Partners in UK offshore wind

MONA OFFSHORE WIND PROJECT

Preliminary Environmental Information Report

Volume 6, annex 10.2: Offshore ornithology displacement assessment

Image of an offshore wind farm

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Prepared by:	Prepared for:
RPS	**Mona Offshore Wind Ltd.**

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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).
Negligible magnitude	Very slight change from the size or extent of distribution of the relevant biogeographic population.
Ornithology	Ornithology is a branch of zoology that concerns the study of birds.
Significant effect	The significance of an effect is determined by considering the overall importance of the receptor and the magnitude of the effect using a matrix-based approach and applying professional judgement as to whether the integrity of an SPA feature will be affected.
Statutory Nature Conservation Bodies (SNCBs)	Comprised of JNCC, Natural Resources Wales, Department of Agriculture, Environment and Rural Affairs/Northern Ireland Environment Agency, Natural England and Scottish Natural Heritage, these agencies provide advice in relation to nature conservation to government.

Acronyms

Term	Meaning
AON	Apparently Occupied Nest
BDMPS	Biologically Defined Minimum Population Scale
CEA	Cumulative Effects Assessment
IBMs	Individual-Based Models
LCI/UCI	Lower/Upper Confidence Interval
MRSea	Marine Renewables Strategic environmental assessment
NE	Natural England
SMP	Seabird Monitoring Programme
SPA	Special Protection Area

Units

Unit	Description
%	Percent
km	Kilometres

1 Offshore ornithology displacement

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 offshore wind farm 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) assess 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 seabirds may move to areas already occupied by other seabirds and thus face higher intra/inter-specific competition due to a higher density of individuals competing for the same resource. Alternatively, displaced seabirds 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 seabirds 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 offshore wind farm development).

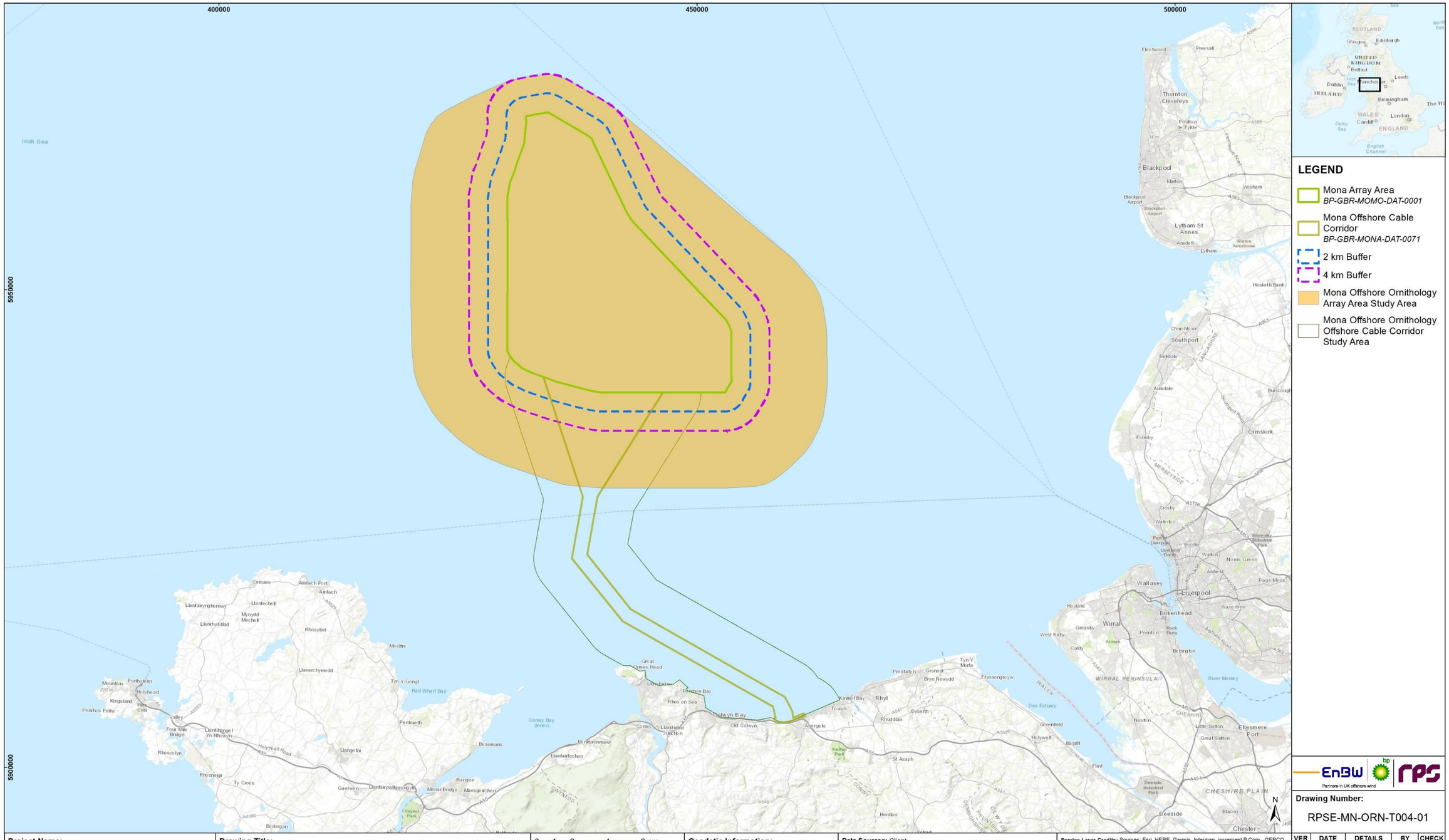
1.1.1.6 The displacement assessment for the Mona Offshore Wind Project makes use of the SNCB Matrix table approach, which was agreed during consultation with the Offshore Ornithology Expert Working Group on 13 July 2022 as part of the Evidence Plan process.

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 Mona Offshore Wind Project during the construction, operations and maintenance, and decommissioning phases. The report considers the most abundant seabird species recorded during the digital aerial surveys carried out between March 2020 and February 2022 to characterise the baseline for the assessment. The full methods and results of the digital aerial surveys are presented in volume 6, annex 10.1: Offshore ornithology baseline characterisation report of the PEIR.

1.1.3 Study area

1.1.3.1 The Mona Array Area is located approximately 23km north of Colwyn Bay in North Wales and 30km off Southport in Lancashire (Figure 1.1). For the purposes of displacement assessment, the monthly abundance of seabirds within the Mona Array Area, the Mona Array Area plus 2km buffer and if appropriate for the species, the Mona Array 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 Mona Offshore Ornithology Array Area study area (Figure 1.1). The Mona Array Area covers 449.97km^2 , the Mona Array Area plus 2km buffer covers 639.26km^2, and the Mona Array Area plus 4km buffer covers 853.66km^2.



Project Name: MONA OFFSHORE WIND PROJECT	**Drawing Title:** OFFSHORE ORNITHOLOGY STUDY AREA	**Geodetic Information:** Datum: ETRS 1989 Projection: ETRS 1989 UTM Zone 30N Scale@379mmx231mm: 1:401,898	**Data Sources:** Client,	**Service Layer Credits:** Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community	**Drawing Number:** RPSE-MN-ORN-T004-01

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00	05/10/22	Initial Issue	NA	JS
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Figure 1.1: The Mona Offshore Ornithology Array Area study area, Mona 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 SNCB Interim Displacement Advice Note (SNCB, 2017). As recommended by the SNCB Note (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 Mona Array Area with the appropriate buffer zone. Finally, displacement matrices were populated based on the displacement and mortality values recommended by the SNCB Note (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 Mona 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 near absent from the Mona Offshore Ornithology Array Area study area (see Appendix A Table A.128). Only four red-throated diver were recorded during the digital aerial surveys, one bird in each of the following months: August 2020, October 2020, November 2020 and December 2021.

1.2.2.2 Out of the species recorded within the Mona 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' and '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 have 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 Mona 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 rarely recorded in the Mona Offshore Ornithology Array Area study area during the baseline surveys and have therefore been excluded from the assessment of displacement from the Mona 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 Mona 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 Mona 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	130,389	1,139,220	42.5%	484,169	614,558
Razorbill	18,148	606,914	42.9%	260,366	278,484
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	71,198	691,526	46.6%	322,251	393,449
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 (614,558)	n/a	August to February (1,139,220)
Razorbill	January to March (606,914)	April to July (278,484)	August to October (606,914)	November to December (341,422)
Atlantic puffin	n/a	April to early August (184,767)	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 (393,449)	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.

		Age Class								
Species	Parameter	0-1	1-2	2-3	3-4	4-5	5-6	Adult	Productivity	Average mortality
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
	Survival	0.709	0.709	0.709	0.760	0.805	n/a	0.906	0.617	0.181

Species	Parameter	Age Class 0-1	1-2	2-3	3-4	4-5	5-6	Adult	Productivity	Average mortality
Atlantic puffin	Proportion in population	0.164	0.119	0.086	0.062	0.048	n/a	0.521	n/a	n/a
Northern gannet	Survival	0.424	0.829	0.891	0.895	0.895	n/a	0.919	0.700	0.187
	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 Mona Offshore Ornithology Array Area study area, which extended up to 10km outside the Mona Array Area. As mentioned within section 1.1.3, full details of the digital aerial survey methods and results are presented in volume 6, annex 10.1: Offshore ornithology baseline characterisation report of the PEIR. All available data collected between March 2020 and February 2022 were 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 Mona Array Area plus 2km buffer (which occurred in March) and the peak count in the breeding season of Year 2 (which occurred in April). 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	6,461	n/a	5,451
LCI	n/a	3,669	n/a	3,852
UCI	n/a	10,475	n/a	7,435
Razorbill				
Mean	2,283	173	140	287
LCI	1,442	91	47	85
UCI	3,382	312	233	532
Atlantic puffin				
Mean	n/a	16	n/a	14
LCI	n/a	0	n/a	2
UCI	n/a	36	n/a	27
Northern gannet				
Mean	105	351	237	n/a
LCI	51	229	142	n/a
UCI	173	495	351	n/a
Black-legged kittiwake				
Mean	1,135	479	783	n/a
LCI	741	322	506	n/a
UCI	1,655	719	1,150	n/a
Manx shearwater				
Mean	23	1,955	254	n/a
LCI	7	439	90	n/a
UCI	48	5,519	527	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 the 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 Mona 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 Mona Array Area are equal to or less than those carried out during the construction phase within the Mona 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 the constructions and decommissioning phases.

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%
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 Mona 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 (Table 1.4) are presented in each Matrix table.

1.3 Results

1.3.1 Common guillemot

Construction and decommissioning phase

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 18 to 417 individuals (LCI; 12 to 263, UCI; 27 to 627; 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 18 to 417 (LCI; 12 to 263, UCI; 27 to 627) mortalities would increase the baseline mortality rate by 0.011 to 0.263% (LCI; 0.008

to 0.166%, UCI; 0.171 to 0.396%). Table 1.9 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 Mona Array Area plus 2km buffer during construction and decommissioning.

Bio-season	Seasonal Abundance (Mona Array Area + 2km buffer)	Regional Baseline Population Population	Regional Baseline Population Baseline Mortality	Number of common guillemot subject to mortality (no. of indiv.)	Increase in baseline mortality (%)
Breeding					
Mean	6,461	614,558	85,424	10 to 226	0.012 to 0.265
LCI	3,669	614,558	85,424	6 to 128	0.007 to 0.150
UCI	10,475	614,558	85,424	16 to 367	0.019 to 0.430
Non-breeding					
Mean	5,451	1,139,220	158,352	8 to 191	0.005 to 0.121
LCI	3,852	1,139,220	158,352	6 to 135	0.004 to 0.085
UCI	7,435	1,139,220	158,352	11 to 260	0.007 to 0.164
Annual (BMPS)					
Mean	11,912	1,139,220	158,352	18 to 417	0.011 to 0.263
LCI	7,521	1,139,220	158,352	12 to 263	0.008 to 0.166
UCI	17,910	1,139,220	158,352	27 to 627	0.171 to 0.396

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

Guillemot 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	6	13	32	65	129	194	258	323	388	452	517	581	646
15	10	19	48	97	194	291	388	485	581	678	775	872	969
20	13	26	65	129	258	388	517	646	775	905	1034	1163	1292
25	16	32	81	162	323	485	646	808	969	1131	1292	1454	1615
30	19	39	97	194	388	581	775	969	1163	1357	1551	1744	1938
35	23	45	113	226	452	678	905	1131	1357	1583	1809	2035	2261
40	26	52	129	258	517	775	1034	1292	1551	1809	2068	2326	2584
45	29	58	145	291	581	872	1163	1454	1744	2035	2326	2617	2907
50	32	65	162	323	646	969	1292	1615	1938	2261	2584	2907	3231
55	36	71	178	355	711	1066	1421	1777	2132	2487	2843	3198	3554
60	39	78	194	388	775	1163	1551	1938	2326	2714	3101	3489	3877
65	42	84	210	420	840	1260	1680	2100	2520	2940	3360	3780	4200
70	45	90	226	452	905	1357	1809	2261	2714	3166	3618	4070	4523
75	48	97	242	485	969	1454	1938	2423	2907	3392	3877	4361	4846
80	52	103	258	517	1034	1551	2068	2584	3101	3618	4135	4652	5169
85	55	110	275	549	1098	1648	2197	2746	3295	3844	4393	4943	5492
90	58	116	291	581	1163	1744	2326	2907	3489	4070	4652	5233	5815
95	61	123	307	614	1228	1841	2455	3069	3683	4297	4910	5524	6138
100	65	129	323	646	1292	1938	2584	3231	3877	4523	5169	5815	6461

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

Guillemot 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	4	7	18	37	73	110	147	183	220	257	294	330	367
15	6	11	28	55	110	165	220	275	330	385	440	495	550
20	7	15	37	73	147	220	294	367	440	514	587	660	734
25	9	18	46	92	183	275	367	459	550	642	734	826	917
30	11	22	55	110	220	330	440	550	660	770	881	991	1101
35	13	26	64	128	257	385	514	642	770	899	1027	1156	1284
40	15	29	73	147	294	440	587	734	881	1027	1174	1321	1468
45	17	33	83	165	330	495	660	826	991	1156	1321	1486	1651
50	18	37	92	183	367	550	734	917	1101	1284	1468	1651	1835
55	20	40	101	202	404	605	807	1009	1211	1413	1614	1816	2018
60	22	44	110	220	440	660	881	1101	1321	1541	1761	1981	2201
65	24	48	119	238	477	715	954	1192	1431	1669	1908	2146	2385
70	26	51	128	257	514	770	1027	1284	1541	1798	2055	2311	2568
75	28	55	138	275	550	826	1101	1376	1651	1926	2201	2477	2752
80	29	59	147	294	587	881	1174	1468	1761	2055	2348	2642	2935
85	31	62	156	312	624	936	1247	1559	1871	2183	2495	2807	3119
90	33	66	165	330	660	991	1321	1651	1981	2311	2642	2972	3302
95	35	70	174	349	697	1046	1394	1743	2091	2440	2788	3137	3486
100	37	73	183	367	734	1101	1468	1835	2201	2568	2935	3302	3669

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

Guillemot 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	10	21	52	105	210	314	419	524	629	733	838	943	1048
15	16	31	79	157	314	471	629	786	943	1100	1257	1414	1571
20	21	42	105	210	419	629	838	1048	1257	1467	1676	1886	2095
25	26	52	131	262	524	786	1048	1309	1571	1833	2095	2357	2619
30	31	63	157	314	629	943	1257	1571	1886	2200	2514	2828	3143
35	37	73	183	367	733	1100	1467	1833	2200	2566	2933	3300	3666
40	42	84	210	419	838	1257	1676	2095	2514	2933	3352	3771	4190
45	47	94	236	471	943	1414	1886	2357	2828	3300	3771	4242	4714
50	52	105	262	524	1048	1571	2095	2619	3143	3666	4190	4714	5238
55	58	115	288	576	1152	1728	2305	2881	3457	4033	4609	5185	5761
60	63	126	314	629	1257	1886	2514	3143	3771	4400	5028	5657	6285
65	68	136	340	681	1362	2043	2724	3404	4085	4766	5447	6128	6809
70	73	147	367	733	1467	2200	2933	3666	4400	5133	5866	6599	7333
75	79	157	393	786	1571	2357	3143	3928	4714	5499	6285	7071	7856
80	84	168	419	838	1676	2514	3352	4190	5028	5866	6704	7542	8380
85	89	178	445	890	1781	2671	3562	4452	5342	6233	7123	8013	8904
90	94	189	471	943	1886	2828	3771	4714	5657	6599	7542	8485	9428
95	100	199	498	995	1990	2985	3981	4976	5971	6966	7961	8956	9951
100	105	210	524	1048	2095	3143	4190	5238	6285	7333	8380	9428	10475

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

Guillemot 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	5	11	27	55	109	164	218	273	327	382	436	491	545
15	8	16	41	82	164	245	327	409	491	572	654	736	818
20	11	22	55	109	218	327	436	545	654	763	872	981	1090
25	14	27	68	136	273	409	545	681	818	954	1090	1226	1363
30	16	33	82	164	327	491	654	818	981	1145	1308	1472	1635
35	19	38	95	191	382	572	763	954	1145	1335	1526	1717	1908
40	22	44	109	218	436	654	872	1090	1308	1526	1744	1962	2180
45	25	49	123	245	491	736	981	1226	1472	1717	1962	2208	2453
50	27	55	136	273	545	818	1090	1363	1635	1908	2180	2453	2726
55	30	60	150	300	600	899	1199	1499	1799	2099	2398	2698	2998
60	33	65	164	327	654	981	1308	1635	1962	2289	2616	2944	3271
65	35	71	177	354	709	1063	1417	1772	2126	2480	2835	3189	3543
70	38	76	191	382	763	1145	1526	1908	2289	2671	3053	3434	3816
75	41	82	204	409	818	1226	1635	2044	2453	2862	3271	3679	4088
80	44	87	218	436	872	1308	1744	2180	2616	3053	3489	3925	4361
85	46	93	232	463	927	1390	1853	2317	2780	3243	3707	4170	4633
90	49	98	245	491	981	1472	1962	2453	2944	3434	3925	4415	4906
95	52	104	259	518	1036	1554	2071	2589	3107	3625	4143	4661	5178
100	55	109	273	545	1090	1635	2180	2726	3271	3816	4361	4906	5451

