found as **Appendix 5A** to the ES which was previously consulted on. Forewind's intention is to provide a meaningful cumulative assessment to inform the stakeholders and decision makers in relation to the project in question. To this end, Forewind have undertaken a thorough screening process to identify projects where confidence in project and environmental data is high enough to allow an assessment to take place. This process ensured that Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D are included in the assessment presented in this chapter. However, whilst Forewind are also aware of other Round 3 projects which are coming forwards, these have had to be screened out due to the low confidence in project and environmental data meaning that any CIA would not result in a conclusion which could be used to inform the decision for Dogger Bank Teesside A & B.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	4.3.94. Consideration should be given to the impacts of suspended sediments on foraging seabirds. Refer to our comments in Annex N.1. for further details. Furthermore, if a negative impact on the sandeel fishery is identified as a result of increased suspended sediments, then a review of the indirect impacts on seabirds will need to be undertaken.	Additional text is presented in Section 4.3 of **Appendix 11A Ornithology Technical Report** to address this point.
	Consultation on Dogger Bank Creyke Beck draft ES	TA: 4.5.3. JNCC seek further information on how construction vessels will be able to appropriately identify and avoid seabird rafts during sensitive periods and how this will be managed.	A code of conduct will be followed by all vessel operators in line with recommendations from DECC (2011).
	Consultation on Dogger Bank Creyke Beck draft ES	TA: 5. For the purposes of consistency and future CIA, figures should be presented for each species detailing the actual numbers predicted to be impacted by each effect and not presented as percentages of the different population scales.	The actual numbers are presented within all relevant tables in Section 10.
	Consultation on Dogger Bank Creyke Beck draft ES	TA:5.2.541 and C11:10.2.14. JNCC seek a clearer explanation of the predicted deviated route, in terms of additional distance a species could be expected to fly. Currently the text suggests that the assessment has only been made against the shortest alternative route, which suggests a high-level of cognitive/spatial awareness by an individual.	The deviation around the project or projects will depend on the route, though given the shape of the individual projects is reasonably consistent. The deviation is considered in terms of the shortest possible route across the North Sea in order that the figures provided give a precautionary estimate of the relative increase in the distance travelled, it is not the shortest 'alternative' route but a predicted deviation (length) of) for the shortest migratory route across the North Sea. If the longest possible route across the North Sea was taken, the increased flight distance required for a likely deviation would be less with regard to the overall route length. Hence the precautionary shortest route has been used.
	Consultation on Dogger Bank Creyke Beck draft ES	Chapter 11:10.2.11. The information presented requires further clarification. A series of percentages are presented, however it is not clear what each percentage refers to. In addition we note that the assessment is at a designated sites level, for the purposes of EIA population level impact should be assessed a several scales – e.g. regional, national, biogeographic.	The significance of the predicted impacts of effects are considered throughout at designated site, national and biogeographic scales, and are presented relevant to these 'populations' (site/suite/national/biogeographic) throughout Sections 6 to 10.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	TA: Table 2.1. UK BAP species are 'priority species' not 'Annex I' species. Common starling is also a UK BAP species.	Species are included in this chapter (see Sections 2, 3, and 4).
	Consultation on Dogger Bank Creyke Beck draft ES	TA: Tables 3.1, 3.2, 3.3 and 3.4. It would be useful if the table headings could be expanded so as to clearly define the source of data i.e. does Table 3.1 contain the summarised results of boat counts or is it the output of the Distance model?	The table headings in **Appendix 11A Ornithology Technical Report** provide clarity regarding data sources.
	Consultation on Dogger Bank Creyke Beck draft ES	TA: Figure 3.1 (and repeated for each project, projects combined and for each species). The graphs produced for population estimates would benefit from being more legible and graphs presented for comparative purposes should be presented with identical scales.	The graphs in **Appendix 11A Ornithology Technical Report** have been prepared to be on identical scales.
	Consultation on Dogger Bank Creyke Beck draft ES	TA: Figure 3.2 (and repeated for each year for each species). JNCC believe that it would not require too much additional work to additionally present the density population estimates in a combined format that incorporates both years' data. In our opinion, this would provide a broader impression of the site usage, accounting for year to year variability. Additionally, providing a map that shows agreement (weak to strong) between years would be helpful. We appreciate that whilst this might not be possible for the Creyke Beck project it should be included for Teesside.	The tables in **Appendix 11A Ornithology Technical Report** include average values across the survey period (and see Sections 4, 6, 7, 10, and 11).
	Consultation on Dogger Bank Creyke Beck draft ES	TA: 3.3.8/Table 3.6. It would be helpful if the ES briefly detailed how the proposed correction factors to separate out breeding and non-breeding birds were generated.	The text refers to the specific section in **Appendix 11A Ornithology Technical Report** where the details are provided and available.
	Consultation on Dogger Bank Creyke Beck draft ES	TA: 4.1.17. Pomarine skua does not breed in the UK	Not stated in this version.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	Chapter (C)11: 59 and TA: 4.1.30. Currently there are contradictions between these two documents regarding whether the 1% national threshold has or has not been exceeded within the project areas and/or the Dogger Bank zone for Lesser black-backed gull. It would appear that the technical appendix provides the more accurate account. Please adjust accordingly.	Text has been corrected (now paragraph 4.1.30).
	Consultation on Dogger Bank Creyke Beck draft ES	TA: 7.4.1. This should read 'migrant waterbirds' not sea birds.	Not stated in this version.
	Consultation on Dogger Bank Creyke Beck draft ES	C11: 6, 2.2.4. The reference list on this page needs updating to reflect amendments made elsewhere - Garthe & Huppop (2004) should also list Furness & Wade (2012) and IEEM (2004) should be 2010.	Full references are made in Section 2.
	Consultation on Dogger Bank Creyke Beck draft ES	C11: 31, 3.2.13. Check that reference should be Wetlands International 2012.	Reference made to Wetlands International (2013) to reflect most recent waterbird population estimates.
	Consultation on Dogger Bank Creyke Beck draft ES	TA: Table of contents . It would be helpful if the table of contents could be expanded to include a schedule of the Appendices for the Technical Appendix, including the tables and figures presented therein.	Present within **Appendix 11A Ornithology Technical Report**.
	Consultation on Dogger Bank Creyke Beck draft ES	TA, 5.1.9. This section needs expanding to also highlight that birds may be displaced away from areas with boats, as has previously been stated elsewhere i.e. birds are not just positively attracted to boats but also negatively displaced.	These points are fully described in Section 4 of **Appendix 11A Ornithology Technical Report**.
	Consultation on Dogger Bank Creyke Beck draft ES	TA: Appendix 2. We would like to see this Appendix presented in a similar format to Appendix 1, detailing the distance from the development site to the designated sites for migrants. We also believe that Appendix 2 would benefit from being referred to, once it has been revised, within each of the appropriate sections pertaining to migrants and not just within the transboundary chapter.	The distances of the projects to these sites are included in Appendix 2 of **Appendix 11A Ornithology Technical Report**.

Consultee	Concern	Comments	Response
NE/JNCC	Consultation on Dogger Bank Creyke Beck draft ES	Appendix 6. Species specific collision risk assessments: For each species, the collision risk graphs for each model would benefit from being presented on identical scales in order to be able to cross compare model predictions. This information should also be presented in tabular format in order to be able to clearly cross-compare between the outputs of the different models.	Collision risk graphs are presented on identical scales and tables summarise annual collision estimates under each option within Appendix 6 of **Appendix 11A Ornithology Technical Report**.
	Consultation on Dogger Bank Creyke Beck draft ES	TA: Appendix 10. Check text in each table heading, as currently it suggests that the buffers for all species are 2km, contrary to text earlier on in the Appendix.	A 2km buffer has been used for all species with the exception of white-billed diver. Results for this species are not presented in the matrices in Appendix 10 of **Appendix 11A Ornithology Technical Report** owing to the very small number recorded.
	Consultation on Dogger Bank Creyke Beck draft ES	Documents not referenced. There are two documents in the Appendix of the Technical Appendix that do not appear to have been referenced anywhere. They appear at the end of Appendix 3: Population estimates and Geographical scope Ecological assumptions?	These earlier draft assumptions documents are provided for reference to comments received during stakeholder discussions during the preparation of the Dogger Bank Creyke Beck ES.
Norwegian Ministry of the Environment	Consultation on Dogger Bank Creyke Beck draft ES	The Norwegian Ministry of the Environment suggests that the impact form this wind farm on possible long range migration routes for birds are assessed in context with the same assessment for other possible wind farm development in relevant distance to seize possible CIA.	Due to a lack of information from assessments, no attempt was made to assess in a quantified manner the cumulative impact of the potential barrier effects posed to migrants by the Dogger Bank Teesside A & B and all other wind farm projects within the North Sea. This is also in part because the potential cumulative impacts of barrier effects from multiple wind farms are not likely to be additive (King *et al*. 2009) and thus are problematic to quantify. The indicative figures presented in Section 10 provides an indication of the percentage of each species' migration zones that overlap with the overall suite of wind farm projects in the North Sea region considered in the cumulative assessment.

Consultee	Concern	Comments	Response
RSPB	Consultation on Dogger Bank Creyke Beck draft ES	The justification for using Option 3 of the SOSS-2 model (Band) is slightly buried, in an annex to the Ornithological Technical Report (OTR). Perhaps this could have been given greater prominence. The RSPB considers that the use of this Option is justified in this case, but that the justification is difficult to locate.	Justification for the use of Option 3 is detailed in Section 4.3 in **Appendix 11A Ornithology Technical Report**.
	Consultation on Dogger Bank Creyke Beck draft ES	In Table 4.15 of the OTR, the figure given for proportion of Kittiwake at collision risk height is misquoted.	The value presented is not misquoted but reflects the proportion in the specific modelled rotor swept area rather than that given for a generic turbine in the Cook *et al*. (2012) report (see Table 4.16 in **Appendix 11A Ornithology Technical Report**). The footnote to this table reflects the worst case scenario of 6MW turbines a minimum of 26m above highest astronomic tide.
	Consultation on Dogger Bank Creyke Beck draft ES	In assessing the potential cumulative impacts, the RSPB consider that the models used in other schemes ought to be taken into account. Some of the data are from other older models and calculated using different avoidance rates. The implications are that using a higher avoidance rate (for example as in the Neart na Gaoithe assessment) will produce a greatly reduced modelled mortality, whereas the use of older collision risk models will generate a higher modelled mortality. This may affect the outcome of the assessment of cumulative impacts.	No attempt was made to standardise estimates using the same assumptions as presented in this assessment, as, based on the information presented on other assessments, this would have only been possible in some cases. The assumptions used in deriving displacement and collision risk estimates in other assessments are highlighted in tabulated summaries where these differ from those used in this assessment.
	Consultation on Dogger Bank Creyke Beck draft ES	Paragraph 4.3.14 OTR: the limited available evidence for common guillemot is ambiguous as to the likelihood of displacement, necessitating that the full range of % displacement values are assessed, as you have done. These documented cases at wind farms augment the approach used by Furness et al (2012). There may be good, biological reasons for the observed variation or study methods may have contributed; either way this wide range makes assessment of risk of displacement for guillemot more challenging.	As per JNCC/NE guidance, predicted impacts of displacement, for each project and species, based on a range of displacement and mortality rates are provided in Appendix 10 of **Appendix 11A Ornithology Technical Report**.

Consultee	Concern	Comments	Response
RSPB	Consultation on Dogger Bank Creyke Beck draft ES	Paragraph 4.3.18 OTR: whilst acknowledging that the Krijgsveld *et al*. 2011 study is one of the best around, it is just one study, relating to relatively small inshore wind farm(s). Whilst this study presents empirical data, it is not clear how indicative it might be of likely displacement by breeding gannets, given the prevalence of gannets during migration. In view of the contrast between this study and the Furness et al rankings, it is appropriate to consider a range of putative displacement effects for gannet, including 25% as per Table 4.8.	For northern gannet, evidence suggests that although the species might not be highly sensitive to disturbance in general (e.g. ship and helicopter traffic) the species may show strong macro-avoidance of offshore wind farms (Krijgsveld *et al*. 2010, 2011). Hence, following the recent NE/JNCC (2012) guidance, a 75% displacement rate has been applied for this species. As per JNCC/NE guidance, a range of displacement and mortality rates are provided in Appendix 10 of **Appendix 11A Ornithology Technical Report**.
	Consultation on Dogger Bank Creyke Beck draft ES	Paragraph 4.3.22 OTR: it is unclear on what basis you have derived the % displacement values for buffers; ie the average of 50% displacement, please clarify.	Evidence from studies in Denmark (Petersen 2005; Petersen *et al*. 2004, 2006) indicates that while birds may also be displaced from buffer areas around wind farms as well as the wind farm itself, the proportions of birds displaced tend to be relatively less in these buffer areas. Thus a linear decrease in the proportion of birds displaced is assumed (as described in Section 3). This more accurately reflects the change in displacement than applying 50% of the displacement of the wind farm for the whole buffer as a gradated change is anticipated through the buffer as distance from the wind farm increases.
	Consultation on Dogger Bank Creyke Beck draft ES	Paragraph 4.3.27 OTR: we do not know what the mortality implications of displacement might be and therefore, as per the NE/JNCC guidance, it seems appropriate to assess the range of possible % mortality to determine sensitivity to variation in this value.	As per JNCC/NE guidance, predicted impacts of displacement, for each project and species, based on a range of displacement and mortality rates are provided in Appendix 10 in **Appendix 11A Ornithology Technical Report**, with the most likely displacement rate and mortality rate results presented in Sections 6 to 10 in this chapter.

Consultee	Concern	Comments	Response
RSPB	Consultation on Dogger Bank Creyke Beck draft ES	Paragraph 4.3.42 OTR: whilst acknowledging the logic of applying 50% of bird numbers displaced during operation to construction and decommissioning, to reflect progressive decreases and increases, it is worthwhile considering recent published research albeit for an onshore study (Pearce-Higgins *et al*. 2012) which indicates that, at least for some species, displacement effects may be initiated during construction and to varying degrees persist during operation. In other words, the greatest effect coincided with construction and for the species most affected showed no diminution (Pearce-Higgins, J. W., L. Stephen, A. Douse, and R. H. W. Langston. 2012). Greater impacts of wind projects on bird populations during construction than subsequent operation: results of a multi-site and multi-species analysis. Journal of Applied Ecology 49:386–394.).	As the assessment of displacement considers how many birds will be lost to the population in the long-term, due to the effective loss of habitat associated with this effect, the impacts predicted during construction and decommissioning are encompassed by those predicted for the operational period and are not additive.
	Consultation on Dogger Bank Creyke Beck draft ES	It has been assumed that the numbers of birds displaced during construction and decommissioning will be 50% of those during operation, based on the expectation that displacement will increase during construction and progressively reduce during decommissioning (4.3.42). Disturbance will be an on-going effect through construction and decommissioning phases of the project (4.3.44). The inference of displacement is that, in the first year, a given number of GU will be displaced and lost to the population, leading to fewer returning in the second year, whereupon further displacement and mortality occur, and so on. How is the ongoing effect incorporated throughout the operational life of the wind farm?	As the assessment of displacement considers how many birds will be lost to the population in the long-term due to the effective loss of habitat associated with this effect, the impacts predicted during construction and decommissioning are encompassed by those predicted for the operational period and are not additive.

Consultee	Concern	Comments	Response
RSPB	Consultation on Dogger Bank Creyke Beck draft ES	Please clarify the derivation of the numbers presented separately for construction/decommissioning and operation (Appendix 11A Tables 5.1, 5.8 & 5.15). It is unclear whether these include the 2km buffer?	The values for construction/decommissioning simply represent 50% of the values for operation (inclusive of the buffer), as it assumed that the average spatial extent of the wind farm project during construction/decommissioning will be half that during the operational phase. Values are the total displacement from the project areas and buffers.
	Consultation on Dogger Bank Creyke Beck draft ES	Taking guillemot as an example, how do numbers presented in the displacement matrices (Tables A10.8 and A10.19 etc), attribute development phases and take account of breeding and non-breeding seasons?	The values presented in Appendix 10 are for the operational period only; those for construction/decommissioning would be 50% of these values. The values sum displacement for the breeding and non-breeding seasons. Separation of the values can be supplied as spreadsheets on request.
Comments received during Dogger Bank Teesside A & B PEI3 consultation			
RSPB	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** Section 2.1.6. It is unfortunate that the number of categories and the bandwidths for flight height estimation varied over time around the critical height of the lower blade sweep.	An extra flight height category was added during the period of data collection to provide improved understanding of behaviour.
	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report**. Population estimation. Information is not presented as to the fit of each model for each species, so it is not possible to determine appropriateness of adopted figures in each and every case. Model based methods are recommended for this purpose Buckland *et al*. 2012).	A manuscript on the population modelling has been prepared for publication in the scientific literature and is currently (January 2014) under peer-review. This provides additional confirmation of the modelling procedure and of model fit.
	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** Section 2.7.7. The basis for regional population estimation relies on old (ESAS) data and therefore may not be applicable for context with recently collected site-based data.	It is acknowledged that the baseline population estimates are based on more recent and intensive survey than those obtained from ESAS. However, the latter provide a means for assessing populations within the North Sea for all species considered and for different times of year.
	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** Table 4.5 Gannet – connectivity also applies to Bass Rock in winter, see Kubetzki *et al*. 2009 & Fort *et al*. 2012.	Table 4.5 in **Appendix 11A Ornithology Technical Report** has been updated with this information.

Consultee	Concern	Comments	Response
RSPB	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** Section 4.3.33. Use of VMS data for sandeel fishery is useful but restricted to one of the main prey items; distribution of clupeids also is associated with several breeding seabirds and adult survival, eg puffin (Breton & Diamond 2013).	Danish VMS data have been used in the population modelling as a proxy for the availability of sandeels. While it is acknowledged that the distribution of other prey species such as clupeids may also help explain the distributions of some seabird species, comparative data for other prey were not available for inclusion in the assessment.
	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** Section 4.3.40. Mortality rates presented for DBT represent the proportion of those birds predicted to be displaced that might be lost to the population. No attempt is made to assess this effect in relation to changes in background annual mortality and consequent population-level effects for relevant SPAs or more widely.	Please also see the points made above with respect to the consultation on the draft ES for Dogger Bank Creyke Beck. With respect to displacement, it is re-iterated that the mortality rates considered in this assessment represent the proportion of those birds predicted to be displaced that might be expected to be lost to the population in the long-term. No attempt is made to assess this effect in relation to changes in background annual mortality that would be required to bring the population to the new lower equilibrium, as a number of uncertainties are likely to determine how long this will take to happen and thus the changes in annual mortality required.
	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** Table 4.16. It is unclear what is considered the proportion at collision risk height (PCH) across model options, since PCH will be different between column 6 and 8. Using footnotes to explain do not make it clearer; the difference should be explicit in the column labels.	Clarification has been provided in Table 4.16 and associated text in **Appendix 11A Ornithology Technical Report**.
	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** Table 4.17. Rotation speed is presented with no indication of what the figure means. Is it minimum, mean or maximum, or some other value?	Clarification has been provided in Table 4.17 and associated text in **Appendix 11A Ornithology Technical Report**.
	Section 42 consultation on the draft ES, statutory	Collision Risk Modelling. Formatting: The collision risk modelling suffers from being spread over several documents, i.e. Chapter 11, Chapter 11A, and its Appendices 6, 7 and 12. Cross referencing between the documents is not straightforward, and the layout and explanation of methods between documents is far from clear.	Clarifications are being provided with respect to other comments on methodology. Information in the technical report is separated between the main text and appendices, such that it is clear which values are taken forward in the assessment. Furthermore, **Chapter 11 Marine and Coastal Ornithology** provides a summary of the information and assessment presented in **Appendix 11A Ornithology Technical Report** and its appendices, therefore for specific detail reference should always be to **Appendix 11A**.

Consultee	Concern	Comments	Response
RSPB	Section 42 consultation on the draft ES, statutory	Collision Risk Modelling overview. Band Option 3 with 98% avoidance rate (99% for gannet) is applied for DBT. Whilst the extended model may offer some advantages, these are more than countered by several fundamental problems (see further comment about Option 3 below): a) The lack of empirical data to validate the collision risk model forseabirds. b) Unknown error associated with flight height estimation during data gathering is compounded by the modelling to 1m bandwidths. c) The 98% avoidance rate applied with Option 3 was originally calculated for Option 1. Avoidance rate is a correction factor accounting for variability in several biological parameters and is considered by Band to be model-specific. Our understanding is that the appropriate avoidance rate for Option 3 is likely to be lower as Option 3 already accounts for some of the incorporated variability. The extended model is the subject of considerable debate, which has prompted a review and further work, commissioned by Marine Scotland and due to deliver by the end of March 2014. The group carrying out this work includes the BTO. Until this work is complete, Option 3 has to be considered to be "work in progress." d) Collision risk predictions obtained from Option 3 are substantially lower than those obtained from Option 1, inappropriately so if a lower avoidance rate correction is applicable, as per c) above. e) 99% avoidance rate for gannets is based on data primarily from birds migrating/non-breeding season and may not apply to breeding birds.	Additional detail regarding the flight height modelling is provided in Johnston *et al*. (2014). Discussion with regards to Collision Risk Modelling options and the appropriate avoidance rates to use within Collision Risk Modelling is ongoing. To inform this, a separate document (Forewind & SMartWind 2013) has been produced to provide a review of avoidance rates of seabirds at offshore wind farms and the applicability of their use within the Band collision risk model. Note is also made of the MROG Paper "*Summary of current issues with Collision Risk Modelling approaches*". As is noted in the comment, further work has been commissioned by Marine Scotland that should also better inform this issue. Option 3 was used throughout the assessment as it allows variation in turbine design (i.e. in their size and height above sea level) to be more accurately incorporated into the assessment of collision risk. Collision risk is not spread evenly within the rotor swept area as is assumed by Options 1 & 2. Using Option 3 allows us to take this into account and thus represented the most appropriate Option to use. However, as stated above, discussions in this regard are ongoing.

Consultee	Concern	Comments	Response
RSPB	Section 42 consultation on the draft ES, statutory	*Continued from above.* Given the current understanding for breeding seabirds, we consider the more precautionary avoidance rate of 98% should be applied for gannets (at least for the breeding season), as for other species, as an indicative value, until empirical data improve the evidence base. Until there is a better evidential base for the collision risk model in general, and the extended Band model has been peer-reviewed, in combination with the calculation of an appropriate avoidance rate, the RSPB are unhappy with the application of Option 3 alone. Currently, we suggest that the assessment should use either Option 1 and 98%, thereby facilitating cumulative impact assessment, or present both Option 3 and Option 1 across a range of avoidance rates. We acknowledge that Option 1 has been presented, in an appendix, but it is not carried forward into the assessment. Furthermore, the presentation of a single value, without a measure of variance, gives a misleading view of the validity of the CRM output.	See above response.

Consultee	Concern	Comments	Response
RSPB	Section 42 consultation on the draft ES, statutory	The use of Option 3. The main assessment is based on the extended Band model (2012), Option 3, and while some results for the basic model, Options 1 and 2, are presented in the further appendices (6,7 and 12), it would be preferable that they were referred to in the assessment (chapter11) and it's Technical Report (11A). Band (2012) explicitly states: "*A collision risk assessment for a specific site should not be based solely on the use of generic data. Where generic data is used, it is recommended that the collision risk for three different options is stated. Supporting text should then discuss and justify which of the options is most likely to characterise the collision risks at this site*." As such, while we welcome the tables presenting the range of options in appendix 6, we would prefer that full reference was made to them in the main assessment. The reference to a range of model options is crucially important, as the extended model and particularly it's associated source data and avoidance rates, is still in question and the subject of wide debate and on-going work across the SNCBs and offshore wind stakeholders. As such it should be considered a work in progress, and therefore not suitable for consideration alone in the consenting process. However, the RSPB acknowledge that it can provide useful contextual information for that consideration. Given these caveats with Option 3, Option 1 should also be presented throughout the document.	Discussion with regards to Collision Risk Modelling options and the appropriate avoidance rates to use within Collision Risk Modelling is ongoing. To inform this, a separate document (Forewind & SMartWind 2013) has been produced to provide a review of avoidance rates of seabirds at offshore wind farms and the applicability of their use within the Band collision risk model. Note is also made of the MROG Paper "*Summary of current issues with Collision Risk Modelling approaches*". As is noted in the comment, further work has been commissioned by Marine Scotland that should also better inform this issue. As stated earlier, Option 3 was used throughout the assessment as it allows variation in turbine design (i.e. in their size and height above sea level) to be more accurately incorporated into the assessment of collision risk. Collision risk is not spread evenly within the rotor swept area as is assumed by Options 1 & 2. Using Option 3 allows us to take this into account and thus represented the most appropriate Option to use. However, as stated above, discussions in this regard are ongoing.

Consultee	Concern	Comments	Response
RSPB	Section 42 consultation on the draft ES, statutory	Avoidance Rates. The assessment is based on the use of a generic avoidance rate of 98%, with 99% for gannet. While the use of 98% is supported in the text by reference to guidance (SNH, 2010) and a review (Cook et al, 2012), the use of 99% for gannet is not, nor is it justified in the supporting text, except by reference to the Triton Knoll application. It is our position that 98% should remain the default avoidance rate for gannet, as stated in SNH (2010) and Cook et al (2012) until empirical evidence is available to justify a change applicable to breeding as well as nonbreeding seasons. In terms of the presentation of avoidance rates, Band (2012) states: "*The collision risk estimate should conclude with a table showing potential collision mortality using a range of assumed avoidance rates, it is recommended that collision risks be evaluated assuming avoidance rates of 95%, 98%, 99% and 99.5%*". While the RSPB acknowledge that all these avoidance rates are presented in Appendix 6, Table 5.3, the main assessment, Chapter 11, Table 7.5 omits 95%. Given that a key concern with the use of the extended model is the cross-option applicability of avoidance rates, the main assessment should also include 95%.	Discussion with regards to Collision Risk Modelling options and the appropriate avoidance rates to use within Collision Risk Modelling is ongoing. To inform this, a separate document (Forewind & SMartWind 2013) has been produced to provide a review of avoidance rates of seabirds at offshore wind farms and the applicability of their use within the Band collision risk model. Note is also made of the MROG Paper "*Summary of current issues with Collision Risk Modelling approaches*". As is noted in the comment, further work has been commissioned by Marine Scotland that should also better inform this issue. **Table 7.8** and **Table 10.13** have now had the 95% collision results added for completeness.

Consultee	Concern	Comments	Response
RSPB	Section 42 consultation on the draft ES, statutory	Flight height bands and confidence levels. Within the methods two additional types of data are described as being collected (Chapter 11A, para 2.1.6), but are not mentioned in any of the results. These are the recording of confidence levels alongside the height bands during boat based survey, and the use of an additional height band at 20-25m from December 2010. Both of these would have given very useful contextual information. The extended model relies on flight height distribution curves presented in Cook *et al*., (2012). These modelled distributions assume that birds are correctly assigned to the correct height category. This assumption is not validated, and initial indications, e.g. from terrestrial trials and offshore post-construction monitoring, are that it may not be valid. Given that the CRM outputs can be strongly influenced by an upward shift of the rotor hub of a few metres, these inaccuracies in raw data may have important implications to the output of collision risk estimated. As such the presentation of confidence limits gathered during data collection would add valuable context. However, and this is not entirely clear from the methods, if no validation of these confidence limits was made and seems subjective, they may be subject to a similar range of inaccuracies as the height data. Key to the contrast in collision rates between the options is that options 2 and 3 allow for varying the height of turbines, although they rely on the use of modelled data to do this. Using this additional height band in Option 1, i.e. by increasing the lower limit of the PCH to 25m, would allow, to some extent, the calculation of changes in collision rate with the revised WCS in mitigation, without the need for Option 3.	Clarification has been added to the text in **Section 3.2** and **Appendix 11A Ornithology Technical Report**.

Consultee	Concern	Comments	Response
RSPB	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** Table 4.21. It is questionable whether these increases in adult background mortality rates could be considered acceptable in the context of an SPA population, eg that an increase of 5-20% in adult background mortality could constitute an impact of low magnitude.	Please also see the points made above with respect to the consultation on the draft ES for Dogger Bank Creyke Beck. Consideration of the impact of the effect of collision in terms of the potential increase in background annual adult mortality is provided for all species at all spatial scales. With respect to thresholds, any decision as to what might be deemed significant (and above which further investigation of potential impacts is required) is, in essence, arbitrary. In relation to the size of a reference population, a value of 1% is commonly used to define a lower threshold for assessing the magnitude of an effect (e.g. Percival 1999, Table 4.1 in **Appendix 11A Ornithology Technical Report**). However, it is felt that the application of the thresholds proposed for the assessment of magnitude in relation to the size of a reference population to the percentage increase in background mortality is inappropriate, not least because there is the potential for an increase in background mortality of over 100%. While the EU guidance is acknowledged, it is noted that this guidance is provided in relation to the potential impacts of hunting and applied specifically to the migratory components of the populations considered. There remains a lack of common guidance for EIA purposes that provides a comparative framework for assessing the magnitude of an effect, at all relevant population scales, in relation to background mortality to that provided by, for example by Percival (1999), in relation to the size of a reference population. In order that there is consistency in the outcomes of the assessments of significance of the effect of collision based on consideration of the proportion of the population impacted or the percentage increase in background mortality, an alternative classification of magnitude is thus proposed for the latter. Further assessment of the population level consequences of predicted impacts is provided through the use of PBR approaches in the HRA for northern gannet and black-legged kittiwake.

Consultee	Concern	Comments	Response
RSPB	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** 4.3.129. The application of a "correction factor" for those species for which less than 100% of the population is included in the SPA site network takes no account of the geographical distribution of colonies and their status, but assumes even distribution of birds irrespective of whether or not they originate from SPA colonies.	The apportioning to protected sites reflects the species' population size at each site and, for breeding birds, the distance of the site from the wind farm project(s). Different correction factors are applied to breeders and non-breeders in the breeding season and non-breeding season to account for their potential different origins.
	Section 42 consultation on the draft ES, statutory	Displacement & Barrier effects. The additive mortality arising from displacement and barriers is unknown (CEH displacement study, Forth & Tay, Searle *et al*. in prep.). Reduced breeding productivity is most likely to be the proximate effect of displacement/barriers, for adult seabirds. Whilst expecting that generally long-lived adults will abandon a breeding attempt to safeguard their own survival to make another breeding attempt in another year, there may be consequences for body condition into the winter and knock-on effects for overwinter survival, as borne out by the CEH work. CEH individual based models indicate that effects on adult and chick survival increased when the distance between the SPA colony and wind farm were smallest, and the main effect driving survival was the cost of the barrier effect rather than displacement per se. The CEH study is a preliminary, but valuable, step in improving our understanding of displacement and barrier effects. In presenting the matrices of displacement x mortality, at least the relative sensitivity for each species can be assessed, although the matrices in Appendix 10 present predictions for the whole year, rather than distinguishing breeding/non-breeding totals.	The valuable work of CEH in understanding the potential impacts on demography of displacement and barrier effects is acknowledged. Further discussion of the likely impacts associated with displacement is provided in an independent review (Furness 2013),

Consultee	Concern	Comments	Response
RSPB	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** 5.2.1 & 5.2.2. The relationship between the values tabulated in Appendix 9 and eg Table 5.1 is not clear. How are the apportionment values applied to the relevant displacement values? The relationship between the matrices presented in Appendix 10 and their equivalent tables in the main assessment are clear, eg Table 5.1.	A worked example is provided using razorbill for the full six projects for operational disaplcement. The appropriate displacement rate for razorbill is 50%, with 5% mortality (see Section 4, Table 4.8 and paragraph 4.3.33 in **Appendix 11A**). In Section 6 of **Appendix 11A Ornithology Technical Report**, Table 6.1 gives the number of birds displaced calculated assuming the 50% rate, and correcting for the number of birds underwater potentially missed by surveys (16.4% for razorbill). This gives breeding season values (means across all three 12 month periods) of: 784 (confidence interval, 640-959) during the breeding season, and 6,405 (5610-7283) during the non-breeding season. The sum of these components is: 7,188 (6,251-8,242), which matches the 50% displacement, 100% mortality value presented in Table A10.18d in Appendix 10 of **Appendix 11A Ornithology Technical Report**. Table A9.59d in Appendix 9 of **Appendix 11A Ornithology Technical Report** gives the apportioning table for razorbill. The total number of breeding birds impacted (during the breeding season) is 20.9, and total number of all non-breeding birds (during both breeding and non-breeding seasons) is 175.37. These are based on median values. Breeding season: Taking the median number of birds from Table 6.1 of **Appendix 11A Ornithology Technical Report** during the breeding season (784), a portion of these birds are assumed to non-breeders (1/3), thus giving 523 breeders and 261 non-breeders. Some of these birds may originate from outside the suite of sites bordering the North Sea, which for both breeding birds and non-breeding birds during the breeding season is assumed to be a proportion of 0.8 (see Table 4.23 and paragraph 4.3.129 in **Appendix 11A Ornithology Technical Report**). This gives a total of 418 breeders and 209 non-breeders during the breeding season. Applying the 5% mortality value to these figures gives 20.9 and 10.5 birds lost. The 20.9 value is given at the bottom of Table A9.59d (third column from left) in Appendix 9 of **Appendix 11A Ornithology Technical Report**.

Consultee	Concern	Comments	Response
RSPB	Section 42 consultation on the draft ES, statutory	*Continued from above.*	*Continued from above.* Non-breeding season: Taking the mean number of non-breeding season birds from Table 6.1 (6,405) in **Appendix 11A Ornithology Technical Report**, all are assumed to be non-breeders. Adjusting for birds potentially originating from outside the North Sea, a proportional value of 0.515 was applied (Table 4.23 in **Appendix 11A Ornithology Technical Report**), giving 3298.6 displaced birds to apportion to protected sites, of which 5% are lost due to mortality giving 164.9 birds. The respective non-breeding components during the breeding season and non-breeding season can then be added together (10.5 + 164.9) to give the total "non-breeding" component of the population across all seasons (= 175.37), which is quoted at the bottom of Table A9.59d (sixth column from left) in Appendix 9 of **Appendix 11A Ornithology Technical Report**. These totals are apportioned amongst the designated sites following the methodology detailed in Section 4 in **Appendix 11A Ornithology Technical Report**. Median proportions of populations are also presented in the tables within Appendix 9 of **Appendix 11A Ornithology Technical Report**, together with upper and lower confidence limits. However, the DB Teesside assessment was carried out on these upper CI values.
	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** Section 5.2.383. In excess of 1% of the relevant reference populations of migratory bean goose, hen harrier and ruff were estimated to pass through DBT. However, the low confidence in the assessment for migratory birds, owing to the paucity of knowledge, means that this finding can only point to the possibility that these species might be at greater risk than other migratory species passing through DBT.	This is acknowledged.

Consultee	Concern	Comments	Response
RSPB	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** Table 5.7. Low or very low confidence in many aspects of the environmental assessment for most species, highlight the general lack of understanding about the impacts of offshore wind farms on seabirds and white-billed diver. This means that it is particularly difficult to provide a comprehensive environmental assessment for DBT, or indeed for any of the Round 3 zones, necessitating a precautionary approach.	This is acknowledged, and it is our consideration that this assessment is precautionary.
	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** 6.3.6, 6.3.7 & Table 6.8. Only a subset of other proposed offshore wind farm sites were included in the cumulative impact assessment for displacement/barrier effects, on the basis of available data. Proposed sites in the Firths of Moray, Forth & Tay have been screened out for inadequate reasons.	Further projects have been included in the CIA list following the publication of recent reports, see **Section 10**. These projects include an extra five sites as follows: Moray Firth, Firth of Forth Alpha and Firth of Forth Bravo, Inch Cape, and Neart na Gaoithe.
	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** 6.3.9 & Table 6.10. Only a subset of other proposed offshore wind farm sites were included in the cumulative impact assessment for collision risk, on the basis of available data. Proposed sites in the Firths of Moray, Forth & Tay have been screened out for inadequate reasons.	
	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** 6.3.10 & Table 6.10. Incompatible estimations of collision risk, by different projects, using different versions of the collision risk model and different avoidance rates, make assessment of cumulative impacts difficult and unreliable, notably so when set against the current state of knowledge. This is a general criticism, applicable to all the Round 3 projects.	No attempt was made to standardise estimates using the same assumptions as presented in this assessment, as, based on the information presented on other assessments, this would have only been possible in some cases. The assumptions used in deriving collision risk estimates in other assessments are highlighted in tabulated summaries where these differ from those used in this assessment.

Consultee	Concern	Comments	Response
RSPB	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** Table 6.10. It would be helpful to recalculate avoidance rates from other sites wherenecessary. This would be a simple exercise (unlike recalculating using a different model option).	See response above.
	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** Table 6.14. Formatted incorrectly and cannot be read.	Table 6.14 and also Table 6.7 in **Appendix 11A Ornithology Technical Report** have been reformatted.
	Section 42 consultation on the draft ES, statutory	**Appendix 11A Ornithology Technical Report** Section 7.7 Monitoring. We welcome the recognition of the value of post consent monitoring, should the project be consented, but consider this section rather premature in view of the adequacy of the cumulative impact assessment in particular.	It is acknowledged that the full scope and specific objectives of monitoring will need to be determined through consultation with the relevant stakeholders. However, EIA are required to provide indications or information regarding likely monitoring in the assumption that the proposal will be consented / approved. This is a standard industry (and IEMA recommended) approach.
	Section 42 consultation on the draft ES, statutory	Table A6.2 in **Appendix 11A Ornithology Technical Report**. Option 2 has a lower collision estimate than Option 3. This is counter-intuitive and should be discussed in the text. Presumably it is because of the dual peaked distribution reported in Cook *et al* (2012) (though not in Johnston *et al*, 2014). In general there should be more discussion of these comparative results.	This is the result of the dual peak in the distribution; additional text has been added in Section A6.4 in Appendix 6 of **Appendix 11A Ornithology Technical Report** for clarification.
	Section 42 consultation on the draft ES, statutory	Tables A7.1-6 in **Appendix 11A Ornithology Technical Report**. These tables wrongly state that Option 1 corrects for variable collision risk within the rotor swept area; it is Option 3 that does this.	Text has been amended in the table titles for clarification.
	Section 42 consultation on the draft ES, statutory	Appendix 12 in **Appendix 11A Ornithology Technical Report**. There is no discussion of how the tabulated figures have been calculated, and no reference or discussion of this appendix within the text. Presumably the figures are calculated using Option 2.	Figures were calculated using Option 3; additional text has been added in Section A12.1 in Appendix 12 of **Appendix 11A Ornithology Technical Report** for clarification.

Consultee	Concern	Comments	Response
RSPB	Section 42 consultation on the draft ES, statutory	Chapter 11. 3.3.11: Certainly in the case of gannets, immature birds increasingly occur at the breeding colony in "clubs" during the breeding season, as they near breeding maturity, especially from 3-4yrs. Furthermore, they are central place foragers, albeit not necessarily returning to the colony as often as breeding adults (Votier *et al*. 2010). So, caution against assuming all immatures behave radically differently from adults during the breeding season.	Noted. However, the assumption made results in a precautionary apportionment of numbers to any site, particularly in the case of northern gannet on this basis.
	Section 42 consultation on the draft ES, statutory	Chapter 11. Table 3.11: Table 3.11. It is unclear what is considered PCH across model options, since PCH will be different between column 6 and 8. Using footnotes to explain do not make it clearer; the difference should be explicit in the column labels.	The difference is described in the titles. For example, the modelled PCH (end) column title identifies that the PCH is for the selected model option (Band Model Option 3 as noted in paragraph 3.3.41), and height range is therefore 26m to 193m (AOD).
	Section 42 consultation on the draft ES, statutory	Chapter 11. General: In view of our comments on the Ornithology Technical Report, we do not agree with the assessment presented here for collision and displacement/barriers.	Noted, and see responses above on the comments raised with respect to the **Appendix 11A Ornithology Technical Report**.
	Section 42 consultation on the draft ES, statutory	Chapter 11. 10.3.12, 10.4.44, 10.4.46: Conclusions of cumulative collision risk assessment for DBT: A long-term moderate adverse cumulative impact is predicted for the national populations of great black-backed gull and lesser black-backed gull; A long-term moderate adverse cumulative impact is predicted for the designated site population of black-legged kittiwake, great black-backed gull, and northern gannet. However, the contribution made by DBT is relatively low based on the assessment methods used (see earlier comments).	Agree that this represents the conclusions as noted in the relevant sections, and with the note that the contribution made by Dogger Bank Teesside A & B is relatively low. Response with respect to the assessment methods have been made earlier (see above) on the comments raised with respect to the **Appendix 11A Ornithology Technical Report**.
	Section 42 consultation on the draft ES, statutory	Chapter 11. 10.4.40: NB assumes that no puffins observed in DBT relate to breeding birds as DBT lies beyond the mean maximum foraging range for puffin.	As described in the methodology section (Section 3) and in **Appendix 11A Ornithology Technical Report**, the designated sites supporting populations of Atlantic puffin are all outside the maximum foraging for this species.

Consultee	Concern	Comments	Response
RSPB	Section 42 consultation on the draft ES, statutory	Chapter 11. 12.2: Given limited empirical data, all assessments are based on interpretations and differences of view, not necessarily differences of fact.	It is accepted that the data used from other assessments is likely to have been derived using different survey methods, different survey durations, times, seasons, etc., and the assessments would have used different methods of calculation.
	Section 42 consultation on the draft ES, statutory	Chapter 11. 12.2.8 Potential Biological Removal: Potential Biological Removal (PBR) almost certainly does not indicate sustainable levels of “harvest”. The major concern is that PBR is unvalidated. PBR appears increasingly in offshore wind energy environmental impact assessments in the UK, almost certainly because it has few data input requirements and is quick and simple to perform – potentially misleading attributes. PBR is highly sensitive to input values. We do not know what is an appropriate recovery factor and, although the peer-reviewed literature provides some discussion as to appropriate values, the resulting PBRs may not set appropriate thresholds for designated populations in particular, given that PBR is defined as permitting a reduction in population size to, but not below, its maximum net productivity level or 50-70% of carrying capacity (Wade 1998). Hornsea Project One provides an example of the potential contrast in outcomes depending on the approach used: the Kittiwake PVA indicates that additional mortality of 1000 birds increases the risk of a smaller median population after 25yrs to 75% - a high level of risk of decline, yet the supposedly sustainable PBR is calculated to be 1023, which consequently does not appear so sustainable. As developed for setting fishery bycatch limits, or for its application for setting hunting bag limits, PBR is predicated on a feedback loop to modify “harvesting” rates iteratively, if necessary. Once wind turbines are erected, there will be limited scope for modifying “take” if it is not sustainable.	Now paragraph 12.2.10. Forewind has commissioned a study into the derivation of appropriate PBR values for the black-legged kittiwake and northern gannet populations of the Flamborough and Filey Coast pSPA. This study is appended (**Appendix E**) to the **HRA Report**. As well as providing justification for the parameters used in setting PBR values (including the use of appropriate recovery factors) the study provides a technical discussion on the theoretical basis of PBR and its use in respect of setting sustainable harvest levels in respect of seabird populations.

Consultee	Concern	Comments	Response
RSPB	Section 42 consultation on the draft ES, statutory	Appendix E Flamborough and Filey Coast pSPA: Potential Biological Removal (PBR) values for Gannet 286-393, Kittiwake 381-400 are cited. As per our overarching comments on PBR above, it is questionable that any of the various cited PBRs for adult kittiwake from FHBC indicate sustainable numbers “that could be removed annually without having a detrimental effect on the sustainable growth of the population”.	See above response for RSPB comment on Chapter 11. 12.2.8.
JNCC / NE	Section 42 consultation on the draft ES, statutory - Presentation of baseline, effects and impacts	52.1. JNCC and NE believe that chapter 11 has been oversimplified by presenting the technical details within a technical appendix making it challenging to gain an overall impression of the potential impacts.	This comment repeats the same comment made in this regard for the Dogger Bank Creyke Beck draft ES. Since that comment, more technical detail on the issues and approaches has been added (see Section 3) and greater detail (such as additional numberical results) has been added in the presentation of the results of the assessment (see Sections 6 to 10). It is our considered understanding that this chapter provides a balanced level of information for both interested parties, as well as the public, to understand the potential impacts. Further cross-references to specific locations within the supporting **Appendix 11A Ornithology Technical Report** has been added if further detail is available for those seeking greater technical clarification. However, it should be noted that there is extensive detail in **Appendix 11A Ornithology Technical Report** which cannot all be presented within the chapter particularly if it relates to contextual explanations. If there are any uncertainties
	Section 42 consultation on the draft ES, statutory - Presentation of baseline, effects and impacts	52.2. For the cumulative impacts (sec 10) it would be useful if Table 10.2 included those project screened out as well as those screened in.	All relevant projects screened out are presented in Table A8.1 in Appendix 8 of of **Appendix 11A Ornithology Technical Report**. Adding the projects screened out would result in pages of named projects that are already named in the table referred to.

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - Presentation of baseline, effects and impacts	52.3. In the assessment of mortality impacts from collision risk modelling, we welcome the presentation of figures on the additional mortality relative to baseline mortality (i.e. additional mortality as a % of baseline mortality) in addition to the use of "% of total population affected". However it is not consistently presented across impacts and receptors and the interpretation in table 3.13, that an increase in baseline mortality of less than 5% is considered "negligible" is not consistent with our advice that where there are predicted increases of greater than 1% relative to baseline mortality, further assessment of impacts at the appropriate population scale is required . EU guidance (EU Guidance document on hunting under Council Directive 79/409/EEC on the conservation of wild birds "The Birds Directive) suggests that a good basis for concluding additional mortality is not significant would be a less than 1% increase in background mortality, though in the case of some declining populations, this may not be sufficiently precautionary. The derivation of this threshold originates from the "small numbers" concept, which in turn was devised to address exploitation of species that may be hunted or taken judiciously for other purposes, under Article 9 of the Birds Directive (Article 9(1)(c) allows for the use of derogations for the capture, keeping or other judicious use of certain birds. Apart from general conditions, there are four specific conditions, which must be respected in order to apply a derogation under Article 9(1)(c). It must represent "judicious use". It must relate to "small numbers". It is only permissible if carried out under „supervised conditions". Finally it must be on a "selective basis". *Continued below.*	Please also see the points made above with respect to the consultation on the draft ES for Dogger Bank Creyke Beck. Consideration of the impact of the effect of collision in terms of the potential increase in background annual adult mortality is provided for all species at all spatial scales. With respect to thresholds, any decision as to what might be deemed significant (and above which further investigation of potential impacts is required) is, in essence, arbitrary. In relation to the size of a reference population, a value of 1% is commonly used to define a lower threshold for assessing the magnitude of an effect (e.g. Percival 1999, see **Table 3.4**). However, it is felt that the application of the thresholds proposed for the assessment of magnitude in relation to the size of a reference population to the percentage increase in background mortality is inappropriate, not least because there is the potential for an increase in background mortality of over 100%. While the EU guidance is acknowledged, it is noted that this guidance is provided in relation to the potential impacts of hunting and applied specifically to the migratory components of the populations considered. There remains a lack of common guidance for EIA purposes that provides a comparative framework for assessing the magnitude of an effect, at all relevant population scales, in relation to background mortality to that provided by, for example by Percival (1999), in relation to the size of a reference population. In order that there is consistency in the outcomes of the assessments of significance of the effect of collision based on consideration of the proportion of the population impacted or the percentage increase in background mortality, an alternative classification of magnitude is thus proposed for the latter and is shown in **Table 3.12** (Table 3.13 in the draft ES Chapter 11). Further assessment of the population level consequences of predicted impacts is provided through the use of population modelling techniques in the HRA for northern gannet and black-legged kittiwake as reported in Section 12. *Continued below.*

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - Presentation of baseline, effects and impacts	*Continued from above.* By comparison, the Applicant considers <5% increase in background adult mortality has negligible impact (Table 3.13). Where figures presented represent >1% increase in mortality, further assessment of the population level consequences should be made, for example through the use of population modelling techniques, or reference to existing literature (e.g. SOSS-04, PVA for northern gannets) before a conclusion can be made on negligible impact. Furthermore, changes to baseline mortality need to be assessed for the other impacts e.g. displacement.	*Continued from above.* With respect to displacement, it should be re-iterated that the mortality rates considered here represent the proportion of those birds predicted to be displaced that might be expected to be lost to the population in the long-term. No attempt is made to assess this effect in relation to changes in background annual mortality that would be required to bring the population to the new lower equilibrium, as a number of uncertainties – e.g. where birds are displaced to, the carrying capacity in those areas – are likely to determine how long this will take to happen and thus the changes in annual mortality required.
	Section 42 consultation on the draft ES, statutory - Presentation of baseline, effects and impacts	52.4. JNCC and Natural England note that the percentage increase relative to baseline mortality figures for lesser black-backed gull and great black-backed gull are incorrectly presented in Ch 11: 10.3.14 and 10.3.15 as the cumulative impacts presented for Creyke Beck A & B and Teesside C & D are lower than for Teesside A & B alone, and the percentage increases with respect to background mortality do not agree with those presented in the Technical Appendix. Furthermore, those figures provided in the Technical Appendix, Appendix 7 using Option 1 of the Band Model have incorrect increases relative to background mortality presented. For example, the 70 birds estimated to collide in the breeding season represents a 2.4% increase relative to baseline mortality at a national population level when <1% increase is stated in the report. This erroneous underestimate is exaggerated further when Teesside A & B projects are assessed in combination with Creyke Beck A & B and Teesside C & D. These figures and their interpretation should be thoroughly checked and revised accordingly throughout all documents.	The grammar in the sentences has been re-worded to clarify the statements being made. However, the figures do not show the combined Dogger Bank project numbers to be lower than for Dogger Bank Teesside A & B alone. The quantities provided in Appendix 7 of **Appendix 11A Ornithology Technical Report** have been checked and amended / clarified as necessary.

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - Presentation of baseline, effects and impacts	52.5. Perhaps as a result of the impact-by-impact approach taken to assessing ornithology impacts the draft ES and draft Habitats Regulations Assessment IfAA Report does not quantitatively consider multiple impacts on a single receptor. This has the potential to result in under-estimation of impacts. For example, black-legged kittiwake is assessed as experiencing impacts due to construction displacement, operational displacement, collision mortality and barrier effects (none of which are necessarily mutually exclusive) yet the potential combination of these impacts is only considered qualitatively. Whilst JNCC and Natural England appreciate this may need to include a qualitative element, where numbers of birds predicted to be affected by an impact is provided, these numbers should be presented (both in terms of % population, and changes to baseline mortality rates). This issue is relevant to the consideration of impacts at both the SPA and national levels.	Additional sections have been added in Sections 6.6 and 7.9 considering project cumulative impacts (i.e. impacts on single receptor), and clarification presented in paragraphs 7.1.3. and 7.1.4 in **Appendix 11A Ornithology Technical Report**. In summary, while it is agreed that it is important to consider the combined impacts of each effect for each receptor, consideration of the combined effects of the two key effects for which quantitative information is provided, displacement and collision, is problematic as the two effects are assessed in different ways. The assessment of displacement considers how many birds will be lost to the population in the long-term, due to the effective loss of habitat associated with this effect. In contrast, the assessment of collision considers how many birds might be lost over the course of a year, and thus considers these annual impacts both in relation to reference population sizes and in relation to changes in background annual mortality. As also summarised, the species potentially impacted by these effects also differ. For displacement, potential impacts are greater for auk species – common guillemot, razorbill, little auk and Atlantic puffin – for which collision estimates are small. For collision, potential impacts are greater for northern gannet, black-legged kittiwake and great black-backed gull, for which the numbers of birds predicted to be impacted by displacement were either relatively small or zero due to their low or very low sensitivity to habitat loss.
	Section 42 consultation on the draft ES, statutory - Displacement effects	53.1. We welcome the use of Natural England/JNCC"s joint interim advice note on seabird displacement ("Presenting information to inform assessment of the potential magnitude and consequences of displacement of seabirds in relation of Offshore Windfarm Developments") in the draft ES, the review of seabird species displacement presented in Appendix B and the provision of displacement matrices in Appendix 10 of the Ornithology Technical Report.	Noted.

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - Displacement effects	54. However, Forewind, while assessing impacts over a 2km buffer, has reduced the impact of effect on a decreasing scale with distance from wind farm over the buffer area. While we do not disagree that it is likely that the impact of the wind farm on displacement of species will decrease with distance, there is no empirical evidence to date that provides any scale over which the decline would occur. JNCC and Natural England therefore continue to advise displacement effects should be assessed at a constant rate within the defined buffer area until such time that evidence suggests otherwise.	The buffer zone displacement rates used in the draft ES were based on a 75%-25% delineation for 0-1km and 1-2km distance bands for the majority of species, and 0-2km and 2km-4km distance bands for divers. There is good evidence suggesting displacement rates follow such gradients, for example, evidence from the Horns Rev and Nysted wind farms (Petersen *et al*. 2006) for auk species (guillemot and razorbill), gannet, common scoter, and diver species, show that, post-construction, the numbers of birds and bird clusters increase with increasing distance from the wind farm (Tables 24 and 25, and Tables 27 and 28 in Petersen *et al*. 2006). This evidence also strongly suggests that displacement for these species/species groups is likely to be proportionally greater nearer the wind farm than at greater distance. Whilst this is only one single study, this evidence provides scientific justification for the chosen 75%-25% ratio delineation, and the displacement rates used.
	Section 42 consultation on the draft ES, statutory - Displacement effects	54.1. A review could also usefully assess the timing of OWF monitoring to see whether there is any evidence to support the assumption that construction phase displacement can be assessed as 50% of operational displacement. JNCC and Natural England have some reservations with this assumption, as some potential displacement variables such as boat traffic will not progress evenly from 0 to 100% during the construction phase. It would be helpful if the predicted levels of boat traffic at different stages of construction could be quantified to see whether they provide any further justification for the 50% figure.	It is predicted that the levels of boat traffic will be uniform throughout the construction and decommissioning phases, as the number of boat trips per turbine will be the same. The values for construction / decommissioning thus simply represent 50% of the values for operation (inclusive of the buffer), as it assumed that the average spatial extent of the wind farm project during construction / decommissioning will be half that during the operational phase. In light of the uncertainty of the exact construction plan that will be applied, it was considered that the application of 50% most accurately applies the ramp up of construction activities and operational wind turbines from nothing at day 1 of construction to fully operational on the final day of construction. Hence, given the same displacement rates, the values for the numbers of birds displaced during construction and decommissioning are taken to represent 50% of the values for operation (inclusive of the buffer), as it assumed that the average spatial extent of the wind farm project during construction/decommissioning will be half the total in the operational phase.

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - Displacement effects	54.2. The displacement-associated mortality rates selected by the Applicant are within the range of those provided by other Applicants for auks. However, JNCC and Natural England have outstanding concerns regarding the importance of Dogger Bank Teesside A and B to sandeels (see below). Depending on the outcome of discussions, we may advise that a higher displacement mortality percentage would be appropriate for auks and we would welcome further discussion with Forewind on this issue. For northern gannet, we do not agree with Forewind‟s approach of applying a 0% displacement related mortality rate for assessing the impacts of Teesside A and B projects on their own, and it seems counter intuitive to the their approach of applying a 5% mortality rate for cumulative assessment purposes. JNCC and Natural England will therefore apply the 5% mortality rate to inform our assessment at both scales.	As per JNCC/NE guidance, predicted impacts of displacement, for each project and species, are provided (in Appendix 10 of **Appendix 11A Ornithology Technical Report**) based on a range of displacement and mortality rates. For mortality rates, the guidance has been followed as cells have been highlighted in light green for higher confidence, and dark green for most confidence. The likely implications of displacement for species survival/productivity are considered in the review carried out in Furness (2013) (see **Appendix 11B Implication of seabirds displacement and mortality review**), which takes into account the relative quality of habitat and habitat availability in the North Sea. Forewind have also provided considerable mitigation through moving the wind farm boundaries away from high intensity sandeel habitat to the West (see also **Chapter 13 Fish and Shellfish Ecology** which discusses suitable habitat within Dogger Bank Teesside A & B for sandeel). While, for auks, a negligible or zero value for mortality may be concluded from Furness (2013), precaution has been retained by using a 5% value (highlighted using a bold border to cells within the table in Appendix 10 of **Appendix 11A Ornithology Technical Report**). Northern gannet is a species with a large foraging range outside of the breeding season. Given the amount of available alternative habitat, and given previous discussions on the topic with NE and JNCC, it was considered appropriate to reflect within the assessment the fact that displacement from an area the size of Dogger Bank Teesside A & B, when considered alone, would be unlikely to result in any mortality. It is considered more likely that mortality will only occur when northern gannet are displaced from larger areas, greater than the size of Dogger Bank Teesside A and B, and for this reason, at the cumulative level, a precautionary mortality rate of 5% has been applied.

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - Displacement effects	54.3. Displacement, particularly cumulative displacement, has the potential to reduce species survival/productivity, and consequently could impact at a site or population level. As the Applicant was unable to locate published displacement mortality rates from other projects, save for Hornsea Project One and the European Offshore Wind Deployment Centre (EOWDC), it has not assessed in-combination/cumulative displacement impacts adequately. Furthermore, though displacement mortality has been presented with reference to populations, values have not been compared against background mortality rates which give a better indication of potential impacts on populations. We welcome further discussions with the Applicant regarding the derivation of appropriate figures for adequate assessment of the cumulative effects of displacement.	Further projects have been included in the CIA list following the publication of recent reports (see **Section 10**). New data have now been added where this is available (including new information for Scottish sites of Inch Cape, Neart na Gaoithe, Firth of Forth Alpha and Bravo, and Moray Firth). However, note where other assessments have not provided additional data, the existing information provided in original Environmental Statements or Addendums has not been re-worked using the methodology employed within the Dogger Bank Teesside A and B assessment, due to either limitations in base data and compounded uncertainties. This is in keeping with the methodology outlined in Section 6.3.5 in **Appendix 11A Ornithology Technical Report**. With respect to displacement, see response previously.

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - Displacement effects	54.4. JNCC and Natural England note that displacement data for white-billed diver, assessed as being of regional importance, have been inconsistently recorded. For example these data are absent from Tables 6.1, 6.2, 7.1, 7.2, 10.3, 10.4, 10.6 and 10.7 but the species is scored as Medium Value, High Sensitivity and Negligible magnitude of effect in Tables 6.3, 7.3, 10.5 and 10.8. Additionally, clarification is sought as to why a mortality rate of 37.5% has been chosen for this species when a precautionary 100% mortality of displaced birds has been and continues to be assumed for red-throated divers in OWF casework relating to the Outer Thames Estuary SPA.	The missing quantities have been included in Tables 5.1, 5.8, 5.15, and 6.1 in **Appendix 11A Ornithology Technical Report** and **Tables 6.2**, **7.1**, **7.2**, **10.3**, **10.4**, **10.6**, and **10.7**. Note, however, that white-billed diver was not a species that was modelled due to its scarcity. Abundance for this species was estimated by scaling raw counts from the area surveyed to the area of the respective projects+buffers. Therefore, confidence limits are not available. We note the point regarding mortality rate for this species. The protocol we use to define mortality rates is based on sensitivity scores of 1-5 from Furness & Wade (2012) (see **Section 3**). However, if other information was available for a given species, then such data should be used. For red-throated divers, the outer-Thames estuary SPA approach assumed 100% mortality. Whilst white-billed divers may be similar to red-throated divers, there is no additional information for this species, nor any certainty, that they would respond in the same way. Therefore, we followed the methodology using the 1-5 scale in Furness and Wade (2012). This gave amortality rate of 37.5% for this species was derived using a scale from 0-50% applied to sensitivity scores of 1-5 from Furness & Wade (2012) (see **Section 3**). This value was therefore deemed appropriate in keeping with the methodology outlined for displacement in **Section 3**. Note, if 100% mortality had have been used, this would not have changed the conclusions of the assessment. For example, for Dogger Bank Teesside A and B, Creyke Beck A and B and Teesside C and D, a total of 43 birds would be impacted by operational displacement. This is still less than the 50 bird threshold at the national level (0.86% of the national and 0.43% of the biogeographic populations).

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - Population Scales	55.1. For adequate assessment of EIA impacts in particular, it is important to present predicted mortality (from collision and displacement) against appropriate population scales. It is particularly important to characterise and define the Biologically Defined Minimum Population Scale (BDMPS). This is the minimum biologically appropriate scale at which, cumulatively and alone, all predicted impacts can be quantified and measured against. For some species more recent estimates are available, for example the SOSS04 PVA report for northern gannets and Frederiksen *et al*. (2012) for black-legged kittiwakes. The developer should provide more detailed recent species-specific information for the calculation of „wider regional" populations which would allow verification of whether appropriate BDMPS have been used. Differences in the values used for BDMPS will produce different estimates of change to baseline mortality which is critical to assessing impacts for HRA and EIA.	It is important to be able to use appropriate population scales and definitions in order to best assess predicted impacts in the EIA and to apportion non-breeding season impacts to individual SPAs. The assessment considers the proportion of birds potentially impacted by an effect at the wider biogeographic scale, at a national scale, and also at the scale of individual designated site scale. The biogeographic populations and thresholds follow standard definitions (see paragraph 3.2.14 (more detail is presented in paragraph 2.7.3 in **Appendix 11A Ornithology Technical Report**)). At present, these agreed biogeographic populations provide the minimum and appropriate wider scale to assess impacts against. Although it is recognised that further refinement would be desirable, we would suggest that the characterisation and definition of appropriate Biologically Defined Minimum Population Scales (BDMPSs) is a significant undertaking, that would require agreement or discussions with a number of parties (including, perhaps, those responsible for present definitions of populations at biogeographic and national scales, e.g. the UK Avian Population Estimates Panel) and, as such, is beyond the scope of this assessment. We understand that present JNCC/Natural England work aims to provide such definitions. *Continued below.*

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - Population Scales	*Continued from above.*	*Continued from above.* While current agreed biogeographic populations provide the minimum and appropriate wider scale to assess impacts against, refinement is appropriate and possible in apportioning non-breeding season impacts to individual SPAs. The population estimates and breeding proportions presented in WWT Consulting & MacArthur Green Ltd (2012) for northern gannets and Frederiksen *et al*. (2012) for black-legged kittiwake provide a means to this, in that they indicate the proportions of birds wintering in different regions, including the North Sea, from different breeding origins. Similar data are not, however, available for other species. Therefore, in our assessment, we have assumed that all non-breeders originate from breeding populations in the North Sea, using the populations presented in Skov *et al*. (1995). This is likely to be precautionary, in that if some birds originate from alternative breeding areas (to the north), we would overestimate the proportion of birds held on Natura sites. One critical advantage in using the figures reported in Skov *et al*. (1995) is that the assessment is able to allow for the variation in numbers of birds present in the North Sea across all months. This approach provides a better assessment of the proportion of birds that might originate from SPAs in the breeding and non-breeding seasons. We also consider an alternative estimate of the number of birds originating from SPAs, taken from Stroud *et al*. (2001) (see paragraph. 4.3.127 in **Appendix 11A Ornithology Technical Report**).

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - Collision Risk Modelling (CRM)	56.1. Collision Risk Modelling (CRM) outputs are from the Band (2012) guidance, recommended by the Statutory Nature Conservation Bodies (SNCBs) including Natural England and JNCC. However, within this guidance, there are two model types ("basic" and "extended") and several options (usually referred to as 1, 2 and 3) which represent bird flight distribution in different ways. While the Applicant has presented potential collision risk impacts from the project against a range of CRM model options (in Appendix 6 and 7 of the Technical Appendix), following Band (2012), they have used Option 3 outputs as the sole basis on which assessment of impacts are made. The use of Option 3 to inform the impact assessment results in significantly lower predicted mortalities when compared with Option 1 results. JNCC and Natural England currently recommend the use of the "basic" Band model (i.e. Option 1 or 2 depending on whether site specific data is appropriate, see Band 2012), not the "extended" Band model used in Option 3. This advice is based on issues regarding some of the assumptions underpinning these options, and in particular from the uncertainty around the appropriateness of applying Avoidance Rates (ARs) derived using the „basic" Band model to the "extended" Band model. Please see Annex 2 for a recent paper produced by the Marine Renewables Ornithology Group (MROG), of which Natural England and JNCC are members, providing an explanation of the uncertainty. Furthermore, use of the basic Band model allows comparison of cumulative impacts to be made with earlier assessments where the basic model (or a variation thereof) has been used.	Discussion with regards to Collision Risk Modelling options and the appropriate avoidance rates to use within Collision Risk Modelling is ongoing. To inform this, a separate document (Forewind & SMartWind 2013) has been produced to provide a review of avoidance rates of seabirds at offshore wind farms and the applicability of their use within the Band collision risk model. Note is also made of the MROG Paper "*Summary of current issues with Collision Risk Modelling approaches*". As is noted in the comment, further work has been commissioned by Marine Scotland that should also better inform this issue. Option 3 was used throughout the assessment as it allows variation in turbine design (i.e. in their size and height above sea level) to be more accurately incorporated into the assessment of collision risk. Collision risk is not spread evenly within the rotor swept area as is assumed by Options 1 & 2. Using Option 3 allows us to take this into account and thus represented the most appropriate Option to use. However, as stated above, discussions in this regard are ongoing.

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - CRM	56.2. Natural England and JNCC do not agree that it is appropriate to focus the impact assessment for collision mortality for northern gannet on figures derived from a 99% avoidance rate, and we consider that equal consideration should be given to figures based on a 98% rate.	Discussion with regards to Collision Risk Modelling options and the appropriate avoidance rates to use within Collision Risk Modelling is ongoing. To inform this, a separate document (Forewind & SMartWind 2013) has been produced to provide a review of avoidance rates of seabirds at offshore wind farms and the applicability of their use within the Band collision risk model. Note is also made of the MROG Paper "*Summary of current issues with Collision Risk Modelling approaches*". As is noted in the comment, further work has been commissioned by Marine Scotland that should also better inform this issue.
	Section 42 consultation on the draft ES, statutory - CRM	56.3. JNCC and Natural England understand that the digital aerial data collection method employed by Forewind enables calculation of flight heights. We suggest that it would be informative to produce a flight height distribution from this data to compare with that of the modelled data presented in Cook *et al*. 2012.	See comment on consultation on the draft ES for the Dogger Bank Creyke Beck projects. The data on flight heights potentially available through the HiDef aerial surveys has much potential, though at the present time, it was felt that further evaluation of the accuracy and precision of the data was probably required before they might be confidently used. In addition, it would also take considerable extra time to revisit the data collected from 2010 to apply the methodology to calculate flight heights for the survey period as this was only developed towards the end of the data collection. Each image would need to be revisited for aerial surveys for the two and a half years used to inform this assessment.
	Section 42 consultation on the draft ES, statutory CRM	56.4. JNCC and Natural England would welcome provision of the completed Band model CRM spreadsheets in an Appendix to the ornithology technical report so these can be reviewed with respect to the final ES, or failing that supplied to JNCC and Natural England for checking purposes.	Due to the number of collision risk scenarios needed to be considered through the course of the Dogger Bank programme, all collision risk modelling has been undertaken through the package 'R', which is a software package that provides rapid calculation of multiple scenarios and datasets. Hence, CRM spreadsheets do not exist in the standard Band Excel format.

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - Assessment of cumulative and in-combination effects	57.1. Natural England and JNCC have provided comments on the approach that Forewind has used for assessing projects to be included for cumulative and in-combination assessment of impacts in the Natural England and JNCC Relevant Representation on the Dogger Bank Creyke Beck projects. For the Dogger Bank Teesside projects ES, Forewind has now included Hornsea Project One and East Anglia One data into the assessments. However the ES still excludes a number of Scottish projects that are within the consenting system (e.g. Moray Offshore Renewables Limited, Inch Cape, Seagreen Alpha and Bravo, Neart na Gaoithe). These projects should be included within the overall assessment, and if there is lower confidence in the data available this should be stated. Additionally, the assessment excludes a number of constructed/operational projects (e.g., Gunfleet Sands, Kentish Flats, Lynn and Inner Dowsing and Scroby Sands). Impacts from these wind farms are unlikely to have been incorporated as part of the baseline and as such should be included in the cumulative/in-combination assessment. We suggest that Forewind consider the document “JNCC and Natural England Suggested Tiers for Cumulative Impact Assessment” (attached as Annex 1) which provides a framework for deciding which projects should be considered in the context of cumulative impact. *Continued below.*	Further projects have been included in the CIA list (see **Section 10**) following the publication of recent reports, including Moray Firth, Firth of Forth Alpha and Bravo, Inch Cape, and Neart na Gaoithe. However, note where other assessments have not provided additional data, the existing information provided in original Environmental Statements or Addendums has not been reworked using the methodology employed within this assessment, in keeping with the methodology outlined in Section 6.3.5 in **Appendix 11A Ornithology Technical Report**. Following the Forewind CIA strategy, as previously consulted on with stakeholders including JNCC and Natural England, Forewind note that it is not considered appropriate to include operational wind farms within the cumulative impact assessment. This is only the case where a project has been operational for the full period over which the baseline data was collected. Where a project was under construction at the start of the surveys and where data allows, projects have been included in the CIA. Whilst it is noted that impacts of operational wind farms may not yet be being experienced, there is no way to tell whether this is the case or whether in fact the contrary is true and the full impacts are already being experienced. Furthermore, the assessment in their ES for these projects is based on a worst case which has not, in reality, been built and hence their predicted impacts would not be expected, and are likely to be lesser in quantity. It would be a strategic level activity to revisit all now operational wind farms and re-calculate the actual predicted impact based on the operational wind farm and outside the scope of work for one developer. Hence it is considered that inclusion of these projects would give unrealistic results which are worse than the realistic worst case scenario and may inaccurately assume that impacts for these projects are not already being experienced at the relevant species or site level.

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - Assessment of cumulative and in-combination effects	*Continued from above.* Forewind has not made any attempt to compare results from other projects using consistent models and parameters. For example, in assessing collision mortalities across different projects the Forewind has used the Extended Band model (Option 3) figures whereas the majority of other projects have presented figures using the Basic Band model (Option1) or equivalent earlier versions of the Band collision risk model. Additionally, for northern gannet Forewind has used an avoidance rate of 99% with the outputs from the Band Option 3 model for the cumulative assessment and added the resultant figures to other projects that have used a mixture of 97, 98 and 99% avoidance rates. It is extremely challenging to draw conclusions on the significance of impact from the cumulative/ in-combination assessment when the estimated impacts have not been standardised. In this context please see the Natural England/JNCC advice provided for the East Anglia Offshore Wind Farm Interested Parties deadline 4, on the 25th November which can be found on the PINs website and which sets out a more strategic assessment of the in-combination impacts on gannet and kittiwake populations of the Flamborough Head and Filey coast pSPA, with an appropriate assessment taking into consideration all projects currently in the planning system: East Anglia Advice on the Planning Portal.	*Continued from above.* As a result, Forewind has not included operational projects in the CIA and feel that to add these impacts to those outlined in the CIA would present an unrealistic worst case scenario which risks overestimating impacts on receptors. Forewind acknowledge and share the frustration of a lack of consistent approach across the industry, however, as previously stated our assessment can only present the data that are available within the assessments presented. Forewind previosuly provided a response in the form of a letter to NE/JNCC advice to East Anglia, this can also be found on the PINS website.
	Section 42 consultation on the draft ES, statutory - Assessment of cumulative and in-combination effects	Similarly, in presenting displacement figures, Forewind has used a variable displacement rate applied to the buffer with distance from the windfarm site which does not align with the approach used in other assessments and Natural England/JNCC guidance.	See response to JNCC/NE point 54 above.

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - Assessment of cumulative and in-combination effects	57.2. Forewind has also only included information in the cumulative assessment for OWFs that have presented displacement mortality figures in their ES/impact assessments – i.e. numbers displaced AND numbers expected to die which reduces the number of projects that are included. The list of projects considered is further reduced when only projects that have apportioned displacement mortality to SPAs are included. This excludes displacement data from a number of projects. If published displacement figures are available (i.e. number of birds displaced) it is possible to apply a standard % mortality figure to this for use in a cumulative assessment. Similarly, if population estimates are available then it is also possible to calculate displacement levels for constructed and consented OWFS that did not conduct a displacement assessment, and to use this information in the cumulative assessment.	See response to JNCC/NE comment number 57.1 above. Where other assessments have not provided additional data, the existing information provided in Environmental Statements or Addendums has not been re-worked using the methodology employed within the Dogger Bank Teesside A & B assessment, due to either limitations in base data and compounded uncertainties. This is in keeping with the methodology outlined in Section 6.3.5 in **Appendix 11A Ornithology Technical Report**.

