MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

Preliminary Environmental Information Report

Volume 4, annex 10.2: Offshore ornithology displacement assessment

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FINAL

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Contents

Figures

Appendices

Glossary

Term	Meaning
Bio-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) bio-seasons used in this report are based on those in Furness (2015), hereafter referred to as bio-seasons. Separate bio-seasons are recognised in this technical report in order to establish the level of importance any seabird species has within the study area during any particular period of time.
Disturbance sensitivity	Disturbance by wind farm structures, ship and helicopter traffic factor used scores from 1 (limited escape behaviour and a very short flight distance when approached), to 5 (strong escape behaviour, at a large response distance).
Habitat specialisation	The habitat specialisation factor represents the range of habitats species are able to use and whether they use these as specialists or generalists. This score classifies species into categories from 1 (tend to forage over large marine areas with little known association with particular marine features) to 5 (tend to feed on very specific habitat features, such as shallow banks with bivalve communities, or kelp beds).
Ornithology	Ornithology is a branch of zoology that concerns the study of birds.
Statutory Nature Conservation Bodies (SNCBs)	JNCC, Natural Resources Wales, Department of Agriculture, Environment and Rural Affairs/Northern Ireland Environment Agency, Natural England and Scottish Natural Heritage, agencies which provide advice in relation to nature conservation to government

Acronyms

Term	Meaning
AON	Apparently Occupied Nest
BDMPS	Biologically Defined Minimum Population Scale
IBMs	Individual-Based Models
LCI/UCI	Lower/Upper Confidence Interval
MRSea	Marine Renewables Strategic environmental assessment
SMP	Seabird Monitoring Programme
SNCB	Statutory Nature Conservation Body's
SPA	Special Protection Area

Units

Unit	Description
%	Percent
km	Kilometres
km²	Kilometres squared

1 Offshore ornithology displacement technical report

1.1 Introduction

1.1.1 Background

1.1.1.1 Seabirds can be impacted by offshore wind farm developments in a number of ways, including collision, displacement, barrier effects and disturbance, as well as indirect impacts such as changes to prey availability. Disturbance as the result of activities during the construction, operations and maintenance and decommissioning phases of an offshore wind farm has the potential to displace seabirds from an area of sea in which the activity is occurring. In relation to offshore wind farm development, displacement is defined as a reduction in the number of seabirds occurring within or immediately adjacent to an offshore wind farm (Furness *et al.*, 2013).

1.1.1.2 Species differ greatly in their susceptibility to disturbance. Species sensitivity to disturbance in response to offshore wind farms has been quantified by Garthe and Hüppop (2004), Furness *et al.* (2013), Bradbury *et al.* (2014) and Wade *et al.* (2016). During the operations and maintenance phase, the presence of operational wind turbines has the potential to directly disturb seabirds leading to displacement from the Morgan Array Area including an area of variable size or buffer around it. In a review of studies from 20 operational offshore wind farms in Europe, Dierschke *et al.* (2016) assessed the extent of displacement or attraction of a number of seabird species. Whilst diver species and Northern gannet *Morus bassanus* showed consistent and strong avoidance behaviour of operational wind farms, Northern fulmar *Fulmarus glacialis*, common scoter *Melanitta nigra*, Manx shearwater *Puffinus puffinus*, razorbill *Alca torda*, common guillemot *Uria aalge*, little gull *Larus minutus* and Sandwich tern *Thalasseus sandvicensis* showed less consistent displacement.

1.1.1.3 As the result of disturbance, displaced birds may move to areas already occupied by other birds and thus face higher intra/inter-specific competition due to a higher density of individuals competing for the same resource. Alternatively, displaced birds may be forced to move into areas of lower quality (e.g. areas of lower prey availability). Such disturbance and resulting displacement could ultimately affect their demographic fitness (i.e. survival rates and breeding productivity) as well as potentially impacting on other birds in areas that displaced birds move to. Changes in mortality levels of displaced birds have been established for waders (e.g. Burton *et al.*, 2006).

1.1.1.4 There is however a lack of empirical evidence on the consequence of displacement of seabirds, in terms of both their survival and productivity. In waterbirds such as waders, geese and seaducks, simulations using Individual-Based Models (IBMs) have demonstrated changes to mortality as the result of changes in energy budgets of individuals (Pettifor *et al.*, 2000; West *et al.*, 2003; Kaiser *et al.*, 2002). IBMs are rarely used to predict the fate of displaced seabirds due to offshore wind farms and impacts on fitness (Topping and Petersen, 2011). Searle *et al.* (2014) developed a simulation model (SeabORD) that predicts changes to seabird productivity and adult survival arising from simulated displacement and barrier effects associated with offshore wind farms. However, the simulation model has only been developed for the Forth and Tay regions of Scotland and is limited to the chick-rearing period.

1.1.1.5 The Statutory Nature Conservation Bodies (SNCBs) have produced guidelines to assess seabird displacement associated with offshore wind farms (SNCB, 2017). The guidelines promote the use of a displacement matrix approach (i.e. representing proportions of seabirds potentially displaced/dying as a result of an offshore wind farm development).

1.1.1.6 The displacement assessment for the Morgan Offshore Wind Project Generation Assets (hereafter referred to as the Morgan Generation Assets) makes use of the SNCB Matrix table approach, which was agreed during consultation with the Offshore Ornithology Expert Working Group on 13 July 2022 as part of the Evidence Plan process.

1.1.2 Aim of report

1.1.2.1 This report presents the method and results of the Matrix table approach to seabird displacement assessment resulting from the Morgan Generation Assets during the construction, operations and maintenance, and decommissioning phases. This report considers the most abundant seabird species recorded during the digital aerial surveys carried out between April 2021 and March 2022 to characterise the baseline for the assessment. The full methods and results of the digital aerial surveys are presented in volume 4, annex 10.1: Offshore ornithology baseline characterisation report of the PEIR. Only 12 months of the 24 month programme of digital aerial survey data was available for the analysis and assessment presented in this PEIR. The technical reports will be updated with the full 24 months of site-specific data for the Environmental Statement.

1.1.3 Study area

1.1.3.1 The Morgan Array Area is located approximately 22.3km southeast of the Isle of Man in the east Irish Sea and 36.2km from the northwest cost of England (Figure 1.1). For the purposes of displacement assessment, the monthly abundance of seabirds within the Morgan Array Area, the Morgan Array Area plus 2km buffer and if appropriate for the species, the Morgan Array Area plus 4km buffer, including upper and lower 95% confidence limits, were generated from the data collected through the programme of digital aerial surveys carried out in the Morgan Offshore Ornithology Array Area study area (Figure 1.1). The Morgan Array Area covers 322.21km^2, the Morgan Array Area plus 2km buffer covers 484.36km^2, and the Morgan Array Area plus 4km buffer covers 671.56km^2.
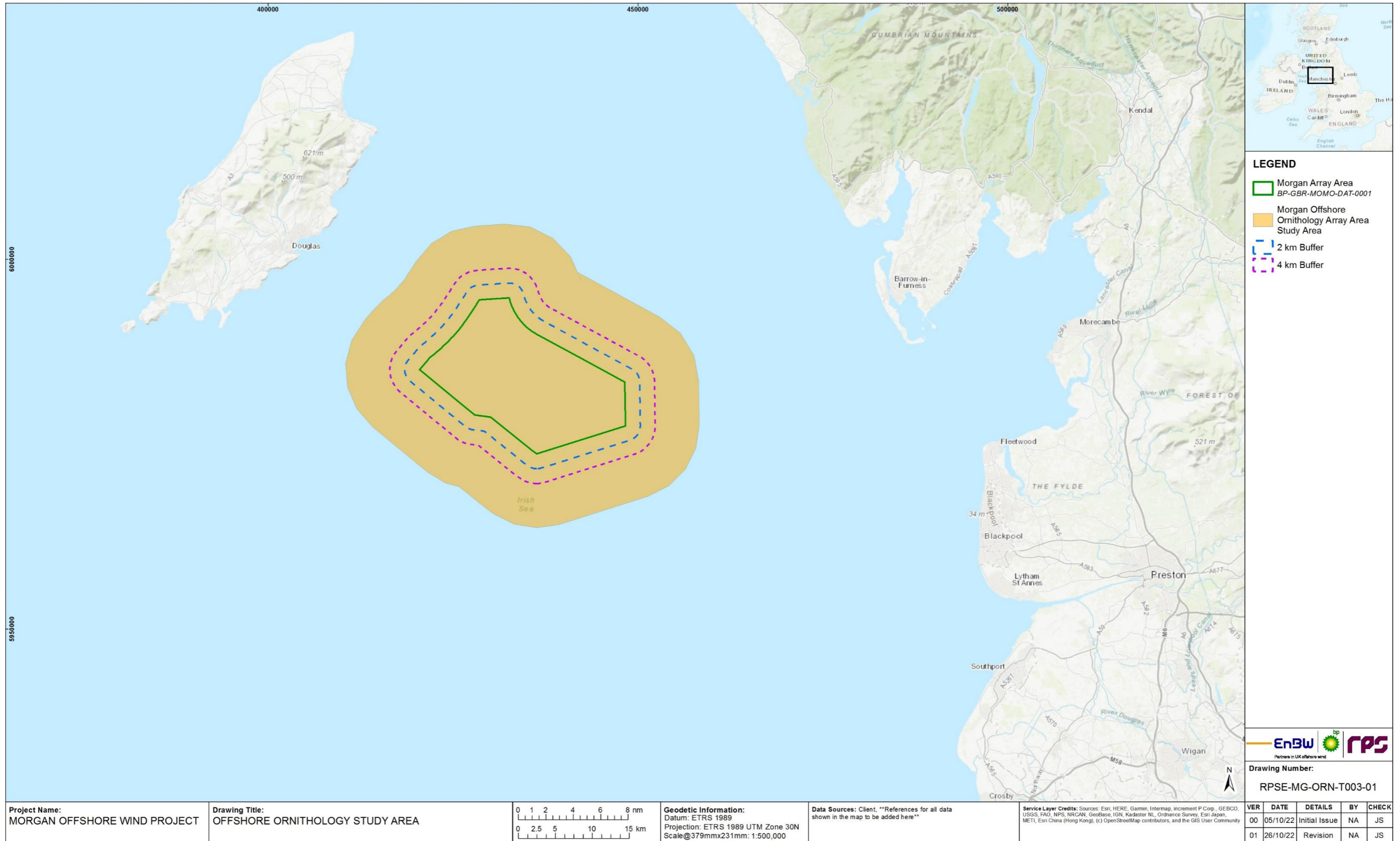
Figure 1.1: Morgan Offshore Ornithology Array Area study area, Morgan Array Area plus associated buffers for displacement.

1.2 Methodology

1.2.1.1 As sensitivity to displacement differs considerably between seabird species, species were screened and progressed for the Matrix table approach using 'Disturbance Sensitivity' and 'Habitat Specialization' scores from Bradbury *et al.* (2014) (expanded from Furness *et al.*, 2013) as recommended by the Joint Statutory Nature Conservation Body's Interim Displacement Advice Note (SNCB, 2017). As recommended by the SNCB (2017), the assessment is based on the mean seasonal peak number of seabirds (average of the highest seasonal value in the two years of survey) in the Morgan Array Area with the appropriate buffer zone. Finally, displacement matrices were populated based on the displacement and mortality values recommended by the SNCB (2017) and the displaced population was assessed against the relevant regional population during the breeding and non-breeding season.

1.2.2 Screening species for displacement assessment

1.2.2.1 Seabird species that qualify under the sensitivity assessment were progressed to the Matrix table stage. The most abundant species within the Morgan Offshore Ornithology Array Area study area and for which there were sufficient sightings to produce robust model and design-based estimates were considered, including common guillemot, razorbill, Atlantic puffin *Fratercula arctica*, black-legged kittiwake *Rissa tridactyla*, Northern gannet and Manx shearwater (Appendix A). Red-throated diver *Gavia stellata* and seaducks are priority species for displacement assessment given their high sensitivity to disturbance from offshore wind farms. These species were however absent from the Morgan Offshore Ornithology Array Area study area.

1.2.2.2 Out of the species recorded within the Morgan Offshore Ornithology Array Area study area, common guillemot, Atlantic puffin and razorbill were selected for the Matrix table stage following the recommendations by the SNCB note (2017). Using the 'Disturbance Sensitivity' and 'Habitat Specialization' scores from Bradbury *et al.* (2014) (expanded from Furness *et al.*, 2013), SNCB recommends that species considered more sensitive to displacement (species with scores of three or higher in either 'Disturbance Sensitivity' or 'Habitat Specialization' category) should be selected in the Matrix table stage. SNCB also recommends that Northern gannet are taken forward to the Matrix table stage (albeit with a score of two) given that there are empirical studies demonstrating that the species is sensitive to displacement and barrier effects (Krijgsveld *et al.*, 2011, Vanermen *et al.*, 2013). A recent study has shown that Northern gannet strongly avoided wind farms (Peschko *et al.*, 2021).

1.2.2.3 Following advice from the Offshore Ornithology Expert Working Group, Manx shearwater and black-legged kittiwake were also included within the assessment. Manx shearwater has a 'disturbance susceptibility' score of one according to Bradbury *et al.* (2014), meaning they are displaced at low levels or less likely to be displaced than other species. However, Wade *et al.* (2016) states that uncertainty surrounding this disturbance susceptibility score is 'very high', and hence have been included in the Matrix table stage. Black-legged kittiwake has also been included due to recent evidence suggesting that the species can be sensitive to displacement from offshore wind farms (Peschko *et al.*, 2020; Vanermen *et al.*, 2016; Leopold *et al.*,2013).

1.2.2.4 For each of the species considered above (common guillemot, razorbill, Atlantic puffin, black-legged kittiwake, Northern gannet and Manx shearwater), displacement impacts

were quantified for the population derived within the Morgan Array Area plus 2km buffer. SNCBs recommend for most species a standard displacement buffer of 2km with the exception of the species groups of divers and seaducks as they can be affected at distances over 4km (Natural England, 2021). As noted above, red-throated diver and other seaducks were not recorded in the Morgan Offshore Ornithology Array Area study area during the baseline surveys and have therefore been excluded from the assessment of displacement from the Morgan Array Area.

1.2.3 Seasonality

1.2.3.1 Bio-seasons used within the displacement assessment were defined according to the breeding, non-breeding and migratory periods (autumn and spring migration) based on Furness (2015) (Table 1.1) and as per the Offshore Ornithology Expert Working Group advice. Colour-coding has been used to define the four main bio-seasons presented in Table 1.1.

Table 1.1: **Seasonal definitions as the basis for assessment, from Furness (2015).**

Species	Pre-Breeding Season/spring migration	Breeding season	Post Breeding Season/autumn migration	Non-breeding/winter season
Common guillemot	n/a	March to July	n/a	August to February
Razorbill	January to March	April to July	August to October	November to December
Atlantic puffin	n/a	April to early August	n/a	Mid-August to March
Northern gannet	December to March	March to September	September to November	n/a
Black-legged kittiwake	January to April	April to August	August to December	n/a
Manx shearwater	Late-March to May	April to August	August to early October	n/a

1.2.4 Regional populations

1.2.4.1 Breeding population sizes are based on colony counts from the Seabird Monitoring Programme (SMP) online database (https://app.bto.org/seabirds/public/index.jsp) for all colonies within mean-maximum foraging range plus one standard deviation (Woodward *et al.,* 2019). One Apparently Occupied Nest (AON) was assumed to equal two breeding seabirds.

1.2.4.2 All breeding sites (including Special Protection Areas (SPAs) and non-SPA sites) within the species-specific foraging ranges from the Morgan Array Area were identified. The location of the breeding sites were sourced from data.gov.uk (Seabird Nesting Counts (British Isles)). The latest colony counts were sourced from the SMP online database (https://app.bto.org/seabirds/public/index.jsp). In the SMP online database, the 'Master Site' can be made up of several sites along the coastline. Where 'Master Site' in the SMP were made up of several nesting sites (i.e. sub-colonies), a centroid was generated for each 'Master Site' to calculate the distance to the Morgan Array Area.

1.2.4.3　During the breeding season, in addition to seabirds associated with breeding colonies, there will be immature seabirds, juvenile seabirds and 'sabbatical' seabirds (mature seabirds not breeding in a given year) present within the region. Population counts therefore must be adjusted to account for these seabirds. It was assumed that all immature seabirds in the Biological Defined Minimum Population Scales (BDMPS) population in the bio-season immediately before the breeding season (usually the return migration bio-season) return to breeding colonies. The total regional population within the breeding season is therefore the sum of breeding adults associated with nearby colonies plus the proportion of immature seabirds from the BDMPS return migration population. This is shown in Table 1.2 The breakdown of regional populations taken from the SMP database are provided within Appendix B for each species.

Table 1.2: **Calculation of regional population during the breeding season.**

Species	Breeding population within mean-max foraging range (JNCC, 2022)	BDMPS return migration population (Furness, 2015)	Proportion of juvenile and immature (Furness, 2015)	Juvenile and immature individuals	Total regional breeding population
Common guillemot	135,788	1,139,220	42.5%	484,169	619,957
Razorbill	20,910	606,914	42.9%	260,366	281,276
Atlantic puffin	34,316	304,557	49.4%	150,451	184,767
Northern gannet	152,372	661,888	44.7%	295,863	448,235
Black-legged kittiwake	75,000	691,526	46.6%	322,251	397,251
Manx shearwater	1,253,612	1,580,895	45.6%	720,888	1,974,500

1.2.4.4　In the non-breeding season, seabirds are not constrained by colony location and can, depending on individual species, range widely within UK seas and beyond. The zone of influence for seabird species where an assessment in the non-breeding season and migratory periods is deemed to be required is based on the 'UK Western Waters' populations defined by Furness (2015).

1.2.4.5　All population estimates based on bio-season are provided within Table 1.3.

Table 1.3: **Bio-season population sizes used within the assessment.**

Species	Pre-Breeding Season/spring migration	Breeding season	Post Breeding Season/autumn migration	Non-breeding/winter season
Common guillemot	n/a	March to July (619,957)	n/a	August to February (1,139,220)
Razorbill	January to March (606,914)	April to July (281,276)	August to October (606,914)	November to December (341,422)

Species	Pre-Breeding Season/spring migration	Breeding season	Post Breeding Season/autumn migration	Non-breeding/winter season
Atlantic puffin	n/a	April to early August (34,316)	n/a	Mid-August to March (304,557)
Northern gannet	December to March (661,888)	March to September (448,235)	September to November (545,954)	n/a
Black-legged kittiwake	January to April (691,526)	April to August (397,251)	August to December (911,586)	n/a
Manx shearwater	March to May (1,580,895)	April to-August (1,974,500)	August to early October (1,580,895)	n/a

1.2.5　Background mortality rates

1.2.5.1　The displacement assessment assumes that all age classes are at risk of the possible impacts of the proposed development equally and as such the baseline mortality rate is a weighted average based on all age classes. Demographic rates for each species from Horswill and Robinson (2015) were entered into a matrix population model. The national-average productivity figure was used from Horswill and Robinson (2015). Productivity values were used to calculate the expected proportions in each age class. Each age class survival rate was multiplied by its proportion and the total for all ages summed to give the average survival rate for all ages. The average mortality rate was subsequently calculated by subtracting the survival rate from 1. The demographic rates and the age class proportions and average mortality rates calculated from them are presented in Table 1.4.

Table 1.4: **Demographic rates from Horswill and Robinson (2015) and population age ratios calculated from stable population models used to estimate average mortality for use in displacement matrices.**

Species	Parameter	Age Class							Productivity	Average mortality
		0-1	1-2	2-3	3-4	4-5	5-6	Adult		
Common guillemot	Survival	0.560	0.792	0.917	0.939	0.939	n/a	0.939	0.672	0.139
	Proportion in population	0.167	0.090	0.069	0.061	0.056	n/a	0.557	n/a	n/a
Razorbill	Survival	0.630	0.630	0.895	0.895	n/a	n/a	0.895	0.570	0.174
	Proportion in population	0.161	0.103	0.066	0.060	n/a	n/a	0.610	n/a	n/a
Atlantic puffin	Survival	0.709	0.709	0.709	0.760	0.805	n/a	0.906	0.617	0.181
	Proportion in population	0.164	0.119	0.086	0.062	0.048	n/a	0.521	n/a	n/a
	Survival	0.424	0.829	0.891	0.895	0.895	n/a	0.919	0.700	0.187

Species	Parameter	Age Class						Adult	Productivity	Average mortality
		0-1	1-2	2-3	3-4	4-5	5-6			
Northern gannet	Proportion in population	0.191	0.081	0.067	0.059	0.053	n/a	0.549	n/a	n/a
Black-legged kittiwake	Survival	0.790	0.854	0.854	0.854	n/a	n/a	0.854	0.690	0.157
	Proportion in population	0.169	0.131	0.111	0.093	n/a	n/a	0.496	n/a	n/a
Manx shearwater	Survival	0.870	0.870	0.870	0.870	0.870	n/a	0.870	0.697	0.131
	Proportion in population	0.150	0.128	0.109	0.092	0.078	n/a	0.442	n/a	n/a

1.2.6 Abundance estimates

1.2.6.1 Density/population estimates were generated from a programme of digital aerial surveys carried out in the Morgan Offshore Ornithology Array Area study area, which extended up to 10km outside the Morgan Array Area. As mentioned within section 1.1.3, full details of the digital aerial survey methods and results are presented in volume 4, annex 10.1: Offshore ornithology baseline characterisation report of the PEIR. All available data collected between April 2021 and March 2022 was utilised. Model-based estimates using the Marine Renewables Strategic environmental assessment (MRSea) package were produced in order to predict numbers across the survey area alongside 95% confidence intervals to provide a level of uncertainty. Design based estimates for bird numbers and densities in each month were also generated and compared to the MRSea estimates to provide additional validation of the MRSea outputs and provide estimates for months where low raw abundances prevented the use of the MRSea model.

1.2.6.2 The primary data that informs the basis for the assessment of displacement effects are seasonal mean peak population estimates including seabirds both on the water and in flight. Mean seasonal peak population estimates of each species were calculated using the defined bio-seasons by Furness (2015) to provide the number of seabirds at risk of displacement impacts, including upper and lower 95% confidence intervals. Peak abundances in each bio-season for each species considered within the displacement assessment are outlined in bold within Appendix A.

1.2.6.3 As an example of the mean seasonal peak population calculation, for common guillemot which breeds from March to July, the average was taken of the peak count for the breeding season in Year 1 of the digital aerial surveys within the Morgan Array Area plus 2km buffer (which occurred in April) and the peak count in the breeding season of Year 2 (which was April, however noting that the results from the full breeding season were not available to be included in this PEIR). In accordance with SNCB (2017), displacement was estimated as affecting seabirds present both in flight and sitting on the water (whether foraging or loafing), having accounted for availability bias (seabirds that may be underwater at the time of the survey). Therefore, abundance estimates of seabirds recorded in flight and sitting were combined to derive the mean seasonal peak population at risk of displacement. Where possible, data relating to age classes of each species is also reported, although the values used

in the matrices will relate to all individuals. Mean seasonal peak abundances and Lower Confidence Intervals (LCI) and Upper Confidence Intervals (UCI) are provided within Table 1.5.

Table 1.5: Mean peak abundances for use in the assessment for each bio-season.

Species	Pre-Breeding season/spring migration	Breeding season	Post Breeding season/autumn migration	Non-breeding/winter season
Common guillemot				
Mean	n/a	4,893	n/a	4,101
LCI	n/a	3,913	n/a	2,444
UCI	n/a	5,999	n/a	6,180
Razorbill				
Mean	166	120	103	233
LCI	63	52	49	48
UCI	317	195	181	485
Atlantic puffin				
Mean	n/a	18	n/a	0
LCI	n/a	0	n/a	0
UCI	n/a	43	n/a	0
Northern gannet				
Mean	53	209	192	n/a
LCI	15	131	93	n/a
UCI	105	305	346	n/a
Black-legged kittiwake				
Mean	645	460	1,619	n/a
LCI	438	317	1,190	n/a
UCI	895	631	2,319	n/a
Manx shearwater				
Mean	59	467	467	n/a
LCI	19	220	138	n/a
UCI	165	1,828	1,820	n/a

1.2.7 Displacement parameters

1.2.7.1 Table 1.6 presents the displacement and mortality rates for the species considered in the displacement assessment. The most likely displacement and mortality rates during the operational period for common guillemot, razorbill and Northern gannet have been obtained from the SNCB note (2017). For auk species such as common guillemot,

razorbill and Atlantic puffin the SNCBs advise a displacement level of 30 to 70%. Black-legged kittiwake rates have been taken from the relevant literature (Table 1.6).

1.2.7.2   As Manx shearwater have a disturbance susceptibility score of one, the recommended rates of 1 to 10% for displacement and 1 to 10% mortality from the SNCB note (2017) guidance was utilised.

Table 1.6:   Displacement and mortality rates for use in the assessment during operations and maintenance phase.

Species	Displacement rates	Mortality rates	Source
Common guillemot	30 to 70%	1 to10%	SNCB (2017)
Razorbill	30 to 70%	1 to 10%	SNCB (2017)
Atlantic puffin	30 to 70%	1 to 10%	SNCB (2017)
Northern gannet	60 to 80%	1 to 10%	East Anglia ONE North, Hornsea 4 and Norfolk Vanguard; based on reference to Cook *et al.* (2018), Skov *et al.* (2018), Leopold *et al.* (2011) and Furness & Wade (2012)
Black-legged kittiwake	30 to 70%	1 to 10%	Peschko *et al.* (2020; Vanermen *et al.* (2016); Leopold *et al.* (2013)
Manx shearwater	1 to 10%	1 to 10%	SNCB (2017)

1.2.7.3   Disturbance and subsequent displacement of seabirds during the construction phase can also occur due to vessel traffic and construction and piling activities occurring within the site. These activities may displace individuals that would normally reside within and around the Morgan Array Area.

1.2.7.4   As actual rates of displacement during the construction phase are difficult to determine, and as recommended by the Offshore Ornithology Expert Working Group, the following methodology is proposed. Given that construction is limited both spatially and temporally and that any potential effects are unlikely to reach the same level as during the operation, the level to be used is half that of the operations and maintenance phase assessments. Table 1.7 shows the displacement and mortality rates used during the construction phase assessment.

1.2.7.5   Decommissioning activities within the Morgan Array Area are equal to or less than those carried out during the construction phase within the Morgan Array Area. Therefore, for the purpose of this assessment it is assumed that the impacts are likely to be similar.