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

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	4	8	19	39	77	116	154	193	231	270	308	347	385
15	6	12	29	58	116	173	231	289	347	404	462	520	578
20	8	15	39	77	154	231	308	385	462	539	616	693	770
25	10	19	48	96	193	289	385	482	578	674	770	867	963
30	12	23	58	116	231	347	462	578	693	809	924	1040	1156
35	13	27	67	135	270	404	539	674	809	944	1079	1213	1348
40	15	31	77	154	308	462	616	770	924	1079	1233	1387	1541
45	17	35	87	173	347	520	693	867	1040	1213	1387	1560	1733
50	19	39	96	193	385	578	770	963	1156	1348	1541	1733	1926
55	21	42	106	212	424	636	847	1059	1271	1483	1695	1907	2119
60	23	46	116	231	462	693	924	1156	1387	1618	1849	2080	2311
65	25	50	125	250	501	751	1002	1252	1502	1753	2003	2253	2504
70	27	54	135	270	539	809	1079	1348	1618	1887	2157	2427	2696
75	29	58	144	289	578	867	1156	1445	1733	2022	2311	2600	2889
80	31	62	154	308	616	924	1233	1541	1849	2157	2465	2773	3082
85	33	65	164	327	655	982	1310	1637	1965	2292	2619	2947	3274
90	35	69	173	347	693	1040	1387	1733	2080	2427	2773	3120	3467
95	37	73	183	366	732	1098	1464	1830	2196	2562	2928	3293	3659
100	39	77	193	385	770	1156	1541	1926	2311	2696	3082	3467	3852

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

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	7	15	37	74	149	223	297	372	446	520	595	669	744
15	11	22	56	112	223	335	446	558	669	781	892	1004	1115
20	15	30	74	149	297	446	595	744	892	1041	1190	1338	1487
25	19	37	93	186	372	558	744	929	1115	1301	1487	1673	1859
30	22	45	112	223	446	669	892	1115	1338	1561	1784	2007	2231
35	26	52	130	260	520	781	1041	1301	1561	1822	2082	2342	2602
40	30	59	149	297	595	892	1190	1487	1784	2082	2379	2677	2974
45	33	67	167	335	669	1004	1338	1673	2007	2342	2677	3011	3346
50	37	74	186	372	744	1115	1487	1859	2231	2602	2974	3346	3718
55	41	82	204	409	818	1227	1636	2045	2454	2862	3271	3680	4089
60	45	89	223	446	892	1338	1784	2231	2677	3123	3569	4015	4461
65	48	97	242	483	967	1450	1933	2416	2900	3383	3866	4349	4833
70	52	104	260	520	1041	1561	2082	2602	3123	3643	4164	4684	5205
75	56	112	279	558	1115	1673	2231	2788	3346	3903	4461	5019	5576
80	59	119	297	595	1190	1784	2379	2974	3569	4164	4758	5353	5948
85	63	126	316	632	1264	1896	2528	3160	3792	4424	5056	5688	6320
90	67	134	335	669	1338	2007	2677	3346	4015	4684	5353	6022	6692
95	71	141	353	706	1413	2119	2825	3532	4238	4944	5651	6357	7063
100	74	149	372	744	1487	2231	2974	3718	4461	5205	5948	6692	7435

1.3.1.2 During the breeding season, a mean peak abundance of 6,461 (LCI; 3,669, UCI; 10,475) common guillemot were present within the Mona 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 10 to 226 (LCI; six to 128, UCI; 16 to 367) common guillemot from the population. The regional population in the breeding season is estimated as 614,558 individuals (Table 1.2) and, using the average baseline mortality rate of 0.139 (Table 1.31), the background predicted mortality in the breeding season is 85,424. The additional mortality of 10 to 226 (LCI; six to 128, UCI; 16 to 367) individuals would increase the baseline mortality rate by 0.012 to 0.265% (LCI; 0.007 to 0.150%, UCI; 0.019 to 0.430%).

1.3.1.3 During the non-breeding season, a mean peak abundance of 5,451 (LCI; 3,852, UCI; 7,435) common guillemot were present within the Mona 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 eight to 191 (LCI; six to 135, UCI; 11 to 260) 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 eight to 191 (LCI; six to 135, UCI; 11 to 260) individuals would increase the baseline mortality rate by 0.005 to 0.121% (LCI; 0.004 to 0.085%, UCI; 0.007 to 0.164%).

1.3.1.4 In both bio-seasons and assessed against the defined common guillemot populations (614,558 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 operational and maintenance phase for common guillemot ranged between 35 to 834 (LCI; 23 to 527, UCI; 53 to 1,253) 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 2.4), the background predicted mortality across all seasons is 158,352. The addition of 35 to 834 (LCI; 23 to 527, UCI; 53 to 1,253) mortalities would increase the mortality relative to the baseline mortality rate by 0.022 to 0.527% (LCI; 0.015 to 0.333%,UCI; 0.033 to 0.791%) 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 the Mona Array Area plus 2km buffer during the operations and maintenance phase.

Bio-season	Seasonal Abundance (Mona Array Area + 2km buffer)	Regional Baseline Population Population	Baseline Mortality	Number of common guillemot subject to mortality (indiv.)	Increase in baseline mortality (%)
Breeding					
Mean	6,461	614,558	85,424	19 to 452	0.022 to 0.529
LCI	3,669	614,558	85,424	11 to 257	0.013 to 0.301
UCI	10,475	614,558	85,424	31 to 733	0.036 to 0.858
Non-breeding					
Mean	5,451	1,139,220	158,352	16 to 382	0.010 to 0.241
LCI	3,852	1,139,220	158,352	12 to 270	0.006 to 0.171
UCI	7,435	1,139,220	158,352	22 to 520	0.014 to 0.328
Annual (BMPS)					
Mean	11,912	1,139,220	158,352	35 to 834	0.022 to 0.527
LCI	7,521	1,139,220	158,352	23 to 527	0.015 to 0.333
UCI	17,910	1,139,220	158,352	53 to 1,253	0.033 to 0.791

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

Guillemot 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	6	13	32	65	129	194	258	323	388	452	517	581	646
20	13	26	65	129	258	388	517	646	775	905	1034	1163	1292
30	19	39	97	194	388	581	775	969	1163	1357	1551	1744	1938
40	26	52	129	258	517	775	1034	1292	1551	1809	2068	2326	2584
50	32	65	162	323	646	969	1292	1615	1938	2261	2584	2907	3231
60	39	78	194	388	775	1163	1551	1938	2326	2714	3101	3489	3877
70	45	90	226	452	905	1357	1809	2261	2714	3166	3618	4070	4523
80	52	103	258	517	1034	1551	2068	2584	3101	3618	4135	4652	5169
90	58	116	291	581	1163	1744	2326	2907	3489	4070	4652	5233	5815
100	65	129	323	646	1292	1938	2584	3231	3877	4523	5169	5815	6461

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

Guillemot 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	4	7	18	37	73	110	147	183	220	257	294	330	367
20	7	15	37	73	147	220	294	367	440	514	587	660	734
30	11	22	55	110	220	330	440	550	660	770	881	991	1101
40	15	29	73	147	294	440	587	734	881	1027	1174	1321	1468
50	18	37	92	183	367	550	734	917	1101	1284	1468	1651	1835
60	22	44	110	220	440	660	881	1101	1321	1541	1761	1981	2201
70	26	51	128	257	514	770	1027	1284	1541	1798	2055	2311	2568
80	29	59	147	294	587	881	1174	1468	1761	2055	2348	2642	2935
90	33	66	165	330	660	991	1321	1651	1981	2311	2642	2972	3302
100	37	73	183	367	734	1101	1468	1835	2201	2568	2935	3302	3669

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

Guillemot 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	10	21	52	105	210	314	419	524	629	733	838	943	1048
20	21	42	105	210	419	629	838	1048	1257	1467	1676	1886	2095
30	31	63	157	314	629	943	1257	1571	1886	2200	2514	2828	3143
40	42	84	210	419	838	1257	1676	2095	2514	2933	3352	3771	4190
50	52	105	262	524	1048	1571	2095	2619	3143	3666	4190	4714	5238
60	63	126	314	629	1257	1886	2514	3143	3771	4400	5028	5657	6285
70	73	147	367	733	1467	2200	2933	3666	4400	5133	5866	6599	7333
80	84	168	419	838	1676	2514	3352	4190	5028	5866	6704	7542	8380
90	94	189	471	943	1886	2828	3771	4714	5657	6599	7542	8485	9428
100	105	210	524	1048	2095	3143	4190	5238	6285	7333	8380	9428	10475

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

Guillemot 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	5	11	27	55	109	164	218	273	327	382	436	491	545
20	11	22	55	109	218	327	436	545	654	763	872	981	1090
30	16	33	82	164	327	491	654	818	981	1145	1308	1472	1635
40	22	44	109	218	436	654	872	1090	1308	1526	1744	1962	2180
50	27	55	136	273	545	818	1090	1363	1635	1908	2180	2453	2726
60	33	65	164	327	654	981	1308	1635	1962	2289	2616	2944	3271
70	38	76	191	382	763	1145	1526	1908	2289	2671	3053	3434	3816
80	44	87	218	436	872	1308	1744	2180	2616	3053	3489	3925	4361
90	49	98	245	491	981	1472	1962	2453	2944	3434	3925	4415	4906
100	55	109	273	545	1090	1635	2180	2726	3271	3816	4361	4906	5451

Table 1.20: LCI predicted common guillemot mortality for the Mona 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	4	8	19	39	77	116	154	193	231	270	308	347	385
20	8	15	39	77	154	231	308	385	462	539	616	693	770
30	12	23	58	116	231	347	462	578	693	809	924	1040	1156
40	15	31	77	154	308	462	616	770	924	1079	1233	1387	1541
50	19	39	96	193	385	578	770	963	1156	1348	1541	1733	1926
60	23	46	116	231	462	693	924	1156	1387	1618	1849	2080	2311
70	27	54	135	270	539	809	1079	1348	1618	1887	2157	2427	2696
80	31	62	154	308	616	924	1233	1541	1849	2157	2465	2773	3082
90	35	69	173	347	693	1040	1387	1733	2080	2427	2773	3120	3467
100	39	77	193	385	770	1156	1541	1926	2311	2696	3082	3467	3852

Table 1.21: UCI predicted common guillemot mortality for the Mona 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	7	15	37	74	149	223	297	372	446	520	595	669	744
20	15	30	74	149	297	446	595	744	892	1041	1190	1338	1487
30	22	45	112	223	446	669	892	1115	1338	1561	1784	2007	2231
40	30	59	149	297	595	892	1190	1487	1784	2082	2379	2677	2974
50	37	74	186	372	744	1115	1487	1859	2231	2602	2974	3346	3718
60	45	89	223	446	892	1338	1784	2231	2677	3123	3569	4015	4461
70	52	104	260	520	1041	1561	2082	2602	3123	3643	4164	4684	5205
80	59	119	297	595	1190	1784	2379	2974	3569	4164	4758	5353	5948
90	67	134	335	669	1338	2007	2677	3346	4015	4684	5353	6022	6692
100	74	149	372	744	1487	2231	2974	3718	4461	5205	5948	6692	7435

1.3.1.6 During the breeding season, the mean peak abundance for common guillemot is 6,461 (LCI; 3,669, UCI; 10,475) individuals within the Mona 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 19 to 452 (LCI; 11 to 257, UCI; 31 to 733) 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 614,558 individuals (Table 1.2). Using the average baseline mortality rate of 0.139 (Table 2.4), the background estimated mortality of common guillemot in the breeding season is 85,424. The addition of 19 to 452 (LCI; 11 to 257, UCI; 31 to 733) mortalities would increase the mortality relative to the baseline mortality rate by 0.022 to 0.529% (LCI; 0.013 to 0.301%, UCI; 0.036 to 0.858%).

1.3.1.7 During the non-breeding season, the mean peak abundance for common guillemot was 5,451 (LCI; 3,852, UCI; 7,435) individuals within the Mona 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 16 to 382 (LCI; 12 to 270, UCI; 22 to 520) common guillemot being subject to mortality. The UK Western Waters BDMPS for the non-breeding season is defined as 1,139,220 individuals (Table 1.3) 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 16 to 382 (LCI; 12 to 270, UCI; 22 to 520) mortalities would increase the mortality relative to the baseline mortality rate by 0.010 to 0.241% (LCI; 0.006 to 0.171%, UCI; 0.014 to 0.326%).

1.3.1.8 In both bio-seasons and assessed against the defined common guillemot populations (614,558 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 razorbill subject to mortality due to displacement during the construction and decommissioning phases was three to 101 individuals (LCI; two to 58, UCI; six to 156; 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 three to 101 (LCI; two to 58, UCI; six to 156) mortalities would increase the mortality relative to the baseline mortality rate by 0.003 to 0.096% (LCI; 0.002 to 0.055%, UCI; 0.006 to 0.148%) at the BDMPS scale. Table 1.23 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 Mona Array Area plus 2km buffer during construction and decommissioning.

Bio-season	Seasonal Abundance (Mona Array Area + 2km buffer)	Regional Baseline Population	Baseline Mortality	Number of razorbill subject to mortality (indiv.)	Increase in baseline mortality (%)
Spring Migration					
Mean	2,283	606,914	105,603	3 to 80	0.003 to 0.076
LCI	1,442	606,914	105,603	2 to 50	0.002 to 0.047
UCI	3,382	606,914	105,603	5 to 118	0.005 to 0.112
Breeding					
Mean	173	278,484	48,456	0 to 6	0.000 to 0.012
LCI	91	278,484	48,456	0 to 3	0.000 to 0.006
UCI	312	278,484	48,456	0 to 11	0.000 to 0.023
Autumn Migration					
Mean	140	606,914	105,603	0 to 5	0.000 to 0.005
LCI	47	606,914	105,603	0 to 2	0.000 to 0.002
UCI	233	606,914	105,603	0 to 8	0.000 to 0.008
Non-breeding					
Mean	287	341,422	59,407	0 to 10	0.000 to 0.017

Bio-season	Seasonal Abundance (Mona Array Area + 2km buffer)	Regional Baseline Population			
		Population	Baseline Mortality	Number of razorbill subject to mortality (indiv.)	Increase in baseline mortality (%)
LCI	85	341,422	59,407	0 to 3	0.000 to 0.005
UCI	532	341,422	59,407	1 to 19	0.002 to 0.032
Annual (BDMPS)					
Mean	2,883	606,914	105,603	3 to 101	0.003 to 0.096
LCI	1,665	606,914	105,603	2 to 58	0.002 to 0.055
UCI	4,459	606,914	105,603	6 to 156	0.006 to 0.148

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

Razorbill 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	2	5	11	23	46	68	91	114	137	160	183	205	228
15	3	7	17	34	68	103	137	171	205	240	274	308	342
20	5	9	23	46	91	137	183	228	274	320	365	411	457
25	6	11	29	57	114	171	228	285	342	400	457	514	571
30	7	14	34	68	137	205	274	342	411	479	548	616	685
35	8	16	40	80	160	240	320	400	479	559	639	719	799
40	9	18	46	91	183	274	365	457	548	639	731	822	913
45	10	21	51	103	205	308	411	514	616	719	822	925	1027
50	11	23	57	114	228	342	457	571	685	799	913	1027	1142
55	13	25	63	126	251	377	502	628	753	879	1005	1130	1256
60	14	27	68	137	274	411	548	685	822	959	1096	1233	1370
65	15	30	74	148	297	445	594	742	890	1039	1187	1336	1484
70	16	32	80	160	320	479	639	799	959	1119	1278	1438	1598
75	17	34	86	171	342	514	685	856	1027	1199	1370	1541	1712
80	18	37	91	183	365	548	731	913	1096	1278	1461	1644	1826
85	19	39	97	194	388	582	776	970	1164	1358	1552	1746	1941
90	21	41	103	205	411	616	822	1027	1233	1438	1644	1849	2055
95	22	43	108	217	434	651	868	1084	1301	1518	1735	1952	2169
100	23	46	114	228	457	685	913	1142	1370	1598	1826	2055	2283

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

Razorbill 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	1	3	7	14	29	43	58	72	87	101	115	130	144
15	2	4	11	22	43	65	87	108	130	151	173	195	216
20	3	6	14	29	58	87	115	144	173	202	231	260	288
25	4	7	18	36	72	108	144	180	216	252	288	324	361
30	4	9	22	43	87	130	173	216	260	303	346	389	433
35	5	10	25	50	101	151	202	252	303	353	404	454	505
40	6	12	29	58	115	173	231	288	346	404	461	519	577
45	6	13	32	65	130	195	260	324	389	454	519	584	649
50	7	14	36	72	144	216	288	361	433	505	577	649	721
55	8	16	40	79	159	238	317	397	476	555	634	714	793
60	9	17	43	87	173	260	346	433	519	606	692	779	865
65	9	19	47	94	187	281	375	469	562	656	750	844	937
70	10	20	50	101	202	303	404	505	606	707	808	908	1009
75	11	22	54	108	216	324	433	541	649	757	865	973	1082
80	12	23	58	115	231	346	461	577	692	808	923	1038	1154
85	12	25	61	123	245	368	490	613	735	858	981	1103	1226
90	13	26	65	130	260	389	519	649	779	908	1038	1168	1298
95	14	27	68	137	274	411	548	685	822	959	1096	1233	1370
100	14	29	72	144	288	433	577	721	865	1009	1154	1298	1442

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

Razorbill 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	3	7	17	34	68	101	135	169	203	237	271	304	338
15	5	10	25	51	101	152	203	254	304	355	406	457	507
20	7	14	34	68	135	203	271	338	406	473	541	609	676
25	8	17	42	85	169	254	338	423	507	592	676	761	846
30	10	20	51	101	203	304	406	507	609	710	812	913	1015
35	12	24	59	118	237	355	473	592	710	829	947	1065	1184
40	14	27	68	135	271	406	541	676	812	947	1082	1218	1353
45	15	30	76	152	304	457	609	761	913	1065	1218	1370	1522
50	17	34	85	169	338	507	676	846	1015	1184	1353	1522	1691
55	19	37	93	186	372	558	744	930	1116	1302	1488	1674	1860
60	20	41	101	203	406	609	812	1015	1218	1420	1623	1826	2029
65	22	44	110	220	440	659	879	1099	1319	1539	1759	1978	2198
70	24	47	118	237	473	710	947	1184	1420	1657	1894	2131	2367
75	25	51	127	254	507	761	1015	1268	1522	1776	2029	2283	2537
80	27	54	135	271	541	812	1082	1353	1623	1894	2164	2435	2706
85	29	57	144	287	575	862	1150	1437	1725	2012	2300	2587	2875
90	30	61	152	304	609	913	1218	1522	1826	2131	2435	2739	3044
95	32	64	161	321	643	964	1285	1606	1928	2249	2570	2892	3213
100	34	68	169	338	676	1015	1353	1691	2029	2367	2706	3044	3382

Table 1.26: Mean predicted razorbill mortality for the Mona 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
10	0	0	1	2	3	5	7	9	10	12	14	16	17
15	0	1	1	3	5	8	10	13	16	18	21	23	26
20	0	1	2	3	7	10	14	17	21	24	28	31	35
25	0	1	2	4	9	13	17	22	26	30	35	39	43
30	1	1	3	5	10	16	21	26	31	36	42	47	52
35	1	1	3	6	12	18	24	30	36	42	48	54	61
40	1	1	3	7	14	21	28	35	42	48	55	62	69
45	1	2	4	8	16	23	31	39	47	54	62	70	78
50	1	2	4	9	17	26	35	43	52	61	69	78	87
55	1	2	5	10	19	29	38	48	57	67	76	86	95
60	1	2	5	10	21	31	42	52	62	73	83	93	104
65	1	2	6	11	22	34	45	56	67	79	90	101	112
70	1	2	6	12	24	36	48	61	73	85	97	109	121
75	1	3	6	13	26	39	52	65	78	91	104	117	130
80	1	3	7	14	28	42	55	69	83	97	111	125	138
85	1	3	7	15	29	44	59	74	88	103	118	132	147
90	2	3	8	16	31	47	62	78	93	109	125	140	156
95	2	3	8	16	33	49	66	82	99	115	131	148	164
100	2	3	9	17	35	52	69	87	104	121	138	156	173