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - Assessment of cumulative and in-combination effects	57.3. Despite the difficulties that a CIA on barrier effect may present, an attempt at assessing the likely cumulative effect should be undertaken.	Assessment of the potential cumulative effects for seabirds from their breeding colonies has not been attempted (and is considered unfeasible) because: 1) the difficulties in assessing the magnitude of the potential impacts of this effect; 2) the complexities in the numbers of potential projects affecting birds foraging from different colonies (see Appendix 8 in **Appendix 11A Ornithology Technical Report**); and 3) the potential cumulative impacts of barrier effects from multiple wind farms are not likely to be additive (King *et al*. 2009), and thus are problematic to quantify. Likewise, no attempt was made to assess in a quantified manner the cumulative impact of the potential barrier effects posed by Dogger Bank Teesside A & B, Creyke Beck A & B, and Teesside C & D and other wind farm projects within the North Sea on the 46 species' populations of terrestrial or waterbird migrants that are UK SPA features whose migration zones (defined by Wright *et al*. 2012) overlap with Dogger Bank Teesside A & B. This also reflects a lack of information from other assessments that would enable the cumulative impact of the potential barrier effects posed to migrants to be assessed. **Table 10.26** provides an indication of the percentage of species' migration zones that overlap with the overall suite of wind farm projects in the North Sea region considered in the cumulative assessment.
	Section 42 consultation on the draft ES, statutory - Availability of diving birds	58.1. Natural England and JNCC acknowledge that due to sitting and flying birds being combined for population estimation modelling by Forewind, the method used to assess availability of auks for aerial survey detection used the proportion of the total foraging trip rather than the proportion of time on the water. As this method differs from that used at other offshore wind farm sites (e.g. East Anglia One Offshore Wind farm), we request further engagement with Forewind, to ensure that this method suitably accounts for availability bias and results in appropriate populations estimates.	Correction for diving birds is a difficult issue dependent on the nature of the data presented (i.e. flying and sitting birds, or just birds on the sea), and also dependent on the studies chosen for review. Here, population estimates included both birds on the sea and birds in flight; therefore, an appropriate correction factor has been applied incorporating the proportion of flight time from reviewed activity budgets. If only birds on the sea were considered, then a different correction factor would have been needed. Reference is also made to our original responses to comments previously received on this issue.

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - Migratory seabirds	60.1. In a number of migrant seabird species accounts (e.g. skuas), the issue of turnover is acknowledged. In the absence of any attempt to quantify turnover, the population estimates provided are likely to significantly underestimate the number of migrant seabirds either transiting the OWF or "stopping over" for short periods, particularly if peak periods of movement have been missed. This in turn is likely to lead to an underestimation of the significance of impact from the OWF at the regional or national scales, and therefore which species have been appropriately scoped in for further assessment. Whilst Arctic and great skuas have already been scoped into CRM, adequately quantifying turnover for species such as pomarine skua and little gull may increase the significance levels of these populations and thereby justify more detailed assessment of these species. Whilst JNCC and Natural England appreciate that the potential migratory seabird population for a given area of sea is difficult to quantify, without further exploration of alternative methods we question whether the approach taken is sufficiently robust for EIA purposes.	A review has been undertaken of the approach taken to this issue in other OWF ESs, including East Anglia ONE. The method used there for great skua makes a precautionary assumption that the entire flyway population of this species would pass through the North Sea/Strait of Dover, and that most (90% of) birds are within 60km of the coast (a zone that includes the wind farm). Because of the much greater distance of the Forewind projects from the coast, such an assumption is both inappropriate and would not be precautionary. It is also noted that the East Anglia ONE assessment adds together a number of precautionary assumptions. Forewind are concerned that the application of this method will present an unrealistic final figure. The proportion of the national and biogeographic populations of great skua likely to migrate through the North Sea is highly uncertain and recent research, for example, has indicated that several breeding populations are likely to take an alternate route to their wintering quarters that spread across the Atlantic (Magnusdottir *et al*. 2012). Even greater uncertainty exists regarding the migratory routes of and wintering quarters of Arctic skua. For species such as pomarine skua and little gull, we have insufficient knowledge of migratory routes and wintering quarters to be able to make any kind of sensible assumptions about numbers passing through the North Sea to conduct an assessment such as that carried out for great skua (but not for either of these species) in the East Anglia ONE ES. A suggested approach is a qualitative assessment that acknowledges turnover but does not attempt to quantify it, given that there is no data with which to do so is preferable to attempting to quantify bird numbers and presenting a misleading estimate that is likely to be inaccurate and would imply a level of precision that the data cannot support. The extent to which numbers would need to be underestimated due to turnover to result in a change in the magnitude of impact predicted is considered.
	Section 42 consultation on the draft ES, statutory - Migratory seabirds	60.2. We advise that Forewind reviews the approach taken to this issue in other OWF ESs, for example East Anglia One. Whilst acknowledging the limitations of this method for OWFs further offshore, there is potential merit in the use of a simple theoretical model of migratory movements to quantify turnover. Furthermore, the APEM migration model has also been used by other OWF developers to produce outputs for migrating seabirds which can then be used in CRM. We would be pleased to explore potential approaches to producing realistic population estimates and associated assessments for migratory seabirds that use or transit Dogger Bank Teesside.	

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory - Barrier Effects	61.1. Ornithology Technical Report A:5.2.384 and C11:10.2.16. JNCC seeks a clearer explanation of the predicted deviated route, in terms of additional distance a species could be expected to fly. Currently the text suggests that the assessment has only been made against the shortest alternative route, which suggests a high-level of cognitive/spatial awareness by an individual.	The additional distance calculated simply represents, for an individual project, half the length of the perimeter of the project. This length is assessed relative to the shortest alternative route, in order to simply demonstrate the maximum proportional increase in the distance that might be travelled.
	Section 42 consultation on the draft ES, statutory - Height of flying birds from digital aerial surveys	62.1. We appreciate that height assessment from digital video surveys is still being evaluated and such data are thus not available at this time. We look forward to a comparison of results between this and boat data when it is available.	See response above.
	Section 42 consultation on the draft ES, statutory - Estimation of Baseline Populations	63.1. Forewind has developed a novel approach to estimate population sizes associated with the development site by combining digital aerial and boat-based survey results. Whilst we note the approach appears robust, it has not been subject to specific peer review and there are a number of aspects which require further explanation e.g. availability bias (see further comments above) and some aspects which have the potential to reduce confidence in population estimates e.g. confidence in species identification, surveys being undertaken in sea state 5 etc.	A manuscript on the population modelling has been prepared for publication in the scientific literature and is currently (January 2014) under peer-review. This provides additional information of the modelling procedure and of model fit. See also comment on consultation on the draft ES for the Dogger Bank Creyke Beck projects: Data were collected in sea-state 5, this accounted for ~14 % of the data. However, as stated in paragraph 2.3.2 in **Appendix 11A Ornithology Technical Report**, sea-state was included as a covariate in the distance model when analysing boat-based data. Consequently, decreased detection probability in sea-state 5 will have been accounted for in the model based population estimates.
	Section 42 consultation on the draft ES, statutory	64. Ornithology Technical Report: Figure 3.1 (and repeated for each project, projects combined and for each species): We appreciate the presentation of all years' data on a common graph, however having each year indicated on the graph would make it clearer.	Figure 3.1 in **Appendix 11A Ornithology Technical Report** and repeated have been amended.

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory	65. Ornithology Technical Report: Figure 3.2 (and repeated for each year for each species): JNCC previously believed that it would not require too much additional work to additionally present the density population estimates in a combined format that incorporates both years‟ data. In our opinion, this would provide a broader impression of the site usage, accounting for year to year variability. Additionally, providing a map that shows agreement (weak to strong) between years would be helpful. This wasn‟t produced for Creyke Beck but the Applicant agreed this could be produced for Teesside A & B.	See response above. All tables in Section 3 in **Appendix 11A Ornithology Technical Report** to provide average values across the two and a half years of surveys, as well as values for each individual year.
	Section 42 consultation on the draft ES, statutory	66. Ornithology Technical Report: Table of contents: It would be helpful if the table of contents could be expanded to include a schedule of the Appendices for the Technical Appendix, including the tables and figures presented therein.	A list of appendices has already been provided. Figures and tables in appendices have now been included in the respective lists in **Appendix 11A Ornithology Technical Report**.
	Section 42 consultation on the draft ES, statutory	67. Ornithology Technical Report: Appendix 4. Figure A4.1 would benefit from greater legibility, maybe grouping species names on each side of the figure would help.	Figure A4.1 in Appendix of **Appendix 11A Ornithology Technical Report** has been amended for clarity.

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory	We believe that, in the absence of any definition of 'favourable conservation status' for kittiwake in the UK, we do not have a sufficiently robust audit mechanism to allow review of the kittiwake population at Flamborough in the context of its contribution to the conservation of the species at UK level, and to secure action to address declines. Furthermore, we support the RSPB's comments and once more raise concerns about collision for Kittiwake from Flamborough Head and Bempton Cliffs SPA. We note that the Draft Environmental Statement refers to the Flamborough and Filey Coast pSPA rather than the existing Flamborough Head and Bempton Cliffs SPA. The assessment should be made against the existing SPA, because the pSPA hasn't even been formally consulted upon.	The reference to populations in the proposed Flamborough and Filey Coast pSPA, rather than the existing Flamborough Head and Bempton Cliffs SPA, follows previous advice provided by Natural England on the HRA Screening for Dogger Bank Creyke Beck, that for the purposes of the Dogger Bank ES and HRA, these potential changes should be reflected in the assessment of this proposal's impacts on the SPA. The ES has therefore been revised to include proposed changes to the Flamborough Head & Bempton Cliffs Special Protection Area (SPA). In 2013 Natural England reviewed the site boundary, interest features and reference populations of the Flamborough Head and Bempton Cliffs SPA to determine whether any changes were needed to meet the requirements of the Habitats Regulations. This concluded that there was a need for a terrestrial extension to the SPA to protect nesting seabirds at Filey and marine extensions out from the cliffs to 2km. As a result of this, in July 2013 the Defra Minister gave approval to Natural England to initiate formal consultation on the proposed extension of the SPA. Therefore, this means that the existing Flamborough Head and Bempton Cliffs SPA is wholly contained within a new potential SPA (pSPA) which has been renamed as Flamborough & Filey Coast pSPA. As a matter of policy, the Government requires pSPAs to be considered in the same way as if they had already been classified. Therefore, the pSPA is provided protection as if it were a fully classified SPA under the Habitat Regulations, and its updated features need to be taken into account by competent authorities when considering plans and projects. As a result of the above position, the ES assesses impacts upon the Flamborough and Filey Coast pSPA. As the Flamborough Head and Bempton Cliffs SPA boundary is contained within the area covered by the pSPA, there is no need to also consider the impacts upon the existing SPA site area.

Consultee	Concern	Comments	Response
JNCC / NE	Section 42 consultation on the draft ES, statutory	We join the RSPB in their concerns relating to the option modelling applied in collision risk scenarios, avoidance rates and potential biological removals (PBR). Use of the Band Option 3 Model for Collision Risk - Although Option 1 with the same avoidance rates is appended, the use of Band Option 3 (aka the extended model) is not appropriate. Whilst this model may offer some advantages, these are more than countered by several fundamental problems. Until there is a better evidential base for the collision risk model in general, and the extended Band model has been peer-reviewed, in combination with the calculation of an appropriate avoidance rate, we are unhappy with the application of Option 3 alone. Currently, we suggest that the assessment should use either Option 1 and 98%, thereby facilitating cumulative impact assessment, or present both Option 3 and Option 1 across a range of avoidance rates. We acknowledge that Option 1 has been presented, in an appendix, but not carried forward into the assessment.	A separate document (Forewind and SMartWind 2013) has been produced to provide a review of avoidance rates of seabirds at offshore wind farms and the applicability of their use within the Band collision risk model.
	Section 42 consultation on the draft ES, statutory	Use of a 99% avoidance rate for gannet. The assessment is based on the use of a generic avoidance rate of 98%, with 99% for gannet. While the use of 98% is supported in the text by reference to guidance (SNH, 2010) and a review (Cook *et al*, 2012), the use of 99% for gannet is not, nor is it justified in the supporting text, except by reference to the Triton Knoll application. It is our position that 98% should remain the default avoidance rate for gannet, as stated in SNH (2010) and Cook *et al* (2012) until empirical evidence is available to justify a change applicable to breeding as well as non-breeding seasons.	Discussion with regards to Collision Risk Modelling options and the appropriate avoidance rates to use within Collision Risk Modelling is ongoing. To inform this, a separate document (Forewind & SMartWind 2013) has been produced to provide a review of avoidance rates of seabirds at offshore wind farms and the applicability of their use within the Band collision risk model. Note is also made of the MROG Paper "*Summary of current issues with Collision Risk Modelling approaches*". As is noted in the comment, further work has been commissioned by Marine Scotland that should also better inform this issue.

3. Methodology

3.1. Study areas

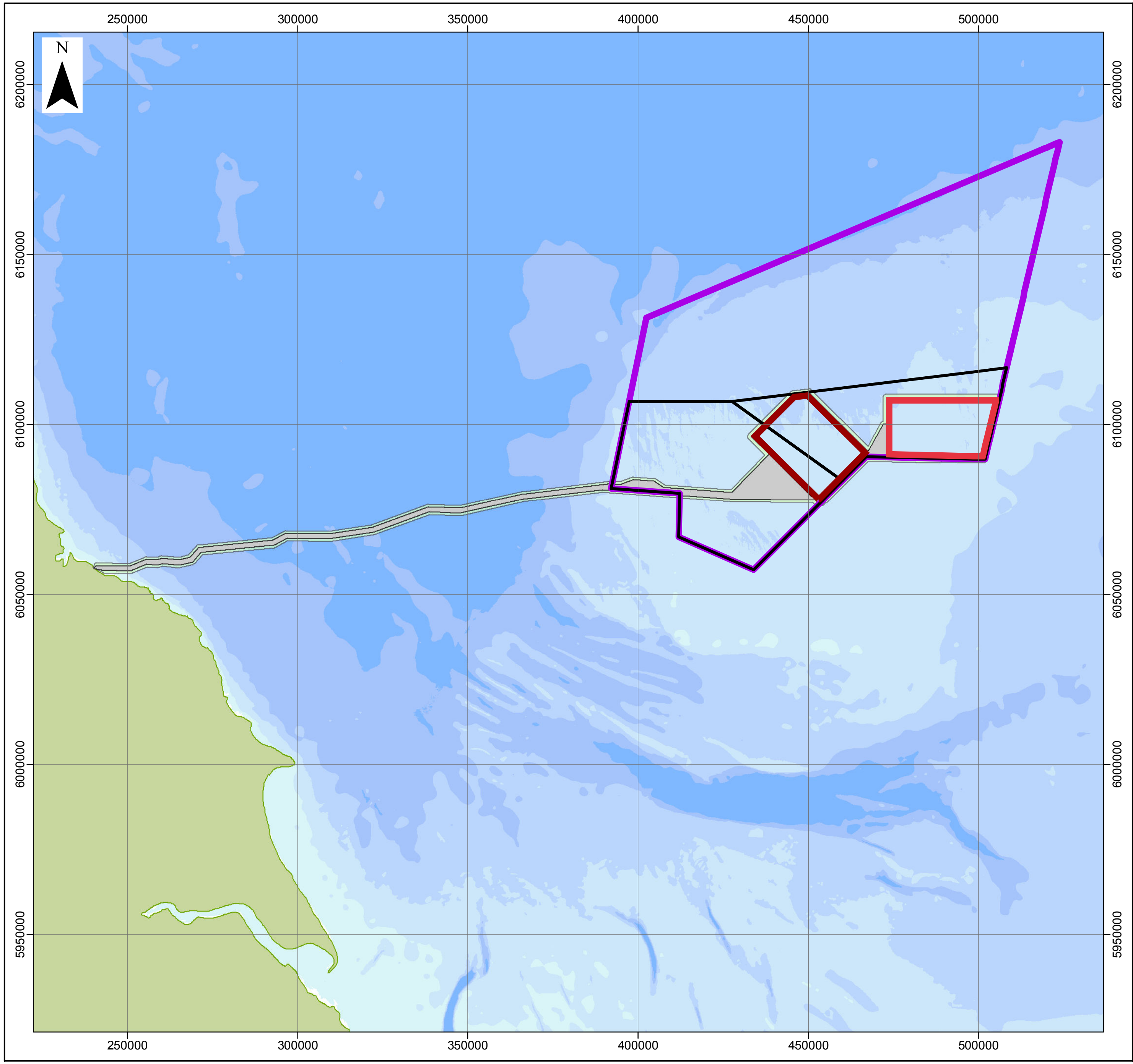
3.1.1. The study area used for this assessment covers a wide ranging region in order to ensure bird species present in the area encompassing and influenced by Dogger Bank Teesside A and Dogger Bank Teesside B (collectively referred to hereafter as Dogger Bank Teesside A & B), are identified and included. The assessment also considers the proportion of birds potentially impacted by an effect at broader national and biogeographic scales, as well as in relation to designated sites.

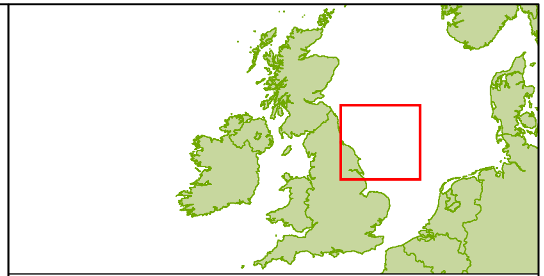
3.1.2. Dogger Bank Teesside A & B comprises two offshore wind farms, both of which are located within the Dogger Bank Zone, as shown on **Figure 3.1**. However, given that the potential impacts on birds could affect species with very large foraging routes (e.g. northern gannet's maximum foraging range is 590km) or species on migration, the study area encompasses:

- All designated sites within either the maximum or mean maximum foraging range (where relevant, see later) of seabirds present in the Dogger Bank Zone;
- Any designated sites in the North Sea that support or contain as a feature any of the seabirds recorded within the Dogger Bank Zone; and
- Any migratory species identified in the review by Wright *et al.* (2012) that cross through the Dogger Bank Zone, particularly those that are Annex II features of European designated sites.

3.1.3. In addition, the Dogger Bank Teesside A & B Export Cable Corridor (see **Figure 3.1**), forms a part of the study area due to the potential disturbance and effects that may occur within it which could affect seabirds. Furthermore, the export cable landfall works would encompass an area of the intertidal zone extending from low water to the small cliffs, a length of less than 1km, including a 1km buffer either side.

3.1.4. Overall, the study area encompasses the entire Zone as well as Dogger Bank Teesside A & B and extends throughout the entire area of the North Sea and surrounding land. This study area is proposed for the description of the baseline. **Figure 3.2** presents the European sites for species that are recorded within the study area (i.e. either foraging or migrating), which have been considered as part of the 'baseline' and impact assessments on marine and coastal ornithology receptors. This figure is derived from screening carried out as part of the HRA process (see Appendix A of the **HRA Report**).





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area

0 20 40
Kilometres

Data Source:
Round 3 offshore wind farm boundary © Crown Copyright, 2013
Background bathymetry image derived in part from © TCarta data 2009.

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

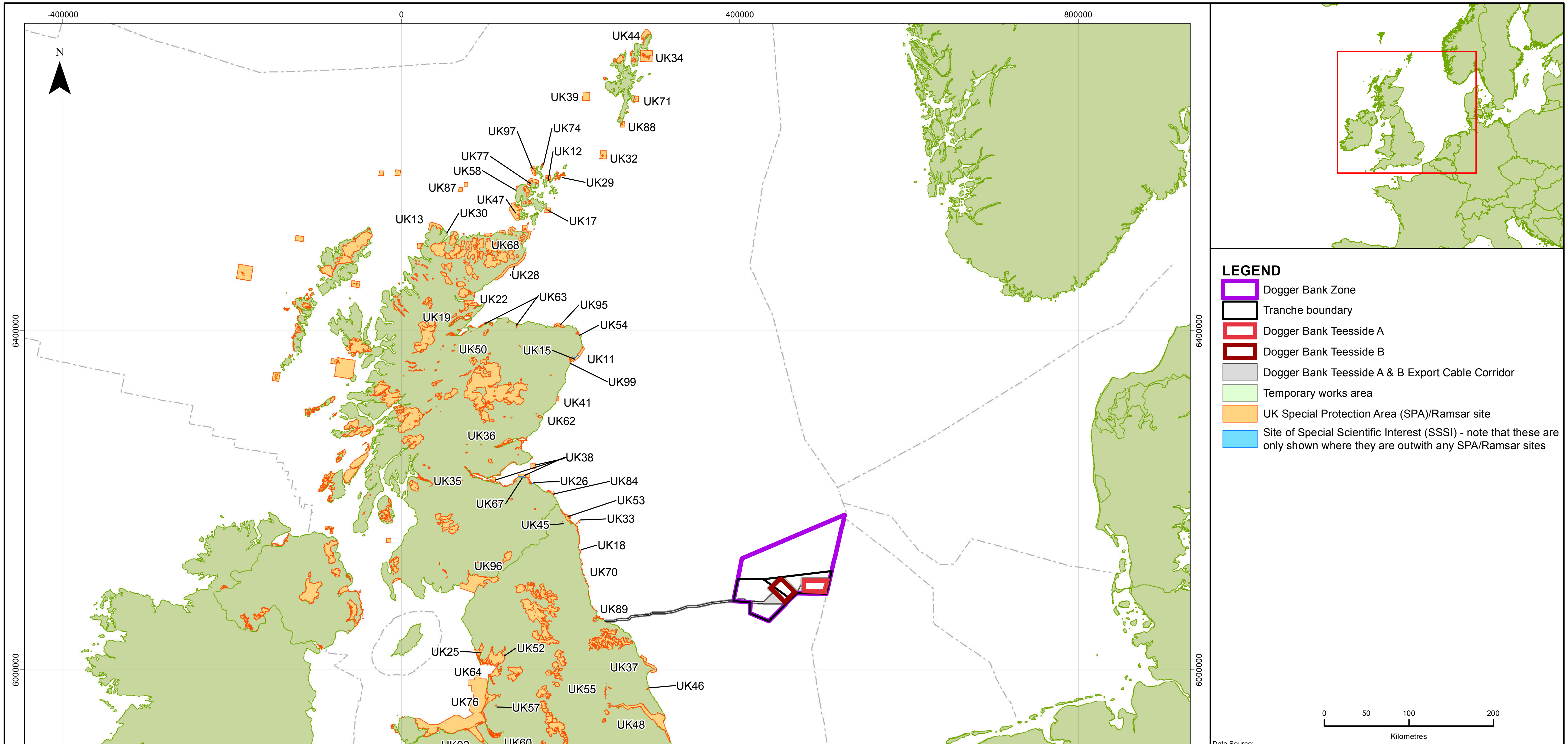
Figure 3.1 Dogger Bank Teesside A & B offshore study area

VER	DATE	REMARKS	Drawn	Checked
1	04/10/2013	PEI3	JE	PT
2	10/02/2014	DCO Submission	JE	PT

DRAWING NUMBER: **F-OFL-MA-229**

SCALE	1:1,700,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND



Data Source:
Environmental designations © Natural England, 2013
Round 3 offshore wind farm boundary © Crown Copyright, 2013
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 3.2 UK designated sites considered

VER	DATE	REMARKS	Drawn	Checked
1	04/10/2013	PEI3	JE	GK
2	10/02/2014	DCO Submission	JE	GK

DRAWING NUMBER:

F-OFL-MA-230

SCALE	1:4,750,000	PLOT SIZE	A3	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

Table 3.1 Reference list for sites presented on Figure 3.2

Site name (and designation)
Abberton Reservoir SPA / Ramsar and component SSSIs (UK1)
Alde–Ore Estuary SPA / Ramsar and SSSI (UK2)
Arun Valley SPA / Ramsar and component SSSIs (UK3)
Avon Valley SPA / Ramsar and Avon Valley (Bickton to Christchurch) SSSI (UK4)
Benacre to Easton Bavents SPA and SSSI (UK5)
Benfleet and Southend Marshes SPA / Ramsar and SSSI (UK6)
Blackwater Estuary (Mid-Essex Coast Phase 4) SPA / Ramsar and SSSI (UK7)
Breydon Water SPA / Ramsar and SSSI (UK8)
Brighton to Newhaven Cliffs SSSI (UK9)
Broadland SPA / Ramsar and component SSSIs (UK10)
Buchan Ness to Collieston Coast SPA and component SSSIs (UK11)
Calf of Eday SPA and SSSI (UK12)
Cape Wrath SPA and SSSI (UK13)
Chichester and Langstone Harbours SPA / Ramsar and component SSSIs (UK14)
Collieston to Whinnyfold Coast SSSI (UK15)
Colne Estuary (Mid-Essex Coast Phase 2) SPA / Ramsar and SSSI (UK16)
Copinsay SPA and SSSI (UK17)
Coquet Island SPA and SSSI (UK18)
Cromarty Firth SPA / Ramsar and component SSSIs (UK19)
Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar and SSSI (UK20)
Dengie (Mid-Essex Coast Phase 1) SPA / Ramsar and SSSI (UK21)
Dornoch Firth and Loch Fleet SPA / Ramsar and component SSSIs (UK22)
Dorset Heathlands SPA and component SSSIs (UK23)
Dover to Kingsdown Cliffs SSSI (UK24)
Duddon Estuary SPA / Ramsar and SSSI (UK25)
Dunbar Coast SSSI (UK26)
Dungeness to Pett Level SPA / proposed Ramsar and component SSSIs (UK27)
East Caithness Cliffs SPA and component SSSIs (UK28)
East Sanday Coast SPA / Ramsar and component SSSIs (UK29)
Eilean Hoan (North Sutherland Coastal Islands) SSSI (UK30)
Exe Estuary SPA / Ramsar and component SSSIs (UK31)
Fair Isle SPA and SSSI (UK32)
Farne Islands SPA and SSSI (UK33)
Fetlar SPA and component SSSIs (UK34)
Firth of Forth SPA / Ramsar and SSSI (UK35)
Firth of Tay and Eden Estuary SPA / Ramsar and component SSSIs (UK36)
Flamborough and Filey Coast pSPA (formerly the Flamborough Head and Bempton Cliffs SPA) and SSSI (UK37)
Forth Islands SPA and component SSSIs (UK38)
Foula SPA and SSSI (UK39)
Foulness (Mid-Essex Coast Phase 5) SPA / Ramsar and SSSI (UK40)
Fowlsheugh SPA and SSSI (UK41)
Gibraltar Point SPA / Ramsar and SSSI (UK42)
Hamford Water SPA / Ramsar and SSSI (UK43)
Hermaness, Saxa Vord and Valla Field SPA and component SSSIs (UK44)
Holburn Lake and Moss Ramsar and SSSI (UK45)
Hornsea Mere SPA and SSSI (UK46)

Site name (and designation)
Hoy SPA and SSSI (UK47)
Humber Flats, Marshes and Coast SPA / (Humber Estuary) Ramsar and component SSSIs (UK48)
Hunstanton Cliffs SSSI (UK49)
Inner Moray Firth SPA / Ramsar and component SSSIs (UK50)
Lee Valley SPA / Ramsar and component SSSIs (UK51)
Leighton Moss SPA / Ramsar and SSSI (UK52)
Lindisfarne SPA / Ramsar and SSSI (UK53)
Loch of Strathbeg SPA / Ramsar and SSSI (UK54)
Lower Derwent Valley SPA / Ramsar and component SSSIs (UK55)
Marazion Marsh SPA and SSSI (UK56)
Martin Mere SPA / Ramsar and SSSI (UK57)
Marwick Head SPA and SSSI (UK58)
Medway Estuary and Marshes SPA / Ramsar and SSSI (UK59)
Mersey Estuary SPA / Ramsar and component SSSIs (UK60)
Mersey Narrows and North Wirral Foreshore SPA / proposed Ramsar and component SSSIs (Not on map)
Minsmere-Walberswick SPA / Ramsar and SSSI (UK61)
Montrose Basin SPA / Ramsar and component SSSIs (UK62)
Moray and Nairn Coast SPA / Ramsar and component SSSIs (UK63)
Morecambe Bay SPA / Ramsar and component SSSIs (UK64)
Nene Washes SPA / Ramsar and SSSI (UK65)
New Forest SPA and SSSI (UK66)
North Berwick Coast SSSI (UK67)
North Caithness Cliffs SPA and component SSSIs (UK68)
North Norfolk Coast SPA / Ramsar and SSS (UK69)
Northumbria Coast SPA / Ramsar and component SSSIs (UK70)
Noss SPA and SSSI (UK71)
Ouse Washes SPA / Ramsar and SSSI (UK72)
Pagham Harbour SPA / Ramsar and SSSI (UK73)
Papa Westray (North Hill and Holm) SPA and component SSSIs (UK74)
Poole Harbour SPA / Ramsar and component SSSIs (UK75)
Ribble and Alt Estuaries SPA / Ramsar and component SSSIs (UK76)
Rousay SPA and SSSI (UK77)
Rutland Water SPA / Ramsar and SSSI (UK78)
Salisbury Plain SPA and SSSI (UK79)
Severn Estuary SPA / Ramsar and component SSSIs (UK80)
Solent and Southampton Water SPA / Ramsar and component SSSIs (UK81)
Somerset Levels and Moors SPA / Ramsar and component SSSIs (UK82)
South West London Waterbodies SPA / Ramsar and component SSSIs (UK83)
St Abb’s Head to Fast Castle SPA and SSSI (UK84)
Stodmarsh SPA / Ramsar and SSSI (UK85)
Stour and Orwell Estuaries SPA / Ramsar and SSSI (UK86)
Sule Skerry and Sule Stack SPA and component SSSIs (UK87)
Sumburgh Head SPA and SSSI (UK88)
Teesmouth and Cleveland Coast SPA / Ramsar and component SSSIs (UK89)
Thames Estuary and Marshes SPA / Ramsar and component SSSIs (UK90)
Thanet Coast and Sandwich Bay SPA / Ramsar and component SSSIs (UK91)
The Dee Estuary SPA / Ramsar and component SSSIs (UK92)
The Swale SPA / Ramsar and SSSI (UK93)

Site name (and designation)
The Wash SPA / Ramsar and SSSI (UK94)
Troup, Pennan and Lion's Heads SPA and (Gamrie & Pennan Coast) SSSI (UK95)
Upper Solway Flats and Marshes SPA / Ramsar (UK96)
West Westray SPA and SSSI (UK97)
Weybourne Cliffs SSSI (UK98)
Ythan Estuary, Sands of Forvie and Meikle Loch SPA / (Ythan Estuary and Meikle Loch) Ramsar and component SSSIs (UK99)

3.2. Characterisation of the existing environment - methodology

Baseline data collection – Dogger Bank Zone

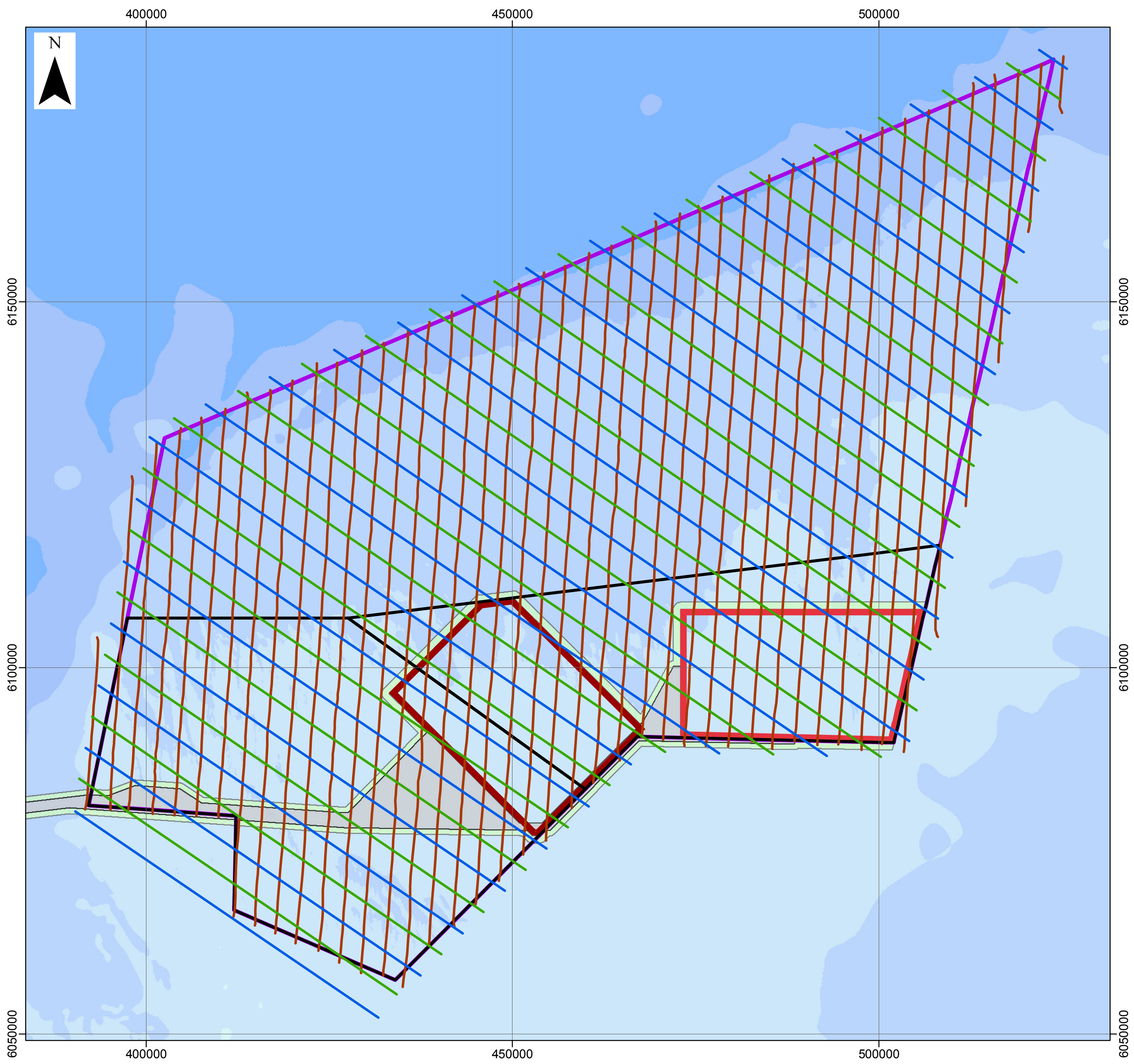
3.2.1. Two types of surveys have been carried out within the Dogger Bank Zone, which includes Dogger Bank Teesside A & B and surrounding areas, as described in paragraph 3.1.2.

Boat based surveys

3.2.2. The offshore Dogger Bank Zone was split into a transect area comprising 21 primary lines located 8km apart, and 20 secondary lines, also located 8km apart but placed equidistant between the primary transects in order to create a mesh of transects 4km apart (see **Figure 3.3** and **Appendix 11A**). Primary and secondary survey lines were used as the zone was too large to complete a survey using transects at 4km spacing in all but a few summer months - due to short day light hours and weather downtime. The wider spacing of the primary transects allowed the whole of the zone to be surveyed during most months, and only if time allowed could the secondary transects be attempted.

3.2.3. Monthly boat based surveys within the Dogger Bank Zone have been undertaken by Gardline Environmental Ltd. between January 2010 and June 2012, amassing almost 2,500 hours of survey data spanning a distance of 42,000km (see Table 2.1 in **Appendix 11A**). These surveys followed a modified methodology to that detailed in Camphuysen *et al.* (2004).

3.2.4. Data was collected from the front bridge of the survey vessel in daylight hours at a speed of 10 knots, traversing the straight line transects across the site, as described in Section 2.1 in **Appendix 11A**, using three observers; the full methodology is described in Section 2.1 in **Appendix 11A**. All height recordings were given confidence levels to denote the reduction in accuracy with recording distance (V=Very High confidence, H=High, M=Moderate, L=Low, N=No confidence). From December 2010 onwards, surveyors specified the confidence with which they were assigning flying birds to individual flight height bands during boat surveys. Out of 25,927 records collected of flying birds, confidence in the band that individuals were assigned to was assessed as high on 23,870 occasions (92% of the time). These assessments were not made prior to December 2010.



LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Aerial bird survey transect

Ornithological survey line plan

- Primary
- Secondary

0 10 20
Kilometres

Data Source:
Ornithological survey line plan © Gardline, 2011,
Round 3 offshore wind farm boundary © Crown Copyright, 2013,

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 3.3 Dogger Bank Zone boat-based survey and aerial survey transects

VER	DATE	REMARKS	Drawn	Checked
1	04/10/2013	PEI3	JE	PT
2	10/02/2014	DCO Submission	JE	PT

DRAWING NUMBER: **F-OFL-MA-231**

SCALE	1:800,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

Aerial surveys

3.2.5. Aerial surveys have been conducted over the Dogger Bank Zone by Hi-Def Surveying Ltd., commencing in spring 2010 and continuing through to June 2012 (see Table 2.2 in **Appendix 11A**). Survey transects were 300m wide and aligned north-south, with 3km between each transect. Survey transects were alternately designated as primary or secondary. All primary transects within the Dogger Bank Zone were covered over the course of a day, to ensure complete coverage, with two planes flying concurrently. Secondary transects across the Dogger Bank Zone were then covered over a second day, if possible on the following day, to supplement the data collected from the surveys of the primary transects. During the surveys, the survey planes flew at a height of 600m/2000ft, recording High Definition (HD) video images on four cameras. The images were subsequently analysed by the survey company which would identify any objects on the video and this was then passed on to specialist ornithologists at the Wildfowl & Wetlands Trust (WWT) consulting for identification to species level. Quality checks were also conducted; for full details of the methodology see Section 2.2 in **Appendix 11A**. Identification to a species level was sought wherever possible, but when this was not possible, sightings were assigned to 14 species groups, including:

- Auk species;
- Big bird;
- Black-backed gull species;
- Tern species;
- Diver species;
- Fulmar/gull species;
- Grey gull species;
- Gull species;
- Large gull species;
- Large wader species;
- Shearwater/auk species;
- Skua species; and
- Small gull species.

3.2.6. It was ensured that there was at least a 90% agreement level between reviewers.

Baseline ornithology – Dogger Bank Teesside A & B Export Cable Corridor

3.2.7. As the export cable itself will only take up a small proportion of this area (a corridor around 10m wide) a detailed survey of ornithological features was not carried out along the length of the Dogger Bank Teesside A & B Export Cable Corridor outside of the Dogger Bank Zone. A desk-based review of data was undertaken to determine the species present and densities along the Dogger Bank Teesside A & B Export Cable Corridor. Data was obtained from European Seabirds At Sea (ESAS) databases (1979-2002), which summarised boat and aerial survey data and species accounts, and from the JNCC Seabird Monitoring Programme Online Database which was used to determine the size of seabird populations at nearby colonies.

Baseline ornithology – intertidal zone desk based study

3.2.8. Wetland Bird Survey (WeBS) and Non-estuarine Coastal Waterbird Survey (NEWS) data were obtained from the BTO covering the intertidal zone (see paragraph 3.1.3). WeBS data, which is count data obtained from over 2000 wetland sites focusing on estuaries and installed waters on a monthly basis, was used to identify population sizes and to ascertain trends in numbers and distribution, as well as to identify important sites for water birds. The surveys primarily target water bird species from intertidal areas.

Baseline ornithology – field surveys

3.2.9. Terrestrial winter bird surveys and inland sea watch surveys were undertaken at the landfall study area between the months of November 2011 and March 2012, and between September 2012 and February 2013, as detailed in Section 2.6 in **Appendix 11A**.

3.2.10. <u>Wintering bird survey</u>: Surveys in the winter of 2011/2012 were carried out using the vantage point methodology (from the car park at Mill Close, Howle (NZ625236), and covered the fields to the south-west of the 1km square, which therefore resulted in no records of birds within the intertidal study area.

3.2.11. Surveys carried out in the autumn passage and winter of 2012/2013 used a combination of walkover, transect and vantage point methodology. Only records of birds occurring on the seaward side of the coast road and which overlapped with the study area were included, though birds in flight have not been included.

3.2.12. <u>Inshore sea watch survey</u>: The vantage point described above was used for the inshore sea watch surveys over the winter of 2011/2012 and 2012/2013, and surveys were carried out in a range of tidal conditions, and recorded birds seen on the sea, the beach, and the car park. Only the birds present in the beach zone were considered to be of relevance to the intertidal baseline.

Baseline - definition of national and biogeographic populations

3.2.13. National population thresholds and numbers are based on the Great Britain (GB) population, and throughout this document may be referred to as either ‘national ‘or ‘GB’ populations. Baseline quantities of birds were obtained to provide a detailed overview of the distribution and abundance of species within the project area (see **Table 3.2**). GB population and threshold levels for non-pelagic gulls (black-headed, lesser black-backed, herring and great black-backed) were obtained from Banks *et al.* (2007), Musgrove *et al.* (2011), and Burton *et al*. (2013). However, these national winter estimates do not include birds that frequent offshore waters, yielding underestimates. GB seabird estimates from summer months were sourced from Musgrove *et al.* (2013). A 1% threshold for a population's national importance was taken when GB population estimates were given as numbers of individuals, with a 1% threshold calculated accordingly when GB populations were given as numbers of pairs or nests (for procedure see Stroud *et al*. (2004), Wetlands International (2006 and 2013), and Kober *et al.* (2010)).

3.2.14. Biogeographic populations and thresholds for seaduck, terns, gulls and divers were obtained from Wetlands International (2013), with seabird biogeographic population's sourced from Kober *et al.* (2010). Other bird species (e.g. Atlantic puffin *Fratercula arctica*, common guillemot *Uria aalge*, great skua *Stercorarius skua*, little auk *Alle alle*, northern gannet, and razorbill *Alca torda*) population estimates, when possible, were taken from a Conservation Status of Migratory Waterbirds in the Agreement Area of the African-Eurasian Waterbird Agreement report (AEWA, 2012), with additional species (i.e. Arctic skua, black-legged kittiwake, northern fulmar *Fulmarus glacialis*, and pomarine skua *Stercorarius pomarinus*) estimates provided by Furness (1996) and Mitchell *et al.* (2004). For lesser black-backed gull and herring gull, respective thresholds for *Larus fuscus graellsii* and *Larus argentatus argenteus* are used here following Holt *et al*. (2012).

3.2.15. The 1% biogeographic thresholds based on breeding populations are assumed to be applicable to winter, though this assumption is not followed for the GB 1% threshold as the species that occur in British waters will differ between winter and summer. Thus, separate 1% thresholds are applied for the GB breeding and winter season, with the definitions of breeding period and post breeding periods defined in Kober *et al.* (2010) as shown in Table 2.3 in **Appendix 11A**.

3.2.16. Where available, regional population estimates for the North Sea were also obtained from Skov *et al.* (1995) and from Table 2.5 in **Appendix 11A**, though these estimates are significantly older than estimates obtained from Mitchell *et al.* (2004) and the JNCC (2012).

Model-based population estimates

3.2.17. Population estimates for the period January 2011 to June 2012 were acquired using a modelling approach on the combined data from the aerial and boat based surveys. A schematic of the modelling approach is presented in Figure 2.1 in **Appendix 11A**. Data was combined, though while it was assumed that 100% of birds within the survey transect are detected using aerial studies this may vary for diver species, and consideration is given to this in the assessment of impacts. In contrast, whilst identification to species level is likely using boat surveys, the phenomenon of attraction or disturbance by the survey boat means the number of birds detected may be inaccurate. As a result, aerial data was used to inform the total number of birds and boat-based survey data was used to inform the species composition. The full modelling process is discussed in Section 2.3 in **Appendix 11A**.

Table 3.2 Great Britain and biogeographic population estimates and 1% thresholds for marine bird species considered in detail in the baseline species accounts

Species	Season	GB population[1]	GB 1% threshold	Biogeographic population[1]	Biogeographic 1% threshold
Common scoter	Winter	100,000 I	1,000	550,000 I	5,500
	Breeding	95 P	50[3]	550,000 I	5,500
White-billed diver *Gavia adamsii*	Winter	-	-	<10,000 I	100
Northern fulmar *Fulmarus glacialis*	Winter	-	-	-	102,000
	Breeding	498,764 P	15,000	2,700,000-4,100,000 P	102,000
Sooty shearwater *Puffinus griseus*	Breeding	-	-	20,000,000 I	200,000
European storm-petrel	Breeding	25,650 P	770	300,000-680,000 P,	14,700
Northern gannet *Morus bassanus*	Winter	-	-	-	12,527
	Breeding	218,546,N	6,600	417,579 P	12,527
Pomarine skua	Breeding	-	-	250,000-3,000,000 I	2,500
Arctic skua	Winter	-	-	-	750
	Breeding	2,136 P	64	75,000 I	750
Great skua *Stercorarius skua*	Winter	-	-	-	408
	Breeding	9,634 P	289	40,800 I	408
Black-legged kittiwake	Winter	-	-	-	82,500
	Breeding	366,832 P	11,000	6,600,000 I	82,500
Black-headed gull	Winter	2,200,000 I	22,000	3,700,000-4,800,000 I	73,500
	Breeding	127,907 P	2,558	3,700,000-4,800,000 I	73,500
Little gull *Larus minutus*	Winter	-	-	72,000-174,000	1,230
Common gull *Larus canus*	Winter	700,000 I	7,000	1,200,000-2,250,000 I	15,750
	Breeding	48,163 P	963	1,200,000-2,250,000 I	15,750
Lesser black-backed gull[2]	Winter	124,654 I	1,200	530,000-570,000 I,(graellsii)	5,500
				325,000-440,000 I,(intermedius)	
	Breeding	110,101 P	3,300	530,000-570,000 I,(graellsii)	5,500
				325,000-440,000 I,(intermedius)	

Species	Season	GB population[1]	GB 1% threshold	Biogeographic population[1]	Biogeographic 1% threshold
Herring gull	Winter	730,000 I	7,300	2,290,000-4,150,000 I	22,560
	Breeding	131,469 P	2,629	2,290,000-4,150,000 I	22,560
Great black-backed gull	Winter	75,860 I	760	330,000-540,000 I	4,350
	Breeding	17,084 P	510	330,000-540,000 I	4,350
Arctic tern *Sterna paradisaea*	Breeding	52,621 I	1,052	1,000,000 I	34,395
Common guillemot *Uria aalge*	Winter	-	-	-	85,000
	Breeding	1,322,354 I	13,200	2,800,000-2,900,000 P	85,000
Razorbill *Alca torda*	Winter	-	-	-	19,500
	Breeding	164,492 I	1,600	1,950,000 I	19,500
Little auk	Winter	-	-	37,500,000 I	375,000
Atlantic puffin *Fratercula arctica*	Winter	-	-	-	135,000
	Breeding	579,189 I	5,800	13,500,000 I	135,000

[1] I = individuals; P = pairs; N = nests.
[2] Threshold for *Larus fuscus graellsii* used here following Holt *et al.* (2011); for other assumptions, see text.
[3] 50 individuals taken as a minimum qualification for the 1% threshold.

3.2.18. Whilst over 100 species of bird were recorded within the Dogger Bank Zone during the boat based and aerial surveys (see Section 3 in **Appendix 11A**), over 20 are seabirds. Modelling was undertaken to determine the populations and abundance for all the birds recorded in the aerial surveys, and of the seabirds recorded, the following occurred in sufficient numbers to enable monthly population estimates to be calculated:

- Arctic skua;
- Atlantic puffin;
- Black-legged kittiwake;
- Common guillemot;
- Great black-backed gull;
- Great skua
- Lesser black-backed gull;
- Little auk
- Northern fulmar;
- Northern gannet; and
- Razorbill.

3.2.19. For important species that were sighted infrequently in the Dogger Bank Zone (sightings of ten or more in boat surveys but insufficient numbers to generate abundance estimates from as described in paragraph 3.2.17 above), such as a common scoter, white-billed diver, sooty shearwater, European storm-petrel, pomarine skua, herring gull, black-headed gull, common gull, little gull and Arctic tern, numbers were insufficient for the modelling methodology outlined in this section. In these instances, population estimates for the study area for these species were estimated using monthly estimates of density calculated from the numbers seen divided by survey effort, which was then multiplied by the size of the area to obtain a population size for the entire area. For all remaining seabirds, their presence in extremely low numbers (less than 10 in the boat surveys), precludes them from being considered further due to their negligible numbers and negligible usage of the Dogger Bank Teesside A & B project areas.

3.2.20. The population estimates of migrant birds were derived using the procedure outlined by Wright *et al*. (2012) see paragraph 3.3.46, as the boat-based surveys are not designed to record migrants as they only provide a snapshot of birds flying close to the sea and consequently underestimate the overall numbers of migrants.

Comparison to ESAS populations

3.2.21. In the period 1979 to 2002, data was collected using aerial and boat-based surveys and collated to form the ESAS database, which was then extracted for both Dogger Bank Teesside A & B to estimate population size. Subsets of the ESAS data were analysed by Skov *et al.* (1995) to identify important bird areas in the North Sea and by Stone *et al* (1995) to map the distribution of seabirds in Northwest European waters. Both of these were summarised in **Appendix 11A**.

3.2.22. When making comparisons of the population estimates derived from baseline surveys to the historical ESAS surveys, a number of issues must be considered. Firstly, the baseline estimates obtained here are based on more recent and intensive surveys than those utilised in the creation of ESAS, with aerial surveys also accounting for biases that may be present in the ESAS data in regards to boat attraction and disturbance. Secondly, the surveys carried out for Dogger Bank Teesside A & B enable monthly population estimates, whereas the ESAS estimates are only available as combined monthly estimates across years or, in some cases, a single estimate for the year, making direct comparisons between the two data sources difficult.

Dogger Bank Teesside A & B Export Cable Corridor baseline populations

3.2.23. The Dogger Bank Teesside A & B Export Cable Corridor takes up a relatively small area being on average 1.5km wide and approximately 158km in length; consequently, detailed ornithological surveys were not undertaken to determine the composition of species exposed to the Dogger Bank Teesside A & B Export Cable Corridor activities and structures and a desk-based study was carried out instead. Data was obtained from the ESAS database (described above), which were then processed in a Geographic Information System (GIS) database to derive population estimates within the Dogger Bank Teesside A & B Export Cable Corridor. These estimates are likely to be an overestimate due to the small area covered by the Dogger Bank Teesside A & B Export Cable Corridor (disturbance would occur across a 10m width per cable within the Dogger Bank Teesside A & B Export Cable Corridor) relative to the study area. To provide further information of seabird activity within the area of the landfall, data were also obtained from recent county bird reports for Cleveland (Teesmouth Bird Club, 2011). This approach was agreed with stakeholders as shown in **Table 2.3**.

3.3. Assessment of impacts - methodology

Basis of impact assessment

3.3.1. As in the baseline, impact assessments are provided separately for Dogger Bank Teesside A and Dogger Bank Teesside B, as well as for the two projects combined (Dogger Bank Teesside A & B). Means of the population estimates for 2010 to 2012, based on the survey period, are used to provide an assessment of the average impacts to bird populations that might result from the proposed projects, accounting for year on year variability.

Determining receptor (species) value and sensitivity

3.3.2. Following the IEEM (2010) guidance, in order to determine the significance of an impact, the value and the sensitivity of the receptor must be determined in order to place the magnitude of the effect into context (and conclude the significance of the impact). Therefore, the assessment of the significance of an impact will reflect the receptor's sensitivity which, as outlined in Maclean *et al.* (2009), has two aspects – the non-impact sensitivity, or value, of the receptor and the specific sensitivity of the receptor to the effect. Value is a measure of the receptor's importance, rarity and worth in particular based on existing designations and its wider conservation status. **Table 3.3** presents the definitions of and criteria for the determining the value of a receptor, using the process highlighted by Percival *et al.* (1999, Table 3.1).

Table 3.3 Definition of terms relating to the value of ornithological receptors (species) within the Dogger Bank Teesside project areas (based on the methodology in Percival *et al.* (1999) and the classification of species

Value	Definition
Very high	A feature species of SPAs, Ramsar sites and SSSIs. Species: Common scoter, northern fulmar, European storm-petrel, northern gannet, Arctic skua, great skua, black-legged kittiwake, black-headed gull, little gull, common gull, lesser black-backed gull, herring gull, great black-backed gull, Arctic tern, common guillemot, razorbill, Atlantic puffin, Manx shearwater *Puffinus puffinus*, red-throated diver *Gavia stellata*, European shag *Phalacrocorax aristotelis*, and common tern *Sterna hirundo*.
High	Bird species that contribute towards the integrity of an SPA, Ramsar site, or SSSI. Includes species that are of international or national importance, for example those whose population estimates exceed 1% of national or international populations. Further encompasses ecologically sensitive species, for example nationally rare species or large birds of prey (particularly those with less than 300 breeding pairs within Great Britain). Species: Little auk.
Medium	Species of regional importance as a result of population size or the context in which they are distributed. Also includes EU Birds Directive Annex 1 species, EU Habitats Directive priority habitat and priority species and Wildlife and any Countryside Act Schedule 1 species not covered above. UK Biodiversity Action Plan (BAP) species are also considered of medium value. Species: Sooty shearwater, Pomarine skua, and white-billed diver.
Low	Includes any other species of conservation interest, for example species listed on the Birds of Conservation Concern lists unless detailed and included in one of the higher receptor criteria. Species: Common redshank *Tringa totanus*.
None	Species is not a feature of any SPA or designated site and is common or widespread throughout Great Britain. Species: Great cormorant *Phalcrocorax carbo*.

3.3.3. Key receptors carried through to the impact assessment include sea bird species that are features of breeding colonies within designated sites (SPAs, Ramsar sites, and SSSIs) and whose maximum potential foraging ranges overlap with Dogger Bank Teesside A & B. It also includes seabirds that occur in the Dogger Bank Zone and potential cable area in nationally or internationally important numbers, automatically conferring national or international importance for these particular species. Migrant species that are features of SPAs are also included whose migration zones (defined by Wright *et al.* (2012)) overlap with the offshore study area.

3.3.4. Species specific sensitivities are highlighted in Maclean *et al.* (2009) and, combined with the level of receptor value, give the overall sensitivity of the species (see Table 4.3 in **Appendix 11A**). However, sensitivity differs depending on the nature of the ‘‘effect’ against which you are examining and assessing the receptor. Consequently, depending on the nature of the effect, different sensitivities have been used in this assessment, and these are described and identified in paragraphs 3.3.14 to 3.3.42 which describe the methodology for assessing specific impacts.

3.3.5. The species-specific sensitivities described later reflect three potential factors:

- The adaptability of a species, namely the degree to which a receptor can avoid or adapt to the onset of an effect;
- Its tolerance, specifically its ability to accommodate a temporary or permanent change without a significant adverse impact; and
- How the sensitivity influences its recoverability and the temporal scale and extent to which a receptor will recover following an effect.

Determining the magnitude

3.3.6. The matrix approach used (developed by Percival *et al.* (1999)) considers the potential magnitude of an effect based on the effect and the sensitivity of the potential receptor by considering realistic 'worst case scenarios' according to the Rochdale Envelope approach (see paragraph 4.1.3 in **Appendix 11A**). The definitions of the magnitude of the effect are presented in **Table 3.4** and are assessed relative to the national and biogeographic populations, taking into account the description of the effect, its spatial extent, timing, frequency, duration, whether it is direct or indirect, its reversibility, whether it can be considered a positive or negative effect and the confidence in predictions.

Table 3.4 Definition of terms relating to the magnitude of an effect upon an ornithological receptor (based on Percival *et al.* (1999))

Value	Definition
Very high	Total loss or major alteration to key elements or features of the baseline conditions meaning that the character or attributes of the site post-development will be fundamentally altered and may be altogether lost. Guide value: >80% of population or habitat lost.
High	A major alteration to the key elements or features of the baseline conditions resulting in a fundamental change in the composition or attributes post-development. Guide value: 20-80% of population or habitat lost.
Medium	Loss or alteration of one or more key elements or features of the baseline conditions such that there will be a partial change of the baseline character / attributes post-construction. Guide value: 5-20% of population or habitat lost.
Low	Minor shift from baseline conditions, with any change discernible and the underlying character and attributes post-development similar to baseline conditions. Guide value: 1-5% of population or habitat lost.
Negligible	Very slight change from baseline conditions seen, with any change barely distinguishable comprising a 'no change' situation. Guide value: <1% of population or habitat lost.

Significance of impact

3.3.7. The impact is assessed by considering the species population at the site relative to that in the wider region as a whole, and the magnitude (see **Table 3.4**) of the effect on those populations (see paragraph 4.1.7 in **Appendix 11A**). Magnitude of effect and the sensitivity of receptors were combined using a matrix approach (see **Table 3.5**) to determine the overall significance of the impact of any effect. The assessment takes into account the proportion of birds impacted by an effect at a national or broad biogeographic scale and additionally in relation to suites of designated sites (i.e. SPAs). Impacts of negligible or minor significance are considered not significant under the EIA Regulations (see **Chapter 4 EIA Process**).

Table 3.5 Categories of the significance of impact (Percival *et al*. 1999) with an additional category of very low sensitivity for compatibility with Maclean *et al.* (2009)

Magnitude	**Sensitivity**				
	Very high	**High**	**Medium**	**Low**	**Very low***
Very high	Major	Major	Major	Moderate	Minor
High	Major	Major	Moderate	Minor	Negligible
Medium	Major	Moderate	Minor	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible	Negligible

* A 'Very low' category was added for compatibility with the grading methodology for sensitivity used in Maclean *et al.* (2009).

Breeding seabirds

3.3.8. In order to assess the potential for impacts on birds from designated sites as a result of the effects (such as displacement, collisions, and barrier effects) stemming from Dogger Bank Teesside A & B, the foraging ranges of key seabirds were identified for the North Sea during the breeding season, and the results are presented in **Table 3.6** (see detail in Section 4.2 in **Appendix 11A**). Migrant birds and seabirds that do not possess defined breeding periods, are not constrained to particular breeding sites and can thus originate from a wider area. In these instances it is not possible to directly link these birds to specific sites and to infer any impact on these sites from Dogger Bank Teesside A & B (see Section 4.2 in **Appendix 11A**).

3.3.9. The apportioning of impacts for non-breeding seabirds draws from recent NE/JNCC (2013b) guidance. For breeding seabirds, information on foraging ranges (Thaxter *et al*. 2012) has been used to determine a suite of designated sites that potentially could be impacted by the effects associated with Dogger Bank Teesside A & B (and other projects) during the breeding season. The mean maximum foraging ranges across all studies reviewed by Thaxter *et al*. (2012) have been used, unless other evidence, e.g. from tracking studies, suggests that use of the these values may exclude birds from more distant protected sites that might also utilise feeding areas within the Dogger Bank Zone. In this regard, recent tracking data (Langston & Boggio 2011; Langston & Teuten 2012; Hamer *et al.* 2000, 2001; Wakefield *et al.* 2013; RSPB 2011; FAME 2012; Fort *et al.* 2012; Magnusdottir *et al.* 2012; Frederiksen *et al.* 2012; Harris *et al.* 2009; Kubetzki *et al*. 2009) for four species (i.e. Atlantic puffin, black-legged kittiwake, great skua, and northern gannet) reveals overlap with Dogger Bank during the winter and/or breeding season. Table 4.5 in **Appendix 11A** presents the relevant designated sites where potential connectivity with the Dogger Bank Zone has been identified for these species.

Table 3.6 Foraging ranges during the breeding season for key seabird species for the Dogger Bank Zone that occur in the North Sea during the breeding season (after Thaxter *et al*. (2012) unless stated)

Species	Mean foraging range	Mean maximum foraging range	Maximum foraging range*
Arctic skua	6km	63km	75km
Atlantic puffin	4km	105km	200km
Black-legged kittiwake	25km	60km	231km[b]
Common guillemot	38km	84km	340km[b]
Great black-backed gull	Not identified	Not identified	60km[a]
Great skua	87km	Not identified	219km
Herring gull	11km	61km	92km
Lesser black-backed gull	72km	140km	181km
Northern fulmar	48km	400km	580km
Northern gannet	93km	230km	590km
Razorbill	24km	49km	312km[b]

* Maximum foraging ranges have been used for black-legged kittiwake, common guillemot, great black-backed gull, northern gannet, and razorbill whilst for all other species the mean maximum range has been used (see paragraph 4.2.4 in **Appendix 11A**.
a Seys *et al.* (2001).
b FAME (2012).

3.3.10. For common guillemot and razorbill, more recent tracking studies (FAME 2012) have shown that these species may forage considerably further from their colonies than suggested by Thaxter *et al*. (2012) and this, together with the continuing use and concentration of birds in the western part of the Dogger Bank Zone during the breeding season, suggests that birds from breeding colonies do forage at least in this area. A maximum foraging range is thus used for these species, together with black-legged kittiwake, to determine the suite of protected sites that might potentially be impacted by the effects associated with each wind farm project during the breeding season (see **Table 3.6**). With respect to northern gannet, more specific information is available for British, Irish and French breeding colonies (Hamer *et al*. 2000, 2001; Wakefield *et al*. 2013). This indicates that northern gannets may forage in the zone from both the Flamborough and Filey Coast pSPA formerly the Flamborough & Bempton Cliffs SPA (and component SSSI) and the Forth Islands SPA (and its component SSSIs), but not from 10 other colonies considered by this study. Thus the Dogger Bank Zone is considered to be within foraging range of birds from these two sites, while (given the foraging range of these birds) it cannot be discounted that birds from the Seevogelschutzgebiet Helgoland SPA in Germany might also forage within the zone

3.3.11. A proportion of the birds present within Dogger Bank Teesside A & B during the breeding season for a species will be non-breeding/immature birds that may not originate from sites for which Dogger Bank Teesside A & B is within foraging range. Consequently, a correction factor has been applied to the key seabirds to separate the breeding and non-breeding numbers out to apportion them to sites within the foraging range but also to the non-breeding populations of the wider suite of sites. The correction factors were determined by identifying the proportion of the national breeding populations (identified using the mean seasonal figures from Skov *et al*. (1995) or Stroud *et al*. (2001)) supported by the designated sites (SPAs) based on the UK SPA Review (Stroud *et al*. 2001). Where the proportion of the Great Britain breeding population supported by SPAs is significantly less than 100%, the correction factor has been identified and is presented in **Table 3.7**. The detailed methodology is presented in paragraph 4.3.114 in **Appendix 11A**. Where it was not possible to derive numbers of breeding birds from sites through identification means, one third of the total number of birds (Stroud *et al*. 2004; Kober *et al*. 2010) present during the breeding season are assumed to be non-breeders. The quantities affected at the site-level have then been related to the species' population size at the site in order to determine the magnitude of the effect.

Table 3.7 Correction factors used in apportioning of impacts to designated sites

Species	Breeders	Non-breeder in the breeding season	Non-breeders outside the breeding season
Northern fulmar	0.600	0.312	0.284
Northern gannet	1.000	1.000	1.000
Arctic skua	0.400	0.400	0.400
Great skua	0.800	0.800	0.800
Black-legged kittiwake	0.800	0.800	0.800
Lesser black-backed gull	1.000	1.000	1.000
Great black-backed gull	0.400	0.335	0.076
Common guillemot	1.000	1.000	1.000
Razorbill	0.800	0.800	0.515
Atlantic puffin	1.000	1.000	1.000

Non-breeding seabirds

3.3.12. The apportioning of impacts for non-breeding seabirds has been carried out on the basis of the recent Natural England and JNCC (2013b) guidance. Seabirds that are present in Dogger Bank Teesside A & B outwith the defined breeding seasons or during the breeding season as non-breeders may potentially originate from designated sites throughout the species' biogeographic ranges. However, apportioning the effects determined for Dogger Bank Teesside A & B to each designated site on the basis of the size of its population relative to the species' overall biogeographic population may lead to an underestimation of the magnitude of effects at some sites, particularly those closest to the Dogger Bank Zone. Therefore, greater weighting has been placed on those designated sites closer to the Dogger Bank Zone (detailed in paragraphs 4.2.12 to 4.2.15 in **Appendix 11A**). The numbers of birds affected at the site-level have then been related to the species' non-breeding population size at the site in order to determine the magnitude of the effect.

Migrants

3.3.13. The review by Wright *et al.* (2012) defined migration zones for those migratory birds designated as features of British SPAs (and other Annex 1 species) that are at potential risk from offshore wind farm developments. This review has been used to scope which species might migrate through Dogger Bank Teesside A & B. It is difficult to link the birds that have been observed, or may be present, within the Dogger Bank Zone on migration to specific designated sites for several reasons. Firstly, because of the distance of the zone offshore and thus the potential coastal and inland sites that birds may originate from. Secondly, because birds may not migrate directly to or from the sites for which they are features of. Thirdly, because several sites might be used by the same individuals at different periods of the year (see comments in Appendix 3 of **Appendix 11A**). Therefore, no attempt has been made to apportion impacts to individual protected sites, and this assessment has instead been undertaken based on the significance of impacts on the national populations of identified species (see paragraph 4.2.11 in **Appendix 11A**).

Approach to assessing impacts (and assumptions)

Assessment of disturbance and displacement

3.3.14. During the construction and decommissioning phases the main disturbances are likely to be caused by the construction of the wind turbines themselves, the laying of cables and the boat / helicopter traffic and noise and vibration associated with these activities. During the operation phase there is potential for a more long-term disturbance of birds to occur due to the long-term presence of moving wind turbines and the associated maintenance boat traffic. These disturbances result in displacement of foraging sea birds that would have to forage elsewhere, and this constitutes an effective loss of habitat (Desholm & Kalhert 2005). Consequently, the assessment of displacement considers how many birds will be lost to the population in the long-term (based on the methodology outlined below), due to the effective loss of habitat associated with this effect.

3.3.15. At present, there is only a relatively limited evidence base on the effects of displacement at offshore wind farms (Rexstad & Buckland 2012). Whilst studies suggest that some species may habituate to this effect, data are nonetheless lacking for most species. Consequently, for the purposes of this assessment it has been assumed that displacement will occur at the same level throughout the lifetime of the projects. The spatial extent of disturbance considered in this assessment is the full extent of the wind farm and an associated buffer within which a proportion of birds are assumed to be displaced.

3.3.16. The calculation and assessment of disturbance and displacement has been developed through identifying the population of each species present in the area of disturbance, the displacement rate for each species including a ‘buffer’ area, and the subsequent mortality rate on the displaced species populations. Mean rather than peak population estimates for each season have been used as these reflect overall usage of the project areas and buffers and in order that the impacts associated with displacement can be properly considered cumulatively (see reasoning in paragraph 4.3.13 in **Appendix 11A**).

3.3.17. The population estimates present within the areas of disturbance have been based on the survey data available for Dogger Bank Teesside A & B and the individual project areas. Population figures are presented in Section 4, and include a correction factor for diving birds that may have been missed due to being underwater (detailed in paragraph 4.3.33 in **Appendix 11A**).

3.3.18. The rate by which each species is predicted to be displaced due to disturbance has been developed through literature review, results of monitoring studies, and recent guidance (Natural England & JNCC 2013b); details are presented in paragraphs 4.3.13 to 4.3.19 in **Appendix 11A**). The displacement rates that have been used in this assessment are presented in **Table 3.8** with respect to disturbance from boats and from operational wind farms, derived from displacement rates identified by Furness & Wade (2012) and Furness *et al.* (2012, 2013).

Table 3.8 Species-sensitivity to disturbance from boats (derived from Furness & Wade (2012) and Furness *et al*. (2012, 2013)) and rates of displacement for seabirds in relation to an operational wind farm taken forward in this assessment

Sensitivity to disturbance	Species / species group	Displacement rate
Very high	Common scoter, velvet scoter *Melanitta fusca*, red-throated diver, great northern diver, and black-throated diver.	100%
High	Common goldeneye *Bucephala clangula*, great cormorant, and greater scaup.	75%
Medium	Common eider, long-tailed duck, great-crested grebe, Slavonian grebe, shag, razorbill, black guillemot, and common guillemot.	50%
Low	Northern gannet[2], herring gull[2], great black-backed gull[2], little tern, little auk, black-headed gull[2], common gull[2], lesser black-backed gull[2], black-legged kittiwake[2], Sandwich tern, common tern, roseate tern, Arctic tern, and Atlantic puffin.	25%
Very low	Great skua, northern fulmar, sooty shearwater, Manx shearwater, European storm-petrel, Leach's storm-petrel, Arctic skua, and little gull.	0%

[1] Scores presented in Furness & Wade (2012) and Furness *et al*. (2012, 2013) were translated into the same categories as presented in Maclean *et al*. (2009) as follows: 1 = very low, 2 = low, 3 = medium, 4 = high, and 5 = very high.
[2] See discussion in paragraphs 3.3.18 and 3.3.19.

3.3.19. For northern gannet, evidence suggests that although the species might not be highly sensitive to disturbance in general (e.g. ship and helicopter traffic) the species may show strong macro-avoidance of offshore wind farms (Krijgsveld *et al*. 2010, 2011). Hence, following recent NE/JNCC (2012) guidance, a 75% displacement rate has been applied.

3.3.20. With respect to gulls, whilst some studies suggest that avoidance may occur, the relative evidence for either displacement or attraction is weak, and there is considerable variability in the apparent displacement / attraction rates reported in the studies reviewed (see Appendix 4 of **Appendix 11A**). Following discussion with stakeholders (see Appendix 3 of **Appendix 11A**), a 0% displacement rate has been applied to all gull species with respect to disturbance and displacement.

3.3.21. Overall, based on studies reviewed (see Appendix 4 of **Appendix 11A**) and discussions with stakeholders (see Appendix 3 of **Appendix 11A**) disturbance and displacement effects have only been considered for those species for which it is expected to occur, namely Atlantic puffin, common guillemot, little auk, northern gannet, razorbill, and white-billed diver. Therefore, no disturbance and displacement effect is expected for Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar within this assessment.

3.3.22. Species-specific buffer distances have been used in relation to disturbance and displacement (as detailed in paragraphs 4.3.20 to 4.3.22 in **Appendix 11A**). For auks, gannets, fulmar, gulls (including black-legged kittiwake) and skuas a buffer of 2km around each wind farm has been used. As a transparent and mathematical way to apply a gradient to reflect decreasing avoidance with increasing distance from the wind farm, different displacement rates have been applied: for 0 - 1km a 75% displacement has been used, and for 1km - 2km a 25% displacement has been used. A 4km buffer would be used for divers and seaducks.

3.3.23. For the purposes of assessment and given the lack of evidence in relation to mortality due to displacement (as discussed in paragraphs 4.3.23 to 4.3.27 in **Appendix 11A**), mortality rates for different species were considered on the basis of sensitivity to habitat loss (as given by Furness & Wade (2012) and Furness *et al*. (2012, 2013)) and through stakeholder discussions, and those used in this assessment are presented in **Table 3.9**. These scores reflect the ability of a species to cope with habitat loss following displacement, and may be viewed as a proxy for the proportion of the species' population that might be expected to be lost (mortality) to the population due to displacement.

Table 3.9 Species-sensitivity to habitat loss (derived from Furness & Wade (2012) and Furness *et al*. (2012, 2013)) and mortality rates for displaced seabirds taken forward in this assessment

Sensitivity due to habitat loss[1]	Species / species group
Very high	Red-necked grebe.
High	Greater scaup, common eider, long-tailed duck, common scoter, common goldeneye, red-throated diver, black-throated diver, great-crested grebe, Slavonian grebe, little tern, and black guillemot.
Medium	Velvet scoter, great northern diver, great cormorant, shag, Sandwich tern, common tern, roseate tern, Arctic tern, common guillemot, razorbill, and Atlantic puffin.
Low	Arctic skua, great skua, black-headed gull, common gull, great black-backed gull, black-legged kittiwake, and little auk.
Very low	Northern fulmar, sooty shearwater, Manx shearwater, European storm-petrel, Leach's storm-petrel, northern gannet, lesser black-backed gull, and herring gull.

[1] Scores presented in Furness & Wade (2012) were translated into the same categories as presented in Maclean *et al.* (2009) as follows: 1 = very low, 2 = low, 3 = medium, 4 = high, and 5 = very high.

3.3.24. Consequently, the sensitivity scores presented in **Table 3.9** have been used therefore to derive the mortality rates as a result of displacement within this assessment. These scores have been applied across a range of potential mortality rates (from 0 to 50%) and are reported on in Appendix 3 of

Appendix 11A. However, within this chapter, based on a recent review (see **Appendix 11C**) the results of which are described in detail in paragraph 4.3.33 in **Appendix 11A**, a precautionary mortality rate of 5% has been used for auks (i.e. Atlantic puffin, common guillemot, and razorbill). For northern gannet, whilst a 0% mortality rate is used for Dogger Bank Teesside A & B projects alone, a 5% mortality has been assumed for the cumulative assessment with other projects (and the Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D projects), see paragraph 4.3.34 in **Appendix 11A** for further details. Whilst for white-billed diver, a mortality rate of 37.5% has been used (based on the sensitivity to habitat loss of black-throated diver and red-throated diver (see **Table 3.9**)).

3.3.25. The overall magnitude of effect associated with predicted displacement (and consequent mortality) is then assessed in relation to national and biogeographic populations and the populations supported by individual designated sites. Given the uncertainty and high degree of variability in relation to displacement and attraction as well as the potential mortality of species, the numbers of birds estimated to be displaced that are then estimated to die have been presented based on a range of alternative displacement and mortality rates (which are presented within Appendix 10 of **Appendix 11A**). Population estimates have been corrected for species which dive underwater.

