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Abbreviations and Acronyms

BDMPS	Biologically Defined Minimum Population Scale
ICOL	Inch Cape Offshore Limited
km	Kilometre
MS-LOT	Marine Scotland Licensing and Operations Team
pSPA	Proposed Special Protection Area
SNH	Scottish Natural Heritage
SPA	Special Protection Area

11B Apportioning Effects to SPA Colonies During the Breeding and Non-Breeding Seasons

11B.1 Introduction

1 Following the advice received in the Scoping Opinion from the Marine Scotland Licensing and Operations Team (MS-LOT), the offshore ornithology assessment for the Development focusses on the potential impacts of collisions, displacement and barrier effects on six species of seabirds. These impacts may arise from interactions between the seabird populations and the Inch Cape Offshore Wind Farm (and its associated infrastructure). The seabird species of interest and the different impacts considered relevant to their populations in the breeding and non-breeding periods (as advised in the Scoping Opinion) are detailed below (*Table 11B.1*).

Table 11B.1 The seabird species and impacts scoped into the assessment according to breeding and non-breeding periods

Species	Seasonal period	Collision	Displacement	Barrier effect
Gannet	Breeding	✓	x	x
	Non-breeding	✓	x	x
Kittiwake	Breeding	✓	✓	✓
	Non-breeding	✓	✓*	✓*
Herring gull	Breeding	✓	x	x
	Non-breeding	✓	x	x
Guillemot	Breeding	x	✓	✓
	Non-breeding	x	✓	✓
Razorbill	Breeding	x	✓	✓
	Non-breeding	x	✓	✓
Puffin	Breeding	x	✓	✓
	Non-breeding	x	x	x
*Displacement and barrier effects to kittiwakes in the non-breeding period were assessed in a qualitative way only (following the advice of the Scoping Opinion).				

2 Each of the seabird species of interest is a qualifying feature of one or more breeding colony Special Protection Areas (SPAs) which have connectivity to the Development Area and the associated two kilometre buffer[1], and which have been identified in the Scoping Opinion for

[1] Although baseline surveys encompassed the Development Area and four kilometre buffer, the Scoping Opinion advised that the impact assessment should be focussed on the Development Area and two kilometre buffer (see *Chapter 11: Ornithology*).

inclusion in the assessment. Connectivity between these SPAs and the Development Area plus two kilometre buffer is determined using the mean maximum foraging range of the species (*Table 11B.*2, Thaxter *et al.* 2012)[2]. To determine the extent to which the predicted impacts can be attributed to the different SPA populations an apportionment exercise was undertaken. Where relevant, the apportioning of the impacts was undertaken in relation to both the breeding and non-breeding periods. This report presents the details of the approach and methods used for apportioning, along with the subsequent apportionment estimates.

Table 11B.2 Connectivity between the Development Area plus two kilometre buffer and seabird breeding colony SPAs as determined by the SPA being within the mean maximum foraging range of one or more qualifying features

Species	Mean maximum foraging range (km)	SPA			
		Forth Islands	Fowlsheugh	St Abbs Head to Fast Castle	Buchan Ness to Collieston Coast
Gannet	229.4	✓	N/A	N/A	N/A
Kittiwake	60.0	✓	✓	✓	x
Herring gull	61.1	✓	✓	✓	x
Guillemot	84.2	✓	✓	✓	✓
Razorbill	48.5	✓	✓	x	N/A
Puffin	105.4	✓	N/A	N/A	N/A

11B.2 Apportioning of impacts during the breeding period

11B.2.1 Methods

Impacts estimated for the Development

3 The seasonal periods that are used for each of the six seabird species are defined in *Appendix 11A: Offshore Ornithology Baseline Survey Report*. Following the advice provided in the Scoping Opinion, the apportioning of impacts during the breeding season was undertaken using a variation of the approach outlined in existing guidance (SNH, 2016). The Marine Scotland Apportioning Tool, which (at the time of writing) is in the course of development, was not available for use in the assessment[3].

4 The breeding colonies of each of the species of interest, which were within the mean maximum foraging range (Thaxter *et al.* 2012) of the Development Area plus two kilometre

[2] This is on the basis of the closest distance between the Development Area plus two kilometre buffer and the breeding colony of interest.
[3] Email of 07 November 2017 from MS-LOT to ICOL.

buffer were first identified. The Seabird 2000 census data 1998 – 2002[4] provided the source information on breeding colony locations, using the 'site' (as opposed to the 'sub-site') level for non-SPAs and the appropriate amalgamation of 'sites' for the SPAs.

5 For each species, the proportion of the impacts attributed to each colony within foraging range of the Development Area and two kilometre buffer was estimated on the basis of:

- The population size of each colony (as numbers of individuals) – N;
- The distance from each colony to the Development Area plus two kilometre buffer – D; and
- The proportion of open sea within the foraging range of each colony – Psea.

6 A weighting value (W) was then calculated for each colony population as:

$$W = (N / \text{Sum of } N) * (\text{Sum of } (D^2) / D) * ((1\text{-Psea}) / (\text{Sum of } (1\text{-Psea}))).$$

The weighting values for the different colonies were then summed, with the proportion of the impacts attributable to each colony being taken as the colony weight divided by the sum of the weighting values. The weighting assumes that colonies within foraging range of the Development Area plus two kilometre buffer would contribute more birds to the on-site population (and therefore experience greater impacts) where they are larger, are closer to the Development Area (and buffer) and have a smaller proportion of open sea within their foraging range. The effect of colony distance is treated as the square term (as opposed to the linear term) because the expectation is that bird densities would decrease in proportion to the increasing area of sea as distance from the colony increases (SNH, 2016).

7 For the purposes of this calculation, distance from the colony to the Development Area plus two kilometre buffer was measured from the approximate central points of each. In the case of the Forth Islands SPA, which comprises a number of widely distributed islands, the distance was taken to the island holding the largest population size (e.g. the Bass Rock in the case of gannet but the Isle of May in the case of kittiwake).

8 It is important that the count data for the colonies considered in the apportionment calculation should be concurrent, or at least derive from a similar time period (SNH, 2016). In the case of the colonies within foraging range of the Development Area plus two kilometre buffer, recent counts are available for the SPA colonies but for many of the non-SPA colonies there have been no counts since the Seabird 2000 census, undertaken from 1998 to 2002 (Mitchell *et al.* 2004). Therefore, to maximise the value of the existing colony count data, the apportionment calculation described above was undertaken in two steps (following the advice in the Scoping Opinion), as follows:

- Apportioning impacts with the SPA and non-SPA colonies included using the Seabird 2000 counts; and

[4] Source - http://jncc.defra.gov.uk/page-4460 [Accessed 15/05/18]

- For the proportion of the impacts assigned to the SPA component, re-apportioning these using the recent count data for the SPA colonies.

9 This two-step process was applied to all species other than gannet, for which there was only one non-SPA colony within mean maximum foraging range (i.e. Troup Head). A count for Troup Head was available from the same year (2014) as the most recent count of the Forth Islands SPA population (*Appendix 11A*), so that the apportionment calculation was undertaken in a single stage.

10 The Seabird 2000 colony count data used in the apportionment calculation were as used by Scottish Natural Heritage (SNH) in the apportionment calculations for gannet, kittiwake and herring gull undertaken for the 2014 *Appropriate Assessment of the Forth and Tay wind farms* (MS-LOT 2014), whilst for guillemot, razorbill and puffin the count data were extracted from the Seabird 2000 census data 1998 – 2002[4]. The recent colony counts used for the SPAs in step two were as provided by SNH in their scoping advice.

Impacts estimated for other wind farms

11 As advised in the Scoping Opinion, breeding season impacts from the other three Forth and Tay wind farms (i.e. Neart na Gaoithe and Seagreen Alpha and Bravo) were estimated quantitatively for incorporation into the cumulative impact assessment. Therefore, it was necessary to also apportion the impacts from these wind farms to the SPA populations with connectivity to the Development Area and two kilometre buffer. For the purposes of this apportionment exercise, Seagreen Alpha and Bravo were treated as a single site given that they are adjoining along their longest boundary.

12 The apportionment calculation for these wind farms was undertaken exactly as for the Development Area and two kilometre buffer, identifying those colonies with connectivity to each of these wind farms (plus a two kilometre buffer) in the same way as for the Development Area and two kilometre buffer.

11B.2.2 Apportionment estimates for the breeding period

13 Based upon calculations undertaken by the approach described above, the apportionment estimates for each of the key seabird species at each of the SPAs with connectivity to the Development Area and two kilometre buffer are presented below (*Table 11B.3*, with copies of the full data used to derive the estimates in *Annex 11B.1*). These estimates are presented for the Development and the other Forth and Tay wind farms.

Table 11B.3 The estimated apportionment of breeding period impacts from the Development and the other Forth and Tay wind farms for each of the seabird breeding colony SPA populations with connectivity to the Development Area plus two kilometre buffer

Wind farm	Species	SPA / colony	Seabird 2000 population estimate (individuals)[1]	Recent population estimate (individuals)[1]	Proportion of impacts attributable to colony / SPA when comparing across all colonies using seabird 2000 counts	Proportion of impacts attributable to SPA after re-apportioning of SPAs using recent colony counts
Inch Cape	Gannet[2]	Forth Islands	-	150,518	-	0.996
		Non-SPA colony	-	12,912	-	0.004
	Kittiwake	Forth Islands	11,594	9,326	0.183	0.210
		Fowlsheugh	37,600	19,310	0.396	0.287
		St Abbs Head to Fast Castle	32,444	6,668	0.192	0.056
		Non-SPA colonies	38,114	-	0.446	0.446
	Herring gull	Forth Islands	13,174	13,160	0.712	0.456
		Fowlsheugh	670	250	0.024	0.006
		St Abbs Head to Fast Castle	1,294	650	0.026	0.008
		Non-SPA colonies	10,970	-	0.530	0.530
	Guillemot	Forth Islands	36,369	28,786	0.360	0.350
		Fowlsheugh	68,526	55,507	0.379	0.377

Wind farm	Species	SPA / colony	Seabird 2000 population estimate (individuals)[1]	Recent population estimate (individuals)[1]	Proportion of impacts attributable to colony / SPA when comparing across all colonies using seabird 2000 counts	Proportion of impacts attributable to SPA after re-apportioning of SPAs using recent colony counts
		St Abbs Head to Fast Castle	43,744	36,206	0.150	0.153
		Buchan Ness to Collieston Coast	29,362	33,632	0.023	0.032
		Non-SPA colonies	10,184	-	0.088	0.088
	Razorbill	Forth Islands	4,678	5,815	0.309	0.319
		Fowlsheugh	6,362	7,426	0.324	0.314
		Non-SPA colonies	3,724	-	0.367	0.367
	Puffin	Forth Islands	140,868	90,010	0.908	0.900
		Farne Islands	111,348	79,924	0.068	0.076
		Non-SPA colonies	7,954	-	0.023	0.023
Neart na Gaoithe	Gannet[2]	Forth Islands	-	150,518	-	0.999
		Non-SPA colony	-	12,912	-	0.001
	Kittiwake	Forth Islands	11,594	9,326	0.460	0.679
		St Abbs Head to Fast Castle	32,444	6,668	0.351	0.133
		Non-SPA colonies	23,388	-	0.189	0.189

Wind farm	Species	SPA / colony	Seabird 2000 population estimate (individuals)[1]	Recent population estimate (individuals)[1]	Proportion of impacts attributable to colony / SPA when comparing across all colonies using seabird 2000 counts	Proportion of impacts attributable to SPA after re-apportioning of SPAs using recent colony counts
	Herring gull	Forth Islands	13,174	13,160	0.804	0.817
		St Abbs Head to Fast Castle	1,294	650	0.021	0.011
		Non-SPA colonies	17,492	-	0.171	0.172
	Guillemot	Forth Islands	36,369	28,786	0.665	0.657
		Fowlsheugh	68,526	55,507	0.084	0.085
		St Abbs Head to Fast Castle	43,744	36,206	0.203	0.210
		Non-SPA colonies	12,611	-	0.048	0.048
	Razorbill	Forth Islands	4,678	5,815	0.785	0.856
		St Abbs Head to Fast Castle	3157	2,067	0.167	0.096
		Non-SPA colonies	987	-	0.047	0.047
	Puffin	Forth Islands	140,868	90,010	0.957	0.953
		Farne Islands	111,348	79,924	0.033	0.036
		Non-SPA colonies	39,886	-	0.011	0.011