Table 1.27: LCI predicted razorbill mortality for the Mona 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
10	0	0	0	1	2	3	4	5	5	6	7	8	9
15	0	0	1	1	3	4	5	7	8	10	11	12	14
20	0	0	1	2	4	5	7	9	11	13	15	16	18
25	0	0	1	2	5	7	9	11	14	16	18	20	23
30	0	1	1	3	5	8	11	14	16	19	22	25	27
35	0	1	2	3	6	10	13	16	19	22	25	29	32
40	0	1	2	4	7	11	15	18	22	25	29	33	36
45	0	1	2	4	8	12	16	20	25	29	33	37	41
50	0	1	2	5	9	14	18	23	27	32	36	41	46
55	1	1	3	5	10	15	20	25	30	35	40	45	50
60	1	1	3	5	11	16	22	27	33	38	44	49	55
65	1	1	3	6	12	18	24	30	35	41	47	53	59
70	1	1	3	6	13	19	25	32	38	45	51	57	64
75	1	1	3	7	14	20	27	34	41	48	55	61	68
80	1	1	4	7	15	22	29	36	44	51	58	66	73
85	1	2	4	8	15	23	31	39	46	54	62	70	77
90	1	2	4	8	16	25	33	41	49	57	66	74	82
95	1	2	4	9	17	26	35	43	52	61	69	78	86
100	1	2	5	9	18	27	36	46	55	64	73	82	91

Table 1.28: UCI predicted razorbill mortality for the Mona 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
10	0	1	2	3	6	9	12	16	19	22	25	28	31
15	0	1	2	5	9	14	19	23	28	33	37	42	47
20	1	1	3	6	12	19	25	31	37	44	50	56	62
25	1	2	4	8	16	23	31	39	47	55	62	70	78
30	1	2	5	9	19	28	37	47	56	66	75	84	94
35	1	2	5	11	22	33	44	55	66	76	87	98	109
40	1	2	6	12	25	37	50	62	75	87	100	112	125
45	1	3	7	14	28	42	56	70	84	98	112	126	140
50	2	3	8	16	31	47	62	78	94	109	125	140	156
55	2	3	9	17	34	51	69	86	103	120	137	154	172
60	2	4	9	19	37	56	75	94	112	131	150	168	187
65	2	4	10	20	41	61	81	101	122	142	162	183	203
70	2	4	11	22	44	66	87	109	131	153	175	197	218
75	2	5	12	23	47	70	94	117	140	164	187	211	234
80	2	5	12	25	50	75	100	125	150	175	200	225	250
85	3	5	13	27	53	80	106	133	159	186	212	239	265
90	3	6	14	28	56	84	112	140	168	197	225	253	281
95	3	6	15	30	59	89	119	148	178	207	237	267	296
100	3	6	16	31	62	94	125	156	187	218	250	281	312

Table 1.29: Mean predicted razorbill mortality for the Mona 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
10	0	0	1	1	3	4	6	7	8	10	11	13	14
15	0	0	1	2	4	6	8	11	13	15	17	19	21
20	0	1	1	3	6	8	11	14	17	20	22	25	28
25	0	1	2	4	7	11	14	18	21	25	28	32	35
30	0	1	2	4	8	13	17	21	25	29	34	38	42
35	0	1	2	5	10	15	20	25	29	34	39	44	49
40	1	1	3	6	11	17	22	28	34	39	45	50	56
45	1	1	3	6	13	19	25	32	38	44	50	57	63
50	1	1	4	7	14	21	28	35	42	49	56	63	70
55	1	2	4	8	15	23	31	39	46	54	62	69	77
60	1	2	4	8	17	25	34	42	50	59	67	76	84
65	1	2	5	9	18	27	36	46	55	64	73	82	91
70	1	2	5	10	20	29	39	49	59	69	78	88	98
75	1	2	5	11	21	32	42	53	63	74	84	95	105
80	1	2	6	11	22	34	45	56	67	78	90	101	112
85	1	2	6	12	24	36	48	60	71	83	95	107	119
90	1	3	6	13	25	38	50	63	76	88	101	113	126
95	1	3	7	13	27	40	53	67	80	93	106	120	133
100	1	3	7	14	28	42	56	70	84	98	112	126	140

Table 1.30: LCI predicted razorbill mortality for the Mona 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
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	8	9
25	0	0	1	1	2	4	5	6	7	8	9	11	12
30	0	0	1	1	3	4	6	7	8	10	11	13	14
35	0	0	1	2	3	5	7	8	10	12	13	15	16
40	0	0	1	2	4	6	8	9	11	13	15	17	19
45	0	0	1	2	4	6	8	11	13	15	17	19	21
50	0	0	1	2	5	7	9	12	14	16	19	21	24
55	0	1	1	3	5	8	10	13	16	18	21	23	26
60	0	1	1	3	6	8	11	14	17	20	23	25	28
65	0	1	2	3	6	9	12	15	18	21	24	27	31
70	0	1	2	3	7	10	13	16	20	23	26	30	33
75	0	1	2	4	7	11	14	18	21	25	28	32	35
80	0	1	2	4	8	11	15	19	23	26	30	34	38
85	0	1	2	4	8	12	16	20	24	28	32	36	40
90	0	1	2	4	8	13	17	21	25	30	34	38	42
95	0	1	2	4	9	13	18	22	27	31	36	40	45
100	0	1	2	5	9	14	19	24	28	33	38	42	47

Table 1.31: UCI predicted razorbill mortality for the Mona 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
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 1.32: Mean predicted razorbill mortality for the Mona Array Area plus 2km buffer during the non-breeding season (construction and decommissioning).

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	1	1	3	6	9	11	14	17	20	23	26	29
15	0	1	2	4	9	13	17	22	26	30	34	39	43
20	1	1	3	6	11	17	23	29	34	40	46	52	57
25	1	1	4	7	14	22	29	36	43	50	57	65	72
30	1	2	4	9	17	26	34	43	52	60	69	77	86
35	1	2	5	10	20	30	40	50	60	70	80	90	100
40	1	2	6	11	23	34	46	57	69	80	92	103	115
45	1	3	6	13	26	39	52	65	77	90	103	116	129
50	1	3	7	14	29	43	57	72	86	100	115	129	144
55	2	3	8	16	32	47	63	79	95	110	126	142	158
60	2	3	9	17	34	52	69	86	103	121	138	155	172
65	2	4	9	19	37	56	75	93	112	131	149	168	187
70	2	4	10	20	40	60	80	100	121	141	161	181	201
75	2	4	11	22	43	65	86	108	129	151	172	194	215
80	2	5	11	23	46	69	92	115	138	161	184	207	230
85	2	5	12	24	49	73	98	122	146	171	195	220	244
90	3	5	13	26	52	77	103	129	155	181	207	232	258
95	3	5	14	27	55	82	109	136	164	191	218	245	273
100	3	6	14	29	57	86	115	144	172	201	230	258	287

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

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	1	2	3	3	4	5	6	7	8	9
15	0	0	1	1	3	4	5	6	8	9	10	11	13
20	0	0	1	2	3	5	7	9	10	12	14	15	17
25	0	0	1	2	4	6	9	11	13	15	17	19	21
30	0	1	1	3	5	8	10	13	15	18	20	23	26
35	0	1	1	3	6	9	12	15	18	21	24	27	30
40	0	1	2	3	7	10	14	17	20	24	27	31	34
45	0	1	2	4	8	11	15	19	23	27	31	34	38
50	0	1	2	4	9	13	17	21	26	30	34	38	43
55	0	1	2	5	9	14	19	23	28	33	37	42	47
60	1	1	3	5	10	15	20	26	31	36	41	46	51
65	1	1	3	6	11	17	22	28	33	39	44	50	55
70	1	1	3	6	12	18	24	30	36	42	48	54	60
75	1	1	3	6	13	19	26	32	38	45	51	57	64
80	1	1	3	7	14	20	27	34	41	48	54	61	68
85	1	1	4	7	14	22	29	36	43	51	58	65	72
90	1	2	4	8	15	23	31	38	46	54	61	69	77
95	1	2	4	8	16	24	32	40	48	57	65	73	81
100	1	2	4	9	17	26	34	43	51	60	68	77	85

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

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	1	1	3	5	11	16	21	27	32	37	43	48	53
15	1	2	4	8	16	24	32	40	48	56	64	72	80
20	1	2	5	11	21	32	43	53	64	74	85	96	106
25	1	3	7	13	27	40	53	67	80	93	106	120	133
30	2	3	8	16	32	48	64	80	96	112	128	144	160
35	2	4	9	19	37	56	74	93	112	130	149	168	186
40	2	4	11	21	43	64	85	106	128	149	170	192	213
45	2	5	12	24	48	72	96	120	144	168	192	215	239
50	3	5	13	27	53	80	106	133	160	186	213	239	266
55	3	6	15	29	59	88	117	146	176	205	234	263	293
60	3	6	16	32	64	96	128	160	192	223	255	287	319
65	3	7	17	35	69	104	138	173	207	242	277	311	346
70	4	7	19	37	74	112	149	186	223	261	298	335	372
75	4	8	20	40	80	120	160	200	239	279	319	359	399
80	4	9	21	43	85	128	170	213	255	298	340	383	426
85	5	9	23	45	90	136	181	226	271	317	362	407	452
90	5	10	24	48	96	144	192	239	287	335	383	431	479
95	5	10	25	51	101	152	202	253	303	354	404	455	505
100	5	11	27	53	106	160	213	266	319	372	426	479	532

1.3.2.2 During the Spring migration season (return migration), the mean peak abundance for razorbill was 2,283 (LCI; 1,442, UCI; 3,382) individuals within the Mona 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 three to 80 (LCI; two to 50, UCI; five to 118) razorbill 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 three to 80 (LCI; two to 50, UCI; five to 118) mortalities would increase the mortality relative to the baseline mortality rate by 0.003 to 0.076% (LCI; 0.002 to 0.047%, UCI; 0.005 to 0.112%).

1.3.2.3 During the breeding season, the mean peak abundance for razorbill was 173 (LCI; 91, UCI; 312) individuals within the Mona 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 six (LCI; zero to three, UCI; zero to 11) razorbill being subject to mortality. The regional population in the breeding season is defined as 278,484 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 48,456. The addition of zero to six (LCI; zero to three, UCI; zero to 11) mortalities would increase the mortality relative to the baseline mortality rate by 0.000 to 0.012% (LCI; 0.000 to 0.006%, UCI; 0.000 to 0.023%).

1.3.2.4 During the autumn migration season (post-breeding migration), the mean peak abundance for razorbill was 140 (LIC; 47, UCI; 233) individuals within the Mona 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 five (LCI; zero to two, UCI; zero to eight) razorbill 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 five mortalities would increase the baseline mortality rate by 0.000 to 0.005% (LCI; 0.000 to 0.002%, UCI; 0.000 to 0.008%).

1.3.2.5 During the non-breeding season (winter season), the mean peak abundance for razorbill was 287 (LCI; 85, UCI; 532) individuals within the Mona Array Area plus 2km buffer. When considering construction and decommissioning phase displacement and mortality rates of 15 to 35% and 1 to 10%, zero to 10 (LCI; zero to three, UCI; one to 19) razorbill 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 zero to 10 (LCI; zero to three, UCI; one to 19) mortalities would increase the mortality relative to the baseline mortality rate by 0.000 to 0.017% (LCI; 0.000 to 0.005%, UCI; 0.002 to 0.032%).

1.3.2.6 In all four bio-seasons and assessed against the defined razorbill populations (606,914 in both migration periods, 278,484 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 razorbill subject to mortality due to displacement was nine to 202 (LCI; four to 130, UCI; 14 to 312) 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 nine to 202 (LCI; four to 130, UCI; 14 to 312) mortalities would increase the mortality relative to the baseline mortality rate by 0.009 – 0.191% (LCI; 0.004 to 0.123%, UCI; 0.013 to 0.295%) at the BDMPS scale.

1.3.2.8 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 Mona Array Area plus 2km buffer during the operations and maintenance phase.

Bio-season	Seasonal Abundance (Mona Array Area + 2km buffer)	Regional Baseline Population			
		Population	Baseline Mortality	Number of razorbill subject to mortality (indiv.)	Increase in baseline mortality (%)
Spring Migration					
Mean	2,283	606,914	105,603	7 to 160	0.007 to 0.152
LCI	1,442	606,914	105,603	4 to 101	0.004 to 0.096
UCI	3,382	606,914	105,603	10 to 237	0.009 to 0.224
Breeding					

Bio-season	Seasonal Abundance (Mona Array Area + 2km buffer)	Regional Baseline Population: Population	Regional Baseline Population: Baseline Mortality	Number of razorbill subject to mortality (indiv.)	Increase in baseline mortality (%)
Mean	173	278,484	48,456	1 to 12	0.002 to 0.025
LCI	91	278,484	48,456	0 to 6	0.000 to 0.012
UCI	312	278,484	48,456	1 to 22	0.002 to 0.045
Autumn Migration					
Mean	140	606,914	105,603	0 to 10	0.000 to 0.009
LCI	47	606,914	105,603	0 to 3	0.000 to 0.003
UCI	233	606,914	105,603	1 to 16	0.001 to 0.015
Non-breeding					
Mean	287	341,422	59,407	1 to 20	0.002 to 0.034
LCI	85	341,422	59,407	0 to 6	0.000 to 0.010
UCI	532	341,422	59,407	2 to 37	0.003 to 0.062
Annual (BDMPS)					
Mean	2,883	606,914	105,603	9 to 202	0.009 to 0.191
LCI	1,665	606,914	105,603	4 to 130	0.004 to 0.123
UCI	4,459	606,914	105,603	14 to 312	0.013 to 0.295

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

Razorbill 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	2	5	11	23	46	68	91	114	137	160	183	205	228
20	5	9	23	46	91	137	183	228	274	320	365	411	457
30	7	14	34	68	137	205	274	342	411	479	548	616	685
40	9	18	46	91	183	274	365	457	548	639	731	822	913
50	11	23	57	114	228	342	457	571	685	799	913	1027	1142
60	14	27	68	137	274	411	548	685	822	959	1096	1233	1370
70	16	32	80	160	320	479	639	799	959	1119	1278	1438	1598
80	18	37	91	183	365	548	731	913	1096	1278	1461	1644	1826
90	21	41	103	205	411	616	822	1027	1233	1438	1644	1849	2055
100	23	46	114	228	457	685	913	1142	1370	1598	1826	2055	2283

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

Razorbill 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	1	3	7	14	29	43	58	72	87	101	115	130	144
20	3	6	14	29	58	87	115	144	173	202	231	260	288
30	4	9	22	43	87	130	173	216	260	303	346	389	433
40	6	12	29	58	115	173	231	288	346	404	461	519	577
50	7	14	36	72	144	216	288	361	433	505	577	649	721
60	9	17	43	87	173	260	346	433	519	606	692	779	865
70	10	20	50	101	202	303	404	505	606	707	808	908	1009
80	12	23	58	115	231	346	461	577	692	808	923	1038	1154
90	13	26	65	130	260	389	519	649	779	908	1038	1168	1298
100	14	29	72	144	288	433	577	721	865	1009	1154	1298	1442

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

Razorbill 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	3	7	17	34	68	101	135	169	203	237	271	304	338
20	7	14	34	68	135	203	271	338	406	473	541	609	676
30	10	20	51	101	203	304	406	507	609	710	812	913	1015
40	14	27	68	135	271	406	541	676	812	947	1082	1218	1353
50	17	34	85	169	338	507	676	846	1015	1184	1353	1522	1691
60	20	41	101	203	406	609	812	1015	1218	1420	1623	1826	2029
70	24	47	118	237	473	710	947	1184	1420	1657	1894	2131	2367
80	27	54	135	271	541	812	1082	1353	1623	1894	2164	2435	2706
90	30	61	152	304	609	913	1218	1522	1826	2131	2435	2739	3044
100	34	68	169	338	676	1015	1353	1691	2029	2367	2706	3044	3382

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

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
10	0	0	1	2	3	5	7	9	10	12	14	16	17
20	0	1	2	3	7	10	14	17	21	24	28	31	35
30	1	1	3	5	10	16	21	26	31	36	42	47	52
40	1	1	3	7	14	21	28	35	42	48	55	62	69
50	1	2	4	9	17	26	35	43	52	61	69	78	87
60	1	2	5	10	21	31	42	52	62	73	83	93	104
70	1	2	6	12	24	36	48	61	73	85	97	109	121
80	1	3	7	14	28	42	55	69	83	97	111	125	138
90	2	3	8	16	31	47	62	78	93	109	125	140	156
100	2	3	9	17	35	52	69	87	104	121	138	156	173

Table 1.40: LCI predicted razorbill mortality for the Mona 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	2	3	4	5	5	6	7	8	9
20	0	0	1	2	4	5	7	9	11	13	15	16	18
30	0	1	1	3	5	8	11	14	16	19	22	25	27
40	0	1	2	4	7	11	15	18	22	25	29	33	36
50	0	1	2	5	9	14	18	23	27	32	36	41	46
60	1	1	3	5	11	16	22	27	33	38	44	49	55
70	1	1	3	6	13	19	25	32	38	45	51	57	64
80	1	1	4	7	15	22	29	36	44	51	58	66	73
90	1	2	4	8	16	25	33	41	49	57	66	74	82
100	1	2	5	9	18	27	36	46	55	64	73	82	91

Table 1.41: UCI predicted razorbill mortality for the Mona 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	1	2	3	6	9	12	16	19	22	25	28	31
20	1	1	3	6	12	19	25	31	37	44	50	56	62
30	1	2	5	9	19	28	37	47	56	66	75	84	94
40	1	2	6	12	25	37	50	62	75	87	100	112	125
50	2	3	8	16	31	47	62	78	94	109	125	140	156
60	2	4	9	19	37	56	75	94	112	131	150	168	187
70	2	4	11	22	44	66	87	109	131	153	175	197	218
80	2	5	12	25	50	75	100	125	150	175	200	225	250
90	3	6	14	28	56	84	112	140	168	197	225	253	281
100	3	6	16	31	62	94	125	156	187	218	250	281	312

Table 1.42: Mean predicted razorbill mortality for the Mona 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	3	4	6	7	8	10	11	13	14
20	0	1	1	3	6	8	11	14	17	20	22	25	28
30	0	1	2	4	8	13	17	21	25	29	34	38	42
40	1	1	3	6	11	17	22	28	34	39	45	50	56
50	1	1	4	7	14	21	28	35	42	49	56	63	70
60	1	2	4	8	17	25	34	42	50	59	67	76	84
70	1	2	5	10	20	29	39	49	59	69	78	88	98
80	1	2	6	11	22	34	45	56	67	78	90	101	112
90	1	3	6	13	25	38	50	63	76	88	101	113	126
100	1	3	7	14	28	42	56	70	84	98	112	126	140