Table 1.7:   Displacement and mortality rates for use in the assessment during construction and decommissioning phase.

Species	Displacement rates	Mortality rates
Common guillemot	15 to 35%	1 to 10%
Razorbill	15 to 35%	1 to 10%
Atlantic puffin	15 to 35%	1 to 10%

Species	Displacement rates	Mortality rates
Northern gannet	30 to 40%	1 to 10%
Black-legged kittiwake	15 to 35%	1 to 10%
Manx shearwater	0.5 to 5%	1 to10%

1.2.7.6   Data on predicted mortality from displacement of seabirds from the Morgan Array Area plus 2km buffer, are then presented in the form of a gridded Matrix table (for the mean value and lower and upper confidence intervals). Predicted mortalities are given for each bio-season and each phase. The mean seasonal peak value for the breeding, non-breeding and migratory periods are imputed into a displacement matrix to assess the potential level of impact. The matrix presents a wide range of potential displacement (10 to 100%) and mortality rates (1 to 100%), with the most likely displacement levels and mortality scenario cells highlighted red.

1.2.7.7   In addition, the degree of change predicted to occur at the population level is further explored by comparing the predicted displacement mortality to the relevant 1% threshold of background mortality for each species. Increases in mortality of less than 1% are considered to be undetectable against natural variation. This approach is consistent with other contemporaneous assessments of offshore wind farm projects (e.g. Hornsea Project Two, Hornsea Project Four, Moray West, Seagreen Alpha and Bravo, East Anglia One North, Norfolk Vanguard and Norfolk Boreas). As such, cells within each matrix in the following species-specific sections are shaded yellow to indicate where the displacement mortality would surpass the 1% threshold of background mortality of the relevant regional or national population for each species. The relevant population against which displacement mortality is compared and the average background mortality for each species are presented in each Matrix table.

1.3   Results

1.3.1   Common guillemot

Construction and decommissioning phases

1.3.1.1   For all seasons combined, the annual predicted mean mortality rate for common guillemot resulting from displacement during the construction and decommissioning phases was between 13 to 315 individuals (LCI; 10 to 223, UCI; 18 to 426; Table 1.8). Using the largest BDMPS of 1,139,220 individuals (Table 1.3) and, using the average baseline mortality rate of 0.139 (Table 1.4), the background predicted mortality across all seasons is 158,352. The addition of 13 to 315 individuals (LCI; 10 to 223, UCI; 18 to 426; Table 1.8) mortalities would increase the baseline mortality rate by 0.008 to 0.199% (LCI; 0.006 to 0.141%, UCI; 0.011 to 0.296%). Table 1.8 further breaks this down into relevant bio-seasons, with displacement matrices presented in Table 1.9 to Table 1.14.

Table 1.8: Common guillemot bio-season displacement estimates for the Morgan Array Area plus 2km buffer during construction and decommissioning.

Bio-season	Seasonal Abundance (Morgan Array Area + 2km buffer)	Regional Baseline Population		Number of common guillemot subject to mortality (no. of indiv.)	Increase in baseline mortality (%)
		Population	Baseline Mortality		
Breeding					
Mean	4,893	619,957	86,174	7 to 171	0.008 to 0.198
LCI	3,913	619,957	86,174	6 to 137	0.007 to 0.159
UCI	5,999	619,957	86,174	9 to 210	0.010 to 0.244
Non-breeding					
Mean	4,101	1,139,220	158,352	6 to 144	0.004 to 0.091
LCI	2,444	1,139,220	158,352	4 to 86	0.003 to 0.054
UCI	6,180	1,139,220	158,352	9 to 216	0.006 to 0.136
Annual (BMPS)					
Mean	8,994	1,139,220	158,352	13 to 315	0.008 to 0.199
LCI	6,357	1,139,220	158,352	10 to 223	0.006 to 0.141
UCI	12,179	1,139,220	158,352	18 to 426	0.011 to 0.269

Table 1.9: Mean predicted common guillemot mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Guillemot Mean mortality figures. All Birds. Breeding Season

Displacement rate (%) \ Mortality rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	5	10	24	49	98	147	196	245	294	343	391	440	489
10	5	10	24	49	98	147	196	245	294	343	391	440	489
15	7	15	37	73	147	220	294	367	440	514	587	661	734
20	10	20	49	98	196	294	391	489	587	685	783	881	979
25	12	24	61	122	245	367	489	612	734	856	979	1101	1223
30	15	29	73	147	294	440	587	734	881	1028	1174	1321	1468
35	17	34	86	171	343	514	685	856	1028	1199	1370	1541	1713
40	20	39	98	196	391	587	783	979	1174	1370	1566	1761	1957
45	22	44	110	220	440	661	881	1101	1321	1541	1761	1982	2202
50	24	49	122	245	489	734	979	1223	1468	1713	1957	2202	2447
55	27	54	135	269	538	807	1076	1346	1615	1884	2153	2422	2691
60	29	59	147	294	587	881	1174	1468	1761	2055	2349	2642	2936
65	32	64	159	318	636	954	1272	1590	1908	2226	2544	2862	3180
70	34	69	171	343	685	1028	1370	1713	2055	2398	2740	3083	3425
75	37	73	183	367	734	1101	1468	1835	2202	2569	2936	3303	3670
80	39	78	196	391	783	1174	1566	1957	2349	2740	3132	3523	3914
85	42	83	208	416	832	1248	1664	2080	2495	2911	3327	3743	4159
90	44	88	220	440	881	1321	1761	2202	2642	3083	3523	3963	4404
95	46	93	232	465	930	1395	1859	2324	2789	3254	3719	4184	4648
100	49	98	245	489	979	1468	1957	2447	2936	3425	3914	4404	4893

Table 1.10: LCI predicted common guillemot mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Guillemot LCI mortality figures. All Birds. Breeding Season

Displacement rate (%) \ Mortality rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	4	8	20	39	78	117	157	196	235	274	313	352	391
10	4	8	20	39	78	117	157	196	235	274	313	352	391
15	6	12	29	59	117	176	235	293	352	411	470	528	587
20	8	16	39	78	157	235	313	391	470	548	626	704	783
25	10	20	49	98	196	293	391	489	587	685	783	880	978
30	12	23	59	117	235	352	470	587	704	822	939	1057	1174
35	14	27	68	137	274	411	548	685	822	959	1096	1233	1370
40	16	31	78	157	313	470	626	783	939	1096	1252	1409	1565
45	18	35	88	176	352	528	704	880	1057	1233	1409	1585	1761
50	20	39	98	196	391	587	783	978	1174	1370	1565	1761	1957
55	22	43	108	215	430	646	861	1076	1291	1507	1722	1937	2152
60	23	47	117	235	470	704	939	1174	1409	1643	1878	2113	2348
65	25	51	127	254	509	763	1017	1272	1526	1780	2035	2289	2543
70	27	55	137	274	548	822	1096	1370	1643	1917	2191	2465	2739
75	29	59	147	293	587	880	1174	1467	1761	2054	2348	2641	2935
80	31	63	157	313	626	939	1252	1565	1878	2191	2504	2817	3130
85	33	67	166	333	665	998	1330	1663	1996	2328	2661	2993	3326
90	35	70	176	352	704	1057	1409	1761	2113	2465	2817	3170	3522
95	37	74	186	372	743	1115	1487	1859	2230	2602	2974	3346	3717
100	39	78	196	391	783	1174	1565	1957	2348	2739	3130	3522	3913

Table 1.11: UCI predicted common guillemot mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Guillemot UCI mortality figures. All Birds. Breeding Season

Displacement rate (%) \ Mortality rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	6	12	30	60	120	180	240	300	360	420	480	540	600
10	6	12	30	60	120	180	240	300	360	420	480	540	600
15	9	18	45	90	180	270	360	450	540	630	720	810	900
20	12	24	60	120	240	360	480	600	720	840	960	1080	1200
25	15	30	75	150	300	450	600	750	900	1050	1200	1350	1500
30	18	36	90	180	360	540	720	900	1080	1260	1440	1620	1800
35	21	42	105	210	420	630	840	1050	1260	1470	1680	1890	2100
40	24	48	120	240	480	720	960	1200	1440	1680	1920	2160	2400
45	27	54	135	270	540	810	1080	1350	1620	1890	2160	2430	2700
50	30	60	150	300	600	900	1200	1500	1800	2100	2400	2700	3000
55	33	66	165	330	660	990	1320	1650	1980	2310	2640	2970	3299
60	36	72	180	360	720	1080	1440	1800	2160	2520	2880	3239	3599
65	39	78	195	390	780	1170	1560	1950	2340	2730	3119	3509	3899
70	42	84	210	420	840	1260	1680	2100	2520	2940	3359	3779	4199
75	45	90	225	450	900	1350	1800	2250	2700	3149	3599	4049	4499
80	48	96	240	480	960	1440	1920	2400	2880	3359	3839	4319	4799
85	51	102	255	510	1020	1530	2040	2550	3059	3569	4079	4589	5099
90	54	108	270	540	1080	1620	2160	2700	3239	3779	4319	4859	5399
95	57	114	285	570	1140	1710	2280	2850	3419	3989	4559	5129	5699
100	60	120	300	600	1200	1800	2400	3000	3599	4199	4799	5399	5999

Table 1.12: Mean predicted common guillemot mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (construction and decommissioning).

Guillemot Mean mortality figures. All Birds. Non-breeding Season. Displacement rate (%)	Mortality rate (%)												
	1	2	5	10	20	30	40	50	60	70	80	90	100
5	4	8	21	41	82	123	164	205	246	287	328	369	410
10	4	8	21	41	82	123	164	205	246	287	328	369	410
15	6	12	31	62	123	185	246	308	369	431	492	554	615
20	8	16	41	82	164	246	328	410	492	574	656	738	820
25	10	21	51	103	205	308	410	513	615	718	820	923	1025
30	12	25	62	123	246	369	492	615	738	861	984	1107	1230
35	14	29	72	144	287	431	574	718	861	1005	1148	1292	1435
40	16	33	82	164	328	492	656	820	984	1148	1312	1476	1640
45	18	37	92	185	369	554	738	923	1107	1292	1476	1661	1845
50	21	41	103	205	410	615	820	1025	1230	1435	1640	1845	2051
55	23	45	113	226	451	677	902	1128	1353	1579	1804	2030	2256
60	25	49	123	246	492	738	984	1230	1476	1722	1968	2215	2461
65	27	53	133	267	533	800	1066	1333	1599	1866	2133	2399	2666
70	29	57	144	287	574	861	1148	1435	1722	2009	2297	2584	2871
75	31	62	154	308	615	923	1230	1538	1845	2153	2461	2768	3076
80	33	66	164	328	656	984	1312	1640	1968	2297	2625	2953	3281
85	35	70	174	349	697	1046	1394	1743	2092	2440	2789	3137	3486
90	37	74	185	369	738	1107	1476	1845	2215	2584	2953	3322	3691
95	39	78	195	390	779	1169	1558	1948	2338	2727	3117	3506	3896
100	41	82	205	410	820	1230	1640	2051	2461	2871	3281	3691	4101

Table 1.14: UCI predicted common guillemot mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (construction and decommissioning).

Guillemot UCI mortality figures. All Birds. Non-breeding Season. Displacement rate (%)	Mortality rate (%)												
	1	2	5	10	20	30	40	50	60	70	80	90	100
5	6	12	31	62	124	185	247	309	371	433	494	556	618
10	6	12	31	62	124	185	247	309	371	433	494	556	618
15	9	19	46	93	185	278	371	464	556	649	742	834	927
20	12	25	62	124	247	371	494	618	742	865	989	1112	1236
25	15	31	77	155	309	464	618	773	927	1082	1236	1391	1545
30	19	37	93	185	371	556	742	927	1112	1298	1483	1669	1854
35	22	43	108	216	433	649	865	1082	1298	1514	1730	1947	2163
40	25	49	124	247	494	742	989	1236	1483	1730	1978	2225	2472
45	28	56	139	278	556	834	1112	1391	1669	1947	2225	2503	2781
50	31	62	155	309	618	927	1236	1545	1854	2163	2472	2781	3090
55	34	68	170	340	680	1020	1360	1700	2039	2379	2719	3059	3399
60	37	74	185	371	742	1112	1483	1854	2225	2596	2966	3337	3708
65	40	80	201	402	803	1205	1607	2009	2410	2812	3214	3615	4017
70	43	87	216	433	865	1298	1730	2163	2596	3028	3461	3893	4326
75	46	93	232	464	927	1391	1854	2318	2781	3245	3708	4172	4635
80	49	99	247	494	989	1483	1978	2472	2966	3461	3955	4450	4944
85	53	105	263	525	1051	1576	2101	2627	3152	3677	4202	4728	5253
90	56	111	278	556	1112	1669	2225	2781	3337	3893	4450	5006	5562
95	59	117	294	587	1174	1761	2348	2936	3523	4110	4697	5284	5871
100	62	124	309	618	1236	1854	2472	3090	3708	4326	4944	5562	6180

Table 1.13: LCI predicted common guillemot mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (construction and decommissioning).

Guillemot LCI mortality figures. All Birds. Non-breeding Season. Displacement rate (%)	Mortality rate (%)												
	1	2	5	10	20	30	40	50	60	70	80	90	100
5	2	5	12	24	49	73	98	122	147	171	196	220	244
10	2	5	12	24	49	73	98	122	147	171	196	220	244
15	4	7	18	37	73	110	147	183	220	257	293	330	367
20	5	10	24	49	98	147	196	244	293	342	391	440	489
25	6	12	31	61	122	183	244	306	367	428	489	550	611
30	7	15	37	73	147	220	293	367	440	513	587	660	733
35	9	17	43	86	171	257	342	428	513	599	684	770	855
40	10	20	49	98	196	293	391	489	587	684	782	880	978
45	11	22	55	110	220	330	440	550	660	770	880	990	1100
50	12	24	61	122	244	367	489	611	733	855	978	1100	1222
55	13	27	67	134	269	403	538	672	807	941	1075	1210	1344
60	15	29	73	147	293	440	587	733	880	1026	1173	1320	1466
65	16	32	79	159	318	477	635	794	953	1112	1271	1430	1589
70	17	34	86	171	342	513	684	855	1026	1198	1369	1540	1711
75	18	37	92	183	367	550	733	917	1100	1283	1466	1650	1833
80	20	39	98	196	391	587	782	978	1173	1369	1564	1760	1955
85	21	42	104	208	415	623	831	1039	1246	1454	1662	1870	2077
90	22	44	110	220	440	660	880	1100	1320	1540	1760	1980	2200
95	23	46	116	232	464	697	929	1161	1393	1625	1857	2090	2322
100	24	49	122	244	489	733	978	1222	1466	1711	1955	2200	2444

1.3.1.2 During the breeding season, a mean peak abundance of 4,893 (LCI; 3,913, UCI; 5,999) common guillemot were present within the Morgan Array Area plus 2km buffer. Using construction and decommissioning phase displacement rates of 15 to 35% and a mortality rate of 1 to 10 % would result in additional loss of seven to 171 (LCI; six to 137, UCI; nine to 210) common guillemot from the population. The regional population in the breeding season is estimated as 619,957 individuals (Table 1.2) and, using the average baseline mortality rate of 0.139 (Table 1.4), the background predicted mortality in the breeding season is 86,174. The additional mortality of seven to 171 (LCI; six to 137, UCI; nine to 210) individuals would increase the baseline mortality rate by 0.008 to 0.198% (LCI; 0.007 to 0.159%, UCI; 0.010 to 0.244%).

1.3.1.3 During the non-breeding season, a mean peak abundance of 4,101 (LCI; 2,444, UCI; 6,180) common guillemot were present within the Morgan Array Area plus 2km buffer. Using displacement rates of 15 to 35% and a mortality rate of 1 to 10% would result in additional loss of six to 144 (LCI; four to 86, UCI; nine to 216) common guillemot from the population. The BDMPS population in the non-breeding season is defined as 1,139,220 individuals (Table 1.3) and, using the average baseline mortality rate of 0.139 (Table 1.4), the background predicted mortality in the non-breeding season is 158,352. The additional annual mortality of six to 144 (LCI; four to 86, UCI; nine to 216) individuals would increase the baseline mortality rate by 0.004 to 0.091% (LCI; 0.003 to 0.054%, UCI; 0.006 to 0.136%).

1.3.1.4 In both bio-seasons and assessed against the defined common guillemot populations (619,957 and 1,139,220 individuals respectively) the predicted mortalities did not surpass a 1% baseline mortality threshold during the construction and decommissioning phases (highlighted yellow cells within each displacement matrix indicates if mortality exceeds 1%).

Operations and maintenance phase

1.3.1.5 For all seasons combined, the annual predicted mortality rate during the operations and maintenance phase for common guillemot ranged between 27 to 630 (LCI; 19 to

445, UCI; 37 to 853) individuals per annum (Table 1.15). Using the largest UK Western Waters BDMPS population of 1,139,220 individuals (Table 1.3) as a proxy for the total BDMPS population across the year, with an average baseline mortality rate of 0.139 (Table 1.4), the background predicted mortality across all seasons is 158,352. The addition of 27 to 630 (LCI; 19 to 445, UCI; 37 to 853) mortalities would increase the mortality relative to the baseline mortality rate by 0.017 to 0.398% (LCI; 0.012 to 0.281%, UCI; 0.023 to 0.539%) at the BDMPS scale. Table 1.15 further breaks this down into relevant bio-seasons, with displacement matrices presented in Table 1.16 to Table 1.21.

Table 1.15: **Common guillemot bio-season displacement estimates for Morgan Array Area plus 2km buffer during the operations and maintenance phase.**

Bio-season	Seasonal Abundance (Morgan Array Area + 2km buffer)	Regional Baseline Population		Number of common guillemot subject to mortality (indiv.)	Increase in baseline mortality (%)
		Population	Baseline Mortality		
Breeding					
Mean	4,893	619,957	86,174	15 to 343	0.017 to 0.398
LCI	3,913	619,957	86,174	12 to 274	0.014 to 0.318
UCI	5,999	619,957	86,174	18 to 420	0.021 to 0.487
Non-breeding					
Mean	4,101	1,139,220	158,352	12 to 287	0.008 to 0.181
LCI	2,444	1,139,220	158,352	7 to 171	0.004 to 0.108
UCI	6,180	1,139,220	158,352	19 to 433	0.012 to 0.273
Annual (BMPS)					
Mean	8,994	1,139,220	158,352	27 to 630	0.017 to 0.398
LCI	6,357	1,139,220	158,352	19 to 445	0.012 to 0.281
UCI	12,179	1,139,220	158,352	37 to 853	0.023 to 0.539

Table 1.16: **Mean predicted common guillemot mortality for the Morgan Array Area plus 2km buffer during the breeding season (operations and maintenance phase).**

Guillemot Mean mortality figures. All Birds. Breeding Season

Displacement rate (%)	Mortality rate (%)												
	1	2	5	10	20	30	40	50	60	70	80	90	100
10	5	10	24	49	98	147	196	245	294	343	391	440	489
20	10	20	49	98	196	294	391	489	587	685	783	881	979
30	15	29	73	147	294	440	587	734	881	1028	1174	1321	1468
40	20	39	98	196	391	587	783	979	1174	1370	1566	1761	1957
50	24	49	122	245	489	734	979	1223	1468	1713	1957	2202	2447
60	29	59	147	294	587	881	1174	1468	1761	2055	2349	2642	2936
70	34	69	171	343	685	1028	1370	1713	2055	2398	2740	3083	3425
80	39	78	196	391	783	1174	1566	1957	2349	2740	3132	3523	3914
90	44	88	220	440	881	1321	1761	2202	2642	3083	3523	3963	4404
100	49	98	245	489	979	1468	1957	2447	2936	3425	3914	4404	4893

Table 1.17: **LCI predicted common guillemot mortality for the Morgan Array Area plus 2km buffer during the breeding season (operations and maintenance phase).**

Guillemot LCI mortality figures. All Birds. Breeding Season

Displacement rate (%)	Mortality rate (%)												
	1	2	5	10	20	30	40	50	60	70	80	90	100
10	4	8	20	39	78	117	157	196	235	274	313	352	391
20	8	16	39	78	157	235	313	391	470	548	626	704	783
30	12	23	59	117	235	352	470	587	704	822	939	1057	1174
40	16	31	78	157	313	470	626	783	939	1096	1252	1409	1565
50	20	39	98	196	391	587	783	978	1174	1370	1565	1761	1957
60	23	47	117	235	470	704	939	1174	1409	1643	1878	2113	2348
70	27	55	137	274	548	822	1096	1370	1643	1917	2191	2465	2739
80	31	63	157	313	626	939	1252	1565	1878	2191	2504	2817	3130
90	35	70	176	352	704	1057	1409	1761	2113	2465	2817	3170	3522
100	39	78	196	391	783	1174	1565	1957	2348	2739	3130	3522	3913

Table 1.18: **UCI predicted common guillemot mortality for the Morgan Array Area plus 2km buffer during the breeding season (operations and maintenance phase).**

Guillemot UCI mortality figures. All Birds. Breeding Season

Displacement rate (%)	Mortality rate (%)												
	1	2	5	10	20	30	40	50	60	70	80	90	100
10	6	12	30	60	120	180	240	300	360	420	480	540	600
20	12	24	60	120	240	360	480	600	720	840	960	1080	1200
30	18	36	90	180	360	540	720	900	1080	1260	1440	1620	1800
40	24	48	120	240	480	720	960	1200	1440	1680	1920	2160	2400
50	30	60	150	300	600	900	1200	1500	1800	2100	2400	2700	3000
60	36	72	180	360	720	1080	1440	1800	2160	2520	2880	3239	3599
70	42	84	210	420	840	1260	1680	2100	2520	2940	3359	3779	4199
80	48	96	240	480	960	1440	1920	2400	2880	3359	3839	4319	4799
90	54	108	270	540	1080	1620	2160	2700	3239	3779	4319	4859	5399
100	60	120	300	600	1200	1800	2400	3000	3599	4199	4799	5399	5999

Table 1.19: **Mean predicted common guillemot mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (operations and maintenance phase).**

Guillemot Mean mortality figures. All Birds. Non-Breeding Season

Displacement rate (%)	Mortality rate (%)												
	1	2	5	10	20	30	40	50	60	70	80	90	100
10	4	8	21	41	82	123	164	205	246	287	328	369	410
20	8	16	41	82	164	246	328	410	492	574	656	738	820
30	12	25	62	123	246	369	492	615	738	861	984	1107	1230
40	16	33	82	164	328	492	656	820	984	1148	1312	1476	1640
50	21	41	103	205	410	615	820	1025	1230	1435	1640	1845	2051
60	25	49	123	246	492	738	984	1230	1476	1722	1968	2215	2461
70	29	57	144	287	574	861	1148	1435	1722	2009	2297	2584	2871
80	33	66	164	328	656	984	1312	1640	1968	2297	2625	2953	3281
90	37	74	185	369	738	1107	1476	1845	2215	2584	2953	3322	3691
100	41	82	205	410	820	1230	1640	2051	2461	2871	3281	3691	4101

Table 1.20: **LCI predicted common guillemot mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (operations and maintenance phase).**

Guillemot LCI mortality figures. All Birds. Non-Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	2	5	12	24	49	73	98	122	147	171	196	220	244
20	5	10	24	49	98	147	196	244	293	342	391	440	489
30	7	15	37	73	147	220	293	367	440	513	587	660	733
40	10	20	49	98	196	293	391	489	587	684	782	880	978
50	12	24	61	122	244	367	489	611	733	855	978	1100	1222
60	15	29	73	147	293	440	587	733	880	1026	1173	1320	1466
70	17	34	86	171	342	513	684	855	1026	1198	1369	1540	1711
80	20	39	98	196	391	587	782	978	1173	1369	1564	1760	1955
90	22	44	110	220	440	660	880	1100	1320	1540	1760	1980	2200
100	24	49	122	244	489	733	978	1222	1466	1711	1955	2200	2444

Table 1.21: **UCI predicted common guillemot mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (operations and maintenance phase).**

Guillemot UCI mortality figures. All Birds. Non-Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	6	12	31	62	124	185	247	309	371	433	494	556	618
20	12	25	62	124	247	371	494	618	742	865	989	1112	1236
30	19	37	93	185	371	556	742	927	1112	1298	1483	1669	1854
40	25	49	124	247	494	742	989	1236	1483	1730	1978	2225	2472
50	31	62	155	309	618	927	1236	1545	1854	2163	2472	2781	3090
60	37	74	185	371	742	1112	1483	1854	2225	2596	2966	3337	3708
70	43	87	216	433	865	1298	1730	2163	2596	3028	3461	3893	4326
80	49	99	247	494	989	1483	1978	2472	2966	3461	3955	4450	4944
90	56	111	278	556	1112	1669	2225	2781	3337	3893	4450	5006	5562
100	62	124	309	618	1236	1854	2472	3090	3708	4326	4944	5562	6180

1.3.1.6 During the breeding season, the mean peak abundance for common guillemot is 4,893 (LCI; 3,913, UCI; 5,999) individuals within the Morgan Array Area plus 2km buffer (Table 1.15). When considering displacement and mortality rates of 30 to 70% and 1 to 10%, respectively, this would result in approximately 15 to 343 (LCI; 12 to 274, UCI; 18 to 420) common guillemot being subject to mortality. During the breeding season the total common guillemot regional baseline population, including breeding adults and immature seabirds, is estimated to be 619,957 individuals (Table 1.2). Using the average baseline mortality rate of 0.139 (Table 1.4), the background estimated mortality of common guillemot in the breeding season is 86,174. The addition of 15 to 343 (LCI; 12 to 274, UCI; 18 to 420) mortalities would increase the mortality relative to the baseline mortality rate by 0.017 to 0.398% (LCI; 0.014 to 0.318%, UCI; 0.021 to 0.487%).

1.3.1.7 During the non-breeding season, the mean peak abundance for common guillemot was 4,101 (LCI; 2,444, UCI; 6,180) individuals within the Morgan Array Area and 2km buffer (Table 1.15). When considering displacement and mortality rates of 30 to 70% and 1 to 10%, this would result in approximately 12 to 287 (LCI; 7 to 171, UCI; 19 to 433) common guillemot being subject to mortality. The UK Western Waters BDMPS for the non-breeding season is defined as 1,139,220 individuals (Table 2.3) and, using the average baseline mortality rate of 0.139, the background predicted mortality in the non-breeding bio-season is 158,352. The addition of 12 to 287 (LCI; 7 to 171, UCI; 19 to 433) mortalities would increase the mortality relative to the baseline mortality rate by 0.008 to 0.181% (LCI; 0.004 to 0.108%, UCI; 0.012 to 0.273%).