Wind farm	Species	SPA / colony	Seabird 2000 population estimate (individuals)[1]	Recent population estimate (individuals)[1]	Proportion of impacts attributable to colony / SPA when comparing across all colonies using seabird 2000 counts	Proportion of impacts attributable to SPA after re-apportioning of SPAs using recent colony counts
Seagreen (Alpha and Bravo combined)	Gannet[2]	Forth Islands	-	150,518	-	0.987
		Non-SPA colony	-	12,912	-	0.013
	Kittiwake	Forth Islands	11,594	9,326	0.062	0.091
		Fowlsheugh	37,600	19,310	0.441	0.412
		Non-SPA colonies	40,644	-	0.497	0.497
	Herring gull	Forth Islands	13,174	13,160	0.299	0.318
		Fowlsheugh	670	250	0.032	0.013
		Non-SPA colonies	17,094	-	0.670	0.670
	Guillemot	Forth Islands	36,369	28,786	0.172	0.165
		Fowlsheugh	68,526	55,507	0.561	0.552
		St Abbs Head to Fast Castle	43,744	36,206	0.126	0.127
		Buchan Ness to Collieston Coast	29,362	33,632	0.041	0.057
		Non-SPA colonies	12,193	-	0.099	0.099

Wind farm	Species	SPA / colony	Seabird 2000 population estimate (individuals)[1]	Recent population estimate (individuals)[1]	Proportion of impacts attributable to colony / SPA when comparing across all colonies using seabird 2000 counts	Proportion of impacts attributable to SPA after re-apportioning of SPAs using recent colony counts
	Razorbill	Fowlsheugh	6,362	7,426	0.603	0.603
		Non-SPA colonies	4.117	-	0.397	0.397
	Puffin	Forth Islands	140,868	90,010	0.806	0.790
		Farne Islands	111,348	79,924	0.161	0.177
		Non-SPA colonies	7,954	-	0.032	0.032

[1]The apportionment calculations are undertaken using the number of individuals estimated at the colony. For guillemot and razorbill this is the direct count of individuals but for other species it is the count of breeding pairs or apparently occupied sites multiplied by two. The recent estimates are as provided by SNH (email of 08 December 2017 from MS-LOT to ICOL).
[2]Recent count data are available for all gannet colonies included, so that the Seabird 2000 data are not used for this species (see text).

11B.3 Apportioning of impacts during the non-breeding periods

11B.3.1 Approaches used for each species

14 In contrast to the breeding period, for which the same approach to apportioning was applied to each species, the approaches used to apportion impacts to the different SPA populations in the non-breeding periods varied between species. This reflects differences in the passage movements and wintering areas used by each of the seabird species of interest, whereas during the breeding period a common approach is warranted on the basis that all of these seabird species are central place foragers (i.e. their available foraging area is constrained by the need to return to the breeding colony to attend nests and chicks). The approaches used to apportion impacts during the non-breeding period followed the advice provided in the Scoping Opinion, except in the case of herring gull for which a simpler (but more precautionary) approach was applied on the basis that the predicted impacts were small.

15 For guillemot and razorbill, impacts during the non-breeding period were apportioned using the breeding season estimates for these species. This was on the basis that many of the adults remain in the vicinity of the breeding colonies throughout the year, with frequent records of adult guillemots returning to their nest sites from October (Brown & Grice 2005, Harris *et al.* 2006). However, birds from these breeding populations may also winter further afield in the North Sea, whilst the wintering populations of both species in the Outer Forth region are likely to be augmented by birds from more northern breeding colonies (Furness 2015). Therefore, applying the breeding period apportionment to the non-breeding period is likely to overestimate the impacts to the SPA populations (and is precautionary).

16 For puffin, no assessment of impacts during the non-breeding period has been undertaken, as they migrate rapidly from their UK breeding areas, leaving the sea areas immediately adjacent to their colonies by late August (Wernham *et al.* 2002, Harris & Wanless 2011).

17 The advice from the Scoping Opinion for apportioning the non-breeding season impacts on herring gulls was to identify a suitable regional population for the Forth and Tay region, and to estimate the proportion of this population which is likely to derive from the regional SPA breeding population. This would be estimated within the context of UK breeding populations (particularly on the east coast) being augmented by large numbers of birds from northern Europe (Furness 2015), and a likely halving in the proportion of the wider population that comprises adult birds from SPA populations between the breeding and non-breeding periods (Furness 2015). However, because the estimated impacts to herring gulls were low it was considered sufficient to apply the breeding season apportioning estimates (which, for the non-breeding period, are highly precautionary).

18 Apportioning of the estimated collision impacts to gannet and kittiwake during the non-breeding season had to account for the passage movements of these species, which may take a proportion of the SPA populations through other offshore wind farms outside the Forth and Tay region. For both of these species, the non-breeding period was split into autumn and spring passage periods, and the apportioning estimates took account of offshore wind farms

in the UK North Sea and Channel for gannet and the UK North Sea for kittiwake. The approaches taken to apportioning the collision estimates from the relevant wind farms to the SPA populations of each of these species are detailed in the specific sections below.

19 The advice from the Scoping Opinion was that only a qualitative assessment of displacement impacts was required for kittiwake during the non-breeding season, whilst no assessment of displacement impacts on gannet was required (*Table 11B.1*). As such, no apportioning of non-breeding season impacts from displacement was required for either species.

11B.3.2 Apportioning gannet collisions during passage periods

Methods

20 The Forth Islands SPA is the only seabird colony SPA with connectivity to the Development Area and two kilometre buffer on the basis of breeding gannet as a qualifying feature (Table 11B.2). The approach taken to estimating the collisions to the Forth Islands SPA gannet population during the autumn and spring passage periods followed that used for apportioning collisions to the Flamborough Head and Filey Coast proposed SPA (pSPA) gannet population in the assessment for the East Anglia THREE wind farm (MacArthur Green, 2015a, Royal HaskoningDHV *et al.,* 2015), and was as agreed in correspondence between ICOL, SNH and MS-LOT[5].

21 This approach uses the Biologically Defined Minimum Population Scales (BDMPS) (Furness 2015) as its basis but with updated information on; (i) the sizes of some of the gannet breeding populations that are deemed to have connectivity to the North Sea during passage periods; and (ii) flight directions (from tracking studies), which enables re-estimation of the proportion of passage birds flying through the North Sea in autumn and spring.

22 The initial collision estimates for gannet at the UK North Sea and Channel wind farms during the autumn and spring passage periods are provided in the East Anglia THREE assessment (see Table 3.6 in Royal HaskoningDHV *et al.,* 2015). However, these estimates were updated in line with the report on Estimates of Ornithological Headroom in Offshore Wind Farm Collision Mortality (MacArthur Green, 2017), which provides a correction factor to revise the annual estimates on the basis of the differences in the 'as built' and 'as consented' wind farm designs. Where the 'as consented' collision estimate for a wind farm differed between the 'Ornithological Headroom' report and the East Anglia THREE assessment, then the value from the 'Ornithological Headroom' report was used as the basis for the calculation (following the advice provided by SNH[5]).

23 For the Development and the other three Forth and Tay wind farms, the collision estimates used were as calculated in the current assessment, using the 2017 design for the Development and the 2014 designs for the other Forth and Tay wind farms (*Appendix 11C: Estimation of the Development-alone and Cumulative Collisions*).

[5] Emails of 01 and 08 November 2017 from MS-LOT to ICOL, and of 8 November 2017 from ICOL to MS-LOT.

24 In addition, the seasonal periods for gannet used in the East Anglia THREE assessment differed from those used in the current assessment (and as advised in the Scoping Opinion). Thus, the autumn and spring passage periods were assumed to be September to November and December to March, respectively, in the East Anglia THREE assessment, whilst in the current assessment they were October to November and December to mid-March, respectively. Consequently, the passage collision estimates provided in the East Anglia THREE assessment (and as amended following MacArthur Green 2017) were corrected according to the differences in the assumed lengths of the respective passage periods (e.g. the collision estimates for the autumn passage period were multiplied by 0.67 to account for the shorter period assumed in the current assessment). This correction was not applied to the collision estimates for the Development or the other Forth and Tay wind farms because these had been calculated according to the seasonal periods advised in the Scoping Opinion.

25 To apportion the estimated collisions at each wind farm, it is assumed that during autumn passage, 63 per cent of gannets from the Forth Islands SPA population (comprising adults, immatures and juveniles) fly south through the North Sea and Channel, with the remainder passing around the north of Scotland before heading south on a route to the west of Ireland (Furness 2015). During spring passage, it is assumed that 27 per cent of gannets from the Forth Islands SPA population (comprising adults and immatures) fly north through the North Sea and Channel, with the remainder taking the westerly route north (Furness 2015, MacArthur Green 2015a). These percentages are used to estimate the proportion of the Forth Islands SPA population that take passage routes within which each wind farm in the UK North Sea and Channel occurs, according to whether the wind farm is north or south of the SPA.

26 During these passage periods, varying proportions of other gannet populations from elsewhere in the UK and northern Europe also pass through the North Sea and Channel, and it is assumed that there is even mixing amongst the birds from the various populations and amongst the different age classes of these populations. The estimated sizes of these populations and assumed proportions passing through the North Sea and Channel are taken from Table 2.2 in MacArthur Green (2015a).

27 Most of these other gannet populations derive from breeding colonies that are to the north of all of the wind farms in the UK North Sea and Channel, so that the proportion of each population that is assumed to have the potential to pass through these wind farms is constant. However, the Troup Head, and Flamborough Head and Filey Coast pSPA populations may pass through wind farms to the north or south of these colonies, as for the Forth Islands SPA population. These populations are assumed to use the same passage routes as the Forth Islands SPA population in equivalent (for Troup Head) or similar (for Flamborough Head and Filey Coast) proportions. Also, birds from the population only have potential to pass through wind farms that are to the south of this colony. As such, the total gannet population size estimated to have the potential to pass through the different wind farms in the UK North Sea and Channel differs between some of these wind farms.

28 The percentage of breeding adults in these populations is estimated to be 55 per cent during both passage periods (with an estimated 26 per cent immatures and 19 per cent juveniles during autumn passage and 45 per cent immatures during spring passage), as derived from

the stable age structure of a population model for gannet (Furness 2015). The values from this age structure are used to estimate the total number of birds from each population which contribute to the North Sea and Channel passage populations (subject to the proportions that take the different passage routes, as detailed above). This estimate of the breeding adult component differs from the estimate of 60 per cent in the Forth Islands SPA population, as calculated from the stable age structure of the Forth Islands SPA gannet population model that has been produced to inform the current assessment (*Appendix 11E: Population Viability Analyses*). However, incorporating the stable age structure estimate which is specific to the Forth Islands SPA population would make little difference to overall calculations.

29 Using the above information, the total gannet population that has the potential to pass through each of the wind farms in the UK North Sea and Channel during each of the autumn and spring passage periods can be estimated. The proportion of this total population that is attributed to the Forth Islands SPA population is then used to apportion the estimated collisions at each wind farm in each passage period to the SPA population. The values derived from this apportionment are then summed to give the total autumn and spring passage collision estimates for the Forth Islands SPA population. For the Development and the other Forth and Tay wind farms, the seasonal-specific age distribution, as recorded during the baseline surveys, is used to allocate these collisions to the different population age classes (*Appendix 11A* and *Appendix 11E*), with the age distribution from Furness (2015) applied to the collisions from the remaining wind farms in the UK North Sea and Channel.

Collision estimates for the Forth Islands SPA gannet population during autumn and spring passage periods

30 The estimated number of gannet collisions at each wind farm in the UK North Sea and Channel during both the autumn and spring passage periods, together with the proportion of these collisions attributed to the Forth Islands SPA population, is detailed below (*Table 11B.4*). Overall, a total of 117 gannet collisions are attributed to the Forth Islands SPA population during autumn passage and 63 during spring passage.

