MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

Great black-backed gull regional populations

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Image of an offshore wind farm

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Term	Meaning
Applicant	Morgan Offshore Wind Limited.
Collision risk	Risk of a bird lethally colliding with a wind turbine within a wind farm.
Collision risk model	A model that calculates collision risk for a species within a wind farm based on a set of wind farm and bird species specific parameters. Collision risk models can be run deterministically or stochastically.
Morgan Offshore Wind Project: Generation Assets	This is the name given to the Morgan Generation Assets project as a whole (includes all infrastructure and activities associated with the project construction, operations and maintenance, and decommissioning).
Season	Bird behaviour and abundance is recognised to differ across a calendar year, with particular months recognised as being part of different seasons. The biologically defined minimum population scales (BDMPS) seasons used in this note are based on those in Furness (2015), hereafter referred to as seasons. Separate seasons are recognised in this note in order to establish the level of importance any seabird species has within the study area during any particular period of time.

Acronyms

Acronym	Description
BDMPS	Biologically Defined Minimum Population Scale
BTO	British Trust for Ornithology
EIA	Environmental Impact Assessment
EWG	Expert Working Group
HRA	Habitats Regulations Assessment
JNCC	Joint Nature Conservation Committee
NRW	Natural Resources Wales
PEIR	Preliminary Environmental Information Report
PVA	Population Viability Analysis
SNCB	Statutory Nature Conservation Body
SPA	Special Protection Areas

Units

Unit	Description
km	Kilometre
m	Metre
%	Percentage

1 GREAT BLACK-BACKED GULL REGIONAL POPULATIONS

1.1 Introduction

1.1.1.1 As part of the meeting with the Statutory Nature Conservation Bodies (SNCBs) on 29 August 2024, Natural England highlighted that the regional populations for great black-backed gull *Larus marinus* had been updated to correct an error. A corrected version was sent to the Applicant on 26 March 2024 but, due to the stage of the application, this update could not be incorporated into the assessments presented in Volume 2, Chapter 5: Offshore ornithology (APP-023). The advice from Natural England accompanying the corrected version stated:

Natural Resources Wales and Natural England have produced a formal interim advice note on offshore ornithology issues for EIA scale impact assessments, regarding demographic rates, EIA scale mortality rates and reference populations for use in offshore wind impact assessments.

We recognize that it may not be possible to incorporate this guidance into your DCO submission given the timings, and so a discussion with NE is needed regarding when any updates (if required) to your assessment might be appropriate.

1.1.1.2 This note therefore considers the implications the use of this updated regional population may have on the assessments presented in Volume 2, Chapter 5: Offshore ornithology (APP-023).

1.1.1.3 A full description of the differences between the approaches used by the Applicant and the SNCBs to derive regional populations is provided in Annex 3.9 to the Applicant's response to the Relevant Representation by Natural England (RR-026.B.36) (PD1-016).

1.1.1.4 This matter has no impact on the assessments provided as part of the Morgan Generation Assets Habitats Regulations Assessment (HRA) process which utilises populations for individual colonies within assessments.

1.2 Implications for assessments

1.2.1 Project alone assessment

1.2.1.1 This section considers the assessment for great black-backed gull in Volume 2, Chapter 5: Offshore ornithology (APP-023) in relation to collision risk associated with the Morgan Generation Assets alone. This is the only assessment for the project alone that may be affected by an updated regional population.

1.2.1.2 The Applicant applied a different approach to calculating regional populations for use in the assessments for the Morgan Generation Assets alone. This approach resulted in a smaller regional population being used in the assessments for all species, except for Manx shearwater and gannet (see Annex 3.9 to the Applicant's response to the Relevant Representation by Natural England (RR-026.B.36) (PD1-016)).

1.2.1.3 The regional populations provided by Natural England in their advice note provided on 26 March 2024 are compared to the regional populations used by the Applicant in Volume 2, Chapter 5: Offshore ornithology (APP-023) in Table 1.1.

Table 1.1: Comparison of regional populations for great black-backed gull used by the Applicant in the project alone assessment and those recommended by Natural England.

Stakeholder	Regional populations (no. of birds)		
	Breeding season	Non-breeding season	Annual
Applicant	999	17,742	17,742
Natural England	13,424	17,742	17,742

1.2.1.4 The project alone assessments in Volume 2, Chapter 5: Offshore ornithology (APP-023) used regional populations that were either the same as or lower than the populations recommended by Natural England. This means that when comparing predicted impacts to the regional population, the assessment conducted by the Applicant in Volume 2, Chapter 5: Offshore ornithology (APP-023) will predict either the same magnitude of impact (non-breeding season) or a higher magnitude of impact (breeding season) than would be achieved by using the regional population recommended by Natural England.