3.3.26. Finally, it should be re-iterated that the mortality rates considered in this assessment present the proportion of those birds predicted to be displaced that could potentially be lost to the population in the long-term. No attempt has been made to assess this effect in relation to changes in background annual mortality that would be required to bring the population to the new lower equilibrium, as how long this will take to happen will depend on a number of factors (where displaced birds move to and the carrying capacity of those areas) and the subsequent changes in annual mortality as a result.

Assessment of disturbance and displacement during construction and decommissioning

3.3.27. During the construction and decommissioning phases the main disturbances are likely to be caused by the construction of the wind turbines themselves, the laying of cables and the boat / helicopter traffic and noise and vibration associated with these activities. These activities would take place across the Dogger Bank Teesside A & B Export Cable Corridor and offshore wind farm, albeit at different locations at different times. Whilst Maclean *et al*. (2009) recommend that disturbance should assume 100% displacement of all bird species, as the area over which disturbance may arise increases during the construction phase and decreases for the decommissioning phase, it has been assumed that the number of birds displaced would be 50% of the populations of each species present for the duration of the construction and decommissioning phases. Disturbance due to inter-array and inter-platform cable laying activities are considered within this element.

3.3.28. The same methodology used for calculating and predicting the magnitude of the effects and determining significance of the displacement impact during operation (see above) has been used to assess displacement for construction and decommissioning, as well as for the export cable laying activities. The only difference being the assumption that only 50% of the populations would be displaced (see above paragraph) during the construction and decommissioning works within the offshore wind farm project areas.

3.3.29. For the Dogger Bank Teesside A & B Export Cable Corridor, the populations affected have been derived using the ESAS data. In total the works along the cable route would only result in disturbance across a small area of the whole Dogger Bank Teesside A & B Export Cable Corridor at any one time, which is estimated to result in disturbance over $18km^2$, or 7.7% of the total cable route. Using the bird densities and population derived from ESAS, presented in **Table 4.16**, the area of disturbance would then generate the number of potential birds disturbed. Subsequently, the application of the disturbance rates and mortality rates identified in paragraphs 3.3.19 to 3.3.21 would be applied to determine overall mortality against which assessment of the impact resulting from the Dogger Bank Teesside A & B export cable construction can be made.

Assessment of disturbance in the operation phase

3.3.30. The assessment of disturbance and displacement during the operation phase has used the same approach and parameters as described in paragraphs 3.3.14 to 3.3.25.

Assessment of disturbance in the intertidal area during export cable landfall works

3.3.31. During the construction activity for the export cable landfall within the intertidal zone, impacts could arise due to habitat loss and / or alteration, and disturbance as a result of physical activity, visual and noise.

3.3.32. The assessment of the disturbance impact resulting from the export cable landfall construction works will use the baseline quantities of birds that have been recorded foraging on the intertidal to determine the average numbers per m^2. From the length and width of the likely construction area, and using the likely distances disturbance is likely to effect foraging birds, the full area of disturbance is calculated. Based on this area, the average numbers of each species present, and hence likely to be disturbed has then been determined. Disturbance is unlikely to extend beyond a buffer of 300m from the boundary of the Dogger Bank Teesside A & B Export Cable Corridor itself, this distance representing the maximum distance at which coastal waterbirds typically show behavioural responses to human disturbance (Smit & Visser 1993; Burton *et al*. 2002).

3.3.33. Using the quantities of birds present within the intertidal area (see above), the magnitude of disturbance is then derived in comparison to either relevant site populations of species or national and biogeographic populations. Subsequently, the sensitivity of waders and seabirds to displacement due to visual and noise disturbance derived from various studies (e.g. Burton *et al.* 2002; Drewitt 2007; Davidson & Rothwell 1993; Smit & Visser 1993) as identified in **Table 3.8**. Gull species are considered to have a low sensitivity in respect of this type of disturbance and intertidal location, which is different to their sensitivity to other forms of disturbance and effects described above. Species sensitivity in relation to habitat loss and / or alteration used in this assessment is presented in **Table 3.9**.

Assessment of barrier effects during operation

3.3.34. Wind farms may pose a barrier effect to migratory birds or those commuting between breeding sites and offshore feeding areas, which could result in elevated energetic costs (Speakman *et al*. 2009) and thus potentially increased mortality. Increases in the energetic costs of the daily movements of seabirds or of the movements of migratory birds have been shown in a number of studies (Tulp *et al*. 1999; Pettersson & Stalin 2003; and Masden *et al*. 2009 and 2010), although Masden *et al.* (2009), in reporting changes in the migratory trajectories of common eiders at a Danish offshore wind farm post-construction suggested that this had minimal likely effect on energetics. However, it was noted that cumulative effects could be significant for instance if other wind farms or human developments worked in combination to disrupt routes of birds. Consequently, the assessment of barrier effects for Dogger Bank Teesside A & B examined both breeding seabirds whose foraging ranges extend to the development area (see **Table 3.6**) and migrating birds.

3.3.35. In relation to breeding seabird and migrant species, the numbers of flying birds used in estimating collision risk (see below) have been taken to represent the populations of birds exposed to the potential barrier effects associated with wind farm development. For breeding seabirds, the maximum number of birds recorded during the two breeding seasons covered by the baseline surveys has been used.

3.3.36. For breeding seabirds, the assessment indicates whether the increase in flight distance posed by barrier effects might prevent birds from an individual designated site from reaching foraging areas beyond Dogger Bank Teesside A & B, based on the species' maximum foraging range and other studies on connectivity and tracking results. The magnitude of the effect on breeding seabirds has been determined through the identification of the population of each species potentially affected by the barrier due to the wind farm, and the percentage of the foraging area from which they may be impeded, and the sensitivity of each species to the increase in energetic costs as a result (which is presented in **Table 3.10**).

Table 3.10 Species-specific sensitivities to barrier effects (following Maclean *et al*. 2009)

Species specific sensitivity	Species / species group
Very high	Black-throated diver.
High	Red-throated diver, great cormorant, geese, and auks.
Medium	Ducks.
Low	Northern fulmar, skuas, and gulls.
Negligible	Northern gannet, terns, and passerines.

3.3.37. The increase in flight distance posed by each wind farm for both migrants crossing the North Sea and breeding seabirds commuting from their colonies to foraging sites has been identified. The increase in flight distance provides a proxy for the increase in energetic cost and, together with information on the number of birds exposed, is considered in evaluating the potential magnitude of the effect. As it is not possible to fully quantify the number of birds that might potentially be impacted by barrier effects, this is by necessity a qualitative judgement and it should be noted that there is presently little understanding of the thresholds above which such increases might impact survival or breeding productivity (Masden *et al*. 2009; Speakman *et al*. 2009). However, in this assessment it has been assumed that each project will pose a barrier to 100% of flying birds throughout their lifetime, and that each wind farm poses a barrier effect to 100% of birds attempting to fly through at 'risk' height (Maclean *et al*. 2009). It should be noted that the assessment does not take account of the possibility that species may habituate to this effect, due to the limited evidence base currently available.

3.3.38. The potential cumulative impacts of barrier effects from multiple wind farms are not likely to be additive (King *et al*. 2009) and thus assessment has been undertaken solely for Dogger Bank Teesside A & B without reference to the individual development areas.

Assessment of collision risk during operation

3.3.39. The possibility of collisions between birds and wind turbines is one of the key ornithological effects associated with offshore wind farms. The size or magnitude of the risk for each species depends on a number of factors including its population in the area of the proposed development, the species' characteristics and their behaviour, notably the proportion of time that they spend flying and the heights at which they fly, and their avoidance of wind turbines. Other aspects such as the weather and differences between diurnal and nocturnal behaviour between species may also affect the magnitude of effect and significance of impacts. Collision could affect a number of species groups, including seabirds that use the area of a wind farm for feeding during the breeding season and other times of year, and waterbirds and terrestrial species that pass through the area on migration in spring and autumn.

3.3.40. Estimates of the probability of any individual bird colliding with a turbine can be obtained from models which incorporate information on the species of concern (flight height data, flight speeds and morphology) and turbine design. From these probabilities and information on the numbers or densities of birds using the area of a wind farm, the potential collision mortality associated with the wind farm can be estimated. Collision risk modelling has been undertaken for 11 species where sufficient population levels arise, i.e. northern gannet, northern fulmar, Arctic skua, great skua, lesser black-backed gull, great black-backed gull, black-legged kittiwake, common guillemot, razorbill, little auk, and Atlantic puffin. Full details of the collision risk modelling are presented in Section 4.3 and Appendix 6 in **Appendix 11A**, and summarised below.

Collision risk model parameters for seabirds

3.3.41. For this assessment the collision risk modelling has used Option 3 of the updated Band model, as it offered the most realistic assessment of collision risk within the Dogger Bank Zone. Firstly, it offers the opportunity to input the actual dimensions of the turbines to be used. This means that the proportion of birds flying within the rotor-swept area can be accurately estimated, rather than being constrained to the proportion estimated to be flying above 20m during the boat surveys. More importantly, collision risk is variable within the rotor-swept area. Collision risk is greatest towards the centre of the turbine, where the area of the rotor sweep is greatest. Under Option 1 of the Band model, birds are assumed to be distributed evenly within the rotor-swept area. However, as they are most likely to be clustered towards the lower reaches of the rotor-swept area, this results in an over-estimate of the number of collisions. By using Option 3, it is possible to account for this variable distribution. Therefore, eight model scenarios were considered using Option 3 of the updated Band model. Eight scenarios were considered which covered a range of wind turbine sizes and heights (see Table 4.17 in **Appendix 11A** for the different scenarios). The scenario which results in the worst case numbers of birds affected was then considered and presented in this assessment, and the relevant paramaters are described below.

3.3.42. The model used monthly population estimates for 2010, 2010/11 and 2011/12 for each of the species considered, in each project area, which were derived following the methodology described in Section 2 of **Appendix 11A**. However, the population data only considers flying birds, a key assumption of the Band model. The population data used in the modelling is presented in Tables 4.14a-c and 4.15a-c in **Appendix 11A**. Species biometric data used in the modelling is presented in **Table 3.11**, including flight height bands, and discussion and reasoning for flight height parameters used in the modelling are discussed in paragraph 4.3.89 in **Appendix 11A**. The model assumed that the proportion of time wind turbines were operational was, on average, 94.55% of the time, though this varied throughout the year (see Table 4.18 in **Appendix 11A**).

3.3.43. For the 11 species considered, the worst case scenario for each project was found to be the use of 6MW wind turbines with a rotor diameter of 167m (a radius of 83.5m), and a hub height of 109.5m above highest astronomical tide (with lower rotor tip height of 26m above highest astronomical tide). These define the worst case ‘scenarios’ against which the impact of collision risk has been assessed (see above). Mitigation measures include moving to a maximum of 200 turbines per project and the height of the rotor tip above the sea has been increased from 22m Highest Astronomical Tide (HAT) to 26m HAT. Further mitigation measures are outlined in paragraph 3.3.55 onwards.

Table 3.11 Species biometric data used in the collision risk model

Species	Body length (m)[1]	Wingspan (m)[1]	Flight speed[2]	Nocturnal activity[3]	Flight	Observed Proportion at CRH (proportion of birds recorded flying above 20m during boat surveys)	Proportion above 20m based on models presented in Cook *et al.* (2012) (with 95% CIs)	Modelled proportion at CRH (26m – 193m) based on models presented in Cook *et al*. (2012) (with 95% CIs)
Arctic skua	0.44	1.18	13.30	0	Flap	0.01	0.04 (0 - 0.96)	0.02 (0 - 0.16)
Atlantic puffin	0.28	0.55	17.60	1	Flap	<0.01	<0.01 (0 - 0.08)	<0.01 (0 - 0.04)
Common guillemot	0.40	0.67	19.10	0.25	Flap	0.04	<0.01 (0 - 0.06)	<0.01 (0 - 0.03)
Black-legged kittiwake	0.39	1.08	13.10	0.50	Flap	0.20	0.16 (0.08 - 0.24)	0.08 (0.03 - 0.13)
Great black-backed gull	0.71	1.58	13.00	0.50	Flap	0.32	0.34 (0.19 - 0.63)	0.24 (0.11 - 0.45)
Great skua	0.56	1.36	14.90	0	Flap	0.08	0.04 (0 – 1.00)	0.03 (0.01 - 0.27)
Lesser black-backed gull	0.58	1.42	9.95	0.50	Flap	0.36	0.28 (0 - 0.58)	0.18 (0.04 - 0.42)
Little auk	0.18	0.44	17.66	0	Flap	0.02	<0.01 (0 - 0.99)	<0.01 (0 - 1.00)
Northern fulmar	0.48	1.07	13.00	0.75	Glide	0.01	<0.01 (0 - 0.26)	<0.01 (0 - 0.23)
Northern gannet	0.94	1.72	14.90	0.25	Flap	0.16	0.10 (0 - 0.21)	0.03 (0 - 0.12)
Razorbill	0.38	0.66	16.00	0	Flap	0.07	0.04 (0 - 0.80)	<0.01 (0 - 0.27)

[1] Taken from BTO BirdFacts website (Robinson 2005).
[2] Taken from Pennycuick (1997).
[3] Taken from Garthe & Hüppop (2004) following Band (2012).

3.3.44. Modelling results for the worst case scenario modelled are reported (see **Appendix 11A**) across a range of different avoidance rates notably 98%, 99% and 99.5% in this chapter. However, assessment has been undertaken based on the 98% rate for collision risk for all species, with the exception of northern gannet where the 99% rate has been used, as this was the agreed approach for the recently consented Triton Knoll project.

3.3.45. From the modelling results, the number of collisions of adult birds predicted across the year is considered in relation to the background mortality at the population scale and for each relevant designated site, where the background mortality is calculated from the adult mortality (1-adult survival) rates presented in the BTO BirdFacts website (Robinson, 2005) and the size of the breeding population at the site or at a national level, in order to determine the magnitude of the effect. Magnitude has then been defined qualitatively from this using the classification presented in **Table 3.12**.

Table 3.12 Definition of the magnitude associated with collision mortality assessed by the percentage increase in background adult mortality

Magnitude	Definition
Very high	>100% increase in background adult mortality
High	50% - 100% increase in background adult mortality
Medium	20% - 50% increase in background adult mortality
Low	5% - 20% increase in background adult mortality
Negligible	<5% increase in background adult mortality

Collision risk model parameters for migrant birds

3.3.46. The migrant bird species whose migration routes would potentially cross each project area and potentially be at risk of collision were determined using the maps provided in Wright *et al*. (2012). For each of these species, the proportion of the total number of birds crossing the North Sea that would cross the footprint of the wind farm (at any height) during each migration season was calculated using the methods described in Wright *et al*. (2012). The methods described in Wright *et al*. (2012) were also used to determine the reference population relevant to the assessment (i.e. the total number of birds crossing the North Sea during each migration), and details of the derivation of each population estimate is given in **Table 3.13** (with additional detail presented in Table 4.19 in **Appendix 11A**), along with the species biometric data used for the modelling of migrant bird collisions.

3.3.47. Collision risk analyses for migrant birds were undertaken using the Band model, following the guidance specifically for migrant birds at offshore sites (Annex 6 of Band 2012). Because of the limited data available on the flight heights of birds during migration, Option 1 of the Band mode was used; i.e. the basic model using the proportion of birds at risk height, with proportions taken from Wright *et al*. (2012). Three scenarios were run, using the lower, central and upper limits of the range of the proportion of birds at risk height, as described in Wright *et al*. (2012), with the results of the central proportion considered in this chapter.

Table 3.13 Species biometric data used in the collision risk model for migrant birds and derivation of population estimates for migrant birds used in collision risk model and for the assessment of barrier effect

Species	Body length (m)[1]	Wingspan (m)[1]	Flight speed (ms^{-1})[2]	Flight type	Proportion at CRH[3] (lower limit)	Prop. at CRH[3] (best estimate)	Proportion at CRH[3] (upper limit)	Reference population size[4]	Population size correction factor[5]	Derivation of population size[6]
Barnacle goose (Svalbard population)	0.64	1.38	21.08	Flap	0.05	0.30	0.75	33,000	1	Musgrove W
Bar-tailed godwit *Limosa lapponica*	0.38	0.75	16.20	Flap	0.05	0.25	0.75	54,280	1	Musgrove W + Crowe
Bean goose	0.75	1.58	21.08	Flap	0.05	0.30	0.75	730	1	Musgrove W
Black-tailed godwit *Limosa limosa islandica*	0.42	0.76	16.20	Flap	0.05	0.25	0.75	5,620	1	WPE5 - Musgrove W - Crowe
Common goldeneye	0.46	0.72	18.65	Flap	0.001	0.15	0.60	29,165	1	Musgrove W + Crowe – Musgrove B
Common pochard	0.46	0.77	18.65	Flap	0.001	0.15	0.60	74,555	0.75	Musgrove W + Crowe – Musgrove B
Common redshank (breeding) *Tringa totanus britannica*	0.28	0.62	16.20	Flap	0.05	0.25	0.75	30,000	0.1	Musgrove B
Common redshank (Icelandic population) *T. totanus robusta*	0.28	0.62	16.20	Flap	0.05	0.25	0.75	275,000	0.5	WPE5/SOSS
Common redshank (mainland Europe population) *T. totanus totanus*	0.28	0.62	16.20	Flap	0.05	0.25	0.75	25,000	1	SOSS

Species	Body length (m)[1]	Wingspan (m)[1]	Flight speed (ms^{-1})[2]	Flight type	Proportion at CRH[3] (lower limit)	Prop. at CRH[3] (best estimate)	Proportion at CRH[3] (upper limit)	Reference population size[4]	Population size correction factor[5]	Derivation of population size[6]
Common ringed plover (non-breeding) *Charadrius hiaticula*	0.19	0.52	16.20	Flap	0.05	0.25	0.75	73,000	0.5	SOSS
Common scoter	0.49	0.84	18.65	Flap	0.001	0.01	0.17	123,060	0.5	Musgrove W + Crowe – Musgrove B
Common shelduck *Tadorna tadorna*	0.62	1.12	18.65	Flap	0.001	0.15	0.60	75,610	1	Musgrove W + Crowe
Common snipe *Gallinago gallinago*	0.26	0.46	16.20	Flap	0.05	0.25	0.75	1,000,000	0.5	Musgrove W
Dunlin (passage) *Calidris alpina schinzii*	0.18	0.40	16.20	Flap	0.05	0.25	0.75	3,700	1	WPE5
Dunlin (non-breeding) C. *alpina alpina*	0.18	0.40	16.20	Flap	0.05	0.25	0.75	438,480	1	Musgrove W + Crowe
Eurasian coot *Fulica atra*	0.37	0.75	18.65	Flap	0.05	0.25	0.95	105,000	0.5	Musgrove W - Musgrove B
Eurasian curlew	0.55	0.90	16.20	Flap	0.05	0.25	0.75	81,850	1	Musgrove W + Crowe - Gibbons
Eurasian oystercatcher (non-breeding) *Haematopus ostralegus*	0.42	0.83	16.20	Flap	0.05	0.25	0.75	200,000	0.35	SOSS
Eurasian teal *Anas crecca*	0.36	0.61	18.65	Flap	0.001	0.15	0.60	249,510	0.5	Musgrove W + Crowe – Musgrove B

Species	Body length (m)[1]	Wingspan (m)[1]	Flight speed (ms^{-1})[2]	Flight type	Proportion at CRH[3] (lower limit)	Prop. at CRH[3] (best estimate)	Proportion at CRH[3] (upper limit)	Reference population size[4]	Population size correction factor[5]	Derivation of population size[6]
Eurasian wigeon *Anas penelope*	0.48	0.80	18.65	Flap	0.001	0.15	0.60	522,370	0.95	Musgrove W + Crowe
European nightjar	0.27	0.60	8.64	Flap	0.10	0.50	0.95	11,500	0.1	Musgrove B
Gadwall *Anas strepera*	0.51	0.90	18.65	Flap	0.001	0.15	0.60	21,975	0.6	Musgrove W – Musgrove B
Golden plover (non-breeding)	0.28	0.72	16.20	Flap	0.05	0.25	0.75	400,000	0.5	Musgrove W
Goosander (breeding males) *Mergus merganser*	0.62	0.90	18.65	Flap	0.001	0.15	0.60	3,500	1	Musgrove B
Goosander (non-breeding)	0.62	0.90	18.65	Flap	0.001	0.15	0.60	3,250	1	Musgrove W – Musgrove B
Great bittern	0.75	1.30	11.00	Flap	0.05	0.50	0.95	400	0.7	Musgrove W - Musgrove B
Greater scaup	0.46	0.78	18.65	Flap	0.001	0.15	0.60	9,360	0.05	Musgrove W + Crowe
Great-crested grebe *Podiceps cristatus*	0.48	0.88	18.65	Flap	0.01	0.10	0.40	24,385	1	Musgrove W + Crowe
Greenshank *Tringa nebularia*	0.32	0.69	16.20	Flap	0.05	0.25	0.75	275	0.1	Musgrove B
Grey plover *Pluvialis squatarola*	0.28	0.77	16.20	Flap	0.05	0.25	0.75	49,315	1	Musgrove W + Crowe
Hen harrier (breeding)	0.48	1.10	8.64	Flap	0.25	0.50	1.00	285	0.1	Musgrove B
Hen harrier (non-breeding)	0.48	1.10	8.64	Flap	0.25	0.50	1.00	375	0.8	SOSS - Baker W

Species	Body length (m)[1]	Wingspan (m)[1]	Flight speed (ms^{-1})[2]	Flight type	Proportion at CRH[3] (lower limit)	Prop. at CRH[3] (best estimate)	Proportion at CRH[3] (upper limit)	Reference population size[4]	Population size correction factor[5]	Derivation of population size[6]
Light-bellied brent goose (Svalbard population) *Branta bernicla hrota*	0.58	1.15	21.08	Flap	0.05	0.30	0.75	3,400	1	Musgrove W
Mallard *Anas platyrhynchos*	0.58	0.90	18.65	Flap	0.001	0.15	0.60	459,500	0.7	Musgrove W + Crowe – Musgrove B
Northern lapwing	0.30	0.84	16.20	Flap	0.05	0.25	0.75	448,950	1	Musgrove W + Crowe – Musgrove B - Gibbons
Northern pintail *Anas acuta*	0.58	0.88	18.65	Flap	0.001	0.15	0.60	30,235	0.5	Musgrove W + Crowe
Northern shoveler *Anas clypeata*	0.48	0.77	18.65	Flap	0.001	0.15	0.60	18,800	0.75	Musgrove W + Crowe – Musgrove B
Red knot *Calidris canutus*	0.24	0.59	16.20	Flap	0.05	0.25	0.75	338,970	0.5	Musgrove W + Crowe
Red-breasted merganser *Mergus serrator*	0.55	0.78	18.65	Flap	0.001	0.15	0.60	2,900	0.1	Musgrove W - Musgrove B
Ruddy turnstone *Arenaria interpres*	0.23	0.54	16.20	Flap	0.05	0.25	0.75	48,000	0.5	Musgrove W
Ruff	0.25	0.53	16.20		0.05	0.25	0.75	2,400	1	Musgrove W
Sanderling *Calidris alba*	0.20	0.42	16.20	Flap	0.05	0.25	0.75	60,000	0.75	WPE5 - Musgrove W + Crowe W
Short-eared owl	0.38	1.02	8.64	Flap	0.10	0.50	0.95	1,030	0.35	Musgrove B
Slavonian grebe	0.34	0.62	18.65	Flap	0.01	0.10	0.40	1,100	0.5	Musgrove W

Species	Body length (m)[1]	Wingspan (m)[1]	Flight speed (ms^{-1})[2]	Flight type	Proportion at CRH[3] (lower limit)	Prop. at CRH[3] (best estimate)	Proportion at CRH[3] (upper limit)	Reference population size[4]	Population size correction factor[5]	Derivation of population size[6]
Tufted duck *Aythya fuligula*	0.44	0.70	18.65	Flap	0.001	0.15	0.60	102,860	0.9	Musgrove W + Crowe – Musgrove B
Velvet scoter	0.54	0.94	18.65	Flap	0.001	0.15	0.60	2,500	0.9	Musgrove W
Whimbrel *Numenius phaeopus*	0.41	0.82	16.20	Flap	0.05	0.25	0.75	23,040	0.5	Baker P - Wernham

[1] Taken from BTO BirdFacts (Robinson 2005).
[2] Taken from published values for flight speed of related species (or those expected to fly at a similar speed) during migration; for all goose species, the average speed readings from 10 Svalbard barnacle geese recorded by satellite transmitters during migration was taken from Griffin *et al*. (2011); for all duck species, grebes and coot, the average of Eurasian wigeon and common eider from Pennycuick (2001) was used; for great bittern, the value for grey heron from Pennycuick for hen harrier, short-eared owl and European nightjar the average of common buzzard, Eurasian sparrowhawk and red kite from Pennycuick (2001) was used; for all waders, the average of great knot (calculated from time and distance values in Pennycuick & Battley (2003)) and bar-tailed godwit (calculated from track speeds recorded by satellite transmitters during migration from Gill *et al*. (2001)) was used.
[3] Taken from Wright *et al*. (2012), except for common scoter which is taken from Cook *et al*. (2012). "Proportion at CRH" is the proportion of migrating birds that are estimated to fly at collision risk height.
[4] The reference population size is defined as the total number of individuals of each species in the population that uses the migration route that encompasses the Dogger Bank Zone.
[5] The "population size correction factor" is the proportion of each reference population that we estimate will cross the North Sea (required to estimate the proportion that will cross the footprint of the wind farm), based on the information in Wright *et al*. (2012), other published sources and expert opinion.
[6] Derivation of population size refers to how population estimates from different sources have been combined. Sources used are SOSS guidance (Wright *et al*. 2012), the Migration Atlas (Wernham *et al*. 2002), breeding/non-breeding population size estimates (GB/UK: Musgrove *et al*. (2013), except for non-breeding hen harrier and passage whimbrel which are from Baker *et al*. (2006); GB/Ireland: Gibbons *et al*. (1993)), wintering waterbird population estimates (Ireland: Crowe *et al*. (2008); International: Wetlands International (2012) (WPE5)). Holt *et al*. (2012) was used to look at the ratio of wintering to passage numbers of sanderling. To convert from breeding pairs to individuals, the number of pairs was multiplied by 2.5 (assuming that 3x the number of breeding pairs would migrate in autumn, following the convention from Stroud *et al*. (2004), but only 2x the number of breeding pairs would migrate in spring, so 2.5x on average per migration).

3.3.48. A single scenario for wind turbine size and height was considered in collision risk models for migrant birds, using the worst case scenario described for seabirds (see above). Collision risk was modelled with a precautionary avoidance rate of 98%. The value used in collision risk models for the proportion of time wind turbines were operational was taken as the average across the year (94.6%).

3.3.49. Collision will be an on-going effect for the bird species migrating through the project area throughout the operational lifetime of the project and, therefore, there is no potential for species to recover from this effect. The degree to which each migrant bird species might be able to avoid or adapt to the effect is incorporated into the estimation of collision rates, by means of specified avoidance rates. A 98% rate has been used in the realistic worst case scenario presented here (Cook *et al*. 2012), though results using rates of 99% and 99.5% are also presented. The migrant bird species-specific sensitivity to collision consequently reflects the tolerance of the species' populations to the mortality associated with collision. **Table 3.14** presents the sensitivity based on the tolerance of populations as assessed by annual survival rates. Following Maclean *et al.* (2009), these species-specific sensitivities have been combined with each migrant bird's value to determine the overall sensitivity of each species to collision. Using the quantification of the number of collisions for each species against the population has then determined the magnitude of collisions, and then using the methodology described above the significance of the impact has then been determined.

Table 3.14 Species-specific sensitivities to collision (for migrant birds considered in this assessment), based on the tolerance of populations to this effect, as assessed by annual survival rates (following Maclean *et al*. 2009 with data taken from Robinson 2005, Grémillet *et al*. 2012, and Harding *et al*. 2011)

Species-specific sensitivity	**Annual adult survival rate**[1]
Very High	>0.90: northern fulmar (0.972), northern gannet (0.919), barnacle goose (Svalbard population), light-bellied brent goose (Svalbard population), shelduck, black-tailed godwit, black-legged kittiwake (0.941), black-headed gull, lesser black-backed gull (0.913), great black-backed gull, little tern, Sandwich tern, common tern, common guillemot (0.946), razorbill (0.900), Atlantic puffin (0.924)
High	0.85-0.90: black-throated diver, great cormorant, oystercatcher, grey plover, whimbrel, ruddy turnstone, Arctic skua (0.886), great skua (0.888), herring gull
Medium	0.80-0.85: common eider, goosander, red-throated diver , hen harrier, red knot, sanderling, little auk
Low	0.75-0.80: bean goose, common scoter, goldeneye, ringed plover
Very Low	<0.75: wigeon, gadwall, teal, mallard, pintail, shoveler, pochard, tufted duck, scaup, long-tailed duck, bittern, coot, golden plover, lapwing, dunlin, ruff, snipe, bar-tailed godwit, curlew, redshank, nightjar

[1] For species for which no published estimates of annual survival exist, species-specific sensitivity was assessed based on proxy species.

Assessment of habitat loss and / or alteration

3.3.50. The construction, operation and decommissioning phases for Dogger Bank Teesside A & B may also potentially impact birds indirectly through changes to habitat (detailed in paragraphs 4.3.88 to 4.3.102 in **Appendix 11A**). Habitat loss would occur from the presence of structures on the seabed (i.e. foundations and scour protection), whilst indirect habitat change could arise from the disturbances occurring during all phases which could result in secondary impacts to prey species (i.e. fish), or reduction in fishing vessels around the wind farm (on which some species are dependent on discards). The differing changes identified above were all considered under one single effect, and have been assessed qualitatively based on the assessments presented in other chapters (such as **Chapter 9 Marine Physical Processes**, **Chapter 12** , and **Chapter 13**). The significances of the effects on fish reported in **Chapter 13** were considered for all seabird receptors, while the significances of effects on 'other' potential prey species were also considered for all species except auks and black-legged kittiwake.

3.3.51. To determine the magnitude of the potential effects associated with habitat loss and / oralteration for seabird receptors, the percentages of national and biogeographic populations exposed to the effects in Dogger Bank Teesside A & B were first considered. Based on the assessment of effects for prey species detailed in **Chapter 13**, a qualitative assessment was then made as to the proportion of these birds that might be impacted, so as to determine a final magnitude in each case. Species sensitivity classifications are presented in **Tables 3.7** and **3.8**.

Consideration of designated sites populations

3.3.52. In quantifying the various impacts described earlier on the designated sites and their component species, the quantities of birds affected (either by disturbance and displacement, barrier effects, and collisions) were apportioned to the designated sites using the correction factors presented in **Table 3.15**. These are derived from the proportion of the GB population supported by the designated sites (SPAs) and Skov *et al*. (1995) and Stroud *et al*. (2001), as described in detail in paragraph 4.3.128 in **Appendix 11A**.

Table 3.15 Correction factors used in the apportioning of impacts to designated sites

Species	Breeders	Non-breeders, breeding season	Non-breeders, non-breeding season
Arctic skua	0.400	0.400	0.400
Atlantic puffin	1.000	1.000	1.000
Black-legged kittiwake	0.800	0.800	0.800
Common guillemot	1.000	1.000	1.000
Great black-backed gull	0.400	0.335	0.076
Great skua	0.800	0.800	0.800
Lesser black-backed gull	1.000	1.000	1.000
Northern fulmar	0.600	0.312	0.284
Northern gannet	1.000	1.000	1.000
Razorbill	0.800	0.800	0.515

3.3.53. As described earlier (see paragraph 3.3.12), no attempt has been made to apportion the barrier effect and collision risk on migrant birds to specific designated sites due to a number of inherent difficulties in linking migrant birds that could be migrating through the Dogger Bank Zone and Dogger Bank Teesside A & B to specific sites.

Impacts and worst case scenarios

3.3.54. Impacts are assessed assuming realistic worst case scenarios which are developed according to the Rochdale Envelope approach (see Section 5). These impacts can occur through the construction, operation and decommissioning phases across all areas of the wind farm development. Construction and decommissioning effects can entail disturbance/displacement and the effects associated with a loss or change of habitat, whereas operational effects will manifest through behavioural responses, mortality associated with collision and indirect effects associated with a changing habitat (see Langston & Pullan (2003) and Peterson *et al.* (2006)). These responses manifest in four main effects, disturbance / displacement from favoured habitats, barrier effects to migration, collision risk and the effects associated with habitat loss which can affect foraging.

Mitigation measures and residual impacts

3.3.55. Mitigation has been incorporated in the project design through the initial baseline survey interpretations, which found concentrations of birds in the north-western and western regions of the Dogger Bank Zone, particularly associated with sand eels and, consequently, the location of the projects have been sited to avoid these areas of high concentrations of birds and minimise potential impacts. Where a moderate or major impact is anticipated following the use of worst case scenarios, the potential for mitigating scenarios is discussed, where appropriate.

3.3.56. Mitigation has also been introduced specifically with respect to the effect of collision risk for birds, a change that was introduced following the final stage of formal consultation (PEI 3) for Dogger Bank Creyke Beck, which has been carried across to Dogger Bank Teesside A & B due to the potential for cumulative impacts to arise. Across species, the probability of avian collision tends to be statistically greater for smaller turbines, both due to their absolute size and because of the greater numbers of turbines needed to generate a defined target amount of electricity (Cook *et al*. 2011). Hence, the impacts of collision have been mitigated against over and above the industry standard, by considering a maximum of 200 turbines per project with a minimum lower rotor tip height raised from 22m to 26m above highest astronomical tide (and thus a rotor radius of 83.5m (a diameter of 167m)).

3.3.57. Specific guidance for mitigation also exists for the overall project design, as highlighted in the EN-3 National Policy Statement (DECC 2011). These include:

- Aviation and navigation lighting should be minimised to avoid the attraction of birds, whilst acknowledging safety;
- Wind turbines should be laid out within the site in a manner to minimise risk where there is a significant risk of collision, subject to other constraints; and

- Construction vessels associated with offshore wind farms should avoid rafting seabirds during sensitive periods where practical.

3.3.58. Where relevant, mitigation measures that are incorporated as part of the project design process and/or can be considered to be industry standard practice (referred to as 'embedded mitigation') are considered throughout the chapter and are reflected in the outcome of the impact assessment.

Cumulative impact assessment methodology

Assessment of disturbance and displacement during construction and decommissioning of other projects within the Dogger Bank Zone

3.3.59. The assessment methodology described in paragraphs 3.3.14 to 3.3.29 has been used for the assessment of the cumulative disturbance and displacement impact during the construction and decommissioning phases for Dogger Bank Teesside A & B in addition to Dogger Bank Teesside C & D and Dogger Bank Creyke Beck A & B.

Assessment of disturbance and displacement during operation of other projects within the Dogger Bank Zone

3.3.60. The assessment methodology described in paragraphs 3.3.14 to 3.3.30 has been used for the assessment of the cumulative disturbance and displacement impact during the operation phase for Dogger Bank Teesside A & B in addition to Dogger Bank Teesside C & D and Dogger Bank Creyke Beck A & B.

Assessment of disturbance and displacement during construction, operation and decommissioning for all projects in the Greater North Sea region

3.3.61. The assessment methodology described in paragraphs 3.3.14 to 3.3.27 in relation to the disturbance and displacement impacts has been used for the assessment of the cumulative impact during all phases for all relevant projects in the OSPAR Greater North Sea region. Estimates of birds displaced by other projects were derived from available ESs, where such information is provided. However, it should be noted that many other projects did not provide mortality predictions, only predictions of the numbers of birds displaced. Furthermore, different displacement rates and mortality rates were used for different projects. In addition, estimates of mortality were not always apportioned to specific designated sites' populations.

Assessment of barrier effect during operation

3.3.62. The assessment methodology described in paragraphs 3.3.34 to 3.3.38 has been used for the assessment of the cumulative barrier effect for Dogger Bank Teesside A & B in addition to Dogger Bank Teesside C & D and Dogger Bank Creyke Beck A & B. However, apportionment of the cumulative barrier effect on terrestrial and waterbird migrants to specific designated sites' populations could not be undertaken due to the inherent complexity in the apportionment of quantities of each species to individual designated sites.

3.3.63. There is considerable uncertainty regarding the assessment of barrier effects posed by offshore wind farms. Consequently, the assessment of the potential cumulative effects for seabirds from their breeding colonies and terrestrial and waterbird migrants as a result of Dogger Bank Teesside A & B and all other offshore wind farm projects in the Greater North Sea region has not been attempted because of:

- The difficulties in assessing the magnitude of any potential barrier effects;
- The complexities in the numbers of potential projects affecting birds foraging from different colonies; and
- The potential cumulative impacts of barrier effects from multiple wind farms are not likely to be additive (King *et al*. 2009), and thus are problematic to quantify.

3.3.64. Similarly, the assessment of the cumulative barrier effect on the populations of terrestrial or waterbird migrant species that are UK SPA features could not be assessed due to the inherent complexities in determining the magnitude of the affect, the apportionment of species to individual designated sites, and inter-relationship between migratory routes and other wind farms.

Assessment of collisions during operation

3.3.65. The assessment methodology described in paragraphs 3.3.39 to 3.3.48 has been used for the assessment of the cumulative collision impact for Dogger Bank Teesside A & B in addition to Dogger Bank Teesside C & D and Dogger Bank Creyke Beck A & B.

3.3.66. The assessment methodology described in paragraphs 3.3.39 to 3.3.48 has been used for the assessment of the cumulative collision impact for Dogger Bank Teesside A & B in addition to all offshore wind farm projects in the OSPAR Greater North Sea region. Estimates of birds affected by other projects were derived from available ESs, where such information is provided. However, it should be noted that different avoidance rates and other methodologies have often been used, which are not strictly comparable to the modelling undertaken for Dogger Bank Teesside A & B. In addition, as with displacement, estimates of collisions were not always apportioned to specific designated sites' populations. Furthermore, no projects quantified their assessments of collisions on migrant bird species, consequently an assessment of cumulative impact on migrant birds could not be assessed beyond the level of Dogger Bank Teesside A & B, Dogger Bank Teesside C & D, and Dogger Bank Creyke Beck.

Assessment of habitat loss and / or alteration

3.3.67. In other offshore wind farm project ESs, only a qualitative assessment has been made of the impact of habitat loss and / or alteration in relation to ornithology, where this has not been scoped out or included in the assessment of other impacts, such as displacement. No predictions of habitat loss and / or alteration were provided in relation to bird species within offshore aggregate projects. Consequently, a qualitative assessment of the cumulative impact of habitat loss and / or alteration has been undertaken.

4. Existing Environment

4.1. Baseline populations for seabirds based on surveys and modelling

4.1.1. The baseline survey results are detailed in **Appendix 11A**, with Tables 3.1, 3.2 and 3.3 presenting the numbers of birds of all species (including seabirds) recorded in each month during boat-based surveys between January 2010 and June 2012, which is summarised in **Table 4.1**. The table presents the total numbers of each species, the peak count, and the average monthly count for the duration of the surveys (January 2010 to June 2012).

Table 4.1 Bird species recorded within the Dogger Bank Zone during boat-based surveys

Species	Latin name	Monthly average	Peak	Total
Divers and grebes				
Diver spp.	*Gavia* spp.	1	3	14
Black throated diver	*Gavia arctica*	<1	2	6
Great northern diver	*Gavia immer*	<1	2	5
Red throated diver	*Gavia stellata*	1	7	24
White billed diver	*Gavia adamsii*	2	11	67
Great-crested grebe	*Podiceps cristatus*	<1	1	1
Seabirds				
Auk spp.	-	307	2,415	8,595
Guillemot/razorbill	*Uria aalge/ Alca torda*	66	750	1844
Atlantic puffin	*Fratercula arctica*	107	352	2,987
Common guillemot	*Uria aalge*	2,090	9,852	58,530
European shag	*Phalacrocorax aristotelis*	<1	1	2
European storm-petrel	*Hydrobates pelagicus*	2	32	45
Great cormorant	*Phalacrocorax carbo*	<1	4	12
Leach's storm petrel	*Oceanodroma leucorhoa*	<1	6	7
Little auk	*Alle alle*	164	1,231	4,586
Manx shearwater	*Puffinus puffinus*	1	12	37
Northern fulmar	*Fulmarus glacialis*	1,027	3,861	28,745
Northern gannet	*Morus bassanus*	1,268	7,872	35,514
Razorbill	*Alca torda*	560	3,502	15,673
Sooty shearwater	*Puffinus griseus*	3	45	70
Gulls, terns and skuas				
Black-backed gull sp.	*Larus marinus/fuscus*	4	66	107
Gull spp.	-	29	331	805
Large gull spp.	-	4	55	123
Small gull spp.	-	<1	1	1

Species	Latin name	Monthly average	Peak	Total
Petrel spp.	-	<1	10	10
Skua spp.	-	1	11	30
Small skua spp.	-	<1	2	3
Tern spp.	*Sterna* spp.	2	26	65
Arctic skua	*Stercorarius parasiticus*	9	81	256
Arctic tern	*Sterna paradisaea*	5	30	126
Black-headed gull	*Chroicocephalus ridibundus*	11	74	295
Black-legged kittiwake	*Rissa tridactyla*	2,573	11,504	72,054
Comic tern	*Sterna hirundo/paradisaea*	1	13	20
Common gull	*Larus canus*	17	86	478
Common tern	*Sterna hirundo*	1	13	31
Glaucous gull	*Larus hyperboreus*	<1	1	2
Great black-backed gull	*Larus marinus*	109	416	3,044
Great skua	*Stercorarius skua*	18	259	512
Herring gull	*Larus argentatus*	36	225	1,002
Iceland gull	*Larus glaucoides*	<1	1	1
Lesser black-backed gull	*Larus fuscus*	93	606	2,611
Little gull	*Larus minutus*	5	121	129
Mediterranean gull	*Larus melanocephalus*	<1	1	1
Pomarine skua	*Stercorarius pomarinus*	3	29	71
Sabine's gull	*Xema sabini*	<1	1	2
Sandwich tern	*Sterna sandvicensis*	<1	9	10
Yellow-legged gull	*Larus michahelis*	<1	2	4
Herons, bitterns and egrets				
Grey heron	*Ardea cinerea*	<1	3	10
Little egret	*Egretta garzetta*	<1	1	1
Waterfowl				
Aythya duck spp.	*Aythya* spp.	<1	2	2
Duck spp.	*Anas* spp.	1	12	30
Godwit spp.	*Limosa* spp.	2	42	42
Goose spp.	-	1	13	14
Small wader sp.	-	1	29	34
Swan spp.	*Cygnus* spp.	<1	6	6
Wader spp.	-	2	37	47
Barnacle goose	*Branta leucopsis*	<1	4	4
Bean goose	*Anser fabalis*	<1	2	3
Brent goose	*Branta bernicla*	1	24	30
Common eider	*Somateria mollissima*	1	17	18
Common goldeneye	*Bucephala clangula*	<1	1	2
Common sandpiper	*Actitis hypoleucos*	<1	1	1

Species	Latin name	Monthly average	Peak	Total
Common scoter	*Melanitta nigra*	15	73	420
Dunlin	*Calidris alpina*	1	12	36
Eurasian curlew	*Numenius arquata*	2	36	55
Eurasian oystercatcher	*Haematopus ostralegus*	<1	3	10
Eurasian redshank	*Tringa totanus*	<1	6	9
Eurasian teal	*Anas crecca*	<1	4	9
Eurasian wigeon	*Anas penelope*	<1	8	8
Golden plover	*Pluvialis apricaria*	<1	2	5
Goosander	*Mergus merganser*	<1	3	5
Green sandpiper	*Tringa ochropus*	<1	1	1
Greenshank	*Tringa nebularia*	<1	1	1
Grey phalarope	*Phalaropus fulicarius*	<1	3	12
Greylag goose	*Anser anser*	<1	10	11
Jack snipe	*Lymnocryptes minimus*	<1	1	1
Little stint	*Calidris minuta*	<1	1	1
Long-tailed duck	*Clangula hyemalis*	<1	1	2
Mallard	*Anas platyrhynchos*	<1	3	6
Northern lapwing	*Vanellus vanellus*	1	13	19
Pink-footed goose	*Anser brachyrhynchus*	2	50	50
Pintail	*Anas acuta*	<1	2	3
Pochard	*Aythya ferina*	<1	3	3
Purple Sandpiper	*Calidris maritima*	<1	1	1
Red knot	*Calidris canutus*	1	14	18
Ringed plover	*Charadrius hiaticula*	<1	3	9
Ruddy turnstone	*Arenaria interpres*	1	10	19
Ruff	*Philomachus pugnax*	<1	3	3
Sanderling	*Calidris alba*	<1	3	6
Tufted duck	*Aythya fuligula*	<1	2	2
Velvet scoter	*Melanitta fusca*	<1	5	13
Whimbrel	*Numenius phaeopus*	1	19	34
White-fronted goose	*Anser albifrons*	<1	2	2
Birds of prey and owls				
Owl spp.	-	<1	1	1
Eurasian sparrowhawk	*Accipiter nisus*	<1	4	10
Hobby	*Falco subbuteo*	<1	1	1
Kestrel	*Falco tinnunculus*	<1	3	13
Long-eared owl	*Asio otus*	<1	5	6
Merlin	*Falco columbarius*	<1	1	2
Osprey	*Pandion haliaetus*	<1	1	1
Short-eared owl	*Asio flammeus*	1	12	26

Species	Latin name	Monthly average	Peak	Total
Terrestrial and passerines				
Acrocephalus warbler spp.	*Acrocephalus* spp.	<1	1	1
Crest spp.	-	<1	1	1
Finch spp.	-	<1	2	2
Hirundines spp.	*Hirundinidae* spp.	<1	2	2
Lark spp.	-	<1	1	1
Locustella warbler spp.	-	<1	1	1
Phylloscopus warbler spp.	*Phylloscopus* spp.	<1	2	3
Pipit spp.	-	<1	2	4
Thrush spp.	-	7	169	206
Unidentified bunting	-	<1	1	1
Unidentified passerine	-	1	15	34
Warbler spp.	-	<1	3	7
Barn swallow	*Hirundo rustica*	2	31	64
Black redstart	*Phoenicurus ochruros*	<1	5	8
Blackcap	*Sylvia atricapilla*	1	8	25
Bluethroat	*Luscinia svecica*	<1	1	2
Brambling	*Fringilla montifringilla*	1	9	20
Carrion crow	*Corvus corone*	<1	3	7
Chaffinch	*Fringilla coelebs*	3	77	90
Chiffchaff	*Phylloscopus collybita*	2	12	51
Collared dove	*Streptopelia decaocto*	1	3	15
Common blackbird	*Turdus merula*	8	174	223
Common crossbill	*Loxia curvirostra*	<1	1	1
Common linnet	*Carduelis cannabina*	<1	1	1
Common redpoll	*Carduelis flammea*	<1	1	1
Common starling	*Sturnus vulgaris*	47	411	1,321
Common swift	*Apus apus*	1	4	18
Dark-eyed junco	*Junco hyemalis*	<1	1	1
Feral pigeon	*Columba livia*	<1	3	3
Fieldfare	*Turdus pilaris*	5	88	130
Garden warbler	*Sylvia borin*	<1	2	5
Goldcrest	*Regulus regulus*	<1	9	13
Grasshopper warbler	*Locustella naevia*	<1	4	5
Greenfinch	*Carduelis chloris*	<1	1	1
Grey wagtail	*Motacilla cinerea*	<1	1	2
House martin	*Delichon urbicum*	<1	7	11
Jackdaw	*Corvus monedula*	<1	1	1
Lapland bunting	*Calcarius lapponicus*	<1	5	6
Lesser whitethroat	*Sylvia curruca*	<1	1	1

Species	Latin name	Monthly average	Peak	Total
Marsh warbler	*Acrocephalus palustris*	<1	1	1
Meadow pipit	*Anthus pratensis*	7	113	192
Northern wheatear	*Oenanthe oenanthe*	1	6	25
Pallas's reed bunting	*Emberiza pallasi*	<1	1	1
Pied flycatcher	*Ficedula hypoleuca*	<1	1	2
Pied wagtail	*Motacilla alba*	1	4	26
Redstart	*Phoenicurus phoenicurus*	1	5	17
Redwing	*Turdus iliacus*	21	300	593
Reed bunting	*Emberiza schoeniclus*	<1	3	6
Reed warbler	*Acrocephalus scirpaceus*	<1	5	10
Ring ouzel	*Turdus torquatus*	<1	2	2
Robin	*Erithacus rubecula*	1	10	27
Sand martin	*Riparia riparia*	<1	1	1
Sedge warbler	*Acrocephalus schoenobaenus*	<1	1	1
Siskin	*Carduelis spinus*	<1	3	6
Skylark	*Alauda arvensis*	<1	2	11
Snow bunting	*Plectrophenax nivalis*	<1	2	4
Song thrush	*Turdus philomelos*	3	44	97
Tree pipit	*Anthus trivialis*	<1	1	1
Waxwing	*Bombycilla garrulus*	2	50	53
Whinchat	*Saxicola rubetra*	<1	1	3
Whitethroat	*Sylvia communis*	<1	2	3
Willow warbler	*Phylloscopus trochilus*	<1	2	7
Woodcock	*Scolopax rusticola*	<1	4	10
Woodpigeon	*Columba palumbus*	1	4	15
Wren	*Troglodytes troglodytes*	<1	4	7
Yellow wagtail	*Motacilla flava*	<1	2	4

4.1.2. The average monthly population estimates for key species within the Dogger Bank Zone, based on modelling of the combined aerial and boat-based surveys and extrapolations from densities obtained from boat-based surveys are presented in **Table 4.2** (based on the mean of the figures presented in Tables 3.4, 3.5, and 3.6 in **Appendix 11A**).

Table 4.2 Average monthly baseline population estimates for key species within the Dogger Bank Zone based on combined aerial and boat-based survey data

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Arctic skua	2	1	1	1	2	3	10	21	33	20	9	3
Arctic tern[1]					38							
Atlantic puffin	4,325	6,217	6,212	2,387	1,468	826	557	570	3,793	5,638	3,130	3,954
Black-headed gull[1]		41					156					
Black-legged kittiwake	15,404	32,057	58,160	26,009	32,718	26,167	18,766	9,880	5,151	11,752	9,787	10,800
Common guillemot	61,252	90,183	104,935	105,160	41,807	27,955	17,522	34,615	41,391	42,519	45,551	44,811
Common gull[1]		56					154					
Common scoter[1]								166				
European storm-petrel									336			
Great black-backed gull	1,862	1,658	1,234	776	495	303	233	237	312	460	705	1,029
Great skua	10	8	8	8	11	16	35	54	64	56	35	19
Herring gull[1]	317									317		
Lesser black-backed gull	54	138	295	663	1,532	1,585	1,077	380	100	40	25	25
Little auk	16,807	5,456	982	183	38	15	2	4	68	1,178	7,598	14,315
Little gull[1]										208		
Northern fulmar	1,029	1,994	3,020	3,844	10,716	8,558	6,223	3,343	1,956	1,969	1,137	923
Northern gannet	779	2,434	10,312	3,447	5,782	3,027	2,793	2,474	1,683	8,862	2,743	963
Pomarine skua[1]									62			
Razorbill	17,895	32,025	34,613	35,888	3,502	27,955	703	3,457	6,157	21,823	14,424	8,994
Sooty shearwater[1]								88				
White-billed diver[1]	80										80	

[1] Numbers of birds were insufficient to estimate monthly population estimates through the preferred modelling approach.

4.1.3. The species with low numbers of sightings during all surveys (as listed in Ta**ble 4.3**) have not been assessed as the data has not enabled population estimates to be derived. This indicates that negligible usage and presence occurs within Dogger Bank Teesside A & B by these species.

Table 4.3 Monthly population estimates within Dogger Bank Teesside A & B for less numerous seabirds

Species	Months present	Monthly population estimates			Population 1% threshold	
		Dogger Bank Teesside A	Dogger Bank Teesside B	Dogger Bank Teesside A & B[1]	GB	Biogeo-graphic
Arctic tern	May-Sep	3	4	7	1,590*	20,000
Black-headed gull	Feb-May	4	4	8	22,000	42,100
	Jul-Nov	14	14	28	3,900*	
Common gull	Feb-May	5	5	10	7,000	16,400
	Jul-Nov	13	14	28	1,440*	
Common scoter	Aug-Dec	16	16	32	1,000	5,500
European storm-petrel	Sep	30	31	61	780*	14,700
Herring gull	Oct-May	28	29	58	7,300	10,200
Little gull	Oct	19	19	38	-	1,100
Pomarine skua	Sep-Oct	6	6	11	-	16,250
Sooty shearwater	Aug-Nov	9	8	16	-	200,000
White-billed diver	Nov-Apr	7	7	15	-	100

[1] In cases where the combined population estimate for Dogger Bank Teesside A & B differs to the total of that presented for each project, this is due to overlap in the buffer extents. This comment applies throughout the chapter.
* Breeding season population threshold.

4.1.4. The following presents a description of the baseline population estimates for Dogger Bank Teesside A and Dogger Bank Teesside B, and Dogger Bank Teesside A & B, with and without 2km buffer extents, for the years 2010 and 2011 for key species, presented in alphabetical order.

Arctic skua

4.1.5. Baseline population estimates of Arctic skua are presented in **Table 4.4**, and full details, including monthly counts, are presented in Tables 3.16, 3.17 and 3.18 in **Appendix 11A**. The Arctic skua are a breeding feature of 12 SPAs and a passage feature of two SPAs (see Appendix 1 in **Appendix 11A**) in the Greater North Sea region, in addition to Arctic skua being a feature of a Ramsar site and five SSSIs (not including those already covered by the SPA designation). Arctic skua are also a UK BAP species and appear on the Birds of Conservation Concern Red list (Eaton *et al*., 2009). The 1% threshold for populations of national or international importance for Arctic skua were not exceeded for Dogger Bank Teesside A & B. As a result, Arctic skua is considered to be a Very High value receptor.

Table 4.4 Baseline population estimates for Arctic skua within Dogger Bank Teesside A, Dogger Bank Teesside B, Dogger Bank Teesside A & B ('Project' column in the table) and including the 2km buffer ('+Buffer' column in the table)

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
2010	January	0	0	0	0	0	0
	February	0	0	0	0	0	0
	March	0	0	0	0	0	0
	April	0	0	0	0	0	0
	May	0	0	0	0	0	0
	June	0	0	0	0	0	0
	July	0	0	0	0	0	1
	August	1	1	0	1	1	2
	September	1	2	1	2	3	4
	October	1	2	1	2	3	3
	November	1	1	1	1	2	2
	December	0	1	1	1	1	1
2011	January	0	0	0	0	0	1
	February	0	0	0	0	0	0
	March	0	0	0	0	0	0
	April	0	0	0	0	0	0
	May	0	0	0	0	0	1
	June	1	1	0	1	1	1
	July	1	2	1	2	3	4
	August	3	4	1	4	6	9
	September	4	6	3	5	8	11
	October	3	4	4	3	5	7
	November	1	1	3	1	2	3
	December	0	0	1	0	1	1
2012	January	0	0	0	0	0	0
	February	0	0	0	0	0	0
	March	0	0	0	0	0	0
	April	0	0	0	0	0	0
	May	0	0	0	0	0	0
	June	0	0	0	0	0	1

4.1.6. The distribution of Arctic skua (see Figures 3.14, 3.15 and 3.16 in **Appendix 11A**) shows that their highest densities occur in the southern part of the Dogger Bank Zone, and are generally present in higher densities within Dogger Bank Teesside A & B than the northern areas of the Zone.

Arctic tern

4.1.7. Arctic terns were present within the Dogger Bank Zone between May and September when an average of three birds each month was estimated within Dogger Bank Teesside A, an estimated four birds each month in Dogger Bank Teesside B, and an estimated seven birds each month in Dogger Bank Teesside A & B (see **Table 4.3**).

4.1.8. Arctic terns are a breeding feature of 56 SPAs and a passage feature of six SPAs within the Greater North Sea region (see Appendices 1 and 2 in **Appendix 11A**). Furthermore, Arctic tern is also a Ramsar and SSSI feature and is classified as an EU Birds Directive Annex 1 species, and is listed on the Birds of Conservation Concern Amber list (Eaton *et al*., 2009). As a result, whilst the population values do not exceed the 1% threshold for national or regional importance due to its designated status, Arctic tern is considered to be a Very High value receptor.

Atlantic puffin

4.1.9. Baseline population estimates for Atlantic puffin are presented in **Table 4.5**, and full details, including monthly counts, are presented in Tables 3.40, 3.41 and 3.42 in **Appendix 11A**. The Atlantic puffin is a breeding feature of 16 SPAs in the Greater North Sea region (see Appendices 1 and 2 in **Appendix 11A**), as well as being a Ramsar and SSSI feature, and also appearing on the Birds of Conservation Concern Amber list (Eaton *et al*. 2009). Despite populations not exceeding the 1% population threshold for national and international importance within Dogger Bank Teesside A and Dogger Bank Teesside B, Atlantic puffin is considered to be a Very High value receptor.

Table 4.5 Baseline population estimates for Atlantic puffin for Dogger Bank Teesside A, Dogger Bank Teesside B, Dogger Bank Teesside A & B ('Project' column in the table) and including the 2km buffer ('+Buffer' column in the table)

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
2010	January	124	169	150	205	274	372
	February	201	275	234	318	435	594
	March	219	300	252	341	471	642
	April	49	68	62	83	111	152
	May	34	47	44	60	78	107
	June	21	30	27	37	49	67
	July	12	16	17	23	29	40
	August	12	16	17	22	28	38
	September	98	136	209	288	308	425
	October	136	188	289	397	425	586
	November	193	265	213	290	406	553
	December	422	577	448	609	870	1,185
2011	January	418	573	399	541	817	1,115
	February	452	619	432	586	883	1,208
	March	582	799	608	823	1,189	1,624
	April	125	172	159	217	284	392
	May	70	96	91	124	161	222
	June	35	48	46	63	81	111
	July	17	24	24	33	42	57
	August	9	12	12	17	21	29
	September	28	38	60	82	87	120
	October	22	30	45	62	67	92
	November	21	29	23	31	44	60

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
	December	50	68	51	70	101	138
2012	January	61	84	64	87	125	171
	February	155	212	155	211	310	424
	March	148	203	170	231	318	433
	April	40	55	50	68	90	123
	May	34	46	44	60	78	105
	June	24	33	31	42	55	76

4.1.10. The distribution of Atlantic puffin (see Figures 3.62, 3.63 and 3.64 in **Appendix 11A**) shows that the greatest densities occur in in the western and north-eastern areas of the Dogger Bank Zone. Dogger Bank Teesside A and Dogger Bank Teesside B are generally in areas of below average density for Atlantic puffin compared to the Zone as a whole.

Black-legged kittiwake

4.1.11. Baseline population estimates for black-legged kittiwake are presented in **Table 4.6**, and full details are presented in Tables 3.22, 3.23 and 3.24 in **Appendix 11A**. Black-legged kittiwake are a breeding feature of 24 SPAs, a wintering feature of four SPAs and a passage feature of six SPAs (see Appendix 1 in **Appendix 11A**), with black-legged kittiwake also on the Birds of Conservation Concern Amber list (Eaton *et al*. 2009), and on the OSPAR list of threatened species in addition to being a Ramsar and SSSI feature. The 1% threshold for populations of national or international importance for black-legged kittiwake were not exceeded for Dogger Bank Teesside A & B. Despite the thresholds not being exceeded in Dogger Bank Teesside A, Dogger Bank Teesside B, or Dogger Bank Teesside A & B, black-legged kittiwake is considered to be a Very High value receptor.

Table 4.6 Baseline population estimates for black-legged kittiwake within Dogger Bank Teesside A, Dogger Bank Teesside B, Dogger Bank Teesside A & B ('Project' column in the table) and including the 2km buffer ('+Buffer' column in the table)

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
2010	January	731	996	1,253	1,712	1,985	2,708
	February	1,386	1,897	2,189	2,978	3,576	4,876
	March	2,196	3,006	3,398	4,604	5,594	7,613
	April	652	896	1,006	1,362	1,659	2,257
	May	874	1,204	1,422	1,931	2,295	3,130
	June	832	1,145	1,331	1,813	2,163	2,948
	July	421	580	799	1,086	1,220	1,657
	August	273	376	518	704	790	1,080
	September	364	503	690	941	1,055	1,442
	October	762	1,043	1,186	1,617	1,948	2,663
	November	618	846	902	1,230	1,520	2,076

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
	December	1,044	1,425	1,439	1,958	2,483	3,378
2011	January	885	1,210	1,037	1,407	1,922	2,619
	February	1,499	2,053	1,742	2,362	3,242	4,412
	March	4,889	6,702	6,487	8,773	11,376	15,465
	April	1,648	2,271	2,564	3,471	4,211	5,752
	May	1,592	2,194	2,555	3,445	4,146	5,640
	June	1,058	1,455	1,776	2,400	2,834	3,850
	July	575	791	988	1,333	1,564	2,126
	August	240	331	422	570	663	902
	September	136	188	240	325	376	513
	October	223	305	321	435	544	740
	November	150	205	212	287	362	493
	December	315	431	406	550	720	980
2012	January	362	496	492	669	854	1,166
	February	2,123	2,900	2,703	3,672	4,826	6,571
	March	3,540	4,853	5,507	7,476	9,047	12,341
	April	1,193	1,644	1,819	2,464	3,012	4,110
	May	1,235	1,705	1,999	2,708	3,234	4,413
	June	760	1,048	1,236	1,675	1,996	2,720

4.1.12. The distribution of black-legged kittiwake (see Figures 3.26, 3.27 and 3.28 in **Appendix 11A**) shows that their highest densities generally occur in the south-western reaches of the Dogger Bank Zone, and generally at moderate to high densities in Dogger Bank Teesside A & B relative to the rest of the Zone. However, densities are often slightly lower in Dogger Bank Teesside A than in Dogger Bank Teesside B.

Black-headed gull

4.1.13. Black-headed gull were present in the Dogger Bank Zone in every month in 2010 and 2011 with the exception of June and December. Between February and May an estimated four birds in Dogger Bank Teesside A, an estimated four birds in Dogger Bank Teesside B, and an estimated eight birds in Dogger Bank Teesside (see **Table 4.3**). Between July and November this increased to an estimated 14 birds in Dogger Bank Teesside A, an estimated 14 birds in Dogger Bank Teesside B, and an estimated 28 birds in Dogger Bank Teesside A & B.

4.1.14. Black-headed gull located in the Greater North Sea region are a breeding feature of five SPAS, a wintering feature of one SPA, and a passage feature of two SPAs (see Appendix 1 in **Appendix 11A**) as well as being a Ramsar feature and a SSSI feature (including two additional SSSIs not part of the SPAs) while being listed on the Birds of Conservation Concern Amber list (Eaton *et al*. 2009). Despite the black-headed gull numbers constituting a level below the 1% threshold for national and regional importance, black-headed gull is considered to be a Very High value receptor.

Common guillemot

4.1.15. Baseline population estimates for common guillemot are presented in **Table 4.7**, and full details, including monthly counts, are presented in Tables 3.31, 3.32 and 3.33 in **Appendix 11A**. Common guillemot are a breeding feature of 26 SPAs, a wintering feature of 11 SPAs, and a passage feature of one SPA within the Greater North Sea region (see Appendices 1 and 2 in **Appendix 11A**). Common guillemot is also a Ramsar and SSSI feature, as well as appearing on the Birds of Conservation Concern Amber list (Eaton *et al*. 2009). The population of common guillemot within the Dogger Bank Zone as a whole surpassed the 1% threshold for populations of national importance in the breeding season and surpassed the 1% threshold for international importance in the winter. However, for Dogger Bank Teesside A and Dogger Bank Teesside B, the 1% threshold for breeding populations of national or international importance were not exceeded. Consequently, due to its designated status, common guillemot is considered to be a Very High value receptor.

Table 4.7 Baseline population estimates for common guillemot for Dogger Bank Teesside A, Dogger Bank Teesside B, Dogger Bank Teesside A & B ('Project' column in the table) and including the 2km buffer ('+Buffer' column in the table)

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
2010	January	3,122	4,251	5,707	7,805	8,829	12,042
	February	3,619	4,949	6,150	8,370	9,769	13,317
	March	3,410	4,667	5,700	7,730	9,110	12,396
	April	2,535	3,464	3,569	4,853	6,105	8,320
	May	366	503	732	1,006	1,098	1,507
	June	319	437	626	864	945	1,302
	July	201	276	460	634	661	910
	August	284	392	920	1,278	1,204	1,670
	September	613	848	1,980	2,766	2,593	3,617
	October	2,359	3,230	3,969	5,418	6,328	8,650
	November	2,558	3,499	4,048	5,524	6,606	9,019
	December	4,196	5,726	6,317	8,597	10,513	14,323
2011	January	2,852	3,898	3,815	5,181	6,667	9,074
	February	3,207	4,386	4,238	5,759	7,445	10,157
	March	6,469	8,862	9,719	13,180	16,188	22,051
	April	6,546	8,974	9,638	13,146	16,184	22,112
	May	875	1,202	1,787	2,448	2,662	3,650
	June	610	837	1,298	1,781	1,908	2,627
	July	362	497	786	1,077	1,148	1,573
	August	237	327	733	1,016	970	1,344
	September	143	198	448	623	591	820
	October	307	419	494	672	800	1,093
	November	252	344	399	543	651	887
	December	603	824	877	1,193	1,480	2,017
2012	January	782	1,070	1,172	1,598	1,954	2,670
	February	3,922	5,356	5,568	7,571	9,490	12,930

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
	March	5,649	7,739	9,645	13,117	15,293	20,837
	April	6,681	9,156	9,489	12,932	16,170	22,088
	May	991	1,364	2,004	2,753	2,995	4,117
	June	645	887	1,310	1,799	1,955	2,687

4.1.16. The distribution of common guillemot (see Figures 3.44, 3.45 and 3.46 in **Appendix 11A**) shows that the greatest densities occur in south-west areas of the Dogger Bank Zone. Densities are generally below average for the Zone within both Dogger Bank Teesside A and Dogger Bank Teesside B for most of the year, though often higher in Dogger Bank Teesside B than Dogger Bank Teesside A.

Common gull

4.1.17. Common gull were present in the Dogger Bank Zone in every month with the exception of June and December. In the months between February and May, an estimated five birds were in Dogger Bank Teesside A, an estimated five birds in Dogger Bank Teesside B, and an estimated ten birds in Dogger Bank Teesside A & B (see **Table 4.1**). In the months between July and November, an estimated 13 birds were in Dogger Bank Teesside A, an estimated 14 birds in Dogger Bank Teesside B, and an estimated 28 birds in Dogger Bank Teesside A & B (see **Table 4.3**).

4.1.18. The common gull is a breeding feature of two SPAs, a wintering feature of six SPAs, and a passage feature of two SPAs in the Greater North Sea region (see Appendix 1 in **Appendix 11A**). In addition, common gull is a Ramsar and SSSI feature and is present on the Birds of Conservation Concern Amber list (Eaton *et al*. 2009). Despite its numbers comprising a level significantly below the 1% threshold for national and regional importance, common gull is considered to be a Very High value receptor.

Common scoter

4.1.19. Common scoter were present throughout the Dogger Bank Zone between August and December, with an average of 16 birds estimated within Dogger Bank Teesside A, and 16 birds estimated within Dogger Bank Teesside B, and an estimate of 32 birds for Dogger Bank Teesside A & B (see **Table 4.3**). Consequently, the population of common scoter was not assessed as important within Dogger Bank Teesside A & B, as they do not achieve national (0.03% of national population) or internationally important numbers.

4.1.20. Common scoter is a breeding feature of one SPA, a wintering feature of 27 SPAs, and a passage feature of a further six in the Greater North Sea region (see Appendices 1 and 2 in **Appendix 11A**). It is also a Ramsar and SSSI feature, as well as a Wildlife & Countryside Act 1981 Schedule 1 species, a UK BAP species and is present on the Birds of Conservation Concern Red List (Eaton *et al*. 2009) and is considered to be a Very High value receptor.

European storm-petrel

4.1.21. European storm-petrel were present in the Dogger Bank Zone in the month of September when an average of 30 birds were estimated within Dogger Bank Teesside A, an estimated 31 birds in Dogger Bank Teesside B, and an estimated 61 birds in Dogger Bank Teesside A & B (see **Table 4.3**). These populations are not of regional, national or international importance.

4.1.22. European storm-petrel is a breeding feature of five SPAs in the Greater North Sea region and a passage feature in an additional SPA (see Appendix 1 in **Appendix 11A**). It is also a Ramsar and SSSI feature, as well as qualifying as an EU Birds Directive Annex 1 species and appearing on the Birds of Conservation Concern Amber list (Eaton *et al*. 2009). As a result of these criteria, the European storm-petrel is considered to be a Very High value receptor.

Great black-backed gull

4.1.23. Baseline population estimates for great black-backed gull are presented in **Table 4.8**, and full details are presented in Tables 3.28, 3.29 and 3.30 in **Appendix 11A**. The great black-backed gull is a breeding feature of 17 SPAs and a wintering feature of two SPAs within the Greater North Sea region (see Appendix 1 in **Appendix 11A**), as well as being a SSSI and Ramsar feature. Great black-backed gull also appear on the Birds of Conservation Concern Amber list (Eaton *et al*. 2009). The peak monthly numbers in the individual project areas and Dogger Bank Teesside A & B do not exceed the population threshold of national importance for wintering or breeding great black-backed gull. Due to its protected status, great black-backed gull is considered to be a Very High value receptor.

Table 4.8 Baseline population estimates for great black-backed gull for Dogger Bank Teesside A, Dogger Bank Teesside B, Dogger Bank Teesside A & B ('Project' column in the table) and including the 2km buffer ('+Buffer' column in the table)

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
2010	January	155	212	204	277	360	488
	February	97	133	124	167	221	301
	March	54	75	69	93	123	167
	April	33	45	27	37	60	83
	May	20	27	17	23	37	50
	June	13	18	11	15	24	34
	July	9	13	8	11	18	24
	August	10	14	9	13	20	27
	September	17	24	22	30	40	54
	October	27	37	35	47	62	84
	November	50	69	63	85	113	154
	December	104	143	126	170	230	310
2011	January	113	155	130	175	243	330
	February	111	153	128	173	240	327
	March	109	149	132	178	241	327

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
	April	74	102	57	77	131	179
	May	41	56	32	43	73	99
	June	24	33	19	25	43	58
	July	18	25	14	19	32	44
	August	17	23	14	18	30	42
	September	19	26	24	32	43	59
	October	23	32	29	39	52	70
	November	30	42	38	51	68	92
	December	52	71	62	83	113	154
2012	January	51	70	62	83	113	154
	February	81	111	95	129	177	240
	March	69	95	88	119	158	213
	April	60	83	48	64	108	144
	May	38	52	32	43	69	94
	June	20	28	17	22	37	50

4.1.24. The distribution of great black-backed gull (see Figures 3.38, 3.39 and 3.40 in **Appendix 11A**) shows that the greatest densities occur in south-western and western areas of the Dogger Bank Zone (Tranche A area). The densities in Dogger Bank Teesside A are generally lower on average compared to the whole Zone, whilst the densities in Dogger Bank Teesside B are often above average, though it lies outside the areas of peak density for great black-backed gull.

Great skua

4.1.25. Baseline population estimates for great skua are presented in **Table 4.9**, and full details, including monthly counts, are presented in Tables 3.19, 3.20 and 3.21 in **Appendix 11A**. Great skua is a Ramsar and SSSI feature and appears on the Birds of Conservation Concern Amber list (Eaton *et al*. 2009). Great skua is also a breeding feature of seven SPAs and a passage feature of two SPAs in the Greater North Sea region (see Appendix 1 in **Appendix 11A**). The 1% threshold for populations of national or international importance for great skua were not exceeded for Dogger Bank Teesside A & B, though it is likely these are underestimates due to the turnover of birds through the passage season. As a result, great skua is considered to be a Very High value receptor.

4.1.26. The distribution of great skua (see Figures 3.20, 3.21 and 3.22 in **Appendix 11A**) shows that their highest densities generally occur in the southern half of the Dogger Bank Zone (in which Dogger Bank Teesside A & B islocated). However, the small population estimates prohibit an in-depth interpretation of distribution.