1.3.1.8 In both bio-seasons and assessed against the defined common guillemot populations (619,957 and 1,139,220 seabirds respectively) the predicted mortality did not surpass the 1% baseline mortality threshold during operation (highlighted yellow cells within each displacement matrix indicates if mortality exceeds 1%).

1.3.2 Razorbill

Construction and decommissioning phases

1.3.2.1 For all seasons combined, the annual predicted number of razorbills subject to mortality due to displacement during the construction and decommissioning phases was one to 22 individuals (LCI; zero to eight, UCI; two to 41; Table 1.22). Using the largest UK Western Waters BDMPS population of 606,914 individuals (Table 1.3), as a proxy for the total BDMPS population across the year, with an average baseline mortality rate of 0.174 (Table 1.4), the background estimated mortality across all seasons is 105,603. The addition of one to 22 individuals (LCI; zero to eight, UCI; two to 41) mortalities would increase the mortality relative to the baseline mortality rate by 0.001 to 0.021% (LCI; 0.000 to 0.008%, UCI; 0.002 to 0.039%) at the BDMPS scale. Table 1.22 further breaks this down into relevant bio-seasons, with displacement matrices presented in Table 1.23 to Table 1.34.

Table 1.22: **Razorbill bio-season displacement estimates for the Morgan Array Area plus 2km buffer during construction and decommissioning.**

Bio-season	Seasonal Abundance (Morgan Array Area + 2km buffer)	Regional Baseline Population		Number of razorbill subject to mortality (indiv.)	Increase in baseline mortality (%)
		Population	Baseline Mortality		
Spring Migration					
Mean	166	606,914	105,603	0 to 6	0.000 to 0.006
LCI	63	606,914	105,603	0 to 2	0.000 to 0.002
UCI	317	606,914	105,603	0 to 11	0.000 to 0.010
Breeding					
Mean	120	281,276	48,942	0 to 4	0.000 to 0.008
LCI	52	281,276	48,942	0 to 2	0.000 to 0.004
UCI	195	281,276	48,942	0 to 7	0.000 to 0.014
Autumn Migration					
Mean	103	606,914	105,603	0 to 4	0.000 to 0.004
LCI	49	606,914	105,603	0 to 2	0.000 to 0.002
UCI	181	606,914	105,603	0 to 6	0.000 to 0.006
Non-breeding					
Mean	233	341,422	59,407	1 to 8	0.002 to 0.013
LCI	48	341,422	59,407	0 to 2	0.000 to 0.003

Bio-season	Seasonal Abundance (Morgan Array Area + 2km buffer)	Regional Baseline Population		Number of razorbill subject to mortality (indiv.)	Increase in baseline mortality (%)
		Population	Baseline Mortality		
UCI	485	341,422	59,407	2 to 17	0.003 to 0.029
Annual (BDMPS)					
Mean	622	606,914	105,603	1 to 22	0.001 to 0.021
LCI	212	606,914	105,603	0 to 8	0.000 to 0.008
UCI	1,178	606,914	105,603	2 to 41	0.002 to 0.039

Table 1.23: Mean predicted razorbill mortality for the Morgan Array plus 2km buffer during Spring migration (construction and decommissioning).

Razorbill Mean mortality figures. All Birds. Spring Migration.

Displacement rate (%)	Mortality rate (%)												
	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	1	2	3	5	7	8	10	12	13	15	17
10	0	0	1	2	3	5	7	8	10	12	13	15	17
15	0	0	1	2	5	7	10	12	15	17	20	22	25
20	0	1	2	3	7	10	13	17	20	23	27	30	33
25	0	1	2	4	8	12	17	21	25	29	33	37	42
30	0	1	2	5	10	15	20	25	30	35	40	45	50
35	1	1	3	6	12	17	23	29	35	41	46	52	58
40	1	1	3	7	13	20	27	33	40	46	53	60	66
45	1	1	4	7	15	22	30	37	45	52	60	67	75
50	1	2	4	8	17	25	33	42	50	58	66	75	83
55	1	2	5	9	18	27	37	46	55	64	73	82	91
60	1	2	5	10	20	30	40	50	60	70	80	90	100
65	1	2	5	11	22	32	43	54	65	76	86	97	108
70	1	2	6	12	23	35	46	58	70	81	93	105	116
75	1	2	6	12	25	37	50	62	75	87	100	112	125
80	1	3	7	13	27	40	53	66	80	93	106	120	133
85	1	3	7	14	28	42	56	71	85	99	113	127	141
90	1	3	7	15	30	45	60	75	90	105	120	134	149
95	2	3	8	16	32	47	63	79	95	110	126	142	158
100	2	3	8	17	33	50	66	83	100	116	133	149	166

Table 1.24: LCI predicted razorbill mortality for the Morgan Array Area plus 2km buffer during Spring migration (construction and decommissioning).

Razorbill LCI mortality figures. All Birds. Spring Migration.

Displacement rate (%)	Mortality rate (%)												
	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	0	1	1	2	3	3	4	4	5	6	6
10	0	0	0	1	1	2	3	3	4	4	5	6	6
15	0	0	0	1	2	3	4	5	6	7	8	9	9
20	0	0	1	1	3	4	5	6	8	9	10	11	13
25	0	0	1	2	3	5	6	8	9	11	13	14	16
30	0	0	1	2	4	6	8	9	11	13	15	17	19
35	0	0	1	2	4	7	9	11	13	15	18	20	22
40	0	1	1	3	5	8	10	13	15	18	20	23	25
45	0	1	1	3	6	9	11	14	17	20	23	26	28
50	0	1	2	3	6	9	13	16	19	22	25	28	32
55	0	1	2	3	7	10	14	17	21	24	28	31	35
60	0	1	2	4	8	11	15	19	23	26	30	34	38
65	0	1	2	4	8	12	16	20	25	29	33	37	41
70	0	1	2	4	9	13	18	22	26	31	35	40	44
75	0	1	2	5	9	14	19	24	28	33	38	43	47
80	1	1	3	5	10	15	20	25	30	35	40	45	50
85	1	1	3	5	11	16	21	27	32	37	43	48	54
90	1	1	3	6	11	17	23	28	34	40	45	51	57
95	1	1	3	6	12	18	24	30	36	42	48	54	60
100	1	1	3	6	13	19	25	32	38	44	50	57	63

Table 1.25: UCI predicted razorbill mortality for the Morgan Array Area plus 2km buffer during Spring migration (construction and decommissioning).

Razorbill UCI mortality figures. All Birds. Spring Migration.

Displacement rate (%)	Mortality rate (%)												
	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	1	2	3	6	10	13	16	19	22	25	29	32
10	0	1	2	3	6	10	13	16	19	22	25	29	32
15	1	1	2	5	10	14	19	24	29	33	38	43	48
20	1	1	3	6	13	19	25	32	38	44	51	57	63
25	1	2	4	8	16	24	32	40	48	55	63	71	79
30	1	2	5	10	19	29	38	48	57	67	76	86	95
35	1	2	6	11	22	33	44	55	67	78	89	100	111
40	1	3	6	13	25	38	51	63	76	89	101	114	127
45	1	3	7	14	29	43	57	71	86	100	114	128	143
50	2	3	8	16	32	48	63	79	95	111	127	143	159
55	2	3	9	17	35	52	70	87	105	122	139	157	174
60	2	4	10	19	38	57	76	95	114	133	152	171	190
65	2	4	10	21	41	62	82	103	124	144	165	185	206
70	2	4	11	22	44	67	89	111	133	155	178	200	222
75	2	5	12	24	48	71	95	119	143	166	190	214	238
80	3	5	13	25	51	76	101	127	152	178	203	228	254
85	3	5	13	27	54	81	108	135	162	189	216	243	269
90	3	6	14	29	57	86	114	143	171	200	228	257	285
95	3	6	15	30	60	90	120	151	181	211	241	271	301
100	3	6	16	32	63	95	127	159	190	222	254	285	317

Table 1.26: Mean predicted razorbill mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Razorbill Mean mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	1	1	2	4	5	6	7	8	10	11	12
10	0	0	1	1	2	4	5	6	7	8	10	11	12
15	0	0	1	2	4	5	7	9	11	13	14	16	18
20	0	0	1	2	5	7	10	12	14	17	19	22	24
25	0	1	2	3	6	9	12	15	18	21	24	27	30
30	0	1	2	4	7	11	14	18	22	25	29	32	36
35	0	1	2	4	8	13	17	21	25	29	34	38	42
40	0	1	2	5	10	14	19	24	29	34	38	43	48
45	1	1	3	5	11	16	22	27	32	38	43	49	54
50	1	1	3	6	12	18	24	30	36	42	48	54	60
55	1	1	3	7	13	20	26	33	40	46	53	59	66
60	1	1	4	7	14	22	29	36	43	50	58	65	72
65	1	2	4	8	16	23	31	39	47	55	62	70	78
70	1	2	4	8	17	25	34	42	50	59	67	76	84
75	1	2	5	9	18	27	36	45	54	63	72	81	90
80	1	2	5	10	19	29	38	48	58	67	77	86	96
85	1	2	5	10	20	31	41	51	61	71	82	92	102
90	1	2	5	11	22	32	43	54	65	76	86	97	108
95	1	2	6	11	23	34	46	57	68	80	91	103	114
100	1	2	6	12	24	36	48	60	72	84	96	108	120

Table 1.28: UCI predicted razorbill mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction).

Razorbill UCI mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	1	2	4	6	8	10	12	14	16	18	20
10	0	0	1	2	4	6	8	10	12	14	16	18	20
15	0	1	1	3	6	9	12	15	18	20	23	26	29
20	0	1	2	4	8	12	16	20	23	27	31	35	39
25	0	1	2	5	10	15	20	24	29	34	39	44	49
30	1	1	3	6	12	18	23	29	35	41	47	53	59
35	1	1	3	7	14	20	27	34	41	48	55	61	68
40	1	2	4	8	16	23	31	39	47	55	62	70	78
45	1	2	4	9	18	26	35	44	53	61	70	79	88
50	1	2	5	10	20	29	39	49	59	68	78	88	98
55	1	2	5	11	21	32	43	54	64	75	86	97	107
60	1	2	6	12	23	35	47	59	70	82	94	105	117
65	1	3	6	13	25	38	51	63	76	89	101	114	127
70	1	3	7	14	27	41	55	68	82	96	109	123	137
75	1	3	7	15	29	44	59	73	88	102	117	132	146
80	2	3	8	16	31	47	62	78	94	109	125	140	156
85	2	3	8	17	33	50	66	83	99	116	133	149	166
90	2	4	9	18	35	53	70	88	105	123	140	158	176
95	2	4	9	19	37	56	74	93	111	130	148	167	185
100	2	4	10	20	39	59	78	98	117	137	156	176	195

Table 1.27: LCI predicted razorbill mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Razorbill LCI mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	0	1	1	2	2	3	3	4	4	5	5
10	0	0	0	1	1	2	2	3	3	4	4	5	5
15	0	0	0	1	2	2	3	4	5	5	6	7	8
20	0	0	1	1	2	3	4	5	6	7	8	9	10
25	0	0	1	1	3	4	5	7	8	9	10	12	13
30	0	0	1	2	3	5	6	8	9	11	12	14	16
35	0	0	1	2	4	5	7	9	11	13	15	16	18
40	0	0	1	2	4	6	8	10	12	15	17	19	21
45	0	0	1	2	5	7	9	12	14	16	19	21	23
50	0	1	1	3	5	8	10	13	16	18	21	23	26
55	0	1	1	3	6	9	11	14	17	20	23	26	29
60	0	1	2	3	6	9	12	16	19	22	25	28	31
65	0	1	2	3	7	10	14	17	20	24	27	30	34
70	0	1	2	4	7	11	15	18	22	25	29	33	36
75	0	1	2	4	8	12	16	20	23	27	31	35	39
80	0	1	2	4	8	12	17	21	25	29	33	37	42
85	0	1	2	4	9	13	18	22	27	31	35	40	44
90	0	1	2	5	9	14	19	23	28	33	37	42	47
95	0	1	2	5	10	15	20	25	30	35	40	44	49
100	1	1	3	5	10	16	21	26	31	36	42	47	52

Table 1.29: Mean predicted razorbill mortality for the Morgan Array Area plus 2km buffer during Autumn migration (construction and decommissioning).

Razorbill Mean mortality figures. All Birds. Autumn Migration.	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	1	1	2	3	4	5	6	7	8	9	10
10	0	0	1	1	2	3	4	5	6	7	8	9	10
15	0	0	1	2	3	5	6	8	9	11	12	14	15
20	0	0	1	2	4	6	8	10	12	14	16	19	21
25	0	1	1	3	5	8	10	13	15	18	21	23	26
30	0	1	2	3	6	9	12	15	19	22	25	28	31
35	0	1	2	4	7	11	14	18	22	25	29	32	36
40	0	1	2	4	8	12	16	21	25	29	33	37	41
45	0	1	2	5	9	14	19	23	28	32	37	42	46
50	1	1	3	5	10	15	21	26	31	36	41	46	52
55	1	1	3	6	11	17	23	28	34	40	45	51	57
60	1	1	3	6	12	19	25	31	37	43	49	56	62
65	1	1	3	7	13	20	27	33	40	47	54	60	67
70	1	1	4	7	14	22	29	36	43	50	58	65	72
75	1	2	4	8	15	23	31	39	46	54	62	70	77
80	1	2	4	8	16	25	33	41	49	58	66	74	82
85	1	2	4	9	18	26	35	44	53	61	70	79	88
90	1	2	5	9	19	28	37	46	56	65	74	83	93
95	1	2	5	10	20	29	39	49	59	68	78	88	98
100	1	2	5	10	21	31	41	52	62	72	82	93	103

Table 1.30: LCI predicted razorbill mortality for the Morgan Array Area plus 2km buffer during Autumn migration (construction and decommissioning).

Razorbill LCI mortality figures. All Birds. Autumn Migration.	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	0	0	1	1	2	2	3	3	4	4	5
10	0	0	0	0	1	1	2	2	3	3	4	4	5
15	0	0	0	1	1	2	3	4	4	5	6	7	7
20	0	0	0	1	2	3	4	5	6	7	8	9	10
25	0	0	1	1	2	4	5	6	7	9	10	11	12
30	0	0	1	1	3	4	6	7	9	10	12	13	15
35	0	0	1	2	3	5	7	9	10	12	14	15	17
40	0	0	1	2	4	6	8	10	12	14	16	18	20
45	0	0	1	2	4	7	9	11	13	15	18	20	22
50	0	0	1	2	5	7	10	12	15	17	20	22	25
55	0	1	1	3	5	8	11	13	16	19	22	24	27
60	0	1	1	3	6	9	12	15	18	21	24	26	29
65	0	1	2	3	6	10	13	16	19	22	25	29	32
70	0	1	2	3	7	10	14	17	21	24	27	31	34
75	0	1	2	4	7	11	15	18	22	26	29	33	37
80	0	1	2	4	8	12	16	20	24	27	31	35	39
85	0	1	2	4	8	12	17	21	25	29	33	37	42
90	0	1	2	4	9	13	18	22	26	31	35	40	44
95	0	1	2	5	9	14	19	23	28	33	37	42	47
100	0	1	2	5	10	15	20	25	29	34	39	44	49

Table 1.32: Mean predicted razorbill mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (construction and decommissioning).

Razorbill Mean mortality figures. All Birds. Non-breeding.	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	1	2	5	7	9	12	14	16	19	21	23
10	0	0	1	2	5	7	9	12	14	16	19	21	23
15	0	1	2	3	7	10	14	17	21	24	28	31	35
20	0	1	2	5	9	14	19	23	28	33	37	42	47
25	1	1	3	6	12	17	23	29	35	41	47	52	58
30	1	1	3	7	14	21	28	35	42	49	56	63	70
35	1	2	4	8	16	24	33	41	49	57	65	73	82
40	1	2	5	9	19	28	37	47	56	65	75	84	93
45	1	2	5	10	21	31	42	52	63	73	84	94	105
50	1	2	6	12	23	35	47	58	70	82	93	105	117
55	1	3	6	13	26	38	51	64	77	90	103	115	128
60	1	3	7	14	28	42	56	70	84	98	112	126	140
65	2	3	8	15	30	45	61	76	91	106	121	136	151
70	2	3	8	16	33	49	65	82	98	114	130	147	163
75	2	3	9	17	35	52	70	87	105	122	140	157	175
80	2	4	9	19	37	56	75	93	112	130	149	168	186
85	2	4	10	20	40	59	79	99	119	139	158	178	198
90	2	4	10	21	42	63	84	105	126	147	168	189	210
95	2	4	11	22	44	66	89	111	133	155	177	199	221
100	2	5	12	23	47	70	93	117	140	163	186	210	233

Table 1.31: UCI predicted razorbill mortality for the Morgan Array Area plus 2km buffer during Autumn migration (construction and decommissioning).

Razorbill UCI mortality figures. All Birds. Autumn Migration.	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	1	2	4	5	7	9	11	13	14	16	18
10	0	0	1	2	4	5	7	9	11	13	14	16	18
15	0	1	1	3	5	8	11	14	16	19	22	24	27
20	0	1	2	4	7	11	14	18	22	25	29	33	36
25	0	1	2	5	9	14	18	23	27	32	36	41	45
30	1	1	3	5	11	16	22	27	33	38	43	49	54
35	1	1	3	6	13	19	25	32	38	44	51	57	63
40	1	1	4	7	14	22	29	36	43	51	58	65	72
45	1	2	4	8	16	24	33	41	49	57	65	73	81
50	1	2	5	9	18	27	36	45	54	63	72	81	91
55	1	2	5	10	20	30	40	50	60	70	80	90	100
60	1	2	5	11	22	33	43	54	65	76	87	98	109
65	1	2	6	12	24	35	47	59	71	82	94	106	118
70	1	3	6	13	25	38	51	63	76	89	101	114	127
75	1	3	7	14	27	41	54	68	81	95	109	122	136
80	1	3	7	14	29	43	58	72	87	101	116	130	145
85	2	3	8	15	31	46	62	77	92	108	123	138	154
90	2	3	8	16	33	49	65	81	98	114	130	147	163
95	2	3	9	17	34	52	69	86	103	120	138	155	172
100	2	4	9	18	36	54	72	91	109	127	145	163	181

Table 1.33: LCI predicted razorbill mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (construction and decommissioning).

Razorbill LCI mortality figures. All Birds. Non-breeding.	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	0	0	1	1	2	2	3	3	4	4	5
10	0	0	0	0	1	1	2	2	3	3	4	4	5
15	0	0	0	1	1	2	3	4	4	5	6	6	7
20	0	0	0	1	2	3	4	5	6	7	8	9	10
25	0	0	1	1	2	4	5	6	7	8	10	11	12
30	0	0	1	1	3	4	6	7	9	10	12	13	14
35	0	0	1	2	3	5	7	8	10	12	13	15	17
40	0	0	1	2	4	6	8	10	12	13	15	17	19
45	0	0	1	2	4	6	9	11	13	15	17	19	22
50	0	0	1	2	5	7	10	12	14	17	19	22	24
55	0	1	1	3	5	8	11	13	16	18	21	24	26
60	0	1	1	3	6	9	12	14	17	20	23	26	29
65	0	1	2	3	6	9	12	16	19	22	25	28	31
70	0	1	2	3	7	10	13	17	20	24	27	30	34
75	0	1	2	4	7	11	14	18	22	25	29	32	36
80	0	1	2	4	8	12	15	19	23	27	31	35	38
85	0	1	2	4	8	12	16	20	24	29	33	37	41
90	0	1	2	4	9	13	17	22	26	30	35	39	43
95	0	1	2	5	9	14	18	23	27	32	36	41	46
100	0	1	2	5	10	14	19	24	29	34	38	43	48

Table 1.34: **UCI predicted razorbill mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (construction and decommissioning).**

Razorbill UCI mortality figures. All Birds. Non-breeding.	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	1	2	5	10	15	19	24	29	34	39	44	49
10	0	1	2	5	10	15	19	24	29	34	39	44	49
15	1	1	4	7	15	22	29	36	44	51	58	65	73
20	1	2	5	10	19	29	39	49	58	68	78	87	97
25	1	2	6	12	24	36	49	61	73	85	97	109	121
30	1	3	7	15	29	44	58	73	87	102	116	131	146
35	2	3	8	17	34	51	68	85	102	119	136	153	170
40	2	4	10	19	39	58	78	97	116	136	155	175	194
45	2	4	11	22	44	65	87	109	131	153	175	196	218
50	2	5	12	24	49	73	97	121	146	170	194	218	243
55	3	5	13	27	53	80	107	133	160	187	213	240	267
60	3	6	15	29	58	87	116	146	175	204	233	262	291
65	3	6	16	32	63	95	126	158	189	221	252	284	315
70	3	7	17	34	68	102	136	170	204	238	272	306	340
75	4	7	18	36	73	109	146	182	218	255	291	327	364
80	4	8	19	39	78	116	155	194	233	272	310	349	388
85	4	8	21	41	82	124	165	206	247	289	330	371	412
90	4	9	22	44	87	131	175	218	262	306	349	393	437
95	5	9	23	46	92	138	184	230	276	323	369	415	461
100	5	10	24	49	97	146	194	243	291	340	388	437	485

1.3.2.2 During the Spring migration season (return migration), the mean peak abundance for razorbill was 166 (LCI; 63, UCI; 317) individuals within the Morgan Array Area plus 2km buffer (Table 1.22). When considering construction and decommissioning phase displacement and mortality rates of 15 to 35% and 1 to 10%, respectively, this would result in approximately zero to six (LCI; zero to two, UCI; zero to 11) razorbills being subject to mortality. The UK Western Waters BDMPS for the return migration season is defined as 606,914 (Table 1.3) and, using the average baseline mortality rate of 0.174 (Table 1.4), the background estimated mortality in the return migration season is 105,603. The addition of zero to six (LCI; zero to two, UCI; zero to 11) mortalities would increase the mortality relative to the baseline mortality rate by 0.000 to 0.006% (LCI; 0.000 to 0.002%, UCI; 0.000 to 0.010%).

1.3.2.3 During the breeding season, the mean peak abundance for razorbill was 120 (LCI; 52, UCI; 195) individuals within the Morgan Array Area plus 2km buffer. When considering construction and decommissioning phase displacement and mortality rates of 15 to 35% and 1 to 10%, respectively, this would result in approximately zero to four (LCI; zero to two, UCI; zero to seven) razorbill being subject to mortality. The regional population in the breeding season is defined as 281,276 individuals (Table 1.22) and, using the average baseline mortality rate of 0.174 (Table 1.4), the background estimated mortality in the breeding season is 48,942. The addition of zero to four (LCI; zero to two, UCI; zero to seven) mortalities would increase the mortality relative to the baseline mortality rate by 0.000 to 0.008% (LCI; 0.000 to 0.004%, UCI; 0.000 to 0.014%).

1.3.2.4 During the autumn migration season (post-breeding migration), the mean peak abundance for razorbill was 103 (LIC; 49, UCI; 181) individuals within the Morgan Array Area plus 2km buffer. When considering construction and decommissioning phase displacement and mortality rates of 15 to 35% and 1 to 10%, this would result in approximately zero to four (LCI; zero to two, UCI; zero to six) razorbills being subject to mortality. The BDMPS population during Autumn migration is defined as 606,914 individuals (Table 1.4) and, using the average baseline mortality rate of 0.174 (Table

1.4), the background estimated mortality during autumn migration season is 105,603. The addition of zero to four (LCI; zero to two, UCI; zero to six) mortalities would increase the baseline mortality rate by 0.000 to 0.004% (LCI; 0.000 to 0.002%, UCI; 0.000 to 0.006%).

1.3.2.5 During the non-breeding season (winter season), the mean peak abundance for razorbills was 233 (LCI; 48, UCI; 485) individuals within the Morgan Array Area plus 2km buffer. When considering construction and decommissioning phase displacement and mortality rates of 15 to 35% and 1 to 10%, one to eight (LCI; zero to two, UCI; one to 17) razorbills are subject to additional mortality. The BDMPS population in the non-breeding winter season is defined as 341,422 individuals (Table 1.3) and, using the average baseline mortality rate of 0.174 (Table 1.4), the background estimated mortality in the non-breeding winter season is 59,407. The addition of one to eight (LCI; zero to two, UCI; one to 17) mortalities would increase the mortality relative to the baseline mortality rate by 0.002 to 0.013% (LCI; 0.000 to 0.003%, UCI; 0.003 to 0.029%).

1.3.2.6 In all four bio-seasons and assessed against the defined razorbill populations (606,914 in both migration periods, 281,276 in the breeding period and 341,422 seabirds in the non-breeding period respectively) the predicted mortality from each season's displacement does not surpass the 1% baseline mortality threshold during construction and decommissioning (highlighted yellow cells within each displacement matrix indicates if mortality exceeds 1%).

Operations and maintenance phase

1.3.2.7 For all seasons combined, the annual predicted number of razorbills subject to mortality due to displacement was zero to 25 (LCI; zero to nine, UCI; two to 47) individuals (Table 1.35). Using the largest UK Western Waters BDMPS population of 606,914 individuals (Table 1.3) as a proxy for the total BDMPS population across the year, with an average baseline mortality rate of 0.174 (Table 1.4), the background estimated mortality across all seasons is 105,603. The addition of zero to 25 (LCI; zero to nine, UCI; two to 47) mortalities would increase the mortality relative to the baseline mortality rate by 0.000 to 0.024% (LCI; 0.000 to 0.009%, UCI; 0.002 to 0.045%) at the BDMPS scale. Table 1.35 further breaks this down into relevant bio-seasons, with displacement matrices presented in Table 1.36 to Table 1.47.