1.2.2 Cumulative assessment

1.2.2.1 Cumulative assessments incorporate projects located across large spatial scales with projects considered cumulatively, potentially affecting different populations of birds than the focal project alone would. This therefore has implications for the biogeographic populations against which impacts are assessed. Previous offshore wind farm assessments have used the same regional populations for project alone and cumulative assessments, accepting that this has the potential within cumulative assessments to over-estimate the potential impact. The derivation of regional populations was a topic of discussion during pre-application EWG meetings. Through these discussions, the Applicant decided to utilise a different approach to the calculation of regional breeding populations for cumulative assessments (when compared to the approach applied for the project alone assessments), which attempts to account for the larger number of colonies potentially impacted by cumulative projects. The approach applied was consistent with the approach recommended by the EWG.

1.2.2.2 During the SNCB meeting on 29 August 2024, Natural England highlighted that the regional populations for great black-backed gull, that were recommended for use in Volume 2, Chapter 5: Offshore ornithology (APP-023), had been updated to correct an error. A comparison between the regional populations used by the Applicant in Volume 2, Chapter 5: Offshore ornithology (APP-023) and those now recommended by Natural England is provided in Table 1.2.

Table 1.2: Comparison of regional populations for great black-backed gull used by the Applicant in the cumulative assessment and recommended by Natural England.

Stakeholder	Regional populations (no. of birds)		
	Breeding season	Non-breeding season	Annual
Applicant	44,753	17,742	44,753
Natural England	13,424	17,742	17,742

1.2.2.3 The regional population in the breeding season applied by the Applicant in Volume 2, Chapter 5: Offshore ornithology (APP-023) is therefore different to that now recommended by Natural England. As the updated regional population in the breeding season is also lower than the regional population in the non-breeding season, the annual regional population also differs. The cumulative assessment for great black-backed gull is therefore repeated in section 1.3 using Natural England's latest recommended regional populations.

1.3 Cumulative assessment

1.3.1.1 The expected mean seasonal and annual collision mortality for great black-backed gull has been compiled for relevant wind farms and is shown in Table 1.3. Totals for each scenario to be considered in the cumulative assessment are provided in Table 1.3.

1.3.1.2 Projects considered to act cumulatively with the Morgan Generation Assets in the breeding season are those within the mean-maximum foraging range (+1 Standard Deviation (SD)) of great black-backed gull from colonies within the mean-maximum foraging range (+1SD) of great black-backed gull from the Morgan Generation Assets. In simple terms, this therefore includes all projects within a radius of twice the foraging range of great black-backed gull from the Morgan Generation Assets.

1.3.1.3 In the non-breeding seasons, projects considered to act cumulatively with the Morgan Generation Assets are those within the relevant Biologically Defined Minimum Population Scale (BDMPS) area from Furness (2015). The seasonal extents used are consistent with those used in the assessment for the Morgan Generation Assets. All collision risk estimates are calculated using an avoidance rate of 99.91% (Ozsanlav-Harris *et al.,* 2023). Collision risk estimates presented in brackets in Table 1.3 are calculated using an avoidance rate of 99.39%, as advocated by the EWG and, for the Morgan Generation Assets, represent collision risk estimates calculated using parameters as advocated by the EWG.

Table 1.3: Expected seasonal and annual collision mortality across relevant wind farms for great black-backed gull.

Note: Values in brackets are calculated using an avoidance rate of 99.39%, as advocated by the EWG and, for the Morgan Generation Assets, represent collision risk estimates calculated using parameters as advocated by the EWG.

Project	Breeding	Non-breeding	Total
Tier 1			
Awel y Môr	0.8	0.1	0.9
Burbo Bank	Unavailable – see Table 1.4		
Burbo Bank Extension	Unavailable – see Table 1.4		
Erebus	0.0	0.1	0.1
Gwynt y Môr	Unavailable – see Table 1.4		
Mona Offshore Wind Project	0.3	0.5	0.7
Ormonde	0.0	0.0	0.0
Rampion	0.7	3.9	4.7
Rampion 2	0.9	2.0	3.0
Robin Rigg	Unavailable – see Table 1.4		
Twinhub	1.0	1.4	2.3
Walney 1 & 2	Unavailable – see Table 1.4		
Walney 3 & 4	0.7	4.4	5.1
West of Duddon Sands	Unavailable – see Table 1.4		
White Cross	0.1	0.0	0.1
Tier 2			
Morecambe Offshore Wind Farm: Generation Assets	0.1	0.1	0.1
Morgan Generation Assets	0.1 (1.1)	0.6 (4.6)	0.7 (5.7)
Scenario Totals			
Scenario 2: Morgan Generation Assets + Morecambe Offshore Windfarm Generation Assets + Transmission Assets			**0.9 (6.7)**
Scenario 3: Morgan Generation Assets + Transmission Assets + Tier 1, Tier 2, Tier 3 projects			**17.8 (121.6)**

1.3.1.4 There are a number of projects for which collision risk estimates are unavailable. This is due to various factors including species not being included in collision risk modelling or projects not having conducted collision risk modelling. To ensure these projects are considered in this assessment, project-specific documents have been reviewed to provide a qualitative assessment of collision for each project. This process is summarised in Table 1.4. Cross reference is also provided to Annex 4.5 to Response to Hearing Action Point 15: Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects Note (REP1-010) in the final conclusion where quantitative calculation of annual collision risk totals are provided.