Table 4.9 Baseline population estimates for great skua within Dogger Bank Teesside A, Dogger Bank Teesside B, Dogger Bank Teesside A & B ('Project' column in the table) and including the 2km buffer ('+Buffer' column in the table)

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
2010	January	0	0	0	0	0	0
	February	0	0	0	0	0	0
	March	0	0	0	0	0	0
	April	0	0	0	0	0	0
	May	0	0	0	0	1	1
	June	1	1	0	1	1	1
	July	1	1	0	1	2	2
	August	1	2	1	2	3	3
	September	2	2	1	2	3	4
	October	2	2	1	2	4	5
	November	2	2	1	2	3	5
	December	1	2	0	2	3	4
2011	January	1	1	0	1	2	3
	February	1	1	0	1	2	2
	March	1	1	0	1	1	2
	April	1	1	0	1	2	2
	May	1	2	0	2	2	3
	June	2	3	1	3	4	5
	July	4	5	1	5	7	10
	August	6	8	3	8	12	16
	September	6	9	4	9	13	18
	October	5	7	3	7	10	14
	November	3	3	1	4	5	7
	December	1	1	0	1	2	3
2012	January	0	1	0	1	1	1
	February	0	0	0	0	1	1
	March	0	0	0	0	1	1
	April	0	0	0	0	1	1
	May	0	0	0	0	1	1
	June	0	1	0	1	1	1

Herring gull

4.1.27. Herring gulls were present in the Dogger Bank Zone between October and May when an average of 28 birds each month was estimated within Dogger Bank Teesside A, an estimated 29 birds each month in Dogger Bank Teesside B, and an estimated 58 birds each month in Dogger Bank Teesside A & B (see **Table 4.3**).

4.1.28. The herring gull is a breeding feature of 30 SPAs, a wintering feature of two SPAs, and a passage feature of two SPAs, within the Greater North Sea region (see Appendix 1 in **Appendix 11A**), as well as a Ramsar, SSSI and Birds of Conservation Concern Red list feature (Eaton *et al*. 2009). The average monthly numbers of herring gull present in Dogger Bank Teesside A and Dogger

Bank Teesside B and the buffer zone (28 and 29 respectively) or Dogger Bank Teesside A & B and the buffer zone (58) do not exceed the population threshold of national importance for wintering (7,300) or breeding (2,629) herring gull. Due to its protected status, herring gull is considered to be a Very High value receptor.

Lesser black-backed gull

4.1.29. Baseline population estimates for lesser black-backed gull are presented in **Table 4.10**, and full details, including monthly counts, are presented in Tables 3.25, 3.26 and 3.27 in **Appendix 11A**. Lesser black-backed gull is a SSSI and Ramsar feature, as well as a breeding feature of 21 SPAs, a wintering feature of two SPAs, and a passage feature of three SPAs in the Greater North Sea region (see Appendix 1 in **Appendix 11A**). They are also present on the Birds of Conservation Concern Amber list (Eaton *et al*. 2009). The populations present do not exceed the population threshold of national importance for wintering or breeding lesser black-backed gull. Due to its protected status, lesser black-backed gull is considered to be a Very High value receptor.

Table 4.10 Baseline population estimates for lesser black-backed gull within Dogger Bank Teesside A, Dogger Bank Teesside B, Dogger Bank Teesside A & B ('Project' column in the table) and including the 2km buffer ('+Buffer' column in the table)

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
2010	January	8	11	7	9	15	20
	February	18	24	15	20	32	44
	March	41	56	34	46	75	101
	April	87	118	61	83	148	201
	May	174	238	141	191	315	431
	June	201	275	160	218	361	498
	July	82	113	77	104	159	216
	August	27	37	25	34	52	72
	September	13	18	11	15	24	33
	October	3	4	2	3	5	7
	November	1	1	1	1	2	3
	December	1	2	1	1	2	3
2011	January	2	2	1	1	3	4
	February	5	7	3	4	8	11
	March	33	45	24	33	57	78
	April	88	120	64	87	152	210
	May	108	148	81	110	189	256
	June	69	94	55	74	124	169
	July	32	43	26	35	58	79
	August	12	17	10	13	22	29
	September	7	10	6	8	13	17
	October	4	5	3	4	6	9
	November	3	4	2	3	5	7
	December	6	8	4	6	11	14

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
2012	January	6	9	5	7	11	15
	February	27	36	19	25	45	61
	March	36	49	30	41	66	90
	April	47	65	33	45	80	110
	May	55	75	44	59	99	135
	June	52	71	40	54	91	124

4.1.30. The distribution of lesser black-backed gulls (see Figures 3.32, 3.33 and 3.34 in **Appendix 11A**) shows that the greatest densities occur in the east and west side of the Dogger Bank Zone. Both Dogger Bank Teesside A & B are likely to have above average densities than the Zone as a whole, and particularly so for Dogger Bank Teesside A.

Little auk

4.1.31. Baseline population estimates for little auk are presented in **Table 4.11**, and full details, including monthly counts, are presented in Tables 3.37, 3.38 and 3.39 in **Appendix 11A**. The little auk is not a feature of any SPA or designation in the Greater North Sea region (see Appendix 1 in **Appendix 11A**) and is not included in any UK or EU conservation listing. Although there is no national threshold for this species, due to the high numbers estimated to occur within Dogger Bank Teesside A and Dogger Bank Teesside B this species is considered to be present in nationally important numbers. Numbers present within Dogger Bank Teesside A & B did not exceed the 1% threshold for international importance. Overall, despite its lack of designation, little auk is considered to be a High value receptor.

Table 4.11 Baseline population estimates for little auk for Dogger Bank Teesside A, Dogger Bank Teesside B, Dogger Bank Teesside A & B ('Project' column in the table) and including the 2km buffer ('+Buffer' column in the table)

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
2010	January	828	1,136	1,281	1,723	2,108	2,860
	February	243	336	329	440	572	773
	March	41	57	55	73	96	130
	April	4	6	4	5	8	11
	May	1	1	1	1	2	3
	June	0	0	0	0	1	1
	July	0	0	0	0	0	0
	August	0	0	0	1	1	1
	September	8	11	11	15	19	26
	October	43	60	58	79	102	139
	November	279	386	336	452	615	838
	December	1,809	2,492	1,965	2,631	3,774	5,117

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
2011	January	813	1,122	696	931	1,510	2,056
	February	308	426	256	343	564	769
	March	151	210	160	214	312	424
	April	17	23	17	23	34	47
	May	2	3	2	3	5	6
	June	1	1	1	1	1	2
	July	0	0	0	1	1	1
	August	1	1	1	1	1	2
	September	4	5	5	6	8	11
	October	15	21	18	24	33	45
	November	77	107	91	121	168	228
	December	600	830	606	810	1,206	1,641
2012	January	218	302	233	313	452	614
	February	253	348	244	326	196	677
	March	25	35	34	45	59	80
	April	4	6	4	5	8	11
	May	2	3	2	3	4	5
	June	2	2	2	2	3	4

4.1.32. The distribution of little auk (see Figures 3.50, 3.51 and 3.52 in **Appendix 11A**) changes throughout the year with the highest densities occurring in the west, north, and north-east of the Zone. Dogger Bank Teesside A and Dogger Bank Teesside B are generally in areas of below average density for little auk compared to the Zone as a whole.

Little gull

4.1.33. Little gull were present in the Dogger Bank Zone in October only, with an average of 19 birds estimated in Dogger Bank Teesside A, an estimated 19 birds in Dogger Bank Teesside B, and an estimated 38 birds in Dogger Bank Teesside A & B (see **Table 4.3**).

4.1.34. Little gull are a Ramsar and SSSI feature, as well as a breeding feature of one SPA, a wintering feature of four SPAs, and a passage feature of eight SPAs in the Greater North Sea region (see Appendix 1 in **Appendix 11A**). Little gull also occurs in the Birds of Conservation Concern Amber list (Eaton *et al*. 2009), though its numbers reflect a level below the 1% threshold for regional and national importance. However, due to its presence as a feature designation in a number of designated sites, it is therefore considered to be a Very High value receptor.

Northern fulmar

4.1.35. The baseline monthly population estimates for northern fulmar are presented in **Table 4.12**, and full details are presented in Tables 3.10, 3.11 and 3.12 in **Appendix 11A**. Numbers of northern fulmar in the Dogger Bank Zone as a whole surpassed the 1% threshold for populations of national importance in the 2010 breeding season, but not for the combined areas of Dogger Bank Teesside

A and Dogger Bank Teesside B (peak was 0.1% of national population in May 2010).

Table 4.12 Baseline population estimates for northern fulmar within Dogger Bank Teesside A, Dogger Bank Teesside B, Dogger Bank Teesside A & B ('Project' column in the table) and including the 2km buffer ('+Buffer' column in the table)

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
2010	January	29	39	43	58	72	97
	February	92	127	131	177	223	303
	March	143	196	148	200	292	397
	April	317	434	289	390	606	825
	May	569	781	540	732	1,110	1,517
	June	564	773	528	716	1,091	1,492
	July	253	347	268	364	522	711
	August	107	146	114	154	220	300
	September	71	97	75	102	145	199
	October	49	67	69	93	118	161
	November	32	44	44	59	76	103
	December	45	62	59	80	104	141
2011	January	46	63	56	75	102	138
	February	72	98	87	117	158	217
	March	89	122	72	97	161	218
	April	102	140	81	109	183	249
	May	98	135	79	107	177	243
	June	91	125	76	103	168	228
	July	101	138	85	115	186	253
	August	110	151	96	129	206	280
	September	124	171	107	145	232	316
	October	119	163	165	224	283	388
	November	49	67	68	92	117	160
	December	37	50	48	65	85	115
2012	January	25	35	33	45	59	80
	February	98	134	123	167	221	301
	March	124	170	117	159	241	328
	April	240	329	199	270	439	599
	May	258	354	223	303	481	656
	June	124	170	108	146	231	316

4.1.36. Northern fulmar is an SPA, Ramsar and SSSI feature and is listed on the Birds of Conservation Concern Amber list (Eaton *et al*. 2009). Northern fulmar are a breeding feature of 26 SPAs and a wintering feature of two SPAs (see Appendices 1 and 2 in **Appendix 11A**), and is considered to be a Very High value receptor.

4.1.37. The distribution of northern fulmar (see Figures 3.2, 3.3 and 3.4 in **Appendix 11A**) show that the highest densities occur in the west and north-east of the Dogger Bank Zone, with moderate to high densities occurring in the north-west corner of Dogger Bank Teesside B in spring and summer 2010 and 2012, and moderate densities in Dogger Bank Teesside A in early summer in 2010 and 2012. Though both areas are generally outside the highest density areas within the Zone.

Northern gannet

4.1.38. Baseline population estimates for northern gannet are presented in **Table 4.13**, and full details are presented in Tables 3.13, 3.14 and 3.15 in **Appendix 11A**. The numbers of northern gannet in the Dogger Bank Zone as a whole were seen to surpass the 1% threshold for populations of international importance in the 2011 and 2012 breeding season, though these thresholds were not exceeded in Dogger Bank Teesside A and Dogger Bank Teesside B.

Table 4.13 Baseline population estimates for northern gannet within Dogger Bank Teesside A, Dogger Bank Teesside B, Dogger Bank Teesside A & B ('Project' column in the table) and including the 2km buffer ('+Buffer' column in the table)

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
2010	January	36	50	59	80	95	130
	February	32	44	46	62	79	107
	March	46	63	64	86	109	148
	April	8	11	9	12	17	23
	May	28	39	34	46	62	85
	June	63	88	75	100	138	188
	July	44	61	67	90	111	151
	August	29	40	44	60	74	100
	September	38	53	58	78	96	131
	October	109	150	155	209	264	359
	November	59	81	76	102	134	183
	December	108	147	128	172	235	319
2011	January	80	109	79	107	159	216
	February	163	224	159	214	322	438
	March	820	1,129	984	1,322	1,805	2,452
	April	106	147	129	174	236	321
	May	110	153	141	189	252	342
	June	104	145	142	191	247	335
	July	127	176	179	239	306	415
	August	140	194	205	275	345	469
	September	163	226	241	325	404	551
	October	442	607	597	806	1,039	1,412
	November	81	111	105	142	186	253
	December	52	71	59	80	111	151
2012	January	22	31	26	36	49	66
	February	300	410	325	438	625	847
	March	1,244	1,711	1,811	2,437	3,054	4,150
	April	379	526	434	583	813	1,111
	May	488	679	611	821	1,099	1,500
	June	152	212	191	257	344	468

4.1.39. Northern gannet is a breeding feature of nine SPAs and a wintering feature of five additional SPAs, and a passage feature of a further five SPAs in the Greater North Sea region. Furthermore, as well as being a Ramsar and an SSSI feature, they are listed on the Birds of Conservation Concern Amber list (Eaton *et al*., 2009), and is considered to be a Very High value receptor.

4.1.40. The distribution of northern gannet (see Figures 3.8, 3.9 and 3.10 in **Appendix 11A)** show that highest densities generally occur in the west and north of the Dogger Bank Zone, though in some months the highest densities occur in the south. Generally, Dogger Bank Teesside A & B experience lower or as low densities of northern gannet compared to elsewhere in the Zone, though Dogger Bank Teesside B occasionally has high densities compared to elsewhere in the Dogger Bank Zone (e.g. in March 2011 and 2012).

Pomarine skua

4.1.41. Pomarine skua were present in the Dogger Bank Zone between September and October, with an estimated six birds in Dogger Bank Teesside A, an estimated six birds in Dogger Bank Teesside B, and an estimated 11 birds in Dogger Bank Teesside A & B (see **Table 4.3**). It should be noted that, due to the turnover of birds through the passage season, this is liable to be an underestimate.

4.1.42. Pomarine skua is not a feature of any SPA or other designated site in the Greater North Sea region and is not present on any UK conservation listing. However, the populations of pomarine skua in Dogger Bank Teesside A, Dogger Bank Teesside B, and Dogger Bank Teesside A & B were assessed to be of regional importance. It is, therefore, considered to be a Medium value receptor.

Razorbill

4.1.43. Baseline population estimates for razorbill are presented in **Table 4.14**, and full details, including monthly counts, are presented in Tables 3.34, 3.35, and 3.36 in **Appendix 11A**. Razorbill is classified as a Ramsar and SSSI feature, as well as being a breeding feature of 18 SPAs, a wintering feature of five SPAs, and a passage feature of two SPAs within the Greater North Sea region (see Appendices 1 and 2 in **Appendix 11A**). Razorbill also appears on the Birds of Conservation Concern Amber list (Eaton *et al*. 2009). The 1% threshold for populations of national or international importance was not exceeded for Dogger Bank Teesside A & B. Razorbill is considered to be a Very High value receptor.

4.1.44. The distribution of razorbill (see Figures 3.50, 3.51 and 3.52 in **Appendix 11A**) shows that the greatest densities occur in south-west of the Dogger Bank Zone. Densities are generally below average for the Zone within both Dogger Bank Teesside A and Dogger Bank Teesside B for most of the year, though often higher in Dogger Bank Teesside B than Dogger Bank Teesside A.

Table 4.14 Baseline population estimates for razorbill for Dogger Bank Teesside A, Dogger Bank Teesside B, Dogger Bank Teesside A & B ('Project' column in the table) and including the 2km buffer ('+Buffer' column in the table)

Year	Month	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
		Project	+Buffer	Project	+Buffer	Project	+Buffer
2010	January	1,164	1,584	2,187	2,991	3,351	4,568
	February	1,464	2,004	2,514	3,420	3,978	5,424
	March	1,311	1,795	2,209	2,990	3,520	4,778
	April	844	1,154	1,138	1,546	1,983	2,702
	May	48	66	69	94	117	160
	June	44	60	62	84	105	145
	July	28	38	48	66	76	104
	August	42	58	148	202	190	261
	September	119	167	429	588	548	758
	October	1,176	1,611	1,984	2,706	3,161	4,326
	November	1,083	1,481	1,684	2,297	2,767	3,782
	December	1,585	2,162	2,304	3,137	3,890	5,301
2011	January	770	1,053	968	1,315	1,738	2,372
	February	867	1,187	1,069	1,452	1,936	2,643
	March	2,447	3,355	3,527	4,777	5,974	8,147
	April	3,009	4,129	4,245	5,782	7,254	9,915
	May	159	219	236	319	395	538
	June	78	107	123	166	201	274
	July	23	32	37	50	61	82
	August	6	8	19	26	24	33
	September	2	3	6	9	8	12
	October	11	15	17	23	28	38
	November	17	23	26	36	43	59
	December	124	169	171	233	295	403
2012	January	280	383	407	555	687	936
	February	2,036	2,780	2,758	3,750	4,795	6,548
	March	2,284	3,130	3,923	5,330	6,207	8,464
	April	2,464	3,379	3,321	4,523	5,785	7,894
	May	223	307	328	444	550	748
	June	350	482	518	703	869	1,186

Sooty shearwater

4.1.45. Sooty shearwater were present in the Dogger Bank Zone between the months of August and October when an average of nine birds were estimated within Dogger Bank Teesside A, an estimated eight birds within Dogger Bank Teesside B, and an estimated 16 birds in Dogger Bank Teesside A & B (see **Table 4.3**). The population within Dogger Bank Teesside A & B constitutes around 0.00008% of the biogeographic population. This population was assessed to have been of regional importance.

4.1.46. Sooty shearwater is not a feature of any SPA or other designated site within the Greater North Sea region. However, sooty shearwater is listed on the Birds of Conservation Concern Amber list (Eaton *et al*. 2009), and is considered to be a Medium value receptor.

White-billed diver

4.1.47. Individuals of white-billed diver were present within the Dogger Bank Zone between November and April, with an average of seven birds estimated in Dogger Bank Teesside A, seven birds in Dogger Bank Teesside B, and 15 birds in Dogger Bank Teesside A & B (see **Table 4.3**), values which were considered to be of regional importance.

4.1.48. The white-billed diver is not a feature of any SPA or other designated sites in the Greater North Sea region and it is not included on any UK conservation listings. The peak numbers present within Dogger Bank Teesside A & B constitute around 0.15% of the biogeographic population, and is considered to be a Medium value receptor.

4.2. Baseline populations for migrant seabirds

4.2.1. Millions of birds of many different species cross the North Sea every year between Europe and Scandinavia to Britain during the spring and autumn migration (Hüppop *et al*. 2006). It is inevitable that a number of these birds are likely to pass over the Dogger Bank Zone during these migrations. Generally, birds migrate northwards in spring and south in autumn, but the scale of movement is often dependent on prevailing weather conditions and the time of year.

4.2.2. Waterbirds generally migrate between their breeding, staging (areas where they rest and feed up during migration), and wintering areas along regular routes or “flyways”. Research into wader migration has found that there are eight global flyways. Waders moving up and down the east coast of England are considered to be part of the East Atlantic Flyway (Delaney *et al*. 2009).

4.2.3. A total of 73 species of waterbird and 62 other terrestrial species were recorded during the boat-based surveys of the Dogger Bank Zone as a whole, as shown in Tables 3.1, 3.2 and 3.3 in **Appendix 11A**. Of the waterbirds, 37 are considered to be ‘marine’ species (seabirds, divers, gulls, terns and skuas, and seaducks), whilst 41 species are considered to be migrants.

4.2.4. The key migrant species present within the Dogger Bank Teesside A & B offshore study area are listed in **Table 4.15**, along with the assessed value of each species and their overall sensitivity to disturbance or effects such as collision risk and barrier effects associated with wind farms.

Table 4.15 Migrant bird species within the Dogger Bank Zone in high numbers or with medium to high sensitivity to wind farm operations

Species	Value	Overall sensitivity	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
			Estimated number crossing through	% of GB or GB / Ireland population	Estimated number crossing through	% of GB or GB / Ireland population	Estimated number crossing through	% of GB or GB / Ireland population
Bar-tailed godwit *Limosa lapponica*	Very High	Medium	482	0.89	544	1.00	971	1.79
Bean goose	Very High	High	9	1.25	11	1.46	18	2.50
Black-tailed godwit	Very High	Very High	41	0.72	41	0.74	75	1.34
Common goldeneye	Very High	High	148	0.51	166	0.57	297	1.02
Common pochard	Very High	Medium	227	0.30	212	0.28	385	0.52
Common redshank *Tringa totanus Britannica* (breeding)	Very High	Medium	24	0.08	25	0.08	44	0.15
Common redshank Icelandic population *Tringa totanus robusta* (non-breeding)	Very High	Medium	993	0.36	1,043	0.38	1,872	0.68
Common redshank mainland Europe population *Tringa tetanus* (non-breeding)	Very High	Medium	230	0.92	257	1.03	461	1.84
Common ringed plover *Charadrius hiaticula* (non-breeding)	Very High	High	315	0.43	347	0.48	626	0.86
Common scoter	Very High	High	20	0.02	22	0.02	39	0.03
Common shelduck *Tadorna tadorna*	Very High	Very High	385	0.51	431	0.57	771	1.02
Common snipe *Gallinago gallinago*	Very High	Medium	3,989	0.40	4,403	0.44	7,927	0.79
Dunlin *Calidris alpina schinzii (passage)*	Very High	Medium	29	0.79	33	0.90	59	1.60
Dunlin *Calidris alpina alpine* (passage & winter)	Very High	Medium	3052	0.70	2,926	0.67	5,072	1.16
Eurasian coot *Fulica atra*	Very High	Medium	199	0.19	174	0.17	273	0.26
Eurasian curlew (non-breeding)	Very High	Medium	733	0.90	679	0.83	1,323	1.62

Species	Value	Overall sensitivity	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
			Estimated number crossing through	% of GB or GB / Ireland population	Estimated number crossing through	% of GB or GB / Ireland population	Estimated number crossing through	% of GB or GB / Ireland population
Eurasian oystercatcher *Haematopus ostralegus* (non-breeding)	Very High	Very High	793	0.40	888	0.44	1,588	0.79
Eurasian teal *Anas crecca*	Very High	Medium	593	0.24	665	0.27	1,189	0.48
Eurasian wigeon *Anas penelope*	Very High	Medium	2,353	0.45	2635	0.50	4,715	0.90
European nightjar *Caprimulgus europaeus*	Very High	Medium	4	0.04	7	0.06	8	0.07
Gadwall *Anas strepera*	Very High	Medium	36	0.16	45	0.20	60	0.27
Golden plover (non-breeding)	Very High	Medium	1,574	0.39	1,267	0.32	2,737	0.68
Goosander *Mergus merganser* (non-breeding)	Very High	Very High	18	0.55	20	0.62	36	1.10
Great bittern	Very High	Medium	2	0.44	2	0.62	3	0.75
Greater scaup	Very High	Medium	2	0.02	2	0.02	3	0.03
Great-crested grebe *Podiceps cristatus*	Very High	Very High	51	0.21	56	0.23	86	0.35
Greenshank *Tringa nebularia*	Very High	Medium	<1	0.06	<1	0.06	<1	0.10
Grey plover *Pluvialis squatarola*	Very High	Very High	421	0.85	464	0.94	836	1.70
Hen harrier (breeding)	Very High	Very High	<1	0.03	<1	0.06	<1	0.09
Hen harrier (non-breeding)	Very High	Very High	6	1.49	6	1.67	11	2.98
Light-bellied brent goose (Svalbard population) *Branta bernicla hrota*	Very High	Very High	2	0.06	2	0.06	2	0.06
Mallard *Anas platyrhynchos*	Very High	Medium	1,636	0.36	1,833	0.40	3,279	0.71
Northern lapwing	Very High	Medium	3,834	0.85	4,225	0.94	7,614	1.70
Northern pintail *Anas acuta*	Very High	Medium	72	0.24	81	0.27	144	0.48
Northern shoveler *Anas clypeata*	Very High	Medium	58	0.30	54	0.28	98	0.52
Red knot *Calidris canutus*	Very High	Very High	1,349	0.40	1,489	0.44	2,681	0.79
Red-breasted merganser *Mergus serrator*	Very High	Very High	1	0.03	1	0.03	2	0.06

Species	Value	Overall sensitivity	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B	
			Estimated number crossing through	**% of GB or GB / Ireland population**	**Estimated number crossing through**	**% of GB or GB / Ireland population**	**Estimated number crossing through**	**% of GB or GB / Ireland population**
Ruddy turnstone *Arenaria interpres*	Very High	Very High	190	0.40	213	0.44	381	0.79
Ruff	Very High	Medium	24	1.01	24	0.98	43	1.80
Sanderling *Calidris alba*	Very High	Very High	358	0.60	395	0.66	712	1.19
Short-eared owl	Very High	Medium	6	0.57	7	0.64	12	1.15
Slavonian grebe	Very High	Very High	2	0.16	2	0.18	3	0.32
Tufted duck *Aythya fuligula*	Very High	Medium	436	0.42	488	0.47	873	0.85
Velvet scoter	Very High	High	13	0.50	14	0.56	25	1.01
Whimbrel *Numenius phaeopus*	Very High	Very High	93	0.40	95	0.41	179	0.78

4.2.5. Most waterbirds were recorded in low numbers, with Eurasian curlew being the most numerous species over the survey period (with 55 and a peak of 36), whilst pink-footed goose occurred in the highest number at any one time (50), as shown in Tables 3.1, 3.2 and 3.3 in **Appendix 11A**).

4.2.6. The most commonly identified terrestrial birds recorded in the survey period were starling, redwing, meadow pipit, and common blackbird (see Tables 3.1, 3.2 and 3.3 in **Appendix 11A**).

4.3. Species population baseline for the Dogger Bank Teesside A & B Export Cable Corridor

4.3.1. The mean and maximum population densities of seabirds recorded for the area of the Dogger Bank Teesside A & B Export Cable Corridor (from the ESAS database based on surveys carried out in 1979 and 2002) are shown in **Table 4.16**. It should be noted that the corridor covers a much larger area than that which may be affected by the construction phase cable laying activities, and that these numbers are considered to be at least an order of magnitude greater than the potential numbers that could be affected.

Table 4.16 Population densities of birds within the Dogger Bank Teesside A & B Export Cable Corridor

Species	Mean density (birds/km^2)	Maximum density (birds/km^2)	Derived mean population
Atlantic puffin	0.21	2.14	49
Black-legged kittiwake	2.37	15.89	555
Common guillemot	3.78	20.62	885
Great black-backed gull	0.08	0.88	19
Great skua	0.03	0.52	7
Herring gull	0.14	1.81	33
Northern fulmar	1.59	9.37	372
Northern gannet	0.20	0.68	47
Razorbill	0.08	1.42	19

4.3.2. Whilst the ESAS data indicated that common scoter, red-throated diver, Manx shearwater, European shag (*Phalacrocorax aristotelis)*, common gull, common tern, and Arctic tern were observed, seawatch surveys carried out by the Yorkshire Naturalists Union (2010) and the Teesmouth and Bird Club (2011) recorded these species on the Teesmouth and Cleveland Coast. Consequently, these species may be present within the Dogger Bank Teesside A & B Export Cable Corridor.

4.3.3. The Dogger Bank Teesside A & B Export Cable Corridor is within the foraging range of seven species from 27 designated sites (see Appendix 1 in **Appendix 11A**). The nearest SPA to the Dogger Bank Teesside A & B Export Cable Corridor is the Teesmouth and Cleveland Coast SPA and Ramsar (and component SSSIs), however, none of the species identified in **Table 4.16** are a feature of this site.

4.4. Species and population baseline for the intertidal study area (export cable landfall)

4.4.1. There were no WeBS data for the export cable landfall. The inter-tidal area overlapped with two sections of the NEWS surveys (covering 2.4km and 4.15km in length) for the winters of 1984/85, 1997/98, and 2006/07. **Table 4.17** presents the results of the NEWS survey, and field surveys carried out over 2011/12 and 2012/13 for the Dogger Bank Teesside A & B Export Cable landfall.

Table 4.17 Baseline count data for the intertidal study area (export cable landfall) for Dogger Bank Teesside A & B

Species	NEWS combined[1]	Inland sea-watch surveys 2011/12[2]	Autumn/winter sea-watch surveys 2012/13[2]
Bar-tailed godwit	0	1	1
Black-headed gull	0	175	318
Carrion crow *Corvus corone*	0	12	10
Common gull	0	2	4
Common linnet *Carduelis cannabina*	0	0	37
Common starling *Sturnus vulgaris*	0	0	0
Dunlin	0	47	0
Eurasian curlew	0	0	1
Eurasian oystercatcher	65	21	12
Goldfinch *Carduelis carduelis*	0	0	12
Great black-backed gull	0	0	2
Great cormorant	0	0	1
Grey plover	0	1	0
Herring gull	0	0	115
Jackdaw *Corvus monedula*	0	0	2
Lesser black-backed gull	0	0	3
Mediterranean gull	0	0	2
Meadow pipit *Anthus pratensis*	0	0	2
Northern lapwing	121	0	0
Ringed plover	0	18	2
Ruddy turnstone	5	5	22
Sanderling	3	104	3

[1] Values given in brackets are the uncorrected counts for two NEWS sections summed together.
[2] Maximum numbers of individuals recorded.

4.5. Biodiversity Action Plan bird species and species which form part of designated sites

Biodiversity Action Plan (BAP) priority species

4.5.1. **Table 4.18** lists the bird species that are UK (England and/or Scotland) BAP species, which are present within the intertidal or offshore areas of the Dogger Bank Teesside A & B study area.

Table 4.18 BAP priority bird species present within the study area

Species	Country	Priority species	Number recorded or passing through	% of GB population
Arctic skua	England and Scotland	Yes	Peak of 6	0.10
Arctic tern	Scotland		Average 5	<0.01
Barnacle goose	Scotland		13	<0.01
Bar-tailed godwit	Scotland		645	1.20
Bean goose	Scotland		13	1.80
Black-tailed godwit	England and Scotland	Yes	53	0.90
Common goldeneye	Scotland		197	0.70
Common greenshank	Scotland		0	0.10
Common linnet	England and Scotland	Yes	1	<0.01
Common scoter	England and Scotland	Yes	26	<0.01
Common starling	England	Yes	659	<0.01
Common tern	Scotland		Peak of 13	0.05
Dunlin[1]	Scotland		4,707 (39)	1.10 (1.10)
Eurasian curlew	England and Scotland	Yes	867	1.10
European greater white-fronted goose[3]	England	Yes	2	0.08
European nightjar	England and Scotland	Yes	14	0.10
European storm-petrel	Scotland		301	0.59
Golden plover	Scotland		1,908	0.50
Great bittern	England and Scotland	Yes	4	1.10
Great cormorant	Scotland		9	0.05
Greater scaup	England and Scotland	Yes	3	<0.01
Greenland greater white-fronted goose[3]	Scotland	Yes	2	0.02
Hen harrier[2]	Scotland	Yes	7 (0)	2.00 (0.10)
Herring gull	England and Scotland	Yes	297	0.09
Leach's storm petrel	Scotland		7	<0.01
Little gull[4]	Scotland		186	-
Long-tailed duck	Scotland		1	<0.01
Merlin	Scotland		2	0.13
Northern lapwing	England and Scotland	Yes	4,396	1.10
Northern pintail	Scotland		2	<0.01
Osprey	Scotland		1	0.51
Ruff	Scotland		32	1.30
Sandwich tern	Scotland		10	0.04
Short-eared owl	Scotland		13	0.80
Slavonian grebe	Scotland		2	0.20
Velvet scoter	Scotland		17	0.70
Whimbrel	Scotland		122	0.50

[1] - Number is *Calidris alpina alpina* (passage & winter) and the population in brackets is *Calidris alpina schinzii* & *C. a. arctica (passage).*
[2] - Number is non-breeding birds and breeding birds in brackets.
[3] - White-fronted goose identified but not separated into sub-species or populations.
[4] - There is no GB population estimate for little gull.

OSPAR threatened species

4.5.2. Black-legged kittiwake is identified as a threatened species under the OSPAR threatened species list (see **Chapter 8 Designates Sites**), and has been considered separately in the assessment where relevant.

National and European designated sites

4.5.3. **Table 4.19** presents a list of all the relevant SSSIs considered in this assessment. The SSSIs are, where relevant combined to fall within an overarching SPA against which assessment has been focussed (see A**ppendix 11A**). **Appendix 11B** lists the SSSIs (or SPAs with combined SSSI component sites) around the UK that have been considered in this assessment, along with the key species for which they are screened into this assessment. Where sites are not stated in the text, no impact has been identified for the features or sites within which those features occur.

Table 4.19 Designated sites (SSSI) component screened in to the ornithology assessment

SPA	Component SSSIs
Abberton Reservoir SPA / Ramsar	Abberton Reservoir
Alde-Ore Estuary SPA / Ramsar	Alde-Ore Estuary
Arun Valley SPA / Ramsar	Amberley Wild Brooks
	Pulborough Brooks
	Waltham Brooks
Avon Valley SPA / Ramsar	Avon Valley (Bickton to Christchurch)
Benacre to Easton Bavents SPA	Benacre to Easton Bavents
Benfleet and Southend Marshes SPA / Ramsar	Benfleet and Southend Marshes
Blackwater Estuary (Mid-Essex Coast Phase 4) SPA / Ramsar	Blackwater Estuary
Breydon Water SPA / Ramsar	Breydon Water, Halvergate Marshes
Broadland SPA / Ramsar	Alderfen Broad
	Ant Broads and Marshes
	Barnby Broad and Marshes
	Broad Fen, Dilham
	Bure Broads and Marshes
	Burgh Common and Muckfleet Marshes
	Calthorpe Broad
	Cantley Marshes
	Crostwick Marsh
	Decoy Carr, Acle
	Ducans Marsh, Claxton
	Geldeston Meadows
	Hall Farm Fen, Hemsby
	Halvergate Marshes
	Hardley Flood
	Limpenhoe Meadows
	Ludham-Potter Heigham Marshes
	Poplar Farm Meadows, Langley
	Priory Meadows, Hickling
	Shallam Dyke Marshes, Thurne
	Smallburgh Fen

SPA	Component SSSIs
Broadland SPA / Ramsar (*continued from above*)	Sprat's Water and Marshes, Carlton Colville
	Stanley and Alder Carrs, Aldeby
	Upper Thurne Broads and Marshes
	Upton Broad and Marshes
	Yare Broads and Marshes
Buchan Ness to Collieston Coast SPA	Collieston to Whinnyfold Coast
	Bullers of Buchan
Calf of Eday SPA	Calf of Eday
Cape Wrath SPA	Cape Wrath
Chichester and Langstone Harbours SPA / Ramsar	Chichester Harbour
	Langstone Harbour
Colne Estuary (Mid-Essex Coast Phase 2) SPA / Ramsar	Colne Estuary
Copinsay SPA	Copinsay
Coquet Island SPA	Coquet Island
Cromarty Firth SPA / Ramsar	Lower River Conon
	Cromarty Firth
	Rosemarkie to Shandwick
Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar	Crouch and Roach Estuaries
Dengie (Mid-Essex Coast Phase 1) SPA / Ramsar	Dengie
Dornoch Firth and Loch Fleet SPA / Ramsar	Dornoch Firth
	Loch Fleet
	Morrich More
	Mound Alderwoods
	Tarbat Ness
Dorset Heathlands SPA	Arne
	Black Hill Heath
	Blue Pool and Norden Heaths
	Bourne Valley
	Brenscombe Heath
	Canford Heath
	Christchurch Harbour
	Corfe and Barrow Hills
	Cranborne Common
	Ebblake Bog
	Ferndown Common
	Ham Common
	Hartland Moor
	Holt and West Moors Heaths
	Holton and Sandford Heaths
	Horton Common
	Hurn Common
	Lions Hill
	Matchams
	Morden Bog and Hyde Heath
	Norden
	Oakers Bog
	Parley Common

SPA	Component SSSIs
Dorset Heathlands SPA (*continued from above*)	Poole Harbour
	Povington and Grange Heaths
	Rempstone Heaths
	Slop Bog and Uddens Heath
	Stoborough and Creech Heaths
	Stokeford Heaths
	Studland and Godlingston Heaths
	Thrashers Heath
	The Moors
	Town Common
	Turbary and Kinson Commons
	Turners Puddle Heath
	Upton Heath
	Verwood Heaths
	Warmwell Heath
	Winfrith Heath
	Worgret Heath
Duddon Estuary SPA / Ramsar	Duddon Estuary
Dungeness to Pett Level SPA / proposed Ramsar	Camber Sands and Rye Saltings
	Dungeness
	Pett Level
	Rye Harbour
East Caithness Cliffs SPA	Berriedale Cliffs
	Castle of Old Wick to Craig Hammel
	Craig Hammel to Sgaps Geo
	Dunbeath to Sgaps Geo
East Sanday Coast SPA / Ramsar	Central Sanday
	Northwall & Central Sanday
	East Sanday Coast
Exe Estuary SPA / Ramsar	Dawlish Warren
	Exe Estuary
Fair Isle SPA	Fair Isle
Farne Islands SPA	Farne Islands
Fetlar SPA	Lamb Hoga
	North Fetlar
	Trona Mires
Firth of Forth SPA / Ramsar	Firth of Forth
Firth of Tay and Eden Estuary SPA / Ramsar	Barry Links
	Eden Estuary
	Inner Tay
	Monifieth Bay
	Tayport to Tentsmuir Coast
Flamborough and Filey Coast pSPA (formerly the Flamborough Head and Bempton Cliffs SPA)	Flamborough Head
Forth Islands SPA	Bass Rock
	Forth Islands
	Inchmickery
	Isle of May
Foula SPA	Foula

SPA	Component SSSIs
Foulness (Mid-Essex Coast Phase 5) SPA / Ramsar	Foulness
Fowlsheugh SPA	Fowlsheugh
Gibraltar Point SPA / Ramsar	Gibraltar Point
Hamford Water SPA / Ramsar	Hamford Water
Hermaness, Saxa Vord and Valla Field SPA	Hermaness
	Saxa Vord
Holburn Lake and Moss Ramsar	Holburn Lake and Moss
Hornsea Mere SPA	Hornsea Mere
Hoy SPA	Hoy
Humber Flats, Marshes and Coast SPA / (Humber Estuary) Ramsar	Humber Flats and Marshes: Barton and Barrow Clay Pits
	Humber Flats and Marshes: Pyewipe and Cleethorpes Coast
	Humber Flats and Marshes: Spurn Head to Saltend Flats
	Humber Flats and Marshes: The Grues
	Humber Flats and Marshes: Upper Humber
	North Lincolnshire Coast
Inner Moray Firth SPA / Ramsar	Beauly Firth
	Longman & Castle Stuart Bays
	Munlochy Bay
	Whiteness Head
Lee Valley SPA / Ramsar	Amwell Quarry
	Rye Meads
	Turnford and Cheshunt Pits
	Walthamstow Reservoirs
Leighton Moss SPA / Ramsar	Leighton Moss
Lindisfarne SPA / Ramsar	Lindisfarne
Loch of Strathbeg SPA / Ramsar	Loch of Strathbeg
Lower Derwent Valley SPA / Ramsar	Breighton Meadows
	Derwent Ings
	Melbourne and Thornton Ings
	Newton Mask
	River Derwent
Marazion Marsh SPA	Marazion Marsh
Martin Mere SPA / Ramsar	Martin Mere
Marwick Head SPA	Marwick Head
Medway Estuary and Marshes SPA / Ramsar	Medway Estuary and Marshes
Mersey Estuary SPA / Ramsar	Mersey Estuary
	New Ferry
Mersey Narrows and North Wirral Foreshore SPA / proposed Ramsar	Mersey Narrows
	North Wirral Foreshore
Minsmere-Walberswick SPA / Ramsar	Minsmere-Walberswick Heaths and Marshes
Montrose Basin SPA / Ramsar	Dun's Dish
	Montrose Basin
Moray and Nairn Coast SPA / Ramsar	Culbin Sands, Culbin Forest & Findhorn Bay
	Lower River Spey
	Spey Bay

SPA	Component SSSIs
Morecambe Bay SPA / Ramsar	Lune Estuary
	Morecambe Bay
	Roudsea Wood and Mosses
	South Walney and Piel Channel Flats
	Wyre Estuary
Nene Washes SPA / Ramsar	Nene Washes (Whittlesey)
New Forest SPA	New Forest
North Caithness Cliffs SPA	Duncansby Head
	Dunnet Head
	Holborn Head
	Red Point Coast
	Stroma
North Norfolk Coast SPA / Ramsar	North Norfolk Coast
Northumbria Coast SPA	Durham Coast
	Lindisfarne
	Newton Links
	Northumberland Shore
Noss SPA	Noss
Ouse Washes SPA / Ramsar	Ouse Washes
Pagham Harbour SPA / Ramsar	Pagham Harbour
Papa Westray (North Hill and Holm) SPA	Holm of Papa Westray
	North Hill
Poole Harbour SPA / Ramsar	Arne
	Holton and Sandford Heaths
	Poole Harbour
	Studland and Godlingston Heaths
	The Moors
	Wareham Meadows
Ribble and Alt Estuaries SPA / Ramsar	Ribble Estuary
	Sefton Coast
Rousay SPA	Rousay
Rutland Water SPA / Ramsar	Rutland Water
Salisbury Plain SPA	Salisbury Plain
Severn Estuary SPA	Bridgwater Bay
	Flat Holm
	Penarth Coast
	Severn Estuary
	Steep Holm
	Sully Island
	Upper Severn Estuary
Solent and Southampton Water SPA / Ramsar	Brading Marshes to St. Helen's Ledges
	Eling and Bury Marshes
	Hurst Castle and Lymington River Estuary
	Hythe to Calshot Marshes
	King's Quay Shore
	Lee-on-The-Solent to Itchen Estuary
	Lincegrove and Hackett's Marshes
	Lower Test Valley
	Lymington River Reedbeds

SPA	Component SSSIs
Solent and Southampton Water SPA / Ramsar (*continued from above*)	Medina Estuary
	Newtown Harbour
	North Solent
	Ryde Sands and Wootton Creek
	Sowley Pond
	Thorness Bay
	Titchfield Haven
	Upper Hamble Estuary and Woods
	Whitecliff Bay and Bembridge Ledges
	Yar Estuary
Somerset Levels and Moors SPA / Ramsar	Catcott Edington and Chilton Moors
	Curry and Hay Moors
	King's Sedgemoor
	Moorlinch
	Shapwick Heath
	Southlake Moor
	Tealham and Tadham Moors
	West Moor
	West Sedge Moor
	Westhay Heath
	Westhay Moor
	Wet Moor
South West London Waterbodies SPA / Ramsar	Kempton Park Reservoirs
	Knight and Bessborough Reservoirs
	Staines Moor
	Thorpe Park No. 1 Gravel Pit
	Wraysbury and Hythe End Gravel Pits
	Wraysbury No. 1 Gravel Pit
	Wraysbury Reservoir
St Abb's Head to Fast Castle SPA	St Abb's Head to Fast Castle Head
Stodmarsh SPA / Ramsar	Stodmarsh
Stour and Orwell Estuaries SPA / Ramsar	Orwell Estuary, Stour Estuary
Sule Skerry and Sule Stack SPA	Sule Skerry
	Sule Stack
Sumburgh Head SPA	Sumburgh Head
Teesmouth and Cleveland Coast SPA / Ramsar	Cowpen Marsh
	Durham Coast
	Redcar Rocks
	Seal Sands
	Seaton Dunes and Common
	South Gare and Coatham Sands
	Tees and Hartlepool Foreshore and Wetlands
Thames Estuary and Marshes SPA / Ramsar	Mucking Flats and Marshes
	South Thames Estuary and Marshes
Thanet Coast and Sandwich Bay SPA / Ramsar	Sandwich Bay to Hacklinge Marshes
	Thanet Coast

SPA	Component SSSIs
The Dee Estuary SPA / Ramsar	Dee Estuary
	Inner Marsh Farm
	Shotton Lagoons & Reedbeds
	Dee Estuary / Aber Afon Dyfrdwy
	Gronant Dunes and Talacre Warren
The Swale SPA	The Swale
The Wash SPA	The Wash
Troup, Pennan and Lion's Head SPA	Gamrie & Pennan Coast
Upper Solway Flats and Marshes SPA / Ramsar	Upper Solway Flats and Marshes
West Westray SPA	West Westray
Ythan Estuary, Sands of Forvie and Meikle Loch SPA / (Ythan Estuary and Meikle Loch) Ramsar	Meikle Loch & Kippet Hills
	Ythan Estuary & Sands of Forvie

5. Worst Case Scenario

5.1. General

5.1.1. This section establishes the realistic worst case scenario for each category of impact as a basis for the subsequent impact assessment. This involves both a consideration of the relative timing of construction and operation of the two projects (Dogger Bank Teesside A and Dogger Bank Teesside B), as well as the particular design parameters of each project that define the Rochdale Envelope[1] for this assessment.

5.1.2. Full details of the range of development options being considered by Forewind are provided within **Chapter 5 Project Description**. For the purpose of the marine and coastal ornithology impact assessment, the key design parameters which form the realistic worst case are set out in **Table 5.1**.

5.1.3. Only those design parameters with the potential to influence the level of impact are identified.

5.1.4. The realistic worst case scenarios identified here are also applied to the cumulative impact assessment. When the worst case scenarios for the project in isolation do not result in the worst case for cumulative impacts, this is addressed within the cumulative impact section of this chapter (Section 10).

5.2. Construction scenarios

5.2.1. The specific timing of the construction of Dogger Bank Teesside A & B will be determined post consent and, therefore, a Rochdale Envelope approach has been undertaken for the EIA. There are a number of key principles relating to how the projects will be built, and that form the basis of the Rochdale Envelope (see **Chapter 5**). For the offshore assessment these are:

- The two projects may be constructed at the same time, or at different times;
- If built at different times, either project could be built first;
- Offshore construction will commence no sooner than 18 months post consent, but must start within seven years of consent (as an anticipated condition of the development consent order). Therefore if the construction period reaches the maximum 6 years, the projects will have to overlap by 6 months; and
- Taking the above into account, the maximum construction period over which the construction of Dogger Bank Teesside A & B could take place is 11.5 years.

[1] As described in Chapter 5 the term 'Rochdale Envelope' refers to case law (R.V. Rochdale MBC Ex Part C Tew 1999 "the Rochdale case"). The 'Rochdale Envelope' for a project outlines the realistic worst case scenario or option for each individual impact, so that it can be safely assumed that all lesser options will have less impact.

5.2.2. To determine which offshore construction scenario is the worst realistic case for a given receptor, two types of effect exist with the potential to cause a maximum level of impact on a given receptor:

- Maximum duration effects; and
- Maximum peak effects.

5.2.3. To ensure that the Rochdale Envelope incorporates all of the possible offshore construction scenarios (as outlined in **Chapter 5**), both the maximum duration effects and the maximum peak effects have been considered for each receptor. Furthermore, the option to construct Dogger Bank Teesside A or Dogger Bank Teesside B in isolation is also considered (‘Build A in isolation’ and ‘Build B in isolation’), enabling the assessment to identify any differences between the two scenarios. The three construction scenarios for Dogger Bank Teesside A & B considered within the assessment for marine and coastal ornithology are, therefore:

- Single project (Build A or Build B) in isolation;
- Build A and B concurrently – provides the worst ‘peak’ impact and maximum working footprint; and
- Build A and Build B sequentially – provides the worst ‘duration’ of impact.

5.2.4. Any differences between the two projects, or differences that could result from the timing and manner in which the first and the second projects are built are identified and discussed in the impact assessment (Section 6).

5.3. Operation scenarios

5.3.1. **Chapter 5** provides details of the operational scenarios for Dogger Bank Teesside A & B. Flexibility is required to allow for the following three scenarios:

- Dogger Bank Teesside A to operate on its own;
- Dogger Bank Teesside B to operate on its own, and
- For the two projects to operate concurrently.

5.3.2. For the marine and coastal ornithology assessment there is not considered to be a material difference between either Dogger Bank Teesside A or Dogger Bank Teesside B operating on their own. As such, only one assessment for the single project scenario is presented and is considered representative for whichever project is operating in isolation (see **Table 5.1**).

Table 5.1 Key design parameters forming the realistic worst case scenarios for the marine and coastal ornithology impact assessment

Impact	Realistic worst case scenario	Rationale
Construction		
Noise – pile driving single impact	Method 100% pile driving – monopoles: Maximum number of piles: 120 x 10+MW Pile diameter: 8m Total Penetration: 45m Hammer Capacity: 3000kJ Max Blow Force: 3000kJ Soft start duration: 0.5 hours Soft start hammer energy: 300kJ Total pile driving duration: 5 hours 30 minutes (active piling time per pile = five hours with soft start duration of 30 minutes).	The worst case scenario for a single hammer blow represents the largest impact footprint and potential for disturbance to ornithology.
Noise - pile driving project impact	Maximum number of piles per project (assuming 100% pile driving multileg piles): • 200 x 6MW wind turbines with four legs (piles) per foundation; • 96 piles for offshore collector platform (four platforms, eight legs per platform, three piles per leg); • 24 piles for offshore converter platform (one platform, eight legs per platform, three piles per leg); • 48 piles for accommodation platforms (two platforms, eight legs per platform, three piles per leg); • 20 piles for meteorological masts (five met masts with four legs per foundation); • Pile diameter: 3.5m (2.7m offshore collector and converter platforms); • Total Penetration: 52m met masts, 55m (6MW) wind turbine, 60m (10MW) wind turbine, 70m offshore converter platforms and accommodation platforms, and 60m offshore collector platforms); • Hammer Capacity:1900kJ; • Max Blow Force: 1900kJ; • Soft start duration: 0.5h; • Soft start hammer energy: 190kJ. Total pile driving duration (active piling time per pile): • Wind turbines and meteorological masts - three hours per pile/leg (excluding 30 minute soft start). • OCPs one hour per pile (average) with a maximum of two hours per pile. Total pile driving duration (active piling time): 2,964 hours per project. • 2,400 hours - wind turbines; • 288 hours - offshore collector platform; • 72 hours - offshore converter platform; • 144 hours – accommodation platforms; and • 60 hours - meteorological masts. Maximum construction period six years, minimum three years. • Maximum of 768 piling operations per year. • Maximum of two simultaneous piling operations. **Cumulative** – a maximum of six projects in simultaneous construction, with a total of 12 piling vessels operating simultaneously.	The worst case scenario for construction of the OWF represents the longest temporal duration of noise impact.

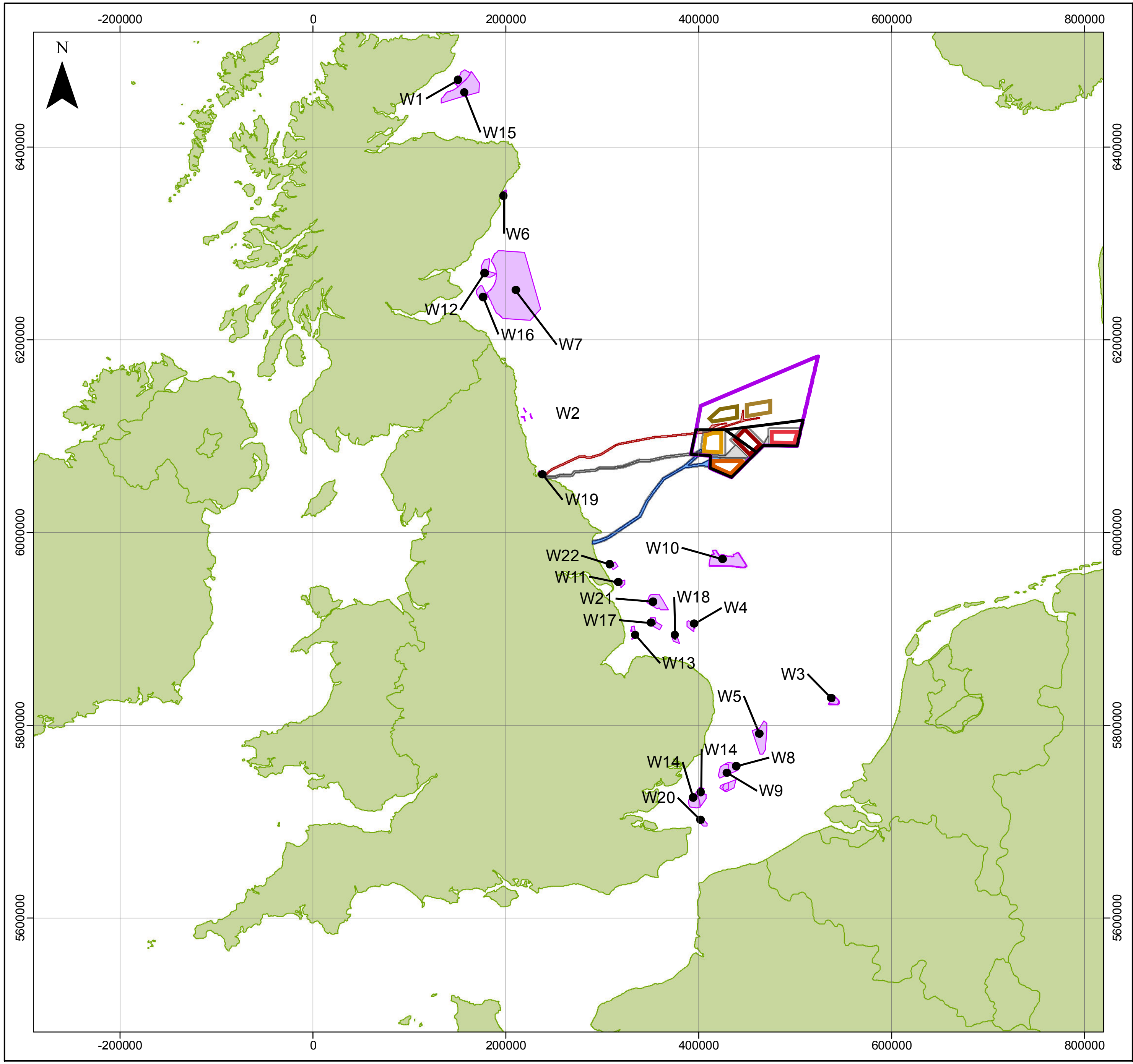
Impact	Realistic worst case scenario	Rationale
Physical disturbance due to presence of construction vessels (offshore wind farm)	Indicative number of vessels movements per project per year for 6MW wind turbines: 5,150 round trips to port, averaging 1,717 each year of three year construction (would reduce by half if a six year construction phase). Maximum of 66 vessels on site at any one time per project during the operation phase. **Cumulative (Dogger Bank Teesside A and Dogger Bank Teesside B)**: 3,434 round trips per year, with a maximum of 132 vessels on site at any one time.	The worst case scenario for construction represents the greatest number of vessels present at one time and throughout the duration of construction.
Physical disturbance due to presence of construction vessels (export cable corridor wind farm)	Dogger Bank Teesside A - length of export cable corridor is 261km. Dogger Bank Teesside B – length of export cable corridor is 220km. Maximum of 6 vessels each year. Dogger Bank Teesside A - duration of export cable corridor works is 687 days. Dogger Bank Teesside B - duration of export cable corridor works is 595 days. Rate of progress is 100m/hour over 60% of total duration. 4 campaigns with 30 days between each campaign.	The worst case scenario for construction represents the greatest number of vessels present at one time and the duration of construction.
Physical, visual and noise disturbance during construction of the export cable landfall	Cofferdam size = 10m wide x 15m long x 3m deep. 1km length. Construction area – one project = 2500m^2. **Cumulative (Dogger Bank Teesside A and Dogger Bank Teesside B)**: Construction area – Dogger Bank Teesside A and Dogger Bank Teesside B = 5000m^2.	The worst case scenario for construction represents the largest extent of potential disturbance.
Indirect impacts of changes in prey resource	The worst case scenario is represented using the impacts identified in **Chapter 13 Fish and Shellfish Ecology**.	The predicted changes to fish resource outlined in **Chapter 13 Fish and Shellfish Ecology** have the potential to impact on foraging success.
Operation		
Physical disturbance due to presence of operational vessels (offshore wind farm)	Indicative number of vessels movements per project per year for 6MW wind turbines: 730 round trips to port each year. Maximum of 26 vessels on site at any one time per project during the operation phase. **Cumulative (Dogger Bank Teesside A and Dogger Bank Teesside B)**: 1,460 round trips per year, with a maximum of 52 vessels on site at any one time.	The worst case scenario for operation represents the greatest number of vessels present at one time and throughout the operation phase.
Collision risk – wind turbines	200 x 6MW wind turbines. Hub height of 109.5m above HAT. Tip height = 26m to 193m above HAT. Rotor diameter = 167m Rotor speed = 8.84rpm. Turbine operation time = average of 94.5% of the year. Maximum blade width = 5.5m. Pitch = 10 degrees.	The worst case scenario is based on observed flight heights.

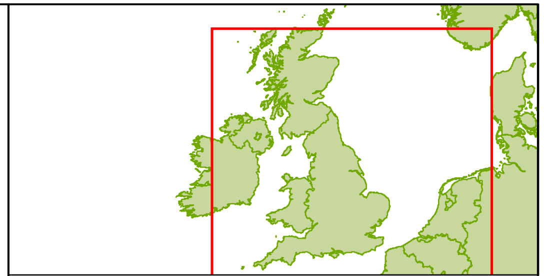
Impact	Realistic worst case scenario	Rationale
Physical barrier	Approximately 196km from Dogger Bank Teesside A boundary to coast. Approximately 165km from Dogger Bank Teesside B boundary to coast. Minimum turbine spacing 750m (6MW).	The worst case scenario is based on the shortest distance to breeding seabird colonies and the coastline, and the shortest distance between turbines.
Indirect impacts of changes in prey resource	The worst case scenario is represented using the impacts defined in **Chapter 13 Fish and Shellfish Ecology**.	The predicted changes to fish resource outlined in **Chapter 13 Fish and Shellfish Ecology** have the potential to impact on foraging success.
Decommissioning		
Noise and disturbance – decommissioning activities	Level of vessel activity may be similar to construction. Decommissioning could extend for up to six years for each project.	The worst case scenario for decommissioning represents the greatest number of vessels present at one time and throughout the duration of decommissioning.
Indirect impacts of changes in prey resource	The worst case scenario is represented using the impacts identified in **Chapter 13 Fish and Shellfish Ecology**.	The predicted changes to fish resource outlined in **Chapter 13 Fish and Shellfish Ecology** have the potential to impact on foraging success.

5.4. Cumulative impact scenarios

5.4.1. Cumulative impacts have been assessed in relation to all of the main effects outlined above and has drawn from the cumulative impact assessment strategy (see **Chapter 33 Cumulative Impact Assessment**), which considered the following:

- Whether impacts on a receptor can occur on a cumulative basis between the wind farm project(s) subject to the application(s) and other wind farm projects, activities and plans in the Dogger Bank Zone. At this level, the assessment considers the effects of the Dogger Bank Teesside A & B projects in conjunction with Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D;
- Whether impacts on a receptor can occur on a cumulative basis between the wind farm project(s) subject to the application(s) and other activities, projects and plans outwith the Dogger Bank Zone (see **Table 5.2** for the other offshore wind farms initially screened in for the cumulative assessment, and the projects are shown on **Figure 5.1**).





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Creyke Beck A
- Dogger Bank Creyke Beck B
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside C
- Dogger Bank Teesside D
- Dogger Bank Teesside A & B Export Cable Corridor
- Dogger Bank Teesside A & B temporary works area
- Dogger Bank Creyke Beck Export Cable Corridor
- Dogger Bank Creyke Beck temporary works area
- Dogger Bank Teesside C & D Export Cable Corridor
- Offshore wind farm

0 70 140
Kilometres

Data Source:
UK offshore wind farm © The Crown Estate, 2013
European wind farm boundary data supplied by MarineFind, 2013

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 5.1 Other projects

VER	DATE	REMARKS	Drawn	Checked
1	11/10/2013	PEI3	LW	PT
2	10/02/2014	DCO Submission	JE	PT

DRAWING NUMBER: **F-OFL-MA-232**

SCALE	1:6,000,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

Table 5.2 Other offshore wind farm projects (as shown on Figure 5.1)

Project title
Beatrice Offshore Wind Farm (W1)
Blyth Offshore Wind Demonstration Site (W2)
Breeveertien II Offshore Wind Farm (W3)
Dudgeon Offshore Wind Farm (W4)
East Anglia ONE (W5)
European Offshore Wind Development Centre / Aberdeen Offshore Wind Farm (W6)
Firth of Forth Alpha and Bravo Offshore Wind Farms (W7)
Galloper Offshore Wind Farm (W8)
Greater Gabbard Offshore Wind Farm (W9)
Hornsea Project One (W10)
Humber Gateway Offshore Wind Farm (W11)
Inch Cape Offshore Wind Farm (W12)
Lincs Offshore Wind Farm (W13)
London Array I/II (W14)
Moray Firth (Telford, Stevenson and MacColl Offshore Wind Farms) (W15)
Neart na Gaoithe Offshore Wind Farm (W16)
Race Bank Offshore Wind Farm (W17)
Sheringham Shoal Offshore Wind Farm (W18)
Teesside Offshore Windfarm (W19)
Thanet Offshore Wind Farm (W20)
Triton Knoll Offshore Wind Farm (W21)
Westermost Rough Offshore Wind Farm (W22)

5.4.2. The cumulative impact assessment for marine and coastal ornithology therefore considers two spatial scales, for which the methodologies used and the confidence in predictions vary.

5.4.3. At the scale of the Dogger Bank Zone, i.e. for Dogger Bank Teesside A & B in conjunction with Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, the determination of the magnitude of cumulative effects follows the methodologies described above, with associated assessment of confidence.

5.4.4. Cumulative assessment is also undertaken at the scale of the Greater North Sea region (defined by the OSPAR Greater North Sea region). Appendix 8 in **Appendix 11A** identifies the projects (which include wind farms and aggregate sites) that have been considered in the cumulative impact assessment in Section 10. The appendix also identifies which of these projects are also within foraging range of the same designated sites identified to be of relevance to the Dogger Bank Teesside A & B.

6. Assessment of Impacts during Construction

6.1. Introduction

6.1.1. The EIA first provides an assessment of the magnitude of different effects that may arise during construction and operation, before reviewing the sensitivities of each key receptor species to these effects and, in conjunction with the assessment of magnitude, assesses the overall significance of impact (see **Table 3.5**). In each instance, the magnitude of effect depends on the species population size in the wind farm region. Intertidal receptor impacts are considered separately.

6.1.2. The assessment of impacts on key marine bird species during the construction phase for Dogger Bank Teesside A, Dogger Bank Teesside B, and Dogger Bank Teesside A & B are extracted from Tables 5.8, 5.16, and 5.24 respectively in **Appendix 11A**, and is based on the detailed assessment presented in Sections 5.2, 5.3, and 5.4 respectively in **Appendix 11A**. This part of the ES chapter provides the impact assessment undertaken by the British Trust for Ornithology (BTO). For a more extensive and detailed description of the assessment process and the data interpretation, the reader is directed to **Appendix 11A** which provides further details.

6.2. Disturbance and displacement during construction

6.2.1. The potential effects of disturbance and displacement, which are considered on-going and non-reversible, are interlinked and reflect different levels of severity, with disturbance entailing the direct reaction or response of the bird to the wind farm development. The main effects would be associated with cable laying and turbine construction, and associated boat traffic (see paragraph 3.3.15).

6.2.2. The numbers of birds displaced annually for each season during the construction phase for each of the species which have been identified as being sensitive to disturbance (see paragraph 3.3.21) is presented in **Table 6.1**. The data presented in **Table 6.1** is extracted from Tables 5.1, 5.9, and 5.17 in **Appendix 11A** for Dogger Bank Teesside A, Dogger Bank Teesside B, and Dogger Bank Teesside A & B respectively. It should be noted that no data is presented for Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, northern fulmar, and white-billed diver due to either the lack of populations present in order to quantify potential disturbance, or, for most, because these species are not sensitive to the types of disturbance that would take place during the construction phase (see paragraph 3.3.21).

6.2.3. Of the key seabirds that are sensitive to the types of disturbance that will arise during construction (i.e. northern gannet, common guillemot, razorbill, little auk, and Atlantic puffin), common guillemot showed the highest numbers displaced followed by razorbill, though the majority of the numbers of birds disturbed occurred outside the breeding season (see **Table 6.1**).

Table 6.1 Mean number of birds displaced during the construction of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) including 2km buffer

Species	Season	Dogger Bank Teesside A	Dogger Bank Teesside B	Dogger Bank Teesside A & B
Atlantic puffin	Breeding	6	8	14
	Wintering	32	38	70
	All	38	45	84
Common guillemot	Breeding	181	373	554
	Wintering	853	1,348	2,201
	All	1,034	1,721	2,755
Little auk	All	37	41	78
Northern gannet	Breeding	56	72	128
	Wintering	99	128	227
	All	155	200	355
Razorbill	Breeding	38	56	93
	Wintering	321	488	809
	All	358	544	902
White-billed diver	All	4	4	7

6.2.4. Based on the mean numbers of birds displaced (in **Table 6.1**), these have then been combined with the species mortality rate (see paragraph 3.3.24) to provide a quantity for the impact of displacement during each year of construction. The results are presented in **Table 6.2**, based on the quantities presented in Appendix 10 in **Appendix 11A**, which also show different ranges of mortality and displacement.

6.2.5. Displacement as a result of the construction activities for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) is predicted to result in a short-term (for the duration of the construction phase which in the worst case could be up to 11.5 years) and temporary **negligible** or **minor adverse** impact on the populations of all the species presented in **Table 6.3**, extracted from the summary of impacts presented in Table 5.24 in **Appendix 11A**. No moderate or major impacts were identified on species at designated site, site suite, national, or biogeographic population levels for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually). **No impact** is predicted on the populations of six seabird species at national or biogeographic population levels.

Table 6.2 Mortality for seabirds and their population affected by disturbance and displacement during the construction of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually)

Species	Season	Dogger Bank Teesside A			Dogger Bank Teesside B			Dogger Bank Teesside A & B		
		Number of birds	% national population	% bio-geographic population	Number of birds	% national population	% bio-geographic population	Number of birds	% national population	% bio-geographic population
Atlantic puffin	Breeding	0	<0.01	N/A	0	<0.01	N/A	1	<0.01	N/A
	Wintering	2	N/A	N/A	2	N/A	N/A	4	N/A	N/A
	All	2	N/A	<0.01	2	N/A	<0.01	4	N/A	<0.01
Common guillemot	Breeding	9	<0.01	N/A	19	<0.01	N/A	28	<0.01	N/A
	Wintering	43	N/A	N/A	67	N/A	N/A	110	N/A	N/A
	All[1]	52	N/A	<0.01 (<0.01 - <0.01)	86	N/A	<0.01 (<0.01 - 0.01)	138	N/A	<0.01 (<0.01 - 0.02)
Little auk	All	2	N/A	<0.01	2	N/A	<0.01	4	N/A	<0.01
Northern gannet	Breeding	0	<0.01	N/A	0	<0.01	N/A	0	<0.01	N/A
	Wintering	0	N/A	N/A	0	N/A	N/A	0	N/A	N/A
	All	0	N/A	<0.01	0	N/A	<0.01	0	N/A	<0.01
Razorbill	Breeding	2	<0.01	N/A	3	<0.01	N/A	5	<0.01	N/A
	Wintering	16	N/A	N/A	24	N/A	N/A	40	N/A	N/A
	All	18	N/A	<0.01	27	N/A	<0.01	45	N/A	<0.01
White-billed diver	All	1	0.02	0.01	1	0.02	0.01	3	0.06	0.03

[1] Biogeographic population for common guillemot is based on the combined *aalge* populations (4,800,000 I) and the *albionis* population (800,000 I), with the range for these populations presented in brackets.

Table 6.3 Summary of impacts on seabirds and their populations due to displacement during the construction of Dogger Bank Teesside A & B

Species	Population[1]	Derivation of impact		
		Value of Receptor	Overal Sensitivity of Receptor	Magnitude of Effect
No impact				
Arctic skua	All	Very High	Low	None
Black-legged kittiwake	All	Very High	Low	None
Great black-backed gull	All	Very High	Low	None
Great skua	All	Very High	Low	None
Lesser black-backed gull	All	Very High	Very Low	None
Northern fulmar	All	Very High	Very Low	None
Negligible impact				
Little auk	All	High	Low	Negligible
White-billed diver	All	Medium	High	Negligible
Minor adverse impact				
Atlantic puffin	All	Very High	Very Low	Negligible
Common guillemot	All	Very High	Medium	Negligible
Northern gannet	All	Very High	Very Low	Negligible
Razorbill	All	Very High	Medium	Negligible

1 Designated site (SSSI), site suite (all linked designated sites), national, and biogeographic population.

6.3. Disturbance and displacement during export cable construction

6.3.1. Consideration was given to the potential mortality effect of disturbance to foraging birds during the Dogger Bank Teesside A & B Export Cable Corridor construction activities. Calculations of the number of birds disturbed and potentially experiencing mortality were undertaken (see Table 4.11 in **Appendix 11A**), however, given that zero mortality was predicted for most birds, and less than one bird for Atlantic puffin and razorbill, and four for common guillemot, these numbers are considered very low. Given the extensive vessel activities in the Dogger Bank Teesside A & B Export Cable Corridor particularly closer inshore, overall a short-term and intermittent negligible impact is considered to occur for Atlantic puffin, common guillemot, and razorbill populations over the duration of the construction phase, whilst no impact is predicted on the other species present in the offshore area.

6.4. Habitat loss and / or alteration (including cable-laying)

6.4.1. The alteration and loss of habitat as a result of the construction activities for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) could result in a permanent and long-term loss of $4.21km^2$ for each wind farm project and $1.01km^2$ for the Dogger Bank Teesside Export Cable Corridor (see paragraph 4.3.105 in **Appendix 11A**). However, during construction, whilst a larger temporary disturbance footprint would arise, this would not result in further loss of foraging habitat for seabirds as they forage on their prey species which would return to the initial disturbed areas within a short duration. Consequently, a short-term (over the duration of the construction phase which in the worst case could be up to 11.5 years including a much shorter period for construction of the offshore export cable) and temporary **negligible** or **minor adverse** impact on the populations of the seabird species presented in **Table 6.4** (extracted from Tables 5.8, 5.16, and 5.24, and the detailed assessment in Sections 5.2, 5.3 and 5.4, in **Appendix 11A**).

Table 6.4 Summary of impacts on seabirds and their populations due to habitat loss and / or alteration during the construction of Dogger Bank Teesside A & B (including cable-laying)

Species	Population[1]	Derivation of impact		
		Value of Receptor	Overal Sensitivity of Receptor	Magnitude of Effect
Negligible impact				
Arctic skua	All	Very High	Low	Negligible
Black-legged kittiwake	All	Very High	Low	Negligible
Great black-backed gull	All	Very high	High	Negligible
Great skua	All	Very High	Low	Negligible
Lesser black-backed gull	All	Very high	Very Low	Negligible
Little auk	All	High	Low	Negligible
Northern fulmar	All	Very High	Very Low	Negligible
Northern gannet	All	Very high	Very Low	Negligible
White-billed diver	All	Medium	High	Negligible
Minor adverse impact				
Atlantic puffin	All	Very high	Medium	Negligible
Common guillemot	All	Very high	Medium	Negligible
Razorbill	All	Very High	Medium	Negligible

[1] Designated site (SSSI), site suite (all linked designated sites), national, and biogeographic population.

6.5. Disturbance from Dogger Bank Teesside A & B Export Cable Corridor landfall construction

6.5.1. The construction of the export cable landfall will result in a highly localised level of physical, visual and noise disturbance (no more than 2.1km in length including a 300m buffer) for foraging birds, resulting in local displacement (see Smit & Visser (1993) and Burton *et al.* (2002)). **Table 4.17** presents the numbers of species present within the intertidal area. Overall, a short-term and temporary **negligible** impact is predicted (see **Table 6.5**) on the seabird and waterbird species recorded as present within the intertidal area, and given the temporary nature of the disturbance no population effect is expected (see detailed assessment in Section 5.5 in **Appendix 11A**).

Table 6.5 Summary of impacts on birds and their populations due to disturbance during the export cable landfall construction for Dogger Bank Teesside A & B

Species	Value	Sensitivity	Magnitude	Impact
Black-headed gull	Low	Low	Negligible	Negligible
Dunlin	Low	Medium	Negligible	Negligible
Eurasian oystercatcher	Low	Medium	Negligible	Negligible
Herring gull	Low	Low	Negligible	Negligible
Northern lapwing	Very high	High	Negligible	Minor adverse
Ringed plover	Very high	Medium	Negligible	Minor adverse
Ruddy turnstone	Low	Medium	Negligible	Negligible
Sanderling	Very high	Medium	Negligible	Minor adverse

6.6. Project Cumulative Impacts

6.6.1. The previous sub-sections above have set out the predicted impacts for a range of effects on bird populations that could arise from the construction (or decommissioning) of Dogger Bank Teesside A & B. This section considers the potential for project cumulative impacts (the combined impacts of all elements of the project) on the various bird populations present to arise from the various effects assessed above.

6.6.2. The two main effects of wind farm construction are: habitat loss, and disturbance and displacement. A cumulative impact could arise where more than one of these effects results in an impact on the same bird population. The potential for this cumulative impact to occur is determined largely by the sensitivities of individual species to the specific effects listed above and whether a species is susceptible to more than one of the effects. The seabirds that are sensitive to both types of disturbance that will arise during construction are northern gannet, common guillemot, razorbill, little auk, and Atlantic puffin. However, given the negligible magnitude of these effects (see **Table 6.3** and **Table 6.4**), and that the areas of habitat loss (or alteration) would occur predominantly in the areas where disturbance is experienced, there would be no predicted increase (or synergism) of the effects, and consequently, no significant project cumulative impacts would arise. Therefore, the conclusions regarding the most significant of the predicted impacts as a result of the construction of Dogger Bank Teesside A & B (presented in **Table 6.3** and **Table 6.4** for seabirds, and **Table 6.5** for waterfowl) can be used to show the overall project cumulative impact on each species and population. The project cumulative impacts are therefore summarised in **Table 6.6**.