Table 1.35: **Razorbill bio-season displacement estimates for the Morgan Array Area plus 2km buffer during the operations and maintenance phase.**

Bio-season	Seasonal Abundance (Morgan Array Area + 2km buffer)	Regional Baseline Population		Number of razorbill subject to mortality (indiv.)	Increase in baseline mortality (%)
		Population	Baseline Mortality		
Spring Migration					
Mean	166	606,914	105,603	0 to 7	0.000 to 0.007
LCI	63	606,914	105,603	0 to 3	0.000 to 0.003
UCI	317	606,914	105,603	1 to 13	0.001 to 0.012

Bio-season	Seasonal Abundance (Morgan Array Area + 2km buffer)	Regional Baseline Population		Number of razorbill subject to mortality (indiv.)	Increase in baseline mortality (%)
		Population	Baseline Mortality		
Breeding					
Mean	120	281,276	48,942	0 to 5	0.000 to 0.010
LCI	52	281,276	48,942	0 to 2	0.000 to 0.004
UCI	195	281,276	48,942	0 to 8	0.000 to 0.016
Autumn Migration					
Mean	103	606,914	105,603	0 to 4	0.000 to 0.004
LCI	49	606,914	105,603	0 to 2	0.000 to 0.002
UCI	181	606,914	105,603	0 to 7	0.000 to 0.007
Non-breeding					
Mean	233	341,422	59,407	0 to 9	0.000 to 0.015
LCI	48	341,422	59,407	0 to 2	0.000 to 0.003
UCI	485	341,422	59,407	1 to 19	0.002 to 0.032
Annual (BDMPS)					
Mean	622	606,914	105,603	0 to 25	0.000 to 0.024
LCI	212	606,914	105,603	0 to 9	0.000 to 0.009
UCI	1,178	606,914	105,603	2 to 47	0.002 to 0.045

Table 1.36: Mean predicted razorbill mortality for the Morgan Array Area plus 2km buffer during Spring migration (operations and maintenance phase).

Razorbill Mean mortality figures. All Birds. Spring Migration

Displacement rate (%)	Mortality rate (%)											
	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	2	3	5	7	8	10	12	13	15	17
20	0	1	2	3	7	10	13	17	20	23	27	30	33
30	0	1	2	5	10	15	20	25	30	35	40	45	50
40	1	1	3	7	13	20	27	33	40	46	53	60	66
50	1	2	4	8	17	25	33	42	50	58	66	75	83
60	1	2	5	10	20	30	40	50	60	70	80	90	100
70	1	2	6	12	23	35	46	58	70	81	93	105	116
80	1	3	7	13	27	40	53	66	80	93	106	120	133
90	1	3	7	15	30	45	60	75	90	105	120	134	149
100	2	3	8	17	33	50	66	83	100	116	133	149	166

Table 1.37: LCI predicted razorbill mortality for the Morgan Array Area plus 2km buffer during Spring migration (operations and maintenance phase).

Razorbill LCI mortality figures. All Birds. Spring Migration

Displacement rate (%)	Mortality rate (%)											
	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	1	1	2	3	3	4	5	6	6
20	0	0	1	1	3	4	5	6	8	9	10	11	13
30	0	0	1	2	4	6	8	9	11	13	15	17	19
40	0	1	1	3	5	8	10	13	15	18	20	23	25
50	0	1	2	3	6	9	13	16	19	22	25	28	32
60	0	1	2	4	8	11	15	19	23	26	30	34	38
70	0	1	2	4	9	13	18	22	26	31	35	40	44
80	1	1	3	5	10	15	20	25	30	35	40	45	50
90	1	1	3	6	11	17	23	28	34	40	45	51	57
100	1	1	3	6	13	19	25	32	38	44	50	57	63

Table 1.38: UCI predicted razorbill mortality for the Morgan Array Area plus 2km buffer during Spring migration (operations and maintenance phase).

Razorbill UCI mortality figures. All Birds. Spring Migration

Displacement rate (%)	Mortality rate (%)											
	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	1	2	3	6	10	13	16	19	22	25	29	32
20	1	1	3	6	13	19	25	32	38	44	51	57	63
30	1	2	5	10	19	29	38	48	57	67	76	86	95
40	1	3	6	13	25	38	51	63	76	89	101	114	127
50	2	3	8	16	32	48	63	79	95	111	127	143	159
60	2	4	10	19	38	57	76	95	114	133	152	171	190
70	2	4	11	22	44	67	89	111	133	155	178	200	222
80	3	5	13	25	51	76	101	127	152	178	203	228	254
90	3	6	14	29	57	86	114	143	171	200	228	257	285
100	3	6	16	32	63	95	127	159	190	222	254	285	317

Table 1.39: Mean predicted razorbill mortality for the Morgan Array Area plus 2km buffer during the breeding season (operations and maintenance phase).

Razorbill Mean mortality figures. All Birds. Breeding Season

Displacement rate (%)	Mortality rate (%)											
	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	1	2	4	5	6	7	8	10	11	12
20	0	0	1	2	5	7	10	12	14	17	19	22	24
30	0	1	2	4	7	11	14	18	22	25	29	32	36
40	0	1	2	5	10	14	19	24	29	34	38	43	48
50	1	1	3	6	12	18	24	30	36	42	48	54	60
60	1	1	4	7	14	22	29	36	43	50	58	65	72
70	1	2	4	8	17	25	34	42	50	59	67	76	84
80	1	2	5	10	19	29	38	48	58	67	77	86	96
90	1	2	5	11	22	32	43	54	65	76	86	97	108
100	1	2	6	12	24	36	48	60	72	84	96	108	120

Table 1.40: LCI predicted razorbill mortality for the Morgan Array Area plus 2km buffer during the breeding season (operations and maintenance phase).

Razorbill LCI mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	1	1	2	2	3	3	4	4	5	5
20	0	0	1	1	2	3	4	5	6	7	8	9	10
30	0	0	1	2	3	5	6	8	9	11	12	14	16
40	0	0	1	2	4	6	8	10	12	15	17	19	21
50	0	1	1	3	5	8	10	13	16	18	21	23	26
60	0	1	2	3	6	9	12	16	19	22	25	28	31
70	0	1	2	4	7	11	15	18	22	25	29	33	36
80	0	1	2	4	8	12	17	21	25	29	33	37	42
90	0	1	2	5	9	14	19	23	28	33	37	42	47
100	1	1	3	5	10	16	21	26	31	36	42	47	52

Table 1.41: UCI predicted razorbill mortality for the Morgan Array Area 2km buffer during the breeding season (operations and maintenance phase).

Razorbill UCI mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	2	4	6	8	10	12	14	16	18	20
20	0	1	2	4	8	12	16	20	23	27	31	35	39
30	1	1	3	6	12	18	23	29	35	41	47	53	59
40	1	2	4	8	16	23	31	39	47	55	62	70	78
50	1	2	5	10	20	29	39	49	59	68	78	88	98
60	1	2	6	12	23	35	47	59	70	82	94	105	117
70	1	3	7	14	27	41	55	68	82	96	109	123	137
80	2	3	8	16	31	47	62	78	94	109	125	140	156
90	2	4	9	18	35	53	70	88	105	123	140	158	176
100	2	4	10	20	39	59	78	98	117	137	156	176	195

Table 1.42: Mean predicted razorbill mortality for the Morgan Array Area plus 2km buffer during Autumn migration (operations and maintenance phase).

Razorbill Mean mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	1	2	3	4	5	6	7	8	9	10
20	0	0	1	2	4	6	8	10	12	14	16	19	21
30	0	1	2	3	6	9	12	15	19	22	25	28	31
40	0	1	2	4	8	12	16	21	25	29	33	37	41
50	1	1	3	5	10	15	21	26	31	36	41	46	52
60	1	1	3	6	12	19	25	31	37	43	49	56	62
70	1	1	4	7	14	22	29	36	43	50	58	65	72
80	1	2	4	8	16	25	33	41	49	58	66	74	82
90	1	2	5	9	19	28	37	46	56	65	74	83	93
100	1	2	5	10	21	31	41	52	62	72	82	93	103

Table 1.43: LCI predicted razorbill mortality for the Morgan Array Area plus 2km buffer during Autumn migration (operations and maintenance phase).

Razorbill LCI mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	1	1	2	2	3	3	4	4	5
20	0	0	0	1	2	3	4	5	6	7	8	9	10
30	0	0	1	1	3	4	6	7	9	10	12	13	15
40	0	0	1	2	4	6	8	10	12	14	16	18	20
50	0	0	1	2	5	7	10	12	15	17	20	22	25
60	0	1	1	3	6	9	12	15	18	21	24	26	29
70	0	1	2	3	7	10	14	17	21	24	27	31	34
80	0	1	2	4	8	12	16	20	24	27	31	35	39
90	0	1	2	4	9	13	18	22	26	31	35	40	44
100	0	1	2	5	10	15	20	25	29	34	39	44	49

Table 1.44: UCI predicted razorbill mortality for the Morgan Array Area plus 2km buffer during Autumn migration (operations and maintenance phase).

Razorbill UCI mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	2	4	5	7	9	11	13	14	16	18
20	0	1	2	4	7	11	14	18	22	25	29	33	36
30	1	1	3	5	11	16	22	27	33	38	43	49	54
40	1	1	4	7	14	22	29	36	43	51	58	65	72
50	1	2	5	9	18	27	36	45	54	63	72	81	91
60	1	2	5	11	22	33	43	54	65	76	87	98	109
70	1	3	6	13	25	38	51	63	76	89	101	114	127
80	1	3	7	14	29	43	58	72	87	101	116	130	145
90	2	3	8	16	33	49	65	81	98	114	130	147	163
100	2	4	9	18	36	54	72	91	109	127	145	163	181

Table 1.45: Mean predicted razorbill mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (operations and maintenance phase).

Razorbill Mean mortality figures. All Birds. Non-Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	2	5	7	9	12	14	16	19	21	23
20	0	1	2	5	9	14	19	23	28	33	37	42	47
30	1	1	3	7	14	21	28	35	42	49	56	63	70
40	1	2	5	9	19	28	37	47	56	65	75	84	93
50	1	2	6	12	23	35	47	58	70	82	93	105	117
60	1	3	7	14	28	42	56	70	84	98	112	126	140
70	2	3	8	16	33	49	65	82	98	114	130	147	163
80	2	4	9	19	37	56	75	93	112	130	149	168	186
90	2	4	10	21	42	63	84	105	126	147	168	189	210
100	2	5	12	23	47	70	93	117	140	163	186	210	233

Table 1.46: **LCI predicted razorbill mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (operations and maintenance phase).**

Razorbill LCI mortality figures. All Birds. Non-Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	1	1	2	2	3	3	4	4	5
20	0	0	0	1	2	3	4	5	6	7	8	9	10
30	0	0	1	1	3	4	6	7	9	10	12	13	14
40	0	0	1	2	4	6	8	10	12	13	15	17	19
50	0	0	1	2	5	7	10	12	14	17	19	22	24
60	0	1	1	3	6	9	12	14	17	20	23	26	29
70	0	1	2	3	7	10	13	17	20	24	27	30	34
80	0	1	2	4	8	12	15	19	23	27	31	35	38
90	0	1	2	4	9	13	17	22	26	30	35	39	43
100	0	1	2	5	10	14	19	24	29	34	38	43	48

Table 1.47: **UCI predicted razorbill mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (operations and maintenance phase).**

Razorbill UCI mortality figures. All Birds. Non-Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	1	2	5	10	15	19	24	29	34	39	44	49
20	1	2	5	10	19	29	39	49	58	68	78	87	97
30	1	3	7	15	29	44	58	73	87	102	116	131	146
40	2	4	10	19	39	58	78	97	116	136	155	175	194
50	2	5	12	24	49	73	97	121	146	170	194	218	243
60	3	6	15	29	58	87	116	146	175	204	233	262	291
70	3	7	17	34	68	102	136	170	204	238	272	306	340
80	4	8	19	39	78	116	155	194	233	272	310	349	388
90	4	9	22	44	87	131	175	218	262	306	349	393	437
100	5	10	24	49	97	146	194	243	291	340	388	437	485

1.3.2.8   During the Spring migration season (return migration), the mean peak abundance for razorbill was 166 (LCI; 63, UCI; 317) individuals within the Morgan Array Area plus 2km buffer (Table 1.35). When considering operations and maintenance phase displacement and mortality rates of 30 to 70% and 1 to 10%, respectively, this would result in approximately zero to seven (LCI; zero to three, UCI; one to 13) razorbills being subject to mortality. The UK Western Waters BDMPS for the return migration season is defined as 606,914 (Table 1.3) and, using the average baseline mortality rate of 0.174 (Table 1.4), the background estimated mortality in the return migration season is 105,603. The addition of zero to seven (LCI; zero to three, UCI; one to 13) mortalities would increase the mortality relative to the baseline mortality rate by 0.000 to 0.007% (LCI; 0.000 to 0.003%, UCI; 0.001 to 0.012%).

1.3.2.9   During the breeding season, the mean peak abundance for razorbill was 120 (LCI; 52, UCI; 195) individuals within the Morgan Array Area plus 2km buffer. When considering operations and maintenance phase displacement and mortality rates of 30 to 70% and 1 to 10%, respectively, this would result in approximately zero to five (LCI; zero to two, UCI; zero to eight) razorbill being subject to mortality. The regional population in the breeding season is defined as 281,276 individuals (Table 1.2) and, using the average baseline mortality rate of 0.174 (Table 1.4), the background estimated mortality in the breeding season is 48,942. The addition of one to five (LCI; zero to two, UCI; one to eight) mortalities would increase the mortality relative to the baseline mortality rate by 0.000 to 0.010% (LCI; 0.000 to 0.004%, UCI; 0.000 to 0.016%).

1.3.2.10   During the Autumn migration season (post-breeding migration), the mean peak abundance for razorbill was 103 (LCI; 49, UCI; 181) individuals within the Morgan Array Area plus 2km buffer. When considering operations and maintenance phase displacement and mortality rates of 30 to 70% and 1 to 10%, this would result in approximately zero to four (LCI; zero to two, UCI; zero to 7) razorbills being subject to mortality. The BDMPS population during Autumn migration is defined as 606,914 individuals (Table 1.3) and, using the average baseline mortality rate of 0.174 (Table 1.4), the background estimated mortality during Autumn migration season is 105,603. The addition of zero to four (LCI; zero to two, UCI; zero to 7) mortalities would increase the baseline mortality rate by 0.000 to 0.004% (LCI; 0.000 to 0.002%, UCI; 0.000 to 0.007%).

1.3.2.11   During the non-breeding season (winter season), the mean peak abundance for razorbills was 622 (LCI; 212, UCI; 1,178) individuals within the Morgan Array Area plus 2km buffer. When considering operations and maintenance phase displacement and mortality rates of 30 to 70% and 1 to 10%, one to 25 (LCI; zero to nine, UCI; two to 47) razorbills are subject to mortality. The BDMPS population in the non-breeding season is defined as 341,422 individuals (Table 1.3) and, using the average baseline mortality rate of 0.174 (Table 1.4), the background estimated mortality in the non-breeding season is 59,407. The addition of one to 25 (LCI; zero to nine, UCI; two to 47) mortalities would increase the mortality relative to the baseline mortality rate by 0.002 to 0.042% (LCI; 0.000 to 0.009%, UCI; 0.003 to 0.079%).

1.3.2.12   In all four bio-seasons and assessed against the defined razorbill populations (606,914 in both migration periods, 281,276 in the breeding period and 341,422 individuals in the non-breeding period respectively), the predicted mortality from each season's displacement does not surpass the 1% baseline mortality threshold during operation (highlighted yellow cells within each displacement matrix indicates if mortality exceeds 1%).

1.3.3   Atlantic puffin

Construction and decommissioning phase

1.3.3.1   For all seasons combined, the annual predicted number of Atlantic puffins subject to mortality due to displacement during the construction and decommissioning phases was zero to one individual (LCI; zero to zero, UCI; zero to two; Table 1.48). Using the largest BDMPS of 304,557 individuals (Table 1.48Table 1.3) and, using the average baseline mortality rate of 0.181 (Table 1.4), the natural predicted mortality across all seasons is 55,125. The addition of zero to one (LCI; zero to zero, UCI; zero to two) mortalities would increase the baseline mortality rate by 0.000 to 0.002% (LCI; 0.000 to 0.00%, UCI; 0.000 to 0.004%). Table 1.48 further breaks this down into relevant bio-seasons, with displacement matrices presented in Table 1.49 to Table 1.54.

Table 1.48: Atlantic puffin bio-season displacement estimates for Morgan Array Area plus 2km buffer during construction and decommissioning.

Bio-season	Seasonal Abundance (Morgan Array Area + 2km buffer)	Regional Baseline Population		Number of Atlantic puffin subject to mortality (indiv.)	Increase in baseline mortality (%)
		Population	Baseline Mortality		
Breeding					
Mean	18	184,767	33,443	0 to 1	0.000 to 0.003
LCI	0	184,767	33,443	0 to 0	0.000 to 0.000
UCI	43	184,767	33,443	0 to 2	0.000 to 0.006
Non-breeding					
Mean	0	304,557	55,125	0 to 0	0.000 to 0.000
LCI	0	304,557	55,125	0 to 0	0.000 to 0.000
UCI	0	304,557	55,125	0 to 0	0.000 to 0.000
Annual (BDMPS)					
Mean	18	304,557	55,125	0 to 1	0.000 to 0.002
LCI	0	304,557	55,125	0 to 0	0.000 to 0.000
UCI	43	304,557	55,125	0 to 2	0.000 to 0.004

Table 1.49: Mean predicted Atlantic puffin mortality for the Morgan Array Area 2km buffer during the breeding season (construction and decommissioning).

Atlantic Puffin Mean mortality figures. All Birds. Autumn Migration	Mortality rate (%)											
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	0	0	0	1	1	1	1	1	1	2	2
10	0	0	0	0	1	1	1	1	1	1	1	2	2
15	0	0	0	0	1	1	1	1	2	2	2	2	3
20	0	0	0	0	1	1	1	2	2	3	3	3	4
25	0	0	0	0	1	1	2	2	3	3	4	4	5
30	0	0	0	1	1	2	2	3	3	4	4	5	5
35	0	0	0	1	1	2	3	3	4	4	5	6	6
40	0	0	0	1	1	2	3	4	4	5	6	6	7
45	0	0	0	1	2	2	3	4	5	6	6	7	8
50	0	0	0	1	2	3	4	5	5	6	7	8	9
55	0	0	0	1	2	3	4	5	6	7	8	9	10
60	0	0	1	1	2	3	4	5	6	8	9	10	11
65	0	0	1	1	2	4	5	6	7	8	9	11	12
70	0	0	1	1	3	4	5	6	8	9	10	11	13
75	0	0	1	1	3	4	5	7	8	9	11	12	14
80	0	0	1	1	3	4	6	7	9	10	12	13	14
85	0	0	1	2	3	5	6	8	9	11	12	14	15
90	0	0	1	2	3	5	6	8	10	11	13	15	16
95	0	0	1	2	3	5	7	9	10	12	14	15	17
100	0	0	1	2	4	5	7	9	11	13	14	16	18

Table 1.50: LCI predicted Atlantic puffin mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Atlantic Puffin LCI mortality figures. All Birds. Autumn Migration	Mortality rate (%)											
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 1.51: UCI predicted Atlantic puffin mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Atlantic Puffin UCI mortality figures. All Birds. Autumn Migration	Mortality rate (%)											
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	0	0	1	1	2	2	3	3	3	4	4
10	0	0	0	0	1	1	2	2	3	3	3	4	4
15	0	0	0	1	1	2	3	3	4	5	5	6	6
20	0	0	0	1	2	3	3	4	5	6	7	8	9
25	0	0	1	1	2	3	4	5	6	8	9	10	11
30	0	0	1	1	3	4	5	6	8	9	10	12	13
35	0	0	1	2	3	5	6	8	9	11	12	14	15
40	0	0	1	2	3	5	7	9	10	12	14	15	17
45	0	0	1	2	4	6	8	10	12	14	15	17	19
50	0	0	1	2	4	6	9	11	13	15	17	19	22
55	0	0	1	2	5	7	9	12	14	17	19	21	24
60	0	1	1	3	5	8	10	13	15	18	21	23	26
65	0	1	1	3	6	8	11	14	17	20	22	25	28
70	0	1	2	3	6	9	12	15	18	21	24	27	30
75	0	1	2	3	6	10	13	16	19	23	26	29	32
80	0	1	2	3	7	10	14	17	21	24	28	31	34
85	0	1	2	4	7	11	15	18	22	26	29	33	37
90	0	1	2	4	8	12	15	19	23	27	31	35	39
95	0	1	2	4	8	12	16	20	25	29	33	37	41
100	0	1	2	4	9	13	17	22	26	30	34	39	43

Table 1.52: Mean predicted Atlantic puffin mortality for the Morgan Array Area 2km buffer during the non-breeding season (construction and decommissioning).

Atlantic Puffin Mean mortality figures. All Birds. Non-breeding.	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 1.53: LCI predicted Atlantic puffin mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (construction and decommissioning).

Atlantic Puffin LCI mortality figures. All Birds. Non-breeding.	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 1.54: UCI predicted Atlantic puffin mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (construction and decommissioning).

Atlantic Puffin UCI mortality figures. All Birds. Non-breeding.	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0

1.3.3.2 During the breeding season, a mean peak abundance of 18 (LCI; zero, UCI; 43) Atlantic puffins were present within the Morgan Array Area plus 2km buffer. Using construction and decommissioning phase displacement rates of 15 to 35% and a mortality rate of 1 to 10% would result in zero to one (LCI; zero to zero; UCI; zero to two) Atlantic puffins being subject to mortality. The regional population in the breeding season is defined as 184,767 individuals (Table 1.2) and, using the average baseline mortality rate of 0.181 (Table 1.4), the background estimated mortality in the breeding season is 33,443. The addition of zero to one (LCI; zero to zero; UCI; zero to two) mortalities would increase the baseline mortality rate by 0.000 to 0.003% (LCI; 0.000 to 0.000%, UCI; 0.000 to 0.006%).

1.3.3.3 During the non-breeding season, a mean peak abundance of 18 (LCI; two, UCI; 43) Atlantic puffins were present within the Morgan Array Area plus 2km buffer. Using displacement rates of 15 to 35% and a mortality rate of 1 to 10% would result in zero to zero Atlantic puffins being subject to mortality (LCI, zero to zero, UCI; zero to zero). As this represents no change, there was no effect in the non-breeding season.

1.3.3.4 In both bio-seasons and assessed against the defined Atlantic puffin populations (184,767 in the breeding season and 304,557 individuals in the non-breeding period respectively) the predicted mortality from each season's displacement does not surpass the 1% baseline mortality threshold during construction and decommissioning (as highlighted yellow within each of the displacement matrices above).

Operations and maintenance phase

1.3.3.5 For all seasons combined, the annual predicted number of Atlantic puffins subject to mortality due to displacement was zero to one (LCI; zero to zero, UCI; zero to two). Using the largest BDMPS of 304,557 individuals (Table 1.3) and, using the average baseline mortality rate of 0.181 (Table 1.4), the background estimated mortality across all seasons is 55,125. The addition of zero to one (LCI; zero to zero, UCI; zero to two) mortalities would increase the baseline mortality rate by 0.000 to 0.002% (LCI; 0.000

to 0.000%, UCI, 0.000 to 0.004%). Table 1.55 further breaks this down into relevant bio-seasons, with displacement matrices presented in Table 1.56 to Table 1.61.

Table 1.55: Atlantic puffin bio-season displacement estimates for Morgan Array Area plus 2km buffer during the operations and maintenance phase.

Bio-season	Seasonal Abundance (Morgan Array Area + 2km buffer)	Regional Baseline Population		Number of Atlantic puffin subject to mortality (indiv.)	Increase in baseline mortality (%)
		Population	Baseline Mortality		
Breeding					
Mean	18	184,767	33,443	0 to 1	0.000 to 0.003
LCI	0	184,767	33,443	0 to 0	0.000 to 0.000
UCI	43	184,767	33,443	0 to 2	0.000 to 0.006
Non-breeding					
Mean	0	304,557	55,125	0 to 0	0.000 to 0.000
LCI	0	304,557	55,125	0 to 0	0.000 to 0.000
UCI	0	304,557	55,125	0 to 0	0.000 to 0.000
Annual (BDMPS)					
Mean	18	304,557	55,125	0 to 1	0.000 to 0.002
LCI	0	304,557	55,125	0 to 0	0.000 to 0.000
UCI	43	304,557	55,125	0 to 2	0.000 to 0.004

Table 1.56: Mean predicted Atlantic puffin mortality for the Morgan Array Area plus 2km buffer during the breeding season (operations and maintenance phase).

Atlantic Puffin Mean mortality figures. All Birds. Breeding Season

Displacement rate (%)	Mortality rate (%)												
	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	0	1	1	1	1	1	1	2	2
20	0	0	0	0	1	1	1	2	2	3	3	3	4
30	0	0	0	1	1	2	2	3	3	4	4	5	5
40	0	0	0	1	1	2	3	4	4	5	6	6	7
50	0	0	0	1	2	3	4	5	5	6	7	8	9
60	0	0	1	1	2	3	4	5	6	8	9	10	11
70	0	0	1	1	3	4	5	6	8	9	10	11	13
80	0	0	1	1	3	4	6	7	9	10	12	13	14
90	0	0	1	2	3	5	6	8	10	11	13	15	16
100	0	0	1	2	4	5	7	9	11	13	14	16	18

Table 1.57: LCI predicted Atlantic puffin mortality for the Morgan Array Area plus 2km buffer during the breeding season (operations and maintenance phase).

Atlantic Puffin LCI mortality figures. All Birds. Breeding Season

Displacement rate (%)	Mortality rate (%)												
	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 1.58: UCI predicted Atlantic puffin mortality for the Morgan Array Area plus 2km buffer during the breeding season (operations and maintenance phase).

Atlantic Puffin UCI mortality figures. All Birds. Breeding Season

Displacement rate (%)	Mortality rate (%)												
	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	1	1	2	2	3	3	3	4	4
20	0	0	0	1	2	3	3	4	5	6	7	8	9
30	0	0	1	1	3	4	5	6	8	9	10	12	13
40	0	0	1	2	3	5	7	9	10	12	14	15	17
50	0	0	1	2	4	6	9	11	13	15	17	19	22
60	0	1	1	3	5	8	10	13	15	18	21	23	26
70	0	1	2	3	6	9	12	15	18	21	24	27	30
80	0	1	2	3	7	10	14	17	21	24	28	31	34
90	0	1	2	4	8	12	15	19	23	27	31	35	39
100	0	1	2	4	9	13	17	22	26	30	34	39	43

Table 1.59: Mean predicted Atlantic puffin mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (operations and maintenance phase).

Atlantic Puffin Mean mortality figures. All Birds. Non-Breeding Season

Displacement rate (%)	Mortality rate (%)												
	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 1.60: LCI predicted Atlantic puffin mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (operations and maintenance phase).