Table 1.4: Qualitative assessment of projects considered cumulatively with the Morgan Generation Assets for which quantitative consideration of collision risk was not undertaken in project-specific documentation for great black-backed gull.

Project	Reason for estimates being unavailable	Qualitative assessment	Final conclusion
Tier 1			
Burbo Bank (Seascape Energy Ltd., 2002)	Species not included in collision risk modelling.	The assessment of collision risk was undertaken on a qualitative basis by investigating flight heights of birds at the project site and was undertaken for species considered to be of International or National importance in the context of the assessments undertaken for the project. Great black-backed gull was not considered to be a species of International or National importance. Surveys of the project comprised aerial and boat-based surveys both of which were undertaken during winter months (aerial undertaken during November to April and boat-based undertaken during December and February). Aerial surveys covered a large area encompassing the Liverpool Bay SPA with boat-based surveys covering the project area. The surveys were undertaken to provide abundance and distribution data for those species considered to be of most importance, namely common scoter *Melanitta nigra* and red-throated diver *Gavia stellata*. Great black-backed gull was not recorded during boat-based surveys, and relatively low numbers were recorded during aerial surveys.	No assessment was conducted for great black-backed gull in relation to collision risk impacts. Great black-backed gull was not considered to be a species of International or National importance in the context of the assessments undertaken. S_D1_4.5 Annex 4.5 to Response to Hearing Action Point 15: Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects Note (REP1-010) calculated an annual collision risk total of 0.3 collisions/annum for the Burbo Bank Offshore Wind Farm.

Project	Reason for estimates being unavailable	Qualitative assessment	Final conclusion
Burbo Bank Extension (DONG Energy, 2013)	Species not included in collision risk modelling.	Collision risk modelling was undertaken. However, great black-backed gull was not included. Site-specific data consisted of six boat-based surveys undertaken between April and September 2011 and six aerial surveys undertaken between November 2010 and April 2011. The peak population of great black-backed gull recorded during boat-based surveys was 18 birds with an average of eight birds. During aerial surveys, great black-backed gulls were recorded in all but one survey, but in small numbers (peak population of 90 birds). The species was considered to be of regional/local importance in the context of the assessment for the project.	No assessment was conducted for great black-backed gull in relation to collision risk impacts. S_D1_4.5 Annex 4.5 to Response to Hearing Action Point 15: Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects Note (REP1-010) calculated an annual collision risk total of 1.0 collisions/annum for the Burbo Bank Extension Offshore Wind Farm.
Walney 1 & 2 (RPS, 2006b)	Species not included in collision risk modelling.	Site-specific surveys, including boat-based surveys, were undertaken across an area of 512 km^2 in the vicinity of the project between May 2004 and September 2005. The project also utilised survey data collected by regional aerial surveys, undertaken across the NW3 aerial survey area between 2002 and 2006, and radar survey data collected between 01 October and 29 October 2005. The peak population of great black-backed gull recorded in the project area plus 2 km buffer during aerial surveys was 43 birds. In boat-based surveys the equivalent population was 65 birds. The proportion of flying great black-backed gulls recorded above 15 m was 28.7 % across all boat-based surveys, although the total number of flying birds was low (108 records). Great black-backed gull was deemed to be a species of medium importance (termed sensitivity in the Walney 1 & 2 assessments). Great black-backed gull was not included in collision risk modelling, and it was considered that, due to the very low numbers of birds recorded at rotor height, the magnitude of collision was negligible.	Very low significance. S_D1_4.5 Annex 4.5 to Response to Hearing Action Point 15: Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects Note (REP1-010) calculated an annual collision risk total of 1.3 collisions/annum for the Walney 1 & 2 Offshore Wind Farm.