31 For the autumn passage period, 14 of the 117 collisions result from the Development and the other Forth and Tay wind farms, of which 13 are assigned to the breeding adult age class (based on 89 to 97 per cent of gannets being recorded in adult plumage in the respective surveys during the autumn passage period – *Appendix 11A*and *Appendix 11E*). The remaining wind farms in the UK North Sea and Channel account for 102 collisions, of which 56, 27 and 19 are assigned to the adult, immature and juvenile age classes, respectively (noting that the small differences in the above totals relate to rounding errors and that the actual calculations of the collision estimates use the values taken to one decimal place as in *Table 11B.4*).

32 For the spring passage period, 27 of the 63 collisions result from the Development and the other Forth and Tay wind farms, of which 26 are assigned to the breeding adult age class (based on 98 to 99 per cent of gannets being recorded in adult plumage in the respective surveys during the spring passage period – *Appendix 11A*and *Appendix 11E*). The remaining wind farms in the UK North Sea and Channel account for 36 collisions, of which 20 and 16 are assigned to the adult and immature age classes, respectively.

33 Therefore, during autumn passage a total of 69, 27 and 20 collisions of adult, immature and juvenile gannets, respectively, are apportioned to the Forth Islands SPA population. During the spring passage, a total of 46 and 17 collisions of adult and immature gannets, respectively, are apportioned to the Forth Islands SPA population.

Table 11B.4 The apportionment of gannet collisions estimated at UK North Sea and Channel wind farms to the Forth Islands SPA population during the autumn and spring passage periods

Wind farm	Autumn passage						Spring passage					
	Estimated population on passage route		Total collisions estimated at wind farm		Collisions apportioned to Forth Islands SPA		Estimated population on passage route		Total collisions estimated at wind farm		Collisions apportioned to Forth Islands SPA	
	Total number of birds[1]	Proportion from Forth Islands SPA	Consented design[2]	Built design[3]	Without seasonal adjustment	After seasonal adjustment[4]	Total number of birds[1]	Proportion from Forth Islands SPA	Consented design[2]	Built design[3]	Without seasonal adjustment	After seasonal adjustment[4]
Greater Gabbard	395,934	0.43	8.8	8.4	3.6	2.4	199,601	0.37	4.8	4.6	1.7	1.5
Gunfleet Sands	395,934	0.43	0.0	0.0	0.0	0.0	199,601	0.37	0.0	0.0	0.0	0.0
Kentish Flats Extension	395,934	0.43	0.8	0.6	0.3	0.2	199,601	0.37	1.1	0.9	0.3	0.3
Lincs	395,934	0.43	1.3	1.3	0.6	0.4	199,601	0.37	1.7	1.7	0.6	0.5
London Array	395,934	0.43	1.5	0.6	0.3	0.2	199,601	0.37	1.5	0.6	0.2	0.2
Lynn and Inner Dowsing	395,934	0.43	0.1	0.1	0.0	0.0	199,601	0.37	0.2	0.2	0.1	0.1
Scroby Sands	395,934	0.43	0.0	0.0	0.0	0.0	199,601	0.37	0.0	0.0	0.0	0.0
Sheringham Shoal	393,559	0.44	3.4	3.3	1.4	1.0	197,226	0.37	0.0	0.0	0.0	0.0
Teesside	373,539	0.46	1.7	1.2	0.5	0.4	197,226	0.37	0.0	0.0	0.0	0.0
Thanet	395,934	0.43	0.3	0.2	0.1	0.0	199,601	0.37	0.35	0.2	0.1	0.1

Wind farm	Autumn passage						Spring passage					
	Estimated population on passage route		Total collisions estimated at wind farm		Collisions apportioned to Forth Islands SPA		Estimated population on passage route		Total collisions estimated at wind farm		Collisions apportioned to Forth Islands SPA	
	Total number of birds[1]	Proportion from Forth Islands SPA	Consented design[2]	Built design[3]	Without seasonal adjustment	After seasonal adjustment[4]	Total number of birds[1]	Proportion from Forth Islands SPA	Consented design[2]	Built design[3]	Without seasonal adjustment	After seasonal adjustment[4]
Humber Gateway	393,559	0.44	1.1	0.5	0.2	0.2	197,226	0.37	1.5	0.7	0.3	0.2
Westernmost Rough	393,559	0.44	0.1	0.1	0.0	0.0	197,226	0.37	0.2	0.2	0.1	0.1
Beatrice	296,629	0.34	48.8	29.6	10.1	6.7	333,298	0.60	9.5	5.8	3.4	3.0
Blyth Demonstrator	373,539	0.46	2.1	2.1	1.0	0.6	197,226	0.37	2.8	2.8	1.0	0.9
Creyke Beck A	373,539	0.46	5.5	5.5	2.5	1.7	197,226	0.37	3.6	3.6	1.3	1.2
Creyke Beck B	373,539	0.46	7.2	7.2	3.3	2.2	197,226	0.37	4.7	4.7	1.8	1.5
Dudgeon	393,559	0.44	38.9	18.0	7.8	5.3	197,226	0.37	19.1	8.8	3.3	2.9
East Anglia ONE	395,934	0.43	198	88.8	38.5	25.8	199,601	0.37	10.0	4.5	1.7	1.4
EOWDC	296,629	0.34	5.1	4.2	1.4	0.9	322,547	0.62	0.1	0.1	0.1	0.0
Galloper	395,934	0.43	30.9	13.4	5.8	3.9	199,601	0.37	12.6	5.5	2.0	1.8
Hornsea P1	393,559	0.44	31.4	18.1	7.9	5.3	197,226	0.37	22.9	13.2	4.9	4.3

Wind farm	Autumn passage						Spring passage					
	Estimated population on passage route		Total collisions estimated at wind farm		Collisions apportioned to Forth Islands SPA		Estimated population on passage route		Total collisions estimated at wind farm		Collisions apportioned to Forth Islands SPA	
	Total number of birds[1]	Proportion from Forth Islands SPA	Consented design[2]	Built design[3]	Without seasonal adjustment	After seasonal adjustment[4]	Total number of birds[1]	Proportion from Forth Islands SPA	Consented design[2]	Built design[3]	Without seasonal adjustment	After seasonal adjustment[4]
Moray Firth	296,629	0.34	35.4	35.4	12.0	8.1	333,298	0.60	8.9	8.9	5.3	4.6
Race Bank	393,559	0.44	11.7	6.2	2.7	1.8	197,226	0.37	4.1	2.2	0.8	0.7
Rampion	395,934	0.43	63.5	43.9	19.0	12.8	199,601	0.37	2.1	1.5	0.5	0.5
Teesside A	373,539	0.46	8.0	8.0	3.7	2.5	197,226	0.37	8.6	8.6	3.2	2.8
Teesside B	373,539	0.46	0.6	0.6	0.3	0.2	197,226	0.37	0.7	0.7	0.2	0.2
Triton Knoll	393,559	0.44	64.1	20.8	9.1	6.1	197,226	0.37	30.1	9.8	3.6	3.2
Hornsea P2	393,559	0.44	14.0	14.0	6.1	4.1	197,226	0.37	5.6	5.6	2.1	1.8
East Anglia THREE	395,934	0.43	33.2	33.2	14.4	9.7	199,601	0.37	9.6	9.6	3.5	3.1
Inch Cape[5]	302,705	0.33	5.0	5.0	1.7	1.7	322,547	0.62	4.0	4.0	2.5	2.5
Neart na Gaoithe[5]	302,705	0.33	14.0	14.0	4.7	4.7	322,547	0.62	14.0	14.0	8.6	8.6
Seagreen Alpha[5]	302,705	0.33	11.0	11.0	3.7	3.7	322,547	0.62	12.0	12.0	7.4	7.4
Seagreen Bravo[5]	302,705	0.33	13.0	13.0	4.3	4.3	322,547	0.62	13.0	13.0	8.0	8.0

Wind farm	Autumn passage						Spring passage					
	Estimated population on passage route		Total collisions estimated at wind farm		Collisions apportioned to Forth Islands SPA		Estimated population on passage route		Total collisions estimated at wind farm		Collisions apportioned to Forth Islands SPA	
	Total number of birds[1]	Proportion from Forth Islands SPA	Consented design[2]	Built design[3]	Without seasonal adjustment	After seasonal adjustment[4]	Total number of birds[1]	Proportion from Forth Islands SPA	Consented design[2]	Built design[3]	Without seasonal adjustment	After seasonal adjustment[4]

[1]The total number of birds estimated to use the passage route differs between wind farms because the proportion of birds taking the passage route through the North Sea and Channel differs between colonies, so that the estimated number varies according to which colonies occur to the north and south of the wind farm (see text).
[2]Collision estimates for the consented design are taken from MacArthur Green (2017) and Royal HaskoningDHV *et al.* (2015), with precedent given to the estimate provided in MacArthur Green (2017) in the case of discrepancies between these two sources. MacArthur Green (2017) provides annual collision estimates only (as opposed to estimates for each seasonal period) so that the seasonal estimates in Royal HaskoningDHV *et al.* (2015) are adjusted accordingly in the case of such discrepancies.
[3]Collision estimates for the built design are calculated from the values for the consented design using the wind farm-specific conversion factors provided in MacArthur Green (2017).
[4]The seasonal adjustment is applied because of the differences in the seasonal periods used by MacArthur Green (2015a) and Royal HaskoningDHV *et al.* (2015) and those used in the current assessment (and as advised in the Scoping Opinion).
[5]Collision estimates for the Development and the other Forth and Tay wind farms are derived from the collision risk modelling undertaken for the current assessment and not from MacArthur Green (2017) and Royal HaskoningDHV *et al.* (2015). As such, no adjustment for seasonal period is required (see text).

11B.3.3 Apportioning kittiwake collisions during passage periods

Methods

34 Three seabird colony SPAs were identified as having connectivity to the Development Area and two kilometre buffer on the basis of breeding kittiwake as a qualifying feature – i.e. Forth Islands, Fowlsheugh, and St Abbs Head to Fast Castle (Table 11B.2). As for gannet, the approach taken to estimating the collisions attributable to these SPA kittiwake populations during the autumn and spring passage periods followed that used for apportioning collisions to the Flamborough Head and Filey Coast pSPA kittiwake population in the assessment for the East Anglia THREE wind farm (MacArthur Green 2015b, Royal HaskoningDHV *et al.* 2015). This approach is based upon the BDMPS for kittiwake (Furness 2015).

35 The initial collision estimates for kittiwake at the UK North Sea wind farms during the autumn and spring passage periods are provided in the East Anglia THREE assessment (see Table 3.7 in Royal HaskoningDHV *et al.* 2015). However, these estimates were updated in line with the report on Estimates of Ornithological Headroom in Offshore Wind Farm Collision Mortality (MacArthur Green 2017), which revises the annual estimates on the basis of the differences in the 'as built' and 'as consented' wind farm designs. Where the 'as consented' collision estimate for a wind farm differed between the 'Ornithological Headroom' report and the East Anglia THREE assessment, then the value from the 'Ornithological Headroom' report was used as the basis for the calculation (following the advice provided by SNH – email of 1 November 2017 from MS-LOT to ICOL).

36 For the Development and the other three Forth and Tay wind farms, the collision estimates used were as calculated in the current assessment, using the 2017 design for the Development and the 2014 designs for the other Forth and Tay wind farms (*Appendix 11C*).

37 In addition, the seasonal periods for kittiwake used in the East Anglia THREE assessment differed from those used in the current assessment (and as advised in the Scoping Opinion). Thus, the autumn and spring passage periods were assumed to be August to December and January to April, respectively, in the East Anglia THREE assessment, whilst in the current assessment they were September to December and January to mid-April, respectively. Consequently, the passage collision estimates provided in the East Anglia THREE assessment (and as amended following MacArthur Green 2017) were corrected according to the differences in the assumed lengths of the respective passage periods (e.g. the collision estimates for the autumn passage period were multiplied by 0.80 to account for the shorter period assumed in the current assessment). This correction was not applied to the collision estimates for the Development or the other Forth and Tay wind farms because these had been calculated according to the seasonal periods advised in the Scoping Opinion.