Table 1.43: LCI predicted razorbill mortality for the Mona 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	8	9
30	0	0	1	1	3	4	6	7	8	10	11	13	14
40	0	0	1	2	4	6	8	9	11	13	15	17	19
50	0	0	1	2	5	7	9	12	14	16	19	21	24
60	0	1	1	3	6	8	11	14	17	20	23	25	28
70	0	1	2	3	7	10	13	16	20	23	26	30	33
80	0	1	2	4	8	11	15	19	23	26	30	34	38
90	0	1	2	4	8	13	17	21	25	30	34	38	42
100	0	1	2	5	9	14	19	24	28	33	38	42	47

Table 1.44: UCI predicted razorbill mortality for the Mona 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	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 1.45: Mean predicted razorbill mortality for the Mona 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	1	1	3	6	9	11	14	17	20	23	26	29
20	1	1	3	6	11	17	23	29	34	40	46	52	57
30	1	2	4	9	17	26	34	43	52	60	69	77	86
40	1	2	6	11	23	34	46	57	69	80	92	103	115
50	1	3	7	14	29	43	57	72	86	100	115	129	144
60	2	3	9	17	34	52	69	86	103	121	138	155	172
70	2	4	10	20	40	60	80	100	121	141	161	181	201
80	2	5	11	23	46	69	92	115	138	161	184	207	230
90	3	5	13	26	52	77	103	129	155	181	207	232	258
100	3	6	14	29	57	86	115	144	172	201	230	258	287

Table 1.46: LCI predicted razorbill mortality for the Mona 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	1	2	3	3	4	5	6	7	8	9
20	0	0	1	2	3	5	7	9	10	12	14	15	17
30	0	1	1	3	5	8	10	13	15	18	20	23	26
40	0	1	2	3	7	10	14	17	20	24	27	31	34
50	0	1	2	4	9	13	17	21	26	30	34	38	43
60	1	1	3	5	10	15	20	26	31	36	41	46	51
70	1	1	3	6	12	18	24	30	36	42	48	54	60
80	1	1	3	7	14	20	27	34	41	48	54	61	68
90	1	2	4	8	15	23	31	38	46	54	61	69	77
100	1	2	4	9	17	26	34	43	51	60	68	77	85

Table 1.47: UCI predicted razorbill mortality for the Mona 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	1	1	3	5	11	16	21	27	32	37	43	48	53
20	1	2	5	11	21	32	43	53	64	74	85	96	106
30	2	3	8	16	32	48	64	80	96	112	128	144	160
40	2	4	11	21	43	64	85	106	128	149	170	192	213
50	3	5	13	27	53	80	106	133	160	186	213	239	266
60	3	6	16	32	64	96	128	160	192	223	255	287	319
70	4	7	19	37	74	112	149	186	223	261	298	335	372
80	4	9	21	43	85	128	170	213	255	298	340	383	426
90	5	10	24	48	96	144	192	239	287	335	383	431	479
100	5	11	27	53	106	160	213	266	319	372	426	479	532

1.3.2.9 During the Spring migration season (return migration), the mean peak abundance for razorbill was 2,283 (LCI; 1,442, UCI; 3,382) individuals within the Mona 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 seven to 160 (LCI; four to 101, UCI; 10 to 237) razorbill 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 seven to 160 (LCI; four to 101, UCI; 10 to 237) mortalities would increase the mortality relative to the baseline mortality rate by 0.007 to 0.152% (LCI; 0.004 to 0.096%, UCI; 0.009 to 0.224%).

1.3.2.10 During the breeding season, the mean peak abundance for razorbill was 173 (LCI; 91, UCI; 312) individuals within the Mona 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 12 (LCI; zero to six, UCI; one to 22) razorbill being subject to mortality. The regional population in the breeding season is defined as 278,484 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 48,456. The addition of one to 12 (LCI; zero to six, UCI; one to 22) mortalities would increase the mortality relative to the baseline mortality rate by 0.002 to 0.025% (LCI; 0.000 to 0.012%, UCI; 0.002 to 0.045%).

1.3.2.11 During the Autumn migration season (post-breeding migration), the mean peak abundance for razorbill was 140 (LCI; 47, UCI; 233) individuals within the Mona 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 10 (LCI; zero to three, UCI; one to 16) razorbill 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 10 (LCI; zero to three, UCI; one to 16) mortalities would increase the baseline mortality rate by 0.000 – 0.009% (LCI; 0.000 to 0.003%, UCI; 0.001 to 0.015%).

1.3.2.12 During the non-breeding season (winter season), the mean peak abundance for razorbill was 287 (LCI; 85, UCI; 532) individuals within the Mona 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 20 (LCI; zero to six, UCI; two to 37) razorbill 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 20 (LCI; zero to six, UCI; two to 37) mortalities would increase the mortality relative to the baseline mortality rate by 0.002 to 0.034% (LCI; 0.000 to 0.010%, UCI; 0.003 to 0.062%).

1.3.2.13 In all four bio-seasons and assessed against the defined razorbill populations (606,914 in both migration periods, 277,328 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 phases

1.3.3.1 For all seasons combined, the annual predicted number of Atlantic puffin 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 1.3) 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 1.49 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 the Mona Array Area plus 2km buffer during construction (and decommissioning).

Bio-season	Seasonal Abundance (Mona Array Area + 2km buffer)	Regional Baseline Population: Population	Regional Baseline Population: Baseline Mortality	Number of Atlantic puffin subject to mortality (indiv.)	Increase in baseline mortality (%)
Breeding					
Mean	16	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	36	184,767	33,443	0 to 1	0.000 to 0.003
Non-breeding					
Mean	14	304,557	55,125	0 to 0	0.000 to 0.000
LCI	2	304,557	55,125	0 to 0	0.000 to 0.000
UCI	27	304,557	55,125	0 to 1	0.000 to 0.002
Annual (BDMPS)					
Mean	30	304,557	55,125	0 to 1	0.000 to 0.002
LCI	2	304,557	55,125	0 to 0	0.000 to 0.000
UCI	63	304,557	55,125	0 to 2	0.000 to 0.004

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

Puffin 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	0	0	0	0	1	1	1	1	1	1	2
15	0	0	0	0	0	1	1	1	1	2	2	2	2
20	0	0	0	0	1	1	1	2	2	2	3	3	3
25	0	0	0	0	1	1	2	2	2	3	3	4	4
30	0	0	0	0	1	1	2	2	3	3	4	4	5
35	0	0	0	1	1	2	2	3	3	4	4	5	6
40	0	0	0	1	1	2	3	3	4	4	5	6	6
45	0	0	0	1	1	2	3	4	4	5	6	6	7
50	0	0	0	1	2	2	3	4	5	6	6	7	8
55	0	0	0	1	2	3	4	4	5	6	7	8	9
60	0	0	0	1	2	3	4	5	6	7	8	9	10
65	0	0	1	1	2	3	4	5	6	7	8	9	10
70	0	0	1	1	2	3	4	6	7	8	9	10	11
75	0	0	1	1	2	4	5	6	7	8	10	11	12
80	0	0	1	1	3	4	5	6	8	9	10	12	13
85	0	0	1	1	3	4	5	7	8	10	11	12	14
90	0	0	1	1	3	4	6	7	9	10	12	13	14
95	0	0	1	2	3	5	6	8	9	11	12	14	15
100	0	0	1	2	3	5	6	8	10	11	13	14	16

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

Puffin 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	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 Mona Array Area plus 2km buffer during the breeding season (construction and decommissioning).

Puffin 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	0	0	1	1	1	2	2	3	3	3	4
15	0	0	0	1	1	2	2	3	3	4	4	5	5
20	0	0	0	1	1	2	3	4	4	5	6	6	7
25	0	0	0	1	2	3	4	5	5	6	7	8	9
30	0	0	1	1	2	3	4	5	6	8	9	10	11
35	0	0	1	1	3	4	5	6	8	9	10	11	13
40	0	0	1	1	3	4	6	7	9	10	12	13	14
45	0	0	1	2	3	5	6	8	10	11	13	15	16
50	0	0	1	2	4	5	7	9	11	13	14	16	18
55	0	0	1	2	4	6	8	10	12	14	16	18	20
60	0	0	1	2	4	6	9	11	13	15	17	19	22
65	0	0	1	2	5	7	9	12	14	16	19	21	23
70	0	1	1	3	5	8	10	13	15	18	20	23	25
75	0	1	1	3	5	8	11	14	16	19	22	24	27
80	0	1	1	3	6	9	12	14	17	20	23	26	29
85	0	1	2	3	6	9	12	15	18	21	24	28	31
90	0	1	2	3	6	10	13	16	19	23	26	29	32
95	0	1	2	3	7	10	14	17	21	24	27	31	34
100	0	1	2	4	7	11	14	18	22	25	29	32	36

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

Puffin 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	0	0	0	0	1	1	1	1	1	1	1
15	0	0	0	0	0	1	1	1	1	1	2	2	2
20	0	0	0	0	1	1	1	1	2	2	2	3	3
25	0	0	0	0	1	1	1	2	2	2	3	3	4
30	0	0	0	0	1	1	2	2	3	3	3	4	4
35	0	0	0	0	1	1	2	2	3	3	4	4	5
40	0	0	0	1	1	2	2	3	3	4	4	5	6
45	0	0	0	1	1	2	3	3	4	4	5	6	6
50	0	0	0	1	1	2	3	4	4	5	6	6	7
55	0	0	0	1	2	2	3	4	5	5	6	7	8
60	0	0	0	1	2	3	3	4	5	6	7	8	8
65	0	0	0	1	2	3	4	5	5	6	7	8	9
70	0	0	0	1	2	3	4	5	6	7	8	9	10
75	0	0	1	1	2	3	4	5	6	7	8	9	11
80	0	0	1	1	2	3	4	6	7	8	9	10	11
85	0	0	1	1	2	4	5	6	7	8	10	11	12
90	0	0	1	1	3	4	5	6	8	9	10	11	13
95	0	0	1	1	3	4	5	7	8	9	11	12	13
100	0	0	1	1	3	4	6	7	8	10	11	13	14

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

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
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	1
30	0	0	0	0	0	0	0	0	0	0	0	1	1
35	0	0	0	0	0	0	0	0	0	0	1	1	1
40	0	0	0	0	0	0	0	0	0	1	1	1	1
45	0	0	0	0	0	0	0	0	1	1	1	1	1
50	0	0	0	0	0	0	0	1	1	1	1	1	1
55	0	0	0	0	0	0	0	1	1	1	1	1	1
60	0	0	0	0	0	0	0	1	1	1	1	1	1
65	0	0	0	0	0	0	1	1	1	1	1	1	1
70	0	0	0	0	0	0	1	1	1	1	1	1	1
75	0	0	0	0	0	0	1	1	1	1	1	1	2
80	0	0	0	0	0	0	1	1	1	1	1	1	2
85	0	0	0	0	0	1	1	1	1	1	1	2	2
90	0	0	0	0	0	1	1	1	1	1	1	2	2
95	0	0	0	0	0	1	1	1	1	1	2	2	2
100	0	0	0	0	0	1	1	1	1	1	2	2	2

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

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	1	1	1	1	2	2	2	2	3
15	0	0	0	0	1	1	2	2	2	3	3	4	4
20	0	0	0	1	1	2	2	3	3	4	4	5	5
25	0	0	0	1	1	2	3	3	4	5	5	6	7
30	0	0	0	1	2	2	3	4	5	6	6	7	8
35	0	0	0	1	2	3	4	5	6	7	8	9	9
40	0	0	1	1	2	3	4	5	6	8	9	10	11
45	0	0	1	1	2	4	5	6	7	9	10	11	12
50	0	0	1	1	3	4	5	7	8	9	11	12	14
55	0	0	1	1	3	4	6	7	9	10	12	13	15
60	0	0	1	2	3	5	6	8	10	11	13	15	16
65	0	0	1	2	4	5	7	9	11	12	14	16	18
70	0	0	1	2	4	6	8	9	11	13	15	17	19
75	0	0	1	2	4	6	8	10	12	14	16	18	20
80	0	0	1	2	4	6	9	11	13	15	17	19	22
85	0	0	1	2	5	7	9	11	14	16	18	21	23
90	0	0	1	2	5	7	10	12	15	17	19	22	24
95	0	1	1	3	5	8	10	13	15	18	21	23	26
100	0	1	1	3	5	8	11	14	16	19	22	24	27

1.3.3.2 During the breeding season, a mean peak abundance of 16 (LCI; zero, UCI; 36) Atlantic puffin were present within the Mona 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 one) Atlantic puffin 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 one) mortalities would increase the baseline mortality rate by 0.000 - 0.003% (LCI; 0.000 to 0.000%, UCI; 0.000 to 0.003%).

1.3.3.3 During the non-breeding season, a mean peak abundance of 14 (LCI; two, UCI; 27) Atlantic puffin were present within the Mona Array Area plus 2km buffer. Using displacement rates of 15 to 35% and a mortality rate of 1 to 10% would result in zero Atlantic puffin being subject to mortality (LCI, zero, UCI; zero to one). This represents no impact to Atlantic puffin in the non-breeding bio-season (LCI; 0.000 to 0.000%, UCI; 0.000 to 0.002%).

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 puffin subject to mortality due to displacement was zero to two (LCI; zero to zero, UCI; zero to five). 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 two (LCI; zero to zero, UCI; zero to five) mortalities would increase the baseline mortality rate by 0.000 to 0.004% (LCI; 0.000

to 0.000%, UCI, 0.000 to 0.009%). 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 the Mona Array Area plus 2km buffer during the operations and maintenance phase.

Bio-season	Seasonal Abundance (Mona Array Area + 2km buffer)	Regional Baseline Population Population	Regional Baseline Population Baseline Mortality	Number of Atlantic puffin subject to mortality (indiv.)	Increase in baseline mortality (%)
Breeding					
Mean	16	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	36	184,767	33,443	0 to 3	0.000 to 0.009
Non-breeding					
Mean	14	304,557	55,125	0 to 1	0.000 to 0.002
LCI	2	304,557	55,125	0 to 0	0.000 to 0.000
UCI	27	304,557	55,125	0 to 2	0.000 to 0.002
Annual (BDMPS)					
Mean	30	304,557	55,125	0 to 2	0.000 to 0.004
LCI	2	304,557	55,125	0 to 0	0.000 to 0.000
UCI	63	304,557	55,125	0 to 5	0.000 to 0.009

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

Puffin 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	0	0	0	0	1	1	1	1	1	1	2
20	0	0	0	0	1	1	1	2	2	2	3	3	3
30	0	0	0	0	1	1	2	2	3	3	4	4	5
40	0	0	0	1	1	2	3	3	4	4	5	6	6
50	0	0	0	1	2	2	3	4	5	6	6	7	8
60	0	0	0	1	2	3	4	5	6	7	8	9	10
70	0	0	1	1	2	3	4	6	7	8	9	10	11
80	0	0	1	1	3	4	5	6	8	9	10	12	13
90	0	0	1	1	3	4	6	7	9	10	12	13	14
100	0	0	1	2	3	5	6	8	10	11	13	14	16

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

Puffin 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	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 Mona Array Area plus 2km buffer during the breeding season (operations and maintenance phase).

Puffin 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	0	0	1	1	1	2	2	3	3	3	4
20	0	0	0	1	1	2	3	4	4	5	6	6	7
30	0	0	1	1	2	3	4	5	6	8	9	10	11
40	0	0	1	1	3	4	6	7	9	10	12	13	14
50	0	0	1	2	4	5	7	9	11	13	14	16	18
60	0	0	1	2	4	6	9	11	13	15	17	19	22
70	0	1	1	3	5	8	10	13	15	18	20	23	25
80	0	1	1	3	6	9	12	14	17	20	23	26	29
90	0	1	2	3	6	10	13	16	19	23	26	29	32
100	0	1	2	4	7	11	14	18	22	25	29	32	36

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

Puffin 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	0	0	0	0	1	1	1	1	1	1	1
20	0	0	0	0	1	1	1	1	2	2	2	3	3
30	0	0	0	0	1	1	2	2	3	3	3	4	4
40	0	0	0	1	1	2	2	3	3	4	4	5	6
50	0	0	0	1	1	2	3	4	4	5	6	6	7
60	0	0	0	1	2	3	3	4	5	6	7	8	8
70	0	0	0	1	2	3	4	5	6	7	8	9	10
80	0	0	1	1	2	3	4	6	7	8	9	10	11
90	0	0	1	1	3	4	5	6	8	9	10	11	13
100	0	0	1	1	3	4	6	7	8	10	11	13	14

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

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	1	1
40	0	0	0	0	0	0	0	0	0	1	1	1	1
50	0	0	0	0	0	0	0	1	1	1	1	1	1
60	0	0	0	0	0	0	0	1	1	1	1	1	1
70	0	0	0	0	0	0	1	1	1	1	1	1	1
80	0	0	0	0	0	0	1	1	1	1	1	1	2
90	0	0	0	0	0	1	1	1	1	1	1	2	2
100	0	0	0	0	0	1	1	1	1	1	2	2	2

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

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	1	1	1	1	2	2	2	2	3
20	0	0	0	1	1	2	2	3	3	4	4	5	5
30	0	0	0	1	2	2	3	4	5	6	6	7	8
40	0	0	1	1	2	3	4	5	6	8	9	10	11
50	0	0	1	1	3	4	5	7	8	9	11	12	14
60	0	0	1	2	3	5	6	8	10	11	13	15	16
70	0	0	1	2	4	6	8	9	11	13	15	17	19
80	0	0	1	2	4	6	9	11	13	15	17	19	22
90	0	0	1	2	5	7	10	12	15	17	19	22	24
100	0	1	1	3	5	8	11	14	16	19	22	24	27

1.3.3.6 During the breeding season, a mean peak abundance of 16 (LCI; zero, UCI, 36) Atlantic puffin were present within the Mona 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 three) Atlantic puffin 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 three) mortalities would increase the baseline mortality rate by 0.000-0.003% (LCI; 0.000 to 0.000%, UCI; 0.000 to 0.009%).

1.3.3.7 During the non-breeding season, a mean peak abundance of 14 (LCI; two, UCI, 27) Atlantic puffin were present within the Mona 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 one (LCI; zero to zero, UCI; zero to two) Atlantic puffin being subject to mortality. The BDMPS population in the non-breeding season is defined as 304,557 individuals (Table 1.3) and, using the average baseline mortality rate of 0.181 (Table 1.4), the background estimated mortality in the non-breeding season 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 0.002%).

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 phases

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 27 (LCI; one to 17; UCI; three to 41) 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 27 (LCI; one to 17; UCI; three to 41) mortalities would increase the mortality relative to the baseline mortality rate by 0.002 – 0.026% (LCI; 0.001 to 0.017%, UCI; 0.003 to 0.040%) 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.

1.3.4.2 In the decommissioning phase, it was estimated that between two and 27 (LCI; one to 17; UCI; three to 41) individuals, or less, are subject to mortality annually.