Table 6.6 Summary of project cumulative impacts on seabird populations and waterfowl populations due to the construction of Dogger Bank Teesside A & B (including cable-laying)

Species	Population[1]	Derivation of impact		
		Value of Receptor	Overall Sensitivity of Receptor	Magnitude of Effect
Negligible impact				
Arctic skua	All	Very High	Low	Negligible
Black-legged kittiwake	All	Very High	Low	Negligible
Great black-backed gull	All	Very high	High	Negligible
Great skua	All	Very High	Low	Negligible
Lesser black-backed gull	All	Very high	Very Low	Negligible
Little auk	All	High	Low	Negligible
Northern fulmar	All	Very High	Very Low	Negligible
White-billed diver	All	Medium	High	Negligible
Black-headed gull	All	Low	Low	Negligible
Dunlin	All	Low	Medium	Negligible
Eurasian oystercatcher	All	Low	Medium	Negligible
Herring gull	All	Low	Low	Negligible
Ruddy turnstone	All	Low	Medium	Negligible
Minor adverse impact				
Atlantic puffin	All	Very High	Very Low	Negligible
Common guillemot	All	Very High	Medium	Negligible
Northern gannet	All	Very High	Very Low	Negligible
Razorbill	All	Very High	Medium	Negligible
Northern lapwing	All	Very high	High	Negligible
Ringed plover	All	Very high	Medium	Negligible
Sanderling	All	Very high	Medium	Negligible

1 Designated site (SSSI), site suite (all linked designated sites), national, and biogeographic population.

6.7. Summary of impacts for designated bird species during the construction phase for Dogger Bank Teesside A & B

6.7.1. No significant displacement or habitat loss and / or alteration impacts are predicted for any of the seabird or waterbird populations and the designated sites which they are features of, as a result of the construction of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually), the Dogger Bank Teesside A & B Export Cable Corridor, or the Dogger Bank Teesside A & B Export Cable Corridor landfall construction.

Disturbance and displacement

BAP species

6.7.2. Arctic skua is the only BAP priority seabird species for which a potential impact as a result of disturbance and displacement is predicted during construction of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually). However, as identified in **Table 6.3**, **no impact** is concluded on the national breeding population during the construction phase as this species displays limited if any sensitivity to disturbance. No other BAP priority bird species would be affected by disturbance and displacement during the construction phase.

OSPAR

6.7.3. As identified in **Table 6.3**, **no impact** is predicted on the black-legged kittiwake population as a result of disturbance and displacement during construction of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually), as this species displays limited if any sensitivity to the type of disturbance effects likely to arise during the construction phase.

Designated sites

6.7.4. The apportionment to designated sites of mortality as a result of disturbance and displacement during the construction and decommissioning phases is outlined in **Table 6.7**. The table considers the percentage of populations for those species which are a feature of the designated sites (extracted from Tables A9.38a-d, A9.41a-d, and A9.44a-d in Appendix 9, and the detailed assessment in Section 5.4, in **Appendix 11A**) for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually). The apportionment is also provided in Appendix 9 of **Appendix 11A**. No apportionment is provided for northern gannet for Dogger Bank Teesside A & B due to the very low numbers of gannet presence, coupled with their low sensitivity to disturbance and hence very low numbers that are predicted to be displaced (zero at all levels of mortality). The SSSI component sites are listed in **Table 4.19**. No moderate or major impacts were identified on species that are features of designated sites, or the designated sites condition status as a result of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually).

6.7.5. Disturbance to foraging little tern within the nearshore export cable construction area could arise due to increased vessel activity and the presence of the cable laying vessels. However, given the localised area of the activity, its temporary nature, and the existing high level of vessel movements in the nearshore zone, a negligible scale magnitude of effect is predicted. Given the low sensitivity of the little tern to boat activity, a **negligible** impact is predicted on the little tern populations of the Northumbria Coast SPA and Ramsar (component SSSIs), and the Teessmouth and Cleveland Coast SPA and Ramsar (component SSSIs).

Habitat loss and / or alteration (including cable-laying)

BAP species

6.7.6. The alteration and loss of habitat as a result of the construction activities for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) is predicted to result in a short-term and temporary (for the duration of the disturbed area for the construction phase which in the worst case could be up to 11.5 years including a much shorter period for construction of the offshore export cable) and temporary **negligible** impact on the national breeding population of the BAP priority species Arctic skua (see **Table 6.4**). No other BAP priority bird species would be affected as a result of habitat loss and / or alteration during the construction phase for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) or Dogger Bank Teesside A or Dogger Bank Teesside B individually.

OSPAR

6.7.7. As identified in **Table 6.4**, a short-term **negligible** impact is predicted on the biogeographic population of black-legged kittiwake as a result of the alteration and loss of habitat as a result of the construction activities for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually).

Designated sites

6.7.8. The alteration and loss of habitat as a result of the construction activities for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) is predicted to result in a short-term (for the duration of the cable-laying which in the worst case could be up to six months) and temporary **negligible** to **minor adverse** impact (see **Table 6.4**) on the populations of the species and designated sites listed in **Table 6.7**. Given the short-term nature of the impact, and the limited area of disturbance and therefore numbers of birds that are a feature of the designated sites, **no** measurable population level **impact** is predicted.

6.7.9. The construction of the nearshore export cable could result in increased suspended sediment concentrations and deposition of sediment (and hence habitat alteration) within the foraging area of breeding little terns that are features of the Northumbria Coast SPA and Ramsar (component SSSIs) and the Teessmouth and Cleveland Coast SPA and Ramsar (component SSSIs). Given the temporary duration and fairly limited extent of the increased suspended sediment concentrations and areas of deposition predicted during the construction phase (see Section 6 in **Chapter 9 Marine Physical Processes**), and that it would occur only within a limited area of the little tern foraging range (lesser in scale for the Northumbria Coast SPA and Ramsar population as it is further away) no direct habitat loss or alteration would arise, and an indirect temporary and intermittent negligible effect due to habitat alteration (affecting their prey or visual foraging behaviour) is predicted. As little tern have a high sensitivity to habitat alteration, this would result in a **negligible** impact on the little tern populations of the Northumbria Coast SPA and Ramsar (component SSSIs) and the Teessmouth and Cleveland Coast SPA and Ramsar (component SSSIs).

Disturbance from export cable landfall construction

BAP species

6.7.10. Herring gull and northern lapwing are the only BAP priority species present within the intertidal study area for which a potential impact as a result of physical, visual and noise disturbance is predicted during the export cable landfall works for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually). **Table 6.5** identifies a predicted short-term **negligible** impact on herring gull and a **minor adverse** impact on northern lapwing national wintering and breeding populations during the construction phase. Given the temporary nature of the disturbance, no population effect is expected (see detailed assessment in Section 5.5 in **Appendix 11A**). No other BAP priority species would be affected by disturbance during landfall works for the export cable.

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6.7.11. **No impact** is predicted on the black-legged kittiwake population during the landfall works for the Dogger Bank Teesside A & B Export Cable Corridor, as they have not been recorded within the intertidal study area during any surveys.

Designated sites

6.7.12. **No impact** is predicted on designated sites populations as there are no seabirds linked to designated sites present in the landfall.

Project cumulative impacts

6.7.13. As discussed in Section 7.6, the individual impact of greatest magnitude and significance is not noticeably increased in magnitude (quantity) by the other construction phase impacts, such that there are no significant cumulative impacts on bird populations during the construction phase. The same occurs with respect to the designated bird populations and designated sites, such that any construction phase project cumulative impacts on BAP species, OSPAR threatened species, or designated sites would not exceed **minor adverse** in significance as described and assessed in Section 6.7 above.

6.7.14. The negligible impact on the Northumbria Coast SPA and Ramsar (component SSSIs) and the Teessmouth and Cleveland Coast SPA and Ramsar (component SSSIs) as a result of temporary habitat alteration is the largest spatial extent potentially affecting foraging little tern, and the spatial extent would not increase in scale as a result of any disturbance impact. Consequently, a negligible cumulative impact would remain on the little tern populations of the Northumbria Coast SPA and Ramsar (component SSSIs) and the Teessmouth and Cleveland Coast SPA and Ramsar (component SSSIs) during the operation phase.

Table 6.7 Apportioning to designated sites of mean mortality as a result of displacement for relevant species during construction (and decommissioning) of Dogger Bank Teesside A & B (breeding bird numbers and percentages are shown in brackets)

Site name[1]	Common guillemot		Razorbill		Atlantic puffin	
	Number of birds	% of site's population	Number of birds	% of site's population	Number of birds	% of site's population
Buchan Ness to Collieston Coast SPA	3.53	0.01	-	-	-	-
Calf of Eday SSSI and SPA	0.25	0.01	-	-	-	-
Cape Wrath SSSI and SPA	4.06	0.01	0.89	0.02	0.02	<0.01
Collieston to Whinnyfold Coast SSSI	-	-	0.11	0.02	-	-
Copinsay SSSI and SPA	2.51	0.01	-	-	-	-
Coquet Island SSSI and SPA	-	-	-	-	0.34	<0.01
East Caithness Cliffs SPA	29.12	0.01	6.45	0.02	0.01	<0.01
Fair Isle SSSI and SPA	3.57	0.01	0.49	0.02	0.16	<0.01
Farne Islands SSSI and SPA	12.58 (3.79)	0.02 (0.01)	0.25 (0.04)	0.02 (0.01)	0.79	<0.01
Flamborough Head SSSI and pSPA	21.19 (9.82)	0.02 (0.01)	7.88 (2.17)	0.03 (0.01)	0.01	<0.01
Forth Islands SPA	5.02 (1.03)	0.01 (0.00)	1.81 (0.11)	0.02 (0.00)	1.33	<0.01
Foula SSSI and SPA	4.13	0.01	1.25	0.02	0.28	<0.01
Fowlsheugh SSSI and SPA	9.39 (1.17)	0.01 (0.00)	1.90	0.02	-	-
Gamrie & Pennan Coast SSSI (Troup, Pennan and Lions Heads SPA)	2.99	0.01	0.94		-	-
Hermaness, Saxa Vord and Valla Field SPA	1.37	0.01	-	-	0.34	<0.01
Hoy SSSI and SPA	1.65	0.01	-	-	0.01	<0.01
Marwick Head SSSI and SPA	3.26	0.01	-	-	-	-
North Caithness Cliffs SPA	12.85	0.01	0.89	0.02	0.15	<0.01
Noss SSSI and SPA	4.04	0.01	-	-	0.02	<0.01
Rousay SSSI and SPA	0.56	0.01	-	-	-	-
St Abb's Head to Fast Castle SSSI and SPA	10.58 (2.57)	0.01 (0.00)	1.31 (0.16)	0.02 (0.00)	-	-
Sule Skerry and Sule Stack SPA	1.13	0.01	-	-	0.74	<0.01
Sumburgh Head SSSI and SPA	0.91	0.01	-	-	-	-
West Westray SPA	2.22	0.01	0.35		-	-

[1] Where a site is identified as 'SPA' or 'Ramsar' alone refer to **Table 4.19** for component SSSIs.

7. Assessment of Impacts during Operation

7.1. Detailed assessment

7.1.1. The assessment of impacts on marine and coastal ornithology receptors during the operation phase for Dogger Bank Teesside A, Dogger Bank Teesside B, and Dogger Bank Teesside A & B (both Dogger Bank Teesside A and Dogger Bank Teesside B) respectively are extracted from Sections 5.2, 5.3, and 5.4 in **Appendix 11A**. This part of the ES chapter provides the impact assessment undertaken by the BTO. For a more extensive and detailed description of the assessment process and the data interpretation, the reader is directed to **Appendix 11A** which provides further details.

7.1.2. The impacts summarised in this section and predicted to arise during the operation phase of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) are:

- Disturbance and displacement effects on seabird populations;
- Barrier effect on breeding populations of seabirds;
- Barrier effect on migrant bird populations;
- Collisions on seabird populations;
- Collisions on migrant birds populations; and
- Habitat loss and / or alteration on seabird populations.

7.2. Disturbance and displacement

7.2.1. The main sources of disturbance and displacement during operation would be associated with the presence of the wind turbines and regular maintenance undertaken by the Operations and Maintenance team which will require vessel and/or helicopter movements and associated human activity (see paragraph 3.3.14).

7.2.2. The numbers of birds displaced annually for each season during the operation phase for each of the species which have been identified as being sensitive to disturbance (see paragraph 3.3.21) is presented in **Table 7.1**. The data presented in **Table 7.1** is extracted from Tables 5.1, 5.8, and 5.15 in **Appendix 11A** for Dogger Bank Teesside A, Dogger Bank Teesside B, and Dogger Bank Teesside A & B respectively, and these tables also contain the confidence ranges. It should be noted that no data is presented for Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar due to either the lack of populations present in order to quantify potential disturbance, or, for most, because these species are not sensitive to the types of disturbance that would take place during the construction and decommissioning phases (see paragraph 3.3.21). Of the key seabirds subject to disturbance (i.e. Atlantic puffin, common guillemot, little auk, northern gannet, razorbill, and white-billed diver), common guillemot and razorbill showed the highest displacement rates (see **Table 7.1**).

Table 7.1 Mean annual number of birds displaced during the operation of Dogger Bank Teesside A & B, and Dogger Bank Teesside A and Dogger Bank Teesside B individually (including 2km buffer) based on the mean of the survey results

Species	Season	Dogger Bank Teesside A	Dogger Bank Teesside B	Dogger Bank Teesside A & B
Atlantic puffin	Breeding	12	16	28
	Wintering	65	75	140
	All	77	91	168
Common guillemot	Breeding	361	747	1,108
	Wintering	1,707	2,696	4,403
	All	2,068	3,442	5,511
Little auk	All	75	81	156
Northern gannet	Breeding	112	144	256
	Wintering	198	255	454
	All	310	399	709
Razorbill	Breeding	75	111	186
	Wintering	641	976	1,618
	All	716	1,087	1,804
White-billed diver	All	7	7	15

7.2.3. Based on the mean numbers of birds displaced (in **Table 7.1**), these have then been combined with the species mortality rate (see paragraph 3.3.21) to provide a quantity for the impact of displacement during each year of operation for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually), as shown in **Table 7.2**, extracted from the quantities presented in Appendix 10 of **Appendix 11A**, which also show different ranges of mortality and displacement.

7.2.4. Disturbance and displacement as a result of the operation of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) resulted in mortality of less than 0.1% of the national and biogeographic populations of the species likely to be affected, whilst no mortality is predicted on Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar. Less than 0.1% of all species' populations are predicted to be affected (see **Table 7.2**). Consequently, displacement and subsequent mortality during the operation phase for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) is predicted to result in **no impact** to a long-term **negligible** or **minor adverse** impact on the national and biogeographic populations for the seabird species presented in **Table 7.3**. No impact is predicted on the populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar. No moderate or major impacts were identified on species at national or biogeographic population levels for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually).

Table 7.2 Mean mortality for seabirds and their population affected by disturbance and displacement during the operation of Dogger Bank Teesside A & B, and Dogger Bank Teesside A and Dogger Bank Teesside B individually

Species	Season	Dogger Bank Teesside A			Dogger Bank Teesside B			Dogger Bank Teesside A & B		
		Number of birds	% national population	% bio-geographic population	Number of birds	% national population	% bio-geographic population	Number of birds	% national population	% bio-geographic population
Atlantic puffin	Breeding	1	<0.01	N/A	1	<0.01	N/A	1	<0.01	N/A
	Wintering	3	N/A	N/A	4	N/A	N/A	7	N/A	N/A
	All	4	N/A	<0.01	5	N/A	<0.01	8	N/A	<0.01
Common guillemot	Breeding	18	<0.01	N/A	37	<0.01	N/A	55	<0.01	N/A
	Wintering	85	N/A	N/A	135	N/A	N/A	220	N/A	N/A
	All[1]	103	N/A	<0.01 (<0.01 - 0.01)	172	N/A	<0.01 (<0.01 - 0.02)	276	N/A	<0.01 (<0.01 - 0.03)
Little auk	All	4	N/A	<0.01	4	N/A	<0.01	8	N/A	<0.01
Northern gannet	Breeding	0	<0.01	N/A	0	<0.01	N/A	0	<0.01	N/A
	Wintering	0	N/A	N/A	0	N/A	N/A	0	N/A	N/A
	All	0	N/A	<0.01	0	N/A	<0.01	0	N/A	<0.01
Razorbill	Breeding	4	<0.01	N/A	6	<0.01	N/A	9	<0.01	N/A
	Wintering	32	N/A	N/A	49	N/A	N/A	81	N/A	N/A
	All	36	N/A	<0.01	54	N/A	<0.01	90	N/A	0.01
White-billed diver	All	3	0.06	0.03	3	0.06	0.03	5	0.10	0.05

[1] Biogeographic population for common guillemot is based on the combined *aalge* populations (4,800,000 I) and the *albionis* population (800,000 I), with the range for these populations presented in brackets.

Table 7.3 Summary of impacts on seabirds and their populations due to displacement during the operation of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually)

Species	Population[1]	Derivation of impact		
		Value of Receptor	Sensitivity of Receptor	Magnitude of Effect
No impact				
Arctic skua	All	Very high	Low	None
Black-legged kittiwake	All	Very high	Low	None
Great black-backed gull	All	Very high	Low	None
Great skua	All	Very high	Low	None
Lesser black-backed gull	All	Very high	Very low	None
Northern fulmar	All	Very high	Very low	None
Negligible impact				
Little auk	All	High	Low	Negligible
White-billed diver	All	Medium	High	Negligible
Minor adverse impact				
Atlantic puffin	All	Very high	Medium	Negligible
Common guillemot	All	Very high	Medium	Negligible
Northern gannet	All	Very high	Very low	Negligible
Razorbill	All	Very high	Medium	Negligible

[1] Designated site (SSSI), site suite (all linked designated sites), national, and biogeographic population.

7.3. Barrier effect on breeding seabirds

7.3.1. The assessment of barrier effects on seabirds is described in paragraphs 3.3.34 to 3.3.38, and further details are available in Section 4 of **Appendix 11A**. Dogger Bank Teesside A and Dogger Bank Teesside B are within the maximum foraging range of six seabird species from designated sites (northern fulmar, northern gannet, black-legged kittiwake, common guillemot, and razorbill) and the development may therefore pose a barrier during the breeding period. Estimates of the mean number of breeding birds of these species in flight in the study area based on the 2010 to 2012 survey data are presented in **Table 7.4**, extracted from Tables 5.2, 5.9, and 5.16 of **Appendix 11A**.

7.3.2. Black-legged kittiwake showed the highest estimates within the study area based on the mean of the 2010 to 2012 surveys for both Dogger Bank Teesside A and Dogger Bank Teesside B (and Dogger Bank Teesside A & B combined), with their breeding period falling April-September. However, a long-term **minor adverse** impact due to the barrier effect is predicted for all population levels for the key seabird species present within the Dogger Bank, as shown in **Table 7.5**. No barrier effect is predicted for species such as Arctic skua, Atlantic puffin, great black-backed gull, great skua, lesser black-backed gull, little auk, or white-billed diver.

Table 7.4 Mean number of breeding seabirds in flight affected by barrier effect each year during the operation of Dogger Bank Teesside A & B, and Dogger Bank Teesside A and Dogger Bank Teesside B individually

Species	Breeding season	Dogger Bank Teesside A			Dogger Bank Teesside B			Dogger Bank Teesside A & B		
		Number in flight	% national population	% bio-geographic population	Number in flight	% national population	% bio-geographic population	Number in flight	% national population	% bio-geographic population
Black-legged kittiwake	Mar-Sep	327	0.04	<0.01	540	0.07	<0.01	866	0.12	0.01
Common guillemot[1]	May-Jul	55	<0.01	<0.01 (<0.01 - <0.01)	114	<0.01	<0.01 (<0.01 - 0.01)	169	0.01	<0.01 (<0.01 - 0.02)
Northern fulmar	Mar-Sep	79	<0.01	<0.01	73	<0.01	<0.01	152	0.02	<0.01
Northern gannet	Apr-Sep	54	0.02	<0.01	70	0.03	<0.01	124	0.06	0.02
Razorbill	May-Jul	22	0.01	<0.01	33	0.01	<0.01	54	0.02	<0.01

[1] Biogeographic population for common guillemot is based on the combined *aalge* populations (4,800,000 I) and the *albionis* population (800,000 I), with the range for these populations presented in brackets.

Table 7.5 Summary of impacts on seabirds and their populations due to barrier effect during the operation of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually)

Species	Population[1]	Derivation of impact		
		Value of Receptor	Sensitivity of Receptor	Magnitude of Effect
No impact				
Arctic skua	All	Very High	Low	None
Atlantic puffin	All	Very high	Very low	None
Great black-backed gull	All	Very High	Low	None
Great skua	All	Very High	Low	None
Lesser black-backed gull	All	Very High	Very Low	None
Little auk	All	High	Low	None
White-billed diver	All	Medium	High	None
Minor adverse impact				
Black-legged kittiwake	All	Very high	Low	Negligible
Common guillemot	All	Very high	High	Negligible
Northern fulmar	All	Very high	Low	Negligible
Northern gannet	All	Very high	Very low	Negligible
Razorbill	All	Very high	Medium	Negligible

[1] Designated site (SSSI), site suite (all linked designated sites), national, and biogeographic population.

7.4. Barrier effect on migrant birds

7.4.1. The assessment of the potential barrier effect considered the 45 species' (including sub-species or separate breeding and non-breeding) populations of terrestrial or waterbird migrants that are species whose migration zones (defined by Wright *et al.* (2012)) overlap with the Dogger Bank Zone. Modelling and subsequent estimates of the migrant birds that could potentially experience a barrier effect during the operation of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) is presented in **Table 7.6** (extracted from Tables 5.6, 5.13, and 5.20 in **Appendix 11A**). The numbers of migrant birds and percentages presented in **Table 7.6** assume a 100% barrier effect. These migrant bird species would experience an increase in flight distance, which would depend on their direction of flight. Taking the worst case, the barrier effect on the shortest east-west migratory route would result in an increase of approximately 10km (2% of the 575km route) for Dogger Bank Teesside A alone, and a 20km increase (3% of the 575km route) for Dogger Bank Teesside B alone, and for Dogger Bank Teesside A & B a 25km increase (4% of the 575km route). Longer migratory routes would increase to a lesser extent, resulting in a decrease in the percentage of the distance added to each route by the barrier effect. Given the low percentages (below 2% for almost all populations with the exception of bean goose and non-breeding hen harrier (both less than 3%) and less than 1% for the majority of species) and given the limited diversion that would result, it is considered unlikely that a noticeable population effect would be evident for all migrant bird species.

Table 7.6 Predicted mean annual numbers of migrant birds and their populations in flight and subject to barrier effect during the operation of Dogger Bank Teesside A & B, and Dogger Bank Teesside A and Dogger Bank Teesside B individually

Species	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B[1]	
	Number crossing project	% national population	Number crossing project	% national population	Number crossing project	% national population
Bar-tailed godwit*	482	0.89	544	1.00	971	1.79
Bean goose*	9	1.25	11	1.46	18	2.50
Black-tailed godwit**	41	0.72	41	0.74	75	1.34
Common goldeneye	148	0.51	166	0.57	297	1.02
Common pochard*	227	0.30	212	0.28	385	0.52
Common redshank (breeding)	24	0.08	25	0.08	44	0.15
Common redshank Icelandic population (non-breeding)	993	0.36	1,043	0.38	1,872	0.68
Common redshank mainland Europe population (non-breeding)	230	0.92	257	1.03	461	1.84
Common ringed plover (non-breeding)	315	0.43	347	0.48	626	0.86
Common scoter**	20	0.02	22	0.02	39	0.03
Common shelduck	385	0.51	431	0.57	771	1.02
Common snipe	3,989	0.40	4,403	0.44	7,927	0.79
Dunlin *Calidris alpine schinzii* (passage)*	29	0.79	33	0.90	59	1.60
Dunlin *Calidris alpina alpina* (passage & winter)	3,052	0.70	2,926	0.67	5,072	1.16
Eurasian coot	199	0.19	174	0.17	273	0.26
Eurasian curlew (non-breeding)**	733	0.90	679	0.83	1,323	1.62
Eurasian oystercatcher (non-breeding)	793	0.40	888	0.44	1,588	0.79
Eurasian teal	593	0.24	665	0.27	1,189	0.48
Eurasian wigeon	2,353	0.45	2,635	0.50	4,715	0.90
European nightjar**	4	0.04	7	0.06	8	0.07
Gadwall	36	0.16	45	0.20	60	0.27
Golden plover (non-breeding)*	1,574	0.39	1,267	0.32	2,737	0.68
Goosander (non-breeding)	18	0.55	20	0.62	36	1.10
Great bittern**	2	0.44	2	0.62	3	0.75

Species	Dogger Bank Teesside A		Dogger Bank Teesside B		Dogger Bank Teesside A & B[1]	
	Number crossing project	% national population	Number crossing project	% national population	Number crossing project	% national population
Greater scaup**	2	0.02	2	0.02	3	0.03
Great-crested grebe	51	0.21	56	0.23	86	0.35
Greenshank	<1	0.06	<1	0.06	<1	0.10
Grey plover	421	0.85	464	0.94	836	1.70
Hen harrier (breeding)*	<1	0.03	<1	0.06	<1	0.09
Hen harrier (non-breeding)*	6	1.49	6	1.67	11	2.98
Light-bellied brent goose (Svalbard population)*	2	0.06	2	0.06	2	0.06
Mallard	1,636	0.36	1,833	0.40	3,279	0.71
Northern lapwing**	3,834	0.85	4,225	0.94	7,614	1.70
Northern pintail	72	0.24	81	0.27	144	0.48
Northern shoveler	58	0.30	54	0.28	98	0.52
Red knot	1,349	0.40	1,489	0.44	2,681	0.79
Red-breasted merganser	1	0.03	1	0.03	2	0.06
Ruddy turnstone	190	0.40	213	0.44	381	0.79
Ruff*	24	1.01	24	0.98	43	1.80
Sanderling	358	0.60	395	0.66	712	1.19
Short-eared owl*	6	0.57	7	0.64	12	1.15
Slavonian grebe*	2	0.16	2	0.18	3	0.32
Tufted duck	436	0.42	488	0.47	873	0.85
Velvet scoter	13	0.50	14	0.56	25	1.01
Whimbrel	93	0.40	95	0.41	179	0.78

[1] The total number crossing Dogger Bank Teesside A & B is likely to be less than the sum of Dogger Bank Teesside A and Dogger Bank Teesside B individually as the migratory routes overlap.
* Scotland BAP priority species.
** England and Scotland BAP priority species.

7.4.2. **Table 7.7** summarises the impact of the barrier effect on all migrant bird species, for a more detailed assessment see Sections 5.2, 5.3, and 5.4 in **Appendix 11A**. Species sensitivity is defined in Table 4.15. A long-term minor adverse impact is predicted for all migrant bird species and their respective populations due to the barrier effect of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually). It should be noted that there is considerable uncertainty regarding the assessment of barrier effects posed by Dogger Bank Teesside A & B due to the uncertainty regarding the numbers of birds passing through each project area, whether birds fly directly to or from the designated sites that they are features of or fly closer to the coastline, the extent to which the project actually poses a barrier effect, and the consequences for survival from the increase in energy expenditure that could be associated with the increases in flight distance for those birds exposed to barrier effects. It has therefore been assumed that 100% of all migrants passing through the site will be affected and undertake a route around the project.

Table 7.7 Summary of impacts on migrant bird species due to the barrier effect during the operation for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually)

Species	Derivation of impacts		
	Value	**Magnitude**	**Impact**
Bar-tailed godwit*	Very high	Negligible	Minor adverse
Bean goose*	Very high	Negligible	Minor adverse
Black-tailed godwit**	Very high	Negligible	Minor adverse
Common goldeneye	Very high	Negligible	Minor adverse
Common pochard*	Very high	Negligible	Minor adverse
Common redshank (breeding)	Very high	Negligible	Minor adverse
Common redshank Icelandic population (non-breeding)	Very high	Negligible	Minor adverse
Common redshank mainland Europe population (non-breeding)	Very high	Negligible	Minor adverse
Common ringed plover (non-breeding)	Very high	Negligible	Minor adverse
Common scoter**	Very high	Negligible	Minor adverse
Common shelduck	Very high	Negligible	Minor adverse
Common snipe	Very high	Negligible	Minor adverse
Dunlin *Calidris alpine schinzii* (passage)*	Very high	Negligible	Minor adverse
Dunlin *Calidris alpina alpina* (passage & winter)	Very high	Negligible	Minor adverse
Eurasian coot	Very high	Negligible	Minor adverse
Eurasian curlew (non-breeding)**	Very high	Negligible	Minor adverse
Eurasian oystercatcher (non-breeding)	Very high	Negligible	Minor adverse
Eurasian teal	Very high	Negligible	Minor adverse
Eurasian wigeon	Very high	Negligible	Minor adverse
European nightjar**	Very high	Negligible	Minor adverse
Gadwall	Very high	Negligible	Minor adverse
Golden plover (non-breeding)*	Very high	Negligible	Minor adverse
Goosander (non-breeding)	Very high	Negligible	Minor adverse
Great bittern**	Very high	Negligible	Minor adverse
Greater scaup**	Very high	Negligible	Minor adverse

Species	Derivation of impacts		
	Value	Magnitude	Impact
Great-crested grebe	Very high	Negligible	Minor adverse
Greenshank	Very high	Negligible	Minor adverse
Grey plover	Very high	Negligible	Minor adverse
Hen harrier (breeding)*	Very high	Negligible	Minor adverse
Hen harrier (non-breeding)*	Very high	Negligible	Minor adverse
Light bellied brent goose (Svalbard population)	Very high	Negligible	Minor adverse
Mallard	Very high	Negligible	Minor adverse
Northern lapwing**	Very high	Negligible	Minor adverse
Northern pintail	Very high	Negligible	Minor adverse
Northern shoveler	Very high	Negligible	Minor adverse
Red knot	Very high	Negligible	Minor adverse
Red-breasted merganser	Very high	Negligible	Minor adverse
Ruddy turnstone	Very high	Negligible	Minor adverse
Ruff*	Very high	Negligible	Minor adverse
Sanderling	Very high	Negligible	Minor adverse
Short-eared owl*	Very high	Negligible	Minor adverse
Slavonian grebe*	Very high	Negligible	Minor adverse
Tufted duck	Very high	Negligible	Minor adverse
Velvet scoter	Very high	Negligible	Minor adverse
Whimbrel	Very high	Negligible	Minor adverse

* Scotland BAP priority species.
** England and Scotland BAP priority species.

7.5. Seabird collision risk

7.5.1. Collision analyses to estimate the probability of seabirds colliding with a turbine were conducted as described in paragraphs 3.3.39 to 3.3.46, and are detailed in Sections 5.2, 5.3, and 5.4 in **Appendix 11A**) for Dogger Bank Teesside A, Dogger Bank Teesside B, and Dogger Bank Teesside A & B (Dogger Bank Teesside A and Dogger Bank Teesside B combined) respectively. **Table 7.8** presents the estimated numbers of seabird collisions for a range of avoidance rates, extracted from Tables 5.3, 5.4, 5.10, 5.11, 5.17, and 5.18 in **Appendix 11A**. As outlined in paragraph 3.3.56, mitigation measures have been embedded in the project design in order to minimise the number of birds potentially affected by collisions.

7.5.2. **Table 7.9** presents the summary of the assessment on seabird populations as a result of the quantitative assessment presented in **Table 7.8** and based on the detailed assessment in Sections 5.2, 5.3, and 5.4 in **Appendix 11A**. The assessment concludes that a long-term negligible or minor adverse impact is predicted on all seabirds' populations for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually), based on a 98% avoidance rate for all species with the exception of northern gannet where a 99% avoidance rate has been assumed (see Section 3 for explanation).

Table 7.8 Estimated mean annual collisions for seabirds and their populations due to the operation of Dogger Bank Teesside A & B, and Dogger Bank Teesside A and Dogger Bank Teesside B individually (breeding bird numbers and percentages are shown in brackets)

Species	Avoidance rate	Dogger Bank Teesside A			Dogger Bank Teesside B			Dogger Bank Teesside A & B[1]		
		Collisions	% national population	% bio-geographic population	Collisions	% national population	% bio-geographic population	Collisions	% national population	% bio-geographic population
Arctic skua	95%	0	0	0	0	0	0	0	0	0
	98%	0	0	0	0	0	0	0	0	0
	99%	0	0	0	0	0	0	0	0	0
	99.5%	0	0	0	0	0	0	0	0	0
Atlantic puffin	95%	0	0	0	0	0	0	0	0	0
	98%	0	0	0	0	0	0	0	0	0
	99%	0	0	0	0	0	0	0	0	0
	99.5%	0	0	0	0	0	0	0	0	0
Black-legged kittiwake	95%	132 (82)	(0.01)	<0.01	203 (135)	(0.02)	<0.01	335 (217)	(0.03)	<0.01
	98%	53 (33)	(<0.01)	<0.01	81 (54)	(0.01)	<0.01	134 (87)	(0.01)	<0.01
	99%	26 (16)	(<0.01)	<0.01	41 (27)	(<0.01)	<0.01	67 (44)	(0.01)	<0.01
	99.5%	13 (8)	(<0.01)	<0.01	20 (13)	(<0.01)	<0.01	34 (22)	(<0.01)	<0.01
Common guillemot	95%	0	0	0	0	0	0	0	0	0
	98%	0	0	0	0	0	0	0	0	0
	99%	0	0	0	0	0	0	0	0	0
	99.5%	0	0	0	0	0	0	0	0	0
Great black-backed gull[2]	95%	71 (25)	0.09 (0.07)	0.02	75 (18)	0.10 (0.05)	0.02	146 (43)	0.19 (0.13)	0.04
	98%	28 (10)	0.02 (0.03)	0.01	30 (7)	0.03 (0.02)	0.01	58 (17)	0.05 (0.05)	0.02
	99%	14 (5)	0.01 (0.01)	<0.01	15 (4)	0.01 (0.01)	<0.01	29 (9)	0.03 (0.03)	0.01
	99.5%	7 (3)	0.01 (0.01)	<0.01	7 (2)	0.01 (0.01)	<0.01	15 (4)	0.01 (0.01)	<0.01
Great skua	95%	1 (0)	<0.01	<0.01	1 (0)	<0.01	<0.01	1 (0)	<0.01	<0.01
	98%	0	0	0	0	0	0	1 (0)	<0.01	<0.01
	99%	0	0	0	0	0	0	0	0	0
	99.5%	0	0	0	0	0	0	0	0	0

Species	Avoidance rate	Dogger Bank Teesside A			Dogger Bank Teesside B			Dogger Bank Teesside A & B[1]		
		Collisions	% national population	% bio-geographic population	Collisions	% national population	% bio-geographic population	Collisions	% national population	% bio-geographic population
Lesser black-backed gull[3]	95%	41 (26)	0.01 (0.01)	<0.01	41 (28)	0.01 (0.01)	<0.01	82 (50)	0.03 (0.02)	0.02
	98%	16 (10)	0.01 (<0.01)	<0.01	16 (11)	0.01 (<0.01)	<0.01	33 (20)	0.03 (0.01)	0.01
	99%	8 (5)	<0.01 (<0.01)	<0.01	8 (6)	<0.01 (<0.01)	<0.01	16 (10)	<0.01 (<0.01)	<0.01
	99.5%	4 (3)	<0.01 (<0.01)	<0.01	4 (3)	<0.01 (<0.01)	<0.01	8 (5)	<0.01 (<0.01)	<0.01
Little auk	95%	0	0	0	0	0	0	0	0	0
	98%	0	0	0	0	0	0	0	0	0
	99%	0	0	0	0	0	0	0	0	0
	99.5%	0	0	0	0	0	0	0	0	0
Northern fulmar	95%	2 (1)	(<0.01)	<0.01	2 (1)	(<0.01)	<0.01	3 (2)	(<0.01)	<0.01
	98%	1 (0)	(<0.01)	<0.01	1 (0)	(<0.01)	<0.01	1 (1)	(<0.01)	<0.01
	99%	0	0	0	0	0	<0.01	1 (0)	(<0.01)	<0.01
	99.5%	0	0	0	0	0	<0.01	0	0	<0.01
Northern gannet	95%	152 (82)	(0.04)	0.02	187 (87)	(0.04)	0.02	339 (170)	(0.08)	0.04
	98%	61 (33)	(0.02)	0.01	75 (35)	(0.02)	0.01	136 (68)	(0.03)	0.01
	99%	30 (16)	(0.01)	<0.01	38 (18)	(0.01)	<0.01	68 (34)	(0.02)	0.01
	99.5%	15 (8)	(<0.01)	<0.01	19 (9)	(<0.01)	<0.01	34 (17)	(0.01)	<0.01
Razorbill	95%	2 (0)	(<0.01 (0)	<0.01	3 (0)	(<0.01 (0)	<0.01	6 (0)	(0)	<0.01
	98%	1 (0)	(<0.01 (0)	<0.01	1 (0)	(0)	<0.01	2 (0)	(0)	<0.01
	99%	0	0	0	1 (0)	(0)	<0.01	1 (0)	(0)	<0.01
	99.5%	0	0	0	0	0	0	1 (0)	(0)	<0.01

[1] The total number for Dogger Bank Teesside A & B may differ slightly due to rounding up of numbers within the model and calculations between Dogger Bank Teesside A and Dogger Bank Teesside B individually.
[2] Great black-backed gull percentage of national population is wintering population and breeding population (with breeding population in brackets).
[3] Biogeographic population percentage is based on the *graellsii* sub-population only (using the lower number of the estimated range of this sub-species, 530,000-570,000).

Table 7.9 Summary of impacts on seabirds and their populations due to collisions during the operation of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually)

Species	Population[1]	Derivation of impact		
		Value	Sensitivity	Magnitude
Negligible impact				
Little auk	All	High	Medium	Negligible
White-billed diver	All	Medium	High	Negligible
Minor adverse impact				
Arctic skua	All	Very high	High	Negligible
Atlantic puffin	All	Very high	Very high	Negligible
Black-legged kittiwake	All	Very high	Very high	Negligible
Common guillemot	All	Very high	Very high	Negligible
Great black-backed gull	All	Very high	Very high	Negligible
Great skua	All	Very high	High	Negligible
Lesser black-backed gull	All	Very high	Very high	Negligible
Northern fulmar	All	Very high	Very high	Negligible
Northern gannet	All	Very high	Very high	Negligible
Razorbill	All	Very high	Very high	Negligible

[1] Designated site (SSSI), site suite (all linked designated sites), national, and biogeographic population.

7.6. Migrant bird collision risk

7.6.1. Collision analyses to estimate the probability of the 45 migrant (terrestrial and waterfowl) bird species, whose migration zones (defined by Wright *et al.* (2012) overlap with the offshore study area, colliding with a turbine were conducted as described in paragraphs 3.3.40 to 3.3.48, and detailed in Sections 5.2, 5.3, and 5.4 in **Appendix 11A** for Dogger Bank Teesside A, Dogger Bank Teesside B, and Dogger Bank Teesside A & B respectively.

7.6.2. **Table 7.10** presents the mean annual collisions for each project individually and for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually), extracted from Tables 5.5, 5.12, and 5.19 in **Appendix 11A**. The collision results are based on a 98% avoidance rate. The '% migration zone' column in the table identifies the percentage of each species migration zone (defined by Wright *et al*. (2012)) which overlaps with the Dogger Bank Teesside A, Dogger Bank Teesside B, and Dogger Bank Teesside A & B. It should be noted that the migration zone overlapping Dogger Bank Teesside A & B is less than that the sum of or Dogger Bank Teesside A and Dogger Bank Teesside B individually.

7.6.3. The collision estimates presented in **Table 7.10** are predicted to result in a long-term negligible or minor impact on the populations of the migrant bird species presented in **Table 7.11**, and detailed in Sections 6.2, 6.3, and 6.4 in **Appendix 11A**.

Table 7.10 Estimated mean annual collisions for migrant birds and their populations during the operation of Dogger Bank Teesside A & B, and Dogger Bank Teesside A and Dogger Bank Teesside B individually based on 98% avoidance rate and Option 1 Band model

Species	Dogger BankTeesside A			Dogger Bank Teesside B			Dogger Bank Teesside A & B		
	Collisions	% reference population	% migration zone	Collisions	% reference population	% migration zone	Collisions	% reference population	% migration zone
Bar-tailed godwit*	0.86	<0.1	3.55	0.80	<0.1	4.01	1.41	<0.1	7.16
Bean goose*	0.02	<0.1	4.18	0.02	<0.1	4.87	0.03	<0.1	8.33
Black-tailed godwit**	0.04	<0.1	2.90	0.03	<0.1	2.95	0.06	<0.1	5.36
Common goldeneye	0.26	<0.1	3.39	0.25	<0.1	3.80	0.43	<0.1	6.80
Common pochard*	0.41	<0.1	2.71	0.31	<0.1	2.52	0.56	<0.1	4.59
Common redshank (breeding)	0.04	<0.1	3.14	0.03	<0.1	3.30	0.06	<0.1	5.91
Common redshank Icelandic population (non-breeding)	1.67	<0.1	2.89	1.45	<0.1	3.04	2.57	<0.1	5.45
Common redshank mainland Europe population (non-breeding)	0.39	<0.1	3.68	0.36	<0.1	4.12	0.63	<0.1	7.37
Common ringed plover (non-breeding)	0.03	<0.1	3.45	0.23	<0.1	3.81	0.41	<0.1	6.86
Common scoter**	0.04	<0.1	3.17	0.03	<0.1	3.55	0.06	<0.1	6.35
Common shelduck	0.75	<0.1	3.39	0.70	<0.1	3.80	1.23	<0.1	6.80
Common snipe	6.54	<0.1	3.19	5.98	<0.1	3.52	10.61	<0.1	6.34
Dunlin *Calidris alpine schinzii* (passage)*	0.05	<0.1	3.16	0.04	<0.1	3.58	0.08	<0.1	6.39
Dunlin *Calidris alpina alpina* (passage & winter)	4.78	<0.1	2.78	3.80	<0.1	2.67	6.49	<0.1	4.63
Eurasian coot	1.44	<0.1	0.76	0.25	<0.1	0.66	0.39	<0.1	1.04
Eurasian curlew (non-breeding)**	1.42	<0.1	3.58	1.09	<0.1	3.32	2.09	<0.1	6.46

Species	Dogger BankTeesside A			Dogger Bank Teesside B			Dogger Bank Teesside A & B		
	Collisions	% reference population	% migration zone	Collisions	% reference population	% migration zone	Collisions	% reference population	% migration zone
Eurasian oystercatcher (non-breeding)	0.25	<0.1	3.17	1.34	<0.1	3.55	2.36	<0.1	6.35
Eurasian teal	1.01	<0.1	3.17	0.94	<0.1	3.55	1.65	<0.1	6.35
Eurasian wigeon	4.26	<0.1	3.16	3.95	<0.1	3.54	6.98	<0.1	6.33
European nightjar**	0.01	<0.1	0.75	0.01	<0.1	1.27	0.01	<0.1	1.35
Gadwall	0.07	<0.1	1.81	0.07	<0.1	2.25	0.09	<0.1	3.01
Golden plover (non-breeding)*	2.67	<0.1	3.15	1.78	<0.1	2.53	3.79	<0.1	5.47
Goosander (non-breeding)	0.004	<0.1	3.67	0.03	<0.1	4.11	0.06	<0.1	7.35
Great bittern**	0.09	<0.1	1.25	0.01	<0.1	1.77	0.01	<0.1	2.15
Greater scaup**	0.003	<0.1	2.60	0.003	<0.1	2.40	0.005	<0.1	4.30
Great-crested grebe	0.003	<0.1	2.10	0.08	<0.1	2.30	0.13	<0.1	3.52
Greenshank	0.0003	<0.1	2.47	0.0002	<0.1	2.38	0.0004	<0.1	4.07
Grey plover	0.72	<0.1	3.42	0.66	<0.1	3.76	1.17	<0.1	6.78
Hen harrier (breeding)*	0.01	<0.1	0.60	0.0003	<0.1	1.25	0.0005	<0.1	1.85
Hen harrier (non-breeding)*	0.34	<0.1	3.72	0.01	<0.1	4.17	0.02	<0.1	7.45
Light-bellied brent goose (Svalbard population)*	0.004	<0.1	0.19	0.003	<0.1	0.19	0.004	<0.1	0.19
Mallard	3.10	<0.1	3.39	2.88	<0.1	3.80	5.07	<0.1	6.80
Northern lapwing**	6.65	<0.1	3.42	6.07	<0.1	3.76	10.79	<0.1	6.78
Northern pintail	0.14	<0.1	3.17	0.13	<0.1	3.55	0.22	<0.1	6.35
Northern shoveler	0.10	<0.1	2.71	0.08	<0.1	2.52	0.14	<0.1	4.59
Red knot	2.22	<0.1	3.18	2.03	<0.1	3.51	3.60	<0.1	6.33
Red-breasted merganser	0.03	<0.1	2.28	0.001	<0.1	2.20	0.003	<0.1	3.86
Ruddy turnstone	0.31	<0.1	3.17	0.29	<0.1	3.55	0.51	<0.1	6.35

Species	Dogger BankTeesside A			Dogger Bank Teesside B			Dogger Bank Teesside A & B		
	Collisions	% reference population	% migration zone	Collisions	% reference population	% migration zone	Collisions	% reference population	% migration zone
Ruff*	0.04	<0.1	4.03	0.03	<0.1	3.92	0.06	<0.1	7.22
Sanderling	0.57	<0.1	3.18	0.52	<0.1	3.51	0.92	<0.1	6.33
Short-eared owl*	0.01	<0.1	3.28	0.01	<0.1	3.67	0.02	<0.1	6.56
Slavonian grebe*	0.0002	<0.1	3.17	0.003	<0.1	3.55	0.005	<0.1	6.35
Tufted duck	0.77	<0.1	3.14	0.72	<0.1	3.51	1.26	<0.1	6.29
Velvet scoter	0.02	<0.1	3.72	0.02	<0.1	4.17	0.04	<0.1	7.45
Whimbrel	0.17	<0.1	3.24	0.14	<0.1	3.31	0.26	<0.1	6.23

* Scotland BAP priority species.
** England and Scotland BAP priority species.

Table 7.11 Summary of impacts on migrant bird populations due to collisions during the operation of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) based on 98% avoidance rate and Option 1 Band model

Species	Derivation of impacts		
	Value	**Sensitivity**	**Impact**
Impact of negligible significance			
Bar-tailed godwit**	Very high	Very low	Negligible
Bean goose**	Very high	Low	Negligible
Common goldeneye	Very high	Low	Negligible
Common pochard**	Very high	Very low	Negligible
Common redshank (breeding)	Very high	Very low	Negligible
Common redshank - Icelandic population (non-breeding)	Very high	Very low	Negligible
Common redshank - mainland Europe population (non-breeding)	Very high	Very low	Negligible
Common ringed plover (non-breeding)	Very high	Low	Negligible
Common scoter***	Very high	Low	Negligible
Common snipe	Very high	Very low	Negligible
Dunlin *Calidris alpine schinzii (passage)***	Very high	Very low	Negligible
Dunlin *Calidris alpina alpine* (passage & winter)**	Very high	Very low	Negligible
Eurasian coot	Very high	Very low	Negligible
Eurasian curlew (non-breeding)***	Very high	Very low	Negligible
Eurasian teal	Very high	Very low	Negligible
Eurasian wigeon	Very high	Very low	Negligible
European nightjar***	Very high	Very low	Negligible
Gadwall	Very high	Very low	Negligible
Golden plover (non-breeding)**	Very high	Very low	Negligible
Great bittern***	Very high	Very low	Negligible
Greater scaup***	Very high	Very low	Negligible
Greenshank	Very high	Very low	Negligible
Mallard	Very high	Very low	Negligible
Northern lapwing***	Very high	Very low	Negligible
Northern pintail	Very high	Very low	Negligible
Northern shoveler	Very high	Very low	Negligible
Ruff**	Very high	Very low	Negligible
Short-eared owl**	Very high	Very low	Negligible
Tufted duck	Very high	Very low	Negligible
Velvet scoter	Very high	Low	Negligible
Impact of minor significance			
Black-tailed godwit***	Very high	Very high	Negligible
Common shelduck	Very high	High	Negligible
Eurasian oystercatcher (non-breeding)	Very high	High	Negligible

Species	Derivation of impacts		
	Value	Sensitivity	Impact
Goosander (non-breeding)	Very high	Medium	Negligible
Great-crested grebe	Very high	Medium	Negligible
Grey plover	Very high	High	Negligible
Hen harrier (breeding)**	Very high	Medium	Negligible
Hen harrier (non-breeding)**	Very high	Medium	Negligible
Light-bellied brent goose (Svalbard population)	Very high	High	Negligible
Red knot	Very high	Medium	Negligible
Red-breasted merganser	Very high	Medium	Negligible
Ruddy turnstone	Very high	High	Negligible
Sanderling	Very high	Medium	Negligible
Slavonian grebe**	Very high	Medium	Negligible
Whimbrel	Very high	High	Negligible

* Designated site (SSSI), site suite (all linked designated sites), national, and biogeographic populations.
** Scotland BAP priority species.
*** England and Scotland BAP priority species.

7.7. Habitat loss and / or alteration on seabird populations

7.7.1. The alteration and /or loss of habitat as a result of the presence of the wind farm and associated structures (including the cables (export, inter-array, and inter-platform) where protected or where cable crossings are required as identified in paragraph 6.4.1) for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) is predicted to result in a long-term **negligible** or **minor adverse** impact on the populations of the majority of key seabird species, and **minor adverse** for Atlantic puffin, common guillemot, and razorbill as presented in **Table 7.12** at all population levels. Details are presented in Section 5.1 in **Appendix 11A**. The assessment is detailed for each seabird species throughout Sections 5.2, 5.3, and 5.4 in **Appendix 11A**.

7.8. Habitat loss and / or alteration from export cable landfall

7.8.1. While the landfall installation methods are not yet finalised, a buried transition pit using horizontal direction drilling (HDD) located in the sub-tidal zone is the preferred option. Consequently, no operational effects are anticipated following burial effects, which are considered to be negligible. Overall, **no long-term impact** would arise as natural processes and habitats would remain above the buried cable.

7.9. Project Cumulative Impacts

7.9.1. The previous sub-sections above have set out the predicted impacts for a range of effects on bird populations that could arise from development of Dogger Bank Teesside A & B. This section considers the potential for project cumulative impacts (the combined impacts of all elements of the project) on the various bird populations present to arise from the various effects assessed.

Table 7.12 Summary of impacts on seabirds and their populations due to habitat loss and / or alteration during the operation of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) including the Dogger Bank Teesside A & B Export Cable Corridor

Species	Population[1]	Derivation of impact		
		Value	Sensitivity	Magnitude
Negligible impact				
Arctic skua	All	Very high	Low	Negligible
Black-legged kittiwake	All	Very high	Low	Negligible
Great black-backed gull	All	Very high	Low	Negligible
Great skua	All	Very high	Low	Negligible
Lesser black-backed gull	All	Very high	Very low	Negligible
Little auk	All	High	Low	Negligible
Northern fulmar	All	Very high	Very low	Negligible
Northern gannet	All	Very high	Very low	Negligible
White-billed diver	All	Medium	High	Negligible
Minor adverse impact				
Atlantic puffin	All	Very high	Medium	Negligible
Common guillemot	All	Very high	Medium	Negligible
Razorbill	All	Very high	Medium	Negligible

[1] Designated site (SSSI), site suite (all linked designated sites), national, and biogeographic population.

7.9.2. The four main effects of wind farm development are: habitat loss, disturbance and displacement, collision risk, and barrier effects. A cumulative impact could arise where more than one of these effects results in an impact on the same bird population. The potential for this cumulative impact to occur is determined largely by the sensitivities of individual species to the specific effects listed above and whether a species is susceptible to more than one of the effects. For the purposes of this part of the assessment, these species specific sensitivities are set out in **Table 7.13** for each of the species and their populations assessed along with a summary of the conclusions derived from the impact assessment, presented in Sections 7.1 to 7.8 above, so that the potential for a project cumulative impact to arise can be determined. Where it is apparent that a species is sensitive to and could be subject to more than one effect then further assessment of the cumulative impact has been undertaken and is presented below.

7.9.3. On the basis of the summary information presented in **Table 7.13** it is apparent that potential project cumulative impact on bird populations would be likely to arise only with respect to northern gannet and black-legged kittiwake for both collision mortality and barrier effects, and common guillemot and razorbill with respect to displacement mortality and barrier effects. There are no species that would be affected, to any significant degree, by both displacement and collision mortality.

Table 7.13 Summary of operation phase impact findings for individual species and their populations as a result of Dogger Bank Teesside A & B to determine potential for project cumulative impacts to arise

Species / group	**Habitat loss (prey resource loss)[1]**	**Displacement mortality**	**Collision mortality**	**Barrier effect**
White-billed diver	Not significant	4 birds predicted	Not significant <1 adult birds / year	Not applicable / no impact
Northern fulmar	Not significant	No displacement impact	Not significant <1 adult birds / year	152 birds in flight in the breeding season – negligible population effect
Northern gannet	Not significant	No displacement impact	61 adult birds / year	124 birds in flight in the breeding season – negligible population effect
Arctic skua	Not significant	No displacement impact	Not significant <1 adult birds / year	Not applicable / no impact
Great skua	Not significant	No displacement impact	Not significant <1 adult birds / year	Not applicable / no impact
Black-legged kittiwake	Not significant	No displacement impact	123 adult birds / year	866 birds in flight in the breeding season – negligible population effect
Lesser black-backed gull	Not significant	No displacement impact	16 adult birds / year	Not applicable / no impact
Great black-backed gull	Not significant	No displacement impact	26 adult birds / year	Not applicable / no impact
Common guillemot	Not significant	299 birds predicted	Not significant <1 adult birds / year	169 birds in flight in the breeding season – negligible population effect
Razorbill	Not significant	103 birds predicted	Not significant <1 adult birds / year	54 birds in flight in the breeding season – negligible population effect
Little auk	Not significant	11 birds predicted	Not significant <1 adult birds / year	Not applicable / no impact
Atlantic puffin	Not significant	10 birds predicted	Not significant <1 adult birds / year	Not applicable / no impact
Migratory birds	Temporary and negligible for the export cable within the intertidal zoneonly	Temporary and negligible for the export cable within the intertidal zone only	Not significant <0.1% of GB population for all species assessed	Not significant at the population level

[1] Includes the export cable corridor.

Collision mortality and barrier effects

7.9.4. This potential project cumulative impact relates solely to northern gannet and black-legged kittiwake populations. Furthermore, this impact would only apply to breeding colonies that are within foraging range of Dogger Bank Teesside A & B. While a potential impact on breeding birds from the barrier that Dogger Bank Teesside A & B could pose has been identified, as discussed in Section 7.3 above, the location of Dogger Bank Teesside A & B is not likely to result in a noticeable effect on the energetics of individual birds such that a population impact would arise.

7.9.5. In the case of northern gannet, the number of birds potentially affected by the barrier effect of the wind farm would represent from 0.06% of the national population and 0.02% of the biogeographic population in the breeding season (see **Table 7.4**). In relation to the individual breeding colonies, the additional foraging distance of up to 10.9% that may need to be travelled due to the barrier effect on those birds that are foraging in the project area is not considered to be significant at the population level, particularly given the habitat flexibility shown by this species and its extensive foraging range. It is therefore considered that no significant cumulative impact on the northern gannet population would arise as a result of collision mortality and barrier effects, over and above the impact of collisions (the impact which has the greatest quantified effect on the northern gannet population).

7.9.6. In the case of black-legged kittiwake, the number of birds potentially affected by the barrier effect of the wind farm would represent from 0.12% of the national population and 0.01% of the biogeographic population in the breeding season (see **Table 7.4**). In relation to the individual breeding colonies, the additional foraging distance of up to 10.8% that may need to be travelled due to the barrier effect on those birds that are foraging in the project area is not considered to be significant at the population level, particularly given the habitat flexibility shown by this species and its extensive foraging range. It is therefore considered that no significant cumulative impact on the black-legged kittiwake population would arise as a result of collision mortality and barrier effects, over and above the impact of collisions (the impact which has the greatest quantified effect on the black-legged kittiwake population).

Displacement mortality and barrier effects

7.9.7. This potential project cumulative impact relates solely to common guillemot and razorbill populations. Furthermore, this impact would only apply to breeding colonies that are within foraging range of Dogger Bank Teesside A & B.

7.9.8. In the case of common guillemot, the number of birds potentially affected by the barrier effect of the wind farm would represent from 0.01% of the national population and less than 0.01% of the biogeographic population in the breeding season (see **Table 7.4**). In relation to the individual breeding colonies, the additional foraging distance of up to 7.4% that may need to be travelled due to the barrier effect on those birds that are foraging in the project area is not considered to be significant at the population level, particularly given the habitat flexibility shown by this species and its extensive foraging range. It is therefore considered that no significant cumulative impact on the common guillemot population would arise as a result of displacement and barrier effects, over and above the impact of displacement (the impact which has the greatest quantified effect on the black common guillemot population).

7.9.9. In the case of razorbill, the number of birds potentially affected by the barrier effect of the wind farm would represent from 0.02% of the national population and less than 0.01% of the biogeographic population in the breeding season (see **Table 7.4**). In relation to the individual breeding colonies, the additional foraging distance of up to 8.0% that may need to be travelled due to the barrier effect on those birds that are foraging in the project area is not considered to be significant at the population level, particularly given the habitat flexibility shown by this species and its extensive foraging range. It is therefore considered that no significant cumulative impact on the razorbill population would arise as a result of collision mortality and barrier effects, over and above the impact of displacement (the impact which has the greatest quantified effect on the razorbill population).

Conclusion on project cumulative impacts

7.9.10. For the range of effects that could impact upon the seabird species and migratory bird populations, it is apparent that for all of the cases examined where the potential for a project cumulative impact could arise, that there is always one contributory impact that is greater in scale which does not significantly increase the overall quantified population effect. It is therefore concluded that no significant cumulative impacts on all bird populations would arise and therefore the conclusions regarding the most significant of the predicted impacts as a result of Dogger Bank Teesside A & B can be used to show the overall project cumulative impact on each species and population. Consequently, **Table 7.14** presents the summary of the project cumulative impact on the bird populations.

Table 7.14 Summary of project cumulative impact on seabirds and migrant bird populations due to the operation of Dogger Bank Teesside A & B

Species	Population[1]	Derivation of impact		
		Value	Sensitivity	Magnitude
Negligible impact				
Little auk	All	High	Medium	Negligible
White-billed diver	All	Medium	High	Negligible
Minor adverse impact				
Arctic skua	All	Very high	High	Negligible
Atlantic puffin	All	Very high	Very high	Negligible
Black-legged kittiwake	All	Very high	Very high	Negligible
Common guillemot	All	Very high	Very high	Negligible
Great black-backed gull	All	Very high	Very high	Negligible
Great skua	All	Very high	High	Negligible
Lesser black-backed gull	All	Very high	Very high	Negligible
Northern fulmar	All	Very high	Very high	Negligible
Northern gannet	All	Very high	Very high	Negligible
Razorbill	All	Very high	Very high	Negligible

[1] Designated site (SSSI), site suite (all linked designated sites), ational, and biogeographic population.

7.10. Summary of impacts for protected bird species and designated sites and their features

Disturbance and displacement

BAP species

7.10.1. Arctic skua is the only BAP priority seabird species for which a potential impact as a result of disturbance and displacement is predicted during the operation phase for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually). However, as identified in **Table 7.3**, **no impact** is predicted on the national breeding population during the operation phase as this species displays limited if any sensitivity to disturbance.

7.10.2. No other BAP priority species would be affected by disturbance and displacement during the operation phase for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually).

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7.10.3. As identified in **Table 7.3**, **no impact** is predicted on the black-legged kittiwake population as a result of disturbance and displacement during the operation phase for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually), as this species displays limited if any sensitivity to disturbance.

Designated sites

7.10.4. **Table 7.15** presents the apportionment to designated sites of mortality as a result of disturbance and displacement as a result of the operation of Dogger Bank Teesside A & B on the populations for species which are a designated feature of the sites (extracted from Tables A9.39d, A9.42d, and A9.45d in Appendix 9 of **Appendix 11A**). Tables A9.39a-c, A9.42a-c, and A9.45a-c in Appendix 9 of **Appendix 11A** present the quantities based on the individual survey year numbers (as the mean value is presented in **Table 7.15**). The individual apportionment (Dogger Bank Teesside A or Dogger Bank Teesside B) is also provided in Appendix 9 of **Appendix 11A**. The SSSI component sites are listed in **Table 4.19**. No apportionment is provided for northern gannet for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) due to the very low numbers of gannet present, coupled with their low sensitivity to disturbance and hence very low numbers that are predicted to be displaced (zero at all levels of mortality).

7.10.5. No significant displacement impacts are predicted for any of the seabird populations and the designated sites which they are features of, as a result of the operation of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually), as summarised in **Table 7.3** and described in paragraphs 7.2.2 to 7.2.4. Given that the most affected site is Flamborough Head SSSI (and pSPA), see **Table 4.19**), the maximum population affected is common guillemot with 0.04% of the population impacted annually (and 0.02% of the breeding population), and razorbill with 0.06% of the population impacted annually (and 0.02% of the breeding population). Consequently, given the negligible magnitude but high value of the SSSI component sites, a **minor adverse** impact is predicted for all the sites listed in **Table 7.15**, as a result of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually).

Table 7.15 Apportioning to designated sites of mean mortality as a result of disturbance and displacement for seabirds during operation of Dogger Bank Teesside A & B (breeding bird numbers and percentages are shown in brackets)

Site name[1]	Atlantic puffin		Common guillemot		Razorbill	
	Number of birds	% of site's population	Number of birds	% of site's population	Number of birds	% of site's population
Buchan Ness to Collieston Coast SPA	-	-	7.07	0.02	-	-
Calf of Eday SSSI and SPA	-	-	0.51	0.02	-	-
Cape Wrath SSSI and SPA	0.04	0.00	8.12	0.02	1.78	0.04
Collieston to Whinnyfold Coast SSSI	-	-	-	-	0.22	0.04
Copinsay SSSI and SPA	-	-	5.01	0.02	-	-
Coquet Island SSSI and SPA	0.68	0.00	-	-	-	-
East Caithness Cliffs SPA	0.01	0.00	58.23	0.02	12.90	0.04
Fair Isle SSSI and SPA	0.31	0.00	7.14	0.02	0.99	0.04
Farne Islands SSSI and SPA	1.58	0.00	25.16 (7.59)	0.03 (0.01)	0.50 (0.08)	0.05 (0.01)
Flamborough Head SSSI and pSPA	0.02	0.00	42.39 (19.64)	0.04 (0.02)	15.76 (4.35)	0.06 (0.02)
Forth Islands SPA	2.66	0.00	10.03 (2.06)	0.03 (0.01)	3.63 (0.21)	0.04 (0.00)
Foula SSSI and SPA	0.56	0.00	8.26	0.02	2.49	0.04
Fowlsheugh SSSI and SPA	-	-	18.79 (2.33)	0.02 (0.00)	3.81	0.04
Gamrie & Pennan Coast SSSI (Troup, Pennan and Lions Heads SPA)	-	-	5.98	0.02	1.88	0.04
Hermaness, Saxa Vord and Valla Field SPA	0.67	0.00	2.74	0.02	-	-
Hoy SSSI and SPA	0.02	0.00	3.30	0.02	-	-
Marwick Head SSSI and SPA	-	-	6.52	0.02	-	-
North Caithness Cliffs SPA	0.30	0.00	25.70	0.02	1.78	0.04
Noss SSSI and SPA	0.03	0.00	8.08	0.02	-	-
Rousay SSSI and SPA	-	-	1.12	0.02	-	-
St Abb's Head to Fast Castle SSSI and SPA	-	-	21.15 (5.13)	0.03 (0.01)	2.61 (0.33)	0.04 (0.01)
Sule Skerry and Sule Stack SPA	1.49	0.00	2.27	0.02	-	-
Sumburgh Head SSSI and SPA	-	-	1.82	0.02	-	-
West Westray SPA	-	-	4.45	0.02	0.69	0.04

[1] Where a site is identified as 'SPA' or 'Ramsar' alone refer to **Table 4.19** for component SSSIs.

7.10.6. Disturbance to foraging little tern within the nearshore export cable area could arise due to increased vessel activity during the operation phase for Dogger Bank Teesside A & B. However, given that any vessel numbers would be small in relation to any maintenance activity, that such activity would be temporary, and the existing high level of vessel movements in the nearshore zone, a negligible scale magnitude of effect is predicted. Given the low sensitivity of the little tern to boat activity, a **negligible** impact is predicted on the little tern populations of the Northumbria Coast SPA and Ramsar (component SSSIs), and the Teessmouth and Cleveland Coast SPA and Ramsar (component SSSIs) in the operation phase.

Barrier effect

BAP species

7.10.7. **No impact** is predicted on the national population of BAP priority species Arctic skua (see paragraph 7.3.2) as a result of the barrier effect during the operation phase for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually). **Table 7.16** presents the results of the assessment of the potential barrier effect on the national populations of migratory BAP species (extracted from Tables 5.6, 5.13, and 5.20 in **Appendix 11A**) during the operation phase for Dogger Bank Teesside A & B. The individual quantities (Dogger Bank Teesside A or Dogger Bank Teesside B) are presented in **Table 7.6**. **Minor adverse** impacts are predicted for all the national populations of the migratory BAP priority species (see **Table 7.16**) as a result of the barrier effect due to the operation of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually).

Table 7.16 Summary of impacts on migrant BAP priority bird species due to the barrier effect during the operation of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually)

Species	Number crossing project	% reference population	Derivation of impact		
			Value	Magnitude	Impact
Black-tailed godwit	75	1.34	Very High	Negligible	Minor adverse
Common scoter	39	0.03	Very High	Negligible	Minor adverse
Eurasian curlew (non-breeding)	1,323	1.62	Very High	Negligible	Minor adverse
European nightjar	8	0.07	Very High	Negligible	Minor adverse
Great bittern	3	0.75	Very High	Negligible	Minor adverse
Greater scaup	3	0.03	Very High	Negligible	Minor adverse
Northern lapwing	7,614	1.70	Very High	Negligible	Minor adverse

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7.10.8. A long-term **minor adverse** impact is predicted on the biogeographic population of black-legged kittiwake as no more than 0.01% of the biogeographic population would be affected by barrier effect during the breeding season (see **Table 7.4** and **Table 7.5**) due to the operation of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually).

Designated sites

7.10.9. No significant barrier impacts are predicted for any of the seabird populations or migrant bird species and the designated sites which they are features of, as a result of the operation of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) (see **Table 7.5**).

7.10.10. **Table 7.17** presents the apportionment to designated sites of the seabird breeding numbers predicted to be present within Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) used in the assessment of barrier effect during the operation phase (extracted from Tables A9.31, A9.32, A9.34, A9.40, and A9.43 in Appendix 9 of **Appendix 11A** and the detailed assessment in Section 5.4 in **Appendix 11A**). The results in **Table 7.17** indicate that the barrier effect is therefore predicted to affect the breeding populations and foraging range of the following species:

- Between 0.28% and 1.10% of the breeding black-legged kittiwake populations at two designated sites could experience a barrier effect during foraging. A maximum of up to 10.8% of the foraging range (see paragraph 5.4.99 in **Appendix 11A**) for each sites' population could be affected, which therefore results in 0.12% or less of the foraging resource potentially being affected at these two sites. At one site (Flamborough Head SSSI (and pSPA)) the birds would possibly be prevented from reaching foraging area beyond. Consequently, a **minor adverse** impact is predicted for these sites in relation to their black-legged kittiwake population;
- Between 0.01% and 0.08% of the breeding common guillemot populations at five designated sites could experience a barrier effect during foraging. A maximum of up to 7.4% of the foraging range (see paragraph 5.4.159 in **Appendix 11A**) for each sites' population could be affected, which therefore results in 0.04% or less of the foraging resource potentially being affected at these five sites. At two sites (Fowlsheugh SSSI (and SPA) and Buchan Ness to Collieston Coast SPA (and component SSSIs)) the birds would possibly be prevented from reaching foraging area beyond. Consequently, a **minor adverse** impact is predicted for these sites in relation to their common guillemot population;
- Between 0.47% and 4.87% of the breeding northern fulmar populations at eight designated sites could experience a barrier effect during foraging. A maximum of up to 6.5% of the foraging range (see paragraph 5.4.28 in **Appendix 11A**) for each sites' population could be affected, which therefore results in 0.32% or less of the foraging resource potentially being affected at these eight sites. At one site (Gamrie & Pennan Coast SSSI (Troup, Pennan and Lion's Head SPA)) the birds would possibly be prevented from reaching foraging areas beyond. Consequently, a **minor adverse** impact is predicted for these sites in relation to their northern fulmar population;
- Between 0.09% and 0.34% of the breeding northern gannet populations at two designated sites could experience a barrier effect during foraging. A maximum of up to 10.9% of the foraging range (see paragraph 5.4.51 in

Appendix 11A) for each sites' population could be affected, which therefore results in 0.04% or less of the foraging resource potentially being affected at these two sites. Consequently, a **minor adverse** impact is predicted for these sites in relation to their northern gannet population ; and

- Between 0.09% and 0.15% of the breeding razorbill populations at four designated sites could experience a barrier effect during foraging. A maximum of up to 8.0% of the foraging range (see paragraph 5.4.189 in **Appendix 11A**) for each sites' population could be affected, which therefore results in 0.01% or less of the foraging resource potentially being affected at these four sites. At two sites (Forth Islands SPA (and component SSSIs) and Fowlsheugh SSSI (and SPA)) the birds would possibly be prevented from reaching foraging area beyond. Consequently, a **minor adverse** impact is predicted for these sites in relation to their razorbill population.

7.10.11. These small-scale reductions in foraging area for each sites' breeding population are predicted to result in a limited potential mortality effect on all sites' breeding populations, and hence a long-term **minor adverse** impact is predicted on the breeding seabirds as a result of the barrier effect that would occur during the operation of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually).

Collisions

BAP species

7.10.12. A long-term **minor adverse** impact is predicted on the national population of BAP priority species Arctic skua (see **Tables 7.8** and **7.9** and paragraph 7.5.2) as a result of collisions during the operation phase for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually). However, it should be noted that no collisions were predicted even assuming a highly conservative 95% avoidance rate (see Table 5.17 in **Appendix 11A**) for Dogger Bank Teesside A & B.

7.10.13. The numbers of BAP birds affected annually is presented in **Table 7.18**, and the impact magnitude for Dogger Bank Teesside A & B, extracted from Sections 5.2, 5.3, and 5.4 and Tables 5.5, 5.12, and 5.19 in **Appendix 11A**. The quantities predicted for Dogger Bank Teesside A and Dogger Bank Teesside B individually are presented in **Table 7.10** and impact assessed in **Table 7.11**. **Negligible** or **minor adverse** impacts are predicted to arise as a result of the collisions for all BAP species due to the operation of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) as summarised in **Table 7.18**.

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7.10.14. A long-term **minor adverse** impact is predicted on the biogeographic population of black-legged kittiwake (see **Table 7.9**) as less than 0.01% of the biogeographic population would be affected by collisions (see **Table 7.8**) due to the operation of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually).

Table 7.17 Apportioning to designated sites of the maximum breeding season numbers of species in flight in Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) for the purposes of assessing potential barrier effects

Site name[1]	Black-legged kittiwake		Common guillemot		Northern fulmar		Northern gannet		Razorbill	
	Number	% of site's popul-ation	Number	% of site's popul-ation	Number	% of site's popul-ation	Number	% of site's popul-ation	Number	% of site's popul-ation
Buchan Ness to Collieston Coast SPA	-	-	-	-	18.77	0.68	-	-	-	-
Durham Coast and Marsden Bay SSSI	11.32	0.28	-	-	-	-	-	-	-	-
Farne Islands SSSI and SPA	-	-	35.55	0.06	-	-	-	-	0.83	0.11
Flamborough Head SSSI and pSPA	836.51	1.10	90.81	0.08	89.06	4.87	52.83	0.34	46.19	0.15
Forth Islands SPA	-	-	9.76	0.03	9.93	0.88	98.13	0.09	3.92	0.09
Fowlsheugh SSSI and SPA	-	-	7.94	0.01	1.81	0.47	-	-	-	-
Gamrie & Pennan Coast SSSI (Troup, Pennan and Lions Heads SPA)	-	-	-	-	17.59	0.49	-	-	-	-
Hunstanton Cliffs SSSI	-	-	-	-	3.03	1.66	-	-	-	-
North Berwick Coast SSSI) (Firth of Forth SPA)	-	-	-	-	9.49	0.87	-	-	-	-
St Abb's Head to Fast Castle SSSI and SPA	-	-	24.23	0.05	-	-	-	-	3.29	0.15
Weybourne Cliffs SSSI	-	-	-	-	0.60	1.66	-	-	-	-

[1] Where a site is identified as 'SPA' refer to **Table 4.19** for component SSSIs.