38 The North Sea kittiwake passage populations derive from breeding colonies in Britain and elsewhere in Europe, particularly Russia, Norway and the Faeroe Islands (Furness 2015). For the purposes of this exercise, the population-size estimates for these different colonies and countries are taken from Table 2.2 in MacArthur Green (2015b), as are the proportions of the

adult and sub-adult[6] birds from these populations that are considered to contribute to the North Sea autumn and spring passage populations (with these proportions being derived from Furness (2015) originally). Thus, it is assumed that 60 per cent of the adult kittiwakes from each of the Forth Islands SPA, Fowlsheugh SPA and St Abbs Head to Fast Castle SPA populations occur in the North Sea during both passage periods, whilst 40 per cent of the sub-adults from these SPA populations occur in the North Sea during autumn passage and 30 per cent during spring passage.

39 The number of sub-adult birds associated with each of the breeding populations that contribute to the North Sea passage populations is calculated on the basis of an estimated age structure comprising 53 per cent adults (as derived from a population model), so that the number of sub-adults equates to 89 per cent of the estimated number of breeding adults (Furness 2015, MacArthur Green 2105b). This age structure is a close match to the 55 per cent of adults derived from the SPA-specific population models produced to inform the current assessment (*Appendix 11E*).

40 The kittiwake colony population estimates used in the East Anglia THREE assessment for the three SPAs with connectivity to the Development Area and two kilometre buffer derive from slightly older counts (2012 – 2013) than those provided by SNH as part of their scoping advice. However, these older counts are a closer temporal match to the other count data used in this apportionment exercise and so are retained in the current calculation.

41 As for gannet above, it is assumed that there is even mixing of the birds from the different colonies and populations included in the apportionment calculation, as well as amongst the different age classes, within the UK North Sea. Thus, the autumn and spring passage period collision estimates for each wind farm in the UK North Sea are apportioned to each of the three SPA populations with connectivity to the Development Area and two kilometre buffer according to the proportion of the estimated total passage population represented by each of these SPA populations.

Collision estimates for Forth Islands SPA, Fowlsheugh SPA and St Abbs Head to Fast Castle SPA kittiwake populations during the autumn and spring passage periods

42 The kittiwake collision estimates for the wind farms in the UK North Sea during the autumn and spring passage periods are apportioned to the three SPA populations of interest (i.e. Forth Islands, Fowlsheugh, and St Abbs Head to Fast Castle) according to the proportion of the respective North Sea passage population which is estimated to comprise birds from each of these SPAs (*Table 11B.5*). This is estimated separately for the breeding adult and sub-adult age classes.

43 Based upon these estimated proportions, the estimated numbers of collisions at each wind farm in the UK North Sea for the adult and sub-adult age classes of these three SPA

[6] The term sub-adult is used where no distinction is made between juveniles and immatures.

populations during autumn and spring passage are presented in *Table 11B.6*. These data suggest the following autumn and spring passage collision estimates at each SPA:

- Forth Islands SPA - 3.8 adults and 1.8 sub-adults during autumn passage and 4.0 adults and 1.8 sub-adults during spring passage.
- Fowlsheugh SPA – 9.5 adults and 5.6 sub-adults during autumn passage and 12.0 adults and 5.3 sub-adults during spring passage.
- St Abbs Head to Fast Castle SPA – 3.4 adults and 2.0 sub-adults during autumn passage and 4.4 adults and 1.9 sub-adults during spring passage.

44 During the autumn passage period approximately 30 per cent of these estimated collisions (for both adults and sub-adults) are attributed to the Development and the other Forth and Tay wind farms, whilst during spring passage approximately 14 per cent are attributed to the Development and the other Forth and Tay wind farms (*Table 11B.6*). In contrast to the calculations for apportioning gannet collisions to the Forth Islands SPA during the passage periods (see *Section 11B.3.2*), the approach taken for kittiwake did not allow for the age distributions recorded during the respective baseline surveys (and as based upon plumage characteristics) to be applied to the passage collision estimates which were attributable to the Development and the other Forth and Tay wind farms. This is because the kittiwake apportioning relies on using estimates of the proportion of the different age classes from each breeding population which occur in the North Sea during each passage period.

45 The baseline surveys for the Development recorded 59 percent and 83 per cent of kittiwakes in adult plumage during the autumn and spring passage periods, respectively (*Appendix 11A*). The equivalent values for the other Forth and Tay wind farms ranged from 57 to 72 percent during autumn passage and 79 to 83 per cent during spring passage. However, age distributions as recorded from plumage characteristics will overestimate the proportion of breeding adults (because kittiwakes generally adopt adult plumage before reaching breeding age – *Appendix 11A*), whilst the contribution of the Development and the other Forth and Tay wind farms to the overall collisions apportioned to the three SPAs of interest during the passage periods was limited. Therefore, any underestimation of the passage period collisions apportioned to the Forth Islands SPA, Fowlsheugh SPA and St Abbs Head to Fast Castle SPA populations as a result of using an estimated stable age distribution with 53 per cent adults will be small.

Table 11B.5 The estimated autumn and spring passage populations of kittiwakes in the North Sea, with the proportional contributions of the Forth Islands SPA, Fowlsheugh SPA and St Abbs Head to Fast Castle SPA populations (after MacArthur Green 2015b)

Passage period	Age class	Number of individuals (with percentage of total North Sea population (adults plus sub-adults) represented by each SPA population age class)			
		North Sea	Forth Islands SPA	Fowlsheugh SPA	St Abbs Head to Fast Castle SPA
Autumn	Adults	480,815	3,720 (0.45%)	11,204 (1.35%)	4,084 (0.49%)
	sub-adults	349,028	2,182 (0.26%)	6,571 (0.79%)	2,395 (0.29%)
Spring	Adults	375,815	3,720 (0.59%)	11,204 (1.78%)	4,084 (0.65%)
	sub-adults	251,944	1,637 (0.26%)	4,928 (0.79%)	1,796 (0.29%)

Table 11B.6 The apportionment of kittiwake collisions estimated at UK North Sea wind farms to the Forth Islands SPA, Fowlsheugh SPA and St Abbs Head to Fast Castle SPA populations during the autumn and spring passage periods. The SPA collisions are presented according to age class (Ad = adults, Sub = sub-adults).

Wind farm	Estimated number of collisions during autumn passage[1]									Estimated number of collisions during spring passage[1]								
	Consented design[2]	Built design[3]	After seasonal adjustment[4]	Forth Islands		Fowlsheugh		St Abbs Head to Fast Castle		Consented design[2]	Built design[3]	After seasonal adjustment[4]	Forth Islands		Fowlsheugh		St Abbs Head to Fast Castle	
				Ad	Sub	Ad	Sub	Ad	Sub				Ad	Sub	Ad	Sub	Ad	Sub
Greater Gabbard	15.0	16.0	12.8	0.06	0.03	0.17	0.10	0.06	0.04	11.4	12.1	10.6	0.06	0.03	0.19	0.08	0.07	0.03
Gunfleet Sands	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
Kentish Flats Extension	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
Lincs	1.2	1.2	1.0	0.00	0.00	0.01	0.01	0.00	0.00	0.9	0.9	0.8	0.00	0.00	0.01	0.01	0.01	0.00
London Array	2.3	0.9	0.7	0.00	0.00	0.01	0.01	0.00	0.00	1.8	0.7	0.6	0.00	0.00	0.01	0.00	0.00	0.00
Lynn and Inner Dowsing	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
Scroby Sands	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
Sheringham Shoal	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
Teesside	25.0	17.0	13.6	0.06	0.04	0.18	0.11	0.07	0.04	15.0	10.6	9.3	0.06	0.02	0.17	0.07	0.06	0.03
Thanet	0.4	0.2	0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.4	0.2	0.2	0.00	0.00	0.00	0.00	0.00	0.00
Humber Gateway	3.2	1.3	1.0	0.00	0.00	0.01	0.01	0.00	0.00	2.6	1.0	0.9	0.01	0.00	0.02	0.01	0.01	0.00
Westernmost Rough	0.2	0.2	0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.2	0.2	0.2	0.00	0.00	0.00	0.00	0.00	0.00
Beatrice	10.7	5.9	4.7	0.02	0.01	0.06	0.04	0.02	0.01	39.8	21.9	19.2	0.11	0.05	0.34	0.15	0.12	0.05

Wind farm	Estimated number of collisions during autumn passage[1]									Estimated number of collisions during spring passage[1]								
	Consented design[2]	Built design[3]	After seasonal adjustment[4]	Forth Islands		Fowlsheugh		St Abbs Head to Fast Castle		Consented design[2]	Built design[3]	After seasonal adjustment[4]	Forth Islands		Fowlsheugh		St Abbs Head to Fast Castle	
				Ad	Sub	Ad	Sub	Ad	Sub				Ad	Sub	Ad	Sub	Ad	Sub
Blyth Demonstrator	2.3	2.3	1.8	0.01	0.00	0.02	0.01	0.01	0.01	1.8	1.8	1.5	0.01	0.00	0.03	0.01	0.01	0.00
Creyke Beck A	58.5	58.5	46.8	0.21	0.12	0.63	0.37	0.23	0.14	154	154.0	134.8	0.80	0.35	2.41	1.06	0.88	0.39
Creyke Beck B	78.2	78.2	62.5	0.28	0.16	0.84	0.50	0.31	0.18	205.7	205.7	180.0	1.07	0.47	3.21	1.41	1.17	0.52
Dudgeon	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
East Anglia ONE	136.9	61.5	49.2	0.22	0.13	0.66	0.39	0.24	0.14	71.0	18.0	15.8	0.09	0.04	0.28	0.12	0.10	0.05
EOWDC	5.9	4.5	3.6	0.02	0.01	0.05	0.03	0.02	0.01	1.1	0.8	0.7	0.00	0.00	0.01	0.01	0.00	0.00
Galloper	27.8	11.7	9.3	0.04	0.02	0.13	0.07	0.05	0.03	31.8	13.3	11.7	0.07	0.03	0.21	0.09	0.08	0.03
Hornsea P1	54.2	32.2	25.8	0.12	0.07	0.35	0.20	0.13	0.07	24.7	14.8	12.9	0.08	0.03	0.23	0.10	0.08	0.04
Moray Firth	2.1	2.1	1.7	0.01	0.00	0.02	0.01	0.01	0.00	35.0	19.3	16.9	0.10	0.04	0.30	0.13	0.11	0.05
Race Bank	23.9	14.2	11.3	0.05	0.03	0.15	0.09	0.06	0.03	5.6	3.3	2.9	0.02	0.01	0.05	0.02	0.02	0.01
Rampion	37.4	25.6	20.5	0.09	0.05	0.28	0.16	0.10	0.06	29.7	20.3	17.8	0.11	0.05	0.32	0.14	0.12	0.05
Teesside A	65.1	65.1	52.1	0.23	0.14	0.70	0.41	0.26	0.15	39.9	39.9	34.9	0.21	0.09	0.62	0.27	0.23	0.10
Teesside B	100.1	100.1	80.1	0.36	0.21	1.08	0.63	0.39	0.23	61.4	61.4	53.7	0.32	0.14	0.96	0.42	0.35	0.15
Triton Knoll	138.9	47.2	37.7	0.62	0.10	0.51	0.30	0.19	0.11	50.2	17.1	14.9	0.09	0.04	0.27	0.12	0.10	0.04
Hornsea P2	8.4	8.4	6.7	0.13	0.02	0.09	0.05	0.03	0.02	19.0	5.7	5.0	0.03	0.01	0.09	0.04	0.03	0.01

Wind farm	Estimated number of collisions during autumn passage[1]									Estimated number of collisions during spring passage[1]								
	Consented design[2]	Built design[3]	After seasonal adjustment[4]	Forth Islands		Fowlsheugh		St Abbs Head to Fast Castle		Consented design[2]	Built design[3]	After seasonal adjustment[4]	Forth Islands		Fowlsheugh		St Abbs Head to Fast Castle	
				Ad	Sub	Ad	Sub	Ad	Sub				Ad	Sub	Ad	Sub	Ad	Sub
East Anglia THREE	69.0	69.0	55.2	0.40	0.15	0.75	0.44	0.27	0.16	49.0	37.6	32.9	0.19	0.09	0.59	0.26	0.21	0.09
Inch Cape[5]	26.0	26.0	26.0	0.12	0.07	0.35	0.21	0.13	0.08	6.0	6.0	6.0	0.04	0.02	0.11	0.05	0.04	0.02
Neart na Gaoithe[5]	33.0	33.0	33.0	0.15	0.09	0.45	0.26	0.16	0.10	3.0	3.0	3.0	0.02	0.01	0.05	0.02	0.02	0.01
Seagreen Alpha[5]	116.0	116.0	116.0	0.42	0.24	1.25	0.73	0.46	0.27	43.0	43.0	43.0	0.22	0.10	0.67	0.30	0.24	0.11
Seagreen Bravo[5]	64.0	64.0	64.0	0.23	0.13	0.69	0.41	0.25	0.15	56.0	56.0	56.0	0.29	0.13	0.87	0.38	0.32	0.14