Atlantic Puffin LCI mortality figures. All Birds. Non-Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 1.61: UCI predicted Atlantic puffin mortality for the Morgan Array Area plus 2km buffer during the non-breeding season (operations and maintenance phase).

Atlantic Puffin UCI mortality figures. All Birds. Non-Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0

1.3.3.6 During the breeding season, a mean peak abundance of 18 (LCI; zero, UCI, 43) Atlantic puffins were present within the Morgan Array Area plus 2km buffer. When considering operations and maintenance phase displacement and mortality rates of 30 to 70% and 1 to 10%, this would result in zero to one (LCI; zero to zero, UCI; zero to two) Atlantic puffins being subject to mortality. The regional population in the breeding season is defined as 184,767 individuals (Table 1.2) and, using the average baseline mortality rate of 0.181 (Table 1.4), the background estimated mortality in the breeding season is 33,443. The addition of zero to one (LCI; zero to zero, UCI; zero to two) mortalities would increase the baseline mortality rate by 0.000 - 0.003% (LCI; 0.000 to 0.000%, UCI; 0.000 to 0.006%).

1.3.3.7 During the non-breeding season, a mean peak abundance of zero (LCI; zero, UCI, zero) Atlantic puffins were present within the Morgan Array Area plus 2km buffer. Using displacement rates of 30 to 70% and a mortality rate of 1 to 10% would result in zero to zero (LCI; zero to zero, UCI; zero to zero) Atlantic puffins being subject to mortality. As this represents no change, there was no effect in the non-breeding season.

1.3.3.8 In both bio-seasons and assessed against the defined Atlantic puffin populations (184,767 in the breeding season and 304,557 seabirds in the non-breeding period respectively) the predicted mortality from each season's displacement does not surpass the 1% baseline mortality threshold during operation (highlighted yellow cells within each displacement matrix indicates if mortality exceeds 1%).

1.3.4 Northern Gannet

Construction and decommissioning phase

1.3.4.1 For all seasons combined, the annual predicted number of Northern gannet subject to mortality due to displacement during the construction and decommissioning phases was two to 18 (LCI; one to 10; UCI; two to 30) individuals (Table 1.63). Using the largest UK Western Waters BDMPS population of 661,888 individuals (Table 1.3), with an average baseline mortality rate of 0.187 (Table 1.4), the background estimated mortality across all seasons is 123,773. The addition of two to 18 (LCI; one to 10; UCI; two to 30) mortalities would increase the mortality relative to the baseline mortality rate by 0.002 to 0.015% (LCI; 0.000 to 0.008%, UCI; 0.002 to 0.024%) at the BDMPS scale. Table 1.62 further breaks this down into relevant bio-seasons, with displacement matrices presented in Table 1.63 to Table 1.71.

Table 1.62: Northern gannet bio-season displacement estimates for Morgan Array Area plus 2km buffer during construction and decommissioning.

Bio-season	Seasonal Abundance (Morgan Array Area + 2km buffer)	Regional Baseline Population	Baseline Mortality	Number of Northern gannet subject to mortality (indiv.)	Increase in baseline mortality (%)
		Population			
Spring Migration					
Mean	53	661,888	123,773	0 to 2	0.000 to 0.002
LCI	15	661,888	123,773	0 to 1	0.000 to 0.001
UCI	105	661,888	123,773	0 to 4	0.000 to 0.003
Breeding					
Mean	209	448,235	83,820	1 to 8	0.001 to 0.010
LCI	131	448,235	83,820	0 to 5	0.000 to 0.006
UCI	305	448,235	83,820	1 to 12	0.001 to 0.014
Autumn Migration					
Mean	192	545,954	102,093	1 to 8	0.001 to 0.008
LCI	93	545,954	102,093	0 to 4	0.000 to 0.004
UCI	346	545,954	102,093	1 to 14	0.001 to 0.014
Annual (BDPMS)					
Mean	454	661,888	123,773	2 to 18	0.002 to 0.015
LCI	239	661,888	123,773	0 to 10	0.000 to 0.008
UCI	756	661,888	123,773	2 to 30	0.002 to 0.024

Table 1.63: Mean predicted Northern gannet mortality for the Morgan Array Area plus 2km buffer during Spring migration (construction and decommissioning).

Gannet Mean mortality figures. All Birds. Spring Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	1	1	2	2	3	3	4	4	5	5
20	0	0	1	1	2	3	4	5	6	7	8	10	11
30	0	0	1	2	3	5	6	8	10	11	13	14	16
40	0	0	1	2	4	6	8	11	13	15	17	19	21
50	0	1	1	3	5	8	11	13	16	19	21	24	27
60	0	1	2	3	6	10	13	16	19	22	25	29	32
70	0	1	2	4	7	11	15	19	22	26	30	33	37
80	0	1	2	4	8	13	17	21	25	30	34	38	42
90	0	1	2	5	10	14	19	24	29	33	38	43	48
100	1	1	3	5	11	16	21	27	32	37	42	48	53

Table 1.64: LCI predicted Northern gannet mortality for the Morgan Array Area plus 2km buffer during Spring migration (construction and decommissioning).

Gannet LCI mortality figures. All Birds. Spring Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	0	0	1	1	1	1	1	1	2
20	0	0	0	0	1	1	1	2	2	2	2	3	3
30	0	0	0	0	1	1	2	2	3	3	4	4	5
40	0	0	0	1	1	2	2	3	4	4	5	5	6
50	0	0	0	1	2	2	3	4	5	5	6	7	8
60	0	0	0	1	2	3	4	5	5	6	7	8	9
70	0	0	1	1	2	3	4	5	6	7	8	9	11
80	0	0	1	1	2	4	5	6	7	8	10	11	12
90	0	0	1	1	3	4	5	7	8	9	11	12	14
100	0	0	1	2	3	5	6	8	9	11	12	14	15

Table 1.65: UCI predicted Northern gannet mortality for the Morgan Array Area plus 2km buffer during Spring migration (construction and decommissioning).

Gannet UCI mortality figures. All Birds. Spring Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	1	2	3	4	5	6	7	8	9	11
20	0	0	1	2	4	6	8	11	13	15	17	19	21
30	0	1	2	3	6	9	13	16	19	22	25	28	32
40	0	1	2	4	8	13	17	21	25	29	34	38	42
50	1	1	3	5	11	16	21	26	32	37	42	47	53
60	1	1	3	6	13	19	25	32	38	44	50	57	63
70	1	1	4	7	15	22	29	37	44	51	59	66	74
80	1	2	4	8	17	25	34	42	50	59	67	76	84
90	1	2	5	9	19	28	38	47	57	66	76	85	95
100	1	2	5	11	21	32	42	53	63	74	84	95	105

Table 1.66: Mean predicted Northern gannet mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Gannet Mean mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	2	4	6	8	10	13	15	17	19	21
20	0	1	2	4	8	13	17	21	25	29	33	38	42
30	1	1	3	6	13	19	25	31	38	44	50	56	63
40	1	2	4	8	17	25	33	42	50	59	67	75	84
50	1	2	5	10	21	31	42	52	63	73	84	94	105
60	1	3	6	13	25	38	50	63	75	88	100	113	125
70	1	3	7	15	29	44	59	73	88	102	117	132	146
80	2	3	8	17	33	50	67	84	100	117	134	150	167
90	2	4	9	19	38	56	75	94	113	132	150	169	188
100	2	4	10	21	42	63	84	105	125	146	167	188	209

Table 1.67: LCI predicted Northern gannet mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Gannet LCI mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	1	3	4	5	7	8	9	10	12	13
20	0	1	1	3	5	8	10	13	16	18	21	24	26
30	0	1	2	4	8	12	16	20	24	28	31	35	39
40	1	1	3	5	10	16	21	26	31	37	42	47	52
50	1	1	3	7	13	20	26	33	39	46	52	59	66
60	1	2	4	8	16	24	31	39	47	55	63	71	79
70	1	2	5	9	18	28	37	46	55	64	73	83	92
80	1	2	5	10	21	31	42	52	63	73	84	94	105
90	1	2	6	12	24	35	47	59	71	83	94	106	118
100	1	3	7	13	26	39	52	66	79	92	105	118	131

Table 1.68: UCI predicted Northern gannet mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Gannet UCI mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	1	2	3	6	9	12	15	18	21	24	27	31
20	1	1	3	6	12	18	24	31	37	43	49	55	61
30	1	2	5	9	18	27	37	46	55	64	73	82	92
40	1	2	6	12	24	37	49	61	73	85	98	110	122
50	2	3	8	15	31	46	61	76	92	107	122	137	153
60	2	4	9	18	37	55	73	92	110	128	146	165	183
70	2	4	11	21	43	64	85	107	128	149	171	192	214
80	2	5	12	24	49	73	98	122	146	171	195	220	244
90	3	5	14	27	55	82	110	137	165	192	220	247	275
100	3	6	15	31	61	92	122	153	183	214	244	275	305

Table 1.69: **Mean predicted Northern gannet mortality for the Morgan Array Area plus 2km buffer during Autumn migration (construction and decommissioning).**

Gannet Mean mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	2	4	6	8	10	12	13	15	17	19
20	0	1	2	4	8	12	15	19	23	27	31	35	38
30	1	1	3	6	12	17	23	29	35	40	46	52	58
40	1	2	4	8	15	23	31	38	46	54	61	69	77
50	1	2	5	10	19	29	38	48	58	67	77	86	96
60	1	2	6	12	23	35	46	58	69	81	92	104	115
70	1	3	7	13	27	40	54	67	81	94	108	121	134
80	2	3	8	15	31	46	61	77	92	108	123	138	154
90	2	3	9	17	35	52	69	86	104	121	138	156	173
100	2	4	10	19	38	58	77	96	115	134	154	173	192

Table 1.70: **LCI predicted Northern gannet mortality for the Morgan Array Area plus 2km buffer during Autumn migration (construction and decommissioning).**

Gannet LCI mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	1	2	3	4	5	6	7	7	8	9
20	0	0	1	2	4	6	7	9	11	13	15	17	19
30	0	1	1	3	6	8	11	14	17	20	22	25	28
40	0	1	2	4	7	11	15	19	22	26	30	33	37
50	0	1	2	5	9	14	19	23	28	33	37	42	47
60	1	1	3	6	11	17	22	28	33	39	45	50	56
70	1	1	3	7	13	20	26	33	39	46	52	59	65
80	1	1	4	7	15	22	30	37	45	52	60	67	74
90	1	2	4	8	17	25	33	42	50	59	67	75	84
100	1	2	5	9	19	28	37	47	56	65	74	84	93

Table 1.71: **UCI predicted Northern gannet mortality for the Morgan Array Area plus 2km buffer during Autumn migration (construction and decommissioning).**

Gannet UCI mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	1	2	3	7	10	14	17	21	24	28	31	35
20	1	1	3	7	14	21	28	35	42	48	55	62	69
30	1	2	5	10	21	31	42	52	62	73	83	93	104
40	1	3	7	14	28	42	55	69	83	97	111	125	138
50	2	3	9	17	35	52	69	87	104	121	138	156	173
60	2	4	10	21	42	62	83	104	125	145	166	187	208
70	2	5	12	24	48	73	97	121	145	170	194	218	242
80	3	6	14	28	55	83	111	138	166	194	221	249	277
90	3	6	16	31	62	93	125	156	187	218	249	280	311
100	3	7	17	35	69	104	138	173	208	242	277	311	346

1.3.4.2 During the Spring migration season (return migration), the mean peak abundance for Northern gannet was 53 (LCI; 15, UCI; 105) individuals within the Morgan Array Area plus 2km buffer (Table 1.62). When considering construction and decommissioning phase displacement and mortality rates of 30 to 40% and 1 to 10%, respectively, this would result in approximately zero to two (LCI; zero to one, UCI; one to four) Northern gannet being subject to mortality. The UK Western Waters BDMPS for the return migration season is defined as 661,888 (Table 1.3) and, using the average baseline mortality rate of 0.187 (Table 1.4), the background estimated mortality in the return migration season is 123,773. The addition of zero to two (LCI; zero to one, UCI; one

to four) mortalities would increase the mortality relative to the baseline mortality rate by 0.000 to 0.002% (LCI; 0.000 to 0.001%, UCI; 0.000 to 0.003%).

1.3.4.3 During the breeding season, the mean peak abundance for Northern gannet was 209 (LCI; 131, UCI; 305) individuals within the Morgan Array Area plus 2km buffer. When considering construction and decommissioning phase displacement and mortality rates of 30 to 40% and 1 to 10%, respectively, this would result in approximately one to eight (LCI; zero to five, UCI; one to 12) Northern gannet being subject to mortality. The regional population in the breeding season is defined as 448,235 individuals (Table 1.2) and, using the average baseline mortality rate of 0.187 (Table 1.4), the background estimated mortality in the breeding season is 83,820. The addition of one to eight (LCI; one to five, UCI; one to 12) mortalities would increase the mortality relative to the baseline mortality rate by 0.001 to 0.010% (LCI; 0.000 to 0.006%, UCI; 0.001 to 0.014%).

1.3.4.4 During the Autumn migration season (post-breeding migration), the mean peak abundance for Northern gannet was 192 (LCI; 93, UCI; 346) individuals within the Morgan Array Area plus 2km buffer. When considering construction and decommissioning phase displacement and mortality rates of 30 to 40% and 1 to 10%, this would result in approximately one to eight (LCI; zero to four, UCI; one to 14) Northern gannets being subject to mortality. The BDMPS population during Autumn migration is defined as 545,954 individuals (Table 1.3) and, using the average baseline mortality rate of 0.187 (Table 1.4), the background estimated mortality during the Autumn migration season is 102,093. The addition of one to eight (LCI; zero to four, UCI; one to 14) mortalities would increase the baseline mortality rate by 0.001 to 0.008% (LCI; 0.000 to 0.004%, UCI; 0.001 to 0.014%).

1.3.4.5 In all three bio-seasons and assessed against the defined Northern gannet populations (661,888 in the spring migration period, 545,954 in the autumn migration period and 448,235 seabirds in the breeding period respectively) the predicted mortality from each season's displacement does not surpass the 1% baseline mortality threshold during construction (highlighted yellow cells within each displacement matrix indicates if mortality exceeds 1%).

Operations and maintenance phase

1.3.4.6 For all seasons combined, the annual predicted number of Northern gannet subject to mortality due to displacement was two to 36 (LCI; two to 18, UCI; five to 60) individuals (Table 1.72). Using the largest UK Western Waters BDMPS population of 661,888 individuals (Table 1.3), with an average baseline mortality rate of 0.187 (Table 1.4), the background estimated mortality across all seasons is 123,773. The addition of two to 36 (LCI; two to 18, UCI; five to 60) mortalities would increase the mortality relative to the baseline mortality rate by 0.002 to 0.029% (LCI; 0.002 to 0.015%, UCI; 0.004 to 0.048%) at the BDMPS scale. Table 1.72 further breaks this down into relevant bio-seasons, with displacement matrices presented in Table 1.73 to Table 1.81.

Table 1.72: Northern gannet bio-season displacement estimates for Morgan Array Area plus 2km buffer during the operations and maintenance phase.

Bio-season	Seasonal Abundance (Morgan Array Area + 2km buffer)	Regional Baseline Population Population	Baseline Mortality	Number of Northern gannet subject to mortality (indiv.)	Increase in baseline mortality (%)
Spring Migration					
Mean	53	661,888	123,773	0 to 4	0.000 to 0.003
LCI	15	661,888	123,773	0 to 1	0.000 to 0.001
UCI	105	661,888	123,773	1 to 8	0.001 to 0.006
Breeding					
Mean	209	448,235	83,820	1 to 15	0.001 to 0.018
LCI	131	448,235	83,820	1 to 10	0.001 to 0.012
UCI	305	448,235	83,820	2 to 24	0.002 to 0.029
Autumn Migration					
Mean	192	545,954	102,093	1 to 15	0.001 to 0.015
LCI	93	545,954	102,093	1 to 7	0.001 to 0.007
UCI	346	545,954	102,093	2 to 28	0.002 to 0.027
Annual (BDPMS)					
Mean	454	661,888	123,773	2 to 36	0.002 to 0.029
LCI	239	661,888	123,773	2 to 18	0.002 to 0.015
UCI	756	661,888	123,773	5 to 60	0.004 to 0.048

Table 1.73: Mean predicted Northern gannet mortality for the Morgan Array Area plus 2km buffer during Spring migration (operations and maintenance phase).

Gannet Mean mortality figures. All Birds. Spring Migration

Displacement rate (%)	Mortality rate (%) 1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	1	1	2	2	3	3	4	4	5	5
20	0	0	1	1	2	3	4	5	6	7	8	10	11
30	0	0	1	2	3	5	6	8	10	11	13	14	16
40	0	1	1	2	4	6	8	11	13	15	17	19	21
50	0	1	1	3	5	8	11	13	16	19	21	24	27
60	0	1	2	3	6	10	13	16	19	22	25	29	32
70	0	1	2	4	7	11	15	19	22	26	30	33	37
80	0	1	2	4	8	13	17	21	25	30	34	38	42
90	0	1	2	5	10	14	19	24	29	33	38	43	48
100	1	1	3	5	11	16	21	27	32	37	42	48	53

Table 1.74: LCI predicted Northern gannet mortality for the Morgan Array Area plus 2km buffer during Spring migration (operations and maintenance phase).

Gannet LCI mortality figures. All Birds. Spring Migration

Displacement rate (%)	Mortality rate (%) 1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	0	0	1	1	1	1	1	1	2
20	0	0	0	0	1	1	1	2	2	2	2	3	3
30	0	0	0	0	1	1	2	2	3	3	4	4	5
40	0	0	0	1	1	2	2	3	4	4	5	5	6
50	0	0	0	1	1	2	3	4	5	5	6	7	8
60	0	0	0	1	2	2	3	4	5	5	6	7	9
70	0	0	1	1	2	3	4	5	6	7	8	9	11
80	0	0	1	1	2	4	5	6	7	8	10	11	12
90	0	0	1	1	3	4	5	7	8	9	11	12	14
100	0	0	1	2	3	5	6	8	9	11	12	14	15

Table 1.75: UCI predicted Northern gannet mortality for the Morgan Array Area 2km buffer during Spring migration (operations and maintenance phase).

Gannet UCI mortality figures. All Birds. Spring Migration

Displacement rate (%)	Mortality rate (%) 1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	1	2	3	4	5	6	7	8	9	11
20	0	0	1	2	4	6	8	11	13	15	17	19	21
30	0	1	2	3	6	9	13	16	19	22	25	28	32
40	0	1	2	4	8	13	17	21	25	29	34	38	42
50	1	1	3	5	11	16	21	26	32	37	42	47	53
60	1	1	3	6	13	19	25	32	38	44	50	57	63
70	1	1	4	7	15	22	29	37	44	51	59	66	74
80	1	2	4	8	17	25	34	42	50	59	67	76	84
90	1	2	5	9	19	28	38	47	57	66	76	85	95
100	1	2	5	11	21	32	42	53	63	74	84	95	105

Table 1.76: Mean predicted Northern gannet mortality for the Morgan Array Area 2km buffer during the breeding season (operations and maintenance phase).

Gannet Mean mortality figures. All Birds. Breeding Season

Displacement rate (%)	Mortality rate (%) 1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	2	4	6	8	10	13	15	17	19	21
20	0	1	2	4	8	13	17	21	25	29	33	38	42
30	1	1	3	6	13	19	25	31	38	44	50	56	63
40	1	2	4	8	17	25	33	42	50	59	67	75	84
50	1	2	5	10	21	31	42	52	63	73	84	94	105
60	1	3	6	13	25	38	50	63	75	88	100	113	125
70	1	3	7	15	29	44	59	73	88	102	117	132	146
80	2	3	8	17	33	50	67	84	100	117	134	150	167
90	2	4	9	19	38	56	75	94	113	132	150	169	188
100	2	4	10	21	42	63	84	105	125	146	167	188	209

Table 1.77: LCI predicted Northern gannet mortality for the Morgan Array Area 2km buffer during the breeding season (operations and maintenance phase).

Gannet LCI mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	1	3	4	5	7	8	9	10	12	13
20	0	1	1	3	5	8	10	13	16	18	21	24	26
30	0	1	2	4	8	12	16	20	24	28	31	35	39
40	1	1	3	5	10	16	21	26	31	37	42	47	52
50	1	1	3	7	13	20	26	33	39	46	52	59	66
60	1	2	4	8	16	24	31	39	47	55	63	71	79
70	1	2	5	9	18	28	37	46	55	64	73	83	92
80	1	2	5	10	21	31	42	52	63	73	84	94	105
90	1	2	6	12	24	35	47	59	71	83	94	106	118
100	1	3	7	13	26	39	52	66	79	92	105	118	131

Table 1.78: UCI predicted Northern gannet mortality for the Morgan Array Area plus 2km buffer during the breeding season (operations and maintenance phase).

Gannet UCI mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	1	2	3	6	9	12	15	18	21	24	27	31
20	1	1	3	6	12	18	24	31	37	43	49	55	61
30	1	2	5	9	18	27	37	46	55	64	73	82	92
40	1	2	6	12	24	37	49	61	73	85	98	110	122
50	2	3	8	15	31	46	61	76	92	107	122	137	153
60	2	4	9	18	37	55	73	92	110	128	146	165	183
70	2	4	11	21	43	64	85	107	128	149	171	192	214
80	2	5	12	24	49	73	98	122	146	171	195	220	244
90	3	5	14	27	55	82	110	137	165	192	220	247	275
100	3	6	15	31	61	92	122	153	183	214	244	275	305

Table 1.79: Mean predicted Northern gannet mortality for the Morgan Array Area plus 2km buffer during Autumn migration (operations and maintenance phase).

Gannet Mean mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	2	4	6	8	10	12	13	15	17	19
20	0	1	2	4	8	12	15	19	23	27	31	35	38
30	1	1	3	6	12	17	23	29	35	40	46	52	58
40	1	2	4	8	15	23	31	38	46	54	61	69	77
50	1	2	5	10	19	29	38	48	58	67	77	86	96
60	1	2	6	12	23	35	46	58	69	81	92	104	115
70	1	3	7	13	27	40	54	67	81	94	108	121	134
80	2	3	8	15	31	46	61	77	92	108	123	138	154
90	2	3	9	17	35	52	69	86	104	121	138	156	173
100	2	4	10	19	38	58	77	96	115	134	154	173	192

Table 1.80: LCI predicted Northern gannet mortality for the Morgan Array Area plus 2km buffer during Autumn migration (operations and maintenance phase).

Gannet LCI mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	1	2	3	4	5	6	7	7	8	9
20	0	0	1	2	4	6	7	9	11	13	15	17	19
30	0	1	1	3	6	8	11	14	17	20	22	25	28
40	0	1	2	4	7	11	15	19	22	26	30	33	37
50	0	1	2	5	9	14	19	23	28	33	37	42	47
60	1	1	3	6	11	17	22	28	33	39	45	50	56
70	1	1	3	7	13	20	26	33	39	46	52	59	65
80	1	1	4	7	15	22	30	37	45	52	60	67	74
90	1	2	4	8	17	25	33	42	50	59	67	75	84
100	1	2	5	9	19	28	37	47	56	65	74	84	93

Table 1.81: UCI predicted Northern gannet mortality for the Morgan Array Area plus 2km buffer during Autumn migration (operations and maintenance phase).

Gannet UCI mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	1	2	3	7	10	14	17	21	24	28	31	35
20	1	1	3	7	14	21	28	35	42	48	55	62	69
30	1	2	5	10	21	31	42	52	62	73	83	93	104
40	1	3	7	14	28	42	55	69	83	97	111	125	138
50	2	3	9	17	35	52	69	87	104	121	138	156	173
60	2	4	10	21	42	62	83	104	125	145	166	187	208
70	2	5	12	24	48	73	97	121	145	170	194	218	242
80	3	6	14	28	55	83	111	138	166	194	221	249	277
90	3	6	16	31	62	93	125	156	187	218	249	280	311
100	3	7	17	35	69	104	138	173	208	242	277	311	346

1.3.4.7 During the Spring migration season (return migration), the mean peak abundance for Northern gannet was 53 (LCI; 15, UCI; 105) individuals within the Morgan Array Area plus 2km buffer (Table 1.72). When considering operations and maintenance phase displacement and mortality rates of 60 to 80% and 1 to 10%, respectively, this would result in approximately one to four (LCI; zero to one, UCI; one to eight) Northern gannet being subject to mortality. The UK Western Waters BDMPS for the return migration season is defined as 661,888 (Table 1.3) and, using the average baseline mortality rate of 0.187 (Table 1.4), the background estimated mortality in the return migration season is 123,773. The addition of one to four (LCI; zero to one, UCI; one to eight) mortalities would increase the mortality relative to the baseline mortality rate by 0.000 to 0.003% (LCI; 0.000 to 0.001%, UCI; 0.001 to 0.006%).

1.3.4.8 During the breeding season, the mean peak abundance for Northern gannet was 209 (LCI; 131, UCI; 305) individuals within the Morgan Array Area plus 2km buffer. When considering operations and maintenance phase displacement and mortality rates of 60 to 80% and 1 to 10%, respectively, this would result in approximately one to 15 (LCI; one to 10, UCI; two to 24) Northern gannet being subject to mortality. The regional population in the breeding season is defined as 448,235 individuals (Table 1.2) and, using the average baseline mortality rate of 0.187 (Table 1.4), the background estimated mortality in the breeding season is 83,820. The addition of one to 15 (LCI; one to 7, UCI; two to 28) mortalities would increase the mortality relative to the baseline mortality rate by 0.001 to 0.015% (LCI; 0.001 to 0.007%, UCI; 0.002 to 0.027%).

1.3.4.9 During Autumn migration season (post-breeding migration), the mean peak abundance for Northern gannet was 192 (LCI; 93, UCI, 346) individuals within the Morgan Array Area plus 2km buffer. When considering operations and maintenance phase displacement and mortality rates of 60 to 80% and 1 to 10%, this would result in approximately one to 15 (LCI; one to seven, UCI; two to 28) Northern gannets being subject to mortality. The BDMPS population during Autumn migration is defined as 545,954 individuals (Table 1.3) and, using the average baseline mortality rate of 0.187 (Table 1.4), the background estimated mortality during Autumn migration season is 102,093. The addition of one to 15 (LCI; one to seven, UCI; two to 28) mortalities would increase the baseline mortality rate by 0.001 to 0.015% (LCI; 0.001 to 0.007%, UCI; 0.002 to 0.027%).