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

Bio-season	Seasonal Abundance (Mona Array Area + 2km buffer)	Regional Baseline Population	Baseline Mortality	Number of Northern gannet subject to mortality (indiv.)	Increase in baseline mortality (%)
Spring Migration					
Mean	105	661,888	123,773	0 – 4	0.000 – 0.003
LCI	51	661,888	123,773	0 – 2	0.000 - 0.002
UCI	173	661,888	123,773	1 – 7	0.001 – 0.006
Breeding					
Mean	351	448,235	83,820	1 – 14	0.001 – 0.017
LCI	229	448,235	83,820	1 – 9	0.001 – 0.011
UCI	495	448,235	83,820	1 – 20	0.001 – 0.024
Autumn Migration					
Mean	237	545,954	102,093	1 – 9	0.001 – 0.009
LCI	142	545,954	102,093	0 – 6	0.000 – 0.006
UCI	351	545,954	102,093	1 – 14	0.001 – 0.014
Annual (BDPMS)					
Mean	693	661,888	123,773	2 – 27	0.002 – 0.026
LCI	422	661,888	123,773	1 – 17	0.001 – 0.017

Bio-season	Seasonal Abundance (Mona Array Area + 2km buffer)	Regional Baseline Population: Population	Regional Baseline Population: Baseline Mortality	Number of Northern gannet subject to mortality (indiv.)	Increase in baseline mortality (%)
UCI	1,019	661,888	123,773	3 – 41	0.003 – 0.040

Table 1.63: Mean predicted Northern gannet mortality for the Mona 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	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 1.64: LCI predicted Northern gannet mortality for the Mona 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	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	15
40	0	0	1	2	4	6	8	10	12	14	16	18	20
50	0	1	1	3	5	8	10	13	15	18	20	23	26
60	0	1	2	3	6	9	12	15	18	21	24	28	31
70	0	1	2	4	7	11	14	18	21	25	29	32	36
80	0	1	2	4	8	12	16	20	24	29	33	37	41
90	0	1	2	5	9	14	18	23	28	32	37	41	46
100	1	1	3	5	10	15	20	26	31	36	41	46	51

Table 1.65: UCI predicted Northern gannet mortality for the Mona 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	2	3	5	7	9	10	12	14	16	17
20	0	1	2	3	7	10	14	17	21	24	28	31	35
30	1	1	3	5	10	16	21	26	31	36	42	47	52
40	1	1	3	7	14	21	28	35	42	48	55	62	69
50	1	2	4	9	17	26	35	43	52	61	69	78	87
60	1	2	5	10	21	31	42	52	62	73	83	93	104
70	1	2	6	12	24	36	48	61	73	85	97	109	121
80	1	3	7	14	28	42	55	69	83	97	111	125	138
90	2	3	8	16	31	47	62	78	93	109	125	140	156
100	2	3	9	17	35	52	69	87	104	121	138	156	173

Table 1.66: Mean predicted Northern gannet mortality for the Mona 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	1	2	4	7	11	14	18	21	25	28	32	35
20	1	1	4	7	14	21	28	35	42	49	56	63	70
30	1	2	5	11	21	32	42	53	63	74	84	95	105
40	1	3	7	14	28	42	56	70	84	98	112	126	140
50	2	4	9	18	35	53	70	88	105	123	140	158	176
60	2	4	11	21	42	63	84	105	126	147	168	190	211
70	2	5	12	25	49	74	98	123	147	172	197	221	246
80	3	6	14	28	56	84	112	140	168	197	225	253	281
90	3	6	16	32	63	95	126	158	190	221	253	284	316
100	4	7	18	35	70	105	140	176	211	246	281	316	351

Table 1.67: LCI predicted Northern gannet mortality for the Mona 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	2	5	7	9	11	14	16	18	21	23
20	0	1	2	5	9	14	18	23	27	32	37	41	46
30	1	1	3	7	14	21	27	34	41	48	55	62	69
40	1	2	5	9	18	27	37	46	55	64	73	82	92
50	1	2	6	11	23	34	46	57	69	80	92	103	115
60	1	3	7	14	27	41	55	69	82	96	110	124	137
70	2	3	8	16	32	48	64	80	96	112	128	144	160
80	2	4	9	18	37	55	73	92	110	128	147	165	183
90	2	4	10	21	41	62	82	103	124	144	165	185	206
100	2	5	11	23	46	69	92	115	137	160	183	206	229

Table 1.68: UCI predicted Northern gannet mortality for the Mona 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	5	10	15	20	25	30	35	40	45	50
20	1	2	5	10	20	30	40	50	59	69	79	89	99
30	1	3	7	15	30	45	59	74	89	104	119	134	149
40	2	4	10	20	40	59	79	99	119	139	158	178	198
50	2	5	12	25	50	74	99	124	149	173	198	223	248
60	3	6	15	30	59	89	119	149	178	208	238	267	297
70	3	7	17	35	69	104	139	173	208	243	277	312	347
80	4	8	20	40	79	119	158	198	238	277	317	356	396
90	4	9	22	45	89	134	178	223	267	312	356	401	446
100	5	10	25	50	99	149	198	248	297	347	396	446	495

Table 1.69: Mean predicted Northern gannet mortality for the Mona 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	5	7	9	12	14	17	19	21	24
20	0	1	2	5	9	14	19	24	28	33	38	43	47
30	1	1	4	7	14	21	28	36	43	50	57	64	71
40	1	2	5	9	19	28	38	47	57	66	76	85	95
50	1	2	6	12	24	36	47	59	71	83	95	107	119
60	1	3	7	14	28	43	57	71	85	100	114	128	142
70	2	3	8	17	33	50	66	83	100	116	133	149	166
80	2	4	9	19	38	57	76	95	114	133	152	171	190
90	2	4	11	21	43	64	85	107	128	149	171	192	213
100	2	5	12	24	47	71	95	119	142	166	190	213	237

Table 1.70: LCI predicted Northern gannet mortality for the Mona 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	1	1	3	4	6	7	9	10	11	13	14
20	0	1	1	3	6	9	11	14	17	20	23	26	28
30	0	1	2	4	9	13	17	21	26	30	34	38	43
40	1	1	3	6	11	17	23	28	34	40	45	51	57
50	1	1	4	7	14	21	28	36	43	50	57	64	71
60	1	2	4	9	17	26	34	43	51	60	68	77	85
70	1	2	5	10	20	30	40	50	60	70	80	89	99
80	1	2	6	11	23	34	45	57	68	80	91	102	114
90	1	3	6	13	26	38	51	64	77	89	102	115	128
100	1	3	7	14	28	43	57	71	85	99	114	128	142

Table 1.71: UCI predicted Northern gannet mortality for the Mona 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	4	7	11	14	18	21	25	28	32	35
20	1	1	4	7	14	21	28	35	42	49	56	63	70
30	1	2	5	11	21	32	42	53	63	74	84	95	105
40	1	3	7	14	28	42	56	70	84	98	112	126	140
50	2	4	9	18	35	53	70	88	105	123	140	158	176
60	2	4	11	21	42	63	84	105	126	147	168	190	211
70	2	5	12	25	49	74	98	123	147	172	197	221	246
80	3	6	14	28	56	84	112	140	168	197	225	253	281
90	3	6	16	32	63	95	126	158	190	221	253	284	316
100	4	7	18	35	70	105	140	176	211	246	281	316	351

1.3.4.3 During the Spring migration season (return migration), the mean peak abundance for Northern gannet was 105 (LCI; 51, UCI; 173) individuals within the Mona 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 four (LCI; zero to two, UCI; one to seven) 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 four (LCI; zero to two, UCI; one to seven) mortalities would increase the mortality relative to the baseline mortality rate by 0.000 – 0.003% (LCI; 0.000 to 0.002%, UCI; 0.001 to 0.006%).

1.3.4.4 During the breeding season, the mean peak abundance for Northern gannet was 351 (LCI; 229, UCI, 495) individuals within the Mona 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 14 (LCI; one to nine, UCI; one to 20) 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 14 (LCI; one to nine, UCI; one to 20) mortalities would increase the mortality relative to the baseline mortality rate by 0.001 to 0.017% (LCI; 0.001 to 0.011%, UCI; 0.001 to 0.024%).

1.3.4.5 During the Autumn migration season (post-breeding migration), the mean peak abundance for Northern gannet was 237 (LCI; 142, UCI; 351) individuals within the Mona 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 nine (LCI; zero to six, UCI; one to 14) Northern gannet 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 nine (LCI; zero to six, UCI; one to 14) mortalities would increase the baseline mortality rate by 0.001 to 0.009% (LCI; 0.000 to 0.006%, UCI; 0.003 to 0.040%).

1.3.4.6 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

1.3.4.7 For all seasons combined, the annual predicted number of Northern gannet subject to mortality due to displacement was four to 55 (LCI; two to 33, UCI; six to 82) 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 2.4), the background estimated mortality across all seasons is 123,773. The addition of four to 55 (LCI; two to 33, UCI; six to 82) mortalities would increase the mortality relative to the baseline mortality rate by 0.003 to 0.044% (LCI; 0.002 to 0.027%, UCI; 0.005 to 0.066%) at the BDMPS scale. Table 1.73 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 the Mona Array Area plus 2km buffer during the operations and maintenance phase.

Bio-season	Seasonal Abundance (Mona Array Area + 2km buffer)	Regional Baseline Population: Population	Regional Baseline Population: Baseline Mortality	Number of Northern gannet subject to mortality (indiv.)	Increase in baseline mortality (%)
Spring Migration					
Mean	105	661,888	123,773	1 to 8	0.001 to 0.006
LCI	51	661,888	123,773	0 to 4	0.000 to 0.003
UCI	173	661,888	123,773	1 to 14	0.001 to 0.011
Breeding					
Mean	351	448,235	83,820	2 to 28	0.002 to 0.033
LCI	229	448,235	83,820	1 to 18	0.001 to 0.021
UCI	495	448,235	83,820	3 to 40	0.004 to 0.048
Autumn Migration					
Mean	237	545,954	102,093	1 to 19	0.001 to 0.019
LCI	142	545,954	102,093	1 to 11	0.001 to 0.011
UCI	351	545,954	102,093	2 to 28	0.002 to 0.027
Annual (BDPMS)					
Mean	693	661,888	123,773	4 to 55	0.003 to 0.044
LCI	422	661,888	123,773	2 to 33	0.002 to 0.027
UCI	1,019	661,888	123,773	6 to 82	0.005 to 0.066

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

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

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	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	15
40	0	0	1	2	4	6	8	10	12	14	16	18	20
50	0	1	1	3	5	8	10	13	15	18	20	23	26
60	0	1	2	3	6	9	12	15	18	21	24	28	31
70	0	1	2	4	7	11	14	18	21	25	29	32	36
80	0	1	2	4	8	12	16	20	24	29	33	37	41
90	0	1	2	5	9	14	18	23	28	32	37	41	46
100	1	1	3	5	10	15	20	26	31	36	41	46	51

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

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	2	3	5	7	9	10	12	14	16	17
20	0	1	2	3	7	10	14	17	21	24	28	31	35
30	1	1	3	5	10	16	21	26	31	36	42	47	52
40	1	1	3	7	14	21	28	35	42	48	55	62	69
50	1	2	4	9	17	26	35	43	52	61	69	78	87
60	1	2	5	10	21	31	42	52	62	73	83	93	104
70	1	2	6	12	24	36	48	61	73	85	97	109	121
80	1	3	7	14	28	42	55	69	83	97	111	125	138
90	2	3	8	16	31	47	62	78	93	109	125	140	156
100	2	3	9	17	35	52	69	87	104	121	138	156	173

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

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	1	2	4	7	11	14	18	21	25	28	32	35
20	1	1	4	7	14	21	28	35	42	49	56	63	70
30	1	2	5	11	21	32	42	53	63	74	84	95	105
40	1	3	7	14	28	42	56	70	84	98	112	126	140
50	2	4	9	18	35	53	70	88	105	123	140	158	176
60	2	4	11	21	42	63	84	105	126	147	168	190	211
70	2	5	12	25	49	74	98	123	147	172	197	221	246
80	3	6	14	28	56	84	112	140	168	197	225	253	281
90	3	6	16	32	63	95	126	158	190	221	253	284	316
100	4	7	18	35	70	105	140	176	211	246	281	316	351

Table 1.77: LCI predicted Northern gannet mortality for the Mona 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	2	5	7	9	11	14	16	18	21	23
20	0	1	2	5	9	14	18	23	27	32	37	41	46
30	1	1	3	7	14	21	27	34	41	48	55	62	69
40	1	2	5	9	18	27	37	46	55	64	73	82	92
50	1	2	6	11	23	34	46	57	69	80	92	103	115
60	1	3	7	14	27	41	55	69	82	96	110	124	137
70	2	3	8	16	32	48	64	80	96	112	128	144	160
80	2	4	9	18	37	55	73	92	110	128	147	165	183
90	2	4	10	21	41	62	82	103	124	144	165	185	206
100	2	5	11	23	46	69	92	115	137	160	183	206	229

Table 1.78: UCI predicted Northern gannet mortality for the Mona 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	5	10	15	20	25	30	35	40	45	50
20	1	2	5	10	20	30	40	50	59	69	79	89	99
30	1	3	7	15	30	45	59	74	89	104	119	134	149
40	2	4	10	20	40	59	79	99	119	139	158	178	198
50	2	5	12	25	50	74	99	124	149	173	198	223	248
60	3	6	15	30	59	89	119	149	178	208	238	267	297
70	3	7	17	35	69	104	139	173	208	243	277	312	347
80	4	8	20	40	79	119	158	198	238	277	317	356	396
90	4	9	22	45	89	134	178	223	267	312	356	401	446
100	5	10	25	50	99	149	198	248	297	347	396	446	495

Table 1.79: Mean predicted Northern gannet mortality for the Mona 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	5	7	9	12	14	17	19	21	24
20	0	1	2	5	9	14	19	24	28	33	38	43	47
30	1	1	4	7	14	21	28	36	43	50	57	64	71
40	1	2	5	9	19	28	38	47	57	66	76	85	95
50	1	2	6	12	24	36	47	59	71	83	95	107	119
60	1	3	7	14	28	43	57	71	85	100	114	128	142
70	2	3	8	17	33	50	66	83	100	116	133	149	166
80	2	4	9	19	38	57	76	95	114	133	152	171	190
90	2	4	11	21	43	64	85	107	128	149	171	192	213
100	2	5	12	24	47	71	95	119	142	166	190	213	237

Table 1.80: LCI predicted Northern gannet mortality for the Mona 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	1	1	3	4	6	7	9	10	11	13	14
20	0	1	1	3	6	9	11	14	17	20	23	26	28
30	0	1	2	4	9	13	17	21	26	30	34	38	43
40	1	1	3	6	11	17	23	28	34	40	45	51	57
50	1	1	4	7	14	21	28	36	43	50	57	64	71
60	1	2	4	9	17	26	34	43	51	60	68	77	85
70	1	2	5	10	20	30	40	50	60	70	80	89	99
80	1	2	6	11	23	34	45	57	68	80	91	102	114
90	1	3	6	13	26	38	51	64	77	89	102	115	128
100	1	3	7	14	28	43	57	71	85	99	114	128	142

Table 1.81: UCI predicted Northern gannet mortality for the Mona 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	4	7	11	14	18	21	25	28	32	35
20	1	1	4	7	14	21	28	35	42	49	56	63	70
30	1	2	5	11	21	32	42	53	63	74	84	95	105
40	1	3	7	14	28	42	56	70	84	98	112	126	140
50	2	4	9	18	35	53	70	88	105	123	140	158	176
60	2	4	11	21	42	63	84	105	126	147	168	190	211
70	2	5	12	25	49	74	98	123	147	172	197	221	246
80	3	6	14	28	56	84	112	140	168	197	225	253	281
90	3	6	16	32	63	95	126	158	190	221	253	284	316
100	4	7	18	35	70	105	140	176	211	246	281	316	351

1.3.4.8 During the Spring migration season (return migration), the mean peak abundance for Northern gannet was 105 (LCI; 51, UCI; 173) individuals within the Mona 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 eight (LCI; zero to four, UCI; one to 14) 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 eight (LCI; zero to four, UCI; one to 14) mortalities would increase the mortality relative to the baseline mortality rate by 0.001 to 0.006% (LCI; 0.000 to 0.003%, UCI; 0.001 to 0.011%).

1.3.4.9 During the breeding season, the mean peak abundance for Northern gannet was 351 (LCI; 229, UCI; 495) individuals within the Mona 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 two to 28 (LCI; one to 18, UCI; three to 40) 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 two to 28 (LCI; one to 18, UCI; three to 40) mortalities would increase the mortality relative to the baseline mortality rate by 0.002 to 0.033% (LCI; 0.001 to 0.021%, UCI; 0.004 to 0.048%).

1.3.4.10 During Autumn migration season (post-breeding migration), the mean peak abundance for Northern gannet was 237 (LCI; 142, UCI, 351) individuals within the Mona 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 19 (LCI; one to 11, 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 19 (LCI; one to 11, UCI; two to 28) mortalities would increase the baseline mortality rate by 0.001 to 0.019% (LCI; 0.001 to 0.011%, UCI; 0.002 to 0.027%).

1.3.4.11 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 phases

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 84 (LCI; two to 55, UCI; five to 123) 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 84 (LCI; two to 55, UCI; five to 123) mortalities would increase the mortality relative to the baseline mortality rate by 0.003 to 0.059% (LCI; 0.001 to 0.038%, UCI; 0.003 to 0.086%) 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.

1.3.5.2 In the decommissioning phase, it was estimated that between four to 84 (LCI; two to 55, UCI; five to 123) seabirds, or less, are subject to mortality annually.