Project	Reason for estimates being unavailable	Qualitative assessment	Final conclusion
West of Duddon Sands (RSKENSR, 2006)	Species not included in collision risk modelling.	Site-specific surveys included boat-based surveys undertaken across an area of 512 km^2 in the vicinity of the project between May 2004 and September 2005. The project also utilised survey data collected by regional aerial surveys, undertaken across the NW3 aerial survey area between 2002 and 2006 and radar survey data collected between 01 October and 29 October 2005. The peak population of great black-backed gull recorded in the project area plus 2 km buffer during aerial surveys was 2 birds. In boat-based surveys the equivalent population was 661 birds. The proportion of flying great black-backed gulls recorded above 15 m was 28.7 % across all boat-based surveys, although the total number of flying birds was low (108 records). Great black-backed gull was deemed to be a species of medium importance (termed sensitivity in the West of Duddon Sands assessments).	Very low significance. S_D1_4.5 Annex 4.5 to Response to Hearing Action Point 15: Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects Note (REP1-010) calculated an annual collision risk total of 1.2 collisions/annum for the West of Duddon Sands Offshore Wind Farm.
Gwynt y Môr (RWE Group and Npower Renewables, 2005)	Species not included in collision risk modelling.	Site-specific surveys undertaken in support of the project included boat-based surveys undertaken between February 2003 and March 2005. Surveys between February 2003 and February 2004 covered a large area along the Welsh coast incorporating the project area, with surveys between March 2004 and March 2005 more focussed on the project area. The assessment also used data from aerial surveys undertaken between 2000 and 2005 which were targeted at recording common scoter. During boat-based surveys used to characterise the project undertaken between 2004 to 2005 (covering an area considered by the project assessment to better represent the behaviour of birds than in 2003-04), 8,900 bird observations were obtained with only 22 flights recorded at a height of greater than 20 m. In these surveys, 70 great black-backed gull were recorded in flight with only 2.9% of these flying above 20 m.	Low significance due to low proportion of flight heights recorded at collision height. S_D1_4.5 Annex 4.5 to Response to Hearing Action Point 15: Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects Note (REP1-010) calculated an annual collision risk total of 1.5 collisions/annum for the Gwynt y Môr Offshore Wind Farm.

Project	Reason for estimates being unavailable	Qualitative assessment	Final conclusion
Robin Rigg (Natural Power, 2002)	Species not included in collision risk modelling.	The project utilised site-specific boat-based surveys to characterise the baseline environment. Two surveys were completed in each month from May 2001 for one year. In addition, aerial surveys were undertaken from November 2001 on a monthly basis through winter and spring to verify the distribution and abundance of seaduck. The mean count of great black-backed gull during boat-based surveys in the wind farm was 0.1 birds with a peak of 1 bird. Great black-backed gull was not assigned an importance rating. The proportion of great black-backed gull flying above 20 m during boat-based surveys across the entire study area was 16%. A qualitative assessment was undertaken for ‘other seabirds’ (a category that included gulls) and it was considered that collision rates would be low/negligible.	Low/Very low significance. S_D1_4.5 Annex 4.5 to Response to Hearing Action Point 15: Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects Note (REP1-010) calculated an annual collision risk total of 0.6 collisions/annum for the Robin Rigg Offshore Wind Farm.

1.3.2 Scenario 2: Morgan Generation Assets together with the Morecambe Offshore Windfarm: Generation Assets and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets

1.3.2.1 The total collision risk for great black-backed gull associated with the Morgan Generation Assets and Morecambe Offshore Windfarm: Generation Assets is 0.9 collisions/annum. This represents a 0.05% increase in the baseline mortality of the largest BDMPS population. When applying the assumptions advocated by Natural England, the total collision risk is 6.7 collisions/annum. This represents a 0.40% increase in the baseline mortality of the SPA population.

1.3.2.2 Great black-backed gull was rated as one of the most vulnerable seabird species to collision impacts by Wade *et al*. (2016), due to the proportion of flights likely to occur at potential risk height and percentage of time in flight. In terms of nocturnal activity rate, great black-backed gull are considered to have a medium rate of activity at night with a score of 3 (out of 5) (Wade *et al*., 2016).

1.3.2.3 The abundance of breeding great black-backed gull in the UK has changed relatively little in recent years (JNCC, 2020). The species is deemed to have a medium recoverability due to a relatively high reproductive potential and the stable trend in breeding abundance.

1.3.2.4 Great black-backed gull is considered to be of regional conservation value due to the abundance of the species recorded during site-specific surveys.

1.3.2.5 Great black-backed gull is deemed to be of very high vulnerability, medium recoverability and regional value. The sensitivity of the receptor is therefore, considered to be medium.

1.3.2.6 Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be medium. The cumulative effect will, therefore, be of **negligible adverse** significance, which is not significant in EIA terms. This is the same conclusion of significance as presented within Volume 2, Chapter 5: Offshore Ornithology (APP-023).

1.3.3 Scenario 3: Tier 1, Tier 2 and Tier 3: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and other relevant projects and plans.