[1]Collision estimates for each age class of each SPA population are calculated by applying the percentage values from *Table 11B.5* to the seasonally adjusted wind farm estimate.
[2]Collision estimates for the consented design are taken from MacArthur Green (2017) and Royal HaskoningDHV *et al.* (2015), with precedent given to the estimate provided in MacArthur Green (2017) in the case of discrepancies between these two sources. MacArthur Green (2017) provides annual collision estimates only (as opposed to estimates for each seasonal period) so that the seasonal estimates in Royal HaskoningDHV *et al.* (2015) are adjusted accordingly in the case of such discrepancies.
[3]Collision estimates for the built design are calculated from the values for the consented design using the wind farm-specific conversion factors provided in MacArthur Green (2017).
[4]The seasonal adjustment is applied because of the differences in the seasonal periods used by MacArthur Green (2015b) and Royal HaskoningDHV *et al.* (2015) and those used in the current assessment (and as advised in the Scoping Opinion).
[5]Collision estimates for the Development and the other Forth and Tay wind farms are derived from the collision risk modelling undertaken for the current assessment and not from MacArthur Green (2017) and Royal HaskoningDHV *et al.* (2015). As such, no adjustment for seasonal period is required (see text).

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Annex 11B.1: Data used to calculate apportionment estimates for SPA breeding colonies

Inch Cape – gannet

Gannet Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea		SNHWeighting	SNH prop
Forth Islands	150,518	53	2809	0.4048	0.5952	0.9210	11.6547	0.6606	2009	7.0909	0.9959
Gamrie and Pennan	12,912	173	29929	0.6942	0.3058	0.0790	1.0939	0.3394	2010	0.0293	0.0041
Sum	163,430	226	32738	1.0991	0.9009	1.0000	12.7485	1.0000		7.1203	1.0000

Inch Cape – kittiwake

Kittiwake Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop	Stage 2 adj - correct SPAs using most recent SPA counts
Forth Islands	11,594	40	1,600.00	0.5283	0.4717	0.096817	28.49125	0.066462	2001	0.183332	0.132264	**0.2102**
Fowlsheugh	37,600	49	2,401.00	0.532662	0.4673	0.313982	18.98626	0.06585	2000	0.392554	0.283207	**0.2874**
St Abbs Head to Fast Castle	32,444	64	4,096.00	0.548817	0.4512	0.270927	11.12939	0.063574	2000	0.19169	0.138294	**0.0562**
SPA Total	**81,638**										**0.553765**	
Burn of Daff	900	61	3,721.00	0.515893	0.4841	0.007516	12.25101	0.068213	1999	0.006281	0.004531	
Catterline to Inv	6,136	41	1,681.00	0.545729	0.4543	0.051239	27.11838	0.064009	1999	0.088942	0.064167	
Dunbar Coast & Harbour	2,382	57	3,249.00	0.47723	0.5228	0.019891	14.03078	0.07366	2000	0.020558	0.014831	
Eyemouth to Burnmouth	5,032	71	5,041.00	0.573243	0.4268	0.04202	9.043047	0.060132	2000	0.02285	0.016485	
Findon Ness - Hare Ness	2,284	65	4,225.00	0.525122	0.4749	0.019073	10.79	0.066912	1999	0.01377	0.009934	
Girdle Ness to Hare Ness	2,790	70	4,900.00	0.530526	0.4695	0.023298	9.303265	0.066151	1999	0.014338	0.010344	
Montrose to Lunnan Bay	768	25	625.00	0.494889	0.5051	0.006413	72.9376	0.071172	2000	0.033292	0.024018	
Newton Hill	16	57	3,249.00	0.51309	0.4869	0.000134	14.03078	0.068608	2002	0.000129	9.28E-05	
Newton Hill - Hall Bay	1,576	60	3,600.00	0.512623	0.4874	0.013161	12.66278	0.068673	1999	0.011444	0.008256	
St Abbs to Eyemouth	2	66	4,356.00	0.580835	0.4192	1.67E-05	10.46511	0.059062	2000	1.03E-05	7.45E-06	
Stonehaven to wine cove	11,612	49	2,401.00	0.533	0.4670	0.096967	18.98626	0.065802	1999	0.121145	0.087399	
Whiting Ness to Ethie Haven SSSI	4,616	21	441.00	0.491	0.5090	0.038546	103.3696	0.07172	2000	0.285771	0.206168	
Non-SPA Total	**38,114**										**0.446235**	
Sum	119,752	796	45586	7.902976	7.097024	1	373.5951	1		1.39	1.00	

Colony counts taken from either JNCC SMP database (http://jncc.defra.gov.uk/smp/) or SB2K database (http://jncc.defra.gov.uk/files/Seabird%202000.zip)

nb/ Stonehaven to Wine Cove is referred to as Crawton - Stonehaven (Fowlsheugh)

nb/ Fowlsheugh SPA is comprised of sites Fowlsheugh 2-5 & Trollochy Cove

Kittiwake Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop
Forth Islands	9,326	40	1,600.00	0.5283	0.4717	0.264163	5.060625	0.339291		0.453574	0.379617
Fowlsheugh	19,310	49	2,401.00	0.532662	0.4673	0.546964	3.372345	0.336165		0.620072	0.518967
St Abbs Head to Fast Castle	6,668	64	4,096.00	0.548817	0.4512	0.188874	1.976807	0.324544		0.121174	0.101416
	35,304	**153**	**8,097**	**1.61**	**1.39**	**1.00**	**10.41**	**1.00**		**1.19**	

Inch Cape – herring gull

Herring gull Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop	Stage 2 adj - correct SPAs using most recent SPA counts
Forth Islands	13174	40	1,600.00	0.52338	0.47662	0.392878	46.86938	0.038671	2001	0.712078	0.438924	0.4555
Fowlsheugh	670	49	2,401.00	0.532883	0.467117	0.019981	31.23324	0.0379		0.023652	0.014579	0.0057
St Abbs Head to Fast Castle	1294	64	4,096.00	0.546917	0.453083	0.03859	18.30835	0.036761		0.025972	0.016009	0.0084
SPA Total	**15,138**										**0.469512**	
Aberdeen City	6,700	73	5,329.00	0.475217	0.524783	0.199809	14.07225	0.042578		0.11972	0.073795	
Border to Burnmouth	32	65	4,225.00	0.561913	0.438087	0.000954	17.74935	0.035544		0.000602	0.000371	
Cunmount Quarry	8	38	1,444.00	0.377193	0.622807	0.000239	51.93283	0.050531		0.000626	0.000386	
Dundee	592	47	2,209.00	0.320483	0.679517	0.017655	33.94794	0.055133		0.033043	0.020368	
Dunbar Coast/Harbour	92	57	3,249.00	0.48001	0.51999	0.002744	23.08126	0.042189		0.002672	0.001647	
Burn of Daff	400	61	3,721.00	0.516258	0.483742	0.011929	20.15345	0.039248	1999	0.009436	0.005816	
Catterline to Inv	3402	41	1,681.00	0.545574	0.454426	0.101455	44.61095	0.03687	1999	0.166874	0.102861	
St Abbs to Eyemouth	398	68	4,624.00	0.581308	0.418692	0.011869	16.21778	0.033971		0.006539	0.004031	
Eyemouth to Burnmouth	166	71	5,041.00	0.573947	0.426053	0.00495	14.87622	0.034568	2000	0.002546	0.001569	
Findon Ness - Hare Ness	88	65	4,225.00	0.525397	0.474603	0.002624	17.74935	0.038507	1999	0.001794	0.001106	
Fife Ness to St Andrews	2	39	1,521.00	0.452704	0.547296	5.96E-05	49.30375	0.044405		0.000131	8.05E-05	
Girdle Ness to Hare Ness	338	70	4,900.00	0.531202	0.468798	0.01008	15.30429	0.038036	1999	0.005868	0.003617	
Inverbervie to St Cyrus	14	33	1,089.00	0.517716	0.482284	0.000418	68.86226	0.03913		0.001125	0.000693	
Kirkaldy	20	73	5,329.00	0.214897	0.785103	0.000596	14.07225	0.063699		0.000535	0.00033	
Transco Installations and Birse	2	66	4,356.00	0.294146	0.705854	5.96E-05	17.21556	0.057269		5.88E-05	3.62E-05	
Newton Hill	510	68	4,624.00	0.513489	0.486511	0.015209	16.21778	0.039473		0.009737	0.006002	
Newton Hill - Hall Bay	254	60	3,600.00	0.513025	0.486975	0.007575	20.83083	0.039511	1999	0.006234	0.003843	
Crawton to Catterline	1452	47	2,209.00	0.546807	0.453193	0.043302	33.94794	0.03677		0.054052	0.033318	
Stonehaven to wine cove	1804	49	2,401.00	0.533	0.467	0.053799	31.23324	0.03789	1999	0.063668	0.039245	
Montrose to Lunan Bay	852	26	676.00	0.495906	0.504094	0.025409	110.9334	0.0409		0.115282	0.07106	
Lunan Bay to Arborath	1268	21	441.00	0.50149	0.49851	0.037815	170.0476	0.040447	2000	0.260083	0.160315	
Non-SPA Total	**18,394**										**0.530488**	
Sum	33,532	1291	74,991.00	11.67486	12.32514	1	898.7713	1		1.62	1.00	

Colony counts taken from either JNCC SMP database (http://jncc.defra.gov.uk/smp/) or SB2K database (http://jncc.defra.gov.uk/files/Seabird%202000.zip)

nb/ Stonehaven to Wine Cove is referred to as Crawton - Stonehaven (Fowlsheugh)

nb/ Fowlsheugh SPA is comprised of sites Fowlsheugh 2-5 & Trollochy Cove

Herring gull Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop
Forth Islands	13,160	40	1,600.00	0.52338	0.47662	0.935989	5.060625	0.341218		1.616242	0.970169
Fowlsheugh	250	49	2,401.00	0.532883	0.467117	0.017781	3.372345	0.334415		0.020053	0.012037
St Abbs Head to Fast Castle	650	64	4,096.00	0.546917	0.453083	0.04623	1.976807	0.324367		0.029643	0.017794
	14,060	**153**	**8,097**	**1.60**	**1.40**	**1.00**	**10.41**	**1.00**		**1.67**	

Inch Cape – guillemot

Guillemot Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop	Stage 2 adj - correct SPAs using most recent SPA counts
Forth Islands	36369	40	1,600.00	0.449052	0.550948	0.193262	31.91313	0.088794	2001	0.547644	0.359916	0.3500
Fowlsheugh	68526	49	2,401.00	0.538278	0.461722	0.364142	21.26656	0.074414	2000	0.576262	0.378724	0.3769
St Abbs Head to Fast Castle	43744	64	4,096.00	0.510264	0.489736	0.232452	12.46606	0.078929	2000	0.228716	0.150314	0.1528
Buchan Ness to Collieston Coast	29362	105	11,025.00	0.703487	0.296513	0.156027	4.631383	0.047788		0.034532	0.022695	0.0319
SPA Total	**178,001**										**0.911648**	
Burn of Daff	37	61	3,721.00	0.558621	0.441379	0.000197	13.72239	0.071135	1999	0.000192	0.000126	
Catterline to Inv	2884	41	1,681.00	0.533174	0.466826	0.015325	30.37537	0.075236	1999	0.035023	0.023018	
Eyemouth to Burnmouth	892	71	5,041.00	0.564835	0.435165	0.00474	10.12914	0.070134	2000	0.003367	0.002213	
Inchkeith	48	77	5,929.00	0.21	0.79	0.000255	8.612076	0.127321		0.00028	0.000184	
Findon Ness - Hare Ness	422	65	4,225.00	0.578374	0.421626	0.002242	12.08544	0.067952	1999	0.001842	0.00121	
Girdle Ness to Hare Ness	75	70	4,900.00	0.59172	0.40828	0.000399	10.42061	0.065801	1999	0.000273	0.00018	
Newton Hill - Hall Bay	61	60	3,600.00	0.55394	0.44606	0.000324	14.18361	0.071889	1999	0.000331	0.000217	
Stonehaven to wine cove	4763	49	2,401.00	0.533	0.467	0.02531	21.26656	0.075264	1999	0.040512	0.026625	
Lunan Bay to Arborath - Whiting Nes	1002	21	441.00	0.470453	0.529547	0.005325	115.7846	0.085345	2000	0.052615	0.034579	
Non-SPA Total	**10,184**										**0.088352**	
Sum	188,185	773	51,061.00	6.795199	6.204801	1	306.8569	1		1.52	1.00	