1.3.4.10 In all three bio-seasons and assessed against the defined Northern gannet populations (661,888 in the spring migration period, 545,954 in the autumn migration period and 448,235 seabirds in the breeding period respectively) the predicted mortality from each season's displacement does not surpass the 1% baseline mortality threshold during operation (highlighted yellow cells within each displacement matrix indicates if mortality exceeds 1%).

1.3.5 Black-legged Kittiwake

Construction and decommissioning phase

1.3.5.1 For all seasons combined, the annual predicted number of black-legged kittiwake subject to mortality due to displacement was four to 96 (LCI; three to 68, UCI; five to 134) individuals (Table 1.82). Using the largest UK Western Waters BDMPS population of 911,586 individuals (Table 1.3), with an average baseline mortality rate of 0.157 (Table 1.4), the background estimated mortality across all seasons is 143,119. The addition of four to 96 (LCI; three to 68, UCI; five to 134) mortalities would increase the mortality relative to the baseline mortality rate by 0.003 to 0.067% (LCI; 0.002 to 0.048%, UCI; 0.003 to 0.094%) at the BDMPS scale. Table 1.82 further breaks this down into relevant bio-seasons, with displacement matrices presented in Table 1.83 to Table 1.91.

Table 1.82: Black-legged kittiwake bio-season displacement estimates for Morgan Array Area plus 2km buffer during construction and decommissioning.

Bio-season	Seasonal Abundance (Morgan Array Area + 2km buffer)	Regional Baseline Population		Number of black-legged kittiwake subject to mortality (indiv.)	Increase in baseline mortality (%)
		Population	Baseline Mortality		
Spring Migration					
Mean	645	691,526	108,570	1 to 23	0.001 to 0.021
LCI	438	691,526	108,570	1 to 15	0.001 to 0.014
UCI	895	691,526	108,570	1 to 31	0.001 to 0.029
Breeding					
Mean	460	397,251	62,368	1 to 16	0.002 to 0.026

Bio-season	Seasonal Abundance (Morgan Array Area + 2km buffer)	Regional Baseline Population		Number of black-legged kittiwake subject to mortality (indiv.)	Increase in baseline mortality (%)
		Population	Baseline Mortality		
LCI	317	397,251	62,368	0 to 11	0.000 to 0.018
UCI	631	397,251	62,368	1 to 22	0.002 to 0.035
Autumn Migration					
Mean	1,619	911,586	143,119	2 to 57	0.001 to 0.040
LCI	1,190	911,586	143,119	2 to 42	0.001 to 0.029
UCI	2,319	911,586	143,119	3 to 81	0.002 to 0.057
Annual (BDPMS)					
Mean	2,724	911,586	143,119	4 to 96	0.003 to 0.067
LCI	1,945	911,586	143,119	3 to 68	0.002 to 0.048
UCI	3,945	911,586	143,119	5 to 134	0.003 to 0.094

Table 1.83: Mean predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during Spring migration (construction and decommissioning).

Black-legged kittiwake Mean mortality figures. All Birds. Spring Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	1	1	3	6	13	19	26	32	39	45	52	58	65
10	1	1	3	6	13	19	26	32	39	45	52	58	65
15	1	2	5	10	19	29	39	48	58	68	77	87	97
20	1	3	6	13	26	39	52	65	77	90	103	116	129
25	2	3	8	16	32	48	65	81	97	113	129	145	161
30	2	4	10	19	39	58	77	97	116	135	155	174	194
35	2	5	11	23	45	68	90	113	135	158	181	203	226
40	3	5	13	26	52	77	103	129	155	181	206	232	258
45	3	6	15	29	58	87	116	145	174	203	232	261	290
50	3	6	16	32	65	97	129	161	194	226	258	290	323
55	4	7	18	35	71	106	142	177	213	248	284	319	355
60	4	8	19	39	77	116	155	194	232	271	310	348	387
65	4	8	21	42	84	126	168	210	252	293	335	377	419
70	5	9	23	45	90	135	181	226	271	316	361	406	452
75	5	10	24	48	97	145	194	242	290	339	387	435	484
80	5	10	26	52	103	155	206	258	310	361	413	464	516
85	5	11	27	55	110	164	219	274	329	384	439	493	548
90	6	12	29	58	116	174	232	290	348	406	464	522	581
95	6	12	31	61	123	184	245	306	368	429	490	551	613
100	6	13	32	65	129	194	258	323	387	452	516	581	645

Table 1.84: LCI predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during Spring migration (construction and decommissioning).

Black-legged kittiwake LCI mortality figures. All Birds. Spring Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	1	2	4	9	13	18	22	26	31	35	39	44
10	0	1	2	4	9	13	18	22	26	31	35	39	44
15	1	1	3	7	13	20	26	33	39	46	53	59	66
20	1	2	4	9	18	26	35	44	53	61	70	79	88
25	1	2	5	11	22	33	44	55	66	77	88	99	110
30	1	3	7	13	26	39	53	66	79	92	105	118	131
35	2	3	8	15	31	46	61	77	92	107	123	138	153
40	2	4	9	18	35	53	70	88	105	123	140	158	175
45	2	4	10	20	39	59	79	99	118	138	158	177	197
50	2	4	11	22	44	66	88	110	131	153	175	197	219
55	2	5	12	24	48	72	96	120	145	169	193	217	241
60	3	5	13	26	53	79	105	131	158	184	210	237	263
65	3	6	14	28	57	85	114	142	171	199	228	256	285
70	3	6	15	31	61	92	123	153	184	215	245	276	307
75	3	7	16	33	66	99	131	164	197	230	263	296	329
80	4	7	18	35	70	105	140	175	210	245	280	315	350
85	4	7	19	37	74	112	149	186	223	261	298	335	372
90	4	8	20	39	79	118	158	197	237	276	315	355	394
95	4	8	21	42	83	125	166	208	250	291	333	374	416
100	4	9	22	44	88	131	175	219	263	307	350	394	438

Table 1.85: UCI predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during Spring migration (construction and decommissioning).

Black-legged kittiwake UCI mortality figures. All Birds. Spring Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	1	2	4	9	18	27	36	45	54	63	72	81	90
10	1	2	4	9	18	27	36	45	54	63	72	81	90
15	1	3	7	13	27	40	54	67	81	94	107	121	134
20	2	4	9	18	36	54	72	90	107	125	143	161	179
25	2	4	11	22	45	67	90	112	134	157	179	201	224
30	3	5	13	27	54	81	107	134	161	188	215	242	269
35	3	6	16	31	63	94	125	157	188	219	251	282	313
40	4	7	18	36	72	107	143	179	215	251	286	322	358
45	4	8	20	40	81	121	161	201	242	282	322	362	403
50	4	9	22	45	90	134	179	224	269	313	358	403	448
55	5	10	25	49	98	148	197	246	295	345	394	443	492
60	5	11	27	54	107	161	215	269	322	376	430	483	537
65	6	12	29	58	116	175	233	291	349	407	465	524	582
70	6	13	31	63	125	188	251	313	376	439	501	564	627
75	7	13	34	67	134	201	269	336	403	470	537	604	671
80	7	14	36	72	143	215	286	358	430	501	573	644	716
85	8	15	38	76	152	228	304	380	456	533	609	685	761
90	8	16	40	81	161	242	322	403	483	564	644	725	806
95	9	17	43	85	170	255	340	425	510	595	680	765	850
100	9	18	45	90	179	269	358	448	537	627	716	806	895

Table 1.86: Mean predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Black-legged Kittiwake Mean mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	1	2	5	9	14	18	23	28	32	37	41	46
10	0	1	2	5	9	14	18	23	28	32	37	41	46
15	1	1	3	7	14	21	28	35	41	48	55	62	69
20	1	2	5	9	18	28	37	46	55	64	74	83	92
25	1	2	6	12	23	35	46	58	69	81	92	104	115
30	1	3	7	14	28	41	55	69	83	97	110	124	138
35	2	3	8	16	32	48	64	81	97	113	129	145	161
40	2	4	9	18	37	55	74	92	110	129	147	166	184
45	2	4	10	21	41	62	83	104	124	145	166	186	207
50	2	5	12	23	46	69	92	115	138	161	184	207	230
55	3	5	13	25	51	76	101	127	152	177	202	228	253
60	3	6	14	28	55	83	110	138	166	193	221	248	276
65	3	6	15	30	60	90	120	150	179	209	239	269	299
70	3	6	16	32	64	97	129	161	193	225	258	290	322
75	3	7	17	35	69	104	138	173	207	242	276	311	345
80	4	7	18	37	74	110	147	184	221	258	294	331	368
85	4	8	20	39	78	117	156	196	235	274	313	352	391
90	4	8	21	41	83	124	166	207	248	290	331	373	414
95	4	9	22	44	87	131	175	219	262	306	350	393	437
100	5	9	23	46	92	138	184	230	276	322	368	414	460

Table 1.87: LCI predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Black-legged Kittiwake LCI mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	1	2	3	6	10	13	16	19	22	25	29	32
10	0	1	2	3	6	10	13	16	19	22	25	29	32
15	0	1	2	5	10	14	19	24	29	33	38	43	48
20	1	1	3	6	13	19	25	32	38	44	51	57	63
25	1	2	4	8	16	24	32	40	48	55	63	71	79
30	1	2	5	10	19	29	38	48	57	67	76	86	95
35	1	2	6	11	22	33	44	55	67	78	89	100	111
40	1	3	6	13	25	38	51	63	76	89	101	114	127
45	1	3	7	14	29	43	57	71	86	100	114	128	143
50	2	3	8	16	32	48	63	79	95	111	127	143	159
55	2	3	9	17	35	52	70	87	105	122	139	157	174
60	2	4	10	19	38	57	76	95	114	133	152	171	190
65	2	4	10	21	41	62	82	103	124	144	165	185	206
70	2	4	11	22	44	67	89	111	133	155	178	200	222
75	2	5	12	24	48	71	95	119	143	166	190	214	238
80	3	5	13	25	51	76	101	127	152	178	203	228	254
85	3	5	13	27	54	81	108	135	162	189	216	243	269
90	3	6	14	29	57	86	114	143	171	200	228	257	285
95	3	6	15	30	60	90	120	151	181	211	241	271	301
100	3	6	16	32	63	95	127	159	190	222	254	285	317

Table 1.88: UCI predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Black-legged Kittiwake UCI mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	1	1	3	6	13	19	25	32	38	44	50	57	63
10	1	1	3	6	13	19	25	32	38	44	50	57	63
15	1	2	5	9	19	28	38	47	57	66	76	85	95
20	1	3	6	13	25	38	50	63	76	88	101	114	126
25	2	3	8	16	32	47	63	79	95	110	126	142	158
30	2	4	9	19	38	57	76	95	114	133	151	170	189
35	2	4	11	22	44	66	88	110	133	155	177	199	221
40	3	5	13	25	50	76	101	126	151	177	202	227	252
45	3	6	14	28	57	85	114	142	170	199	227	256	284
50	3	6	16	32	63	95	126	158	189	221	252	284	316
55	3	7	17	35	69	104	139	174	208	243	278	312	347
60	4	8	19	38	76	114	151	189	227	265	303	341	379
65	4	8	21	41	82	123	164	205	246	287	328	369	410
70	4	9	22	44	88	133	177	221	265	309	353	398	442
75	5	9	24	47	95	142	189	237	284	331	379	426	473
80	5	10	25	50	101	151	202	252	303	353	404	454	505
85	5	11	27	54	107	161	215	268	322	375	429	483	536
90	6	11	28	57	114	170	227	284	341	398	454	511	568
95	6	12	30	60	120	180	240	300	360	420	480	540	599
100	6	13	32	63	126	189	252	316	379	442	505	568	631

Table 1.89: Mean predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during Autumn migration (construction and decommissioning).

Black-legged kittiwake Mean mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	2	3	8	16	32	49	65	81	97	113	130	146	162
10	2	3	8	16	32	49	65	81	97	113	130	146	162
15	2	5	12	24	49	73	97	121	146	170	194	219	243
20	3	6	16	32	65	97	130	162	194	227	259	291	324
25	4	8	20	40	81	121	162	202	243	283	324	364	405
30	5	10	24	49	97	146	194	243	291	340	389	437	486
35	6	11	28	57	113	170	227	283	340	397	453	510	567
40	6	13	32	65	130	194	259	324	389	453	518	583	648
45	7	15	36	73	146	219	291	364	437	510	583	656	729
50	8	16	40	81	162	243	324	405	486	567	648	729	810
55	9	18	45	89	178	267	356	445	534	623	712	801	890
60	10	19	49	97	194	291	389	486	583	680	777	874	971
65	11	21	53	105	210	316	421	526	631	737	842	947	1052
70	11	23	57	113	227	340	453	567	680	793	907	1020	1133
75	12	24	61	121	243	364	486	607	729	850	971	1093	1214
80	13	26	65	130	259	389	518	648	777	907	1036	1166	1295
85	14	28	69	138	275	413	550	688	826	963	1101	1239	1376
90	15	29	73	146	291	437	583	729	874	1020	1166	1311	1457
95	15	31	77	154	308	461	615	769	923	1077	1230	1384	1538
100	16	32	81	162	324	486	648	810	971	1133	1295	1457	1619

Table 1.90: LCI predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during Autumn migration (construction and decommissioning).

Black-legged kittiwake LCI mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	1	2	6	12	24	36	48	60	71	83	95	107	119
10	1	2	6	12	24	36	48	60	71	83	95	107	119
15	2	4	9	18	36	54	71	89	107	125	143	161	179
20	2	5	12	24	48	71	95	119	143	167	190	214	238
25	3	6	15	30	60	89	119	149	179	208	238	268	298
30	4	7	18	36	71	107	143	179	214	250	286	321	357
35	4	8	21	42	83	125	167	208	250	292	333	375	417
40	5	10	24	48	95	143	190	238	286	333	381	428	476
45	5	11	27	54	107	161	214	268	321	375	428	482	536
50	6	12	30	60	119	179	238	298	357	417	476	536	595
55	7	13	33	65	131	196	262	327	393	458	524	589	655
60	7	14	36	71	143	214	286	357	428	500	571	643	714
65	8	15	39	77	155	232	309	387	464	541	619	696	774
70	8	17	42	83	167	250	333	417	500	583	666	750	833
75	9	18	45	89	179	268	357	446	536	625	714	803	893
80	10	19	48	95	190	286	381	476	571	666	762	857	952
85	10	20	51	101	202	303	405	506	607	708	809	910	1012
90	11	21	54	107	214	321	428	536	643	750	857	964	1071
95	11	23	57	113	226	339	452	565	678	791	904	1017	1131
100	12	24	60	119	238	357	476	595	714	833	952	1071	1190

Table 1.91: UCI predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during Autumn migration (construction and decommissioning).

Black-legged kittiwake UCI mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	2	5	12	23	46	70	93	116	139	162	186	209	232
10	2	5	12	23	46	70	93	116	139	162	186	209	232
15	3	7	17	35	70	104	139	174	209	243	278	313	348
20	5	9	23	46	93	139	186	232	278	325	371	417	464
25	6	12	29	58	116	174	232	290	348	406	464	522	580
30	7	14	35	70	139	209	278	348	417	487	557	626	696
35	8	16	41	81	162	243	325	406	487	568	649	730	812
40	9	19	46	93	186	278	371	464	557	649	742	835	928
45	10	21	52	104	209	313	417	522	626	730	835	939	1044
50	12	23	58	116	232	348	464	580	696	812	928	1044	1160
55	13	26	64	128	255	383	510	638	765	893	1020	1148	1275
60	14	28	70	139	278	417	557	696	835	974	1113	1252	1391
65	15	30	75	151	301	452	603	754	904	1055	1206	1357	1507
70	16	32	81	162	325	487	649	812	974	1136	1299	1461	1623
75	17	35	87	174	348	522	696	870	1044	1217	1391	1565	1739
80	19	37	93	186	371	557	742	928	1113	1299	1484	1670	1855
85	20	39	99	197	394	591	788	986	1183	1380	1577	1774	1971
90	21	42	104	209	417	626	835	1044	1252	1461	1670	1878	2087
95	22	44	110	220	441	661	881	1102	1322	1542	1762	1983	2203
100	23	46	116	232	464	696	928	1160	1391	1623	1855	2087	2319

1.3.5.2 During the Spring migration season (return migration), the mean peak abundance for black-legged kittiwake was 645 (LCI; 438, UCI; 895) individuals within the Morgan Array Area plus 2km buffer (Table 1.82). When considering construction and decommissioning phase displacement and mortality rates of 15 to 35% and 1 to 10%, respectively, this would result in approximately one to 23 (LCI; one to 15, UCI; one to 31) black-legged kittiwake being subject to mortality. The UK Western Waters BDMPS for the return migration season is defined as 691,526 (Table 1.3) and, using the average baseline mortality rate of 0.157 (Table 1.4), the background estimated mortality in the return migration season is 108,570. The addition of one to 23 (LCI; one to 15, UCI; one to 31) mortalities would increase the mortality relative to the

baseline mortality rate by 0.001 to 0.021% (LCI; 0.001 to 0.014%, UCI; 0.001 to 0.029%).

1.3.5.3 During the breeding season, the mean peak abundance for black-legged kittiwake was 460 (LCI; 317, UCI; 631) individuals within the Morgan Array Area plus 2km buffer. When considering construction and decommissioning phase displacement and mortality rates of 15 to 35% and 1 to 10%, respectively, this would result in approximately one to 16 (LCI; zero to 11, UCI; one to 22) black-legged kittiwake being subject to mortality. The regional population in the breeding season is defined as 397,251 individuals (Table 1.2) and, using the average baseline mortality rate of 0.157 (Table 1.4), the background estimated mortality in the breeding season is 62,368. The addition of one to 16 (LCI; zero to 11, UCI; one to 22) mortalities would increase the mortality relative to the baseline mortality rate by 0.002 to 0.026% (LCI; 0.000 to 0.018%, UCI; 0.002 to 0.035%).

1.3.5.4 During the Autumn migration season (post-breeding migration), the mean peak abundance for black-legged kittiwake was 1,619 (LCI; 1,190, UCI; 2,319) individuals within the Morgan Array Area plus 2km buffer. When considering construction and decommissioning phase displacement and mortality rates of 15 to 35% and 1 to 10%, this would result in approximately two to 57 (LCI; one to 42, UCI; three to 81) black-legged kittiwake being subject to mortality. The BDMPS population during Autumn migration is defined as 911,586 individuals (Table 1.3) and, using the average baseline mortality rate of 0.157 (Table 1.4), the mortality during the Autumn migration season is 143,119. The addition of two to 57 (LCI; one to 42, UCI; three to 81) mortalities would increase the baseline mortality rate by 0.003 to 0.067% (LCI; 0.002 to 0.048%, UCI; 0.003 to 0.009%).

1.3.5.5 In all three bio-seasons and assessed against the defined black-legged kittiwake populations (691,526 in the spring migration period, 911,586 in the autumn migration period and 397,251 seabirds in the breeding period respectively) the predicted mortality from each season's displacement does not surpass the 1% baseline mortality threshold during construction (highlighted yellow cells within each displacement matrix indicates if mortality exceeds 1%).

Operations and maintenance phase

1.3.5.6 For all seasons combined, annual predicted number of black-legged kittiwake subject to mortality due to displacement was eight to 176 (LCI; six to 127, UCI; 11 to 250) individuals (Table 1.92). Using the largest UK Western Waters BDMPS population of 911,586 individuals (Table 1.3), with an average baseline mortality rate of 0.157 (Table 1.4), the background estimated mortality across all seasons is 143,119. The addition of eight to 176 (LCI; six to 127, UCI; 11 to 250) mortalities would increase the mortality relative to the baseline mortality rate by 0.006 to 0.123% (LCI; 0.004 to 0.089%, UCI; 0.008 to 0.175%) at the BDMPS scale. Table 1.92 further breaks this down into relevant bio-seasons, with displacement matrices presented in Table 1.93 to Table 1.101.

Table 1.92: Black-legged kittiwake bio-season displacement estimates for Morgan Array Area plus 2km buffer during the operations and maintenance phase.

Bio-season	Seasonal Abundance (Morgan Array Area + 2km buffer)	Regional Baseline Population		Number of black-legged kittiwake subject to mortality (indiv.)	Increase in baseline mortality (%)
		Population	Baseline Mortality		
Spring Migration					
Mean	645	691,526	108,570	2 to 45	0.002 to 0.041
LCI	438	691,526	108,570	1 to 31	0.001 to 0.029
UCI	895	691,526	108,570	3 to 63	0.003 to 0.058
Breeding					
Mean	460	397,251	62,368	1 to 32	0.002 to 0.051
LCI	317	397,251	62,368	1 to 22	0.002 to 0.035
UCI	631	397,251	62,368	2 to 44	0.003 to 0.071
Autumn Migration					
Mean	1,619	911,586	143,119	5 to 113	0.003 to 0.079
LCI	1,190	911,586	143,119	4 to 83	0.003 to 0.058
UCI	2,319	911,586	143,119	7 to 162	0.005 to 0.113
Annual (BDPMS)					
Mean	2,724	911,586	143,119	8 to 176	0.006 to 0.123
LCI	1,945	911,586	143,119	6 to 127	0.004 to 0.089
UCI	3,945	911,586	143,119	11 to 250	0.008 to 0.175

Table 1.93: Mean predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during Spring migration (operations and maintenance phase).

Black-legged Kittiwake Mean mortality figures. All Birds. Spring Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	1	1	3	6	13	19	26	32	39	45	52	58	65
20	1	3	6	13	26	39	52	65	77	90	103	116	129
30	2	4	10	19	39	58	77	97	116	135	155	174	194
40	3	5	13	26	52	77	103	129	155	181	206	232	258
50	3	6	16	32	65	97	129	161	194	226	258	290	323
60	4	8	19	39	77	116	155	194	232	271	310	348	387
70	5	9	23	45	90	135	181	226	271	316	361	406	452
80	5	10	26	52	103	155	206	258	310	361	413	464	516
90	6	12	29	58	116	174	232	290	348	406	464	522	581
100	6	13	32	65	129	194	258	323	387	452	516	581	645

Table 1.94: LCI predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during Spring migration (operations and maintenance phase).

Black-legged Kittiwake LCI mortality figures. All Birds. Spring Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	1	2	4	9	13	18	22	26	31	35	39	44
20	1	2	4	9	18	26	35	44	53	61	70	79	88
30	1	3	7	13	26	39	53	66	79	92	105	118	131
40	2	4	9	18	35	53	70	88	105	123	140	158	175
50	2	4	11	22	44	66	88	110	131	153	175	197	219
60	3	5	13	26	53	79	105	131	158	184	210	237	263
70	3	6	15	31	61	92	123	153	184	215	245	276	307
80	4	7	18	35	70	105	140	175	210	245	280	315	350
90	4	8	20	39	79	118	158	197	237	276	315	355	394
100	4	9	22	44	88	131	175	219	263	307	350	394	438

Table 1.95: UCI predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during Spring migration (operations and maintenance phase).

Black-legged Kittiwake UCI mortality figures. All Birds. Spring Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	1	2	4	9	18	27	36	45	54	63	72	81	90
20	2	4	9	18	36	54	72	90	107	125	143	161	179
30	3	5	13	27	54	81	107	134	161	188	215	242	269
40	4	7	18	36	72	107	143	179	215	251	286	322	358
50	4	9	22	45	90	134	179	224	269	313	358	403	448
60	5	11	27	54	107	161	215	269	322	376	430	483	537
70	6	13	31	63	125	188	251	313	376	439	501	564	627
80	7	14	36	72	143	215	286	358	430	501	573	644	716
90	8	16	40	81	161	242	322	403	483	564	644	725	806
100	9	18	45	90	179	269	358	448	537	627	716	806	895

Table 1.96: Mean predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during the breeding season (operations and maintenance phase).

Black-legged Kittiwake Mean mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	1	2	5	9	14	18	23	28	32	37	41	46
20	1	2	5	9	18	28	37	46	55	64	74	83	92
30	1	3	7	14	28	41	55	69	83	97	110	124	138
40	2	4	9	18	37	55	74	92	110	129	147	166	184
50	2	5	12	23	46	69	92	115	138	161	184	207	230
60	3	6	14	28	55	83	110	138	166	193	221	248	276
70	3	6	16	32	64	97	129	161	193	225	258	290	322
80	4	7	18	37	74	110	147	184	221	258	294	331	368
90	4	8	21	41	83	124	166	207	248	290	331	373	414
100	5	9	23	46	92	138	184	230	276	322	368	414	460

Table 1.97: LCI predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during the breeding season (operations and maintenance phase).

Black-legged Kittiwake LCI mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	1	2	3	6	10	13	16	19	22	25	29	32
20	1	1	3	6	13	19	25	32	38	44	51	57	63
30	1	2	5	10	19	29	38	48	57	67	76	86	95
40	1	3	6	13	25	38	51	63	76	89	101	114	127
50	2	3	8	16	32	48	63	79	95	111	127	143	159
60	2	4	10	19	38	57	76	95	114	133	152	171	190
70	2	4	11	22	44	67	89	111	133	155	178	200	222
80	3	5	13	25	51	76	101	127	152	178	203	228	254
90	3	6	14	29	57	86	114	143	171	200	228	257	285
100	3	6	16	32	63	95	127	159	190	222	254	285	317

Table 1.98: UCI predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during the breeding season (operations and maintenance phase).

Black-legged Kittiwake UCI mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	1	1	3	6	13	19	25	32	38	44	50	57	63
20	1	3	6	13	25	38	50	63	76	88	101	114	126
30	2	4	9	19	38	57	76	95	114	133	151	170	189
40	3	5	13	25	50	76	101	126	151	177	202	227	252
50	3	6	16	32	63	95	126	158	189	221	252	284	316
60	4	8	19	38	76	114	151	189	227	265	303	341	379
70	4	9	22	44	88	133	177	221	265	309	353	398	442
80	5	10	25	50	101	151	202	252	303	353	404	454	505
90	6	11	28	57	114	170	227	284	341	398	454	511	568
100	6	13	32	63	126	189	252	316	379	442	505	568	631

Table 1.99: Mean predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during Autumn migration (operations and maintenance phase).