1.3.3.1 The total collision risk for great black-backed gull associated with the Morgan Generation Assets and other projects is 17.8 collisions/annum. This represents a 1.06% increase in the baseline mortality of the largest BDMPS population. When applying the assumptions advocated by Natural England, the total collision risk is 121.6 collisions/annum. This represents a 7.23% increase in the baseline mortality of the SPA population. As these impacts represent more than a 1% increase in the baseline mortality of the BDMPS population, population modelling has been conducted.

1.3.3.2 Two Population Viability Analysis (PVA) models have been run for the BDMPS population for great black-backed gull which incorporate different survival rates. The first of these rates is based on guidance in Horswill and Robinson (2015) which suggests the use of survival data for other large gull species (in this case survival rate data for herring gull has been used). The second rate represents survival data reported as part of the BTO's Retrap Adult Survival project which has been collected subsequent to the publication of Horswill and Robinson (2015), and is considered to be of moderate quality, therefore providing a relatively accurate survival trend (BTO, 2024). The input logs for these PVAs is provided in Appendix A. Scenarios modelled are outlined within Table 1.5 below and results in Table 1.6 and Table 1.7.

Table 1.5: Annual increases in great black-backed gull regional population baseline mortality rate as a result of collision mortality from cumulative projects using species-group (99.39) and species-specific (99.91) avoidance rates.

Scenario	Cumulative predicted adult mortalities	Population	Increase in baseline mortality	Decrease in survival rate
Applicant – Avoidance rate 99.91	17.8	17,742	1.06%	0.001003511
Natural England – Avoidance rate 99.39	121.6	17,742	7.23%	0.006853728

Table 1.6: PVA results for great black-backed gull for the regional population (survival rate = Horswill and Robinson, 2015)

Year	Impact scenario	Simulated population size	Median population change (%)	Median growth rate	Lower confidence limit of simulated growth rate	Upper confidence limit of simulated growth rate	Median CGR	Median CPS
2030	Baseline (unimpacted)	33,821	2.15	1.022	0.951	1.100	-	-
2030	Avoidance rate = 99.3%	33,791	2.04	1.020	0.949	1.098	0.999	0.999
2030	Avoidance rate = 99.91%	33,541	1.31	1.013	0.943	1.090	0.992	0.991
2065	Baseline (unimpacted)	72,077	115.29	1.022	1.012	1.031	-	-
2065	Avoidance rate = 99.3%	69,019	106.38	1.020	1.011	1.030	0.999	0.957
2065	Avoidance rate = 99.91%	53,449	59.91	1.013	1.003	1.022	0.992	0.742

Table 1.7: PVA results for great black-backed gull for the regional population (survival rate = BTO Retrap Adult Survival)

Year	Impact scenario	Simulated population size	Median population change (%)	Median growth rate	Lower confidence limit of simulated growth rate	Upper confidence limit of simulated growth rate	Median CGR	Median CPS
2030	Baseline (unimpacted)	68,892	5.19	1.052	0.879	1.180	-	-
2030	Avoidance rate = 99.3%	68,799	5.07	1.051	0.878	1.177	0.999	0.999
2030	Avoidance rate = 99.91%	68,342	4.37	1.044	0.869	1.170	0.992	0.992
2065	Baseline (unimpacted)	336,579	373.14	1.044	1.018	1.068	-	-
2065	Avoidance rate = 99.3%	322,432	353.24	1.043	1.017	1.067	0.999	0.958
2065	Avoidance rate = 99.91%	251,444	253.16	1.036	1.010	1.060	0.992	0.746

1.3.3.3 When assuming an impact of 17.8 collisions/annum the model predicts a median counterfactual of growth rate of 0.999 after 35 years (for both models). Under this impact scenario, the predicted counterfactual median impacted population size would be approximately 4.21% to 4.26% smaller compared to that which the model predicts would occur in the absence of any additional impact after 35 years. This is a relative reduction in population size (compared to that which might otherwise have arisen).

1.3.3.4 When assuming an impact of 121.6 collisions/annum the model predicts a median counterfactual of growth rate of 0.992 after 35 years (for both models). Under this impact scenario, the predicted counterfactual median impacted population size would be approximately 25.39% to 25.85% smaller compared to that which the model predicts would occur in the absence of any additional impact after 35 years. This is a relative reduction in population size (compared to that which might otherwise have arisen).

1.3.3.5 There are a number of uncertainties associated with the PVA modelling, these include:

- Over-estimation of cumulative impacts. The PVA modelling does not account for changes in the predicted cumulative impacts due to the decommissioning of projects considered cumulatively over the lifetime of the Morgan Generation Assets. The PVA metrics are therefore precautionary. Whilst there is potential for future projects to contribute to the cumulative impact predicted in Table 1.3, as many are yet to enter the planning system there is some uncertainty that remains in relation to whether these projects will come forward.
- No consideration has been made for density dependent compensation of demographic parameters within the modelled population, nor immigration, both of which could reduce the magnitude of any population change.