Colony counts taken from either JNCC SMP database (http://jncc.defra.gov.uk/smp/) or SB2K database (http://jncc.defra.gov.uk/files/Seabird%202000.zip)
nb/ Stonehaven to Wine Cove is referred to as Crawton - Stonehaven (Fowlsheugh)
nb/ Fowlsheugh SPA is comprised of sites Fowlsheugh 2-5 & Trollochy Cove

Guillemot Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop
Forth Islands	28,786	40	1,600.00	0.449052	0.550948	0.186763	11.95125	0.306266		0.683602	0.383899
Fowlsheugh	55,507	49	2,401.00	0.538278	0.461722	0.360129	7.964182	0.256666		0.736153	0.41341
St Abbs Head to Fast Castle	36,206	64	4,096.00	0.510264	0.489736	0.234904	4.668457	0.272239		0.298548	0.167659
Buchan Ness to Collieston Coast	33,632	105	11,025.00	0.703487	0.296513	0.218204	1.734422	0.164829		0.062381	0.035032
	154,131	**258**	**19,122**	**2.20**	**1.80**	**1.00**	**26.32**	**1.00**		**1.78**	

Inch Cape – razorbill

Razorbill Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop	Stage 2 adj - correct SPAs using most recent SPA counts
Forth Islands	4678	40	1,600.00	0.598141	0.401859	0.316852	13.705	0.085529	2001	0.371405	0.308922	0.3189
Fowlsheugh	6362	49	2,401.00	0.534342	0.465658	0.430913	9.132861	0.099107	2000	0.390034	0.324416	0.3145
SPA Total	**11,040**										**0.633338**	
Burn of Daff	54	61	3,721.00	0.518827	0.481173	0.003658	5.89304	0.10241	1999	0.002207	0.001836	
Catterline to Inv	1962	41	1,681.00	0.543248	0.456752	0.132891	13.04462	0.097212	1999	0.168518	0.140167	
Crawton to Catterline	398	47	2,209.00	0.548471	0.451529	0.026957	9.926664	0.0961	2000	0.025716	0.02139	
Montrose to Lunan Bay	4	25	625.00	0.496074	0.503926	0.000271	35.0848	0.107252		0.001019	0.000848	
Newton Hill	58	57	3,249.00	0.515161	0.484839	0.003928	6.749154	0.10319		0.002736	0.002276	
Newton Hill - Hall Bay	112	60	3,600.00	0.515051	0.484949	0.007586	6.091111	0.103213	1999	0.004769	0.003967	
Stonehaven to wine cove	578	49	2,401.00	0.533	0.467	0.039149	9.132861	0.099393	1999	0.035537	0.029559	
Lunan Bay to Arbroath	558	21	441.00	0.499163	0.500837	0.037795	49.72336	0.106595	2000	0.200321	0.16662	
Non-SPA Total	**3,724**										**0.366662**	
Sum	14,764	450	21,928.00	5.301479	4.698521	1	158.4835	1		1.20	1.00	

Colony counts taken from either JNCC SMP database (http://jncc.defra.gov.uk/smp/) or SB2K database (http://jncc.defra.gov.uk/files/Seabird%202000.zip)
nb/ Stonehaven to Wine Cove is referred to as Crawton - Stonehaven (Fowlsheugh)
nb/ Fowlsheugh SPA is comprised of sites Fowlsheugh 2-5 & Trollochy Cove

Razorbill Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop
Forth Islands	5,815	40	1,600.00	0.598141	0.401859	0.439166	2.500625	0.463229		0.508713	0.503496
Fowlsheugh	7,426	49	2,401.00	0.534342	0.465658	0.560834	1.666389	0.536771		0.501649	0.496504
	13,241	**89**	**4,001**	**1.13**	**0.87**	**1.00**	**4.17**	**1.00**		**1.01**	

Inch Cape – puffin

Puffin Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop		Stage 2 adj - correct SPAs using most recent SPA counts
Forth Islands	140868	40	1,600.00	0.413622	0.586378	0.541446	44.66438	0.081323	2001	1.96666	0.908249		0.9005
Farne Is	111348	103	10,609.00	0.630319	0.369681	0.427982	6.736073	0.05127	2000	0.147807	0.06826		0.0760
SPA Total	**252,216**										**0.976509**		
Buchan Ness to Collieston SPA	2,484	105	11,025.00	0.723648	0.276352	0.009548	6.481905	0.038326		0.002372	0.001095		
Fowlsheugh SPA	100	49	2,401.00	0.581235	0.418765	0.000384	29.76385	0.058077		0.000664	0.000307		
Inchcomb	80	84	7,056.00	0.55	0.45	0.000307	10.12798	0.062409		0.000194	8.98E-05		
Burn of Daff	40	61	3,721.00	0.60106	0.39894	0.000154	19.20532	0.055328	1999	0.000163	7.54E-05		
Catterline to Inv	688	41	1,681.00	0.559098	0.440902	0.002644	42.5122	0.061147	1999	0.006874	0.003175		
Eyemouth to Burnmouth	42	71	5,041.00	0.535299	0.464701	0.000161	14.17635	0.064448	2000	0.000147	6.81E-05		
Inchkeith	3282	77	5,929.00	0.21	0.79	0.012615	12.05313	0.109563		0.016659	0.007693		
Findon Ness - Hare Ness	206	65	4,225.00	0.618776	0.381224	0.000792	16.91432	0.052871	1999	0.000708	0.000327		
Girdle Ness to Hare Ness	6	70	4,900.00	0.631833	0.368167	2.31E-05	14.58429	0.05106	1999	1.72E-05	7.93E-06		
Newton Hill	34	68	4,624.00	0.593626	0.406374	0.000131	15.4548	0.056359		0.000114	5.26E-05		
Newton Hill - Hall Bay	6	60	3,600.00	0.596816	0.403184	2.31E-05	19.85083	0.055916	1999	2.56E-05	1.18E-05		
Crawton to Catterline	180	47	2,209.00	0.573082	0.426918	0.000692	32.35084	0.059208		0.001325	0.000612		
Stonehaven to wine cove	426	49	2,401.00	0.533	0.467	0.001637	29.76385	0.064767	1999	0.003156	0.001458		
Lunan Bay to Arborath	380	21	441.00	0.438093	0.561907	0.001461	162.0476	0.077929	2000	0.018445	0.008518		
Non-SPA Total	**7,954**										**0.023491**		
Sum	260,170	1011	71,463.00	8.789509	7.210491	1	476.6877	1		2.17	1.00		

Colony counts taken from either JNCC SMP database (http://jncc.defra.gov.uk/smp/) or SB2K database (http://jncc.defra.gov.uk/files/Seabird%202000.zip)

nb/ Stonehaven to Wine Cove is referred to as Crawton - Stonehaven (Fowlsheugh)

nb/ Fowlsheugh SPA is comprised of sites Fowlsheugh 2-5 & Trollochy Cove

Puffin Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop
Forth Islands	90,010	40	1,600.00	0.413622	0.586378	0.529676	7.630625	0.613329		2.478927	0.922146
Farne Is	79,924	103	10,609.00	0.630319	0.369681	0.470324	1.150815	0.386671		0.209288	0.077854
	169,934	**143**	**12,209**	**1.04**	**0.96**	**1.00**	**8.78**	**1.00**		**2.69**	

Neart na Gaoithe – gannet

Gannet Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea		SNHWeighting	SNH prop
Forth Islands	150,518	31944.47894	1020449735	0.40483	0.59517	0.920994	35.50	0.66		21.59649	0.998724
Gamrie and Pennan	12,912	187620.532	35201464011	0.694233	0.305767	0.079006	1.03	0.34		0.027591	0.001276
	163,430	219,565	36,221,913,746	1.099	0.901	1.000	36.525	1.000	0.000	21.624	1.000

Neart na Gaoithe – kittiwake

Kittiwake Colony Name	Pop (pairs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop	Stage 2 adj - correct SPAs using most recent SPA counts
Forth Islands	5797	21075.52	444177474	0.528315	0.47168457	0.171951	54.3906	0.08561		0.800672	0.45986	**0.679**
St Abb's Head to Fast Castle	16222	38572.15	1487810542	0.568421	0.43157883	0.481179	16.23801	0.078331		0.612031	0.351515	**0.133**
	22019										0.811375	
Berwick to Scottish Border	1527	54271.88	2945437114	0.552683	0.44731731	0.045294	8.202204	0.081187		0.030162	0.017323	
Catterline to Inverbervie	3068	66466.79	4417833537	0.545729	0.45427121	0.091003	5.468535	0.08245		0.041032	0.023566	
Dunbar Coast	1060	33844.36	1145440480	0.47723	0.52276977	0.031442	21.09152	0.094882		0.062922	0.036139	
Dunbar Harbour	131	33454.75	1119220398	0.482772	0.51722821	0.003886	21.58563	0.093876		0.007874	0.004522	
Eyemouth to Burnmouth	2516	46881.59	2197883507	0.573243	0.42675729	0.07463	10.99197	0.077456		0.063539	0.036493	
Forth Islands - Bass Rock to Haystack	465	67963.02	4618972722	0.184084	0.81591648	0.013793	5.230401	0.148088		0.010683	0.006136	
Lunan Bay to Arbroath	2542	40334.13	1626842362	0.502116	0.49788351	0.075401	14.85029	0.090365		0.101185	0.058115	
Montrose to Lunan Bay	384	47902.56	2294655698	0.494889	0.50511061	0.01139	10.52841	0.091677		0.010994	0.006314	
St Abbs to Eyemouth	1	43137.03	1860803504	0.580835	0.41916462	2.97E-05	12.98314	0.076078		2.93E-05	1.68E-05	
	11694										**0.188625**	
	33713	493903.8	2.4159E+10	5.490318	5.5096824	1	181.5607	1		1.741123	1	

Kittiwake Colony Name	Pop (pairs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop
Forth Islands	4663	21075.52	444177474	0.528315	0.47168457	0.583094	4.349586	0.5222		1.324413	0.836605
St Abb's Head to Fast Castle	3334	38572.15	1487810542	0.568421	0.43157883	0.416906	1.298544	0.4778		0.258667	0.163395
	7997	**59647.67**	**1931988016**	**1.096737**	**0.9032634**	**1**	**5.64813**	**1**		**1.58308**	**1**