Back-legged Kittiwake Mean mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	2	3	8	16	32	49	65	81	97	113	130	146	162
20	3	6	16	32	65	97	130	162	194	227	259	291	324
30	5	10	24	49	97	146	194	243	291	340	389	437	486
40	6	13	32	65	130	194	259	324	389	453	518	583	648
50	8	16	40	81	162	243	324	405	486	567	648	729	810
60	10	19	49	97	194	291	389	486	583	680	777	874	971
70	11	23	57	113	227	340	453	567	680	793	907	1020	1133
80	13	26	65	130	259	389	518	648	777	907	1036	1166	1295
90	15	29	73	146	291	437	583	729	874	1020	1166	1311	1457
100	16	32	81	162	324	486	648	810	971	1133	1295	1457	1619

Table 1.100: LCI predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during Autumn migration (operations and maintenance phase).

Back-legged Kittiwake LCI mortality figures. All Birds. Autumn Migration Displacement rate (%)	Mortality rate (%)												
	1	2	5	10	20	30	40	50	60	70	80	90	100
10	1	2	6	12	24	36	48	60	71	83	95	107	119
20	2	5	12	24	48	71	95	119	143	167	190	214	238
30	4	7	18	36	71	107	143	179	214	250	286	321	357
40	5	10	24	48	95	143	190	238	286	333	381	428	476
50	6	12	30	60	119	179	238	298	357	417	476	536	595
60	7	14	36	71	143	214	286	357	428	500	571	643	714
70	8	17	42	83	167	250	333	417	500	583	666	750	833
80	10	19	48	95	190	286	381	476	571	666	762	857	952
90	11	21	54	107	214	321	428	536	643	750	857	964	1071
100	12	24	60	119	238	357	476	595	714	833	952	1071	1190

Table 1.101: UCI predicted black-legged kittiwake mortality for the Morgan Array Area plus 2km buffer during Autumn migration (operations and maintenance phase).

Back-legged Kittiwake UCI mortality figures. All Birds. Autumn Migration Displacement rate (%)	Mortality rate (%)												
	1	2	5	10	20	30	40	50	60	70	80	90	100
10	2	5	12	23	46	70	93	116	139	162	186	209	232
20	5	9	23	46	93	139	186	232	278	325	371	417	464
30	7	14	35	70	139	209	278	348	417	487	557	626	696
40	9	19	46	93	186	278	371	464	557	649	742	835	928
50	12	23	58	116	232	348	464	580	696	812	928	1044	1160
60	14	28	70	139	278	417	557	696	835	974	1113	1252	1391
70	16	32	81	162	325	487	649	812	974	1136	1299	1461	1623
80	19	37	93	186	371	557	742	928	1113	1299	1484	1670	1855
90	21	42	104	209	417	626	835	1044	1252	1461	1670	1878	2087
100	23	46	116	232	464	696	928	1160	1391	1623	1855	2087	2319

1.3.5.7 During the Spring migration season (return migration), the mean peak abundance for black-legged kittiwake was 645 (LCI; 438, UCI; 895) individuals within the Morgan Array Area plus 2km buffer (Table 1.92). When considering operations and maintenance phase displacement and mortality rates of 30 to 70% and 1 to 10%, respectively, this would result in approximately two to 45 (LCI; one to 31, UCI; three to 63) black-legged kittiwake being subject to mortality. The UK Western Waters BDMPS for the return migration season is defined as 691,526 (Table 1.3) and, using the average baseline mortality rate of 0.157 (Table 1.4), the background estimated mortality in the return migration season is 108,570. The addition of two to 45 (LCI; one to 31, UCI; three to 63) mortalities would increase the mortality relative to the baseline mortality rate by 0.002 to 0.041% (LCI; 0.001 to 0.029%, UCI; 0.003 to 0.058%).

1.3.5.8 During the breeding season, the mean peak abundance for black-legged kittiwake was 460 (LCI; 317, UCI; 631) individuals within the Morgan Array Area plus 2km buffer. When considering operations and maintenance phase displacement and mortality rates of 30 to 70% and 1 to 10%, respectively, this would result in approximately one to 32 (LCI; one to 22, UCI; two to 44) black-legged kittiwake being subject to mortality. The regional population in the breeding season is defined as 397,251 individuals (Table 2.2) and, using the average baseline mortality rate of 0.157 (Table 1.4), the background estimated mortality in the breeding season is 62,368. The addition of one to 32 (LCI; one to 22, UCI; two to 40) mortalities would increase the mortality relative to the baseline mortality rate by 0.002 to 0.051% (LCI; 0.002 to 0.035%, UCI; 0.003 to 0.071%).

1.3.5.9 During the Autumn migration season (post-breeding migration), the mean peak abundance for black-legged kittiwake was 1,619 (LCI; 1,190, UCI; 2,319) individuals within the Morgan Array Area plus 2km buffer. When considering operations and maintenance phase displacement and mortality rates of 30 to 70% and 1 to 10%, this would result in approximately five to 113 (LCI; four to 83, UCI; seven to 162) black-legged kittiwake being subject to mortality. The BDMPS population during Autumn migration is defined as 911,586 individuals (Table 1.3) and, using the average baseline mortality rate of 0.157 (Table 1.4), the background estimated mortality during the Autumn migration season is 143,119. The addition of five to 113 (LCI; four to 83, UCI; seven to 162) mortalities would increase the baseline mortality rate by 0.003 to 0.079% (LCI; 0.003 to 0.058%, UCI; 0.005 to 0.113%).

1.3.5.10 In all three bio-seasons and assessed against the defined black-legged kittiwake populations (691,526 in the spring migration period, 911,586 in the autumn migration period and 397,251 individuals in the breeding period respectively) the predicted mortality from each season's displacement does not surpass a 1% baseline mortality threshold during operation (highlighted yellow cells within each displacement matrix indicates if mortality exceeds 1%).

1.3.6 Manx shearwater

Construction and decommissioning phases

1.3.6.1 For all seasons combined, the annual predicted number of Manx shearwater subject to mortality due to displacement during the construction and decommissioning phases was zero to 11 (LCI; zero to three, UCI; two to 38) individuals (Table 1.102). Using the largest UK Western Waters BDMPS population of 1,974,500 individuals (Table 1.3), with an average baseline mortality rate of 0.131 (Table 1.4), the background estimated mortality across all seasons is 258,660. The addition of zero to 11 (LCI; zero to three, UCI; two to 38) mortalities would increase the mortality relative to the baseline mortality rate by 0.000 to 0.004% (LCI; 0.000 to 0.001%, UCI; 0.001 to 0.015%) at the BDMPS scale. Table 1.102 further breaks this down into relevant bio-seasons, with displacement matrices presented in Table 1.103 to Table 1.111.

Table 1.102: Manx shearwater bio-season displacement estimates for Morgan Array Area plus 2km buffer during construction and decommissioning.

Bio-season	Seasonal Abundance (Morgan Array Area + 2km buffer)	Regional Baseline Population		Number of Manx shearwater subject to mortality (indiv.)	Increase in baseline mortality (%)
		Population	Baseline Mortality		
Spring Migration					
Mean	59	1,580,895	207,097	0 to 1	0.000 to 0.000
LCI	19	1,580,895	207,097	0 to 0	0.000 to 0.000
UCI	165	1,580,895	207,097	0 to 2	0.000 to 0.001
Breeding					
Mean	467	1,974,500	258,660	0 to 5	0.000 to 0.002

Bio-season	Seasonal Abundance (Morgan Array Area + 2km buffer)	Regional Baseline Population		Number of Manx shearwater subject to mortality (indiv.)	Increase in baseline mortality (%)
		Population	Baseline Mortality		
LCI	220	1,974,500	258,660	0 to 2	0.000 to 0.001
UCI	1,828	1,974,500	258,660	2 to 18	0.001 to 0.007
Autumn Migration					
Mean	467	1,580,895	207,097	0 to 5	0.000 to 0.002
LCI	138	1,580,895	207,097	0 to 1	0.000 to 0.000
UCI	1,828	1,580,895	207,097	2 to 18	0.001 to 0.009
Annual (BDPMS)					
Mean	993	1,974,500	258,660	0 to 11	0.000 to 0.004
LCI	377	1,974,500	258,660	0 to 3	0.000 to 0.001
UCI	3,813	1,974,500	258,660	2 to 38	0.001 to 0.015

Table 1.103: Mean predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during Spring migration (construction and decommissioning).

Manx Shearwater Mean mortality figures. All Birds. Spring Migration

Displacement rate (%) \ Mortality rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	0	1	1	2	2	3	4	4	5	5	6
10	0	0	0	1	1	2	2	3	4	4	5	5	6
15	0	0	0	1	2	3	4	4	5	6	7	8	9
20	0	0	1	1	2	4	5	6	7	8	9	11	12
25	0	0	1	1	3	4	6	7	9	10	12	13	15
30	0	0	1	2	4	5	7	9	11	12	14	16	18
35	0	0	1	2	4	6	8	10	12	14	17	19	21
40	0	0	1	2	5	7	9	12	14	17	19	21	24
45	0	1	1	3	5	8	11	13	16	19	21	24	27
50	0	1	1	3	6	9	12	15	18	21	24	27	30
55	0	1	2	3	6	10	13	16	19	23	26	29	32
60	0	1	2	4	7	11	14	18	21	25	28	32	35
65	0	1	2	4	8	12	15	19	23	27	31	35	38
70	0	1	2	4	8	12	17	21	25	29	33	37	41
75	0	1	2	4	9	13	18	22	27	31	35	40	44
80	0	1	2	5	9	14	19	24	28	33	38	42	47
85	1	1	3	5	10	15	20	25	30	35	40	45	50
90	1	1	3	5	11	16	21	27	32	37	42	48	53
95	1	1	3	6	11	17	22	28	34	39	45	50	56
100	1	1	3	6	12	18	24	30	35	41	47	53	59

Table 1.104: LCI predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during Spring migration (construction and decommissioning).

Manx Shearwater LCI mortality figures. All Birds. Spring Migration

Displacement rate (%) \ Mortality rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	0	0	0	1	1	1	1	1	2	2	2
10	0	0	0	0	0	1	1	1	1	1	2	2	2
15	0	0	0	0	1	1	1	1	2	2	2	3	3
20	0	0	0	0	1	1	2	2	2	3	3	3	4
25	0	0	0	0	1	1	2	2	3	3	4	4	5
30	0	0	0	1	1	2	2	3	3	4	5	5	6
35	0	0	0	1	1	2	3	3	4	5	5	6	7
40	0	0	0	1	2	2	3	4	5	5	6	7	8
45	0	0	0	1	2	3	3	4	5	6	7	8	9
50	0	0	0	1	2	3	4	5	6	7	8	9	10
55	0	0	1	1	2	3	4	5	6	7	8	9	10
60	0	0	1	1	2	3	5	6	7	8	9	10	11
65	0	0	1	1	2	4	5	6	7	9	10	11	12
70	0	0	1	1	3	4	5	7	8	9	11	12	13
75	0	0	1	1	3	4	6	7	9	10	11	13	14
80	0	0	1	2	3	5	6	8	9	11	12	14	15
85	0	0	1	2	3	5	6	8	10	11	13	15	16
90	0	0	1	2	3	5	7	9	10	12	14	15	17
95	0	0	1	2	4	5	7	9	11	13	14	16	18
100	0	0	1	2	4	6	8	10	11	13	15	17	19

Table 1.105: UCI predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during Spring migration (construction and decommissioning).

Manx Shearwater UCI mortality figures. All Birds. Spring Migration

Displacement rate (%) \ Mortality rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	1	2	3	5	7	8	10	12	13	15	17
10	0	0	1	2	3	5	7	8	10	12	13	15	17
15	0	0	1	2	5	7	10	12	15	17	20	22	25
20	0	1	2	3	7	10	13	17	20	23	26	30	33
25	0	1	2	4	8	12	17	21	25	29	33	37	41
30	0	1	2	5	10	15	20	25	30	35	40	45	50
35	1	1	3	6	12	17	23	29	35	40	46	52	58
40	1	1	3	7	13	20	26	33	40	46	53	59	66
45	1	1	4	7	15	22	30	37	45	52	59	67	74
50	1	2	4	8	17	25	33	41	50	58	66	74	83
55	1	2	5	9	18	27	36	45	54	64	73	82	91
60	1	2	5	10	20	30	40	50	59	69	79	89	99
65	1	2	5	11	21	32	43	54	64	75	86	97	107
70	1	2	6	12	23	35	46	58	69	81	92	104	116
75	1	2	6	12	25	37	50	62	74	87	99	111	124
80	1	3	7	13	26	40	53	66	79	92	106	119	132
85	1	3	7	14	28	42	56	70	84	98	112	126	140
90	1	3	7	15	30	45	59	74	89	104	119	134	149
95	2	3	8	16	31	47	63	78	94	110	125	141	157
100	2	3	8	17	33	50	66	83	99	116	132	149	165

Table 1.106: Mean predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Manx Shearwater Mean mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	1	2	5	9	14	19	23	28	33	37	42	47
10	0	1	2	5	9	14	19	23	28	33	37	42	47
15	1	1	4	7	14	21	28	35	42	49	56	63	70
20	1	2	5	9	19	28	37	47	56	65	75	84	93
25	1	2	6	12	23	35	47	58	70	82	93	105	117
30	1	3	7	14	28	42	56	70	84	98	112	126	140
35	2	3	8	16	33	49	65	82	98	114	131	147	163
40	2	4	9	19	37	56	75	93	112	131	149	168	187
45	2	4	11	21	42	63	84	105	126	147	168	189	210
50	2	5	12	23	47	70	93	117	140	163	187	210	234
55	3	5	13	26	51	77	103	128	154	180	205	231	257
60	3	6	14	28	56	84	112	140	168	196	224	252	280
65	3	6	15	30	61	91	121	152	182	212	243	273	304
70	3	7	16	33	65	98	131	163	196	229	262	294	327
75	4	7	18	35	70	105	140	175	210	245	280	315	350
80	4	7	19	37	75	112	149	187	224	262	299	336	374
85	4	8	20	40	79	119	159	198	238	278	318	357	397
90	4	8	21	42	84	126	168	210	252	294	336	378	420
95	4	9	22	44	89	133	177	222	266	311	355	399	444
100	5	9	23	47	93	140	187	234	280	327	374	420	467

Table 1.108: UCI predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Manx Shearwater UCI mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	2	4	9	18	37	55	73	91	110	128	146	165	183
10	2	4	9	18	37	55	73	91	110	128	146	165	183
15	3	5	14	27	55	82	110	137	165	192	219	247	274
20	4	7	18	37	73	110	146	183	219	256	292	329	366
25	5	9	23	46	91	137	183	229	274	320	366	411	457
30	5	11	27	55	110	165	219	274	329	384	439	494	548
35	6	13	32	64	128	192	256	320	384	448	512	576	640
40	7	15	37	73	146	219	292	366	439	512	585	658	731
45	8	16	41	82	165	247	329	411	494	576	658	740	823
50	9	18	46	91	183	274	366	457	548	640	731	823	914
55	10	20	50	101	201	302	402	503	603	704	804	905	1005
60	11	22	55	110	219	329	439	548	658	768	877	987	1097
65	12	24	59	119	238	356	475	594	713	832	951	1069	1188
70	13	26	64	128	256	384	512	640	768	896	1024	1152	1280
75	14	27	69	137	274	411	548	686	823	960	1097	1234	1371
80	15	29	73	146	292	439	585	731	877	1024	1170	1316	1462
85	16	31	78	155	311	466	622	777	932	1088	1243	1398	1554
90	16	33	82	165	329	494	658	823	987	1152	1316	1481	1645
95	17	35	87	174	347	521	695	868	1042	1216	1389	1563	1737
100	18	37	91	183	366	548	731	914	1097	1280	1462	1645	1828

Table 1.107: LCI predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Manx Shearwater LCI mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	1	2	4	7	9	11	13	15	18	20	22
10	0	0	1	2	4	7	9	11	13	15	18	20	22
15	0	1	2	3	7	10	13	17	20	23	26	30	33
20	0	1	2	4	9	13	18	22	26	31	35	40	44
25	1	1	3	6	11	17	22	28	33	39	44	50	55
30	1	1	3	7	13	20	26	33	40	46	53	59	66
35	1	2	4	8	15	23	31	39	46	54	62	69	77
40	1	2	4	9	18	26	35	44	53	62	70	79	88
45	1	2	5	10	20	30	40	50	59	69	79	89	99
50	1	2	6	11	22	33	44	55	66	77	88	99	110
55	1	2	6	12	24	36	48	61	73	85	97	109	121
60	1	3	7	13	26	40	53	66	79	92	106	119	132
65	1	3	7	14	29	43	57	72	86	100	114	129	143
70	2	3	8	15	31	46	62	77	92	108	123	139	154
75	2	3	8	17	33	50	66	83	99	116	132	149	165
80	2	4	9	18	35	53	70	88	106	123	141	158	176
85	2	4	9	19	37	56	75	94	112	131	150	168	187
90	2	4	10	20	40	59	79	99	119	139	158	178	198
95	2	4	10	21	42	63	84	105	125	146	167	188	209
100	2	4	11	22	44	66	88	110	132	154	176	198	220

Table 1.109: Mean predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during Autumn Migration (construction and decommissioning).

Manx Shearwater Mean mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	1	2	5	9	14	19	23	28	33	37	42	47
10	0	1	2	5	9	14	19	23	28	33	37	42	47
15	1	1	4	7	14	21	28	35	42	49	56	63	70
20	1	2	5	9	19	28	37	47	56	65	75	84	93
25	1	2	6	12	23	35	47	58	70	82	93	105	117
30	1	3	7	14	28	42	56	70	84	98	112	126	140
35	2	3	8	16	33	49	65	82	98	114	131	147	163
40	2	4	9	19	37	56	75	93	112	131	149	168	187
45	2	4	11	21	42	63	84	105	126	147	168	189	210
50	2	5	12	23	47	70	93	117	140	163	187	210	234
55	3	5	13	26	51	77	103	128	154	180	205	231	257
60	3	6	14	28	56	84	112	140	168	196	224	252	280
65	3	6	15	30	61	91	121	152	182	212	243	273	304
70	3	7	16	33	65	98	131	163	196	229	262	294	327
75	4	7	18	35	70	105	140	175	210	245	280	315	350
80	4	7	19	37	75	112	149	187	224	262	299	336	374
85	4	8	20	40	79	119	159	198	238	278	318	357	397
90	4	8	21	42	84	126	168	210	252	294	336	378	420
95	4	9	22	44	89	133	177	222	266	311	355	399	444
100	5	9	23	47	93	140	187	234	280	327	374	420	467

Table 1.110: LCI predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during Autumn Migration (construction and decommissioning).

Manx Shearwater LCI mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	0	0	1	1	3	4	6	7	8	10	11	12	14
10	0	0	1	1	3	4	6	7	8	10	11	12	14
15	0	0	1	2	4	6	8	10	12	14	17	19	21
20	0	1	1	3	6	8	11	14	17	19	22	25	28
25	0	1	2	3	7	10	14	17	21	24	28	31	35
30	0	1	2	4	8	12	17	21	25	29	33	37	41
35	0	1	2	5	10	14	19	24	29	34	39	43	48
40	1	1	3	6	11	17	22	28	33	39	44	50	55
45	1	1	3	6	12	19	25	31	37	43	50	56	62
50	1	1	3	7	14	21	28	35	41	48	55	62	69
55	1	2	4	8	15	23	30	38	46	53	61	68	76
60	1	2	4	8	17	25	33	41	50	58	66	75	83
65	1	2	4	9	18	27	36	45	54	63	72	81	90
70	1	2	5	10	19	29	39	48	58	68	77	87	97
75	1	2	5	10	21	31	41	52	62	72	83	93	104
80	1	2	6	11	22	33	44	55	66	77	88	99	110
85	1	2	6	12	23	35	47	59	70	82	94	106	117
90	1	2	6	12	25	37	50	62	75	87	99	112	124
95	1	3	7	13	26	39	52	66	79	92	105	118	131
100	1	3	7	14	28	41	55	69	83	97	110	124	138

Table 1.111: UCI predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during Autumn Migration (construction and decommissioning).

Manx Shearwater UCI mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
5	2	4	9	18	37	55	73	91	110	128	146	165	183
10	2	4	9	18	37	55	73	91	110	128	146	165	183
15	3	5	14	27	55	82	110	137	165	192	219	247	274
20	4	7	18	37	73	110	146	183	219	256	292	329	366
25	5	9	23	46	91	137	183	229	274	320	366	411	457
30	5	11	27	55	110	165	219	274	329	384	439	494	548
35	6	13	32	64	128	192	256	320	384	448	512	576	640
40	7	15	37	73	146	219	292	366	439	512	585	658	731
45	8	16	41	82	165	247	329	411	494	576	658	740	823
50	9	18	46	91	183	274	366	457	548	640	731	823	914
55	10	20	50	101	201	302	402	503	603	704	804	905	1005
60	11	22	55	110	219	329	439	548	658	768	877	987	1097
65	12	24	59	119	238	356	475	594	713	832	951	1069	1188
70	13	26	64	128	256	384	512	640	768	896	1024	1152	1280
75	14	27	69	137	274	411	548	686	823	960	1097	1234	1371
80	15	29	73	146	292	439	585	731	877	1024	1170	1316	1462
85	16	31	78	155	311	466	622	777	932	1088	1243	1398	1554
90	16	33	82	165	329	494	658	823	987	1152	1316	1481	1645
95	17	35	87	174	347	521	695	868	1042	1216	1389	1563	1737
100	18	37	91	183	366	548	731	914	1097	1280	1462	1645	1828

1.3.6.2 During the Spring migration season (return migration), the mean peak abundance for Manx shearwater was 59 (LCI; 19, UCI; 165) individuals within the Morgan Array Area plus 2km buffer (Table 1.102). When considering construction and decommissioning phase displacement and mortality rates of 0 to 5% and 1 to 10%, respectively, this would result in approximately zero to one (LCI; zero, UCI; zero to two) Manx shearwater being subject to mortality. The BDMPS population during Spring migration is defined as 1,580,895 individuals (Table 1.3) and, using the average mortality rate of 0.131 (Table 1.4), the background estimated mortality during Spring migration season is 207,097. The addition of zero to one (LCI; zero, UCI; zero to two)

mortalities would increase the baseline mortality rate by 0.000 to 0.000% (LCI; 0.000 to 0.000%, UCI; 0.000 to 0.001%).

1.3.6.3 During the breeding season, the mean peak abundance for Manx shearwater was 467 (LCI; 220, UCI, 1,828) individuals within the Morgan Array Area plus 2km buffer. When considering construction and decommissioning phase displacement and mortality rates of 0 to 5% and 1 to 10%, respectively, this would result in approximately zero to five (LCI; zero to two, UCI; two to 18) Manx shearwater being subject to mortality. The regional population in the breeding season is defined as 1,974,500 individuals (Table 1.2) and, using the average baseline mortality rate of 0.131 (Table 1.4), the background estimated mortality in the breeding season is 258,660. The addition of one to five (LCI; zero to two, UCI; two to 18) mortalities would increase the mortality relative to the baseline mortality rate by 0.000 to 0.002% (LCI; 0.000 to 0.001%, UCI; 0.001 to 0.007%).

1.3.6.4 During the Autumn migration season (post-breeding migration), the mean peak abundance for Manx shearwater was 254 (LCI; 90, UCI; 527) individuals within the Morgan Array Area plus 2km buffer. When considering construction and decommissioning phase displacement and mortality rates of 0 to 5% and 1 to 10%, this would result in approximately zero to one (LCI; zero to zero, UCI; zero to three) Manx shearwater being subject to mortality. The BDMPS population during Autumn migration is defined as 1,580,895 individuals (Table 1.3) and, using the average baseline mortality rate of 0.131 (Table 1.4), the background estimated mortality during Autumn migration season is 207,097. The addition of zero to one (LCI; zero to zero, UCI; zero to three mortalities would increase the baseline mortality rate by 0.000 to 0.000% (LCI; 0.000 to 0.000%, UCI; 0.000 to 0.001%).

1.3.6.5 In all three bio-seasons and assessed against the defined Manx shearwater populations (1,580,895 in both migration periods and 1,974,500 seabirds in the breeding period respectively) the predicted mortality from each season's displacement does not surpass the 1% baseline mortality threshold during construction (highlighted yellow cells within each displacement matrix indicates if mortality exceeds 1%).

Operations and maintenance phase

1.3.6.6 For all seasons combined, the annual predicted number of Manx shearwater subject to mortality due to displacement was zero to 11 (LCI; zero to three, UCI; two to 38) individuals (Table 1.112). Using the largest UK Western Waters BDMPS population of 1,974,500 individuals (Table 1.3), with an average baseline mortality rate of 0.131 (Table 1.4), the background estimated mortality across all seasons is 258,660. The addition of zero to 11 (LCI; zero to three, UCI; two to 38) mortalities would increase the mortality relative to the baseline mortality rate by 0.000 to 0.004% (LCI; 0.000 to 0.001%, UCI; 0.001 to 0.015%) at the BDMPS scale. Table 1.112 further breaks this down into relevant seasons, with displacement matrices presented in in Table 1.113 to Table 1.121.

Table 1.112: Manx shearwater bio-season displacement estimates for Morgan Array Area plus 2km buffer during the operations and maintenance phase.

Bio-season	Seasonal Abundance (Morgan Array Area + 2km buffer)	Regional Baseline Population		Number of Manx shearwater subject to mortality (indiv.)	Increase in baseline mortality (%)
		Population	Baseline Mortality		
Spring Migration					
Mean	59	1,580,895	207,097	0 to 1	0.000 to 0.000
LCI	19	1,580,895	207,097	0 to 0	0.000 to 0.000
UCI	165	1,580,895	207,097	0 to 2	0.000 to 0.001
Breeding					
Mean	467	1,974,500	258,660	0 to 5	0.000 to 0.002
LCI	220	1,974,500	258,660	0 to 2	0.000 to 0.001
UCI	1,828	1,974,500	258,660	2 to 18	0.001 to 0.009
Autumn Migration					
Mean	467	1,580,895	207,097	0 to 5	0.000 to 0.002
LCI	138	1,580,895	207,097	0 to 1	0.000 to 0.000
UCI	1,828	1,580,895	207,097	2 to 18	0.000 to 0.007
Annual (BDPMS)					
Mean	993	1,974,500	258,660	0 to 11	0.000 to 0.004
LCI	377	1,974,500	258,660	0 to 3	0.000 to 0.001
UCI	3,813	1,974,500	258,660	2 to 38	0.001 to 0.015

Table 1.113: Mean predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during Spring Migration (operations and maintenance phase).