1.3.3.6 The Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects Note (S_D1_4.5 Annex 4.5 to Response to Hearing Action Point 15: Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects Note (REP1-010)) calculated a relative impact of 6.0 collisions/annum from those projects for which quantitative impacts are not available in project-specific documentation. As these impacts are relative impacts (due to the use of relative density data in the supporting calculations) it is not deemed appropriate to combine them with the absolute impact estimates provided in Table 1.3. However, it was concluded in the Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects Note (S_D1_4.5 Annex 4.5 to Response to Hearing Action Point 15: Offshore Ornithology CEA and In-combination Gap-filling of Historical Projects Note (REP1-010)) that the inclusion of these projects would not result in a material difference to the conclusions reached for great black-backed gull. This conclusion is considered to apply to the assessments presented here.

1.3.3.7 Avoidance rates for great black-backed gull used in collision risk modelling have been taken from Ozsanlav-Harris *et al.* (2023). The research conducted by Ozsanlav-Harris *et al*. (2023) reviews the approach to calculate the avoidance rate of specific species and groupings, comparing this to the approach by Cook (2021). The Ozsanlav-Harris *et al*. (2023) dataset contains information on collision data from 23 monitoring reports of 19 wind farms (including one offshore), encompassing 11 species or species groups spanning the years 2000 to 2019. Cook (2021) suggests that a minimum of 10 sites may be used as an arbitrary threshold sample size to inform the selection of species-specific avoidance rates over group-specific estimates. This threshold is surpassed by the dataset for great black-backed gull used in Ozsanlav-Harris *et al*. (2023) to calculate species-specific avoidance rates. It is therefore considered that the species-specific rate, specifically for great black-backed gull, represents the best available evidence for use in collision risk modelling.

1.3.3.8 In addition, Volume 4, Annex 5.3: Offshore Ornithology Collision Risk Modelling Technical Report (APP-055) reviews the evidence supporting the use of different flight speeds in collision risk modelling for great black-backed gull. Based on the evidence presented in Volume 4, Annex 5.3: Offshore Ornithology Collision Risk Modelling Technical Report (APP-055) it is considered that the best available evidence in relation to flight speed for great black-backed gull is the value presented by Skov *et al.* (2018) with this value supported by a larger sample size collected across all seasons than the value presented by Alerstam *et al.* (2007). The data associated with Skov *et al.* (2018) were also collected in UK waters in an area of sea that is considered similar to that in which the Morgan Generation Assets are located (i.e. not close to large breeding colonies) and more is known about the methodology employed to capture flight speed data. The value presented by Alerstam *et al.* (2007) is not considered representative of the flight speed of great black-backed gull due to the limited sample size and restricted seasonal coverage, and it is therefore considered that it should not be used for collision risk modelling. It is important to note that the avoidance rates calculated in Ozsanlav-Harris *et al*. (2023) utilise the flight speed data from Alerstam *et al.* (2007) to derive avoidance rates. This therefore introduces an element of uncertainty in collision risk modelling that may deviate from the use of flight speed data from Alerstam *et al.* (2007). However, the flight speeds from Alerstam *et al.* (2007) are not appropriate for use in collision risk modelling, as discussed in Volume 4, Annex 5.3: Offshore Ornithology Collision Risk Modelling Technical Report (APP-055), and it is considered that the use of these flight speed data introduces a much greater level of uncertainty in collision risk estimates calculated using those data.

1.3.3.9 The use of species-specific avoidance rates and more robust flight speeds from Skov *et al.* (2018) has a significant effect on the collision risk estimates not only for the Morgan Generation Assets, as illustrated in Table 1.3, but also for projects considered cumulatively. Whilst differences in avoidance rates can be addressed through a simple correction, updating collision risk estimates to account for differences in flight speed is more complex and, to provide an accurate estimate, would require updated modelling. Previous sensitivity analyses have shown that changes in flight speed from Alerstam *et al.* (2007) to Skov *et al.* (2018) can reduce collision risk estimates for great black-backed gull by 19.7% (Ørsted, 2018b).

1.3.3.10 Consideration has also been given to the differences in impact magnitude that occur between turbine scenarios that are assessed as part of project applications and those that are eventually built (as-built scenarios) (Table 1.8). If the collision risk estimates associated with the as-built turbine scenarios for all projects considered as part of the cumulative assessment were used, it is likely that the cumulative total would be significantly reduced and therefore represent an even smaller proportion of the baseline mortality of the regional BDMPS population. Walney 3 & 4 is one of the biggest contributors to the cumulative total, and it is anticipated that these impacts are, in reality, significantly lower than originally predicted during assessments (see Table 1.8).

Table 1.8: Comparison of differences between assessed and as-built turbine scenario for projects considered cumulatively.