Table 7.18 Summary of impacts on migrant bird species and populations due to collisions during the operation of Dogger Bank Teesside A & B

Species	Annual collisions	% national population	% of migration zone	Derivation of impact		
				Value	Sensitivity	Magnitude
Negligible impact						
Common scoter	0.06	<0.1	6.35	Very high	Low	Negligible
Eurasian curlew (non-breeding)	2.09	<0.1	6.46	Very high	Very low	Negligible
European nightjar	0.01	<0.1	1.35	Very high	Very low	Negligible
Great bittern	0.01	<0.1	2.15	Very high	Very low	Negligible
Greater scaup	0.005	<0.1	4.30	Very high	Very low	Negligible
Northern lapwing	10.79	<0.1	6.78	Very high	Very low	Negligible
Minor adverse impact						
Black-tailed godwit	0.06	<0.1	5.36	Very high	Very high	Negligible

Designated sites

7.10.15. **Table 7.9** presents the summary of the assessment on seabird populations at the designated site level based on the predicted collisions presented in **Table 7.8**. For all designated sites and their qualifying features, a long-term **minor adverse** impact is predicted on the seabirds' populations due to the operation of Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually).

7.10.16. **Table 7.19** presents the apportionment to designated sites of the seabird species breeding numbers predicted to be affected by collisions during the operation phase (extracted from Tables A9.33d, A9.35d, A9.36d, and A9.37d in Appendix 9 of **Appendix 11A**) for Dogger Bank Teesside A & B. Collision predictions for each survey year are presented in Tables A9.33a-c, A9.35a-c, A9.36a-c, and A9.37a-c in Appendix 9 of **Appendix 11A**.

7.10.17. The percentage of populations of black-legged kittiwake affected by collisions as a result of the operation of Dogger Bank Teesside A & B is at or below 0.01% for 23 designated sites (see **Table 7.19**). This represents a 0.17% increase in background mortality for these sites. The percentage of populations of black-legged kittiwake at the Durham Coast and Marsden Bay SSSI affected by collisions as a result of the operation of Dogger Bank Teesside A & B is at or below 0.03% of the total population and 0.02% of the breeding population, which represents a 0.62% increase in background mortality for this site's population. The percentage of populations of black-legged kittiwake at the Flamborough Head SSSI (and pSPA) affected by collisions as a result of the operation of Dogger Bank Teesside A & B is at or below 0.07% of the total population and 0.06% of the breeding population, which represents a 1.34% increase in background mortality for this site's population.

Table 7.19 Apportioning to designated sites of seabirds mean annual mortality resulting from collisions during the operation phase for Dogger Bank Teesside A & B (breeding bird numbers and percentages are shown in brackets) based on 98% avoidance rate for all species other than northern gannet (95% avoidance rate used)

Site name[1]	Black-legged kittiwake			Great black-backed gull			Lesser black-backed gull			Northern gannet		
	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality
Alde-Ore Estuary SSSI and SPA	-	-	-	-	-	-	1.18	0.01	0.12	-	-	-
Brighton to Newhaven Cliffs SSSI	0.25	0.01	0.17	-	-	-	-	-	-	-	-	-
Buchan Ness to Collieston Coast SPA	3.54	0.01	0.17	-	-	-	-	-	-	-	-	-
Calf of Eday SSSI and SPA	0.10	0.01	0.17	0.86	0.09	0.35	-	-	-	-	-	-
Cape Wrath SSSI and SPA	1.30	0.01	0.17	-	-	-	-	-	-	-	-	-
Copinsay SSSI and SPA	0.50	0.01	0.17	0.51	0.09	0.35	-	-	-	-	-	-
Dover to Kingsdown Cliffs SSSI	0.31	0.01	0.17	-	-	-	-	-	-	-	-	-
Dunbar Coast SSSI	0.15	0.01	0.17	-	-	-	-	-	-	-	-	-
Durham Coast and Marsden Bay SSSI	1.92 (1.20)	0.03 (0.02)	0.62	-	-	-	-	-	-	-	-	-
East Caithness Cliffs SPA	11.33	0.01	0.17	0.48	0.09	0.35	-	-	-	-	-	-
Eilean Hoan (North Sutherland Coastal Islands) SSSI	-	-	-	0.50	0.09	0.35	-	-	-	-	-	-
Fair Isle SSSI and SPA	0.41	0.01	0.17	-	-	-	-	-	-	1.32	0.01	0.18
Farne Islands SSSI and SPA	1.12	0.01	0.17	-	-	-	-	-	-	-	-	-
Flamborough Head SSSI and pSPA	67.08 (54.51)	0.07 (0.06)	1.34	-	-	-	-	-	-	10.23 (7.10)	0.05 (0.04)	0.79

Site name[1]	Black-legged kittiwake			Great black-backed gull			Lesser black-backed gull			Northern gannet		
	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality
Forth Islands SPA	1.07	0.01	0.17	-	-	-	0.84	0.01	0.12	34.66 (14.14)	0.03 (0.01)	0.36
Foula SSSI and SPA	0.14	0.01	0.17	-	-	-	-	-	-	-	-	-
Fowlsheugh SSSI and SPA	2.64	0.01	0.17	-	-	-	-	-	-	-	-	-
Gamrie & Pennan Coast SSSI (Troup, Pennan and Lions Heads SPA)	4.21	0.01	0.17	-	-	-	-	-	-	-	-	-
Hermaness, Saxa Vord and Valla Field SPA	0.08	0.01	0.17	-	-	-	-	-	-	9.01	0.01	0.18
Hoy SSSI and SPA	0.11	0.01	0.17	0.08	0.09	0.35	-	-	-	-	-	-
Marwick Head SSSI and SPA	0.76	0.01	0.17	-	-	-	-	-	-	-	-	-
North Caithness Cliffs SPA	2.86	0.01	0.17	-	-	-	-	-	-	-	-	-
Noss SSSI and SPA	0.14	0.01	0.17	-	-	-	-	-	-	3.61	0.01	0.18
Rousay SSSI and SPA	0.39	0.01	0.17	-	-	-	-	-	-	-	-	-
St Abb's Head to Fast Castle SSSI and SPA	4.58	0.01	0.17	-	-	-	-	-	-	-	-	-
Sule Skerry and Sule Stack SPA	-	-	-	-	-	-	-	-	-	1.73	0.01	0.18
Sumburgh Head SSSI and SPA	0.15	0.01	0.17	-	-	-	-	-	-	-	-	-
West Westray SPA	1.54	0.01	0.17	-	-	-	-	-	-	-	-	-

[1] Where a site is identified as 'SPA' or 'Ramsar' alone refer to **Table 4.19** for component SSSIs.

7.10.18. The percentage of populations of great black-backed gull affected by collisions as a result of the operation of Dogger Bank Teesside A & B is at or below 0.09% for all five designated sites for which this species is a feature, which represents a 0.35% increase in background mortality.

7.10.19. The percentage of populations of lesser black-backed gull affected by collisions as a result of the operation of Dogger Bank Teesside A & B is at or below 0.01% for the two designated sites for which this species is a feature, which represents a 0.12% increase in background mortality.

7.10.20. The percentage of populations of northern gannet affected by collisions as a result of the operation of Dogger Bank Teesside A & B is at or below 0.01% for four designated sites (see **Table 7.19**), with a greater percentage affected for the Flamborough Head SSSI and pSPA (0.05% of the total population and 0.04% of the breeding population) and Forth Islands SPA (and component sites) (0.03% of the total population and 0.01% of the breeding population). For four sites this represents a 0.18% increase in background mortality, and 0.79% for the Flamborough Head SSSI (and pSPA) and 0.36% for the Forth Islands SPA (and component SSSIs).

7.10.21. Given these low increases in background mortality a **minor adverse** impact is considered to result for all the sites listed in **Table 7.19**, on the basis of the assessment summarised in **Table 7.9**.

Habitat loss and / or alteration

BAP species

7.10.22. The alteration and loss of habitat as a result of the operation phase for Dogger Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) is predicted to result in a long-term **negligible** impact on the national breeding population of the BAP priority species Arctic skua (see **Table 7.12**).

7.10.23. No other BAP priority species would be affected as a result of habitat loss and / or alteration during the operation phase for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually).

OSPAR list of threatened species

7.10.24. The alteration and loss of habitat as a result of the operation phase for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) is predicted to result in a long-term **negligible** impact on the biogeographic population of black-legged kittiwake (see **Table 7.12**).

Designated sites

7.10.25. The alteration and loss of habitat as a result of the operation phase for Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B individually) is predicted to result in a long-term **minor adverse** impact (see **Table 7.12**) on the populations of the species (i.e. Atlantic puffin, common guillemot, and razorbill) and designated sites listed in **Table 7.15**. Given the negligible scale of the impact no measurable population level impact is predicted for the population of these seabird species that are a feature of the designated sites listed in **Table 7.15**.

7.10.26. The presence of the nearshore export cable could cause scour, which would result in increased suspended sediment concentrations and deposition of sediment (and hence habitat alteration) within the foraging area of breeding little terns that are features of the Northumbria Coast SPA and Ramsar (component SSSIs) and the Teessmouth and Cleveland Coast SPA and Ramsar (component SSSIs). Given the temporary duration and fairly limited extent of the increased suspended sediment concentrations and areas of deposition during the operation phase (see Section 7 in **Chapter 9 Marine Physical Processes**), and that it would occur only within a limited area of the little tern foraging range (lesser in scale for the Northumbria Coast SPA and Ramsar population as it is further away) no direct habitat loss or alteration would arise, and an indirect temporary and intermittent negligible effect due to habitat alteration (affecting their prey or visual foraging behaviour) is predicted. As little tern have a high sensitivity to habitat alteration, this would result in a **negligible** impact on the little tern populations of the Northumbria Coast SPA and Ramsar (component SSSIs) and the Teessmouth and Cleveland Coast SPA and Ramsar (component SSSIs).

Project cumulative impacts

7.10.27. As discussed in Section 7.9, the individual impact of greatest magnitude and significance during the operation phase is not noticeably increased in magnitude (quantity) by the other impacts, such that there are no significant cumulative impacts on bird populations. The same occurs with respect to the designated bird populations and designated sites, such that any project cumulative impacts on BAP species, OSPAR threatened species, or designated sites would not exceed **minor adverse** in significance during the operation phase.

7.10.28. The negligible impact on the Northumbria Coast SPA and Ramsar (component SSSIs) and the Teessmouth and Cleveland Coast SPA and Ramsar (component SSSIs) resulting fromthe temporary habitat alterationas a result of the operation of Dogger Bank Teesside A & B, is the largest spatial extent potentially affecting foraging little tern, and the spatial extent would not increase in scale as a result of any disturbance impact. Consequently, a negligible cumulative impact would remain on the little tern populations of the Northumbria Coast SPA and Ramsar (component SSSIs) and the Teessmouth and Cleveland Coast SPA and Ramsar (component SSSIs) during the operation phase.

8. Assessment of Impacts during Decommissioning

8.1. Detailed assessment

8.1.1. The assessment of impacts on key coastal and marine bird species during the decommissioning phase for Dogger Bank Teesside A, Dogger Bank Teesside B, and Dogger Bank Teesside A & B (Dogger Bank Teesside A and Dogger Bank Teesside B combined), including the export cable, is based on the detailed assessment in Sections 5.2, 5.3, and 5.4 respectively, in **Appendix 11A**.

8.1.2. The impacts for decommissioning are predicted to be the same as for the construction phase (see Section 6, **Table 6.6**). Consequently, all impacts would be of similar significance.

8.1.3. On completion of decommissioning, all impacts would either immediately, or within the short-term, cease and no impacts on seabirds or migrant birds would arise at any population level.

9. Inter-relationships

9.1. Introduction

9.1.1. The objective of this section is to identify where the accumulation of residual impacts on a single receptor, and the relationship between those impacts, gives rise to a need for additional mitigation.

9.1.2. Marine birds and coastal birds interact with the food resource they consume (such as intertidal invertebrates, or marine fish species), the influence of birds on these resources and receptors is limited. Consequently, any effects on birds would result in no further impacts or alteration to impacts on other receptors, with the exception of the human receptors who value the intrinsic or specific visual benefit of observing marine and coastal bird species either at sea, along the coast, or at their breeding colonies. As there will be no accumulation of residual impacts on marine and coastal ornithology there will be no need for additional mitigation.

9.1.3. No other inter-relationships influenced by the impact on birds are identified. However, the following has the potential to impact on birds:

- Visual disturbance due to presence of humans;
- Noise generated by anthropogenic sources;
- Presence of static or mobile structures; and
- Changes to intertidal and marine ecological receptors.

9.1.4. **Table 9.1** summarises the inter-relationships set out above. A holistic overview of all the inter-related impacts associated with the proposed development is provided in **Chapter 31 Inter-relationships**.

Table 9.1 Inter-relationships relevant to the assessment of marine and coastal ornithology)

Inter-relationships	Section where addressed	Linked chapter
All phases		
Impacts on a change in food resource due to a reduction or increased competition.	Impacts on foraging ranges are discussed throughout Sections 6 and 7 of this chapter.	**Chapter 12 Marine and Intertidal Ecology, Chapter 13 Fish and Shellfish Ecology, Chapter 14 Marine mammals**, and **Appendix 11C**
Impacts on birds from disturbance due to human presence, the presence of structures including lighting and noise and vibration.	Impacts on birds from disturbance are discussed throughout Sections 6 and 7 of this chapter.	**Chapter 16 Shipping and Navigation, Chapter 19 Military Activities and Civil Aviation, Chapter 20 Seascape and Visual** and **Chapter 29 Noise and Vibration**

10. Cumulative Impacts

10.1. CIA strategy and screening

10.1.1. This section describes the Cumulative Impact Assessment (CIA) for marine and coastal ornithology taking into consideration other plans, projects and activities. A summary of the CIA is presented in **Chapter 33**.

10.1.2. Forewind has developed a strategy (the 'CIA Strategy') for the assessment of cumulative impacts in consultation with statutory stakeholders including the Marine Management Organisation (MMO), the JNCC, Natural England and Centre for Environment, Fisheries and Aquaculture Science (Cefas). Details of the approach to cumulative impact assessment adopted for this ES are provided in **Chapter 4**.

10.1.3. In its simplest form the Strategy involves consideration of:

- Whether impacts on a receptor can occur on a cumulative basis between the wind farm project(s) subject to the application(s) and other wind farm projects, activities and plans in the Dogger Bank Zone (either consented or forthcoming); and
- Whether impacts on a receptor can occur on a cumulative basis with other activities, projects and plans outwith the Dogger Bank Zone (e.g. other offshore wind farm developments), for which sufficient information regarding location and scale exist.

10.1.4. In this manner, the assessment considers (where relevant) the potential for cumulative impacts in the following sequence:

- With the first and third phase of development in the Dogger Bank Zone, known as Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D respectively;
- With the above, plus any other activities, projects and plans in the Dogger Bank Zone; and
- With all of the above, in addition to any other activities, projects and plans outwith the Dogger Bank Zone.

10.1.5. The strategy recognises that data and information sufficient to undertake an assessment will not be available for all potential projects, activities, plans and / or parameters, and seeks to establish the 'confidence' Forewind can have in the data and information available.

10.1.6. There are two key steps to the Forewind CIA strategy, which both involve 'screening' in order to arrive, ultimately, at an informed, defensible and reasonable list of other plans, projects and activities to take forward in the assessment.

10.1.7. In order to identify the activities, projects and plans to take forward in the detailed assessment that follows, a two-step screening process is undertaken:

- Impact screening (**Table 10.1**): consideration of the potential for each impact, as assessed for Dogger Bank Teesside A & B in isolation, to contribute to a cumulative impact both within and outwith the Dogger Bank Zone. This step also involves an appraisal of the confidence in the information available to inform the screening decision (following the methodology set out in **Chapter 4**); and
- Project screening (Section 6.3 in **Appendix 11A**): the identification of the actual individual plans, projects and activities that may result in cumulative impacts for inclusion in the CIA. In order to inform this, Forewind has produced an exhaustive list of plans, projects and activities occurring within a very large study area encompassing the greater North Sea and beyond (referred to as the 'CIA Project List', see **Chapter 4**). The list has been appraised, based on the confidence Forewind has in being able to undertake an assessment from the information and data available, enabling individual plans, projects and activities to be screened in or out.

Table 10.1 Potential cumulative impacts (impact screening)

Impact	Seabirds (breeding and non-breeding)	Migratory birds (passage or wintering species)
Disturbance and displacement during construction / operation / decommissioning	Yes	No
Collision risk	Yes	Yes
Barrier effect	Yes	Yes
Habitat loss and / or alteration	Yes	No

Dogger Bank Teesside A & B Offshore Wind Farm

10.1.8. For marine and coastal ornithology, the potential for cumulative impacts is identified in relation to disturbance and displacement (during construction, operation, and decommissioning), collision risk, barrier effect, and habitat loss and / or alteration.

10.1.9. The tables in Appendix 8 of **Appendix 11A** presents the extensive list of projects screened for the cumulative assessment on the marine and coastal ornithological receptors presented in **Table 10.1** and listed in Section 4. Within these screening tables, the confidence in the project details and the available data is scored. Where there is a medium to high confidence in the available data and project information, the project is then considered further in relation to its information and quantification on its predicted impacts. The screening tables presented in Appendix 8 of **Appendix 11A** also identify which of these projects are within foraging range of the same protected sites identified and considered in the assessment of Dogger Bank Creyke Beck A & B. **Table 10.2** presents the list of projects screened in to the cumulative assessment based on the above, extracted from Appendix 8 of **Appendix 11A**.

Table 10.2 Projects and activities considered within the cumulative assessment for marine and coastal ornithology (project screening)

Project	Screened in
Beatrice Offshore Wind Farm	Yes
Blyth Offshore Wind Demonstration Site	Yes
Breeveertien II Offshore Wind Farm	Yes
Dogger Bank Creyke Beck A & B	Yes
Dogger Bank Teesside C & D	Yes
Dudgeon Offshore Wind Farm	Yes
East Anglia ONE Offshore Wind Farm	Yes
European Offshore Wind Development Centre / Aberdeen Offshore Wind Farm	Yes
Firth of Forth Alpha and Bravo Offshore Wind Farms	Yes
Galloper Offshore Wind Farm	Yes
Greater Gabbard Offshore Wind Farm	Yes
Hornsea Project One Offshore Wind Farm	Yes
Humber Gateway Offshore Wind Farm	Yes
Inch Cape Offshore Wind Farm	Yes
Kentish Flats Offshore Wind Farm	No
Lincs Offshore Wind Farm	Yes
London Array I/II Offshore Wind Farm	Yes
Moray Firth (Telford, Stevenson and MacColl Offshore Wind Farms)	Yes
Neart na Gaoithe Offshore Wind Farm	Yes
Offshore- Bürger- windpark Butendiek (Germany)	No
Race Bank Offshore Wind Farm	Yes
Sheringham Shoal Offshore Wind Farm	Yes
Teesside Offshore Windfarm	Yes
Thanet Offshore Wind Farm	Yes
Triton Knoll Offshore Wind Farm	Yes
Westermost Rough Offshore Wind Farm	Yes

10.1.10. Following this screening step, the relevant quantities and assessments in relation to the impacts listed above were extracted from any available EIAs. Thus the projects for which data were available only represent a subset of the wide list of projects initially examined in the screening process. It should also be noted that the detailed collision estimates and displacement estimates required for the cumulative assessment were not always available in the EIAs for the projects initially screened in and identified in Appendix 8 of **Appendix 11A** and in some cases even where data was available, they did not contain quantities for the bird species considered in the assessment of Dogger Bank Teesside A & B. Furthermore, only a limited number of projects presented collision and displacement estimates apportioned to individual European designated sites and their populations. No attempt has been made to estimate values for projects and activities where no EIA is available.

Dogger Bank Teesside A & B Export Cable Corridor

10.1.11. Three other projects were initially considered relevant for the screening in terms of distance and activities in relation to the Dogger Bank Teesside A & B Export Cable Corridor construction and landfall construction activities. However, only limited information was available regarding the Underground Coal Gasification project, and the recommended Marine Conservation Zones do not have birds listed as features though birds may benefit indirectly (quantification is not provided). The remaining project, the Yorkshire and Humber Carbon Capture and Storage project is located a significant distance away from the landfall works and is not expected to be built at the same time as the construction of the cable landfall works. Consequently, no other projects are considered for the cumulative assessment for the cable landfall, and therefore no change in the assessment of Dogger Bank Teesside A & B alone, would occur.

Projects carried forward

10.1.12. It should be noted that:

- Where Forewind is aware that a plan, project or activity could take place in the future, but has no information on how the plan, project or activity will be executed, it is screened out of the assessment; and
- Existing projects, activities and plans are already having an impact and so are part of the existing environment as it has been assessed throughout this ES. Therefore these projects have not been included in the cumulative assessment. This includes commercial fishing, whereby the benthic habitats that currently exist within the Dogger Bank Zone and wider North Sea region are already widely influenced by this activity.

10.1.13. The 'projects' that have subsequently been screened into the cumulative assessment at the wider North Sea level are identified in **Table 10.17** (see Section 6.3 in **Appendix 11A**).

10.2. Cumulative impacts of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

10.2.1. This section provides the results of the cumulative impact assessment for Dogger Bank Teesside A & B in conjunction with Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, extracted from Section 6.2 in **Appendix 11A**. It is predominantly summary in form due to the very detailed and extensive technical report that provides and describes all of the construction, operation, and decommissioning phase cumulative impacts resulting from the Dogger Bank Creyke Beck A & B, Dogger Bank Teesside A & B and Dogger Bank Teesside C & D on all of the seabird and migratory bird species and their associated designated sites.

10.2.2. The following cumulative impacts have been assessed:

- Disturbance / displacement during construction, operation, and decommissioning;
- Barrier effects during operation;
- Collision risk during operation; and
- Direct habitat loss and/ or alteration during construction, operation, and decommissioning.

Displacement during construction

10.2.3. The cumulative numbers of birds displaced annually for each season during the construction and decommissioning phase for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D for each of the seabird species that have been identified as being sensitive to disturbance (see paragraph 3.3.21) is presented in **Table 10.3**. The data presented in **Table 10.3** is extracted from Tables 5.15 and 6.1 in **Appendix 11A**; the tables in **Appendix 11A** also contain the confidence ranges. It should be noted that no data is presented for Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar due to either the lack of populations present in order to quantify potential disturbance, or, for most, because these species are not sensitive to the types of disturbance that would take place during the construction and decommissioning phases (see paragraph 3.3.21).

10.2.4. Based on the mean numbers of birds displaced (in **Table 10.3**), these have then been combined with the species mortality rate (see paragraph 3.3.21) to provide a quantity for the impact of cumulative displacement during each year of construction and decommissioning for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D. The results are presented in **Table 10.4**, based on the quantities presented in Appendix 10 of **Appendix 11A**, which also show different ranges of cumulative mortality and displacement.

10.2.5. Displacement as a result of the construction or decommissioning activities for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D is predicted to result in a short-term (for the duration of the construction or decommissioning phase which in the worst case could be up to 11.5 years) and temporary **negligible** or **minor adverse** cumulative impact on the populations of six seabird species at national or biogeographic population levels, see **Table 10.5** (extracted from Section 6.2 and Table 6.7 in **Appendix 11A**). **No impact** is predicted on the populations of six seabird species at national or biogeographic population levels.

Habitat loss and / or alteration during construction (including cable-laying)

10.2.6. The alteration and loss of habitat as a result of the cumulative construction activities including cable laying for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D is predicted to result in a short-term (for the duration of the construction phase which in the worst case could be up to six years per project or up to 11.5 years if sequential build is undertaken) and temporary **negligible** or **minor adverse** cumulative impact on the populations of seabird species presented in **Table 6.4** (construction impacts). No change in the magnitude or significance is predicted between Dogger Bank Teesside A & B alone or combined with Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D. Detailed assessment is presented in Section 6.2 in **Appendix 11A**.

Table 10.3 Number of birds displaced during the construction of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D (including 2km buffer) based on the mean of the survey results (January 2010 to June 2012)

Species	Season	Mean number of birds displaced		
		Dogger Bank Teesside A & B	Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D
Atlantic puffin	Breeding	14	54	68
	Wintering	70	233	303
	All	84	287	371
Common guillemot	Breeding	554	3,316	3,870
	Wintering	2,201	7,706	9,907
	All	2,755	11,022	13,777
Little auk	All	78	147	225
Northern gannet	Breeding	128	373	501
	Wintering	227	492	719
	All	355	865	1,220
Razorbill	Breeding	93	299	392
	Wintering	809	2,393	3,202
	All	902	2,692	3,594
White-billed diver	All	7	15	22

Table 10.4 Mortality for seabirds and their population affected by disturbance and displacement during the construction of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D based on the mean of the survey results (January 2010 to June 2012)

Species	Season	Dogger Bank Teesside A & B			Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D			Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D		
		Number of birds	% national population	% bio-geographic population	Number of birds	% national population	% bio-geographic population	Number of birds	% national population	% bio-geographic population
Atlantic puffin	Breeding	1	<0.01	N/A	3	<0.01	N/A	3	<0.01	N/A
	Wintering	4	N/A	N/A	12	N/A	N/A	15	N/A	N/A
	All	4	N/A	<0.01	14	N/A	<0.01	19	N/A	<0.01
Common guillemot	Breeding	28	<0.01	N/A	166	0.01	N/A	194	0.01	N/A
	Wintering	110	N/A	N/A	385	N/A	N/A	495	N/A	N/A
	All[1]	138	N/A	<0.01 (<0.01 - 0.02)	551	N/A	0.01 (0.01 - 0.07)	689	N/A	0.01 (0.01 - 0.09)
Little auk	All	4	N/A	<0.01	7	N/A	<0.01	11	N/A	<0.01
Northern gannet[2]	Breeding	0	<0.01	N/A	0	<0.01	N/A	25	0.01	N/A
	Wintering	0	N/A	N/A	0	N/A	N/A	36	N/A	N/A
	All	0	N/A	<0.01	0	N/A	<0.01	61	N/A	0.01
Razorbill	Breeding	5	<0.01	N/A	15	0.01	N/A	20	0.01	N/A
	Wintering	40	N/A	N/A	120	N/A	N/A	160	N/A	N/A
	All	45	N/A	<0.01	135	N/A	0.01	180	N/A	0.01
White-billed diver	All	3	0.06	0.03	5	0.10	0.05	8	0.16	0.08

[1] Biogeographic population for common guillemot is based on the combined *aalge* populations (4,800,000 I) and the *albionis* population (800,000 I), with the range for these populations presented in brackets.
[2] Combined projects have assumed a 5% mortality rate for those birds displaced in the long-term (see paragraph 3.3.24).

Table 10.5 Summary of impacts on seabirds and their populations due to displacement and mortality during the construction of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

Species	Population[1]	Derivation of impact		
		Value	Sensitivity	Magnitude
No cumulative impact				
Arctic skua	All	Very High	Low	None
Black-legged kittiwake	All	Very High	Low	None
Great black-backed gull	All	Very High	Low	None
Great skua	All	Very High	Low	None
Lesser black-backed gull	All	Very High	Very Low	None
Northern fulmar	All	Very High	Very Low	None
Negligible cumulative impact				
Little auk	All	High	Low	Negligible
White-billed diver	All	Medium	High	Negligible
Minor adverse cumulative impact				
Atlantic puffin	All	Very High	Very Low	Negligible
Common guillemot	All	Very High	Medium	Negligible
Northern gannet	All	Very High	Very Low	Negligible
Razorbill	All	Very High	Medium	Negligible

[1] Designated site (SSSI), site suite (all linked designated sites), national, and biogeographic population.

Displacement / disturbance during operation

10.2.7. The cumulative numbers of birds displaced annually for each season during the operation phase for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D for each of the species, which have been identified as being sensitive to disturbance (see paragraph 3.3.21), is presented in **Table 10.6**. The data presented in **Table 10.6** is extracted from Tables 5.15 and 6.1 in **Appendix 11A**; the tables in **Appendix 11A** also contain the confidence ranges. Of the key seabirds subject to disturbance (i.e. Atlantic puffin, common guillemot, little auk, northern gannet, razorbill, and white-billed diver), common guillemot and razorbill showed the highest displacement rates (see **Table 10.6**).

10.2.8. It should be noted that no data is presented for Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar due to either the lack of populations present in order to quantify potential disturbance, or for most because these species are not sensitive to the types of disturbance that would take place during the construction and decommissioning phases (see paragraph 3.3.21).

10.2.9. Based on the mean numbers of birds displaced (in **Table 10.6**), these have then been combined with the species mortality rate (see paragraph 3.3.21) to provide a quantity for the impact of cumulative displacement during each year of operation for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D . The results are presented in **Table 10.7**, based on the quantities presented in Appendix 10 of **Appendix 11A**, which also show different ranges of mortality and displacement.

Table 10.6 Number of birds displaced during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D (including 2km buffer) based on the mean of the survey results (January 2010 to June 2012)

Species	Season	Mean number of birds displaced		
		Dogger Bank Teesside A & B	Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D
Atlantic puffin	Breeding	28	109	137
	Wintering	140	465	605
	All	168	574	742
Common guillemot	Breeding	1,108	6,633	7,741
	Wintering	4,403	15,411	19,814
	All	5,511	22,044	27,555
Little auk	All	156	294	450
Northern gannet	Breeding	256	746	1,002
	Wintering	454	984	1,438
	All	709	1,731	2,440
Razorbill	Breeding	186	598	784
	Wintering	1,618	4,787	6,405
	All	1,804	5,384	7,188
White-billed diver	All	15	28	43

10.2.10. Disturbance and displacement as a result of the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D resulted in mortality of less than 0.32% of the national and biogeographic populations of the species likely to be affected (see **Table 10.7**). No mortality is predicted on Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar. The species most affected is predicted to be white-billed diver, whilst less than 0.03% of all other species' national and biogeographic populations are predicted to be affected (see **Table 10.7**).

10.2.11. Consequently, cumulative displacement and subsequent mortality during the operation phase for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D is predicted to range from **no** cumulative **impacts** on certain species to long-term **negligible** or **minor adverse** cumulative impacts on the national and biogeographic populations for other seabird species as shown in **Table 10.8**.

Table 10.7 Mortality for seabirds and their population affected by disturbance and displacement during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D based on the mean of the survey results (January 2010 to June 2012)

Species	Season	Dogger Bank Teesside A & B			Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D			Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D		
		Number of birds	% national population	% bio-geographic population	Number of birds	% national population	% bio-geographic population	Number of birds	% national population	% bio-geographic population
Atlantic puffin	Breeding	1	<0.01	N/A	5	<0.01	N/A	7	<0.01	N/A
	Wintering	7	N/A	N/A	23	N/A	N/A	30	N/A	N/A
	All	8	N/A	<0.01	29	N/A	<0.01	37	N/A	<0.01
Common guillemot	Breeding	55	<0.01	N/A	332	0.02	N/A	387	0.02	N/A
	Wintering	220	N/A	N/A	771	N/A	N/A	991	N/A	N/A
	All[1]	276	N/A	<0.01 (<0.01 - 0.03)	1,102	N/A	0.02 (0.02 - 0.13)	1,378	N/A	0.02 (0.03 - 0.16)
Little auk	All	8	N/A	<0.01	15	N/A	<0.01	23	N/A	<0.01
Northern gannet[2]	Breeding	0	<0.01	N/A	0	<0.01	N/A	50	0.02	N/A
	Wintering	0	N/A	N/A	0	N/A	N/A	72	N/A	N/A
	All	0	N/A	<0.01	0	N/A	<0.01	122	N/A	0.01
Razorbill	Breeding	9	<0.01	N/A	30	0.01	N/A	39	0.02	N/A
	Wintering	81	N/A	N/A	239	N/A	N/A	320	N/A	N/A
	All	90	N/A	0.01	269	N/A	0.02	359	N/A	0.03
White-billed diver	All	5	0.10	0.05	11	0.22	0.11	16	0.32	0.16

[1] Biogeographic population for common guillemot is based on the combined *aalge* populations (4,800,000 I) and the *albionis* population (800,000 I), with the range for these populations presented in brackets.
[2] Combined projects have assumed a 5% mortality rate for those birds displaced in the long-term whilst no mortality has been assumed for individual projects (see paragraph 3.3.24).

Table 10.8 Summary of impacts on seabirds and their populations due to cumulative displacement during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

Species	Population[1]	Derivation of impact		
		Value	Sensitivity	Magnitude
No cumulative impact				
Arctic skua	All	Very high	Low	None
Black-legged kittiwake	All	Very high	Low	None
Great black-backed gull	All	Very high	Low	None
Great skua	All	Very high	Low	None
Lesser black-backed gull	All	Very high	Very low	None
Northern fulmar	All	Very high	Very low	None
Negligible cumulative impact				
Little auk	All	High	Low	Negligible
White-billed diver	All	Medium	High	Negligible
Minor adverse cumulative impact				
Atlantic puffin	All	Very high	Very low	Negligible
Common guillemot	All	Very high	Medium	Negligible
Northern gannet	All	Very high	Very low	Negligible
Razorbill	All	Very high	Medium	Negligible

[1] Designated site (SSSI), site suite (all linked designated sites), national, and biogeographic population.

Barrier effect on seabirds during operation

10.2.12. The presence and operation of wind turbines in the Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D are predicted to result in a barrier effect to marine and migratory bird species. The projects are within the mean maximum foraging range of five seabird species that are a feature of designated sites (i.e. northern fulmar, northern gannet, black-legged kittiwake, common guillemot, and razorbill) and the projects may therefore pose a barrier during the breeding period. Estimates of the mean numbers of breeding seabirds in flight are presented in **Table 10.9**, extracted from Tables 5.16 and 6.2 in **Appendix 11A**.

10.2.13. The average increase in flight distance due to the barrier presented by Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D is approximately 25km which equates to 10.8% of the foraging range of black-legged kittiwake, 7.4% of the foraging range of common guillemot, 6.25% of the foraging range of northern fulmar, 10.9% of the foraging range of northern gannet, and 8.0% of the foraging range of razorbill. Foraging ranges considered are identified in **Table 3.6**, being maximum foraging range for all species with the exception of northern fulmar where mean maximum foraging range has been used.

Table 10.9 Predicted number of breeding seabirds in flight affected by barrier effect during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D based on the mean estimates

Species	Breeding season	Dogger Bank Teesside A & B			Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D			Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D		
		Number in flight	% national population	% bio-geographic population	Number in flight	% national population	% bio-geographic population	Number in flight	% national population	% bio-geographic population
Black-legged kittiwake	Apr-Sep	866	0.12	0.01	3,011	0.41	0.05	3,877	0.52	0.06
Common guillemot[1]	May-Jul	169	0.01	<0.01 (<0.01 - 0.02)	1,010	0.06	0.02 (0.02 - 0.13)	1,179	0.07	0.02 (0.02 - 0.15)
Northern fulmar	Mar-Sep	152	0.02	0.01	294	0.03	0.01	446	0.04	0.02
Northern gannet	Apr-Sep	151	0.07	0.02	331	0.15	0.03	482	0.22	0.05
Razorbill	May-Jul	54	0.02	<0.01	174	0.08	0.01	228	0.10	0.02

[1] Biogeographic population for common guillemot is based on the combined *aalge* populations (4,800,000 I) and the *albionis* population (800,000 I), with the range for these populations presented in brackets.

10.2.14. Overall, based on the potential barrier effect on the numbers of breeding seabirds presented in **Table 10.9** and the foraging ranges affected, a long-term minor adverse cumulative impact is predicted for all population levels of the species (see **Table 10.10**), as detailed in Section 6.2 in **Appendix 11A**. No change in the level of the cumulative impact is predicted for these species compared to Dogger Bank Teesside A & B alone. No barrier effect is predicted for species such as Arctic skua, Atlantic puffin, great black-backed gull, great skua, lesser black-backed gull, little auk, or white-billed diver.

Table 10.10 Summary of impacts on seabirds and their populations due to cumulative barrier effect during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

Species	Population[1]	Derivation of impact		
		Value	Sensitivity	Magnitude
No cumulative impact				
Arctic skua	All	Very High	Low	None
Atlantic puffin	All	Very high	Very low	None
Great black-backed gull	All	Very High	Low	None
Great skua	All	Very High	Low	None
Lesser black-backed gull	All	Very High	Very Low	None
Little auk	All	High	Low	None
White-billed diver	All	Medium	High	None
Minor adverse cumulative impact				
Black-legged kittiwake	All	Very high	Low	Negligible
Common guillemot	All	Very high	Medium	Negligible
Northern fulmar	All	Very high	Very low	Negligible
Northern gannet	All	Very high	Very low	Negligible
Razorbill	All	Very high	Medium	Negligible

[1] Designated site (SSSI), site suite (all linked designated sites), national, and biogeographic population.

Barrier effect on migrant birds during operation

10.2.15. The assessment of the potential cumulative barrier effect considered the 47 species' populations (including sub-species and breeding and non-breeding populations) of terrestrial or waterbird migrants that are species whose migration zones (defined by Wright *et al*. (2012)) overlap with the Dogger Bank Zone. Modelling and subsequent estimates of the migrant seabirds that could potentially experience a cumulative barrier effect during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D is presented in **Table 10.11**, and detailed in Section 6.2 and Table 6.6 in **Appendix 11A**. The numbers of migrant birds and percentages presented in **Table 10.11** assume a 100% barrier effect. The numbers of migrant birds predicted to cross the project area are 4.51% of the national (non-breeding) or 'reference' population of hen harrier, 3.74% of the national or 'reference' population of bean goose, and 2.79% of the national or 'reference' population of mainland Europe's common redshank. The remaining species crossing the cumulative area are below 2.7% of their national or 'reference' populations, with over 35 species below 2% of their national or 'reference' population, and 17 species below 1% of their national or 'reference' population.

Table 10.11 Predicted numbers of migrant birds and their populations in flight and subject to barrier effect during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

Species	Dogger Bank Teesside A & B		Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	
	Number crossing project	% reference population	Number crossing projects	% reference population
Barnacle goose	0	0.00	23	0.07
Bar-tailed godwit*	971	1.79	1,462	2.69
Bean goose*	18	2.50	27	3.74
Black-tailed godwit**	75	1.34	128	2.27
Common goldeneye	297	1.02	450	1.54
Common pochard*	385	0.52	687	0.92
Common redshank (breeding)	44	0.15	75	0.25
Common redshank Icelandic population (non-breeding)	1,872	0.68	3,152	1.15
Common redshank mainland Europe population (non-breeding)	461	1.84	697	2.79
Common ringed plover (non-breeding)	626	0.86	948	1.30
Common scoter**	39	0.03	59	0.05
Common shelduck	771	1.02	1,166	1.54
Common snipe	7,927	0.79	12,015	1.20
Dunlin *Calidris alpine schinzii* (passage)*	59	1.60	89	2.40
Dunlin *Calidris alpina alpina* (passage & winter)	5,072	1.16	9,729	2.22
Eurasian coot	273	0.26	281	0.27
Eurasian curlew (non-breeding)**	1,323	1.62	2,052	2.51
Eurasian oystercatcher (non-breeding)	1,588	0.79	2,403	1.20
Eurasian teal	1,189	0.48	1,799	0.72
Eurasian wigeon	4,715	0.90	7,132	1.37
European nightjar**	8	0.07	18	0.15
Gadwall	60	0.27	114	0.52
Golden plover (non-breeding)*	2,737	0.68	4,602	1.15
Goosander (breeding males)	0	0.00	1	0.02
Goosander (non-breeding)	36	1.10	54	1.67
Great bittern**	3	0.75	6	1.46

Species	Dogger Bank Teesside A & B		Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	
	Number crossing project	% reference population	Number crossing projects	% reference population
Greater scaup**	3	0.03	6	0.06
Great-crested grebe	86	0.35	167	0.69
Greenshank	<1	0.10	1	0.19
Grey plover	836	1.70	1,268	2.57
Hen harrier (breeding)*	<1	0.09	1	0.24
Hen harrier (non-breeding)*	11	2.98	17	4.51
Light-bellied brent goose (Svalbard population)*	2	0.06	75	2.22
Mallard	3,279	0.71	4,960	1.08
Northern lapwing**	7,614	1.70	1,1548	2.57
Northern pintail	144	0.48	218	0.72
Northern shoveler	98	0.52	174	0.92
Red knot	2,681	0.79	4,063	1.20
Red-breasted merganser	2	0.06	3	0.11
Ruddy turnstone	381	0.79	576	1.20
Ruff*	43	1.80	66	2.77
Sanderling	712	1.19	1,079	1.80
Short-eared owl*	12	1.15	18	1.74
Slavonian grebe*	3	0.32	5	0.48
Tufted duck	873	0.85	1,321	1.28
Velvet scoter	25	1.01	38	1.52
Whimbrel	179	0.78	273	1.18

* Scotland BAP priority species.
** England and Scotland BAP priority species.

10.2.16. These migrant bird species would experience an increase in flight distance, which would depend on their direction of flight. Taking the worst case, the barrier effect on the shortest east-west migratory route would result in an increase of up to 25km (4% of the 575km route). Longer migratory routes would increase to a lesser extent, resulting in a decrease in the percentage of the distance added to each route by the barrier effect.

10.2.17. Given the relatively low percentages, uncertainty over the actual numbers and barrier effect on these species as well as the limited diversion that would result, it is considered unlikely that a noticeable population effect would be evident for all migrant bird species. **Table 10.12** summarises the impact of the barrier effect on all migrant bird species, as detailed in Section 6.2 in **Appendix 11A**, species sensitivity is presented in **Table 4.15**.

Table 10.12 Summary of impacts on migrant bird species due to the cumulative barrier effect during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

Species	% reference population	Derivation of impacts		
		Value	Magnitude	Impact
Barnacle goose *Branta leucopsis* (Svalbard population)*	0.07	Very high	Negligible	Minor adverse
Bar-tailed godwit*	2.69	Very high	Negligible	Minor adverse
Bean goose*	3.74	Very high	Negligible	Minor adverse
Black-tailed godwit**	2.27	Very high	Negligible	Minor adverse
Common goldeneye	1.54	Very high	Negligible	Minor adverse
Common pochard*	0.92	Very high	Negligible	Minor adverse
Common redshank (breeding)	0.25	Very high	Negligible	Minor adverse
Common redshank Icelandic population (non-breeding)	1.15	Very high	Negligible	Minor adverse
Common redshank mainland Europe population (non-breeding)	2.79	Very high	Negligible	Minor adverse
Common ringed plover (non-breeding)	1.30	Very high	Negligible	Minor adverse
Common scoter**	0.05	Very high	Negligible	Minor adverse
Common shelduck	1.54	Very high	Negligible	Minor adverse
Common snipe	1.20	Very high	Negligible	Minor adverse
Dunlin *Calidris alpine schinzii* (passage)*	2.40	Very high	Negligible	Minor adverse
Dunlin *Calidris alpina alpine* (passage & winter)	2.22	Very high	Negligible	Minor adverse
Eurasian coot	0.27	Very high	Negligible	Minor adverse
Eurasian curlew (non-breeding)**	2.51	Very high	Negligible	Minor adverse
Eurasian oystercatcher (non-breeding)	1.20	Very high	Negligible	Minor adverse
Eurasian teal	0.72	Very high	Negligible	Minor adverse
Eurasian wigeon	1.37	Very high	Negligible	Minor adverse
European nightjar**	0.15	Very high	Negligible	Minor adverse
Gadwall	0.52	Very high	Negligible	Minor adverse
Golden plover (non-breeding)*	1.15	Very high	Negligible	Minor adverse
Goosander (breeding males)	0.02	Very high	Negligible	Minor adverse
Goosander (non-breeding)	1.67	Very high	Negligible	Minor adverse

Species	% reference population	Derivation of impacts		
		Value	Magnitude	Impact
Great bittern**	1.46	Very high	Negligible	Minor adverse
Greater scaup**	0.06	Very high	Negligible	Minor adverse
Great-crested grebe	0.69	Very high	Negligible	Minor adverse
Greenshank	0.19	Very high	Negligible	Minor adverse
Grey plover	2.57	Very high	Negligible	Minor adverse
Hen harrier (breeding)*	0.24	Very high	Negligible	Minor adverse
Hen harrier (non-breeding)*	4.51	Very high	Negligible	Minor adverse
Light-bellied brent goose (Svalbard population)	2.22	Very high	Negligible	Minor adverse
Mallard	1.08	Very high	Negligible	Minor adverse
Northern lapwing**	2.57	Very high	Negligible	Minor adverse
Northern pintail	0.72	Very high	Negligible	Minor adverse
Northern shoveler	0.92	Very high	Negligible	Minor adverse
Red knot	1.20	Very high	Negligible	Minor adverse
Red-breasted merganser	0.11	Very high	Negligible	Minor adverse
Ruddy turnstone	1.20	Very high	Negligible	Minor adverse
Ruff*	2.77	Very high	Negligible	Minor adverse
Sanderling	1.80	Very high	Negligible	Minor adverse
Short-eared owl*	1.74	Very high	Negligible	Minor adverse
Slavonian grebe*	0.48	Very high	Negligible	Minor adverse
Tufted duck	1.28	Very high	Negligible	Minor adverse
Velvet scoter	1.52	Very high	Negligible	Minor adverse
Whimbrel	1.18	Very high	Negligible	Minor adverse

* Scotland BAP priority species.
** England and Scotland BAP priority species.

10.2.18. Given the low percentages of the migrant bird GB populations that could be affected (47 species' populations including sub-species and breeding and non-breeding populations), below 5% for all populations and less than 2% for 35 (as shown in **Table 10.11**), and given the limited diversion (a maximum of 4%) that would result, it is considered unlikely that a noticeable population effect would be evident for all migrant bird species. Consequently, for all migrant bird species, a long-term **minor adverse** cumulative impact is predicted on their populations due to the cumulative barrier effect of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D. No change in significance or magnitude occurs in comparison with Dogger Bank Teesside A & B alone.

10.2.19. It should be noted that there is considerable uncertainty regarding the assessment of the cumulative barrier effects posed by the Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D due to the uncertainty regarding the numbers of birds passing through each project area, whether birds fly directly to or from the designated sites that they are features of or fly closer to the coastline, the extent to which the project actually poses a barrier effect, and the consequences for survival from the increase in energy expenditure that could be associated with the increases in flight distance for those birds exposed to barrier effects.

Collisions on seabirds during operation

10.2.20. Collision analyses to estimate the probability of seabirds colliding with a turbine were conducted and are detailed in Section 6.2 in **Appendix 11A**. **Table 10.13** presents the numbers of bird collisions for a range of avoidance rates, extracted from **Table 7.9**, and from Tables 6.3 and 6.4 in **Appendix 11A**. No collisions are expected for Arctic skua, Atlantic puffin, common guillemot, and little auk, therefore these species are not shown in the **Table 10.13**.

10.2.21. The estimated collisions identified in **Table 10.13** indicate that negligible numbers (less than 10 birds annually) of great skua, northern fulmar, and razorbill would be affected by cumulative collisions annually as a result of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D. The very low numbers affected represents less than 0.01% of their total national populations or less than 0.01% of their national breeding populations during the breeding season, and significanty less than 0.01% of their biogeographic populations.

10.2.22. Estimated annual cumulative collisions (using the 98% avoidance rate for all species with the exception of northern gannet for which 99% is considered appropriate) for black-legged kittiwake (553), great black-backed gull (163), lesser black-backed gull (88), and northern gannet (217) respresent very low national population level effects, which are:

- 0.21% for the national wintering population of great black-backed gull (0.11% of the national breeding population), and 0.05% of the biogeographic population;
- 0.07% for the national wintering population of lesser black-backed gull (0.03% of the national breeding population), and 0.03% of the biogeographic population;
- 0.05% for the national breeding population of black-legged kittiwake and 0.01% of the biogeographic population; and
- 0.05% for the national breeding population of northern gannet and 0.02% of the biogeographic population).

10.2.23. **Table 10.14** presents the summary of the assessment on seabird populations, and the detailed assessment is presented in Section 6.2 in **Appendix 11A**. The assessment concludes that a long-term **negligible** or **minor adverse** cumulative impact is predicted on all seabirds' populations due to collisions as a result of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, with one exception. There is no change in the magnitude and significance of impacts compared to the collisions as a result of Dogger Bank Teesside A & B on its own, with the exception of the impact on the designated site population of black-legged kittiwake, which is considered and reported on further in Section 10.4 below.

Table 10.13 Estimated collisions for seabirds and their populations due to operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D (numbers in brackets are the breeding bird numbers and percentages)

Species	Avoidance rate	Dogger Bank Teesside A & B			Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D			Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D		
		Collisions	% national population	% bio-geographic population	Collisions	% national population	% bio-geographic population	Collisions	% national population	% bio-geographic population
Arctic skua	95%	0	0	0	0	0	0	0	0	0
	98%	0	0	0	0	0	0	0	0	0
	99%	0	0	0	0	0	0	0	0	0
	99.5%	0	0	0	0	0	0	0	0	0
Atlantic puffin	95%	0	0	0	0	0	0	0	0	0
	98%	0	0	0	0	0	0	0	0	0
	99%	0	0	0	0	0	0	0	0	0
	99.5%	0	0	0	0	0	0	0	0	0
Black-legged kittiwake	95%	335 (217)	(0.03)	<0.01	1,048 (753)	(0.10)	0.02	1,382 (970)	(0.13)	0.02
	98%	134 (87)	(0.01)	<0.01	419 (301)	(0.04)	0.01	553 (388)	(0.05)	0.01
	99%	67 (44)	(0.01)	<0.01	210 (150)	(0.02)	<0.01	277 (194)	(0.03)	<0.01
	99.5%	34 (22)	(<0.01)	<0.01	104 (75)	(0.01)	<0.01	138 (97)	(0.01)	<0.01
Common guillemot	95%	0	0	0	0	0	0	0	0	0
	98%	0	0	0	0	0	0	0	0	0
	99%	0	0	0	0	0	0	0	0	0
	99.5%	0	0	0	0	0	0	0	0	0
Great black-backed gull[1]	95%	146 (43)	0.19 (0.13)	0.04	261 (47)	0.34 (0.14)	0.08	407 (90)	0.54 (0.26)	0.12
	98%	58 (17)	0.05 (0.05)	0.02	105 (19)	0.11 (0.06)	0.03	163 (36)	0.17 (0.11)	0.05
	99%	29 (9)	0.03 (0.03)	0.01	52 (9)	0.06 (0.03)	0.02	81 (18)	0.08 (0.05)	0.02
	99.5%	15 (4)	0.01 (0.01)	<0.01	26 (5)	0.03 (0.01)	0.01	41 (9)	0.04 (0.03)	0.01
Great skua	95%	1 (0)	<0.01	<0.01	3 (2)	(0.01)	<0.01	4 (2)	(0.01)	<0.01
	98%	1 (0)	(<0.01)	<0.01	1 (1)	(0.01)	<0.01	2 (1)	(0.01)	<0.01
	99%	0	0	0	1 (0)	(0.00)	<0.01	1 (0)	(0.00)	<0.01
	99.5%	0	0	0	0	0	0	0	0	0

Species	Avoidance rate	Dogger Bank Teesside A & B			Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D			Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D		
		Collisions	% national population	% bio-geographic population	Collisions	% national population	% bio-geographic population	Collisions	% national population	% bio-geographic population
Lesser black-backed gull[2]	95%	82 (50)	0.03 (0.02)	0.02	136 (94)	0.03 (0.04)	0.03	219 (144)	0.06 (0.07)	0.04
	98%	33 (20)	0.01 (0.01)	0.01	55 (38)	0.01 (0.02)	0.01	88 (58)	0.02 (0.03)	0.02
	99%	16 (10)	<0.01 (<0.01)	<0.01	28 (19)	0.01 (0.01)	0.01	44 (29)	0.01(0.01)	0.01
	99.5%	8 (5)	<0.01 (<0.01)	<0.01	14 (10)	<0.01 (<0.01)	<0.01	22 (15)	0.01 (0.01)	<0.01
Little auk	95%	0	0	0	0	0	0	0	0	0
	98%	0	0	0	0	0	0	0	0	0
	99%	0	0	0	0	0	0	0	0	0
	99.5%	0	0	0	0	0	0	0	0	0
Northern fulmar	95%	3 (2)	(<0.01)	<0.01	7 (2)	(<0.01)	<0.01	10 (4)	(<0.01)	<0.01
	98%	1 (1)	(<0.01)	<0.01	3 (1)	(<0.01)	<0.01	4 (2)	(<0.01)	<0.01
	99%	1 (0)	(<0.01)	<0.01	1 (1)	(<0.01)	<0.01	2 (1)	(<0.01)	<0.01
	99.5%	0	0	<0.01	1 (0)	(<0.01)	<0.01	1 (0)	(<0.01)	<0.01
Northern gannet	95%	339 (170)	(0.08)	0.04	746 (350)	(0.16)	0.08	1,085 (520)	(0.24)	0.11
	98%	136 (68)	(0.03)	0.01	298 (140)	(0.06)	0.03	434 (208)	(0.09)	0.04
	99%	68 (34)	(0.02)	0.01	149 (70)	(0.03)	0.02	217 (104)	(0.05)	0.02
	99.5%	34 (17)	(0.01)	<0.01	75 (35)	(0.02)	0.01	109 (52)	(0.02)	0.01
Razorbill	95%	6 (0)	(0)	<0.01	14 (0)	(0)	<0.01	20 (0)	(0)	<0.01
	98%	2 (0)	(0)	<0.01	6 (0)	(0)	<0.01	8 (0)	(0)	<0.01
	99%	1 (0)	(0)	<0.01	3 (0)	(0)	<0.01	4 (0)	(0)	<0.01
	99.5%	1 (0)	(0)	<0.01	1 (0)	(0)	<0.01	2 (0)	(0)	<0.01

[1] Great black-backed gull percentage of national population is wintering population and breeding population (with breeding population in brackets)
[2] Biogeographic population percentage is based on the *graellsii* sub-population only (using the lower number of the estimated range of this sub-species, 530,000-570,000).

Table 10.14 Summary of impacts on key seabirds and their populations due to collisions during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

Species	Population[1]	Derivation of impact		
		Value	Sensitivity	Magnitude
Negligible cumulative impact				
Little auk	All	High	Medium	Negligible
White-billed diver	All	Medium	High	Negligible
Minor adverse cumulative impact				
Arctic skua	All	Very high	High	Negligible
Atlantic puffin	All	Very high	Very high	Negligible
Black-legged kittiwake	Site suite National Biogeographic	Very high	Very high	Negligible
Common guillemot	All	Very high	Very high	Negligible
Great black-backed gull	All	Very high	Very high	Negligible
Great skua	All	Very high	High	Negligible
Lesser black-backed gull	All	Very high	Very high	Negligible
Northern fulmar	All	Very high	Very high	Negligible
Northern gannet	All	Very high	Very high	Negligible
Razorbill	All	Very high	Very high	Negligible
Moderate adverse cumulative impact				
Black-legged kittiwake	Designated site	Very high	Very high	Low

[1] Designated site (SSSI), site suite (all linked designated sites), national, and biogeographic population.

Migrant bird collision risk

10.2.24. The assessment of the potential cumulative collisions considered the 46 species' populations of terrestrial or waterbird migrants that are species whose migration zones (defined by Wright *et al*. (2012)) overlap with the Dogger Bank Zone. Modelling of the migrant birds that could potentially experience a cumulative collision impact during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D is detailed in Section 6.2 in **Appendix 11A**. The predicted annual collisions as a result of the operation of Dogger Bank Teesside A & B and Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D is presented in **Table 10.15** using data extracted from Table 6.5 in **Appendix 11A**.

10.2.25. The collision estimates presented in **Table 10.15** are predicted to result in a long-term **negligible** or **minor adverse** cumulative impact on the populations of the migrant bird species as identified in **Table 10.16**, based on the detailed assessment presented in Section 6.2 and summarised in Table 6.7 in **Appendix 11A**. No change in the magnitude or significance of the collision impacts is predicted when compared to Dogger Bank Teesside A & B alone.

Table 10.15 Estimated annual cumulative collisions for migrant birds and their populations affected during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D based on 98% avoidance rate for all species and Option 1 Band model

Species	Dogger Bank Teesside A & B			Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D		Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D		
	Estimated annual collisions	% reference population	% migration zone	Estimated annual collisions	% reference population	Estimated annual collisions	% reference population	% migration zone
Barnacle goose (Svalbard population)	0.00	0	0	0.08	<0.1	0.08	<0.1	0.24
Bar-tailed godwit*	1.41	<0.1	7.16	3.06	<0.1	4.47	<0.1	10.78
Bean goose*	0.03	<0.1	8.33	0.07	<0.1	0.10	<0.1	12.47
Black-tailed godwit**	0.06	<0.1	5.36	0.14	<0.1	0.20	<0.1	9.08
Common goldeneye	0.43	<0.1	6.80	0.95	<0.1	1.38	<0.1	10.28
Common pochard*	0.56	<0.1	4.59	1.56	<0.1	2.12	<0.1	8.19
Common redshank (breeding)	0.06	<0.1	5.91	0.16	<0.1	0.22	<0.1	9.95
Common redshank Icelandic population (non-breeding)	2.57	<0.1	5.45	6.54	<0.1	9.11	<0.1	9.17
Common redshank mainland Europe population (non-breeding)	0.63	<0.1	7.37	1.38	<0.1	2.01	<0.1	11.15
Common ringed plover (non-breeding)	0.41	<0.1	6.86	0.89	<0.1	1.30	<0.1	10.39
Common scoter**	0.06	<0.1	6.35	0.13	<0.1	0.19	<0.1	9.61
Common shelduck	1.23	<0.1	6.80	2.7	<0.1	3.93	<0.1	10.28
Common snipe	10.61	<0.1	6.34	23.3	<0.1	33.91	<0.1	9.61

Species	Dogger Bank Teesside A & B			Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D		Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D		
	Estimated annual collisions	% reference population	% migration zone	Estimated annual collisions	% reference population	Estimated annual collisions	% reference population	% migration zone
Dunlin *Calidris alpine schinzii* (passage)*	0.08	<0.1	6.39	0.16	<0.1	0.24	<0.1	9.62
Dunlin *Calidris alpina alpina* (passage & winter)	6.49	<0.1	4.63	19.78	<0.1	26.27	<0.1	8.88
Eurasian coot	0.39	<0.1	1.04	0.45	<0.1	0.84	<0.1	1.07
Eurasian curlew (non-breeding)**	2.09	<0.1	6.46	4.74	<0.1	6.83	<0.1	10.03
Eurasian oystercatcher (non-breeding)	2.36	<0.1	6.35	5.17	<0.1	7.53	<0.1	9.61
Eurasian teal	1.65	<0.1	6.35	3.62	<0.1	5.27	<0.1	9.61
Eurasian wigeon	6.98	<0.1	6.33	15.27	<0.1	22.25	<0.1	9.58
European nightjar**	0.01	<0.1	1.35	0.05	<0.1	0.06	<0.1	3.09
Gadwall	0.09	<0.1	3.01	0.27	<0.1	0.36	<0.1	5.77
Golden plover (non-breeding)*	3.79	<0.1	5.47	9.66	<0.1	13.45	<0.1	9.20
Goosander (breeding males)	0.00	0	0	0.003	<0.1	0.003	<0.1	0.15
Goosander (non-breeding)	0.06	<0.1	7.35	0.12	<0.1	0.18	<0.1	11.12
Great bittern**	0.01	<0.1	2.15	0.01	<0.1	0.02	<0.1	4.17
Greater scaup**	0.005	<0.1	4.30	0.015	<0.1	0.02	<0.1	7.63
Great-crested grebe	0.13	<0.1	3.52	0.4	<0.1	0.53	<0.1	6.87
Greenshank	0.0004	<0.1	4.07	0.0016	<0.1	0.002	<0.1	7.62
Grey plover	1.17	<0.1	6.78	2.56	<0.1	3.73	<0.1	10.29

Species	Dogger Bank Teesside A & B			Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D		Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D		
	Estimated annual collisions	% reference population	% migration zone	Estimated annual collisions	% reference population	Estimated annual collisions	% reference population	% migration zone
Hen harrier (breeding)*	0.0005	<0.1	1.85	0.0025	<0.1	0.003	<0.1	4.70
Hen harrier (non-breeding)*	0.02	<0.1	7.45	0.05	<0.1	0.07	<0.1	11.27
Light-bellied brent goose (Svalbard population)*	0.003	<0.1	0.19	0.247	<0.1	0.25	<0.1	7.40
Mallard	5.07	<0.1	6.80	11.12	<0.1	16.19	<0.1	10.28
Northern lapwing**	10.79	<0.1	6.78	23.73	<0.1	34.52	<0.1	10.29
Northern pintail	0.22	<0.1	6.35	0.49	<0.1	0.71	<0.1	9.61
Northern shoveler	0.14	<0.1	4.59	0.4	<0.1	0.54	<0.1	8.19
Red knot	3.60	<0.1	6.33	7.91	<0.1	11.51	<0.1	9.59
Red-breasted merganser	0.003	<0.1	3.86	0.007	<0.1	0.01	<0.1	7.18
Ruddy turnstone	0.51	<0.1	6.35	1.11	<0.1	1.62	<0.1	9.60
Ruff*	0.06	<0.1	7.22	0.13	<0.1	0.19	<0.1	11.06
Sanderling	0.92	<0.1	6.33	2.03	<0.1	2.95	<0.1	9.59
Short-eared owl*	0.02	<0.1	6.56	0.05	<0.1	0.07	<0.1	9.93
Slavonian grebe*	0.005	<0.1	6.35	0.015	<0.1	0.02	<0.1	9.61
Tufted duck	1.26	<0.1	6.29	2.77	<0.1	4.03	<0.1	9.51
Velvet scoter	0.04	<0.1	7.45	0.08	<0.1	0.12	<0.1	11.27
Whimbrel	0.26	<0.1	6.23	0.59	<0.1	0.85	<0.1	9.47

* Scotland BAP priority species. ** England and Scotland BAP priority species.

Table 10.16 Summary of impacts on migrant bird species and their populations due to collisions during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

Species	Estimated annual collisions	Derivation of impacts		
		Value	Sensitivity	Magnitude
Negligible cumulative impact				
Bar-tailed godwit**	4.47	Very high	Very low	Negligible
Bean goose**	0.10	Very high	Low	Negligible
Common goldeneye	1.38	Very high	Low	Negligible
Common pochard**	2.12	Very high	Very low	Negligible
Common redshank (breeding)	0.22	Very high	Very low	Negligible
Common redshank - Icelandic population (non-breeding)	9.11	Very high	Very low	Negligible
Common redshank - mainland Europe population (non-breeding)	2.01	Very high	Very low	Negligible
Common ringed plover (non-breeding)	1.30	Very high	Low	Negligible
Common scoter***	0.19	Very high	Low	Negligible
Common snipe	33.91	Very high	Very low	Negligible
Dunlin *Calidris alpine schinzii (passage)***	0.24	Very high	Very low	Negligible
Dunlin *Calidris alpina alpina* (passage & winter)**	26.27	Very high	Very low	Negligible
Eurasian coot	0.84	Very high	Very low	Negligible
Eurasian curlew (non-breeding)***	6.83	Very high	Very low	Negligible
Eurasian teal	5.27	Very high	Very low	Negligible
Eurasian wigeon	22.25	Very high	Very low	Negligible
European nightjar***	0.06	Very high	Very low	Negligible
Gadwall	0.36	Very high	Very low	Negligible
Golden plover (non-breeding)**	13.45	Very high	Very low	Negligible
Great bittern***	0.02	Very high	Very low	Negligible
Greater scaup***	0.02	Very high	Very low	Negligible
Greenshank	0.002	Very high	Very low	Negligible
Mallard	16.19	Very high	Very low	Negligible
Northern lapwing***	34.52	Very high	Very low	Negligible
Northern pintail	0.71	Very high	Very low	Negligible
Northern shoveler	0.54	Very high	Very low	Negligible
Tufted duck	4.03	Very high	Very low	Negligible
Ruff**	0.19	Very high	Very low	Negligible
Short-eared owl**	0.07	Very high	Very low	Negligible
Velvet scoter	0.12	Very high	Low	Negligible
Minor adverse cumulative impact				
Barnacle goose (Svalbard population)	0.08	Very high	Very high	Negligible
Black-tailed godwit***	0.20	Very high	Very high	Negligible
Common shelduck	3.93	Very high	High	Negligible
Eurasian oystercatcher (non-breeding)	7.53	Very high	High	Negligible
Goosander (breeding males)	0.003	Very high	Medium	Negligible
Goosander (non-breeding)	0.18	Very high	Medium	Negligible
Great-crested grebe	0.53	Very high	Medium	Negligible
Grey plover	3.73	Very high	High	Negligible

Species	Estimated annual collisions	Derivation of impacts		
		Value	Sensitivity	Magnitude
Hen harrier (breeding)**	0.003	Very high	Medium	Negligible
Hen harrier (non-breeding)**	0.07	Very high	Medium	Negligible
Light-bellied brent goose (Svalbard population)	0.25	Very high	High	Negligible
Red knot	11.51	Very high	Medium	Negligible
Red-breasted merganser	0.01	Very high	Medium	Negligible
Ruddy turnstone	1.62	Very high	High	Negligible
Sanderling	2.95	Very high	Medium	Negligible
Slavonian grebe**	0.02	Very high	Medium	Negligible
Whimbrel	0.85	Very high	High	Negligible

* Designated site (SSSI), site suite (all linked designated sites), national, and biogeographic populations.
** Scotland BAP priority species.
*** England and Scotland BAP priority species.

10.2.26. Due to the lack of knowledge concerning species' precise migration routes and their likely variability in response to turbines and collision avoidance, and as no indication as to the proportion of each species in relation to the designated sites no attempt can be made to apportion impacts to these individual designated sites. Consequently, whilst the magnitude at the population level is negligible it is unknown whether impacts may potentially be greater or less for individual designated site populations.

Habitat loss and / or alteration during operation

10.2.27. The alteration and loss of habitat as a result of the presence of the wind farm and associated structures (including the export cables) for the Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D is predicted to result in a long-term **negligible** or **minor adverse** cumulative impact on the populations of all of the seabird species (see detailed assessment in Section 6.2 and summary in Table 6.7 in **Appendix 11A**). No change in the level or significance of the cumulative impact is predicted for these species compared to Dogger Bank Teesside A & B alone as presented in **Table 7.12**, and no significant impacts have been predicted.

Disturbance and displacement during decommissioning

10.2.28. The displacement impacts on seabirds during decommissioning of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D are predicted to be the same as for the construction phase, described in paragraph 10.2.5 and **Table 10.5**. Short-term **negligible** and **minor adverse** cumulative impacts are predicted, with no significant impacts predicted. On completion of decommissioning there would be no disturbance or displacement activities and no further impacts would arise.

Habitat loss and / or alteration during decommissioning

10.2.29. The alteration and loss of habitat during decommissioning and the impact on seabirds as a result of the Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D are predicted to be the same as for the construction phase, described in paragraph 10.2.6. Short-term **negligible** and **minor adverse** cumulative impacts are predicted (as presented in **Table 6.4**), with no significant impacts predicted. On completion of decommissioning there would be no disturbance or changes to habitats and no further impacts would arise.

10.3. Cumulative impacts of Dogger Bank Teesside A & B and all other projects

10.3.1. This section provides the results of the cumulative impact assessment for Dogger Bank Teesside A & B in conjunction with other plans and projects which share similar receptors to those identified in Section 4 (existing environment) and assessed for the construction (Section 6), operation (Section 7), and decommissioning (Section 8) phases, extracted from Section 6.3 in **Appendix 11A**. It is predominantly summary in form due to the very detailed and extensive technical report that provides and describes all of the construction, operation, and decommissioning phase cumulative impacts resulting from the Dogger Bank Teesside A & B and all other projects on all of the seabird and migratory bird species and their associated designated sites.

10.3.2. The assessment is considered for the national and biogeographic populations for migratory species due to the uncertainties in relation to the apportionment of migratory birds to individual designated sites. The following cumulative impacts have been assessed:

- Disturbance / displacement during construction, operation, and decommissioning;
- Barrier effects to foraging seabirds during operation;
- Collision risk to seabirds during operation; and
- Direct habitat loss and / or alteration during operation.

10.3.3. Collision risk modelling for migrant bird species that may pass through Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D revealed that at the Great Britain population level, the overall predicted annual losses would be **negligible** to **minor adverse** (see **Table 10.16**). It is therefore not expected that cumulative collisions with other projects would be measurably greater, as no specific species sensitivities were identified through the assessment work. Furthermore, information on collision losses of migrant birds from other projects was generally not provided, consequently, the negligible cumulative impact predicted for migrant bird collisions as a result of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D would remain.

10.3.4. Further screening was also undertaken to refine the list of projects (see paragraph 10.1.13 and **Table 10.2**) screened into this cumulative assessment based on the generic criteria set out at the beginning of this section. Completed projects that became operational prior to the collection of baseline data for the present assessment are considered to already have influenced the ornithological baseline data and are thus not considered further (e.g. Lynn). The full list of projects that are therefore considered for the cumulative assessment is provided in **Table 10.17** (extracted from Table 6.8 in **Appendix 11A**, see for more detail) and specific omissions are described where relevant within the assessment sub-sections below. A review of the available assessment information for these projects in the form of ESs and appropriate assessments has been undertaken to obtain the relevant data to enable the cumulative assessment to be undertaken. In some cases information is unavailable for particular projects to inform the cumulative assessment for one or more specific impacts, and these are identified with a 'No' in **Table 10.17**.

Table 10.17 Projects and cumulative impacts considered

Project	Displacement / disturbance	Collision Risk
Dogger Bank Creyke Beck A & B	Yes	Yes
Dogger Bank Teesside C & D	Yes	Yes
Beatrice Offshore Wind Farm	Yes	Yes
Blyth Offshore Wind Demonstration Site	No	Yes
Breeveertien II Offshore Wind Farm	No	Yes
Dudgeon Offshore Wind Farm	No	Yes
East Anglia ONE Offshore Wind Farm	Yes	Yes
European Offshore Wind Development Centre / Aberdeen Offshore Wind Farm	Yes	Yes
Firth of Forth Alpha and Bravo Offshore Wind Farms	Yes	Yes
Galloper Offshore Wind Farm	Yes	Yes
Greater Gabbard Offshore Wind Farm	No	Yes
Hornsea Project One Offshore Wind Farm	Yes	Yes
Humber Gateway Offshore Wind Farm	No	Yes
Inch Cape Offshore Wind Farm	Yes	Yes
Lincs Offshore Wind Farm	No	Yes
London Array I/II Offshore Wind Farm	Yes	Yes
Moray Firth (Telford, Stevenson and MacColl Offshore Wind Farms)	Yes	Yes
Neart na Gaoithe Offshore Wind Farm	Yes	Yes
Race Bank Offshore Wind Farm	No	Yes
Sheringham Shoal Offshore Wind Farm	No	Yes
Teesside Offshore Windfarm	No	Yes
Thanet Offshore Wind Farm	Yes	Yes
Triton Knoll Offshore Wind Farm	No	Yes
Westermost Rough Offshore Wind Farm	No	Yes

10.3.5. For the cumulative assessment of Dogger Bank Teesside A & B and all other projects, no attempt has been made to standardise estimates using the same assumptions as presented in other ESs for those projects listed in **Table 10.17**. Based on the information presented in the assessments for other projects, this would have only been possible in some cases. In addition, the values / assumptions used in other project's assessments may have been agreed with statutory advisors and/or be specific to those projects and thus it would not be appropriate to use standardised estimates here. Therefore, the assumptions used in deriving displacement and collision risk estimates in other assessments have been highlighted where these differ from those used in this assessment.

10.3.6. The information available from other projects' Environmental Statements was, at times, limited in relation to the numbers of birds predicted to be displaced and collision risk estimates; in some cases no attempt was made to estimate values. Even where data were available, estimates were not available for all the key marine species considered within this chapter. Note also that estimates of the numbers of displaced birds failing to breed were considered in relation to reference populations in the Beatrice Offshore Wind Farm and Moray Firth Offshore Wind Farm assessments. However, due to fundamental differences in impact assessment methodologies, the numbers from those two assessments could not be reconciled with other assessments that had considered direct mortality of displaced birds, and were thus not included in the cumulative assessment.

Disturbance / displacement during construction / operation / decommissioning

10.3.7. **Table 10.18** presents the displacement estimates provided for all available projects (see detail in Table 6.9 and Section 6.3 in **Appendix 11A**). No other displacement estimates were provided for little auk, therefore, the quantities presented in **Table 10.6** and **10.7**, for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D would remain (as would the impact significance). The other species (i.e. Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, northern fulmar, and northern gannet) are not considered to be sensitive to disturbance or their mortality is considered to be essentially zero with respect to their foraging strategy.