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

Bio-season	Seasonal Abundance (Mona 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	1,135	691,526	108,570	2 to 40	0.002 to 0.037
LCI	741	691,526	108,570	1 to 26	0.001 to 0.024
UCI	1,655	691,526	108,570	2 to 58	0.002 to 0.053
Breeding					
Mean	479	393,449	61,771	1 to 17	0.002 to 0.027
LCI	322	393,449	61,771	0 to 11	0.000 to 0.018
UCI	719	393,449	61,771	1 to 25	0.002 to 0.040
Autumn Migration					
Mean	783	911,586	143,119	1 to 27	0.001 to 0.019
LCI	506	911,586	143,119	1 to 18	0.001 to 0.013
UCI	1,150	911,586	143,119	2 to 40	0.001 to 0.028
Annual (BDPMS)					
Mean	2,397	911,586	143,119	4 to 84	0.003 to 0.059
LCI	1,569	911,586	143,119	2 to 55	0.001 to 0.038
UCI	3,524	911,586	143,119	5 to 123	0.003 to 0.086

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

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	2	6	11	23	34	45	57	68	79	91	102	114
15	2	3	9	17	34	51	68	85	102	119	136	153	170
20	2	5	11	23	45	68	91	114	136	159	182	204	227
25	3	6	14	28	57	85	114	142	170	199	227	255	284
30	3	7	17	34	68	102	136	170	204	238	272	306	341
35	4	8	20	40	79	119	159	199	238	278	318	358	397
40	5	9	23	45	91	136	182	227	272	318	363	409	454
45	5	10	26	51	102	153	204	255	306	358	409	460	511
50	6	11	28	57	114	170	227	284	341	397	454	511	568
55	6	12	31	62	125	187	250	312	375	437	499	562	624
60	7	14	34	68	136	204	272	341	409	477	545	613	681
65	7	15	37	74	148	221	295	369	443	516	590	664	738
70	8	16	40	79	159	238	318	397	477	556	636	715	795
75	9	17	43	85	170	255	341	426	511	596	681	766	851
80	9	18	45	91	182	272	363	454	545	636	726	817	908
85	10	19	48	96	193	289	386	482	579	675	772	868	965
90	10	20	51	102	204	306	409	511	613	715	817	919	1022
95	11	22	54	108	216	323	431	539	647	755	863	970	1078
100	11	23	57	114	227	341	454	568	681	795	908	1022	1135

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

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	1	1	4	7	15	22	30	37	44	52	59	67	74
15	1	2	6	11	22	33	44	56	67	78	89	100	111
20	1	3	7	15	30	44	59	74	89	104	119	133	148
25	2	4	9	19	37	56	74	93	111	130	148	167	185
30	2	4	11	22	44	67	89	111	133	156	178	200	222
35	3	5	13	26	52	78	104	130	156	182	207	233	259
40	3	6	15	30	59	89	119	148	178	207	237	267	296
45	3	7	17	33	67	100	133	167	200	233	267	300	333
50	4	7	19	37	74	111	148	185	222	259	296	333	371
55	4	8	20	41	82	122	163	204	245	285	326	367	408
60	4	9	22	44	89	133	178	222	267	311	356	400	445
65	5	10	24	48	96	144	193	241	289	337	385	433	482
70	5	10	26	52	104	156	207	259	311	363	415	467	519
75	6	11	28	56	111	167	222	278	333	389	445	500	556
80	6	12	30	59	119	178	237	296	356	415	474	534	593
85	6	13	31	63	126	189	252	315	378	441	504	567	630
90	7	13	33	67	133	200	267	333	400	467	534	600	667
95	7	14	35	70	141	211	282	352	422	493	563	634	704
100	7	15	37	74	148	222	296	371	445	519	593	667	741

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

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	2	3	8	17	33	50	66	83	99	116	132	149	166
15	2	5	12	25	50	74	99	124	149	174	199	223	248
20	3	7	17	33	66	99	132	166	199	232	265	298	331
25	4	8	21	41	83	124	166	207	248	290	331	372	414
30	5	10	25	50	99	149	199	248	298	348	397	447	497
35	6	12	29	58	116	174	232	290	348	405	463	521	579
40	7	13	33	66	132	199	265	331	397	463	530	596	662
45	7	15	37	74	149	223	298	372	447	521	596	670	745
50	8	17	41	83	166	248	331	414	497	579	662	745	828
55	9	18	46	91	182	273	364	455	546	637	728	819	910
60	10	20	50	99	199	298	397	497	596	695	794	894	993
65	11	22	54	108	215	323	430	538	645	753	861	968	1076
70	12	23	58	116	232	348	463	579	695	811	927	1043	1159
75	12	25	62	124	248	372	497	621	745	869	993	1117	1241
80	13	26	66	132	265	397	530	662	794	927	1059	1192	1324
85	14	28	70	141	281	422	563	703	844	985	1125	1266	1407
90	15	30	74	149	298	447	596	745	894	1043	1192	1341	1490
95	16	31	79	157	314	472	629	786	943	1101	1258	1415	1572
100	17	33	83	166	331	497	662	828	993	1159	1324	1490	1655

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

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	10	14	19	24	29	34	38	43	48
15	1	1	4	7	14	22	29	36	43	50	57	65	72
20	1	2	5	10	19	29	38	48	57	67	77	86	96
25	1	2	6	12	24	36	48	60	72	84	96	108	120
30	1	3	7	14	29	43	57	72	86	101	115	129	144
35	2	3	8	17	34	50	67	84	101	117	134	151	168
40	2	4	10	19	38	57	77	96	115	134	153	172	192
45	2	4	11	22	43	65	86	108	129	151	172	194	216
50	2	5	12	24	48	72	96	120	144	168	192	216	240
55	3	5	13	26	53	79	105	132	158	184	211	237	263
60	3	6	14	29	57	86	115	144	172	201	230	259	287
65	3	6	16	31	62	93	125	156	187	218	249	280	311
70	3	7	17	34	67	101	134	168	201	235	268	302	335
75	4	7	18	36	72	108	144	180	216	251	287	323	359
80	4	8	19	38	77	115	153	192	230	268	307	345	383
85	4	8	20	41	81	122	163	204	244	285	326	366	407
90	4	9	22	43	86	129	172	216	259	302	345	388	431
95	5	9	23	46	91	137	182	228	273	319	364	410	455
100	5	10	24	48	96	144	192	240	287	335	383	431	479

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

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	23	26	29	32
15	0	1	2	5	10	14	19	24	29	34	39	43	48
20	1	1	3	6	13	19	26	32	39	45	52	58	64
25	1	2	4	8	16	24	32	40	48	56	64	72	81
30	1	2	5	10	19	29	39	48	58	68	77	87	97
35	1	2	6	11	23	34	45	56	68	79	90	101	113
40	1	3	6	13	26	39	52	64	77	90	103	116	129
45	1	3	7	14	29	43	58	72	87	101	116	130	145
50	2	3	8	16	32	48	64	81	97	113	129	145	161
55	2	4	9	18	35	53	71	89	106	124	142	159	177
60	2	4	10	19	39	58	77	97	116	135	155	174	193
65	2	4	10	21	42	63	84	105	126	147	167	188	209
70	2	5	11	23	45	68	90	113	135	158	180	203	225
75	2	5	12	24	48	72	97	121	145	169	193	217	242
80	3	5	13	26	52	77	103	129	155	180	206	232	258
85	3	5	14	27	55	82	109	137	164	192	219	246	274
90	3	6	14	29	58	87	116	145	174	203	232	261	290
95	3	6	15	31	61	92	122	153	184	214	245	275	306
100	3	6	16	32	64	97	129	161	193	225	258	290	322

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

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	4	7	14	22	29	36	43	50	58	65	72
15	1	2	5	11	22	32	43	54	65	75	86	97	108
20	1	3	7	14	29	43	58	72	86	101	115	129	144
25	2	4	9	18	36	54	72	90	108	126	144	162	180
30	2	4	11	22	43	65	86	108	129	151	173	194	216
35	3	5	13	25	50	75	101	126	151	176	201	226	252
40	3	6	14	29	58	86	115	144	173	201	230	259	288
45	3	6	16	32	65	97	129	162	194	226	259	291	324
50	4	7	18	36	72	108	144	180	216	252	288	324	360
55	4	8	20	40	79	119	158	198	237	277	316	356	395
60	4	9	22	43	86	129	173	216	259	302	345	388	431
65	5	9	23	47	93	140	187	234	280	327	374	421	467
70	5	10	25	50	101	151	201	252	302	352	403	453	503
75	5	11	27	54	108	162	216	270	324	377	431	485	539
80	6	12	29	58	115	173	230	288	345	403	460	518	575
85	6	12	31	61	122	183	244	306	367	428	489	550	611
90	6	13	32	65	129	194	259	324	388	453	518	582	647
95	7	14	34	68	137	205	273	342	410	478	546	615	683
100	7	14	36	72	144	216	288	360	431	503	575	647	719

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

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	1	2	4	8	16	23	31	39	47	55	63	70	78
15	1	2	6	12	23	35	47	59	70	82	94	106	117
20	2	3	8	16	31	47	63	78	94	110	125	141	157
25	2	4	10	20	39	59	78	98	117	137	157	176	196
30	2	5	12	23	47	70	94	117	141	164	188	211	235
35	3	5	14	27	55	82	110	137	164	192	219	247	274
40	3	6	16	31	63	94	125	157	188	219	251	282	313
45	4	7	18	35	70	106	141	176	211	247	282	317	352
50	4	8	20	39	78	117	157	196	235	274	313	352	392
55	4	9	22	43	86	129	172	215	258	301	345	388	431
60	5	9	23	47	94	141	188	235	282	329	376	423	470
65	5	10	25	51	102	153	204	254	305	356	407	458	509
70	5	11	27	55	110	164	219	274	329	384	438	493	548
75	6	12	29	59	117	176	235	294	352	411	470	529	587
80	6	13	31	63	125	188	251	313	376	438	501	564	626
85	7	13	33	67	133	200	266	333	399	466	532	599	666
90	7	14	35	70	141	211	282	352	423	493	564	634	705
95	7	15	37	74	149	223	298	372	446	521	595	669	744
100	8	16	39	78	157	235	313	392	470	548	626	705	783

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

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
10	1	1	3	5	10	15	20	25	30	35	40	46	51
15	1	2	4	8	15	23	30	38	46	53	61	68	76
20	1	2	5	10	20	30	40	51	61	71	81	91	101
25	1	3	6	13	25	38	51	63	76	89	101	114	127
30	2	3	8	15	30	46	61	76	91	106	121	137	152
35	2	4	9	18	35	53	71	89	106	124	142	159	177
40	2	4	10	20	40	61	81	101	121	142	162	182	202
45	2	5	11	23	46	68	91	114	137	159	182	205	228
50	3	5	13	25	51	76	101	127	152	177	202	228	253
55	3	6	14	28	56	83	111	139	167	195	223	250	278
60	3	6	15	30	61	91	121	152	182	213	243	273	304
65	3	7	16	33	66	99	132	164	197	230	263	296	329
70	4	7	18	35	71	106	142	177	213	248	283	319	354
75	4	8	19	38	76	114	152	190	228	266	304	342	380
80	4	8	20	40	81	121	162	202	243	283	324	364	405
85	4	9	22	43	86	129	172	215	258	301	344	387	430
90	5	9	23	46	91	137	182	228	273	319	364	410	455
95	5	10	24	48	96	144	192	240	288	336	385	433	481
100	5	10	25	51	101	152	202	253	304	354	405	455	506

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

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
10	1	2	6	12	23	35	46	58	69	81	92	104	115
15	2	3	9	17	35	52	69	86	104	121	138	155	173
20	2	5	12	23	46	69	92	115	138	161	184	207	230
25	3	6	14	29	58	86	115	144	173	201	230	259	288
30	3	7	17	35	69	104	138	173	207	242	276	311	345
35	4	8	20	40	81	121	161	201	242	282	322	362	403
40	5	9	23	46	92	138	184	230	276	322	368	414	460
45	5	10	26	52	104	155	207	259	311	362	414	466	518
50	6	12	29	58	115	173	230	288	345	403	460	518	575
55	6	13	32	63	127	190	253	316	380	443	506	569	633
60	7	14	35	69	138	207	276	345	414	483	552	621	690
65	7	15	37	75	150	224	299	374	449	523	598	673	748
70	8	16	40	81	161	242	322	403	483	564	644	725	805
75	9	17	43	86	173	259	345	431	518	604	690	776	863
80	9	18	46	92	184	276	368	460	552	644	736	828	920
85	10	20	49	98	196	293	391	489	587	684	782	880	978
90	10	21	52	104	207	311	414	518	621	725	828	932	1035
95	11	22	55	109	219	328	437	546	656	765	874	983	1093
100	12	23	58	115	230	345	460	575	690	805	920	1035	1150

1.3.5.3 During the Spring migration season (return migration), the mean peak abundance for black-legged kittiwake was 1,135 (LCI; 741, UCI; 1,655) individuals within the Mona 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 two to 40 (LCI; one to 26, UCI; two to 58) 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 40 (LCI; one to 26, UCI; two to 58) mortalities would increase the mortality relative to the baseline mortality rate by 0.002 to 0.037% (LCI; 0.001 to 0.024%, UCI; 0.002 to 0.053%).

1.3.5.4 During the breeding season, the mean peak abundance for black-legged kittiwake was 479 (LCI; 322, UCI; 719) individuals within the Mona 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 17 (LCI; zero to 11, UCI; one to 25) black-legged kittiwake being subject to mortality. The regional population in the breeding season is defined as 393,449 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 61,771. The addition of one to 17 (LCI; zero to 11, UCI; one to 25) mortalities would increase the mortality relative to the baseline mortality rate by 0.002 to 0.027% (LCI; 0.000 to 0.018%, UCI; 0.002 to 0.040%).

1.3.5.5 During the Autumn migration season (post-breeding migration), the mean peak abundance for black-legged kittiwake was 783 (LCI; 506, UCI; 1,150) individuals within the Mona 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 one to 27 (LCI; one to 18, UCI; two to 40) 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), and decommissioning mortality during the Autumn migration season is 143,119. The addition of one to 27 (LCI; one to 18, UCI; two to 40) mortalities would increase the baseline mortality rate by 0.001 to 0.019% (LCI; 0.001 to 0.013%, UCI; 0.001 to 0.028%).

1.3.5.6 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 393,449 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

1.3.5.7 For all seasons combined, annual predicted number of black-legged kittiwake subject to mortality due to displacement was six to 168 (LCI; five to 110, UCI; 10 – 247) 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 six to 168 (LCI; five to 110, UCI; 10 – 247) mortalities would increase the mortality relative to the baseline mortality rate by 0.004 to 0.117% (LCI; 0.003 to 0.077%, UCI; 0.007 to 0.173%) 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 the Mona Array Area plus 2km buffer during the operations and maintenance phase.

Bio-season	Seasonal Abundance (Mona 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	1,135	691,526	108,570	3 to 79	0.003 to 0.072
LCI	741	691,526	108,570	2 to 52	0.002 to 0.048
UCI	1,655	691,526	108,570	5 to 116	0.005 to 0.107
Breeding					
Mean	479	393,449	61,771	1 to 34	0.002 to 0.055
LCI	322	393,449	61,771	1 to 23	0.002 to 0.037
UCI	719	393,449	61,771	2 to 50	0.003 to 0.081
Autumn Migration					
Mean	783	911,586	143,119	2 to 55	0.001 to 0.038
LCI	506	911,586	143,119	2 to 35	0.001 to 0.024
UCI	1,150	911,586	143,119	3 to 81	0.002 to 0.057
Annual (BDPMS)					
Mean	2,397	911,586	143,119	6 to 168	0.004 to 0.117
LCI	1,569	911,586	143,119	5 to 110	0.003 to 0.077
UCI	3,524	911,586	143,119	10 to 247	0.007 to 0.173

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

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	2	6	11	23	34	45	57	68	79	91	102	114
20	2	5	11	23	45	68	91	114	136	159	182	204	227
30	3	7	17	34	68	102	136	170	204	238	272	306	341
40	5	9	23	45	91	136	182	227	272	318	363	409	454
50	6	11	28	57	114	170	227	284	341	397	454	511	568
60	7	14	34	68	136	204	272	341	409	477	545	613	681
70	8	16	40	79	159	238	318	397	477	556	636	715	795
80	9	18	45	91	182	272	363	454	545	636	726	817	908
90	10	20	51	102	204	306	409	511	613	715	817	919	1022
100	11	23	57	114	227	341	454	568	681	795	908	1022	1135

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

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	1	1	4	7	15	22	30	37	44	52	59	67	74
20	1	3	7	15	30	44	59	74	89	104	119	133	148
30	2	4	11	22	44	67	89	111	133	156	178	200	222
40	3	6	15	30	59	89	119	148	178	207	237	267	296
50	4	7	19	37	74	111	148	185	222	259	296	333	371
60	4	9	22	44	89	133	178	222	267	311	356	400	445
70	5	10	26	52	104	156	207	259	311	363	415	467	519
80	6	12	30	59	119	178	237	296	356	415	474	534	593
90	7	13	33	67	133	200	267	333	400	467	534	600	667
100	7	15	37	74	148	222	296	371	445	519	593	667	741

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

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	2	3	8	17	33	50	66	83	99	116	132	149	166
20	3	7	17	33	66	99	132	166	199	232	265	298	331
30	5	10	25	50	99	149	199	248	298	348	397	447	497
40	7	13	33	66	132	199	265	331	397	463	530	596	662
50	8	17	41	83	166	248	331	414	497	579	662	745	828
60	10	20	50	99	199	298	397	497	596	695	794	894	993
70	12	23	58	116	232	348	463	579	695	811	927	1043	1159
80	13	26	66	132	265	397	530	662	794	927	1059	1192	1324
90	15	30	74	149	298	447	596	745	894	1043	1192	1341	1490
100	17	33	83	166	331	497	662	828	993	1159	1324	1490	1655

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

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	10	14	19	24	29	34	38	43	48
20	1	2	5	10	19	29	38	48	57	67	77	86	96
30	1	3	7	14	29	43	57	72	86	101	115	129	144
40	2	4	10	19	38	57	77	96	115	134	153	172	192
50	2	5	12	24	48	72	96	120	144	168	192	216	240
60	3	6	14	29	57	86	115	144	172	201	230	259	287
70	3	7	17	34	67	101	134	168	201	235	268	302	335
80	4	8	19	38	77	115	153	192	230	268	307	345	383
90	4	9	22	43	86	129	172	216	259	302	345	388	431
100	5	10	24	48	96	144	192	240	287	335	383	431	479

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

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	23	26	29	32
20	1	1	3	6	13	19	26	32	39	45	52	58	64
30	1	2	5	10	19	29	39	48	58	68	77	87	97
40	1	3	6	13	26	39	52	64	77	90	103	116	129
50	2	3	8	16	32	48	64	81	97	113	129	145	161
60	2	4	10	19	39	58	77	97	116	135	155	174	193
70	2	5	11	23	45	68	90	113	135	158	180	203	225
80	3	5	13	26	52	77	103	129	155	180	206	232	258
90	3	6	14	29	58	87	116	145	174	203	232	261	290
100	3	6	16	32	64	97	129	161	193	225	258	290	322

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

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	4	7	14	22	29	36	43	50	58	65	72
20	1	3	7	14	29	43	58	72	86	101	115	129	144
30	2	4	11	22	43	65	86	108	129	151	173	194	216
40	3	6	14	29	58	86	115	144	173	201	230	259	288
50	4	7	18	36	72	108	144	180	216	252	288	324	360
60	4	9	22	43	86	129	173	216	259	302	345	388	431
70	5	10	25	50	101	151	201	252	302	352	403	453	503
80	6	12	29	58	115	173	230	288	345	403	460	518	575
90	6	13	32	65	129	194	259	324	388	453	518	582	647
100	7	14	36	72	144	216	288	360	431	503	575	647	719

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

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	1	2	4	8	16	23	31	39	47	55	63	70	78
20	2	3	8	16	31	47	63	78	94	110	125	141	157
30	2	5	12	23	47	70	94	117	141	164	188	211	235
40	3	6	16	31	63	94	125	157	188	219	251	282	313
50	4	8	20	39	78	117	157	196	235	274	313	352	392
60	5	9	23	47	94	141	188	235	282	329	376	423	470
70	5	11	27	55	110	164	219	274	329	384	438	493	548
80	6	13	31	63	125	188	251	313	376	438	501	564	626
90	7	14	35	70	141	211	282	352	423	493	564	634	705
100	8	16	39	78	157	235	313	392	470	548	626	705	783

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

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
10	1	1	3	5	10	15	20	25	30	35	40	46	51
20	1	2	5	10	20	30	40	51	61	71	81	91	101
30	2	3	8	15	30	46	61	76	91	106	121	137	152
40	2	4	10	20	40	61	81	101	121	142	162	182	202
50	3	5	13	25	51	76	101	127	152	177	202	228	253
60	3	6	15	30	61	91	121	152	182	213	243	273	304
70	4	7	18	35	71	106	142	177	213	248	283	319	354
80	4	8	20	40	81	121	162	202	243	283	324	364	405
90	5	9	23	46	91	137	182	228	273	319	364	410	455
100	5	10	25	51	101	152	202	253	304	354	405	455	506

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

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
10	1	2	6	12	23	35	46	58	69	81	92	104	115
20	2	5	12	23	46	69	92	115	138	161	184	207	230
30	3	7	17	35	69	104	138	173	207	242	276	311	345
40	5	9	23	46	92	138	184	230	276	322	368	414	460
50	6	12	29	58	115	173	230	288	345	403	460	518	575
60	7	14	35	69	138	207	276	345	414	483	552	621	690
70	8	16	40	81	161	242	322	403	483	564	644	725	805
80	9	18	46	92	184	276	368	460	552	644	736	828	920
90	10	21	52	104	207	311	414	518	621	725	828	932	1035
100	12	23	58	115	230	345	460	575	690	805	920	1035	1150

1.3.5.8 During the Spring migration season (return migration), the mean peak abundance for black-legged kittiwake was 1,135 (LCI; 741, UCI; 1,655) individuals within the Mona 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 three to 79 (LCI; two to 52, UCI; five to 116) 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 three to 79 (LCI; two to 52, UCI; five to 116) mortalities would increase the mortality relative to the baseline mortality rate by 0.003 – 0.072% (LCI; 0.002 to 0.048%, UCI; 0.005 to 0.107%).