Project	Assessed turbine scenario	As-built turbine scenario	Collision risk estimate used in assessments	Likely impact on collision risk estimates due to change in turbine scenario
Rampion	175 x 4 MW with a lower tip height of 35 m	116 x 3.45 MW with a lower tip height of 28 m	0.4 - 2.4	Likely no change. Reduction in the number of turbines likely balanced by increase in risk from the smaller turbine model and decreased lower tip height.
Walney 3 + 4	207 x 3.6 MW with a lower tip height of 22 m	87 turbines with capacities of 7 and 8 MW with a lower tip height of 34 and 31 m	0.4 - 2.7	Significant reduction. The as-built scenario at Walney Extension consists of fewer, larger, higher turbines. Updated collision risk modelling for Walney Extension has shown significant reductions in the associated collision risk (Wheeldon *et al*., 2023).

1.3.3.11 When taking into account the following elements of the assessment as discussed above, it is considered that the collision total associated with the Morgan Generation Assets cumulatively with other projects will not surpass the 1% baseline mortality threshold of the great black-backed gull regional population:

- It is considered that an avoidance rate of 99.91% is appropriate for great black-backed gull based on the information presented in Ozsanlav-Harris *et al.* (2023) (see Volume 4, Annex 5.3: Offshore Ornithology Collision Risk Modelling Technical Report (APP-055))
- It is considered that the flight speed information provided by Skov *et al.* (2018) provides a far more robust appraisal of great black-backed gull flight behaviour than any other source of flight height data (see Volume 4, Annex 5.3: Offshore Ornithology Collision Risk Modelling Technical Report (APP-055))
- Use of collision risk estimates that represent the assessed turbine scenario at projects that make a significant contribution to the total potential in-combination impact, with the use of as-built scenarios leading to significant reductions in collision risk estimates.

1.3.3.12 Great black-backed gull was rated as one of the most vulnerable seabird species to collision impacts by Wade *et al*. (2016), due to the proportion of flights likely to occur at potential risk height and percentage of time in flight. In terms of nocturnal activity rate, great black-backed gull are considered to have a medium rate of activity at night with a score of 3 (out of 5) (Wade *et al*., 2016).

1.3.3.13 The abundance of breeding great black-backed gull in the UK has changed relatively little in recent years (JNCC, 2020). The species is deemed to have a medium recoverability due to a relatively high reproductive potential and the stable trend in breeding abundance.

1.3.3.14 Great black-backed gull is considered to be of regional conservation value due to the abundance of the species recorded during site-specific surveys.

1.3.3.15 Great black-backed gull is deemed to be of very high vulnerability, medium recoverability and regional value. The sensitivity of the receptor is therefore, considered to be medium.

1.3.3.16 Overall, the magnitude of the cumulative impact is deemed to be low and the sensitivity of the receptor is considered to be medium. The cumulative effect will, therefore, be of **minor adverse significance**, which is not significant in EIA terms. This is the same conclusion of significance as presented within Volume 2, Chapter 5: Offshore Ornithology (APP-023).

1.4 Summary

1.4.1.1 The changes to the regional populations for great black-backed gull considered in this technical note result in an increased impact on the baseline mortality of the largest regional BDMPS population. This increase is beyond the 1% threshold used to identify if further, more detailed assessment is required. As a result population modelling has been conducted.

1.4.1.2 The assessment presented has reached the same conclusion of significance as presented within Volume 2, Chapter 5: Offshore Ornithology (APP-023), namely that cumulative impacts on great black-backed gull will be of minor significance which is not significant in EIA terms.

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Appendix A: PVA logs

A.1 Great black-backed gull using survival rate from Horswill and Robinson (2015)