Neart na Gaoithe – herring gull

Herring gull Colony Name	Pop (pairs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop	Stage 2 adj - correct SPAs using most recent SPA counts
Forth Islands	6587	21075.51836	444177474	0.52338	0.47662	0.403739	123.4764	0.04291		2.139176	0.804352	**0.817**
Fowlsheugh	335	73403.71434	5388105280	0.530268	0.469732	0.020533	10.17899	0.04229		0.008839	0.003324	**0.001**
St Abb's Head to Fast Castle	647	38572.14723	1487810542	0.567119	0.432881	0.039657	36.8632	0.038972		0.056973	0.021422	**0.011**
	7569										0.829098	
Berwick to Scottish Border	82	54271.88143	2945437114	0.555143	0.444857	0.005026	18.62048	0.040051		0.003748	0.001409	
Berwick upon Tweed	246	57493.92045	3305550889	0.534337	0.465663	0.015078	16.59192	0.041924		0.010488	0.003944	
Border to Burnmouth	16	50819.44354	2582615841	0.561913	0.438087	0.000981	21.2364	0.039441		0.000821	0.000309	
Catterline to Inverbervie	1701	66466.78521	4417833537	0.545574	0.454426	0.10426	12.41456	0.040912		0.052954	0.019911	
Crawton to Catterline	726	70885.33866	5024731237	0.546807	0.453193	0.044499	10.9151	0.040801		0.019818	0.007452	
Cunmont Quarry	4	45966.75344	2112942422	0.377193	0.622807	0.000245	25.95691	0.056072		0.000357	0.000134	
Dunbar Coast	11	33844.35669	1145440480	0.474283	0.525717	0.000674	47.88154	0.047331		0.001528	0.000575	
Dunbar Harbour	35	33454.7515	1119220398	0.48001	0.51999	0.002145	49.00326	0.046815		0.004921	0.001851	
Dundee	296	49704.00987	2470488597	0.320483	0.679517	0.018143	22.20024	0.061177		0.024641	0.009265	
Eyemouth to Burnmouth	83	46881.59027	2197883507	0.573947	0.426053	0.005087	24.95376	0.038358		0.004869	0.001831	
Fidra, The Lamb and Eyebroughy Islands	7	41562.60532	1727450161	0.353866	0.646134	0.000429	31.74937	0.058172		0.000792	0.000298	
Fife Ness to St Andrews	1	32344.96524	1046196776	0.452704	0.547296	6.13E-05	52.42365	0.049273		0.000158	5.95E-05	
Forth Islands - Bass Rock to Haystack	4262	67963.02467	4618972722	0.184317	0.815683	0.261232	11.87395	0.073436		0.227789	0.085651	
Inverbervie to St Cyrus	7	58371.72202	3407257932	0.517716	0.482284	0.000429	16.09665	0.04342		0.0003	0.000113	
Kirkcaldy Town Centre	10	60175.0361	3621034970	0.214897	0.785103	0.000613	15.14635	0.070683		0.000656	0.000247	
Lunan Bay to Arbroath	634	40334.13395	1626842362	0.50149	0.49851	0.03886	33.71282	0.044881		0.058798	0.022109	
Montrose to Lunan Bay	426	47902.56463	2294655698	0.495906	0.504094	0.026111	23.90139	0.045384		0.028323	0.01065	
St Abbs to Eyemouth	199	43137.0317	1860803504	0.581308	0.418692	0.012197	29.47407	0.037695		0.013552	0.005096	
	8746										0.170902	
	16315	1034631.295	54845451441	9.892662	11.10734	1	634.671	1	0	2.659503	1	

Herring gull Colony Name	Pop (pairs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop
Forth Islands	6,580	21075.51836	444177474	0.52338	0.47662	0.935989	16.48	0.35		5.330468	0.99
Fowlsheugh	125	73403.71434	5388105280	0.530268	0.469732	0.017781	1.36	0.34		0.008227	0.00
St Abbs Head to Fast Castle	325	38572.14723	1487810542	0.567119	0.432881	0.04623	4.92	0.31		0.071388	0.01
	7,030	133,051	7,320,093,296	2	1.38	1.00	22.76	1.00	0.00	5.41	1.00

Neart na Gaoithe – guillemot

Guillemot Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop	Stage 2 adj - correct SPAs using most recent SPA counts
Forth Islands	36369	21076	444177474	0.4490525	0.55095	0.18906	190.2999	0.069558		2.50257	0.664727	**0.6570**
Fowlsheugh	68526	73404	5388105280	0.549245	0.45076	0.356225	15.68769	0.056909		0.318025	0.084473	**0.0854**
St Abb's Head to Fast Castle	43744	38572	1487810542	0.5317661	0.46823	0.227399	56.81297	0.059115		0.763721	0.202858	**0.2097**
	148639										**0.952058**	
Farne Islands	31117	80803	6529044634	0.6224262	0.37757	0.161759	12.9463	0.047669		0.099828	0.026516	
Berwick to Scottish Border	45	54272	2945437114	0.5666712	0.43333	0.000234	28.69759	0.054708		0.000367	9.76E-05	
Burn of Daff	37	85724	7348655158	0.5586209	0.44138	0.000192	11.50237	0.055725		0.000123	3.27E-05	
Catterline to Inverbervie	2884	66467	4417833537	0.5331736	0.46683	0.014992	19.13312	0.058938		0.016906	0.004491	
Crawton - Stonehaven (Fowlsheugh)	4763	74947	5617010539	0.5358857	0.46411	0.02476	15.04839	0.058595		0.021832	0.005799	
Crawton to Catterline	2002	70885	5024731237	0.5384334	0.46157	0.010407	16.82218	0.058273		0.010202	0.00271	
Eyemouth to Burnmouth	892	46882	2197883507	0.564835	0.43517	0.004637	38.45834	0.05494		0.009798	0.002602	
Farne Islands - Inner Group	210	79629	6340734502	0.6068206	0.39318	0.001092	13.33078	0.049639		0.000722	0.000192	
Farne Islands - Outer Group	170	80168	6426920321	0.6333914	0.36661	0.000884	13.15201	0.046285		0.000538	0.000143	
Findon Ness - Hare Ness	422	90079	8114301504	0.5783744	0.42163	0.002194	10.41703	0.053231		0.001216	0.000323	
Forth Islands - Bass Rock to Haystack	48	67963	4618972722	0.1944945	0.80551	0.00025	18.29994	0.101696		0.000464	0.000123	
Girdle Ness to Hare Ness	75	94090	8852887029	0.5917198	0.40828	0.00039	9.547952	0.051546		0.000192	5.1E-05	
Lunan Bay to Arbroath	1002	40334.13395	1626842362	0.4704527	0.52955	0.005209	51.95767	0.066856		0.018094	0.004806	
Newtonhill - Hall Bay	61	84531.60821	7145592786	0.5539401	0.44606	0.000317	11.82924	0.056316		0.000211	5.61E-05	
	43728										0.047942	
	192367	1149825.266	84526940246	9.079303	7.9207	1	533.9435	1	0	3.76481	1	

Guillemot Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop
Forth Islands	28,786	21076	444177474	0.4490525	0.55095	0.23889	16.48	0.37		1.475603	0.69
Fowlsheugh	55,507	73404	5388105280	0.549245	0.45076	0.460643	1.36	0.31		0.191905	0.09
St Abbs Head to Fast Castle	36,206	38572	1487810542	0.5317661	0.46823	0.300467	4.92	0.32		0.470902	0.22
	120,499	**133,051**	**7,320,093,296**	**2**	**1.47**	**1.00**	**22.76**	**1.00**		**2.14**	**1.00**

Neart na Gaoithe – razorbill

Razorbill Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop	Stage 2 adj - correct SPAs using most recent SPA counts
Forth Islands	4678	21075.52	444177474	0.598141	0.401859	0.530265	24.75769	0.147001		1.929854	0.785275	**0.8565**
St Abb's Head to Fast Castle	3157	38572.15	1487810542	0.574818	0.425182	0.357855	7.391268	0.155533		0.411386	0.167397	**0.0962**
	7835										**0.952672**	
Berwick to Scottish Border	48	54271.88	2945437114	0.534336	0.465664	0.005441	3.733506	0.170341		0.00346	0.001408	
Eyemouth to Burnmouth	377	46881.59	2197883507	0.563759	0.436241	0.042734	5.003362	0.159579		0.03412	0.013884	
Lunan Bay to Arbroath	558	40334.13	1626842362	0.499163	0.500837	0.063251	6.759602	0.183208		0.078331	0.031873	
Montrose to Lunan Bay	4	47902.56	2294655698	0.496074	0.503926	0.000453	4.792356	0.184338		0.000401	0.000163	
	987										**0.047328**	
	8822	249037.8	1.0997E+10	3.266292	2.733708	1	52.43778	1	0	2.457552	1	

Razorbill Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop
Forth Islands	5815	21075.52	444177474	0.598141	0.401859	0.737757	4.349586	0.4859		1.559221	0.899054
St Abb's Head to Fast Castle	2067	38572.15	1487810542	0.574818	0.425182	0.262243	1.298544	0.5141		0.175069	0.100946
	7882	59647.67	1931988016	1.172959	0.827041	1.00	5.64813	1.00	0.00	1.73	1.00

Neart na Gaoithe – puffin

Puffin Colony Name	Pop (pairs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop		Stage 2 adj - correct SPAs using most recent SPA counts
Forth Islands	70434	21075.51836	444177474	0.4136	0.5864	0.482256	195.99	0.085117		8.04503	0.956739		0.953
Farne Islands	55674	80654.88318	6505210180	0.6303	0.3697	0.381196	13.38225	0.053662		0.273742	0.032554		0.036
	126108										0.989293		
Fowlsheugh	49	73403.71434	5388105280	0.5909	0.4091	0.000335	16.15676	0.059378		0.000322	3.83E-05		
Burn of Daff	20	85724.29736	7348655158	0.6011	0.3989	0.000137	11.84629	0.057909		9.39E-05	1.12E-05		
Catterline to Inverbervie	344	66466.78521	4417833537	0.5591	0.4409	0.002355	19.70521	0.064		0.00297	0.000353		
Coquet Island	17208	113579.4005	12900280215	0.5402	0.4598	0.117822	6.748251	0.066746		0.053069	0.006311		
Crawton - Stonehaven (Fowlsheugh)	214	74946.718	5617010539	0.5802	0.4198	0.001465	15.49834	0.060933		0.001384	0.000165		
Crawton to Catterline	90	70885.33866	5024731237	0.5731	0.4269	0.000616	17.32517	0.06197		0.000662	7.87E-05		
Eyemouth to Burnmouth	21	46881.59027	2197883507	0.5353	0.4647	0.000144	39.60825	0.067455		0.000384	4.57E-05		
Findon Ness - Hare Ness	103	90079.41776	8114301504	0.6188	0.3812	0.000705	10.72851	0.055337		0.000419	4.98E-05		
Forth Islands - Bass Rock to Haystack	1681	67963.02467	4618972722	0.2079	0.7921	0.01151	18.84712	0.114973		0.02494	0.002966		
Girdle Ness to Hare Ness	3	94089.78175	8852887029	0.6318	0.3682	2.05E-05	9.833439	0.053442		1.08E-05	1.28E-06		
Lunan Bay to Arbroath	190	40334.13395	1626842362	0.4381	0.5619	0.001301	53.51123	0.081565		0.005678	0.000675		
Newton Hill	17	82775.87218	6851845014	0.5936	0.4064	0.000116	12.70524	0.058988		8.72E-05	1.04E-05		
Newtonhill - Hall Bay	3	84531.60821	7145592786	0.5968	0.4032	2.05E-05	12.18294	0.058525		1.46E-05	1.74E-06		
	19943										0.010707		
	146051	1093392.084	87054328543	8.11091	6.88909	1	454.069	1	0	8.408807	1		

Puffin Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop
Forth Islands	45005	21075.51836	444177474	0.4136	0.5864	0.53	15.65	0.61		5.082691	0.96
Farne Is	39962	80654.88318	6505210180	0.6303	0.3697	0.47	1.07	0.39		0.194278	0.04
	84,967	101,730	6,949,387,654	1.04	0.96	1.00	16.71	1.00	0.00	5.28	1.00

Seagreen – gannet

Gannet Colony Name	Pop (individuals)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea		SNHWeighting	SNH prop
Forth Islands	150,518	79622.37568	6339722708	0.40483	0.59517	0.920994	4.46	0.66		2.714527	0.9874
Gamrie and Pennan	12,912	148140.4528	21945593766	0.694233	0.305767	0.079006	1.29	0.34		0.03456	0.0126
	163,430	227,763	28,285,316,474	1.10	0.90	1.00	5.75	1.00	0.00	2.75	1.00