1.3.5.9 During the breeding season, the mean peak abundance for black-legged kittiwake was 479 (LCI; 322, UCI; 719) individuals within the Mona 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 34 (LCI; one to 23, UCI; two to 50) black-legged kittiwake being subject to mortality. The regional population in the breeding season is defined as 393,449 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 61,771. The addition of one to 34 (LCI; one to 23, UCI; two to 50) mortalities would increase the mortality relative to the baseline mortality rate by 0.002 to 0.055% (LCI; 0.002 to 0.037%, UCI; 0.003 to 0.081%).

1.3.5.10 During the Autumn migration season (post-breeding migration), the mean peak abundance for black-legged kittiwake was 783 (LCI; 506, UCI; 1,150) individuals within the Mona 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 two to 55 (LCI; two to 35, 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 background estimated mortality during the Autumn migration season is 143,119. The addition of two to 55 (LCI; two to 35, UCI; three to 81) mortalities would increase the baseline mortality rate by 0.001 to 0.038% (LCI; 0.001 to 0.024%, UCI; 0.002 to 0.057%).

1.3.5.11 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 393,449 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 one to 11 (LCI; zero to two, UCI; three 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 one to 11 (LCI; zero to two, UCI; three to 38) mortalities would increase the mortality relative to the baseline mortality rate by 0.000 – 0.005% (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 the Mona Array Area plus 2km buffer during construction (and decommissioning).

Bio-season	Seasonal Abundance (Mona 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	23	1,580,895	207,097	0 to 0	0.000 to 0.000
LCI	7	1,580,895	207,097	0 to 0	0.000 to 0.000
UCI	48	1,580,895	207,097	0 to 0	0.000 to 0.000
Breeding					
Mean	1,955	1,974,500	258,660	1 to 10	0.000 to 0.004

Bio-season	Seasonal Abundance (Mona Array Area + 2km buffer)	Regional Baseline Population: Population	Regional Baseline Population: Baseline Mortality	Number of Manx shearwater subject to mortality (indiv.)	Increase in baseline mortality (%)
LCI	439	1,974,500	258,660	0 to 2	0.000 to 0.001
UCI	5,519	1,974,500	258,660	3 to 28	0.001 to 0.011
Autumn Migration					
Mean	254	1,580,895	207,097	0 to 1	0.000 to 0.000
LCI	90	1,580,895	207,097	0 to 0	0.000 to 0.000
UCI	527	1,580,895	207,097	0 to 3	0.000 to 0.001
Annual (BDPMS)					
Mean	2,232	1,974,500	258,660	1 to 11	0.000 to 0.005
LCI	536	1,974,500	258,660	0 to 2	0.000 to 0.001
UCI	6,094	1,974,500	258,660	3 to 31	0.001 to 0.015

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

Manx Shearwater 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	0	0	0	0	0	0	0	1	1	1	1	1	1
10	0	0	0	0	0	1	1	1	1	2	2	2	2
15	0	0	0	0	1	1	1	2	2	2	3	3	3
20	0	0	0	0	1	1	2	2	3	3	4	4	5
25	0	0	0	1	1	2	2	3	3	4	5	5	6
30	0	0	0	1	1	2	3	3	4	5	6	6	7
35	0	0	0	1	2	2	3	4	5	6	6	7	8
40	0	0	0	1	2	3	4	5	6	6	7	8	9
45	0	0	1	1	2	3	4	5	6	7	8	9	10
50	0	0	1	1	2	3	5	6	7	8	9	10	12
55	0	0	1	1	3	4	5	6	8	9	10	11	13
60	0	0	1	1	3	4	6	7	8	10	11	12	14
65	0	0	1	1	3	4	6	7	9	10	12	13	15
70	0	0	1	2	3	5	6	8	10	11	13	14	16
75	0	0	1	2	3	5	7	9	10	12	14	16	17
80	0	0	1	2	4	6	7	9	11	13	15	17	18
85	0	0	1	2	4	6	8	10	12	14	16	18	20
90	0	0	1	2	4	6	8	10	12	14	17	19	21
95	0	0	1	2	4	7	9	11	13	15	17	20	22
100	0	0	1	2	5	7	9	12	14	16	18	21	23

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

Manx Shearwater 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	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	1	1	1
15	0	0	0	0	0	0	0	1	1	1	1	1	1
20	0	0	0	0	0	0	1	1	1	1	1	1	1
25	0	0	0	0	0	1	1	1	1	1	1	2	2
30	0	0	0	0	0	1	1	1	1	1	2	2	2
35	0	0	0	0	0	1	1	1	1	2	2	2	2
40	0	0	0	0	1	1	1	1	2	2	2	3	3
45	0	0	0	0	1	1	1	2	2	2	3	3	3
50	0	0	0	0	1	1	1	2	2	2	3	3	4
55	0	0	0	0	1	1	2	2	2	3	3	3	4
60	0	0	0	0	1	1	2	2	3	3	3	4	4
65	0	0	0	0	1	1	2	2	3	3	4	4	5
70	0	0	0	0	1	1	2	2	3	3	4	4	5
75	0	0	0	1	1	2	2	3	3	4	4	5	5
80	0	0	0	1	1	2	2	3	3	4	4	5	6
85	0	0	0	1	1	2	2	3	4	4	5	5	6
90	0	0	0	1	1	2	3	3	4	4	5	6	6
95	0	0	0	1	1	2	3	3	4	5	5	6	7
100	0	0	0	1	1	2	3	4	4	5	6	6	7

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

Manx Shearwater 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	0	0	0	0	0	1	1	1	1	2	2	2	2
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 1.106: Mean predicted Manx shearwater mortality for the Mona 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	1	2	5	10	20	29	39	49	59	68	78	88	98
10	2	4	10	20	39	59	78	98	117	137	156	176	196
15	3	6	15	29	59	88	117	147	176	205	235	264	293
20	4	8	20	39	78	117	156	196	235	274	313	352	391
25	5	10	24	49	98	147	196	244	293	342	391	440	489
30	6	12	29	59	117	176	235	293	352	411	469	528	587
35	7	14	34	68	137	205	274	342	411	479	547	616	684
40	8	16	39	78	156	235	313	391	469	547	626	704	782
45	9	18	44	88	176	264	352	440	528	616	704	792	880
50	10	20	49	98	196	293	391	489	587	684	782	880	978
55	11	22	54	108	215	323	430	538	645	753	860	968	1075
60	12	23	59	117	235	352	469	587	704	821	938	1056	1173
65	13	25	64	127	254	381	508	635	762	890	1017	1144	1271
70	14	27	68	137	274	411	547	684	821	958	1095	1232	1369
75	15	29	73	147	293	440	587	733	880	1026	1173	1320	1466
80	16	31	78	156	313	469	626	782	938	1095	1251	1408	1564
85	17	33	83	166	332	499	665	831	997	1163	1329	1496	1662
90	18	35	88	176	352	528	704	880	1056	1232	1408	1584	1760
95	19	37	93	186	371	557	743	929	1114	1300	1486	1672	1857
100	20	39	98	196	391	587	782	978	1173	1369	1564	1760	1955

Table 1.107: LCI predicted Manx shearwater mortality for the Mona 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	1	2	4	9	13	18	22	26	31	35	40	44
15	1	1	3	7	13	20	26	33	40	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	40	53	66	79	92	105	119	132
35	2	3	8	15	31	46	61	77	92	108	123	138	154
40	2	4	9	18	35	53	70	88	105	123	140	158	176
45	2	4	10	20	40	59	79	99	119	138	158	178	198
50	2	4	11	22	44	66	88	110	132	154	176	198	220
55	2	5	12	24	48	72	97	121	145	169	193	217	241
60	3	5	13	26	53	79	105	132	158	184	211	237	263
65	3	6	14	29	57	86	114	143	171	200	228	257	285
70	3	6	15	31	61	92	123	154	184	215	246	277	307
75	3	7	16	33	66	99	132	165	198	230	263	296	329
80	4	7	18	35	70	105	140	176	211	246	281	316	351
85	4	7	19	37	75	112	149	187	224	261	299	336	373
90	4	8	20	40	79	119	158	198	237	277	316	356	395
95	4	8	21	42	83	125	167	209	250	292	334	375	417
100	4	9	22	44	88	132	176	220	263	307	351	395	439

Table 1.108: UCI predicted Manx shearwater mortality for the Mona 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	3	6	14	28	55	83	110	138	166	193	221	248	276
10	6	11	28	55	110	166	221	276	331	386	442	497	552
15	8	17	41	83	166	248	331	414	497	579	662	745	828
20	11	22	55	110	221	331	442	552	662	773	883	993	1104
25	14	28	69	138	276	414	552	690	828	966	1104	1242	1380
30	17	33	83	166	331	497	662	828	993	1159	1325	1490	1656
35	19	39	97	193	386	579	773	966	1159	1352	1545	1738	1932
40	22	44	110	221	442	662	883	1104	1325	1545	1766	1987	2208
45	25	50	124	248	497	745	993	1242	1490	1738	1987	2235	2484
50	28	55	138	276	552	828	1104	1380	1656	1932	2208	2484	2760
55	30	61	152	304	607	911	1214	1518	1821	2125	2428	2732	3035
60	33	66	166	331	662	993	1325	1656	1987	2318	2649	2980	3311
65	36	72	179	359	717	1076	1435	1794	2152	2511	2870	3229	3587
70	39	77	193	386	773	1159	1545	1932	2318	2704	3091	3477	3863
75	41	83	207	414	828	1242	1656	2070	2484	2897	3311	3725	4139
80	44	88	221	442	883	1325	1766	2208	2649	3091	3532	3974	4415
85	47	94	235	469	938	1407	1876	2346	2815	3284	3753	4222	4691
90	50	99	248	497	993	1490	1987	2484	2980	3477	3974	4470	4967
95	52	105	262	524	1049	1573	2097	2622	3146	3670	4194	4719	5243
100	55	110	276	552	1104	1656	2208	2760	3311	3863	4415	4967	5519

Table 1.109: Mean predicted Manx shearwater mortality for the Mona 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	0	1	1	3	4	5	6	8	9	10	11	13
10	0	1	1	3	5	8	10	13	15	18	20	23	25
15	0	1	2	4	8	11	15	19	23	27	30	34	38
20	1	1	3	5	10	15	20	25	30	36	41	46	51
25	1	1	3	6	13	19	25	32	38	44	51	57	64
30	1	2	4	8	15	23	30	38	46	53	61	69	76
35	1	2	4	9	18	27	36	44	53	62	71	80	89
40	1	2	5	10	20	30	41	51	61	71	81	91	102
45	1	2	6	11	23	34	46	57	69	80	91	103	114
50	1	3	6	13	25	38	51	64	76	89	102	114	127
55	1	3	7	14	28	42	56	70	84	98	112	126	140
60	2	3	8	15	30	46	61	76	91	107	122	137	152
65	2	3	8	17	33	50	66	83	99	116	132	149	165
70	2	4	9	18	36	53	71	89	107	124	142	160	178
75	2	4	10	19	38	57	76	95	114	133	152	171	191
80	2	4	10	20	41	61	81	102	122	142	163	183	203
85	2	4	11	22	43	65	86	108	130	151	173	194	216
90	2	5	11	23	46	69	91	114	137	160	183	206	229
95	2	5	12	24	48	72	97	121	145	169	193	217	241
100	3	5	13	25	51	76	102	127	152	178	203	229	254

Table 1.110: LCI predicted Manx shearwater mortality for the Mona 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	0	0	1	1	2	2	3	3	4	4	5
10	0	0	0	1	2	3	4	5	5	6	7	8	9
15	0	0	1	1	3	4	5	7	8	9	11	12	14
20	0	0	1	2	4	5	7	9	11	13	14	16	18
25	0	0	1	2	5	7	9	11	14	16	18	20	23
30	0	1	1	3	5	8	11	14	16	19	22	24	27
35	0	1	2	3	6	9	13	16	19	22	25	28	32
40	0	1	2	4	7	11	14	18	22	25	29	32	36
45	0	1	2	4	8	12	16	20	24	28	32	36	41
50	0	1	2	5	9	14	18	23	27	32	36	41	45
55	0	1	2	5	10	15	20	25	30	35	40	45	50
60	1	1	3	5	11	16	22	27	32	38	43	49	54
65	1	1	3	6	12	18	23	29	35	41	47	53	59
70	1	1	3	6	13	19	25	32	38	44	50	57	63
75	1	1	3	7	14	20	27	34	41	47	54	61	68
80	1	1	4	7	14	22	29	36	43	50	58	65	72
85	1	2	4	8	15	23	31	38	46	54	61	69	77
90	1	2	4	8	16	24	32	41	49	57	65	73	81
95	1	2	4	9	17	26	34	43	51	60	68	77	86
100	1	2	5	9	18	27	36	45	54	63	72	81	90

Table 1.111: UCI predicted Manx shearwater mortality for the Mona 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	0	1	1	3	5	8	11	13	16	18	21	24	26
10	1	1	3	5	11	16	21	26	32	37	42	47	53
15	1	2	4	8	16	24	32	40	47	55	63	71	79
20	1	2	5	11	21	32	42	53	63	74	84	95	105
25	1	3	7	13	26	40	53	66	79	92	105	119	132
30	2	3	8	16	32	47	63	79	95	111	126	142	158
35	2	4	9	18	37	55	74	92	111	129	148	166	184
40	2	4	11	21	42	63	84	105	126	148	169	190	211
45	2	5	12	24	47	71	95	119	142	166	190	213	237
50	3	5	13	26	53	79	105	132	158	184	211	237	264
55	3	6	14	29	58	87	116	145	174	203	232	261	290
60	3	6	16	32	63	95	126	158	190	221	253	285	316
65	3	7	17	34	69	103	137	171	206	240	274	308	343
70	4	7	18	37	74	111	148	184	221	258	295	332	369
75	4	8	20	40	79	119	158	198	237	277	316	356	395
80	4	8	21	42	84	126	169	211	253	295	337	379	422
85	4	9	22	45	90	134	179	224	269	314	358	403	448
90	5	9	24	47	95	142	190	237	285	332	379	427	474
95	5	10	25	50	100	150	200	250	300	350	401	451	501
100	5	11	26	53	105	158	211	264	316	369	422	474	527

1.3.6.2 During the Spring migration season (return migration), the mean peak abundance for Manx shearwater was 23 (LCI; seven, UCI; 48) individuals within the Mona 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 (LCI; zero, UCI; zero) Manx shearwater being subject to mortality. As this represents no change, there was no effect in the return migration season.

1.3.6.3 During the breeding season, the mean peak abundance for Manx shearwater was 1,955 (LCI; 439, UCI, 5,519) individuals within the Mona 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 one to 10 (LCI; zero to two, UCI; three to 28) 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 10 (LCI; zero to two, UCI; three to 28) 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 0.011%).

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 Mona 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 two to 23 (LCI; zero to seven, UCI; seven to 60) 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 two to 23 (LCI; zero to seven, UCI; seven to 60) mortalities would increase the mortality relative to the baseline mortality rate by 0.001 to 0.009% (LCI; 0.000 to 0.003%, UCI; 0.003 to 0.023%) at the BDMPS scale.

1.3.6.7 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 the Mona Array Area plus 2km buffer during the operations and maintenance phase.