A.1.1 Set up

The log file was created on: 2024-10-08 19:08:01 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##              Package        Version
## popbio        "popbio"       "2.4.4"
## shiny         "shiny"        "1.1.0"
## shinyjs       "shinyjs"      "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT            "DT"           "0.5"
## plotly        "plotly"       "4.8.0"
## rmarkdown     "rmarkdown"    "1.10"
## dplyr         "dplyr"        "0.7.6"
## tidyr         "tidyr"        "0.8.1"
```

A.1.2 Basic information

This run had reference name “GBBG_ Model_1”.

PVA model run type: simplescenarios.

Model to use for environmental stochasticity: betagamma.

Model for density dependence: nodd.

Include demographic stochasticity in model?: Yes.

Number of simulations: 5000.

Random seed: 15.

Years for burn-in: 5.

Case study selected: None.

A.1.3 Baseline demographic rates

Species chosen to set initial values: Great Black-Backed Gull.

Region type to use for breeding success data:

Available colony-specific survival rate: National. Sector to use within breeding success region: .

Age at first breeding: 5.

Is there an upper constraint on productivity in the model?: Yes, constrained to 3 per pair.

Number of subpopulations: 1.

Are demographic rates applied separately to each subpopulation?: No.

Units for initial population size: all.individuals

Are baseline demographic rates specified separately for immatures?: Yes.

A.1.3.1 Population 1

Initial population values: Initial population 17742 in 2000

Productivity rate per pair: mean: 1.06052 , sd: 0.1319869

Adult survival rate: mean: 0.834 , sd: 0.034

Immatures survival rates:

Age class 0 to 1 - mean: 0.798 , sd: 0.092 , DD: NA

Age class 1 to 2 - mean: 0.834 , sd: 0.034 , DD: NA

Age class 2 to 3 - mean: 0.834 , sd: 0.034 , DD: NA

Age class 3 to 4 - mean: 0.834 , sd: 0.034 , DD: NA

Age class 4 to 5 - mean: 0.834 , sd: 0.034 , DD: NA

A.1.4 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: Yes

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.1.4.1 Impact on Demographic Rates

Scenario A - Name: AR: 99.91% – All subpopulations

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.001003511 , se: NA

Scenario B - Name: AR: 99.39% - All subpopulations

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.006853728 , se: NA

A.1.5 Output:

First year to include in outputs: 2030

Final year to include in outputs: 2065

How should outputs be produced, in terms of ages?: whole.population

Target population size to use in calculating impact metrics: NA

Quasi-extinction threshold to use in calculating impact metrics: NA

A.2 Great black-backed gull using survival rate from BTO's Retrap Adult Survival project

A.2.1 Set up

The log file was created on: 2024-10-08 19:18:30 using Tool version 2, with R version 3.5.1, PVA package version: 4.18 (with UI version 1.7)

```
##              Package        Version
## popbio       "popbio"       "2.4.4"
## shiny        "shiny"        "1.1.0"
## shinyjs      "shinyjs"      "1.0"
## shinydashboard "shinydashboard" "0.7.1"
## shinyWidgets   "shinyWidgets"   "0.4.5"
## DT           "DT"           "0.5"
## plotly       "plotly"       "4.8.0"
## rmarkdown    "rmarkdown"    "1.10"
## dplyr        "dplyr"        "0.7.6"
## tidyr        "tidyr"        "0.8.1"
```

A.2.1.1 Basic information

This run had reference name "GBBG_ Model_2".

PVA model run type: simplescenarios.

Model to use for environmental stochasticity: betagamma.

Model for density dependence: nodd.

Include demographic stochasticity in model?: Yes.

Number of simulations: 5000.

Random seed: 15.

Years for burn-in: 5.

Case study selected: None.

A.2.2 Baseline demographic rates

Species chosen to set initial values: Great Black-Backed Gull.

Region type to use for breeding success data: .

Available colony-specific survival rate: National. Sector to use within breeding success region: .

Age at first breeding: 5.

Is there an upper constraint on productivity in the model?: Yes, constrained to 3 per pair.

Number of subpopulations: 1.

Are demographic rates applied separately to each subpopulation?: No.

Units for initial population size: all.individuals

Are baseline demographic rates specified separately for immatures?: Yes.

A.2.2.1 Population 1

Initial population values: Initial population 17742 in 2000

Productivity rate per pair: mean: 1.06052 , sd: 0.1319869

Adult survival rate: mean: 0.85 , sd: 0.1111755

Immatures survival rates:

Age class 0 to 1 - mean: 0.85 , sd: 0.1111755 , DD: NA

Age class 1 to 2 - mean: 0.85 , sd: 0.1111755 , DD: NA

Age class 2 to 3 - mean: 0.85 , sd: 0.1111755 , DD: NA

Age class 3 to 4 - mean: 0.85 , sd: 0.1111755 , DD: NA

Age class 4 to 5 - mean: 0.85 , sd: 0.1111755 , DD: NA

A.2.3 Impacts

Number of impact scenarios: 2.

Are impacts applied separately to each subpopulation?: No

Are impacts of scenarios specified separately for immatures?: No

Are standard errors of impacts available?: No

Should random seeds be matched for impact scenarios?: Yes

Are impacts specified as a relative value or absolute harvest?: relative

Years in which impacts are assumed to begin and end: 2030 to 2065

A.2.3.1 Impact on Demographic Rates

Scenario A - Name: AR: 99.91% – All subpopulations

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.001003511 , se: NA

Scenario B - Name: AR: 99.39% - All subpopulations

All subpopulations

Impact on productivity rate mean: 0 , se: NA

Impact on adult survival rate mean: 0.006853728 , se: NA

A.2.3.2 Output

First year to include in outputs: 2030

Final year to include in outputs: 2065

How should outputs be produced, in terms of ages?: whole.population

Target population size to use in calculating impact metrics: NA

Quasi-extinction threshold to use in calculating impact metrics: NA