10.3.8. Based on the total numbers of the species displaced (see **Table 10.18**) the estimates of cumulative mortality (based on the 5% mortality rate) as a result of the construction, operation, and decommissioning of Dogger Bank Teesside A & B and all other projects is presented in **Table 10.20**, where the other projects Environmental Statements could be reconciled with the assessment undertaken herein. **Table 10.21** presents the total mortality for each species along with an indication of the significance of the mortality quantities with respect to the national and international populations.

Table 10.18 Predictions of the numbers of displaced birds obtained for additional offshore wind farm sites in the North Sea extracted from other project ESs

Project	Season	Atlantic puffin	Common guillemot	Little auk	Northern gannet	Razorbill
Beatrice Offshore Wind Farm	Total	478	6,014	-	68	768
East Anglia ONE Offshore Wind Farm	Spring	-	430	-	65	120
	Breeding	-	-	-	43	-
	Autumn	-	-	-	1,870	-
	Winter	-	820	-	64	200
	Total	-	1,250	-	2,042	320
European Offshore Wind Development Centre / Aberdeen Offshore Wind Farm	Total	62	386	-	32	129
Firth of Forth Alpha Offshore Wind Farm	Breeding	790	2,858	-	761	604
Firth of Forth Bravo Offshore Wind Farm	Breeding	1,002	3,215	-	512	232
Galloper[1] Offshore Wind Farm	Breeding[2]	-	-	-	-	-
	Winter[2]	-	3,219	-	-	342
	Total	-	3,219	-	-	342
Hornsea Project One Offshore Wind Farm	Breeding	428	1,037	-	239	366
	Post-breeding	-	5,705	-	-	2,926
	Winter	503	4,609	-	237	2,628
	Total	931	11,351	-	476	5,920
Inch Cape Offshore Wind Farm	Breeding	1,800	2,185	-	1,001	819
	Post-breeding	1,344	1,588	-		1,435
	Winter	190	880	2,319	147	326
	Total	3,334	4,653	2,319	1,148	2,580
London Array I/II Offshore Wind Farm	Total	-	2,400	-	162	250
Moray Firth (Telford, Stevenson and MacColl Offshore Wind Farms)[5]	Breeding	1,588	5,738	-	119	1,320
Neart na Gaoithe Offshore Wind Farm	Breeding	3,450	1,095	-	1,715	117
	Chick on sea	-	1,487	-		920
	Post-breeding	1,446	2,923	-		1,178
	Winter	318	816	-	626	154
	Total	5,214	6,321	-	2,341	2,369
Thanet[1] Offshore Wind Farm	Total[3]	193	193	-	37	193
Dogger Bank Teesside A & B[4]	Breeding	28	1,108	-	256	186
	Winter	140	4,403	156	454	1,618
	Total	168	5,511	156	709	1,804

Project	Season	Atlantic puffin	Common guillemot	Little auk	Northern gannet	Razorbill
Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D[4]	Breeding	109	6,633	-	746	598
	Winter	465	15,411	294	984	4,787
	Total	574	22,044	294	1,731	5,384
Total	**Total**	**14,334**	**75,144**	**2,769**	**10,138**	**22,215**

[1] No specific displacement rates were presented; hence, it has been assumed that all birds in the areas of the respective projects were displaced.
[2] A total displacement estimate was obtained following the methodology used in the Dogger Bank Teesside A & B assessments, assuming that breeding populations were separate to non-breeding (post-breeding / migration / wintering) populations.
[3] Impacts of displacement were predicted for all auks combined; a worst case has been assumed by applying the total estimate to each species rather than splitting it between the three auk species.
[4] Figures based on median population estimates are used for consistency across projects.
[5] Assessment was done on breeding season populations.

Table 10.19 Predictions of the mortality as a result of displaced birds for additional offshore wind farm sites in the North Sea using displacement mortality rates presented in respective environmental statements and addendums

Project	Season	Atlantic puffin	Common guillemot	Little auk	Northern gannet	Razorbill
East Anglia ONE Offshore Wind Farm	All	-	125	-	30	20
European Offshore Wind Development Centre / Aberdeen Offshore Wind Farm	All	62	386	0	-	129
Firth of Forth Alpha Offshore Wind Farm	Breeding	11	41	-	12	9
Firth of Forth Bravo Offshore Wind Farm	Breeding	14	46	-	8	3
Hornsea Project One Offshore Wind Farm	All	48	264	-	7	121
Neart na Gaoithe Offshore Wind Farm	All	380	332	-	47	131
Dogger Bank Teesside A & B	All	8	276	8	0	90
Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	All	29	1,102	15	122	269
Total		**553**	**2,572**	**23**	**226**	**772**

10.3.9. Overall, given the mortality rates presented in **Table 10.20**, the construction, operation, and decommissioning of Dogger Bank Teesside A & B and all other projects is predicted to result in a **negligible** or **minor adverse** cumulative impact on the populations of the species presented in **Table 10.21** (see detailed assessment in Section 6.3 in **Appendix 11A**), with the exception of the designated site population of common guillemot, which is discussed in Section 10.4 below, where a **moderate adverse** cumulative impact is predicted as a result of the disturbance resulting from Dogger Bank Teesside A & B and all other projects.

Table 10.20 Mortality for seabirds and their population affected by cumulative disturbance and displacement during the construction, operation, and decommissioning of Dogger Bank Teesside A & B and all other projects

Species	Mortality	Percentage of population	
		National population[1]	Biogeographic population[2]
Atlantic puffin	553	N/A	0.004
Common guillemot	2,572	N/A	0.05 (0.05 - 0.32)
Little auk	23	N/A[3]	<0.01
Northern gannet	226	N/A	0.02
Razorbill	772	N/A	0.05

[1] Only the GB breeding populations are defined for Atlantic puffin, common guillemot, northern gannet, and razorbill; therefore this percentage is an overestimate as it is based on the total birds affected (including outside breeding season) against the breeding population where no differentiation has been made in **Table 10.18**.
[2] Biogeographic population for common guillemot is based on the combined *aalge* population (4,800,000 I) and the *albionis* population (800,000 I), with the range for these populations presented in brackets, assuming 100% mortality for either subspecies.
[3] There is no GB population estimate for little auk.

Table 10.21 Summary of impacts on key seabirds and their populations due to cumulative displacement during the construction, operation, and decommissioning of the Dogger Bank Teesside A & B and all other projects

Species	Population[1]	Derivation of impact		
		Value	Sensitivity	Magnitude
No cumulative impact				
Arctic skua	All	Very high	Low	None
Black-legged kittiwake	All	Very high	Low	None
Great black-backed gull	All	Very high	Low	None
Great skua	All	Very high	Low	None
Lesser black-backed gull	All	Very high	Very low	None
Northern fulmar	All	Very high	Very low	None
Negligible cumulative impact				
Little auk	All	High	Low	Negligible
White-billed diver	All	Medium	High	Negligible
Minor adverse cumulative impact				
Atlantic puffin	All	Very high	Very low	Negligible
Common guillemot	National Biogeographic	Very high	Medium	Negligible
Northern gannet	All	Very high	Very low	Negligible
Razorbill	All	Very high	Medium	Negligible
Moderate adverse cumulative impact				
Common guillemot	Designated site	Very high	Medium	Low

[1] Designated site (SSSI), national (GB), and biogeographic populations.

Barrier effect on seabirds and migratory seabirds during operation

10.3.10. Due to complexities in determining the foraging range of the key marine species for all sites and the inter-relationship due to the wide scale separation between all other wind farm projects in the North Sea, barrier effect on the breeding populations of seabirds or migrant birds cannot be undertaken (see paragraphs 3.3.59 and 3.3.60). However, it is considered that the scale of the cumulative impact assessed for the barrier effect arising from Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D would not noticeably increase given the scale of the foraging area (i.e. the North Sea) or as a result of the additional migratory route distance required to be travelled.

Seabird collision risk

10.3.11. The presence of operating wind turbines of the Dogger Bank Teesside A & B and the other wind farm projects could result in cumulative collision risk for seabirds. **Table 10.22** (extracted from Table 6.10 in **Appendix 11A**) presents the collision estimates obtained from the other project ESs, which were then added to the cumulative collision estimates for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D. **Table 10.23** presents the annual collision estimates for all projects against the national and biogeographic populations and the increase in background mortality. No numbers of Atlantic puffin were identified in **Table 10.22** therefore no population would be affected, therefore this species is not included in **Table 10.23**. It should be noted that with the exception of the gulls, all seabirds only have national breeding populations determined (see **Table 3.2**) therefore the percentages for most are an overestimate of the population that could be affected. No further collision estimates were identified for little auk (and refer to **Table 10.13**) with less than one bird affected annually. The national populations of great black-backed gull and lesser black-backed gull are considered to be underestimates; therefore, the predicted annual collisions for these species are likely to be over-estimates.

10.3.12. **Table 10.24** presents the assessment of the impact of collisions from the operation of Dogger Bank Teesside A & B and all other projects using the quantitative results presented in **Table 10.22** and **Table 10.23**, based on the detailed assessment presented in Section 6.3 in **Appendix 11A**. A long-term (for the lifetime of the wind farms) **negligible** or **minor adverse** cumulative impact is predicted for almost all national and biogeographic populations of the seabird species with the exception of:

- A long-term **moderate adverse** cumulative impact is predicted for the national populations of great black-backed gull, lesser black-backed gull, and northern gannet; and
- A long-term **moderate adverse** cumulative impact is predicted for the designated site population of black-legged kittiwake, great black-backed gull, and northern gannet.

10.3.13. Details of the impacts on the designated sites' populations are presented in Section 10.4 below.

Table 10.22 Annual collision estimates for seabirds for Dogger Bank Teesside A & B and other projects

Project	Model used	Arctic skua	Atlantic puffin	Black-legged kittiwake	Common guillemot	Great black-backed gull	Great skua	Lesser black-backed gull	Northern fulmar	Northern gannet	Razorbill
Beatrice Offshore Wind Farm	Band (2012) Option 1 (*) / Option 3 (**)	11[1*]	-	44[1**]	27[1*]	239[1**]	25[1*]	-	13[1**]	42[1**]	1[1*]
Blyth Offshore Wind Demonstration Site	Band (2012) Option 1	-	-	10[2]	-	33[2]	-	-	-	15[2]	-
Breeveertien II Offshore Wind Farm	Band *et al.* (2007)	-	-	-	-	40	-	548	-	137	-
Dudgeon Offshore Wind Farm	Band (2000)	-	-	-	-	-	-	153[3]	-	597[4]	-
East Anglia ONE Offshore Wind Farm	Band (2012) Option 1			780[1]		115[1]	-	394[1]	-	314[3]	
European Offshore Wind Development Centre / Aberdeen Offshore Wind Farm	Band (2012) Option 2	-	-	34	3	12	-	-	2	17	1
Firth of Forth Alpha Offshore Wind Farm	Band (2012) Option 1 (*) / Option 3 (**)	-	-	148[1**]	-	146[1*]	-	6[1**]	3[1**]	493[1**]	-
Firth of Forth Bravo Offshore Wind Farm	Band (2012) Option 1 (*) / Option 3 (**)	-	-	104[1**]	-	121[1*]	-	6[1**]	5[1**]	334[1**]	-
Galloper Offshore Wind Farm	Band *et al.* (2007)	4	-	148	-	104	27	661	-	112	-
Greater Gabbard Offshore Wind Farm	Band (2000)	-	-	-	-	-	15[5]	22[5]	-	-	-
Hornsea Project One Offshore Wind Farm	Band (2012) Option 4	9[1]	-	31[1]	-	127[1]	<1[1]	22[1]	-	27[3]	-
Humber Gateway Offshore Wind Farm	Band (2000)	1[6]	-	34[6]	-	64[6]	1[6]	13[6]	-	18[6]	-
Inch Cape Offshore Wind Farm	Band (2000)	1[1]	-	547[1]	-	147[1]	2[1]	-	-	675[1]	-

Project	Model used	Arctic skua	Atlantic puffin	Black-legged kittiwake	Common guillemot	Great black-backed gull	Great skua	Lesser black-backed gull	Northern fulmar	Northern gannet	Razorbill
Lincs Offshore Wind Farm	Band (2000)	-	-	-	-	-	-	34	-	9	-
London Array I/II Offshore Wind Farm	Band (2000)	-	-	-	-	-	-	-	-	5[3]	-
Moray Firth (Telford, Stevenson and MacColl Offshore Wind Farms)	Band (2012) Option 3	-	-	48[3]	-	59[8]	-	-	-	13[7]	-
Neart na Gaoithe Offshore Wind Farm	Band (2012) Option 1	0.15[1]	0[1]	86[1]	1[1]	21[1]	0.18[1]	3[1]	-	237[3]	0[1]
Race Bank Offshore Wind Farm	Band (2000)	-	-	-	3	96	-	296	8	198	1
Sheringham Shoal Offshore Wind Farm	Band (2000)	-	-	-	-	-	-	33	-	31	-
Teesside Offshore Wind Farm	Band (2000)	1[9]	-	28[9]	-	33[9]	-	-	-	2[9]	-
Thanet Offshore Wind Farm	Band (2000)	-	-	1	-	1	-	32	-	1	-
Triton Knoll Offshore Wind Farm	Band (2000)	-	-	158	3	487	4	85	7	129	-
Westermost Rough Offshore Wind Farm	Band (2000)	-	-	1	-	1	-	1	-	1	-
Dogger Bank Teesside A & B[10]	Option 3	0	0	134	0	58	1	33	1	68	2
Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D[10]	Option 3	0	0	419	0	105	1	55	3	149	6
Total		**27**	**0**	**2,755**	**37**	**2,009**	**76**	**2,397**	**42**	**3,627**	**11**

[1] Avoidance rate of 99% used. [2] Avoidance rate of 88% used. [3] Avoidance rate of 99% used. [4] Avoidance rate of 97% used. [5] Avoidance rate of 99.82% used.
[6] Avoidance rate of 95% used. [7] Avoidance rate of 99.5% used. [8] Avoidance rate of 98.5% used. [9] Avoidance rate of 99.62% used.
[10] Figures based on median population estimates are used for consistency across projects.

Table 10.23 Annual cumulative collisions for seabirds and their population during the operation of Dogger Bank Teesside A & B and all other projects

Species	Annual collisions	National population[1]		Biogeographic population	
		Percentage of population[1]	Increase in background mortality	Percentage of population[2]	Increase in background mortality
Arctic skua	27	0.64	<1%	0.04	<1%
Black-legged kittiwake	2,755	0.20	4.0%	<0.10	<1%
Common guillemot[2]	37	<0.01	<1%	<0.01 (<0.01 - <0.01)	<1%
Great black-backed gull	2,009	Winter = 2.65 Breeding = 3.90	43.4%	0.61	5.3%
Great skua	76	0.40	<1%	0.16	<1%
Lesser black-backed gull[3]	2,397	Winter = 1.92 Breeding = 0.70	8.2%	0.42	4.9%
Northern fulmar	42	<0.01	<1%	<0.01	<1%
Northern gannet	3,627	0.50	6.6%	0.40	4.5%
Razorbill	11	<0.01	<1%	<0.01	<1%

[1] Only the GB breeding populations are defined for Arctic skua, black-legged kittiwake, common guillemot, great skua, northern fulmar, northern gannet, and razorbill; therefore this percentage is an overestimate as it is based on the total birds affected (including outside breeding season) against the breeding population.
[2] Biogeographic population for common guillemot is based on the combined *aalge* populations (4,800,000 I) and the *albionis* population (800,000 I), with the range for these populations presented in brackets, assuming 100% mortality for either subspecies.
[3] Biogeographic population of lesser black-backed gull is based on the sub-species *graellsii* population (population estimate 530,000 to 570,000).

10.3.14. In relation to the **moderate adverse** cumulative impact (**Table 10.24**) due to annual collisions as a result of Dogger Bank Teesside A & B and all other projects on the great black-backed gull national population, 2,009 (3.9% of the British breeding population and 2.6% of the British wintering population) collisions annually are predicted, which would result in a 43.4% increase to background mortality for the national population (referenced to the breeding population). Dogger Bank Teesside A & B contributes 58 (see **Table 7.8**) or 2.89% of the total collisions annually predicted for all projects, whilst Dogger Bank Creyke Beck A & B, Dogger Bank Teesside A & B and Dogger Bank Teesside C & D contribute 163 (see **Table 10.13**) or 8.11% of the total collisions annually predicted for all projects. This contribution would result in an increase of 3.5% to background mortality at the national population level.

10.3.15. In relation to the **moderate adverse** cumulative impact (**Table 10.24**) due to annual collisions as a result of Dogger Bank Teesside A & B and all other projects on the lesser black-backed gull national population, 2,397 (0.7% of the British breeding population and 1.9% of the British wintering population) collisions annually are predicted for all projects, which would result in a 8.2% increase to background mortality for the national population. Dogger Bank Teesside A & B contributes 33 (see **Table 7.8**) or 1.38% of the total collisions annually predicted for all projects, whilst Dogger Bank Creyke Beck A & B, Dogger Bank Teesside A & B and Dogger Bank Teesside C & D combined, contribute 88 (see **Table 10.13**) or 3.67% of the total collisions annually predicted for all projects. This contribution would result in an increase of 0.3% to background mortality at the national population level.

Table 10.24 Summary of impacts on key seabirds and their populations due to cumulative collisions during the operation phase for Dogger Bank Teesside A & B and all other projects

Species	Population[1]	Derivation of impact		
		Value	Sensitivity	Magnitude
Negligible cumulative impact				
Little auk	All	High	Medium	Negligible
White-billed diver	All	Medium	High	Negligible
Minor adverse cumulative impact				
Arctic skua	All	Very high	High	Negligible
Atlantic puffin	All	Very high	Very high	Negligible
Black-legged kittiwake	National Biogeographic	Very high	Very high	Negligible
Common guillemot	All	Very high	Very high	Negligible
Great black-backed gull	Biogeographic	Very high	Very high	Negligible
Great skua	All	Very high	High	Negligible
Lesser black-backed gull	Designated site Biogeographic	Very high	Very high	Negligible
Northern fulmar	All	Very high	Very high	Negligible
Northern gannet	Biogeographic	Very high	Very high	Negligible
Razorbill	All	Very high	Very high	Negligible
Moderate adverse cumulative impact				
Black-legged kittiwake	Designated site	Very high	Very high	Low
Great black-backed gull	Designated site National	Very high	Very high	Low
Lesser black-backed gull	National	Very high	Very high	Low
Northern gannet	Designated site National	Very high	Very high	Low

[1] Designated site (SSSI), national (GB), and biogeographic populations.

10.3.16. In relation to the **moderate adverse** cumulative impact (**Table 10.24**) due to annual collisions as a result of Dogger Bank Teesside A & B and all other projects on the northern gannet national population. 3,627 (0.5% of the British breeding population) collisions annually are predicted, which would result in a 6.6% increase in background mortality for the national population. Dogger Bank Teesside A & B contributes 68 in total and 34 during the breeding season (see **Table 7.8**) or 1.87% of the total collisions annually predicted for all projects, whilst Dogger Bank Creyke Beck A & B, Dogger Bank Teesside A & B and Dogger Bank Teesside C & D combined, contribute 217 in total or 104 in the breeding season (see **Table 10.13**), or 5.98% of the total collisions annually predicted for all projects. This contribution would result in an increase of 0.4% to background mortality at the national population level.

Migrant bird collision risk

10.3.17. Aside from the Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, collision estimates were only available for migrant birds for the Beatrice, Breeveertien II, the European Offshore Wind Development Centre, and the Lincs projects. Where collision risk estimates were provided these were limited to only a small number of species compared to those assessed as part of the Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D. Assessment could therefore only be undertaken for barnacle goose and common scoter, and the results are presented in **Table 10.25**. Other species data is provided (for pink-footed goose, greylag goose, common eider, and red throated diver) but their migration zones do not overlap with the Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D. Furthermore, other projects provided for species groups (landbirds, waders, and geese / swans), which provides very limited information. Overall, few other projects provide quantitative estimates of collision risk for migrant birds, and those that do provide grouped data for most species.

Table 10.25 Annual collision estimates for migrant birds during the operation phase for Dogger Bank Teesside A & B and all other projects

Species	Estimated annual collisions	% of reference population	Value	Species sensitivity	Overall sensitivity	Magnitude
Negligible cumulative impact						
Common scoter	3.69	<0.1%	Very High	Low	High	Negligible
Minor adverse cumulative impact						
Barnacle goose (Svalbard population)	7.70	<0.1%	Very High	Very High	Very High	Negligible

Note: estimates were only available for species whose migration zones overlap with the Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B, and Dogger Bank Teesside C & D from this assessment and for the assessment for the European Offshore Wind Development Centre.

10.3.18. The cumulative collisions for barnacle goose and common scoter as a result of Dogger Bank Teesside A & B and all other projects are predicted to result in a long-term **minor adverse** cumulative impact on the national population of barnacle goose, and a **negligible** cumulative impact on the national population of common scoter (as shown in **Table 10.25**).

10.3.19. Whilst noting that there is considerable uncertainty regarding the assessment of collision posed by offshore wind farms in relation to migrant birds, considering the proportions of species' migration zones that overlap with wind farms in the Greater North Sea region (and only those that overlap with the Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D), it is clear that considerable proportions of species' populations would potentially be exposed to this effect, as presented in **Table 10.26**.

Table 10.26 Indicative figures of the percentages of the migration zones of migrant birds that overlap with the overall suite of wind farm projects in the North Sea region (calculated following Wright *et al*. (2012))

Species	% migration zone	Overall sensitivity
Barnacle goose (Svalbard population)	59%	Very High
Bar-tailed godwit	72%	Medium
Bean goose	74%	High
Black-tailed godwit	57%	Medium
Common goldeneye	69%	High
Common pochard	61%	Medium
Common redshank (breeding)	66%	Medium
Common redshank Icelandic population (non-breeding)	57%	Medium
Common redshank mainland Europe population (non-breeding)	74%	Medium
Common ringed plover (non-breeding)	61%	High
Common scoter	62%	High
Common shelduck	69%	Very High
Common snipe	62%	Medium
Dunlin *Calidris alpine schinzii* (passage)	61%	Medium
Dunlin *Calidris alpina alpine* (passage & winter)	61%	Medium
Eurasian coot	67%	Medium
Eurasian curlew (non-breeding)	68%	Medium
Eurasian oystercatcher (non-breeding)	63%	Very High
Eurasian teal	62%	Medium
Eurasian wigeon	62%	Medium
European nightjar	60%	Medium
Gadwall	41%	Medium
Golden plover (non-breeding)	50%	Medium
Goosander (breeding males)	74%	Very High
Goosander (non-breeding)	59%	Very High
Great bittern	63%	Medium
Greater scaup	51%	Medium
Great-crested grebe	53%	Very High
Greenshank	58%	Medium
Grey plover	68%	Very High
Hen harrier (breeding)	48%	Very High
Hen harrier (non-breeding)	75%	Very High
Light-bellied brent goose (Svalbard population)	62%	Very High
Mallard	68%	Medium
Northern lapwing	68%	Medium
Northern pintail	62%	Medium

Species	% migration zone	Overall sensitivity
Northern shoveler	61%	Medium
Red knot	62%	Very High
Red-breasted merganser	55%	Very High
Ruff	67%	Medium
Sanderling	62%	Very High
Short-eared owl	67%	Medium
Slavonian grebe	62%	Very High
Tufted duck	61%	Medium
Velvet scoter	74%	High
Whimbrel	60%	Very High
Ruddy turnstone	62%	Very High

Habitat loss and / or alteration during operation

10.3.20. While indirect (habitat loss and / or alteration) effects were considered in most assessments for other projects, in many they were either scoped out or included in the assessment of other effects, such as displacement, as identified in paragraphs 6.3.13 and 6.3.14 in **Appendix 11A**. Furthermore, where this was assessed for other projects, it was undertaken at the designated site population level due to the wide scale of the available foraging habitat for species outside the breeding season.

10.3.21. Consequently, the national population level impacts for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B, and Dogger Bank Teesside C & D (described in paragraph 10.2.27 above) would remain.

10.4. Summary of cumulative impacts for protected bird species and designated sites and their features

Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

BAP priority species

Disturbance / displacement during construction and decommissioning phases

10.4.1. Arctic skua is the only BAP priority seabird species for which a potential impact as a result of disturbance and displacement is predicted during the construction and decommissioning phases for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D. As identified in **Table 10.5**, **no cumulative** impact is predicted on the national population of Arctic skua (either during the breeding season or outwith the breeding season).

10.4.2. No other BAP priority bird species would be affected by disturbance and displacement during the construction and decommissioning phases for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D.

Disturbance / displacement during operation phase

10.4.3. Arctic skua is the only BAP priority seabird species for which a potential impact as a result of disturbance and displacement is predicted during the operation phase for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D. As identified in **Table 10.8**, **no cumulative** impact is predicted on the national population of Arctic skua (either during the breeding season or outwith the breeding season).

10.4.4. No other BAP priority species would be affected by disturbance and displacement during the operation phase for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D.

Barrier effect during operation

10.4.5. **No cumulative** impact is predicted on the national population of BAP priority species Arctic skua (see paragraph 10.2.14) as a result of the barrier effect during the operation phase for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D.

10.4.6. **Table 10.12** presents the results of the assessment of the potential barrier effect on the national population of migratory BAP species, and the numbers affected are presented in **Table 10.11**. A long-term **minor adverse** cumulative impact is predicted for the national populations of the migratory BAP priority species (i.e. black-tailed godwit, common scoter, Eurasian curlew, European nightjar, great bittern, greater scaup, and northern lapwing) as a result of the barrier effect due to the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D.

Collisions during operation

10.4.7. Arctic skua is the only BAP priority seabird species for which a potential impact as a result of collisions is predicted during the operation phase for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D. As less than one mortality each year is predicted as a result of collision (see **Table 10.13**) and given the negligible scale of magnitude of the effect on the national population (either during the breeding season or outwith the breeding season), a long-term **minor adverse** cumulative impact is predicted (see **Table 10.14**).

10.4.8. **Table 10.15** presents the estimates of collisions for migrant BAP priority species as a result of collisions due to the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, and based on these results and the populations effected, it is assessed (see **Table 10.16**) that a long-term **negligible** cumulative impact is predicted on the national populations of common scoter, Eurasian curlew, European nightjar, great bittern, greater scaup, and northern lapwing. A long-term **minor adverse** cumulative impact is predicted on the national population of black-tailed godwit.

Habitat loss and / or alteration during operation

10.4.9. The alteration and loss of habitat as a result of the operation phase for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D is predicted to result in a long-term **negligible** cumulative impact on the national population of the BAP priority species Arctic skua either during the breeding season or outwith the breeding season, as identified in paragraphs 7.9.21 and 10.2.27.

10.4.10. No other BAP priority species would be affected as a result of habitat loss and / or alteration during the operation phase for Dogger Bank Teesside A & B and the Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D.

OSPAR threatened species

Disturbance / displacement during construction and decommissioning phases

10.4.11. **No cumulative** impact is predicted on the biogeographic populations of black-legged kittiwake (either during the breeding season or outwith the breeding season) as a result of disturbance and displacement during the construction of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D (see **Table 10.5**).

Disturbance / displacement during operation phase

10.4.12. **No cumulative** impact is predicted on the biogeographic populations of black-legged kittiwake (either during the breeding season or outwith the breeding season) as a result of disturbance and displacement during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D (see **Table 10.8**).

Barrier effect during operation

10.4.13. A long-term **minor adverse** cumulative impact is predicted as approximately 0.06% of the biogeographic populations (see **Table 10.9**) of black-legged kittiwake would be affected as a result of barrier effect during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D as assessed in **Table 10.10**.

Collisions during operation

10.4.14. It is estimated that up to 553 (388 during the breeding season) black-legged kittiwake would potentially experience collisions during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D (see **Table 10.13**). These numbers represent annual mortality numbers. This is predicted to result in a long-term **minor adverse** cumulative impact on black-legged kittiwake as 0.01% of the biogeographic population (see **Table 10.13**) would be affected, as assessed in **Table 10.14**.

Habitat loss and / or alteration during operation

10.4.15. A long-term **negligible** cumulative impact is predicted on the biogeographic populations of black-legged kittiwake as a result of habitat loss and / or alteration during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, as identified in paragraphs 7.9.23 and 10.2.27.

Designated sites

Disturbance / displacement during construction and decommissioning phases

10.4.16. **Table 10.27** presents the apportionment to designated sites of mortality as a result of cumulative disturbance and displacement during the construction and decommissioning phases for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D on the seabirds and their populations which are a feature of the designated sites. The results have been extracted from Tables A9.47d, A9.55d, A9.58d, and A9.61d in Appendix 9 of **Appendix 11A**, which also contain the confidence ranges, with Tables A9.47a-c, A9.55a-c, A9.58a-c, and A9.61a-c presenting the results based on each survey year.

10.4.17. At the designated site level, the cumulative impact is assessed as being short-term and **minor adverse** for all designated sites (as summarised in **Table 10.5**) given the very low numbers predicted to be affected by mortality.

10.4.18. Disturbance to foraging little tern within the nearshore export cable construction area for Dogger Bank Teesside A & B and Dogger Bank Teesside C & D could arise due to the combined increase in vessel activity and the presence of the cable laying vessels. However, given the localised area of the activity, its temporary nature, and the existing high level of vessel movements in the nearshore zone, a negligible scale magnitude of effect is predicted. This is not predicted to increase in scale compared to Dogger Bank Teesside A & B alone as it is unlikely that the activities will take place at the same time, and due to the temporary nature of the combined disturbance. Given the low sensitivity of the little tern to boat activity, a short-term and temporary **negligible** cumulative impact is predicted on the little tern populations of the Northumbria Coast SPA and Ramsar (component SSSIs), and the Teessmouth and Cleveland Coast SPA and Ramsar (component SSSIs) due to the construction of the nearshore export cable for Dogger Bank Teesside A & B and Dogger Bank Teesside C & D.

Disturbance / displacement during operation phase

10.4.19. **Table 10.28** presents the apportionment to designated sites of mortality as a result of cumulative disturbance and displacement during the operation phase for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D on the seabirds and their populations which are a feature of the designated sites. The results have been extracted from Tables A9.48d, A9.56d, A9.59d, and A9.62d in Appendix 9 of **Appendix 11A**, which also contain the confidence ranges, with Tables A9.48a-c, A9.56a-c, A9.59a-c, and A9.62a-c showing the results for each survey year.

10.4.20. Less than 0.25% of all sites' populations are predicted to be affected. Consequently, at the designated site level, the cumulative impact is assessed as being long-term and **minor adverse** for all designated sites (as summarised in **Table 10.8**) given the very low numbers predicted to be affected by mortality, (see **Table 10.28**).

Table 10.27 Apportioning to designated sites of predicted mortality for all relevant species and their populations as a result of disturbance and displacement during construction and decommissioning phases for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D (breeding bird numbers and percentages are shown in brackets)

Site name[1]	Atlantic puffin		Common guillemot		Northern gannet		Razorbill	
	Number of birds	% of site's population	Number of birds	% of site's population	Number of birds	% of site's population	Number of birds	% of site's population
Buchan Ness to Collieston Coast SPA	-	-	19.53 (2.94)	0.05 (0.01)	-	-	-	-
Calf of Eday SSSI and SPA	-	-	1.20	0.04	-	-	-	-
Cape Wrath SSSI and SPA	0.09	<0.01	19.07	0.04	-	-	3.53	0.07
Collieston to Whinnyfold Coast SSSI	-	-	-	-	-	-	0.43	0.07
Copinsay SSSI and SPA	-	-	11.76	0.04	-	-	-	-
Coquet Island SSSI and SPA	1.50	<0.01	-	-	-	-	-	-
East Caithness Cliffs SPA	0.03	<0.01	136.64	0.04	-	-	25.62	0.07
Fair Isle SSSI and SPA	0.69	<0.01	16.76	0.04	1.29	0.01	1.96	0.07
Farne Islands SSSI and SPA	3.49	<0.01	65.94 (24.71)	0.08 (0.04)	-	-	0.99 (0.15)	0.09 (0.02)
Flamborough Head SSSI and pSPA	0.05	<0.01	121.95 (68.57)	0.13 (0.08)	8.53 (5.49)	0.04 (0.03)	31.45 (8.77)	0.11 (0.04)
Forth Islands SPA	5.89	<0.01	25.03 (6.32)	0.06 (0.02)	30.16 (10.22)	0.02 (0.01)	7.40 (0.61)	0.08 (0.01)
Foula SSSI and SPA	1.24	<0.01	19.38	0.04	-	-	4.95	0.07
Fowlsheugh SSSI and SPA	-	-	48.96 (10.35)	0.06 (0.02)	-	-	7.88 (0.32)	0.08 (0.00)
Gamrie & Pennan Coast SSSI (Troup, Pennan and Lions Heads SPA)	-	-	14.03	0.04	-	-	3.74	0.07
Hermaness, Saxa Vord and Valla Field SPA	1.49	<0.01	6.43	0.04	8.75	0.01	-	-

Site name[1]	Atlantic puffin		Common guillemot		Northern gannet		Razorbill	
	Number of birds	% of site's population	Number of birds	% of site's population	Number of birds	% of site's population	Number of birds	% of site's population
Hoy SSSI and SPA	0.04	<0.01	7.75	0.04	-	-	-	-
Marwick Head SSSI and SPA	-	-	15.30	0.04	-	-	-	-
North Caithness Cliffs SPA	0.67	<0.01	60.30	0.04	-	-	3.54	0.07
Noss SSSI and SPA	0.08	<0.01	18.97	0.04	3.51	0.01	-	-
Rousay SSSI and SPA	-	-	2.64	0.04	-	-	-	-
St Abb's Head to Fast Castle SSSI and SPA	-	-	53.65 (16.05)	0.07 (0.03)	-	-	5.13 (0.59)	0.09 (0.01)
Sule Skerry and Sule Stack SPA	3.29	<0.01	5.32	0.04	-	-	-	-
Sumburgh Head SSSI and SPA	-	-	4.26	0.04	-	-	-	-
West Westray SPA	-	-	10.44	0.04	-	-	1.38	0.07

[1] Where a site is identified as 'SPA' or 'Ramsar' alone refer to **Table 4.19** for component SSSIs.

Table 10.28 Apportioning to designated sites of mortality as a result of displacement for seabirds and their populations due to disturbance and displacement during the operation phase for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D (breeding bird numbers and percentages are shown in brackets)

Site name[1]	Atlantic puffin		Common guillemot		Northern gannet		Razorbill	
	Number of birds	% of site's population	Number of birds	% of site's population	Number of birds	% of site's population	Number of birds	% of site's population
Buchan Ness to Collieston Coast SPA	-	-	39.05 (5.88)	0.11 (0.02)	-	-	-	-
Calf of Eday SSSI and SPA	-	-	2.39	0.09	-	-	-	-
Cape Wrath SSSI and SPA	0.18	0.01	38.13	0.09	-	-	7.06	0.14
Collieston to Whinnyfold Coast SSSI	-	-	-	-	-	-	0.86	0.14
Copinsay SSSI and SPA	-	-	23.52	0.09	-	-	-	-
Coquet Island SSSI and SPA	3.00	0.01	-	-	-	-	-	-
East Caithness Cliffs SPA	0.05	0.01	273.29	0.09	-	-	51.25	0.14
Fair Isle SSSI and SPA	1.38	0.01	33.52	0.09	2.57	0.02	3.93	0.14
Farne Islands SSSI and SPA	6.98	0.01	131.88 (49.41)	0.16 (0.08)	-	-	1.98 (0.30)	0.18 (0.04)
Flamborough Head SSSI and pSPA	0.09	0.01	243.89 (137.15)	0.25 (0.16)	17.06 (10.97)	0.09 (0.06)	62.89 (17.55)	0.23 (0.08)
Forth Islands SPA	11.78	0.01	50.05 (12.63)	0.13 (0.04)	60.33 (20.45)	0.04 (0.02)	14.79 (1.23)	0.16 (0.02)
Foula SSSI and SPA	2.49	0.01	38.75	0.09	-	-	9.90	0.14
Fowlsheugh SSSI and SPA	-	-	97.91 (20.70)	0.12 (0.03)	-	-	15.76 (0.64)	0.15 (0.01)
Gamrie & Pennan Coast SSSI (Troup, Pennan and Lions Heads SPA)	-	-	28.06	0.09	-	-	7.48	0.14

Site name[1]	Atlantic puffin		Common guillemot		Northern gannet		Razorbill	
	Number of birds	% of site's population	Number of birds	% of site's population	Number of birds	% of site's population	Number of birds	% of site's population
Hermaness, Saxa Vord and Valla Field SPA	2.98	0.01	12.87	0.09	17.50	0.02	-	-
Hoy SSSI and SPA	0.08	0.01	15.50	0.09	-	-	-	-
Marwick Head SSSI and SPA	-	-	30.60	0.09	-	-	-	-
North Caithness Cliffs SPA	1.34	0.01	120.59	0.09	-	-	7.09	0.14
Noss SSSI and SPA	0.15	0.01	37.93	0.09	7.02	0.02	-	-
Rousay SSSI and SPA	-	-	5.27	0.09	-	-	-	-
St Abb's Head to Fast Castle SSSI and SPA	-	-	107.29 (32.10)	0.14 (0.05)	-	-	10.26 (1.18)	0.17 (0.03)
Sule Skerry and Sule Stack SPA	6.58	0.01	10.64	0.09	3.36	0.02	-	-
Sumburgh Head SSSI and SPA	-	-	8.53	0.09	-	-	-	-
West Westray SPA	-	-	20.88	0.09	-	-	2.76	0.14

[1] Where a site is identified as 'SPA' or 'Ramsar' alone refer to **Table 4.19** for component SSSIs.

10.4.21. Disturbance to foraging little tern within the nearshore export cable area could arise due to increased vessel activity during the operation phase for Dogger Bank Teesside A & B and Dogger Bank Teesside C & D. However, given that any vessel numbers would be small in relation to any maintenance activity, that such activity would be temporary, and the existing high level of vessel movements in the nearshore zone, a negligible scale magnitude of effect is predicted. Furthermore, it is unlikely that such activity would be undertaken for both projects' export cables at the same time. Given the low sensitivity of the little tern to boat activity, a temporary and intermittent **negligible** cumulative impact is predicted on the little tern populations of the Northumbria Coast SPA and Ramsar (component SSSIs), and the Teessmouth and Cleveland Coast SPA and Ramsar (component SSSIs) in the operation phase during the operation phase for Dogger Bank Teesside A & B and Dogger Bank Teesside C & D.

Barrier effect during operation

10.4.22. **Table 10.29** presents the apportionment to designated sites of the seabird species breeding numbers predicted to be present within Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D for the assessment of cumulative barrier effect during the operation phase (extracted from Tables A9.46, A9.49, A9.51, A9.57, and A9.60 in Appendix 9 of **Appendix 11A**).

10.4.23. The results in **Table 10.29** indicate that the barrier effect is predicted to affect the breeding populations and foraging range of the following species:

- Between 0.22% and 4.85% of the breeding black-legged kittiwake populations at three designated sites, with up to 10.8% of the foraging range (see paragraph 6.2.107 in **Appendix 11A**), which could result in a reduction of between 0.02% and 0.52% of the foraging area used by the sites' populations. The barrier effect might prevent black-legged kittiwake from the Durham Coast and Marsden Bay SSSI from reaching foraging areas beyond Dogger Bank Teesside A & B;
- Between 0.07% and 0.52% of the breeding common guillemot populations at six designated sites, with up to 7.4% of the foraging range (see paragraph 6.2.171 in **Appendix 11A**), which could result in a reduction of between 0.01% and 0.04% of the foraging area used by the sites' populations. The barrier effect might prevent common guillemot from Fowlsheugh SSSI (and SPA), Forth Islands SPA, Buchan Ness to Collieston Coast SPA, and St Abb's Head to Fast Castle SSSI (and SPA) from reaching foraging areas beyond Dogger Bank Teesside A & B;
- Between 0.91% and 15.60% of the breeding northern fulmar populations at eight designated sites, with up to 6.25% of the foraging range (see paragraph 6.2.28 in **Appendix 11A**), which could result in a reduction of between 0.06% to 0.98% of the foraging area used by the sites' populations. The barrier effect might prevent northern fulmar from Gamrie & Pennan Coast SSSI (Troup, Pennan and Lion's Head SPA) from reaching foraging areas beyond Dogger Bank Teesside A & B;

- Between 0.28% and 1.07% of the breeding northern gannet populations at two designated sites, with up to 10.9% of the foraging range (see paragraph 6.2.59 in **Appendix 11A**), which could result in a reduction of between 0.03% and 0.12% of the foraging area used by the sites' populations; and
- Between 0.08% and 0.64% of the breeding razorbill populations at five designated sites, with up to 8.0% of the foraging range (see paragraph 6.2.201 in **Appendix 11A**), which could result in a reduction of between 0.01% and 0.05% of the foraging area used by the sites' populations. The barrier effect might prevent razorbill from Fowlsheugh SSSI (and SPA), Forth Islands SPA, and St Abb's Head to Fast Castle SSSI (and SPA) from reaching foraging areas beyond Dogger Bank Teesside A & B.

10.4.24. The small-scale reductions in foraging area for each sites' breeding population are predicted to result in a limited potential mortality effect on all sites' breeding populations, and hence a long-term **minor adverse** cumulative impact is predicted on the breeding seabird feature for all designated sites listed in **Table 10.29** as a result of the barrier effect that would occur during the operation of the Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D (as assessed in **Table 10.10**).

Collisions during operation

10.4.25. **Table 10.30** presents the apportionment to designated sites of the seabird breeding numbers predicted to be affected by cumulative collisions during the operation phase for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D (extracted from Tables A9.50d, A9.52d, A9.53d, and A9.54d in Appendix 9 of **Appendix 11A**).

10.4.26. The percentage of the sites' populations of black-legged kittiwake affected by collisions is around 0.04% for 23 sites resulting in a predicted mortality increase at these sites of 0.58% (see **Table 10.30**). These increases are considered to be negligible. The following sites resulted in higher percentages of collisions relative to the sites' population:

- Farne Islands SSSI - up to 0.09% of the site's population, 0.06% of the breeding population, is predicted to be affected by collisions, which could result in an increase of 1.72% in background mortality, which is considered to be negligible in magnitude;
- Durham Coast and Marsden Bay SSSI - up to 0.17% of the site's population, 0.14% of the breeding population, is predicted to be affected by collisions, which could result in an increase of 3.21% in background mortality, which is considered to be negligible in magnitude; and
- Flamborough Head SSSI (and pSPA) - up to 0.30% of the site's population, 0.27% of the breeding population, is predicted to be affected by collisions, which could result in an increase of 5.72% in background mortality, which is considered to be low in magnitude.

Table 10.29 Apportioning to designated sites of the maximum breeding season numbers of species in flight for the purposes of assessing potential cumulative barrier effects (breeding bird numbers and percentages are shown in brackets) of the Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

Site name[1]	Black-legged kittiwake		Common guillemot		Northern fulmar		Northern gannet		Razorbill	
	Number of adults	% of site's popul-ation	Number of adults	% of site's popul-ation	Number of adults	% of site's popul-ation	Number of adults	% of site's popul-ation	Number of adults	% of site's popul-ation
Buchan Ness to Collieston Coast SPA	-	-	20.83	0.07	53.28	1.92	-	-	-	-
Durham Coast and Marsden Bay SSSI	9.12	0.22	-	-	-	-	-	-	-	-
Farne Islands SSSI and SPA	72.25	0.91	232.39	0.36	-	-	-	-	3.50	0.45
Flamborough Head SSSI and pSPA	3,696.72	4.85	619.89	0.52	285.25	15.60	168.65	1.07	192.36	0.64
Forth Islands SPA	-	-	61.70	0.21	28.16	2.50	313.25	0.28	13.28	0.29
Fowlsheugh SSSI and SPA	-	-	87.42	0.13	5.15	1.33	-	-	4.71	0.08
Gamrie & Pennan Coast SSSI (Troup, Pennan and Lions Heads SPA)	-	-	-	-	32.51	0.91	-	-	-	-
Hunstanton Cliffs SSSI	-	-	-	-	8.85	4.86	-	-	-	-
North Berwick Coast SSS) (Firth of Forth SPA)	-	-	-	-	26.92	2.47	-	-	-	-
St Abb's Head to Fast Castle SSSI and SPA	-	-	154.54	0.35	-	-	-	-	13.87	0.61
Weybourne Cliffs SSSI	-	-	-	-	1.75	4.86	-	-	-	-

[1] Where a site is identified as 'SPA' refer to **Table 4.19** for component SSSIs.

Table 10.30 Apportioning to designated sites of the mean annual mortality on seabirds resulting from cumulative collisions during the operation phase for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D (breeding bird numbers and percentages are shown in brackets) based on 98% avoidance rate for all species other than northern gannet (95% avoidance rate used)

Site name[1]	Black-legged kittiwake			Great black-backed gull			Lesser black-backed gull			Northern gannet		
	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality
Alde-Ore Estuary SSSI and SPA	-	-	-	-	-	-	3.16	0.04	0.29	-	-	-
Brighton to Newhaven Cliffs SSSI	0.94	0.04	0.58	-	-	-	-	-	-	-	-	-
Buchan Ness to Collieston Coast SPA	13.23	0.04	0.58	-	-	-	-	-	-	-	-	-
Calf of Eday SSSI and SPA	0.36	0.04	0.58	2.10	0.22	1.07	-	-	-	-	-	-
Cape Wrath SSSI and SPA	4.86	0.04	0.58	-	-	-	-	-	-	-	-	-
Copinsay SSSI and SPA	1.87	0.04	0.58	1.24	0.22	1.07	-	-	-	-	-	-
Dover to Kingsdown Cliffs SSSI	1.15	0.04	0.58	-	-	-	-	-	-	-	-	-
Dunbar Coast SSSI	0.56	0.04	0.58	-	-	-	-	-	-	-	-	-
Durham Coast and Marsden Bay SSSI	9.64 (6.96)	0.17 (0.14)	3.21	-	-	-	-	-	-	-	-	-
East Caithness Cliffs SPA	42.34	0.04	0.58	1.17	0.22	1.07	-	-	-	-	-	-
Eilean Hoan (North Sutherland Coastal Islands) SSSI	-	-	-	1.21	0.22	1.07	-	-	-	-	-	-
Fair Isle SSSI and SPA	1.52	0.04	0.58	-	-	-	-	-	-	4.33	0.04	0.60
Farne Islands SSSI and SPA	8.88 (4.69)	0.09 (0.06)	1.72	-	-	-	-	-	-	-	-	-

Site name[1]	Black-legged kittiwake			Great black-backed gull			Lesser black-backed gull			Northern gannet		
	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality
Flamborough Head SSSI and pSPA	284.95 (237.98)	0.30 (0.27)	5.72	-	-	-	-	-	-	34.57 (24.33)	0.18 (0.14)	2.69
Forth Islands SPA	3.98	0.04	0.58	-	-	-	2.25	0.04	0.29	107.67 (40.58)	0.08 (0.04)	1.13
Foula SSSI and SPA	0.51	0.04	0.58	-	-	-	-	-	-	-	-	-
Fowlsheugh SSSI and SPA	9.85	0.04	0.58	-	-	-	-	-	-	-	-	-
Gamrie & Pennan Coast SSSI (Troup, Pennan and Lions Heads SPA)	15.71	0.04	0.58	-	-	-	-	-	-	-	-	-
Hermaness, Saxa Vord and Valla Field SPA	0.30	0.04	0.58	-	-	-	-	-	-	29.45	0.04	0.60
Hoy SSSI and SPA	0.42	0.04	0.58	0.19	0.22	1.07	-	-	-	-	-	-
Marwick Head SSSI and SPA	2.84	0.04	0.58	-	-	-	-	-	-	-	-	-
North Caithness Cliffs SPA	10.70	0.04	0.58	-	-	-	-	-	-	-	-	-
Noss SSSI and SPA	0.53	0.04	0.58	-	-	-	-	-	-	11.81	0.04	0.60
Rousay SSSI and SPA	1.46	0.04	0.58	-	-	-	-	-	-	-	-	-
St Abb's Head to Fast Castle SSSI and SPA	17.11	0.04	0.58	-	-	-	-	-	-	-	-	-
Sule Skerry and Sule Stack SPA	-	-	-	-	-	-	-	-	-	5.65	0.04	0.60
Sumburgh Head SSSI and SPA	0.58	0.04	0.58	-	-	-	-	-	-	-	-	-
West Westray SPA	5.77	0.04	0.58	-	-	-	-	-	-	-	-	-

[1] Where a site is identified as 'SPA' or 'Ramsar' alone refer to **Table 4.19** for component SSSIs.

10.4.27. The percentage of the sites' populations of great black-backed gull affected by collisions is 0.22% at all five sites with a predicted mortality increase at all sites is 1.07% (see **Table 10.30**). These increases are considered to be negligible.

10.4.28. The percentage of the sites' populations of lesser black-backed gull affected by collisions is 0.04% at two sites with a predicted mortality increase at all sites of 0.29% (see **Table 10.30**). These increases are considered to be negligible.

10.4.29. The percentage of the sites' populations of northern gannet affected by collisions is around 0.04% for four sites resulting in a predicted mortality increase at these sites of 0.60% (see **Table 10.30**). These increases are considered to be negligible. The following sites resulted in higher percentages of collisions relative to the sites' population:

- Forth Islands SPA (and component SSSIs) - up to 0.08% of the site's population, 0.04% of the breeding population, is predicted to be affected by collisions, which could result in an increase of 1.13% in background mortality, which is considered to be negligible in magnitude;
- Flamborough Head SSSI (and pSPA) - up to 0.18% of the site's population, 0.14% of the breeding population, is predicted to be affected by collisions, which could result in an increase of 2.69% in background mortality, which is considered to be negligible in magnitude.

10.4.30. The small-scale increases in background mortality and percentage of populations for most sites' populations are predicted to result in a long-term **minor adverse** cumulative impact (as assessed in **Table 10.14**) on the individual seabird features for all designated sites listed in **Table 10.30** as a result of collisions during the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D. There is one exception, notably the Flamborough Head SSSI (and pSPA), where a long-term **moderate adverse** cumulative impact is predicted on the black-legged kittiwake population (see **Table 10.14**) due to the potential increase in background mortality.

Habitat loss and / or alteration during construction / operation / decommissioning

10.4.31. No significant cumulative habitat loss and / or alteration impacts are predicted for any of the seabird species' populations and the designated sites which they are features of as identified in paragraphs 10.2.6, 10.2.27, and 10.2.29.

10.4.32. The construction, operation, and decommissioning phases for the nearshore export cable for Dogger Bank Teesside A & B and Dogger Bank Teesside C & D could result in increased suspended sediment concentrations and deposition of sediment (and hence habitat loss and / or alteration) within the foraging area of breeding little terns that are features of the Northumbria Coast SPA and Ramsar (component SSSIs) and the Teessmouth and Cleveland Coast SPA and Ramsar (component SSSIs). The scale, magnitude and subsequent impact of the habitat alteration due to the construction (see paragraph 6.7.5), operation (see paragraph 7.10.26), and decommissioning for Dogger Bank Teesside A & B alone would not significantly increase in scale with the combined alteration of Dogger Bank Teesside C & D due to the temporary nature of any habitat alterationsand the spatially overlapping footprint of the effect (which would not increase in scale due to additive effects). Consequently, a **negligible** cumulative impact on the little tern populations of the Northumbria Coast SPA and Ramsar (component SSSIs) and the Teessmouth and Cleveland Coast SPA and Ramsar (component SSSIs) would arise during the construction, operation, and decommissioning phases for Dogger Bank Teesside A & B and Dogger Bank Teesside C & D.

Dogger Bank Teesside A & B and all other projects

BAP priority species

Disturbance / displacement during construction / operation / decommissioning

10.4.33. Arctic skua is the only BAP priority seabird species for which a potential impact as a result of disturbance and displacement is predicted during the construction, operation, and decommissioning phases for Dogger Bank Teesside A & B and all other projects. As identified in **Table 10.21**, **no cumulative impact** is predicted on the national population of Arctic skua (either during the breeding season or outwith the breeding season).

10.4.34. No other BAP priority bird species would be affected by disturbance and displacement during the construction, operation, and decommissioning phases for Dogger Bank Teesside A & B and all other projects.

Collisions during operation

10.4.35. Arctic skua is the only BAP priority seabird species for which a potential impact as a result of collision is predicted during operation phase for Dogger Bank Teesside A & B and other projects. As less than 17 collisions each year are predicted (see **Table 10.23**) and given the negligible scale of magnitude of the effect on the national population (either during the breeding season or outwith the breeding season) and the low increase in background mortality for the population (<1%), a long-term **minor adverse** cumulative impact is predicted (see **Table 10.24**).

10.4.36. **Table 10.25** presents the estimates of collisions for the migrant BAP priority species common scoter as a result of collisions due to the operation of Dogger Bank Teesside A & B and other projects. On the basis of the quantities in relation to the national population predicted to be affected, a long-term **negligible** cumulative impact is predicted. As identified in paragraph 10.3.17 no other species were assessed.

Habitat loss and / or alteration during operation

10.4.37. For the reasons discussed in paragraph 10.3.20, no national population level impact due to habitat loss and / or alteration has been assessed as a result of Dogger Bank Teesside A & B and all other projects. Consequently, the impact on the BAP Arctic skua population for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B, and Dogger Bank Teesside C & D (described in paragraph 10.4.7 above) would remain.

10.4.38. No other BAP priority species would be affected as a result of habitat loss and / or alteration during the operation phase for Dogger Bank Teesside A & B and all other projects.

OSPAR threatened species

Disturbance / displacement during construction / operation / decommissioning

10.4.39. Black-legged kittiwake is an OSPAR threatened species. **No cumulative impact** is predicted on the biogeographic population of black-legged kittiwake as a result of disturbance and displacement during the construction, operation, and decommissioning phases for Dogger Bank Teesside A & B and all other projects (see **Table 10.21**).

Collisions during operation

10.4.40. A long-term **minor adverse** cumulative impact is predicted on black-legged kittiwake (as assessed in **Table 10.24**) as less than 0.10% of the biogeographic population would be affected by collisions (see **Table 10.23**) with a resulting increase in background mortality of <1% each year predicted for the operation phase of Dogger Bank Teesside A & B and all other projects. This is considered to be negligible in scale of magnitude in relation to the biogeographic population (either during the breeding season or outwith the breeding season).

Habitat loss and / or alteration during operation

10.4.41. For the reasons discussed in paragraph 10.3.20, no biogeographic population level impact due to habitat loss and / or alteration has been assessed as a result of Dogger Bank Teesside A & B and all other projects. Consequently, the impact on the OSPAR threatened black-legged kittiwake population for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B, and Dogger Bank Teesside C & D (described in paragraph 10.4.15 above) would remain.

Designated sites

Disturbance / displacement during construction / operation / decommissioning

10.4.42. **Table 10.31** presents the apportionment of predicted mortality due to disturbance and displacement as a result of the construction, operation, and decommissioning of Dogger Bank Teesside A & B and other projects, though only five projects (the European Offshore Wind Development Centre, Firth of Forth Alpha, Firth of Forth Bravo, Hornsea Project One, and Neart na Gaoithe) apportioned their impact to designated sites (i.e. the Buchan Ness and Collieston Coast SPA, the Coquet Island SSSI (and SPA), the Farne Islands SSSI (and SPA), the Flamborough Head SSSI (and pSPA), the Forth Islands SPA, the Fowlsheugh SSSI (and SPA), and the St Abb's Head to Fast Castle SSSI (and SPA)). The data is extracted from Table A13.1 in Appendix 13 of **Appendix 11A**. Numbers for Atlantic puffin, common guillemot, northern gannet, and razorbill only are shown, all other numbers are the same as for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D as presented in **Table 10.28**.

10.4.43. It should be noted that Dogger Bank Teesside A & B is not within mean maximum foraging range of any designated sites' breeding populations of Atlantic puffin, therefore, the attributed losses (in **Table 10.31**) relate to non-breeding populations sites only.

Table 10.31 Apportioning to designated sites of mortality as a result of disturbance and displacement for seabirds and their populations during the construction, operation, and decommissioning phases for Dogger Bank Teesside A & B,and all other projects

Project	Atlantic puffin		Common guillemot		Northern gannet		Razorbill	
	Number of birds	Percentage of site population	Number of birds	Percentage of site population	Number of birds	Percentage of site population	Number of birds	Percentage of site population
Buchan Ness to Collieston Coast SPA[1]								
Dogger Bank Teesside A & B	-	-	7	0.02	-	-	-	-
Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	-	-	32	0.09	-	-	-	-
European Offshore Wind Development Centre / Aberdeen Offshore Wind Farm	-	-	298	1.50	-	-	99	2.30
Firth of Forth Alpha	-	-	<1	0	-	-	-	-
Firth of Forth Bravo	-	-	1	0	-	-	-	-
Neart na Gaoithe	-	-	1	0	-	-	-	-
Total	**-**	**-**	**339**	**1.62**	**-**	**-**	**-**	**-**
Coquet Island SSSI (and SPA)								
Dogger Bank Teesside A & B	<1	<0.01	-	-	-	-	-	-
Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	3	0.01	-	-	-	-	-	-
Hornsea Project One	9	0.05	-	-	-	-	-	-
Total	**12**	**0.06**	**-**	**-**	**-**	**-**	**-**	**-**
Farne Islands SSSI (and SPA)								
Dogger Bank Teesside A & B	2	<0.01	25	0.03	-	-	<1	0.05
Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	5	0.01	107	0.13	-	-	2	0.13
Hornsea Project One	18	0.04	-	-	-	-	-	-
Neart na Gaoithe	-	-	5	0.01			<1	0.01
Total	**25**	**0.05**	**137**	**0.17**	**-**	**-**	**2**	**0.19**

Project	Atlantic puffin		Common guillemot		Northern gannet		Razorbill	
	Number of birds	Percentage of site population	Number of birds	Percentage of site population	Number of birds	Percentage of site population	Number of birds	Percentage of site population
Flamborough Head SSSI (and pSPA)								
Dogger Bank Teesside A & B	<1	<0.01	43	0.04	<1	<0.01	16	0.06
Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	<1	0.01	201	0.21	17	0.09	47	0.17
Hornsea Project One	3	0.30	127	0.15	0	0	79	0.40
Total	**3**	**0.31**	**371**	**0.40**	**17**	**0.09**	**142**	**0.63**
Forth Islands SPA[1]								
Dogger Bank Teesside A & B	3	0.00	10	0.03	16	0.01	4	0.04
Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	9	0.01	40	0.10	44	0.03	11	0.12
Firth of Forth Alpha	10	0.01	3	0.02	11	0.01	<1	0.02
Firth of Forth Bravo	13	0.01	4	0.02	7	0.01	<1	0.01
Neart na Gaoithe	241	0.20	46	0.20	34	0.03	7	0.20
Total	**276**	**0.23**	**103**	**0.37**	**112**	**0.09**	**22**	**0.39**
Fowlsheugh SSSI (and SPA)								
Dogger Bank Teesside A & B	-	-	19	0.02	-	-	4	0.04
Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	-	-	79	0.09	-	-	12	0.11
European Offshore Wind Development Centre / Aberdeen Offshore Wind Farm	-	-	88	0.20	-	-	30	0.60
Firth of Forth Alpha	-	-	18	0.04	-	-	3	0.05
Firth of Forth Bravo	-	-	22	0.05	-	-	1	0.02
Neart na Gaoithe	-	-	8	0.01	-	-	-	-
Total	**-**	**-**	**234**	**0.42**	**-**	**-**	**50**	**0.82**

Project	Atlantic puffin		Common guillemot		Northern gannet		Razorbill	
	Number of birds	Percentage of site population	Number of birds	Percentage of site population	Number of birds	Percentage of site population	Number of birds	Percentage of site population
St Abb's Head to Fast Castle SSSI (and SPA)								
Dogger Bank Teesside A & B	-	-	21	0.03	-	-	3	0.04
Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	-	-	86	0.11	-	-	7	0.13
Firth of Forth Alpha	-	-	2	0.01	-	-	<1	0.01
Firth of Forth Bravo	-	-	3	0.01	-	-	<1	0.00
Neart na Gaoithe	-	-	17	0.05	-	-	1	0.04
Total	**-**	**-**	**129**	**0.21**	**-**	**-**	**11**	**0.17**

[1] Where a site is identified as 'SPA', refer to **Table 4.19** for component SSSIs.

10.4.44. Given the quantities affected, a **minor adverse** cumulative impact is predicted on the designated sites for which the bird species affected are a feature (as assessed in **Table 10.21**) as a result of the disturbance associated with offshore wind farms, with the exception of the common guillemot feature for the Buchan Ness and Collieston Coast SPA.

10.4.45. The disturbance and displacement as a result of the construction, operation, and decommissioning of Dogger Bank Teesside A & B and other projects on the Buchan Ness to Collieston Coast SPA (its component SSSIs) is predicted to result in a **moderate adverse** cumulative impact. However, given the very small 'contribution' as a result of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D (39 birds or 0.12% of the site's population) compared to 1.5% of the site's population due to the operation of the European Offshore Wind Development Centre, it is clear that, regardless of the overall potential cumulative impact on the population, any contribution from Dogger Bank Teesside A & B (and Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D) would always remain at a non significant level.

Collisions during operation

10.4.46. **Table 10.32** presents the apportionment of predicted mortality due to collisions as a result of the operation phase for Dogger Bank Teesside A & B and other projects. The data is extracted from Table A13.2 in Appendix 13 of **Appendix 11A**. **Table 10.33** presents the aggregated number impacted, the percentage population impacted, and the percentage increase in mortality for each species apportioned to each designated site as a result of cumulative collisions during the operation phase for Dogger Bank Teesside A & B and other projects. The quantities in the table are extracted from Section 6.3 in **Appendix 11A**. Given the quantities affected, a long-term **minor adverse** cumulative impact is predicted on the designated sites for which the bird species affected are a feature (as assessed in **Table 10.24**) as a result of cumulative collisions, with the exception of a number of designated sites for which black-legged kittiwake, great black-backed gull, and northern gannet are a feature (see **Table 10.24**). Where the increase in population mortality is less than 5% this results in a negligible magnitude, whilst for those sites where the increase in population mortality is above 5% this would result in a low to moderate magnitude of effect.

Table 10.32 Numbers of birds predicted to be lost from protected sites due to collision, using information from other ESs, to assess the cumulative impact at the North Sea scale for Dogger Bank Teesside A & B and all other projects

Project	Atlantic puffin	Black-legged kittiwake	Common guillemot	Great black-backed gull	Lesser black-backed gull	Northern fulmar	Northern gannet	Razorbill
Alde-Ore Estuary SSSI (and SPA)								
East Anglia ONE	-	-	-	-	16	-	-	-
Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	-	-	-	-	3	-	-	-
Total	**-**	**-**	**-**	**-**	**19**	**-**	**-**	**-**
Buchan Ness to Collieston Coast SPA[1]								
Firth of Forth Alpha	-	2	-	-	-	<1	-	-
Firth of Forth Bravo	-	2	-	-	-	<1	-	-
Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	-	13	<1	-	-	<1	-	-
Total	**-**	**17**	**<1**	**-**	**-**	**<1**	**-**	**-**
East Caithness Cliffs SPA[1]								
Beatrice	-	21	27	18	-	5	-	1
Moray	-	36	-	-	-	-	-	-
Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	-	42	<1	1	-	<1	-	<1
Total	**-**	**99**	**27**	**19**	**-**	**5**	**-**	**1**

Project	Atlantic puffin	Black-legged kittiwake	Common guillemot	Great black-backed gull	Lesser black-backed gull	Northern fulmar	Northern gannet	Razorbill
Flamborough Head SSSI (and pSPA)								
Dudgeon	-	-	-	-	-	-	597	-
East Anglia ONE	-	80	-	-	-	-	24	-
Hornsea Project One	-	15	-	-	-	-	6	-
Triton Knoll	-	158	-	-	-	-	129	-
Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	<1	285	<1	-	-	<1	35	<1
Total	**<1**	**538**	**<1**	**-**	**-**	**-**	**791**	**<1**
Forth Islands SPA[1]								
Firth of Forth Alpha	-	8	-	-	1	<1	443	-
Firth of Forth Bravo	-	11	-	-	1	<1	276	-
Neart na Gaoithe	-	16	-	-	3	-	188	-
Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	<1	4	<1	-	2	<1	108	<1
Total	**<1**	**39**	**<1**	**-**	**7**	**<1**	**1,015**	**<1**
Fowlsheugh SSSI (and SPA)								
Firth of Forth Alpha	-	13	-	-	-	<1	-	-
Firth of Forth Bravo	-	7	-	-	-	<1	-	-
Neart na Gaoithe	-	2	-	-	-	-	-	-
Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	-	10	<1	-	-	<1	-	<1
Total	**-**	**32**	**<1**	**-**	**-**	**<1**	**-**	**<1**

Project	Atlantic puffin	Black-legged kittiwake	Common guillemot	Great black-backed gull	Lesser black-backed gull	Northern fulmar	Northern gannet	Razorbill
Gamrie & Pennan Coast SSSI (Troup, Pennan and Lions Heads SPA)								
Moray	-	12	-	-	-	-	13	-
Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	-	16	<1	-	-	<1	-	<1
Total	**-**	**28**	**<1**	**-**	**-**	**<1**	**-**	**<1**
North Caithness Cliffs SPA								
Moray	-	14	-	59	-	-	-	-
Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	<1	11	<1	-	-	<1	-	<1
Total	**<1**	**25**	**<1**	**-**	**-**	**<1**	**-**	**<1**
St Abb's Head to Fast Castle SSSI (and SPA)								
Firth of Forth Alpha	-	5	-	-	-	-	-	-
Firth of Forth Bravo	-	2	-	-	-	-	-	-
Neart na Gaoithe	-	6	-	-	-	-	-	-
Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D	-	17	<1	-	-	-	-	<1
Total	**-**	**30**	**<1**	**-**	**-**	**-**	**-**	**<1**

[1] Where a site is identified as 'SPA' or 'Ramsar' alone refer to **Table 4.19** for component SSSIs.

Table 10.33 Cumulative collision impact for each designated site and species, including increase in mortality, at the North Sea scale for Dogger Bank Teesside A & B and all other projects

Site	Species	Annual mortality	Percentage of site population	Percentage increase in mortality	Impact
Alde-Ore Estuary SSSI (and SPA)	Lesser black-backed gull	19	0.38%	1.83%	Minor adverse
Buchan Ness to Collieston Coast SPA[1]	Black-legged kittiwake	17	<1%	0.8%	Minor adverse
	Common guillemot	<1	<1%	<1%	Minor adverse
	Northern fulmar	<1	<1%	<1%	Minor adverse
East Caithness Cliffs SPA[1]	Black-legged kittiwake	99	<1%	1.4%	Minor adverse
	Common guillemot	27	<1%	<1%	Minor adverse
	Great black-backed gull	**19**	**3.6%**	**17.5%**	**Moderate adverse**
	Northern fulmar	5	<1%	<1%	Minor adverse
	Razorbill	1	<1%	<1%	Minor adverse
Flamborough Head SSSI (and pSPA)	Atlantic puffin	<1	<1%	<1%	Minor adverse
	Black-legged kittiwake	538	0.6%	10.8%	Minor adverse
	Common guillemot	<1	<1%	<1%	Minor adverse
	Northern gannet	**791**	**5.0%**	**61.6%**	**Moderate adverse**
	Razorbill	<1	<1%	<1%	Minor adverse
Forth Islands SPA[1]	Atlantic puffin	<1	<1%	<1%	Minor adverse
	Black-legged kittiwake	**39**	**<1%**	**5.6%**	**Moderate adverse**
	Common guillemot	<1	<1%	<1%	Minor adverse
	Lesser black-backed gull	7	0.2%	0.9%	Minor adverse
	Northern fulmar	<1	<1%	<1%	Minor adverse
	Northern gannet	**1,015**	**0.9%**	**10.6%**	**Moderate adverse**
	Razorbill	<1	<1%	<1%	Minor adverse
Fowlsheugh SSSI (and SPA)	Black-legged kittiwake	32	0.2%	1.9%	Minor adverse
	Common guillemot	<1	<1%	<1%	Minor adverse
	Northern fulmar	<1	<1%	<1%	Minor adverse
	Razorbill	<1	<1%	<1%	Minor adverse
Gamrie & Pennan Coast SSSI (Troup, Pennan and Lions Heads SPA)	Black-legged kittiwake	28	<1%	1.0%	Minor adverse
	Common guillemot	<1	<1%	<1%	Minor adverse
	Northern fulmar	<1	<1%	<1%	Minor adverse
	Razorbill	<1	<1%	<1%	Minor adverse
North Caithness Cliffs SPA	Black-legged kittiwake	25	<1%	1.4%	Minor adverse
	Common guillemot	<1	<1%	<1%	Minor adverse
	Northern fulmar	<1	<1%	<1%	Minor adverse
	Razorbill	<1	<1%	<1%	Minor adverse
St Abb's Head to Fast Castle SSSI (and SPA)	Black-legged kittiwake	30	<1%	1.0%	Minor adverse
	Common guillemot	<1	<1%	<1%	Minor adverse
	Razorbill	<1	<1%	<1%	Minor adverse

[1] Where a site is identified as 'SPA' or 'Ramsar' alone refer to **Table 4.19** for component SSSIs.

Black-legged kittiwake

10.4.47. The cumulative collisions on the black-legged kittiwake population of the Flamborough Head SSSI (and pSPA) for East Anglia ONE, Hornsea Project One, Triton Knoll, Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B, and Dogger Bank Teesside C & D amounts to 538 birds (see **Table 10.32**). These numbers represent mean annual mortality numbers, and equate to approximately 0.6% of the site's population and represent an increase of up to 10.8% of the background mortality of adult black-legged kittiwake at this site (see **Table 10.33**), which is considered to be low in magnitude. Consequently, a long-term **moderate adverse** cumulative impact on the black-legged kittiwake population is predicted as a result of collisions. It should be noted that 100% of the impact associated with the Triton Knoll project was apportioned to this site, even though the project is within the foraging range of other designated sites for which black-legged kittiwake is a feature. It should be noted that Dogger Bank Teesside A & B alone contributes 67 birds (0.07% of the site's population) or an increase of 1.34% in background mortality.

10.4.48. The cumulative collisions on the black-legged kittiwake population of the Forth Islands SPA (and its component SSSIs) for Firth of Forth Alpha, Firth of Forth Bravo, Neart na Gaoithe, Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B, and Dogger Bank Teesside C & D amounts to 39 birds (see **Table 10.32**). These numbers represent mean annual mortality numbers, and equate to less than 1% of the site's population and represent an increase of approximately 5.6% of the background mortality of adult black-legged kittiwakes at this site (see **Table 10.33**), which is considered to be negligible in magnitude. Consequently, a long-term **moderate adverse** cumulative impact on the black-legged kittiwake population is predicted as a result of collisions. It should be noted that Dogger Bank Teesside A & B alone contributes 1 bird (0.01% of the site's population) or an increase of 0.17% in background mortality.

Great black-backed gull

10.4.49. The cumulative collisions on the great black-backed gull population of the East Caithness Cliffs SPA (and its component SSSIs) for Beatrice, Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B, and Dogger Bank Teesside C & D amounts to 19 birds (see **Table 10.32**). These numbers represent mean annual mortality numbers, and equate to 3.6% of the site's population. It is predicted that an increase in background mortality of 17.5% would arise at this site as a result (see **Table 10.33**). It should be noted that 100% of the impact associated with the Beatrice project was apportioned to this site, even though the project is within the foraging range of other designated sites for which great black-backed gull is a feature and as it was noted that birds might originate outside the designated site especially as most birds occurred outside the breeding season. However, it should also be noted that Dogger Bank Teesside A & B contributes less than one collision a year, and as such is a negligible contributory factor the cumulative impact. Overall, a low magnitude effect has been assumed (due to the Beatrice project contribution), and a long-term **moderate adverse** cumulative impact is, therefore, predicted on the great black-backed gull population as a result of collisions.

Northern gannet

10.4.50. The cumulative collisions on the northern gannet population of the Flamborough Head SSSI (and pSPA) for Dudgeon, East Anglia ONE, Hornsea Project One, Triton Knoll, Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B, and Dogger Bank Teesside C & D amounts to 791 birds (see **Table 10.32**). These numbers represent mean annual mortality numbers. This equates to 5.0% of the site's population and represents an increase of up to 61.6% of the background mortality of adult northern gannets at this site (see **Table 10.33**). It should be noted that 100% of the impact associated with the Dudgeon project was apportioned to this site, even though the Dudegon project is within the foraging range of other designated sites for which northern gannet is a feature. It should be noted that Dogger Bank Teesside A & B alone contributes only 10 birds (0.05% of the site's population) or an increase of 0.79% in background mortality. Although the cumulative increase in background mortality is likely to be a considerable overestimate, a low magnitude of effect on the population is expected. Consequently, a long-term **moderate adverse** cumulative impact on the northern gannet population is predicted as a result of collisions.