Manx Shearwater Mean mortality figures. All Birds. Spring Migration

Displacement rate (%) \ Mortality rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	1	1	2	2	3	4	4	5	5	6
20	0	0	1	1	2	4	5	6	7	8	9	11	12
30	0	0	1	2	4	5	7	9	11	12	14	16	18
40	0	0	1	2	5	7	9	12	14	17	19	21	24
50	0	1	1	3	6	9	12	15	18	21	24	27	30
60	0	1	2	4	7	11	14	18	21	25	28	32	35
70	0	1	2	4	8	12	17	21	25	29	33	37	41
80	0	1	2	5	9	14	19	24	28	33	38	42	47
90	1	1	3	5	11	16	21	27	32	37	42	48	53
100	1	1	3	6	12	18	24	30	35	41	47	53	59

Table 1.114: LCI predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during Spring Migration (operations and maintenance phase).

Manx Shearwater LCI mortality figures. All Birds. Spring Migration

Displacement rate (%) \ Mortality rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	0	1	1	1	1	1	2	2	2
20	0	0	0	0	1	1	2	2	2	3	3	3	4
30	0	0	0	1	1	2	2	3	3	4	5	5	6
40	0	0	0	1	2	2	3	4	5	5	6	7	8
50	0	0	0	1	2	3	4	5	6	7	8	9	10
60	0	0	1	1	2	3	5	6	7	8	9	10	11
70	0	0	1	1	3	4	5	7	8	9	11	12	13
80	0	0	1	2	3	5	6	8	9	11	12	14	15
90	0	0	1	2	3	5	7	9	10	12	14	15	17
100	0	0	1	2	4	6	8	10	11	13	15	17	19

Table 1.115: UCI predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during Spring Migration (operations and maintenance phase).

Manx Shearwater UCI mortality figures. All Birds. Spring Migration

Displacement rate (%) \ Mortality rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	2	3	5	7	8	10	12	13	15	17
20	0	1	2	3	7	10	13	17	20	23	26	30	33
30	0	1	2	5	10	15	20	25	30	35	40	45	50
40	1	1	3	7	13	20	26	33	40	46	53	59	66
50	1	2	4	8	17	25	33	41	50	58	66	74	83
60	1	2	5	10	20	30	40	50	59	69	79	89	99
70	1	2	6	12	23	35	46	58	69	81	92	104	116
80	1	3	7	13	26	40	53	66	79	92	106	119	132
90	1	3	7	15	30	45	59	74	89	104	119	134	149
100	2	3	8	17	33	50	66	83	99	116	132	149	165

Table 1.116: Mean predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during the breeding season (operations and maintenance phase).

Manx Shearwater Mean mortality figures. All Birds. Breeding Season

Displacement rate (%) \ Mortality rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	1	2	5	9	14	19	23	28	33	37	42	47
20	1	2	5	9	19	28	37	47	56	65	75	84	93
30	1	3	7	14	28	42	56	70	84	98	112	126	140
40	2	4	9	19	37	56	75	93	112	131	149	168	187
50	2	5	12	23	47	70	93	117	140	163	187	210	234
60	3	6	14	28	56	84	112	140	168	196	224	252	280
70	3	7	16	33	65	98	131	163	196	229	262	294	327
80	4	7	19	37	75	112	149	187	224	262	299	336	374
90	4	8	21	42	84	126	168	210	252	294	336	378	420
100	5	9	23	47	93	140	187	234	280	327	374	420	467

Table 1.117: LCI predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during the breeding season (operations and maintenance phase).

Manx Shearwater LCI mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	2	4	7	9	11	13	15	18	20	22
20	0	1	2	4	9	13	18	22	26	31	35	40	44
30	1	1	3	7	13	20	26	33	40	46	53	59	66
40	1	2	4	9	18	26	35	44	53	62	70	79	88
50	1	2	6	11	22	33	44	55	66	77	88	99	110
60	1	3	7	13	26	40	53	66	79	92	106	119	132
70	2	3	8	15	31	46	62	77	92	108	123	139	154
80	2	4	9	18	35	53	70	88	106	123	141	158	176
90	2	4	10	20	40	59	79	99	119	139	158	178	198
100	2	4	11	22	44	66	88	110	132	154	176	198	220

Table 1.118: UCI predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during the breeding season (operations and maintenance phase).

Manx Shearwater UCI mortality figures. All Birds. Breeding Season	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	2	4	9	18	37	55	73	91	110	128	146	165	183
20	4	7	18	37	73	110	146	183	219	256	292	329	366
30	5	11	27	55	110	165	219	274	329	384	439	494	548
40	7	15	37	73	146	219	292	366	439	512	585	658	731
50	9	18	46	91	183	274	366	457	548	640	731	823	914
60	11	22	55	110	219	329	439	548	658	768	877	987	1097
70	13	26	64	128	256	384	512	640	768	896	1024	1152	1280
80	15	29	73	146	292	439	585	731	877	1024	1170	1316	1462
90	16	33	82	165	329	494	658	823	987	1152	1316	1481	1645
100	18	37	91	183	366	548	731	914	1097	1280	1462	1645	1828

Table 1.119: Mean predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during Autumn migration (operations and maintenance phase).

Manx Shearwater Mean mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	1	2	5	9	14	19	23	28	33	37	42	47
20	1	2	5	9	19	28	37	47	56	65	75	84	93
30	1	3	7	14	28	42	56	70	84	98	112	126	140
40	2	4	9	19	37	56	75	93	112	131	149	168	187
50	2	5	12	23	47	70	93	117	140	163	187	210	234
60	3	6	14	28	56	84	112	140	168	196	224	252	280
70	3	7	16	33	65	98	131	163	196	229	262	294	327
80	4	7	19	37	75	112	149	187	224	262	299	336	374
90	4	8	21	42	84	126	168	210	252	294	336	378	420
100	5	9	23	47	93	140	187	234	280	327	374	420	467

Table 1.120: LCI predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during Autumn migration (operations and maintenance phase).

Manx Shearwater LCI mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	1	3	4	6	7	8	10	11	12	14
20	0	1	1	3	6	8	11	14	17	19	22	25	28
30	0	1	2	4	8	12	17	21	25	29	33	37	41
40	1	1	3	6	11	17	22	28	33	39	44	50	55
50	1	1	3	7	14	21	28	35	41	48	55	62	69
60	1	2	4	8	17	25	33	41	50	58	66	75	83
70	1	2	5	10	19	29	39	48	58	68	77	87	97
80	1	2	6	11	22	33	44	55	66	77	88	99	110
90	1	2	6	12	25	37	50	62	75	87	99	112	124
100	1	3	7	14	28	41	55	69	83	97	110	124	138

Table 1.121: UCI predicted Manx shearwater mortality for the Morgan Array Area plus 2km buffer during Autumn migration (operations and maintenance phase).

Manx Shearwater UCI mortality figures. All Birds. Autumn Migration	Mortality rate (%)												
Displacement rate (%)	1	2	5	10	20	30	40	50	60	70	80	90	100
10	2	4	9	18	37	55	73	91	110	128	146	165	183
20	4	7	18	37	73	110	146	183	219	256	292	329	366
30	5	11	27	55	110	165	219	274	329	384	439	494	548
40	7	15	37	73	146	219	292	366	439	512	585	658	731
50	9	18	46	91	183	274	366	457	548	640	731	823	914
60	11	22	55	110	219	329	439	548	658	768	877	987	1097
70	13	26	64	128	256	384	512	640	768	896	1024	1152	1280
80	15	29	73	146	292	439	585	731	877	1024	1170	1316	1462
90	16	33	82	165	329	494	658	823	987	1152	1316	1481	1645
100	18	37	91	183	366	548	731	914	1097	1280	1462	1645	1828

1.3.6.7 During the Spring migration season (return migration), the mean peak abundance for Manx shearwater was 59 (LCI; 19, UCI; 165) individuals within the Morgan Array Area plus 2km buffer (Table 1.112). When considering operations and maintenance phase displacement and mortality rates of 0 to 10% and 1 to 10%, respectively, this would result in approximately zero to one (LCI; zero to zero, UCI; zero to two) Manx shearwater being subject to mortality. The BDMPS population during Spring migration is defined as 1,580,895 individuals (Table 1.3) and, using the average baseline mortality rate of 0.131 (Table 1.4), the background estimated mortality during Spring migration season is 207,097. The addition of zero to one (LCI; zero to zero, UCI; zero to two) mortalities would increase the baseline mortality rate by 0.000 to 0.000% (LCI; 0.000 to 0.000%, UCI; 0.000 to 0.001%).

1.3.6.8 During the breeding season, the mean peak abundance for Manx shearwater was 467 (LCI; 220, UCI; 1,828) individuals within the Morgan Array Area plus 2km buffer. When considering operations and maintenance phase displacement and mortality rates of 0 to 10% and 1 to 10%, respectively, this would result in approximately two to five (LCI; zero to one, UCI; six to 18) Manx shearwater being subject to mortality. The regional population in the breeding season is defined as 1,974,500 individuals (Table 1.2) and, using the average baseline mortality rate of 0.131 (Table 1.4), the background estimated mortality in the breeding season is 258,660. The addition of two to five (LCI; zero to one, UCI; six to 18) mortalities would increase the mortality relative to the baseline mortality rate by 0.000 to 0.002% (LCI; 0.000 to 0.001%, UCI; 0.001 to 0.009%).

1.3.6.9   During the Autumn migration season (post-breeding migration), the mean peak abundance for Manx shearwater is 467 (LCI; 138, UCI; 1,828) individuals within the Morgan Array Area plus 2km buffer. When considering operations and maintenance phase displacement and mortality rates of 0 to 10% and 1 to 10%, this would result in approximately zero to five (LCI; zero to one, UCI; two to 18) Manx shearwater being subject to mortality. The BDMPS population during Autumn migration is defined as 1,580,895 individuals (Table 1.3) and, using the average baseline mortality rate of 0.131 (Table 1.4), the background estimated mortality during the Autumn migration season is 207,097. The addition of zero to five (LCI; zero to one, UCI; two to 18) mortalities would increase the baseline mortality rate by 0.000 to 0.002% (LCI; 0.000 to 0.000%, UCI; 0.000 to 0.007%).

1.3.6.10   In all three bio-seasons and assessed against the defined Manx shearwater populations (1,580,895 in both migration periods and 1,974,500 individuals in the breeding period respectively) the predicted mortality from each season's displacement does not surpass a 1% baseline mortality threshold during operation (highlighted yellow cells within each displacement matrix indicates if mortality exceeds 1%).

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Appendix A Bird Data for Displacement Assessment

Table A 1: **Common guillemot modelled abundance (all behaviours and all ages classes) within the Morgan Array Area plus associated buffer. Calendar Years 1 and 2 for surveys: [April 2021 to March 2022]. Availability Bias used [0.2405]. Bio-season colour coded as in Table 1.1. Peak figures used in displacement assessment in each bio-season are outlined in bold.**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Array plus 2km												
Year 1	n/a	n/a	n/a	**5,427**	1,110	730	419	458	1,135	2,707	318	**4,101**
LCI	n/a	n/a	n/a	**4,281**	708	520	268	315	767	2,110	201	**2,444**
UCI	n/a	n/a	n/a	**6,758**	1,624	988	613	642	1,605	3,334	467	**6,180**
Year 2	2,369	2,338	**4,359**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	1,908	1,859	**3,545**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	2,883	2,877	**5,240**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Morgan Offshore Ornithology Array Area study area												
Year 1	n/a	n/a	n/a	13,281	3,451	2,051	2,771	5,803	8,523	8,954	2,850	11,326
LCI	n/a	n/a	n/a	10,543	2,053	1,365	1,694	4,358	5,942	7,184	2,069	6,473
UCI	n/a	n/a	n/a	16,504	5,451	2,988	3,988	7,602	11,699	10,906	3,827	17,570
Year 2	6,512	6,966	10,506	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	4,962	5,157	8,452	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	8,304	9,069	12,803	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table A 2: Razorbill modelled abundance (all behaviours and all ages classes) within the Morgan Array Area plus associated buffer. Calendar Years 1 and 2 for surveys: [April 2021 to March 2022]. Availability Bias used [0.1818]. Bio-season colour coded as in Table 1.1. Peak figures used in displacement assessment in each bio-season are outlined in bold.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Array plus 2km												
Year 1	n/a	n/a	n/a	**120**	33	94	0	0	11	**103**	14	**233**
LCI	n/a	n/a	n/a	**52**	0	20	0	0	0	**49**	0	**48**
UCI	n/a	n/a	n/a	**195**	69	166	0	0	35	**181**	44	**485**
Year 2	118	0	**166**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	0	0	**63**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	266	0	**317**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Morgan Offshore Ornithology Array Area study area												
Year 1	n/a	n/a	n/a	540	99	183	0	20	159	336	184	1,184
LCI	n/a	n/a	n/a	360	43	106	0	0	66	203	56	582
UCI	n/a	n/a	n/a	761	194	302	0	41	266	483	323	1,843
Year 2	393	271	636	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	176	27	382	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	666	594	860	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table A 3: Atlantic Puffin modelled abundance (all behaviours and all ages classes) within the Morgan Array Area plus associated buffer. Calendar Years 1 and 2 for surveys: [April 2021 to March 2022]. Availability Bias used [0.1416]. Bio-season colour coded as in Table 1.1. Peak figures used in displacement assessment in each bio-season are outlined in bold.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Array plus 2km												
Year 1	n/a	n/a	n/a	18	**18**	0	**0**	0	0	0	0	0
LCI	n/a	n/a	n/a	0	**0**	0	**0**	0	0	0	0	0
UCI	n/a	n/a	n/a	37	**48**	0	**0**	0	0	0	0	0
Year 2	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Morgan Offshore Ornithology Array Area study area												
Year 1	n/a	n/a	n/a	19	56	0	9	0	0	0	0	9
LCI	n/a	n/a	n/a	0	9	0	0	0	0	0	0	0
UCI	n/a	n/a	n/a	38	106	0	28	0	0	0	0	29
Year 2	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table A 4: Northern gannet modelled abundance (all behaviours and all ages classes) within the Morgan Array Area plus associated buffer. Calendar Years 1 and 2 for surveys: [April 2021 to March 2022]. Bio-season colour coded as in Table 1.1. Peak figures used in displacement assessment in each bio-season are outlined in bold.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Array plus 2km												
Year 1	n/a	n/a	n/a	60	24	22	105	**209**	**192**	111	15	**53**
LCI	n/a	n/a	n/a	22	0	0	58	**131**	**93**	56	0	**15**
UCI	n/a	n/a	n/a	111	48	55	174	**305**	**346**	177	32	**105**
Year 2	23	22	**23**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	0	0	**0**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	47	56	**47**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Morgan Offshore Ornithology Array Area study area												
Year 1	n/a	n/a	n/a	309	252	125	315	679	504	219	54	78
LCI	n/a	n/a	n/a	173	130	61	218	377	250	133	23	31
UCI	n/a	n/a	n/a	477	401	199	452	1,080	917	304	104	138
Year 2	39	91	109	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	8	30	30	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	71	159	222	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table A 5: Black-legged kittiwake modelled abundance (all behaviours and all ages classes) within the Morgan Array Area plus associated buffer. Calendar Years 1 and 2 for surveys: ril 2021 to March 2022]. Bio-season colour coded as in Table 1.1. Peak figures used in displacement assessment in each bio-season are outlined in bold.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Array plus 2km												
Year 1	n/a	n/a	n/a	**460**	95	64	23	132	23	588	177	**1,619**
LCI	n/a	n/a	n/a	**317**	31	22	0	13	0	199	109	**1,190**
UCI	n/a	n/a	n/a	**631**	210	114	47	599	49	1,367	263	**2,139**
Year 2	634	292	**830**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	403	211	**558**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	945	393	**1,158**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Morgan Offshore Ornithology Array Area study area												
Year 1	n/a	n/a	n/a	1,165	463	210	55	495	378	1,398	511	3,336
LCI	n/a	n/a	n/a	784	263	117	23	124	215	517	297	2,365
UCI	n/a	n/a	n/a	1,629	804	330	103	1,665	582	3,079	792	4,515
Year 2	2,129	927	2,135	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	1,371	647	1,330	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	3,102	1,296	3,154	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table A 6: Manx shearwater modelled abundance (all behaviours and all ages classes) within the Morgan Array Area plus associated buffer. Calendar Years 1 and 2 for surveys: [April 2021 to March 2022]. Bio-season colour coded as in Table 1.1. Peak figures used in displacement assessment in each bio-season are outlined in bold.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Array plus 2km												
Year 1	n/a	n/a	n/a	**117**	31	372	273	**467**	193	0	0	0
LCI	n/a	n/a	n/a	**38**	7	220	114	**138**	86	0	0	0
UCI	n/a	n/a	n/a	**330**	65	583	512	**1,828**	354	0	0	0
Year 2	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Morgan Offshore Ornithology Array Area study area												
Year 1	n/a	n/a	n/a	518	71	736	1,161	2,096	576	0	0	0
LCI	n/a	n/a	n/a	158	23	356	546	658	293	0	0	0
UCI	n/a	n/a	n/a	1,789	122	1,418	2,231	6,883	1,030	0	0	0
Year 2	0	8	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	0	24	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Appendix B Regional Populations

B.1 Breeding Season

Table B 1: Common guillemot breeding colonies within the mean-max plus one standard deviation foraging ranges of the Morgan Array Area and regional population (total no. of individuals) used to assess displacement during the breeding season.

Colonies	Qualifying species	Master site in SMP	no.	Last counted
SPA	NO	Aberdaron Coast and Bardsey Island SPA	2,826	2019
SPA	NO	Balcary Point	639	2018
SPA	NO	Great Orme and Little Orme	3,417	2021
SPA	YES	Howth village	871	2015
SPA	YES	Ireland's Eye	4,410	2015
SPA	YES	Lambay Island	59,983	2015
SPA	NO	Mynydd Cilan, Trwyn y Wylfa ac Ynysoedd Sant Tudwal	3,475	2021
SPA	NO	Porth Llanlleiana to Porth Eilian	5,550	2016
SPA	NO	Puffin Island	3,820	2021
SPA	NO	South Stack	7,592	2021
NON-SPA		Coastal Gwynedd	14,116	2019
NON-SPA		Isle of Man	5,306	2018
NON-SPA		Larne Lough to Portmuck	2,617	2019
NON-SPA		Meikle Ross and Little Ross	27	2018
NON-SPA		Monrieth Cliffs and Scar Rocks	350	2016
NON-SPA		Muck Island	2,782	2019
NON-SPA		Mull of Galloway	277	2019
NON-SPA		Port Morgan, Devil's Bridge, Laggantalluch Head	229	2000
NON-SPA		St Bee's Head	17,501	2021
		Total	**135,788**	**INDV**

Table B 2: **Razorbill breeding colonies within the mean-max plus one standard deviation foraging ranges of the Morgan Array Area and regional population (total no. of indiv) used to assess displacement during the breeding season.**

Colonies	Qualifying species	Master site in SMP	no.	Last counted
SPA	NO	Ailsa Craig	1,116	2021
SPA	NO	Aberdaron Coast and Bardsey Island SPA	3,834	2019
SPA	NO	Great Orme and Little Orme	296	2021
SPA	YES	Howth Village	279	2015
SPA	YES	Ireland's Eye	1,600	2015
SPA	YES	Lambay Island	7,353	2015
SPA	NO	Lleyn Peninsula	326	2016/2021
SPA	NO	Point Lynas to Trwyn Du	14	2016
SPA	NO	Porth Llanlleiana to Porth Eilian	457	2016
SPA	NO	Puffin Island	681	2021
SPA	NO	Rigg Bay + Cruggleton	0	2020
SPA	NO	South Stack	1,479	2016/2019
NON-SPA		Balcary Point	91	2018
NON-SPA		Bray	150	2010
NON-SPA		Coastal Cwynedd	557	2019
NON-SPA		Isle of Man	696	2017
NON-SPA		Larne Lough to Portmuck	679	2019
NON-SPA		Meikle Ross and Little Ross	3	2018
NON-SPA		Monreith Cliffs and Scar Rocks	0	2016
NON-SPA		Muck Island	1,118	2019
NON-SPA		Mull of Galloway	44	2019
NON-SPA		Port Morgan, Devil's Bridge, Laggantalluch Head	37	2021
NON-SPA		St Bees Head and Town	94	2021
NON-SPA		Starling Knowe to Downan Point	6	2021
		Total	**20,910**	**INDV**

Table B 3: Northern gannet breeding colonies within the mean-max plus on standard deviation foraging ranges of the Morgan Array Area and regional population (total no. of pairs) used to assess displacement during the breeding season.

Colonies	Qualifying species	master site in SMP	no.	Last counted
SPA	YES	Ailsa Craig	32,226	2014
SPA	YES	Grassholm	36,011	2015
SPA	YES	Great Saltee	2,446	2004
SPA	YES	Ireland's Eye	350	2015
NON-SPA		Channel Islands	2,777	2015
NON-SPA		Monreith Cliffs and Scar Rocks	2,376	2014
		Total	**76,186**	**AON**

Table B 4: Black-legged kittiwake breeding colonies within the mean-max plus on standard deviation foraging ranges of the Morgan Array Area and regional population (total no. of indv) used to assess displacement during the breeding season.

Colonies	Qualifying species	master site in SMP	no.	Last counted
SPA	NO	Aberdaron Coast and Bardsey Island SPA	121	2019
SPA	YES	Ailsa Craig	490	2021
SPA	NO	Bae Caerfyrddin/Carmarthen Bay	11	2018
SPA	NO	Grassholm	30	2018
SPA	YES	Horn Head	2,042	2015
SPA	YES	Howth Village	3,081	2015
SPA	YES	Inishtrahull Island	7	2016
SPA	YES	Ireland's Eye	1,610	2015
SPA	YES	Isle of Colonsay	143	2018
SPA	YES	Lambay Island	3,320	2015
SPA	NO	Mynydd Cilan, Trwyn y Wylfa ac Ynysoedd Sant Tudwal	338	2016
SPA	NO	Point Lynas to Trwyn Du	156	2016
SPA	NO	Porth Llanlleiana to Porth Eilian	52	2002
SPA	NO	Puffin Island	203	2021
SPA	NO	Ramsey and St David`s Peninsula Coast	83	2018/2019
SPA	YES	Rathlin Island	13,706	2021
SPA	NO	Rockabill	266	2018
SPA	YES	Saltee Islands	845	2013
SPA	YES	Wicklow Head	707	2022

Colonies	Qualifying species	master site in SMP	no.	Last counted
NON-SPA		Bray	1,473	2010
NON-SPA		Caldey Island	271	2021
NON-SPA		Causeway Coast	568	2000
NON-SPA		Creadan Head to Foilakipeen	26	2018
NON-SPA		Downhill	92	2015
NON-SPA		Dunmore East to Red Head	442	2014
NON-SPA		Giants Causeway Coast	13	2000
NON-SPA		Great Orme and Little Orme	1,078	2019
NON-SPA		Islay - East (Port Askaig to Bowmore)	59	2018
NON-SPA		Islay - West (Port Askaig to Bruichladdich)	246	2019
NON-SPA		Isle of Man	685	2013/2017
NON-SPA		Larne Lough to Portmuck	1,145	2019
NON-SPA		Coastal Cwynedd	614	2021
NON-SPA		Maggy's Leap	656	2017/2019
NON-SPA		Monreith Cliffs and Scar Rocks	19	2018
NON-SPA		Morecambe Central Gas Platform	556	2016
NON-SPA		Muck Island	562	2021
NON-SPA		Mull of Galloway	108	2019
NON-SPA		Mumbles head	90	2018
NON-SPA		New Quay to Lochtyn	332	2018
NON-SPA		North Antrim coast	204	2019
NON-SPA		Port Mona, Devil's Bridge, Laggantalluch Head	32	2000
NON-SPA		Portally to Benlea Head	100	2018
NON-SPA		Sanda Islands - Kintyre	33	2019
NON-SPA		Skerry Islands	76	2000
NON-SPA		St Bees Head and Town	809	2021
		Total	**75,000**	**IDV**

Table B 5: **Atlantic puffin breeding colonies within the mean-max plus one standard deviation foraging ranges of the Morgan Array Area and regional population (total no. of indv) used to assess displacement during the breeding season.**

Colonies	Qualifying species	master site in SMP	no.	Last counted
SPA	NO	Aberdaron Coast and Bardsey Island	282	2019
SPA	NO	Ailsa Craig	125	2021
SPA	NO	Glannau Ynys Gybi/ Holy Island Coast	12	2021
SPA	YES	Lambay Island	144	2015
SPA	NO	Puffin Island	13	2021
SPA	NO	Rathlin Island	407	2021
SPA	YES	Saltee Islands	300	2000
SPA	NO	Sheep Island	1	2021
SPA	YES	Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro	32,942	2021
NON-SPA		Sanda Island	54	2019
NON-SPA		Castlemartin Coast (Berryslade to Barafundle Bay)	14	2021
NON-SPA		Caldey Island	17	2021
NON-SPA		St bees head	5	2021
		Total	**34,416**	**INDV**

Table B 6: **Manx Shearwater breeding colonies within the mean-max plus one standard deviation foraging ranges of the Morgan Array Area and regional population (total no. of indv) used to assess displacement during the breeding season.**

Colonies	Qualifying species	master site in SMP	no.	Last counted
SPA	NO	Ailsa Craig	20	2018
SPA	YES	Bardsey Island	16,183	2001
SPA	NO	Bishop & Clerks and Ramsey	4,796	2016
SPA	YES	Blasket Islands	3,584	2001
SPA	NO	Canna and Sanday	2	2001
SPA	YES	Copeland Islands	4,850	2007
SPA	YES	Cruagh Island	3,286	2001
SPA	YES	Deenish Island and Scariff Island	2,010	2000
SPA	NO	Fetlar, Shetlands	7	2002
SPA	YES	High Island, Inishshark and Davillaun	869	2015
SPA	NO	Isles of Scilly	495	2015/2019
SPA	YES	Puffin Island	6,329	2000
SPA	YES	Rum	120,000	2001
SPA	YES	Saltee Islands	250	2001/2002
SPA	YES	Skelligs	738	2001
SPA	YES	Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro	455,156	2018
SPA	NO	Treshnish Isles	1,992	2018
NON-SPA	n/a	Inchmarnock Island	1	2002
NON-SPA	n/a	Isle of Man	424	2014
NON-SPA	n/a	Jethou	5	2000
NON-SPA	n/a	Lundy	5,504	2017
NON-SPA	n/a	Sanda Island	300	2006
NON-SPA	n/a	Sark	5	2000
		Total	**1,253,612**	**INDV**