Bio-season	Seasonal Abundance (Mona Array Area + 2km buffer)	Regional Baseline Population: Population	Regional Baseline Population: Baseline Mortality	Number of Manx shearwater subject to mortality (indiv.)	Increase in baseline mortality (%)
Spring Migration					
Mean	23	1,580,895	207,097	0 to 0	0.000 to 0.000
LCI	7	1,580,895	207,097	0 to 0	0.000 to 0.000
UCI	48	1,580,895	207,097	0 to 0	0.000 to 0.000
Breeding					
Mean	1,955	1,974,500	258,660	2 to 20	0.001 to 0.008
LCI	439	1,974,500	258,660	0 to 4	0.000 to 0.002
UCI	5,519	1,974,500	258,660	6 to 55	0.002 to 0.021
Autumn Migration					
Mean	254	1,580,895	207,097	0 to 3	0.000 to 0.001
LCI	90	1,580,895	207,097	0 to 3	0.000 to 0.001
UCI	527	1,580,895	207,097	1 to 5	0.000 to 0.002
Annual (BDPMS)					
Mean	2,232	1,974,500	258,660	2 to 23	0.001 to 0.009
LCI	536	1,974,500	258,660	0 to 7	0.000 to 0.003
UCI	6,094	1,974,500	258,660	7 to 60	0.003 to 0.023

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

Manx Shearwater 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	0	0	1	1	1	1	2	2	2	2
20	0	0	0	0	1	1	2	2	3	3	4	4	5
30	0	0	0	1	1	2	3	3	4	5	6	6	7
40	0	0	0	1	2	3	4	5	6	6	7	8	9
50	0	0	1	1	2	3	5	6	7	8	9	10	12
60	0	0	1	1	3	4	6	7	8	10	11	12	14
70	0	0	1	2	3	5	6	8	10	11	13	14	16
80	0	0	1	2	4	6	7	9	11	13	15	17	18
90	0	0	1	2	4	6	8	10	12	14	17	19	21
100	0	0	1	2	5	7	9	12	14	16	18	21	23

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

Manx Shearwater 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	0	0	0	0	1	1	1
20	0	0	0	0	0	0	1	1	1	1	1	1	1
30	0	0	0	0	0	1	1	1	1	1	2	2	2
40	0	0	0	0	1	1	1	1	2	2	2	3	3
50	0	0	0	0	1	1	1	2	2	2	3	3	4
60	0	0	0	0	1	1	2	2	3	3	3	4	4
70	0	0	0	0	1	1	2	2	3	3	4	4	5
80	0	0	0	1	1	2	2	3	3	4	4	5	6
90	0	0	0	1	1	2	3	3	4	4	5	6	6
100	0	0	0	1	1	2	3	4	4	5	6	6	7

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

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

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
10	2	4	10	20	39	59	78	98	117	137	156	176	196
20	4	8	20	39	78	117	156	196	235	274	313	352	391
30	6	12	29	59	117	176	235	293	352	411	469	528	587
40	8	16	39	78	156	235	313	391	469	547	626	704	782
50	10	20	49	98	196	293	391	489	587	684	782	880	978
60	12	23	59	117	235	352	469	587	704	821	938	1056	1173
70	14	27	68	137	274	411	547	684	821	958	1095	1232	1369
80	16	31	78	156	313	469	626	782	938	1095	1251	1408	1564
90	18	35	88	176	352	528	704	880	1056	1232	1408	1584	1760
100	20	39	98	196	391	587	782	978	1173	1369	1564	1760	1955

Table 1.117: LCI predicted Manx shearwater mortality for the Mona 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	1	2	4	9	13	18	22	26	31	35	40	44
20	1	2	4	9	18	26	35	44	53	61	70	79	88
30	1	3	7	13	26	40	53	66	79	92	105	119	132
40	2	4	9	18	35	53	70	88	105	123	140	158	176
50	2	4	11	22	44	66	88	110	132	154	176	198	220
60	3	5	13	26	53	79	105	132	158	184	211	237	263
70	3	6	15	31	61	92	123	154	184	215	246	277	307
80	4	7	18	35	70	105	140	176	211	246	281	316	351
90	4	8	20	40	79	119	158	198	237	277	316	356	395
100	4	9	22	44	88	132	176	220	263	307	351	395	439

Table 1.118: UCI predicted Manx shearwater mortality for the Mona 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	6	11	28	55	110	166	221	276	331	386	442	497	552
20	11	22	55	110	221	331	442	552	662	773	883	993	1104
30	17	33	83	166	331	497	662	828	993	1159	1325	1490	1656
40	22	44	110	221	442	662	883	1104	1325	1545	1766	1987	2208
50	28	55	138	276	552	828	1104	1380	1656	1932	2208	2484	2760
60	33	66	166	331	662	993	1325	1656	1987	2318	2649	2980	3311
70	39	77	193	386	773	1159	1545	1932	2318	2704	3091	3477	3863
80	44	88	221	442	883	1325	1766	2208	2649	3091	3532	3974	4415
90	50	99	248	497	993	1490	1987	2484	2980	3477	3974	4470	4967
100	55	110	276	552	1104	1656	2208	2760	3311	3863	4415	4967	5519

Table 1.119: Mean predicted Manx shearwater mortality for the Mona 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	1	3	5	8	10	13	15	18	20	23	25
20	1	1	3	5	10	15	20	25	30	36	41	46	51
30	1	2	4	8	15	23	30	38	46	53	61	69	76
40	1	2	5	10	20	30	41	51	61	71	81	91	102
50	1	3	6	13	25	38	51	64	76	89	102	114	127
60	2	3	8	15	30	46	61	76	91	107	122	137	152
70	2	4	9	18	36	53	71	89	107	124	142	160	178
80	2	4	10	20	41	61	81	102	122	142	163	183	203
90	2	5	11	23	46	69	91	114	137	160	183	206	229
100	3	5	13	25	51	76	102	127	152	178	203	229	254

Table 1.120: LCI predicted Manx shearwater mortality for the Mona 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	0	1	2	3	4	5	5	6	7	8	9
20	0	0	1	2	4	5	7	9	11	13	14	16	18
30	0	1	1	3	5	8	11	14	16	19	22	24	27
40	0	1	2	4	7	11	14	18	22	25	29	32	36
50	0	1	2	5	9	14	18	23	27	32	36	41	45
60	1	1	3	5	11	16	22	27	32	38	43	49	54
70	1	1	3	6	13	19	25	32	38	44	50	57	63
80	1	1	4	7	14	22	29	36	43	50	58	65	72
90	1	2	4	8	16	24	32	41	49	57	65	73	81
100	1	2	5	9	18	27	36	45	54	63	72	81	90

Table 1.121: UCI predicted Manx shearwater mortality for the Mona 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	1	1	3	5	11	16	21	26	32	37	42	47	53
20	1	2	5	11	21	32	42	53	63	74	84	95	105
30	2	3	8	16	32	47	63	79	95	111	126	142	158
40	2	4	11	21	42	63	84	105	126	148	169	190	211
50	3	5	13	26	53	79	105	132	158	184	211	237	264
60	3	6	16	32	63	95	126	158	190	221	253	285	316
70	4	7	18	37	74	111	148	184	221	258	295	332	369
80	4	8	21	42	84	126	169	211	253	295	337	379	422
90	5	9	24	47	95	142	190	237	285	332	379	427	474
100	5	11	26	53	105	158	211	264	316	369	422	474	527

1.3.6.8 During the Spring migration season (return migration), the mean peak abundance for Manx shearwater was 23 (LCI; seven, UCI; 48) individuals within the Mona 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 (LCI; zero to zero, UCI; zero to zero) Manx shearwater being subject to mortality. As this represents no change, there was no effect in the return migration season.

1.3.6.9 During the breeding season, the mean peak abundance for Manx shearwater was 1,955 (LCI; 439, UCI; 5,519) individuals within the Mona 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 20 (LCI; zero to four, UCI; six to 55) 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 20 (LCI; zero to four, UCI; six to 55) mortalities would increase the mortality relative to the baseline mortality rate by 0.001 to 0.008% (LCI; 0.000 to 0.002%, UCI; 0.002 to 0.021%).

1.3.6.10 During the Autumn migration season (post-breeding migration), the mean peak abundance for Manx shearwater is 254 (LCI; 90, UCI; 527) individuals within the Mona 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 three (LCI; zero to three, UCI; one to five) 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 three (LCI; zero to three, UCI; one to five) mortalities would increase the baseline mortality rate by 0.000 to 0.001% (LCI; 0.000 to 0.003%, UCI; 0.003 to 0.023%).

1.3.6.11 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%).

1.4 References

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Appendix A Bird data for displacement assessment

Table A.122: Common guillemot modelled abundance (all behaviours and all ages classes) within the Mona Array Area plus associated buffer. Calendar Years 1, 2 and 3 for surveys: [March 2020 to February 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	**8,409**	854	139	1,348	533	373	188	17	1,232	0
LCI	n/a	n/a	**4,832**	455	32	744	199	150	50	1	422	0
UCI	n/a	n/a	**13,467**	1,385	404	2,225	1,218	844	583	2,318	2,924	0
Year 2	2,185	**5,028**	**4,512**	4,429	297	899	1,255	69	92	1,032	99	3,102
LCI	1,380	**3,179**	**2,505**	2,465	123	471	723	9	29	742	30	2,154
UCI	2,322	**7,384**	**7,482**	7,301	583	1,625	1,997	334	172	1,386	238	4,329
Year 3	**5,874**	2,810	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	**4,525**	2022	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	**7,485**	3,880	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mona offshore ornithology array area study area												
Year 1	n/a	n/a	17,177	2,293	512	3,153	1,687	2,247	849	847	2,749	0
LCI	n/a	n/a	9,723	1,218	169	1,584	687	1,119	282	350	814	0
UCI	n/a	n/a	27,481	3,782	1,419	5,740	3,583	4,409	2,238	5,288	7,713	0
Year 2	3,394	9,063	11,786	9,433	905	2,466	3,699	763	415	3,552	738	7,015
LCI	1,075	5,396	6,325	5,062	394	1,203	1,935	180	255	2,549	360	4,828
UCI	10,203	14,181	20,451	15,805	1,810	4,608	6,305	2,415	630	4,753	1,320	9,734
Year 3	10,960	5,370	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	8,311	3,845	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	14,119	7,319	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table A.123:Razorbill modelled abundance (all behaviours and all ages classes) within the Mona Array Area plus associated buffer. Calendar Years 1, 2 and 3 for surveys: [March 2020 to February 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	**2,170**	106	**122**	12	104	67	**279**	11	**372**	0
LCI	n/a	n/a	**1,330**	30	**53**	0	34	24	**95**	0	**62**	0
UCI	n/a	n/a	**3,268**	217	**230**	35	194	128	**465**	36	**735**	0
Year 2	662	**4,081**	1,680	**227**	18	41	8	0	0	0	0	**201**
LCI	0	**2,729**	727	**129**	0	0	0	0	0	0	0	**108**
UCI	1,577	**5,746**	3,258	**394**	47	105	26	0	0	0	0	**329**
Year 3	**597**	578	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	**267**	240	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	**1,094**	1,133	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mona offshore ornithology array area study area												
Year 1	n/a	n/a	4,638	190	251	173	408	169	606	170	375	0
LCI	n/a	n/a	2,756	82	145	67	206	90	209	68	63	0
UCI	n/a	n/a	7,125	325	374	307	639	267	1,398	320	729	0
Year 2	669	6,473	5,818	571	30	72	101	188	44	72	79	1,101
LCI	0	4,129	2,674	325	0	26	41	34	0	0	13	581
UCI	1,565	9,450	11,258	956	61	129	200	353	88	147	149	1,815
Year 3	941	1,246	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	397	564	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	1,805	2,300	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table A.124: Atlantic Puffin modelled abundance (all behaviours and all ages classes) within the Mona Array Area plus associated buffer. Calendar Years 1, 2 and 3 for surveys: [March 2020 to February 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	**43**	8	0	0	**31**	0	0	0	0	0
LCI	n/a	n/a	**7**	0	0	0	**0**	0	0	0	0	0
UCI	n/a	n/a	**31**	24	0	0	**73**	0	0	0	0	0
Year 2	0	0	0	0	0	0	0	0	0	0	0	0
LCI	0	0	0	0	0	0	0	0	0	0	0	0
UCI	0	0	0	0	0	0	0	0	0	0	0	0
Year 3	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mona offshore ornithology array area study area												
Year 1	n/a	n/a	102	23	0	0	31	8	0	0	0	0
LCI	n/a	n/a	50	0	0	0	0	0	0	0	0	0
UCI	n/a	n/a	165	47	0	0	73	24	0	0	0	0
Year 2	0	0	8	0	0	0	0	8	0	0	0	0
LCI	0	0	0	0	0	0	0	0	0	0	0	0
UCI	0	0	24	0	0	0	0	24	0	0	0	0
Year 3	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table A.125:Northern gannet modelled abundance (all behaviours and all ages classes) within the Mona Array Area plus associated buffer. Calendar Years 1, 2 and 3 for surveys: [March 2020 to February 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	**87**	52	16	20	**299**	271	70	50	**71**	0
LCI	n/a	n/a	**42**	19	0	6	**203**	166	30	18	**25**	0
UCI	n/a	n/a	**142**	88	34	47	**407**	403	119	92	**116**	0
Year 2	33	0	**205**	299	91	45	69	120	**402**	149	26	12
LCI	6	0	**112**	191	50	13	33	53	**254**	101	6	0
UCI	62	0	**333**	430	150	88	124	223	**583**	214	54	40
Year 3	13	**22**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	0	**0**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	34	**45**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mona offshore ornithology array area study area												
Year 1	n/a	n/a	240	124	44	87	669	509	270	264	151	7
LCI	n/a	n/a	159	71	16	45	440	272	183	163	71	0
UCI	n/a	n/a	348	189	75	149	942	841	392	382	245	20
Year 2	34	0	833	584	185	248	354	436	747	376	73	13
LCI	7	0	413	355	122	123	158	178	440	249	26	0
UCI	62	0	1,434	874	263	436	647	850	1,138	543	114	40
Year 3	20	45	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	0	14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	41	83	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table A.126: Black-legged kittiwake modelled abundance (all behaviours and all ages classes) within the Mona Array Area plus associated buffer. Calendar Years 1, 2 and 3 for surveys: [March 2020 to February 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	**834**	188	17	**383**	204	69	8	0	**389**	309
LCI	n/a	n/a	**508**	116	0	**250**	127	33	0	0	**231**	177
UCI	n/a	n/a	**1,262**	279	34	**550**	288	114	22	0	**598**	482
Year 2	**451**	353	**1,410**	**574**	110	109	**516**	0	6	41	140	**1,117**
LCI	**319**	236	**957**	**393**	44	56	**270**	0	0	13	77	**780**
UCI	**607**	494	**1,995**	**789**	184	176	**888**	0	20	79	207	**1,702**
Year 3	852	**1,162**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	654	**759**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	1,093	**1,708**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mona offshore ornithology array area study area												
Year 1	n/a	n/a	2,235	450	50	853	402	145	147	39	1,129	715
LCI	n/a	n/a	1,381	254	22	539	237	81	86	13	697	394
UCI	n/a	n/a	3,351	721	86	1,272	623	207	225	73	1,669	1,152
Year 2	899	666	4,066	1,450	360	600	1,897	14	26	152	517	2,337
LCI	615	444	2,675	987	189	304	735	0	0	75	304	1,481
UCI	1,241	938	5,843	2,018	628	1,016	3,854	37	61	243	823	3,506
Year 3	1,841	2,517	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	1,184	1,543	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	2,747	3,822	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table A.127:Manx shearwater modelled abundance (all behaviours and all ages classes) within the Mona Array Area plus associated buffer. Calendar Years 1, 2 and 3 for surveys: [March 2020 to February 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	**6**	0	0	13	**1,056**	**71**	26	0	0	0
LCI	n/a	n/a	**0**	0	0	0	**176**	**31**	0	0	0	0
UCI	n/a	n/a	**19**	0	0	34	**3,251**	**129**	53	0	0	0
Year 2	0	0	6	**40**	0	**2,854**	1,793	**437**	16	0	0	0
LCI	0	0	0	**13**	0	**679**	701	**148**	2	0	0	0
UCI	0	0	20	**76**	0	**7,787**	3,511	**924**	63	0	0	0
Year 3	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mona offshore ornithology array area study area												
Year 1	n/a	n/a	44	0	0	125	3,042	126	65	0	0	0
LCI	n/a	n/a	6	0	0	45	500	65	25	0	0	0
UCI	n/a	n/a	97	0	0	225	6,750	191	120	0	0	0
Year 2	0	0	13	101	0	8,541	3,640	913	405	0	0	0
LCI	0	0	0	46	0	3,811	2,032	581	44	0	0	0
UCI	0	0	27	179	0	13,795	5,400	13,01	806	0	0	0
Year 3	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table A.128: Red-throated diver modelled abundance (all behaviours and all ages classes) within the Mona Array Area plus associated buffer. Calendar Years 1, 2 and 3 for surveys: [March 2020 to February 2022].

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Array plus 4km												
Year 1	n/a	n/a	0	0	0	0	0	6	0	**7**	0	0
LCI	n/a	n/a	0	0	0	0	0	0	0	**0**	0	0
UCI	n/a	n/a	0	0	0	0	0	20	0	**20**	0	0
Year 2	0	0	0	0	0	0	0	0	**0**	**0**	**0**	0
LCI	0	0	0	0	0	0	0	0	**0**	**0**	**0**	0
UCI	0	0	0	0	0	0	0	0	**0**	**0**	**0**	0
Year 3	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mona offshore ornithology array area study area												
Year 1	n/a	n/a	0	0	0	0	0	6	0	7	6	0
LCI	n/a	n/a	0	0	0	0	0	0	0	0	0	0
UCI	n/a	n/a	0	0	0	0	0	20	0	20	20	0
Year 2	0	0	0	0	0	0	0	0	0	0	0	6
LCI	0	0	0	0	0	0	0	0	0	0	0	0
UCI	0	0	0	0	0	0	0	0	0	0	0	20
Year 3	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LCI	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UCI	0	0	n/a	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.129: Common guillemot breeding colonies within the mean-max plus one standard deviation foraging ranges of the Mona 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	2021
NON-SPA		Isle of Man	5,306	2018
NON-SPA		Meikle Ross and Little Ross	27	2018
NON-SPA		Monrieth Cliffs and Scar Rocks	350	2016
NON-SPA		Mull of Galloway	277	2019
NON-SPA		Port Mona, Devil’s Bridge, Laggantalluch Head	229	2000
NON-SPA		St Bee’s Head	17,501	2021
		Total	**130,389**	**INDV**

Table B.130: Razorbill breeding colonies within the mean-max plus one standard deviation foraging ranges of the Mona 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	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
SPA	YES	Wicklow Head	157	2022
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		Meikle Ross and Little Ross	3	2018
NON-SPA		Monreith Cliffs and Scar Rocks	0	2016
NON-SPA		Mull of Galloway	44	2019
NON-SPA		Port Mona, Devil's Bridge, Laggantalluch Head	37	2021
NON-SPA		St Bees Head and Town	94	2021
		Total	**18,148**	**INDV**

Table B.131: Northern gannet breeding colonies within the mean-max plus on standard deviation foraging ranges of the Mona 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	27,77	2015
NON-SPA		Monreith Cliffs and Scar Rocks	23,76	2014
		Total	**76,186**	**AON**

Table B.132: Black-legged kittiwake breeding colonies within the mean-max plus on standard deviation foraging ranges of the Mona 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	Howth Village	3,081	2015
SPA	YES	Inishtrahull Island	7	2016
SPA	YES	Ireland's Eye	1,610	2015
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
NON-SPA		Bray	1,473	2010
NON-SPA		Caldey Island	271	2021

Colonies	Qualifying species	master site in SMP	no.	Last counted
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		Lundy	284	2018
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	**71,198**	**INDV**

Table B.133: Atlantic puffin breeding colonies within the mean-max plus one standard deviation foraging ranges of the Mona 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
	YES	South Stack	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.134: Manx Shearwater breeding colonies within the mean-max plus one standard deviation foraging ranges of the Mona 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	Bishop & Clerks and Ramsey	4796	2016
SPA	NO	Fetlar, Shetlands	7	2002
SPA	NO	Treshnish Isles	1992	2018
SPA	NO	Canna and Sanday	2	2001
SPA	NO	Ailsa Craig	20	2018
SPA	NO	Isles of Scilly	495	2015/2019
SPA	YES	Copeland Islands	4850	2007
SPA	YES	Deenish Island and Scariff Island	2010	2000
SPA	YES	Puffin Island	6329	2000
SPA	YES	Rum	120000	2001
SPA	YES	Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro	455156	2018
SPA	YES	Bardsey Island	16183	2001
SPA	YES	Saltee Islands	250	2001/2002
SPA	YES	Skelligs	738	2001
SPA	YES	Blasket Islands	3584	2001
SPA	YES	High Island, Inishshark and Davillaun	869	2015
SPA	YES	Cruagh Island	3286	2001
NON-SPA		Inchmarnock Island	1	2002
NON-SPA		Sanda Island	300	2006
NON-SPA		Isle of Man	424	2014
NON-SPA		Lundy	5504	2017
NON-SPA		Sark	5	2000
NON-SPA		Jethou	5	2000
		Total	**1,253,612**	**INDV**