Habitat loss and / or alteration during operation

10.4.51. The project specific findings in relation to habitat loss and / or alteration as a result of Dogger Bank Teesside A & B and all other projects on designated sites (based on the generic seabirds) are detailed in paragraphs 6.3.13 and 6.3.14 in **Appendix 11A**. **Table 10.34** presents the qualitative cumulative assessment of habitat loss and / or alteration on the seabird species at the designated site level, noting that much overlap occurs with regard to other impacts such as displacement. Furthermore, whilst other projects identified effects

10.4.52. Considering the maximum significance of the habitat loss and / or alteration predicted for other projects (see **Table 10.34**) with respect to the affect of habitat loss and / or alteration on the populations of seabirds that are features of designated sites, a long-term **minor adverse** cumulative impact is predicted on the Atlantic puffin, black-legged kittiwake, common guillemot, northern fulmar, northern gannet, and razorbill populations for the designated sites within foraging range of Dogger Bank Teesside A & B, which are listed in **Table 10.28** and **Table 10.29**. However, a **moderate adverse cumulative** impact is predicted with respect to the named populations for the following designated sites:

- Buchan Ness to Collieston Coast SPA (and component SSSIs) – Common guillemot;
- Forth Islands SPA (and component SSSIs) – Common guillemot and razorbill;
- Fowlsheugh SSSI (and SPA) - Common guillemot and razorbill; and
- St Abb's Head to Fast Castle SSSI (and SPA) - Common guillemot and razorbill.

Table 10.34 Summary of information on the significance of indirect effects where presented in the other project's impact assessments reviewed for the cumulative impact assessment

Species	Arctic skua	Atlantic puffin	Black-legged kittiwake	Common guillemot	Great black-backed gull	Great skua	Lesser black-backed gull	Little auk	Northern fulmar	Northern gannet	Razorbill	White-billed diver
Beatrice	Minor	Minor	Minor	Minor	Minor	Minor	-	-	Minor	Minor	Minor	-
Dudgeon	-	-	-	-	-	-	Negligible	-	Negligible	Negligible	-	-
Firth of Forth Alpha and Bravo	-	Moderate	Minor	Moderate	-	-	-	-	-	-	Moderate	-
Galloper	Negligible	-	Negligible	Negligible	Minor	Negligible	Negligible		Negligible	Negligible	Negligible	-
Inch Cape	-	Negligible	Negligible	Negligible	Negligible	-	Negligible	-	Negligible	Negligible	Negligible	-
Triton Knoll	-	Minor	Negligible	Minor	-	-	-	-	Negligible	Negligible	Minor	-
Dogger Bank Teesside A & B	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dogger Bank Creyke Beck A & B	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dogger Bank Teesside C & D	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Maximum	**Minor**	**Moderate**	**Minor**	**Moderate**	**Minor**	**Minor**	**Negligible**	**Negligible**	**Minor**	**Minor**	**Moderate**	**Negligible**

10.4.53. The derivation of a moderate adverse cumulative impact due to habitat loss and / or alteration at these designated sites and for these species is derived from the assessment undertaken in the Firth of Forth Alpha and Bravo ES, whilst the contribution from Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B, and Dogger Bank Teesside C & D has been assessed as negligible for these species at these sites. The combined effect from other projects was not assigned any greater significance than minor adverse.

11. Transboundary Effects

11.1. Introduction

11.1.1. The assessment of impacts has been undertaken in relation to a species' biogeographic (or international) population and in relation to specific designated sites or the suite of transboundary designated sites around the North Sea 'region'. It should be noted that, for seabirds, it has only been possible to ascertain whether there could potentially be impacts on the breeding colony for the designated sites that they are features of. In addition to the designated sites at which they are breeding features (see Appendix 1 in **Appendix 11A**), a number of the seabird species considered in this assessment are also included as winter or passage features of further SPAs (see Appendix 2 in **Appendix 11A**). However, as the extent of movements of birds between Dogger Bank Teesside A & B and other marine areas is unknown, it is not possible to determine whether there might also be potential impacts on these sites' wintering or passage features.

11.1.2. Sections 6, 7, 8, and 10 present the conclusions of the assessment of the construction phase, operation phase, decommissioning phase, and cumulative impacts on the biogeographic populations of the seabird and migrant bird species which may form designated features of transboundary sites and populations. This section presents the quantification and results of the assessment of impacts on the transboundary sites and their respective species.

11.1.3. It should be noted for all quantified predictions of the populations that could be affected by disturbance and displacement, collisions, and barrier effects, a worst case assumption and rating has been taken with respect to displacement and mortality rates.

11.1.4. Transboundary effects are further summarised in **Chapter 32 Transboundary Effects**.

11.2. Impacts on transboundary ornithology features / sites during construction of Dogger Bank Teesside A & B

Disturbance / displacement

Dogger Bank Teesside A & B

11.2.1. For seabirds, Dogger Bank Teesside A & B is predicted to result in short-term **negligible** to **minor adverse** impacts on the biogeographic or transboundary sites' populations for all identified species as a result of displacement or disturbance during the construction phase (see assessment in **Table 6.3**). **Table 11.1** (extracted from Tables A9.38d, A9.41d, and A9.44d in Appendix 9 of **Appendix 11A**) presents the specific site populations affected for transboundary sites, all of which are at or below 0.02% of each site's identified species' population. No Atlantic puffin numbers were apportioned to any of the sites, therefore they have not been included.

Table 11.1 Apportioning to transboundary sites of mean mortality as a result of disturbance and displacement for relevant species during construction (and decommissioning) of Dogger Bank Teesside A & B (breeding bird numbers and percentages are shown in brackets)

Site name	Common guillemot		Razorbill	
	Number of birds	% of site's population	Number of birds	% of site's population
Baie de Morlaix SPA	-	-	-	-
Cap d'Erquy – Cap Frehel SPA	0.07	0.01	0.01	0.02
Chausay SPA	-	-	0.01	0.02
Cote de Granit Rose-Sept Iles SPA	0	0.01	0.01	0.02
Ouessant-Molene SPA	-	-	0	0.02
Seevogelschutzgebiet Helgoland SPA	0.75 (0.08)	0.01 (0.00)	0.01	0.02
Hallands Vadero SPA	0	0.01	-	-

Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

11.2.2. For seabirds, Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D are predicted to result in **no impact** to short-term **negligible** to **minor adverse** cumulative impact on the biogeographic or transboundary sites' populations for all identified species as a result of cumulative displacement or disturbance during the construction phase (see assessment in **Table 10.5**). **Table 11.2** presents the specific site populations affected for transboundary sites, all of which are at or below 0.07% of each site's identified species' population. The results are extracted from Tables A9.47d, A9.55d, A9.58d, and A9.61d in Appendix 9 of **Appendix 11A**.

Habitat loss and / or alteration

Dogger Bank Teesside A & B

11.2.3. For seabirds, Dogger Bank Teesside A & B (or Dogger Bank Teesside A or Dogger Bank Teesside B) are predicted to result in short-term **negligible** to **minor adverse** impacts on the biogeographic or transboundary sites' populations for all identified species as a result of habitat loss and / or alteration during the construction phase (as assessed in **Table 6.4**). Given the negligible numbers present (see **Table 11.1**) this would result in a short-term negligible impact on the transboundary sites (listed in **Table 11.1**) for which these species are a feature.

Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

11.2.4. As paragraph 11.2.3 above for Dogger Bank Teesside A & B alone. There is no change in the significance of the impact, therefore a short-term **negligible** to **minor adverse** cumulative impact is predicted on the biogeographic or transboundary sites' populations for all identified species as assessed in **Table 6.4**. Given the negligible numbers present (see **Table 11.2**) this would result in a short-term negligible impact on the transboundary sites (listed in **Table 11.2**) for which these species are a feature.

Table 11.2 Apportioning to transboundary sites of mean mortality as a result of disturbance and displacement for all relevant species and their populations during construction and decommissioning phases for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D (breeding bird numbers and percentages are shown in brackets)

Site name	Atlantic puffin		Common guillemot		Northern gannet		Razorbill	
	Number of birds	% of site's population	Number of birds	% of site's population	Number of birds	% of site's population	Number of birds	% of site's population
Baie de Morlaix SPA	0	0.00	-	-	-	-	-	-
Cap d'Erquy – Cap Frehel SPA	-	-	0.31	0.04	-	-	0.02	0.07
Chausay SPA	-	-	-	-	-	-	0.03	0.07
Cote de Granit Rose-Sept Iles SPA	0.02	0.00	0.02	0.04	7.02	0.01	0.05	0.07
Ouessant-Molene SPA	0	0.00	-	-	-	-	0.01	0.07
Seevogelschutzgebiet Helgoland SPA	-	-	3.25	0.04	0.06 (0.01)	0.02 (0.01)	0.03	0.07
Hallands Vadero SPA	-	-	0.01	0.04	-	-	-	-

11.3. Impacts on transboundary ornithology features / sites during operation (including cumulative impacts) of Dogger Bank Teesside A & B

Disturbance / displacement

Dogger Bank Teesside A & B

11.3.1. For seabirds, Dogger Bank Teesside A & B is predicted to result in **no impact** to long-term **negligible** to **minor adverse** impacts on the biogeographic or transboundary sites' populations for all identified species as a result of displacement or disturbance during the operation phase (as assessed in **Table 7.3**). **Table 11.3** presents the specific site populations affected for transboundary sites, all of which are below 0.04% of each site's identified species' population. The results are extracted from Tables A9.39d, A9.42d, and A9.45d of Appendix 9 in **Appendix 11A**.

Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

11.3.2. For seabirds, Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D are predicted to result in no impact to long-term **negligible** to **minor adverse** cumulative impacts on the biogeographic or transboundary sites' populations for all identified species as a result of the cumulative displacement or disturbance during the operation phase (as assessed in **Table 10.8**). **Table 11.4** presents the specific site populations affected for transboundary sites, all of which are below 0.14% of each site's identified species' population. The results are extracted from Tables A9.48d, A9.56d, A9.59d, and A9.62d of Appendix 9 in **Appendix 11A**, which also contain the confidence ranges, with Tables A9.48a-c, A9.56a-c, A9.59a-c, and A9.62a-c presenting the results based on each survey year.

Dogger Bank Teesside A & B and all other projects

11.3.3. For seabirds, Dogger Bank Teesside A & B and other projects are predicted to result in no impact to long-term **negligible** to **minor adverse** cumulative impacts on the biogeographic or transboundary sites' populations for all identified species as a result of the cumulative displacement or disturbance during the construction, operation, and decommissioning phases (as assessed in **Table 10.21**). No apportionment of affected species for transboundary designated sites was identified from other projects; therefore, the impact on the transboundary sites and the species that are a feature of them identified in **Table 11.4** would remain.

Table 11.3 Apportioning to transboundary sites of mean mortality as a result of disturbance and displacement for seabirds during operation of Dogger Bank Teesside A & B (breeding bird numbers and percentages are shown in brackets)

Site name	Atlantic puffin		Common guillemot		Razorbill	
	Number of birds	% of site's population	Number of birds	% of site's population	Number of birds	% of site's population
Baie de Morlaix SPA	0	0.00	-	-	-	-
Cap d'Erquy – Cap Frehel SPA	-	-	0.13	0.02	0.01	0.04
Chausay SPA	-	-	-	-	0.02	0.04
Cote de Granit Rose-Sept Iles SPA	0.01	0.00	0.01	0.02	0.02	0.04
Ouessant-Molene SPA	0	0.00	-	-	0	0.04
Seevogelschutzgebiet Helgoland SPA	-	-	1.51 (0.15)	0.02 (0.00)	0.02	0.04
Hallands Vadero SPA	-	-	0	0.02	-	-

Table 11.4 Apportioning to transboundary sites of mean mortality as a result of disturbance and displacement for seabirds and their populations during the operation phase for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D (breeding bird numbers and percentages are shown in brackets)

Site name	Atlantic puffin		Common guillemot		Northern gannet		Razorbill	
	Number of birds	% of site's population	Number of birds	% of site's population	Number of birds	% of site's population	Number of birds	% of site's population
Baie de Morlaix SPA	0	0.01	-	-	-	-	-	-
Cap d'Erquy – Cap Frehel SPA	-	-	0.62	0.09	-	-	0.04	0.14
Chausay SPA	-	-	-	-	-	-	0.06	0.14
Cote de Granit Rose-Sept Iles SPA	0.03	0.01	0.03	0.09	14.04	0.02	0.09	0.14
Ouessant-Molene SPA	0	0.01	-	-	-	-	0.02	0.14
Seevogelschutzgebiet Helgoland SPA	-	-	6.51 (0.15)	0.09 (0.00)	0.11 (0.03)	0.04 (0.01)	0.07	0.14
Hallands Vadero SPA	-	-	0.02	0.09	-	-	-	-

Barrier effect

Dogger Bank Teesside A & B

11.3.4. For seabirds, Dogger Bank Teesside A & B is predicted to result in long-term **minor adverse** impact on the biogeographic or transboundary site's (Seevogelschutzgebiet Helgoland SPA) populations for all identified species as a result of barrier effect on foraging seabirds during the operation phase (as assessed in **Table 7.5**). **Table 11.5** (extracted from Tables A9.31, A9.32, and A9.40 in Appendix 9 of **Appendix 11A**) presents the specific populations affected for the Seevogelschutzgebiet Helgoland SPA. Below 0.69% of the populations of all of the site's species are predicted to be affected.

Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

11.3.5. For seabirds, Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D are predicted to result in long-term **minor adverse** cumulative impacts on the biogeographic or transboundary site's (Seevogelschutzgebiet Helgoland SPA) populations for all identified species as a result of barrier effect on foraging seabirds during the operation phase (as assessed in **Table 10.10**). **Table 11.6** presents the specific site populations affected for transboundary sites (extracted from Tables A9.46, A9.49, and A9.57 of Appendix 9 in **Appendix 11A**).

11.3.6. As shown in **Table 11.6**, the percentage of the transboundary site's populations that may experience barrier effect are below 0.22% for the common guillemot and northern gannet populations for the Seevogelschutzgebiet Helgoland SPA, but 2.06% for the northern fulmar population. However, given the extensive foraging range of these species and the insignificant reduction in foraging area, a long-term **minor adverse** cumulative impact would remain for the site.

Dogger Bank Teesside A & B and all other projects

11.3.7. The apportionment of the populations of seabirds or migrant birds that potentially could experience a cumulative barrier effect was not identified for transboundary sites and species from the other projects that have been reviewed. Consequently, the impact on the Seevogelschutzgebiet Helgoland SPA and its species identified in paragraph 11.3.6 above and the number of birds affected in **Table 11.6** remains unchanged.

Table 11.5 Apportioning to transboundary sites of the maximum breeding season numbers of species in flight in Dogger Bank Teesside A & B for the purposes of assessing potential barrier effects

Site name	Common guillemot		Northern fulmar		Northern gannet	
	Number	**% of site's population**	**Number**	**% of site's population**	**Number**	**% of site's population**
Seevogelschutzgebiet Helgoland SPA	1.07	0.02	1.26	0.69	0.16	0.07

Table 11.6 Apportioning to transboundary sites of the maximum breeding season numbers of species in flight for the purposes of assessing potential cumulative barrier effects (breeding bird numbers and percentages are shown in brackets) of the Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

Site name	Common guillemot		Northern fulmar		Northern gannet	
	Number of adults	**% of site's population**	**Number of adults**	**% of site's population**	**Number of adults**	**% of site's population**
Seevogelschutzgebiet Helgoland SPA	2.49	0.05	3.79	2.06	0.51	0.22

Collision risk

Dogger Bank Teesside A & B

11.3.8. For seabirds, Dogger Bank Teesside A & B is predicted to result in long-term **negligible** to **minor adverse** cumulative impacts on the biogeographic or transboundary sites' populations for all identified species as a result of collisions during the operation phase (as assessed in **Table 7.9**). **Table 11.7** (extracted from Tables A9.33d, A9.35d, A9.36d, and A9.37d in Appendix 9 of **Appendix 11A**) presents the specific site populations affected for transboundary sites, all of which are below 0.09% of each site's identified species' population and result in an increase in background mortality of less than 0.35%. Overall, given the negligible magnitude of the effect, a long-term **minor adverse** cumulative impact remains for the transboundary sites listed in **Table 11.7**.

Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

11.3.9. For seabirds, Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D are predicted to result in no impact to long-term **negligible** to **minor adverse** cumulative impacts on the biogeographic or transboundary sites' populations for all identified species as a result of collisions during the operation phase (as assessed in **Table 10.14**). **Table 11.8** (extracted from Tables A9.50d, A9.52d, A9.53d, and A9.54d of Appendix 9 in **Appendix 11A**) presents the specific site populations affected for transboundary sites, all of which are below 0.22% of each site's identified species' population and result in an increase in background mortality of less than 1.07%. Overall, given the negligible magnitude of the effect, a long-term **minor adverse** cumulative impact remains for the transboundary sites listed in **Table 11.8**.

Dogger Bank Teesside A & B and all other projects

11.3.10. No apportionment of the populations of seabirds or migrant birds that potentially could experience collisions was provided for transboundary designated sites and species from the other projects that have been reviewed. Consequently, the impacts on the transboundary sites and the species identified in paragraph 11.3.9 above and **Table 11.8** remain unchanged.

Habitat loss and / or alteration

Dogger Bank Teesside A & B

11.3.11. The alteration and loss of habitat as a result of Dogger Bank Teesside A & B is predicted to result in a long-term **negligible** to **minor adverse** impact on the biogeographic or transboundary sites' populations for all seabird species as assessed in **Table 7.12**. Given the negligible numbers present (see **Table 11.3**) this would result in a short-term **negligible** impact on the transboundary sites (listed in **Table 11.3**) for which these species are a feature.

Table 11.7 Apportioning to transboundary sites of seabirds mean annual mortality resulting from collisions during the operation phase for Dogger Bank Teesside A & B (breeding bird numbers and percentages are shown in brackets)

Site name	Black-legged kittiwake			Great black-backed gull			Lesser black-backed gull			Northern gannet		
	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality
Baie de Morlaix SPA	-	-	-	0.47	0.09	0.35	0.07	0.01	0.12	-	-	-
Baie de Saint-Brieuc-Est SPA	-	-	-	0.01	0.09	0.35	0	0.01	0.12	-	-	-
Baie de Seine Occidentale SPA	-	-	-	0.86	0.09	0.35	-	-	-	-	-	-
Baie du Mont Saint Michel SPA	-	-	-	0.38	0.09	0.35	0.04	0.01	0.12	-	-	-
Cap d'Erquy – Cap Frehel SPA	0.02	0.01	0.17	0.02	0.09	0.35	0	0.01	0.12	-	-	-
Chausay SPA	-	-	-	1.49	0.09	0.35	-	-	-	-	-	-
Cote de Granit Rose-Sept Iles SPA	0.05	0.01	0.17	0.20	0.09	0.35	0.27	0.01	0.12	7.22	0.01	0.18
Falaise du Bessin Occidental SPA	0.45	0.01	0.17	-	-	-	0.01	0.01	0.12	-	-	-
Ilot du Trevors SPA	-	-	-	0.02	0.09	0.35	0.02	0.01	0.12	-	-	-
Ilots Notre-Dame et Chevret SPA	-	-	-	-	-	-	0	0.01	0.12	-	-	-
Littoral Seino-Marin SPA	0.12	0.01	0.17	0.08	0.09	0.35	-	-	-	-	-	-
Ouessant-Molene SPA	-	-	-	2.88	0.09	0.35	1.98	0.01	0.12	-	-	-
Niedersachsiches Wattenmeer un andrezendes Kustenmeer SPA	-	-	-	0.01	0.09	0.35	9.59	0.01	0.12	-	-	-

Site name	Black-legged kittiwake			Great black-backed gull			Lesser black-backed gull			Northern gannet		
	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality
Ramsar S-H Wattenmeer und angrenzende Kustengebiet SPA and Ramsar	-	-	-	0.04	0.09	0.35	3.03	0.01	0.12	-	-	-
Seevogelschutzgebiet Helgoland SPA	-	-	-	-	-	-	0.85	0.01	0.12	0.07 (0.03)	0.02 (0.01)	0.36
Duinen en Lage Land Texel SPA	-	-	-	-	-	-	5.82	0.01	0.12	-	-	-
Duinen Vlieland SPA	-	-	-	-	-	-	1.04	0.01	0.12	-	-	-
Waddenzee SPA and Ramsar	-	-	-	-	-	-	7.90	0.01	0.12	-	-	-
Zwanenwater SPA and Ramsar	-	-	-	-	-	-	0.05	0.01	0.12	-	-	-
Hallands Vadero SPA	-	-	-	-	-	-	0.01	0.01	0.12	-	-	-

Table 11.8 Apportioning to transboundary sites of the annual mortality on seabirds resulting from cumulative collisions during the operation phase for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D (breeding bird numbers and percentages are shown in brackets)

Site name	Black-legged kittiwake			Great black-backed gull			Lesser black-backed gull			Northern gannet		
	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality
Baie de Morlaix SPA	-	-	-	1.14	0.22	1.07	0.18	0.04	0.29	-	-	-
Baie de Saint-Brieuc-Est SPA	-	-	-	0.03	0.22	1.07	0.01	0.04	0.29	-	-	-
Baie de Seine Occidentale SPA	-	-	-	2.11	0.22	1.07	-	-	-	-	-	-
Baie du Mont Saint Michel SPA	-	-	-	0.93	0.22	1.07	0.11	0.04	0.29	-	-	-
Cap d'Erquy – Cap Frehel SPA	0.07	0.04	0.58	0.04	0.22	1.07	0	0.04	0.29	-	-	-
Chausay SPA	-	-	-	3.65	0.22	1.07	-	-	-	-	-	-
Cote de Granit Rose-Sept Iles SPA	0.19	0.04	0.58	0.48	0.22	1.07	0.71	0.04	0.29	23.61	0.04	0.60
Falaise du Bessin Occidental SPA	1.69	0.04	0.58	-	-	-	0.04	0.04	0.29	-	-	-
Ilot du Trevors SPA	-	-	-	0.04	0.22	1.07	0.07	0.04	0.29	-	-	-
Ilots Notre-Dame et Chevret SPA	-	-	-	-	-	-	0	0.04	0.29	-	-	-
Littoral Seino-Marin SPA	0.44	0.04	0.58	0.19	0.22	1.07	-	-	-	-	-	-
Ouessant-Molene SPA	-	-	-	7.03	0.22	1.07	5.31	0.04	0.29	-	-	-
Niedersachsiches Wattenmeer un andrezendes Kustenmeer SPA	-	-	-	0.01	0.22	1.07	25.76	0.04	0.29	-	-	-

Site name	Black-legged kittiwake			Great black-backed gull			Lesser black-backed gull			Northern gannet		
	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality	Number	% of site's popul-ation	% back-ground mortality
Ramsar S-H Wattenmeer und angrenzende Kustengebiet SPA and Ramsar	-	-	-	0.09	0.22	1.07	8.14	0.04	0.29	-	-	-
Seevogelschutzgebiet Helgoland SPA	-	-	-	-	-	-	2.28	0.04	0.29	0.20 (0.07)	0.07 (0.03)	1.02
Duinen en Lage Land Texel SPA	-	-	-	-	-	-	15.64	0.04	0.29	-	-	-
Duinen Vlieland SPA	-	-	-	-	-	-	2.79	0.04	0.29	-	-	-
Waddenzee SPA and Ramsar	-	-	-	-	-	-	21.22	0.04	0.29	-	-	-
Zwanenwater SPA and Ramsar	-	-	-	-	-	-	0.12	0.04	0.29	-	-	-
Hallands Vadero SPA	-	-	-	-	-	-	0.02	0.04	0.29	-	-	-

Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

11.3.12. The alteration and loss of habitat as a result of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D is predicted to result in a long-term **negligible** to **minor adverse** cumulative impact on the biogeographic or transboundary sites' populations for all seabird species as assessed in **Table 7.12** (as there is no change in magnitude compared to Dogger Bank Teesside A & B alone). Given the negligible numbers present (see **Table 11.4**) this would result in a short-term **negligible** cumulative impact on the transboundary sites (listed in **Table 11.4**) for which these species are a feature.

Dogger Bank Teesside A & B and all other projects

11.3.13. For the reasons discussed in paragraph 10.3.20, no biogeographic population level impact due to habitat loss and / or alteration has been assessed as a result of Dogger Bank Teesside A & B and all other projects. Consequently, the national population level impacts for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B, and Dogger Bank Teesside C & D (described in paragraph 11.3.12 above) would remain.

11.4. Impacts on transboundary ornithology features / sites during decommissioning of Dogger Bank Teesside A & B

Disturbance / displacement

Dogger Bank Teesside A & B

11.4.1. For seabirds, Dogger Bank Teesside A & B is predicted to result in short-term **negligible** to **minor adverse** impacts on the biogeographic or transboundary sites' populations for all identified species as a result of disturbance and displacement during the decommissioning phase as described in paragraph 11.2.1. **Table 11.1** presents the specific site populations affected for transboundary sites, and the impacts are the same as for construction (see paragraph 11.2.1).

Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

11.4.2. For seabirds, Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D are predicted to result in short-term **negligible** to **minor adverse** cumulative impacts on the biogeographic or transboundary sites' populations for all identified species as a result of cumulative disturbance and displacement during the decommissioning phase, as described in paragraph 11.2.2. **Table 11.2** presents the specific site populations affected for transboundary sites, and the impacts are the same as for construction (see paragraph 11.2.2).

Habitat loss and / or alteration

Dogger Bank Teesside A & B

11.4.3. For seabirds, Dogger Bank Teesside A & B is predicted to result in short-term **negligible** to **minor adverse** impacts on the biogeographic or transboundary sites' populations for all identified species as a result of habitat loss and / or alteration during the decommissioning phase (as described in paragraph 10.2.3 due to the similarity with the construction phase). Given the negligible numbers present (see **Table 11.1**) this would result in a short-term **negligible** impact on the transboundary sites (listed in **Table 11.1**) for which these species are a feature during the decommissioning phase.

Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

11.4.4. As per paragraph 11.4.3 above for Dogger Bank Teesside A & B alone. There is no change in the significance of the impact as result of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D during the decommissioning phase, therefore, a short-term **negligible** to **minor adverse** cumulative impact is predicted on the biogeographic or transboundary site populations for all identified species as described in paragraph 10.2.3. Given the negligible numbers present (see **Table 11.2**) this would result in a short-term **negligible** cumulative impact on the transboundary sites (listed in **Table 11.2**) for which these species are a feature during the decommissioning phase.

12. Summary

12.1. Summary of impacts

12.1.1. This chapter of the ES has provided a characterisation of the existing environment for marine and coastal ornithology based on both existing and site specific survey data, and has assessed the potential impacts on seabirds and migrant birds at designated site, designated site suite, national and biogeographic population levels.

12.1.2. **Table 12.1** provides a summary of these potential impacts on the national populations of seabirds and migrant birds arising from the worst case scenarios (set out in Section 5) for Dogger Bank Teesside A & B (both Dogger Bank Teesside A and Dogger Bank Teesside B). The magnitude and the significance of the potential impacts for Dogger Bank Teesside A & B are at similar levels to Dogger Bank Teesside A and Dogger Bank Teesside B alone. **Tables 12.2** and **12.3** provide a summary of the cumulative impacts on the national populations of seabirds and migrant birds from Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, and Dogger Bank Teesside A & B and all other projects, respectively

Summary of impacts on the national populations of seabirds and migrant birds

Construction phase (see Tables 12.1 and 12.2)

Dogger Bank Teesside A & B

12.1.3. The construction phase for Dogger Bank Teesside A & B is predicted to result in **no impacts** to the national populations of some seabird species (i.e Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar) and short-term **negligible** to **minor adverse** impacts on other seabirds (i.e. Atlantic puffin, common guillemot, little auk, northern gannet, razorbill, and white-billed diver) present in the study area as a result of disturbance and displacement and subsequent mortality.

12.1.4. Disturbance during the landfall construction works for Dogger Bank Teesside A & B are predicted to result in short-term and temporary **negligible** to **minor adverse** impacts on a number of seabird and waterbird species, notably black-headed gull, dunlin, Eurasian oystercatcher, herring gull, northern lapwing, ringed plover, ruddy turnstone, and sanderling.

12.1.5. Habitat loss and / or alteration during the construction phase for Dogger Bank Teesside A & B is predicted to result in short-term and temporary **negligible** impacts on the national populations of some seabird species (i.e Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, little auk, northern fulmar, northern gannet, and white-billed diver) present in the study area and short-term and temporary **minor adverse** impacts on the remaining seabirds present (Atlantic puffin, common guillemot, and razorbill) in the study area.

Table 12.1 Summary of predicted impacts of Dogger Bank Teesside A & B on national populations of seabirds and migrant birds (there is no difference in magnitude and significance of the impacts for Dogger Bank Teesside A or Dogger Bank Teesside B individually)

Description of impact	Receptor	Residual impact
Construction phase		
Disturbance / displacement	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar	**No impact**
	Populations of little auk and white billed diver	Short-term **negligible**
	Populations of Atlantic puffin, common guillemot, northern gannet, and razorbill	Short-term **minor adverse**
Disturbance during landfall activities	Populations of black-headed gull, dunlin, Eurasian oystercatcher, herring gull, and ruddy turnstone	Short-term and temporary **negligible**
	Populations of northern lapwing, ringed plover, and sanderling	Short-term and temporary **minor adverse**
Habitat loss and / or alteration	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, little auk, northern fulmar, northern gannet, and white-billed diver	Short-term and temporary **negligible**
	Populations of Atlantic puffin, common guillemot, and razorbill	Short-term and temporary **minor adverse**
Operational phase		
Disturbance / displacement	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar	**No impact**
	Populations of little auk and white billed diver	Long-term **negligible**
	Populations of Atlantic puffin, common guillemot, northern gannet, and razorbill	Long-term **minor adverse**
Barrier effect	Populations of Arctic skua, Atlantic puffin, great black-backed gull, great skua, lesser black-backed gull, little auk, and white billed diver	**No impact**
	Populations of black-legged kittiwake, common guillemot, northern fulmar, northern gannet, and razorbill	Long-term **minor adverse**
	All migrant birds and their populations (see **Table 7.7** for species list)	Long-term **minor adverse**
Collisions	Populations of little auk and white billed diver	Long-term **negligible**
	Populations of Arctic skua, Atlantic puffin, black-legged kittiwake, common guillemot, great black-backed gull, great skua, lesser black-backed gull, northern fulmar, northern gannet, and razorbill	Long-term **minor adverse**
	All migrant birds and their populations (see **Table 7.11** for species list)	Long-term **negligible** to **minor adverse**
Habitat loss and / or alteration	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, little auk, northern fulmar, northern gannet, and white-billed diver	Long-term **negligible**
	Populations of Atlantic puffin, common guillemot, and razorbill	Long-term **minor adverse**

Description of impact	Receptor	Residual impact
Decommissioning phase		
Disturbance / displacement	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar	**No impact**
	Populations of little auk and white billed diver	Short-term and temporary **negligible**
	Populations of Atlantic puffin, common guillemot, northern gannet, and razorbill	Short-term and temporary **minor adverse**
Habitat loss and / or alteration	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, little auk, northern fulmar, northern gannet, and white-billed diver	Short-term and temporary **negligible**
	Populations of Atlantic puffin, common guillemot, and razorbill	Short-term and temporary **minor adverse**

Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

12.1.6. Cumulative disturbance and displacement impacts on the species described in paragraph 12.1.3 above for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D would be of similar magnitude and significance to the construction phase, i.e. **no impact** for some species and short-term **negligible** to **minor adverse** cumulative for the remaining seabird species.

12.1.7. Cumulative habitat loss and / or alteration impacts on the seabird species listed in paragraph 12.1.5 above for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D would be of similar magnitude and significance to the construction phase for Dogger Bank Teesside A & B alone (see paragraph 12.1.5), i.e. short-term **negligible** to **minor adverse** cumulative impacts.

Operation phase (see Tables 12.1 to 12.3)

Dogger Bank Teesside A & B

12.1.8. The operation phase for Dogger Bank Teesside A & B is predicted to result in **no impacts** to the national populations of some seabird species species (i.e Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar) and long-term **negligible** to **minor adverse** impacts on other seabirds present in the study area (i.e. Atlantic puffin, common guillemot, little auk, northern gannet, razorbill, and white-billed diver) as a result of disturbance and displacement and subsequent mortality.

12.1.9. Barrier effects on foraging seabirds during the operation phase for Dogger Bank Teesside A & B are predicted to result in **no impacts** to the national populations of some seabird species (i.e Arctic skua, Atlantic puffin, great black-backed gull, great skua, lesser black-backed gull, little auk, and white-billed diver) and long-term **minor adverse** impacts on other seabirds present in the study area (i.e. black-legged kittiwake, common guillemot, northern fulmar, northern gannet, and razorbill) and 41 species (and 3 sub-species) of migrant birds (see **Table 7.7** for species list) that pass through the study area.

Table 12.2 Summary of predicted cumulative impacts of the Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D on national populations of seabirds and migrant birds

Description of impact	Receptor	Residual impact
Construction phase		
Disturbance / displacement	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar	**No impact**
	Populations of little auk and white billed diver	Short-term **negligible**
	Populations of Atlantic puffin, common guillemot, northern gannet, and razorbill	Short-term **minor adverse**
Habitat loss and / or alteration	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, little auk, northern fulmar, northern gannet, and white-billed diver	Short-term and temporary **negligible**
	Populations of Atlantic puffin, common guillemot, and razorbill	Short-term and temporary **minor adverse**
Operational phase		
Disturbance / displacement	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar	**No impact**
	Populations of little auk and white billed diver	Long-term **negligible**
	Populations of Atlantic puffin, common guillemot, northern gannet, and razorbill	Long-term **minor adverse**
Barrier effect	Populations of Arctic skua, Atlantic puffin, great black-backed gull, great skua, lesser black-backed gull, little auk, and white billed diver	**No impact**
	Populations of black-legged kittiwake, common guillemot, northern fulmar, northern gannet, and razorbill	Long-term **minor adverse**
	All migrant birds and their populations (see **Table 10.12** for species list)	Long-term **minor adverse**
Collisions	Populations of little auk and white billed diver	Long-term **negligible**
	Populations of Arctic skua, Atlantic puffin, black-legged kittiwake, common guillemot, great black-backed gull, great skua, lesser black-backed gull, northern fulmar, northern gannet, and razorbill	Long-term **minor adverse**
	All migrant birds and their populations (see **Table 10.16** for species list)	Long-term **negligible** to **minor adverse**
Habitat loss and / or alteration	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, little auk, northern fulmar, northern gannet, and white-billed diver	Long-term **negligible**
	Populations of Atlantic puffin, common guillemot, and razorbill	Long-term **minor adverse**

Description of impact	Receptor	Residual impact
Decommissioning phase		
Disturbance / displacement	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar	**No impact**
	Populations of little auk and white billed diver	Short-term and temporary **negligible**
	Populations of Atlantic puffin, common guillemot, northern gannet, and razorbill	Short-term and temporary **minor adverse**
Habitat loss and / or alteration	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, little auk, northern fulmar, northern gannet, and white-billed diver	Short-term and temporary **negligible**
	Populations of Atlantic puffin, common guillemot, and razorbill	Short-term and temporary **minor adverse**

12.1.10. Collisions during the operation phase for Dogger Bank Teesside A & B are predicted to result in long-term **negligible** impacts on the national populations of some species (i.e. little auk, and white-billed diver) and on the national populations of 27 species (and 3 sub-species) of migrant birds (see **Table 7.11** for species list) that pass through the study area, and **minor adverse** impacts on the national populations of the remaining seabird species (i.e Arctic skua, Atlantic puffin, black-legged kittiwake, common guillemot, great black-backed gull, great skua, lesser black-backed gull, northern fulmar, northern gannet, and razorbill) present in the study area and on the national populations of 14 species of migrant birds (see **Table 7.11** for species list) that pass through the study area.

12.1.11. Habitat loss and / or alteration during the operation phase for Dogger Bank Teesside A & B is predicted to result in long-term **negligible** impacts on the national populations of some seabird species (i.e Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, little auk, northern fulmar, northern gannet, and white-billed diver) present in the study area and long-term **minor adverse** impacts on the national populations of the remaining seabird species (Atlantic puffin, common guillemot, and razorbill) present in the study area.

Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D

12.1.12. Similar impacts on the species described above for Dogger Bank Teesside A & B alone are predicted to occur as a result of the operation of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, see paragraphs 12.1.8 to 12.1.11.

Dogger Bank Teesside A & B and all other projects

12.1.13. The operation phase for Dogger Bank Teesside A & B and all other projects (cumulatively) is predicted to result in **no impacts** to the national populations of some seabird species (i.e Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar) and long-term **negligible** to **minor adverse** impacts on other seabirds present in the study area (i.e. Atlantic puffin, common guillemot, little auk, northern gannet, razorbill, and white-billed diver) as a result of disturbance and displacement and subsequent mortality throughout the construction, operation, and decommissioning phases for Dogger Bank Teesside A & B.

Table 12.3 Summary of predicted cumulative impacts of Dogger Bank Teesside A & B and all other projects on national populations of seabirds and migrant birds

Description of impact	Receptor	Residual impact
Disturbance / displacement during construction / operation / decommissioning	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar	**No impact**
	Populations of little auk and white billed diver	Long-term **negligible**
	Populations of Atlantic puffin, common guillemot, northern gannet, and razorbill	Long-term **minor adverse**
Collisions	Populations of common scoter, little auk and white billed diver	Long-term **negligible**
	Populations of Arctic skua, Atlantic puffin, barnacle goose (Svalbard population), black-legged kittiwake, common guillemot, great skua, northern fulmar, and razorbill	Long-term **minor adverse**
	Populations of great black-backed gull, lesser black-backed gull, and northern gannet	Long-term **moderate adverse**

12.1.14. Collisions during the operation phase for Dogger Bank Teesside A & B and all other projects (cumulatively) are predicted to result in long-term **negligible** impacts on the national populations of some seabird and waterbird species present in the study area (i.e. common scoter, little auk, and white-billed diver) and long-term **minor adverse** impacts on the national populations of the remaining seabird species (i.e Arctic skua, Atlantic puffin, barnacle goose (Svalbard population), black-legged kittiwake, common guillemot, great black-backed gull, great skua, lesser black-backed gull, northern fulmar, and razorbill) present in the study area. However, a long-term **moderate adverse** impact is predicted on the national populations of great black-backed gull, lesser black-backed gull, and northern gannet (these are discussed in more detail in Section 12.2). No additional impacts on migrant birds were identified through the review of other projects' documentation, therefore, the cumulative collision impacts described in paragraph 12.1.10 would remain.

12.1.15. Habitat loss and / or alteration during the operation phase for Dogger Bank Teesside A & B and all other projects (cumulatively) could not be assessed at the national population level.

Decommissioning phase (see Tables 12.1 and 12.2)

12.1.16. The impacts on the national populations of seabirds present within the study area are predicted to be the same as those identified for the construction phase for Dogger Bank Teesside A & B, and cumulatively for the Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, as described in paragraphs 12.1.3 to 12.1.7 above.

Summary of impacts on BAP priority species

Construction phase (see Table 12.4)

12.1.17. During the construction phase for Dogger Bank Teesside A & B **no impact** is predicted on the national population of Arctic skua and a short-term and temporary **negligible** impact is predicted on the national population of herring gull due to disturbance during the construction phase (including landfall works). A short-term **negligible** impact is predicted on the national population of Artic skua and herring gull due to habitat loss and / or alteration during the construction phase for Dogger Bank Teesside A & B.

12.1.18. Similar impacts on the national population of Arctic skua, described in paragraph 12.1.18 above for Dogger Bank Teesside A & B alone, are predicted to occur as a result of the cumulative construction of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D.

Operation phase (see Table 12.4)

12.1.19. **No impact** is predicted on the national population of Arctic skua as a result of disturbance and displacement during the operation phase for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D.

12.1.20. **No impact** is predicted on the national population of Arctic skua as a result of barrier effect during the operation phase for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D. However a long-term **minor adverse** impact is predicted on the national populations of migrant BAP species (i.e. black-tailed godwit, common scoter, Eurasian curlew, European nightjar, great bittern, greater scaup, and northern lapwing) as a result of barrier effects during the operation phase for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D.

12.1.21. A long-term **negligible** impact is predicted on the national populations of migrant BAP species (i.e. common scoter, Eurasian curlew, European nightjar, great bittern, greater scaup, and northern lapwing) as a result of collisions during the operation phase for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D. A long-term **minor adverse** impact is predicted on the national populations of Arctic skua and migratory black-tailed godwit as a result of collisions during the operation phase for Dogger Bank Teesside A & B, and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, and for Dogger Bank Teesside A & B and all other projects.

12.1.22. Habitat loss and / or alteration during the operation phase for Dogger Bank Teesside A & B is predicted to result in long-term **negligible** impacts on the national population of Arctic skua, and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, and for Dogger Bank Teesside A & B. Habitat loss and / or alteration during the operation phase for Dogger Bank Teesside A & B and all other projects (cumulatively) could not be assessed at the Arctic skua national population level.

Table 12.4 Summary of the impacts on BAP priority bird species

Description of impact	Receptor	Residual impact
Construction phase (Dogger Bank Teesside A & B)		
Disturbance / displacement	Arctic skua and their populations	**No impact**
Disturbance during landfall activities	Herring gull and their populations	Short-term and temporary **negligible**
Habitat loss and / or alteration	Populations of Arctic skua and herring gull	Short-term **negligible**
Construction phase (Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D)		
Disturbance / displacement	Arctic skua and their populations	**No impact**
Habitat loss and / or alteration	Arctic skua and their populations	Short-term **negligible**
Operation phase (Dogger Bank Teesside A & B)		
Disturbance / displacement	Arctic skua and their populations	**No impact**
Barrier effect	Arctic skua and their populations	**No impact**
	Populations of black-tailed godwit, common scoter, Eurasian curlew (non-breeding), European nightjar, great bittern, greater scaup, and northern lapwing	Long-term **minor adverse**
Collisions	Arctic skua and their populations	Long-term **minor adverse**
	Populations of common scoter, Eurasian curlew (non-breeding), European nightjar, great bittern, greater scaup, and northern lapwing	Long-term **negligible**
	Black-tailed godwit and their populations	Long-term **minor adverse**
Habitat loss and / or alteration	Arctic skua and their populations	Long-term **negligible**
Operation phase (Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D)		
Disturbance / displacement	Arctic skua and their populations	**No impact**
Barrier effect	Arctic skua and their populations	**No impact**
	Populations of black-tailed godwit, common scoter, Eurasian curlew, European nightjar, great bittern, greater scaup, and northern lapwing	Long-term **minor adverse**
Collisions	Arctic skua and their populations	Long-term **minor adverse**
	Populations of common scoter, Eurasian curlew, European nightjar, great bittern, greater scaup, and northern lapwing	Long-term **negligible**
	Black-tailed godwit and their populations	Long-term **minor adverse**
Habitat loss and / or alteration	Arctic skua and their populations	Long-term **negligible**
Operation phase (Dogger Bank Teesside A & B and all other projects)		
Disturbance / displacement during construction / operation / decommissioning	Arctic skua and their populations	**No impact**
Barrier effect	Arctic skua and their populations	**No impact**
Collisions	Arctic skua and their populations	Long-term **minor adverse**
	Populations of common scoter	Long-term **negligible**

Description of impact	Receptor	Residual impact
Decommissioning phase (Dogger Bank Teesside A & B)		
Disturbance / displacement	Arctic skua and their populations	**No impact**
Habitat loss and / or alteration	Arctic skua and their populations	Short-term **negligible**
Decommissioning phase (Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D)		
Disturbance / displacement	Arctic skua and their populations	**No impact**
Habitat loss and / or alteration	Arctic skua and their populations	Short-term **negligible**

Decommissioning phase (see Table 12.4)

12.1.23. The impacts on the national populations of Arctic skua and the BAP migrant species present within the study area are predicted to be the same as those identified for the construction phase for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, as described in paragraphs 12.1.18 and 12.1.19 above.

Summary of impacts on OSPAR threatened species

Construction phase (see Table 12.5)

12.1.24. During the construction phase **no impacts** are predicted on the biogeographic population of black-legged kittiwake due to disturbance during offshore and landfall works for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D.

12.1.25. Habitat loss and / or alteration during the construction phase is predicted to result in a short-term **negligible** impact on the biogeographic population of black-legged kittiwake for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D.

Operation phase (see Table 12.5)

12.1.26. **No impact** is predicted on the biogeographic population of black-legged kittiwake due to disturbance and displacement during the operation phase for Dogger Bank Teesside A & B, and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, and for Dogger Bank Teesside A & B and all other projects.

12.1.27. A long-term **minor adverse** impact is predicted on the biogeographic population of black-legged kittiwake as a result of barrier effect during the operation phase for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, and for Dogger Bank Teesside A & B and all other projects.

12.1.28. A long-term **minor adverse** impact is predicted on the biogeographic population of black-legged kittiwake as a result of collisions during the operation phase for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, and for Dogger Bank Teesside A & B and all other projects.

Table 12.5 Summary of the impacts on the OSPAR threatened species (black-legged kittiwake)

Description of impact	Receptor	Residual impact
Construction phase (Dogger Bank Teesside A & B)		
Disturbance / displacement	Black-legged kittiwake and their biogeographic population	**No impact**
Disturbance during landfall activities	Black-legged kittiwake and their biogeographic population	**No impact**
Habitat loss and / or alteration	Black-legged kittiwake and their biogeographic population	Short-term **negligible**
Construction phase (Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D)		
Disturbance / displacement	Black-legged kittiwake and their biogeographic population	**No impact**
Habitat loss and / or alteration	Black-legged kittiwake and their biogeographic population	Short-term **negligible**
Operation phase (Dogger Bank Teesside A & B)		
Disturbance / displacement	Black-legged kittiwake and their biogeographic population	**No impact**
Barrier effect	Black-legged kittiwake and their biogeographic population	Long-term **minor adverse**
Collisions	Black-legged kittiwake and their biogeographic population	Long-term **minor adverse**
Habitat loss and / or alteration	Black-legged kittiwake and their biogeographic population	Long-term **negligible**
Operation phase (Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D)		
Disturbance / displacement	Black-legged kittiwake and their biogeographic population	**No impact**
Barrier effect	Black-legged kittiwake and their biogeographic population	Long-term **minor adverse**
Collisions	Black-legged kittiwake and their biogeographic population	Long-term **minor adverse**
Habitat loss and / or alteration	Black-legged kittiwake and their biogeographic population	Long-term **negligible**
Operation phase (Dogger Bank Teesside A & B and all other projects)		
Disturbance / displacement during construction / operation / decommissioning	Black-legged kittiwake and their biogeographic population	**No impact**
Barrier effect	Black-legged kittiwake and their biogeographic population	Long-term **minor adverse**
Collisions	Black-legged kittiwake and their biogeographic population	Long-term **minor adverse**
Decommissioning phase (Dogger Bank Teesside A & B)		
Disturbance / displacement	Black-legged kittiwake and their biogeographic population	**No impact**
Habitat loss **and /** or alteration	Black-legged kittiwake and their biogeographic population	Short-term **negligible**

Description of impact	Receptor	Residual impact
Decommissioning phase (Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D)		
Disturbance / displacement	Black-legged kittiwake and their biogeographic population	**No impact**
Habitat loss and / or alteration	Black-legged kittiwake and their biogeographic population	Short-term **negligible**

12.1.29. A long-term **negligible** impact is predicted on the biogeographic population of black-legged kittiwake as a result of habitat loss and / or alteration during the operation phase for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D. Habitat loss and / or alteration during the operation phase for Dogger Bank Teesside A & B and all other projects (cumulatively) could not be assessed at the black-legged kittiwake biogeographic population level.

Decommissioning phase (see Table 12.5)

12.1.30. The impacts on the biogeographic population of black-legged kittiwake are predicted to be the same as those identified for the construction phase for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, as described in paragraphs 12.1.24 and 12.1.25 above.

Summary of impacts on the designated sites

Construction phase (see Table 12.6)

12.1.31. Short-term **minor adverse** impacts on designated sites (their seabird features) as a result of disturbance and displacement during offshore and landfall works in the construction phase for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D.

12.1.32. Habitat loss and / or alteration during the construction phase is predicted to result in short-term **negligible** to **minor adverse** impacts on designated sites (their seabird features) for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D.

Operation phase (see Table 12.6)

12.1.33. The operation phase for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D are predicted to result in long-term **minor adverse** impacts on designated sites (see **Tables 7.13** and **10.27**) as a result of disturbance and displacement. The operation phase for Dogger Bank Teesside A & B and all other projects is predicted to result in long-term **minor adverse** cumulative impacts on designated sites (their seabird features) as a result of disturbance and displacement with the exception of a long-term **moderate adverse** cumulative impact on two designated sites (see **Table 12.6** and discussed further in Section 12.2).

Table 12.6 Summary of the impacts on designated sites (see Section 12.2 Consideration of Moderate Adverse Impacts)

Description of impact	Receptor	Residual impact
Construction phase (Dogger Bank Teesside A & B)		
Disturbance /displacement	All relevant designated sites and their features listed in **Table 6.6**	Short-term **minor adverse**
Disturbance during landfall activities	All relevant designated sites and their features listed in paragraph 6.6.10	**No impact**
Habitat loss and / or alteration	All relevant designated sites and their features listed in **Table 6.6**	Short-term **minor adverse**
Construction phase (Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D)		
Disturbance /displacement	All relevant designated sites and their features listed in **Table 10.27**	Short-term **minor adverse**
Habitat loss and / or alteration	All relevant designated sites and their features listed in **Table 10.27**	Short-term **negligible** to **minor adverse**
Operation phase (Dogger Bank Teesside A & B)		
Disturbance /displacement	All relevant designated sites and their features listed in **Table 7.13**	Long-term **minor adverse**
Barrier effect	All relevant designated sites and their features listed in **Table 7.15**	Long-term **minor adverse**
Collisions	All relevant designated sites and their features listed in **Table 7.17**	Long-term **negligible** to **minor adverse**
Habitat loss and / or alteration	All relevant designated sites and their features listed in **Table 7.13**	Long-term **minor adverse**
Operation phase (Dogger Bank Teesside A & B and the Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D)		
Disturbance /displacement	All relevant designated sites and their features listed in **Table 10.28**	Long-term **minor adverse**
Barrier effect	All relevant designated sites and their features listed in **Table 10.29**	Long-term **minor adverse**
Collisions	Black-legged kittiwake feature of Flamborough Head SSSI and pSPA	Long-term **moderate adverse**
	All remaining designated sites and their features listed in **Table 10.30**	Long-term **minor adverse**
Habitat loss and / or alteration	All relevant designated sites and their features listed in **Table 10.28**	Long-term **minor adverse**
Operation phase (Dogger Bank Teesside A & B and all other projects)		
Disturbance / displacement during construction / operation / decommissioning	Common guillemot feature of Buchan Ness to Collieston Coast SPA (and component SSSIs)	Long-term **moderate adverse**
	All remaining designated sites and their features listed in **Table 10.28**	Long-term **minor adverse**

Description of impact	Receptor	Residual impact
Collisions	Black-legged kittiwake and northern gannet features of Flamborough Head SSSI and pSPA	Long-term **moderate adverse**
	Great black-backed gull feature of East Caithness Cliffs SPA (and component SSSIs)	Long-term **moderate adverse**
	Black-legged kittiwake feature of Forth Islands SPA (and component SSSIs)	Long-term **moderate adverse**
	All remaining designated sites and their features listed in **Table 10.30**	Long-term **minor adverse**
Habitat loss and / or alteration	Common guillemot feature of Buchan Ness to Collieston Coast SPA (and component SSSIs)	Long-term **moderate adverse**
	Common guillemot and razorbill features of Forth Islands SPA (and component SSSIs)	Long-term **moderate adverse**
	Common guillemot and razorbill features of Fowlsheugh SSSI (and SPA)	Long-term **moderate adverse**
	Common guillemot and razorbill features of St Abb's Head to Fast Castle SSSI (and SPA)	Long-term **moderate adverse**
Decommissioning phase (Dogger Bank Teesside A & B)		
Disturbance /displacement	All relevant designated sites and their features listed in **Table 6.6**	Short-term **minor adverse**
Habitat loss and / or alteration	All relevant designated sites and their features listed in **Table 6.6**	Short-term **minor adverse**
Decommissioning phase (Dogger Bank Teesside A & B and the Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D)		
Disturbance /displacement	All relevant designated sites and their features listed in **Table 10.27**	Short-term **minor adverse**
Habitat loss and / or alteration	All relevant designated sites and their features listed in **Table 10.27**	Short-term **negligible** to **minor adverse**

12.1.34. A long-term **minor adverse** impact is predicted on designated sites (see **Tables 7.15** and **10.28**) as a result of barrier effect during the operation phase for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, and for Dogger Bank Teesside A & B and all other projects.

12.1.35. A long-term **negligible** to **minor adverse** impact is predicted on designated sites (see **Table 7.17**) as a result of collisions during the operation phase for Dogger Bank Teesside A & B. During the operation phase for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D a long-term **minor adverse** impact is predicted on designated sites (see **Table 10.30**) as a result of collisions with the exception of a long-term **moderate adverse** cumulative impact on one designated site (see **Table 12.6** and discussed further in Section 12.2). The operation phase for Dogger Bank Teesside A & B and all other projects is predicted to result in long-term **minor adverse** cumulative impacts on designated sites (see **Table 10.30**) as a result of collisions with the exception of a long-term **moderate adverse** cumulative impact on the black-legged kittiwake, great black-backed gull, and northern gannet features of four designated sites (see **Table 12.6** and discussed further in Section 12.2).

12.1.36. A long-term **minor adverse** impact is predicted on the majority of designated sites (see **Table 7.13** and **Table 10.28**) as a result of habitat loss and / or alteration during the operation phase for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D. A **moderate adverse** cumulative impact is predicted on on the common guillemot and razorbill populations at four designated sites (see Section 12.2) as a result of habitat loss and / or alteration during the operation phase for Dogger Bank Teesside A & B and all other projects.

Decommissioning phase (see Table 12.6)

12.1.37. The impacts on designated sites (their seabird features) are predicted to be the same as those identified for the construction phase for Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, as described in paragraphs 12.1.31 to 12.1.32 above.

Summary of impacts on biogeographic populations and transboundary sites

Construction phase (see Table 12.7)

12.1.38. The construction phase impacts on the biogeographic populations of seabirds as a result of Dogger Bank Teesside A & B and Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D are similar in type and significance to those identified for national populations in paragraphs 12.1.3 to 12.1.7, ranging from **no impacts** on some species' biogeographic population, to short-term and temporary **negligible** to **minor adverse** on other seabird species' biogeographic populations.

12.1.39. The construction phase impacts on transboundary sites as a result of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D are similar in type and significance to those identified for designated sites in paragraphs 12.1.31 to 12.1.32 ranging from short-term **negligible** to **minor adverse** on impacts on transboundary sites (see list of sites in **Tables 11.1** and **11.2**).

Operation phase (see Table 12.7)

12.1.40. The operation phase impacts on the biogeographic populations of seabirds as a result of Dogger Bank Teesside A & B, and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, and the Dogger Bank Teesside A & B and all other projects are similar in type and significance to those identified for national populations in paragraphs 12.1.8 to 12.1.15, ranging from **no impacts** on some species' biogeographic population, to short-term and temporary **negligible** to **minor adverse** on other seabird species' biogeographic populations. No moderate or major impacts have been predicted at the biogepgraphic population level for any species.

Table 12.7 Summary of the impacts on transboundary sites and biogeographic populations of seabirds and migrant birds

Description of impact	Receptor	Residual impact
Construction phase (Dogger Bank Teesside A & B)		
Disturbance / displacement	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar	**No impact**
	Populations of little auk and white billed diver	Short-term **negligible**
	Populations of Atlantic puffin, common guillemot, northern gannet, and razorbill	Short-term **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.1**	Short-term **minor adverse**
Disturbance during landfall activities	Populations of black-headed gull, dunlin, Eurasian oystercatcher, herring gull, and ruddy turnstone	Short-term and temporary **negligible**
	Populations of northern lapwing, ringed plover, and sanderling	Short-term and temporary **minor adverse**
Habitat loss and / or alteration	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, little auk, northern fulmar, northern gannet, and white-billed diver	Short-term and temporary **negligible**
	Populations of Atlantic puffin, common guillemot, and razorbill	Short-term and temporary **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.1**	Short-term **minor adverse**
Construction phase (Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D)		
Disturbance / displacement	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar	**No impact**
	Populations of little auk and white billed diver	Short-term **negligible**
	Populations of Atlantic puffin, common guillemot, northern gannet, and razorbill	Short-term **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.2**	Short-term **minor adverse**
Habitat loss and / or alteration	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, little auk, northern fulmar, northern gannet, and white-billed diver	Short-term and temporary **negligible**
	Populations of Atlantic puffin, common guillemot, and razorbill	Short-term and temporary **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.2**	Short-term **negligible** to **minor adverse**
Operational phase (Dogger Bank Teesside A & B)		
Disturbance / displacement	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar	**No impact**
	Populations of little auk and white billed diver	Long-term **negligible**
	Populations of Atlantic puffin, common guillemot, northern gannet, and razorbill	Long-term **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.3**	Long-term **minor adverse**

Description of impact	Receptor	Residual impact
Barrier effect	Populations of Arctic skua, Atlantic puffin, great black-backed gull, great skua, lesser black-backed gull, little auk, and white billed diver	**No impact**
	Populations of black-legged kittiwake, common guillemot, northern fulmar, northern gannet, and razorbill	Long-term **minor adverse**
	All migrant birds and their populations (see **Table 7.7** for species list)	Long-term **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.5**	Long-term **minor adverse**
Collisions	Populations of little auk and white billed diver	Long-term **negligible**
	Populations of Arctic skua, Atlantic puffin, black-legged kittiwake, common guillemot, great black-backed gull, great skua, lesser black-backed gull, northern fulmar, northern gannet, and razorbill	Long-term **minor adverse**
	All migrant birds and their populations (see **Table 7.11** for species list)	Long-term **negligible** to **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.7**	Long-term **negligible** to **minor adverse**
Habitat loss and / or alteration	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, little auk, northern fulmar, northern gannet, and white-billed diver	Long-term **negligible**
	Populations of Atlantic puffin, common guillemot, and razorbill	Long-term **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.3**	Long-term **minor adverse**
Operation phase (Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D)		
Disturbance / displacement	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar	**No impact**
	Populations of little auk and white billed diver	Long-term **negligible**
	Populations of Atlantic puffin, common guillemot, northern gannet, and razorbill	Long-term **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.4**	Long-term **minor adverse**
Barrier effect	Populations of Arctic skua, Atlantic puffin, great black-backed gull, great skua, lesser black-backed gull, little auk, and white billed diver	**No impact**
	Populations of black-legged kittiwake, common guillemot, northern fulmar, northern gannet, and razorbill	Long-term **minor adverse**
	All migrant birds and their populations (see **Table 10.12** for species list)	Long-term **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.6**	Long-term **minor adverse**

Description of impact	Receptor	Residual impact
Collisions	Populations of little auk and white billed diver	Long-term **negligible**
	Populations of Arctic skua, Atlantic puffin, black-legged kittiwake, common guillemot, great black-backed gull, great skua, lesser black-backed gull, northern fulmar, northern gannet, and razorbill	Long-term **minor adverse**
	All migrant birds and their populations (see **Table 10.16** for species list)	Long-term **negligible** to **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.8**	Long-term **minor adverse**
Habitat loss and / or alteration	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, little auk, northern fulmar, northern gannet, and white-billed diver	Long-term **negligible**
	Populations of Atlantic puffin, common guillemot, and razorbill	Long-term **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.4**	Long-term **minor adverse**
Operation phase (Dogger Bank Teesside A & B and all other projects)		
Disturbance / displacement during construction / operation / decommissioning	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar	**No impact**
	Populations of little auk and white billed diver	Long-term **negligible**
	Populations of Atlantic puffin, common guillemot, northern gannet, and razorbill	Long-term **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.4**	Long-term **minor adverse**
Collisions	Populations of common scoter, little auk and white billed diver	Long-term **negligible**
	Populations of Arctic skua, Atlantic puffin, barnacle goose (Svalbard population), black-legged kittiwake, common guillemot, great black-backed gull, great skua, lesser black-backed gull, northern fulmar, northern gannet, and razorbill	Long-term **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.8**	Long-term **minor adverse**
Decommissioning phase (Dogger Bank Teesside A & B)		
Disturbance / displacement	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar	**No impact**
	Populations of little auk and white billed diver	Short-term and temporary **negligible**
	Populations of Atlantic puffin, common guillemot, northern gannet, and razorbill	Short-term and temporary **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.1**	Short-term **minor adverse**

Description of impact	Receptor	Residual impact
Habitat loss and / or alteration	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, little auk, northern fulmar, northern gannet, and white-billed diver	Short-term and temporary **negligible**
	Populations of Atlantic puffin, common guillemot, and razorbill	Short-term and temporary **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.1**	Short-term **minor adverse**
Decommissioning phase (Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D)		
Disturbance / displacement	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, and northern fulmar	**No impact**
	Populations of little auk and white billed diver	Short-term and temporary **negligible**
	Populations of Atlantic puffin, common guillemot, northern gannet, and razorbill	Short-term and temporary **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.2**	Short-term **minor adverse**
Habitat loss and / or alteration	Populations of Arctic skua, black-legged kittiwake, great black-backed gull, great skua, lesser black-backed gull, little auk, northern fulmar, northern gannet, and white-billed diver	Short-term and temporary **negligible**
	Populations of Atlantic puffin, common guillemot, and razorbill	Short-term and temporary **minor adverse**
	All relevant transboundary sites and their features listed in **Table 11.2**	Short-term **negligible** to **minor adverse**

12.1.41. The operation phase impacts on transboundary sites as a result of Dogger Bank Teesside A & B, and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D, and the Dogger Bank Teesside A & B and all other projects are similar in type and significance to those identified for designated sites in paragraphs 12.1.33 to 12.1.36. However, only long-term **negligible** to **minor adverse** cumulative impacts are predicted on transboundary sites (see **Tables 11.3**, **11.4**, **11.5**, **11.6**, **11.7**, and **11.8** for list of sites), and no moderate or major impacts have been predicted for any transboundary sites.

Decommissioning phase (see Table 12.7)

12.1.42. The decommissioning phase impacts on biogeographic populations and transboundary sites as a result of Dogger Bank Teesside A & B and cumulatively for Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D are predicted to be the same as those identified for the construction phase, see paragraphs 12.1.38 and 12.1.39 above.

12.2. Consideration of moderate adverse impacts

12.2.1. No moderate adverse impacts were predicted on the national and biogeographic populations of seabirds and migrant birds (including BAP and OSPAR threatened species) and designated sites as a result of displacement, barrier effects, collisions, or habitat loss and / or alteration as a result of the construction, operation, and decommissioning of Dogger Bank Teesside A & B alone.

12.2.2. No moderate adverse cumulative impacts were predicted on the national and biogeographic populations of seabirds and migrant birds (including BAP and OSPAR threatened species) and designated sites as a result of displacement, barrier effects, or habitat loss and / or alteration as a result of the construction, operation, and decommissioning of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D. However, as identified in **Table 12.6**, whilst long-term **minor adverse** impacts were predicted for the majority of designated and transboundary sites, a **moderate adverse** impact is predicted on the Flamborough Head SSSI (and pSPA) due to the collision impact on the black-legged kittiwake population of the site.

12.2.3. No moderate adverse cumulative impacts were predicted on the national and biogeographic populations of seabirds and migrant birds (including BAP and OSPAR threatened species) and designated sites as a result of barrier effects or habitat loss and / or alteration as a result of the construction, operation, and decommissioning of Dogger Bank Teesside A & B and all other projects. However, as identified in **Table 12.3** and **Table 12.6**, whilst long-term **minor adverse** impacts were predicted for the majority of national and biogeographic populations of seabirds and migrant birds (including BAP and OSPAR threatened species) and designated and transboundary sites, **moderate adverse** impacts have been predicted for the following based on current information:

- National population of great black backed gull, lesser black-backed gull, and northern gannet due to collisions as a result of Dogger Bank Teesside A & B and all other projects;
- Buchan Ness to Collieston Coast SPA (and component SSSIs) - disturbance and displacement affecting the common guillemot population, and habitat loss and / or alteration affecting the common guillemot population;
- East Caithness Cliffs SPA (and component SSSIs) – collisions affecting the great black-backed gull population;
- Flamborough Head SSSI (and pSPA) – collisions affecting the black-legged kittiwake and northern gannet populations;
- Forth Islands SPA (and component SSSIs) – collisions affecting the black-legged kittiwake population, and habitat loss and / or alteration affecting the common guillemot and razorbill populations;
- Fowlsheugh SSSI (and SPA) – habitat loss and / or alteration affecting the common guillemot and razorbill populations; and

- St Abb's Head to Fast Castle SSSI (and SPA) – habitat loss and / or alteration affecting the common guillemot and razorbill populations.

12.2.4. Mitigation has been undertaken to reduce and minimise the potential impacts on seabirds, migrant birds and their respective designated site (see paragraph 3.3.56) resulting in a maximum of 200 turbines for Dogger Bank Teesside A and Dogger Bank Teesside B and also for Dogger Bank Creyke Beck A, Dogger Bank Creyke Beck B, Dogger Bank Teesside C and Dogger Bank Teesside D, as well as raising the lowest rotor height above sea level for the turbines (from 22m to 26m).

12.2.5. It should be noted that with respect to the great black-backed gull and lesser black-backed gull populations and the predicted **moderate adverse impact** on the national population due to collisions as a result of Dogger Bank Teesside A & B and all other projects has been based using the lowest population estimates. The assessment has not distributed the numbers affected between the national and the *intermedius*[2] population of these species that are likely to be present. It is considered that if apportionment was further undertaken between populations and their derivation (i.e. the different populations) the magnitude of the potential mortality numbers on these species would reduce. Consequently, the impact from Dogger Bank Teesside A & B and other projects is not expected to be significant in relation to the national population of great black-backed gull and lesser black-backed gull.

12.2.6. It should be noted that with respect to the national population of northern gannet and the predicted **moderate adverse** cumulative impact due to collisions as a result of Dogger Bank Teesside A & B and all other projects, Dogger Bank Teesside A & B contribute 68 birds out of the total 3,627 (or 1.87%) as shown on **Table 10.24**, with Dogger Bank Creyke Beck A & B, Dogger Bank Teesside A & B and Dogger Bank Teesside C & D combined, contributing 217 to the total (see **Table 10.13**), an increase of 0.4% to background mortality at the national population level.

12.2.7. It should be noted that the **moderate adverse** impacts as a result of Dogger Bank Teesside A & B cumulatively with other projects described in paragraph 12.2.3 above (and in more detail in Section 10.4) result from over-estimation of mortality on common guillemot from disturbance and displacement and subsequent assumption of 100% on the Buchan Ness to Collieston Coast SPA (and component SSSIs) of the EOWDC project's displacement quantities. Given this and the negligible contribution to mortality from Dogger Bank Teesside A & B (see paragraphs 10.4.44 and 10.4.45) it is considered that the impact from Dogger Bank Teesside A & B is not expected to be significant with respect to the common guillemot population of the Buchan Ness to Collieston Coast SPA (and component SSSIs). Similarly, with respect to the **moderate adverse** cumulative impact on the common guillemot population due to habitat loss and / or alteration as a result of Dogger Bank Teesside A & B and all other projects, as stated in paragraph 12.2.7 above, the significance has derived from the assessment carried out for the Firth of Forth Alpha and Bravo projects, whilst

[2] *Intermedius* is a 'race' of lesser black-backed gull (*Larus fuscus intermedius*) native to the Netherlands, Denmark and Norway.

the contribution from Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B, and Dogger Bank Teesside C & D has been assessed as negligible.

12.2.8. With respect to the **moderate adverse** impact as a result of Dogger Bank Teesside A & B cumulatively with other projects on the East Caithness Cliffs SPA (and component SSSIs) due to collisions affecting the great black-backed gull population, it is noted that 100% of the site's population is predicted to be affected by the Beatrice project. There are a number of other sites supporting this species within foraging range and it is highly possible that birds originate outwith the designated site, particularly as most birds occurred outside the breeding season. Given that 100% of the project's collision numbers are apportioned to this site and, furthermore, Dogger Bank Teesside A & B contributes a negligible quantity (see paragraph 10.4.49, which indicates all Dogger Bank projects would contribute less than 1 collision each year). Therefore, it is considered that the impact from Dogger Bank Teesside A & B is not expected to be significant with respect to the great black-backed gull population of the East Caithness Cliffs SPA (and component SSSIs).

12.2.9. With respect to the **moderate adverse** impact as a result of Dogger Bank Teesside A & B cumulatively with other projects on the Flamborough Head SSSI (and pSPA) due to collisions affecting the black-legged kittiwake and northern gannet populations, it is noted that 100% of the Triton Knoll project's black-legged kittiwake mortality was apportioned to the site. Given that other sites supporting this species are within foraging range of Triton Knoll it is evident that over apportionment has been undertaken. Similarly for northern gannet, 100% of the Triton Knoll and Dudgeon projects' northern gannet mortality was apportioned to the site (see paragraph 10.4.50). Natural England indicated that a harvest of up to 113 northern gannets (of any age) per year would result in only a 5% chance of affecting long -term success of the Flamborough Head SSSI (and Flamborough and Filey Coast pSPA formerly the Flamborough Head and Bempton Cliffs SPA) population, based on Potential Biological Removal (PBR) calculations carried out as part of the Triton Knoll Offshore Wind Farm assessment (RWE Npower Renewables, 2012). Recent information (albeit not the population figures at Flamborough Head) regarding the increasing population of northern gannet at Flamborough Head SSSI (see Aitken *et al*. (2012) referenced in Natural England (2013)) and further work undertaken for Triton Knoll indicated that a PBR of between 286 to 393 adult birds would be the point whereby population growth would not be sustained. Given that the cumulative collisions of Dogger Bank Teesside A & B and all other projects is predicted to result in 203 adult northern gannets being affected annually, this amount falls below the PBR threshold. The Triton Knoll PBR calculations in relation to black-legged kittiwake, as recorded in the Ornithology Statement of Common Ground between Natural England, JNCC and RWE Npower Renewables, provide a PBR figure of 381 of adult kittiwake that could be removed annually from the Flamborough and Filey Coast pSPA, formerly the Flamborough Head and Bempton Cliffs SPA (and Flamborough Head SSSI) population without having a detrimental effect on the sustainable growth of the population. Further calculations, as part of the Hornsea Project One HRA (SMart Wind, 2013), indicate that a PBR of 1,023 adult black-legged kittiwake could be removed annually from the Flamborough and Filey Coast pSPA, formerly the Flamborough Head and Bempton Cliffs SPA (and Flamborough Head SSSI) population without having a detrimental effect on the sustainable growth of the population. Given that the total number of collisions (411 adult black-legged kittiwake) as a result of Dogger Bank Teesside A & B and all other projects would not exceed the PBR threshold likely to result in a reduction in the population, it is therefore considered that the impact from Dogger Bank Teesside A & B is not expected to be significant with respect to the long-term sustainability of the black-legged kittiwake and northern gannet population of the Flamborough Head SSSI (and Flamborough and Filey Coast pSPA). This is particularly the case when noting that the magnitude of the potential mortality on the black-legged kittiwake and northern gannet populations would reduce if apportioning of the impacted bird numbers were attributed to other sites that are within foraging range of Triton Knoll and Hornsea Project One.

12.2.10. With respect to the **moderate adverse** cumulative impact on the common guillemot and razorbill populations of the Forth Islands SPA (and component SSSIs) due to habitat loss and / or alteration as a result of Dogger Bank Teesside A & B and all other projects, as stated in paragraph 12.2.7 above, the significance has derived from the assessment carried out for the Firth of Forth Alpha and Bravo projects, whilst the contribution from Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B, and Dogger Bank Teesside C & D has been assessed as negligible.

12.2.11. With respect to the **moderate adverse** cumulative impact on the common guillemot and razorbill populations of the Fowlsheugh SSSI (and SPA) due to habitat loss and / or alteration as a result of Dogger Bank Teesside A & B and all other projects, as stated in paragraph 12.2.7 above, the significance has derived from the assessment carried out for the Firth of Forth Alpha and Bravo projects, whilst the contribution from Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B, and Dogger Bank Teesside C & D has been assessed as negligible.

12.2.12. With respect to the **moderate adverse** cumulative impact on the common guillemot and razorbill populations of the St Abb's Head to Fast Castle SSSI (and SPA) due to habitat loss and / or alteration as a result of Dogger Bank Teesside A & B and all other projects, as stated in paragraph 12.2.7 above, the significance has derived from the assessment carried out for the Firth of Forth Alpha and Bravo projects, whilst the contribution from Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B, and Dogger Bank Teesside C & D has been assessed as negligible.

13. References

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