Seagreen – kittiwake

Kittiwake Colony Name	Pop (pairs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/coldist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop	Stage 2 adj - correct SPAs using most recent SPA counts
Forth Islands	5797	67631.56	4574028542	0.517716	0.482284	0.129055	7.219715	0.08053		0.075033	0.062187	**0.0910**
Fowlsheugh	18800	46482.69	2160640896	0.50149	0.49851	0.418531	15.28398	0.083239		0.532465	0.441307	**0.4125**
	24597										0.503494	
Burn of Daff	450	54915.73	3015737262	0.495906	0.504094	0.010018	10.95028	0.084171		0.009234	0.007653	
Catterline to Inverbervie	3068	43038.03	1852272177	0.513489	0.486511	0.068301	17.82847	0.081236		0.09892	0.081985	
Crawton - Stonehaven (Fowlsheugh)	5806	47762.38	2281245415	0.513025	0.486975	0.129255	14.47594	0.081313		0.152143	0.126096	
Crawton to Catterline	4739	44793.56	2006463277	0.294146	0.705854	0.105501	16.4584	0.11786		0.20465	0.169614	
Findon Ness - Hare Ness	1142	57635.84	3321889864	0.528315	0.471685	0.025424	9.941083	0.07876		0.019906	0.016498	
Girdle Ness to Hare Ness	1395	60618.98	3674661080	0.529771	0.470229	0.031056	8.986729	0.078517		0.021913	0.018162	
Lunan Bay to Arbroath	2542	47703.43	2275616832	0.515893	0.484107	0.056591	14.51175	0.080834		0.066383	0.055019	
Montrose to Lunan Bay	384	45737.85	2091950977	0.545729	0.454271	0.008549	15.78583	0.075852		0.010236	0.008484	
Newton Hill	8	53150.66	2824993178	0.527811	0.472189	0.000178	11.68965	0.078844		0.000164	0.000136	
Newtonhill - Hall Bay	788	54255.71	2943682486	0.527811	0.472189	0.017543	11.21832	0.078844		0.015516	0.01286	
	20322										0.496506	
	44919	623726.4	33023181988	6.011102	5.988898	1	154.3502	1	0	1.206564	1	

Kittiwake Colony Name	Population	Distance_m	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/coldist2	colsea/sumsea		SNHWeighting	SNH prop
Forth Islands	4,663	67631.56	4574028542	0.517716	0.482284	0.325674	1.47	0.49		0.23579	0.1808
Fowlsheugh	9,655	46482.69	2160640896	0.50149	0.49851	0.674326	3.12	0.51		1.068315	0.8192
	14,318	114,114	6,734,669,439	1.02	0.98	1.00	4.59	1.00	0.00	1.30	1.0000

Seagreen – herring gull

Herring gull Colony Name	Pop (pairs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/coldist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop	Stage 2 adj - correct SPAs using most recent SPA counts
Forth Islands	6587	67631.56	4574028542	0.52338	0.47662	0.425819	13.30756	0.048992		0.277618	0.299	**0.3176**
Fowlsheugh	335	46482.69	2160640896	0.530268	0.469732	0.021656	28.17181	0.048284		0.029458	0.032	**0.0126**
	6922										0.33	
Aberdeen City	3350	66036.06	4360760937	0.475217	0.524783	0.216562	13.95838	0.053943		0.163061	0.175	
Birse and Gas Installation Sites (Auchenblae to Stonehaven)	0	64161.97	4116758606	0.36814	0.63186	0	14.7857	0.064949		0	0	
Burn of Daff	200	54915.73	3015737262	0.516258	0.483742	0.012929	20.18384	0.049724		0.012976	0.014	
Catterline to Inverbervie	1701	43038.03	1852272177	0.545574	0.454426	0.109962	32.86189	0.046711		0.168791	0.181	
Crawton - Stonehaven (Fowlsheugh)	902	47762.38	2281245415	0.527704	0.472296	0.05831	26.68243	0.048547		0.075533	0.081	
Crawton to Catterline	726	44793.56	2006463277	0.546807	0.453193	0.046933	30.33655	0.046584		0.066325	0.071	
Cunmont Quarry	4	67596.06	4569226838	0.377193	0.622807	0.000259	13.32155	0.064018		0.000221	2E-04	
Fife Ness to St Andrews	1	69096.28	4774295892	0.452704	0.547296	6.46E-05	12.74935	0.056257		4.64E-05	5E-05	
Findon Ness - Hare Ness	44	57635.84	3321889864	0.525397	0.474603	0.002844	18.32366	0.048785		0.002543	0.003	
Girdle Ness to Hare Ness	169	60618.98	3674661080	0.531202	0.468798	0.010925	16.56457	0.048188		0.008721	0.009	
Hall Bay to Craigeven Bay	0	51420.67	2644085759	0.515837	0.484163	0	23.02088	0.049767		0	0	
Inverbervie to St Cyrus	7	43941.19	1930827975	0.517716	0.482284	0.000453	31.52491	0.049574		0.000707	8E-04	
Lunan Bay to Arbroath	634	47703.43	2275616832	0.50149	0.49851	0.040985	26.74843	0.051242		0.056176	0.06	
Montrose to Lunan Bay	426	45737.85	2091950977	0.495906	0.504094	0.027539	29.09684	0.051816		0.04152	0.045	
Newton Hill	255	53150.66	2824993178	0.513489	0.486511	0.016485	21.54666	0.050009		0.017762	0.019	
Newtonhill - Hall Bay	127	54255.71	2943682486	0.513025	0.486975	0.00821	20.6779	0.050056		0.008498	0.009	
Transco Installations and Birse	1	73824.35	5450035033	0.294146	0.705854	6.46E-05	11.16858	0.072555		5.24E-05	6E-05	
	8547										0.67	
	15469	1059803	60869173027	9.271454	9.728546	1.00	405.0315	1.00	0	0.930007	1.00	

Herring gull Colony Name	Pop (pairs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/coldist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop
Forth Islands	6580	67631.56	4574028542	0.52338	0.47662	0.981357	1.472372	0.503639		0.72772	0.962
Fowlsheugh	125	46482.69	2160640896	0.530268	0.469732	0.018643	3.116978	0.496361		0.028843	0.038
	6705	114114.3	6734669439	1.053649	0.946351	1.00	4.589349	1.00	0	0.756563	1.00

Seagreen – guillemot

Guillemot Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop		Stage 2 adj - correct SPAs using most recent SPA counts
Buchan Ness to Collieston Coast	29362	91264.83	8329268294	0.70079	0.29921	0.154379	8.829222	0.043293		0.059011	0.041415		**0.0575**
Forth Islands	36369	67631.56	4574028542	0.449052	0.550948	0.191221	16.07794	0.079717		0.245085	0.172008		**0.1651**
Fowlsheugh	68526	46482.69	2160640896	0.549245	0.450755	0.360295	34.03664	0.06522		0.799812	0.56133		**0.5516**
St Abb's Head to Fast Castle	43744	79847	6375543023	0.531766	0.468234	0.229997	11.53485	0.067749		0.179737	0.126145		**0.1267**
	178001										0.900897		
Berwick to Scottish Border	45	90083.8	8115090904	0.566671	0.433329	0.000237	9.062247	0.062699		0.000134	9.43E-05		
Boddam to Collieston	0	92554.51	8566337561	0.711338	0.288662	0	8.584877	0.041767		0	0		
Burn of Daff	37	54915.73	3015737262	0.558621	0.441379	0.000195	24.38573	0.063864		0.000303	0.000213		
Catterline to Inverbervie	2884	43038.03	1852272177	0.533174	0.466826	0.015163	39.7031	0.067546		0.040665	0.02854		
Crawton - Stonehaven (Fowlsheugh)	4763	47762.38	2281245415	0.535886	0.464114	0.025043	32.2372	0.067153		0.054214	0.038049		
Crawton to Catterline	2002	44793.56	2006463277	0.538433	0.461567	0.010526	36.65203	0.066785		0.025766	0.018083		
Eyemouth to Burnmouth	892	84078.58	7069206989	0.564835	0.435165	0.00469	10.403	0.062965		0.003072	0.002156		
Findon Ness - Hare Ness	422	57635.84	3321889864	0.578374	0.421626	0.002219	22.13829	0.061006		0.002997	0.002103		
Girdle Ness to Hare Ness	75	60618.98	3674661080	0.59172	0.40828	0.000394	20.01299	0.059075		0.000466	0.000327		
Lunan Bay to Arbroath	1002	47703.43	2275616832	0.470453	0.529547	0.005268	32.31693	0.076621		0.013045	0.009155		
Newtonhill - Hall Bay	61	54255.71	2943682486	0.55394	0.44606	0.000321	24.98264	0.064541		0.000517	0.000363		
Sands of Forvie NNR (Cliff Nesters)	10	83542.03	6979271239	0.654429	0.345571	5.26E-05	10.53705	0.050001		2.77E-05	1.94E-05		
	12193										0.099103		
	190194	1046209	73540955842	9.088728	6.911272	1	341.4947	1	0	1.424851	1		

Guillemot Colony Name	Population	Distance_m	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	SNHWeighting	SNH prop
Buchan Ness to Collieston Coast	33632	91264.83	8329268294	0.70079	0.29921	0.218204	2.573993	0.169127	0.094991	0.063875
Forth Islands	28786	67631.56	4574028542	0.449052	0.550948	0.186763	4.687221	0.31142	0.272617	0.183316
Fowlsheugh	55507	46482.69	2160640896	0.549245	0.450755	0.360129	9.922741	0.254787	0.910471	0.612227
St Abb's Head to Fast Castle	36206	79847	6375543023	0.531766	0.468234	0.234904	3.362769	0.264667	0.209068	0.140583
	154131	285226.1	21439480755	2.230853	1.769147	1.00	20.54672	1.00	1.487147	1.00

Seagreen – razorbill

Razorbill Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop		Stage 2 adj - correct SPAs using most recent SPA counts
Fowlsheugh	6362	46483	2160640896	0.530302	0.469698	0.607119	13.167	0.089394		0.714612	0.603412		**0.6034**
	6362												
Burn of Daff	54	54915.73	3015737262	0.518827	0.481173	0.005153	9.433565	0.091578		0.004452	0.003759		
Catterline to Inverbervie	1962	43038.03	1852272177	0.543248	0.456752	0.187232	15.35906	0.08693		0.249986	0.211086		
Crawton - Stonehaven (Fowlsheugh)	578	47762.38	2281245415	0.528739	0.471261	0.055158	12.47089	0.089692		0.061696	0.052096		
Crawton to Catterline	398	44793.56	2006463277	0.548471	0.451529	0.037981	14.17876	0.085936		0.046278	0.039077		
Findon Ness - Hare Ness	337	57635.84	3321889864	0.525055	0.474945	0.03216	8.564147	0.090393		0.024896	0.021022		
Girdle Ness to Hare Ness	56	60618.98	3674661080	0.52568	0.47432	0.005344	7.74198	0.090274		0.003735	0.003154		
Lunan Bay to Arbroath	558	47703.43	2275616832	0.499163	0.500837	0.053249	12.50173	0.095321		0.063456	0.053582		
Montrose to Lunan Bay	4	45737.85	2091950977	0.496074	0.503926	0.000382	13.59934	0.095909		0.000498	0.00042		
Newton Hill	58	53150.66	2824993178	0.515161	0.484839	0.005535	10.07052	0.092276		0.005143	0.004343		
Newtonhill - Hall Bay	112	54255.71	2943682486	0.515051	0.484949	0.010688	9.664478	0.092297		0.009534	0.00805		
	4117										**0.396588**		
	10479	556094.9	28449153446	5.745771	5.254229	1.00	126.7515	1.00	0	1.184286	1.00		

Razorbill Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop
Fowlsheugh	7426	46482.69	2160640896	0.530302						

Seagreen - puffin

Puffin Colony Name	Pop (pairs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop	Stage 2 adj - correct SPAs using most recent SPA counts
Forth Islands	70434	67631.56469	4574028542	0.413622	0.586378	0.541446	17.27375042	0.084038		0.785990033	0.8065	**0.7902**
Farne Islands	55674	106787.4044	11403549741	0.630319	0.369681	0.427982	6.928599362	0.052981		0.157106725	0.1612	**0.1774**
	126108										0.9677	
Buchan Ness to Collieston Coast	1165	91264.82506	8329268294	0.721549	0.278451	0.008956	9.485902564	0.039907		0.003390191	0.0035	
Fowlsheugh	49	46482.69459	2160640896	0.59094	0.40906	0.000377	36.56814401	0.058625		0.000807525	0.0008	
Boddam to Collieston	77	92554.51129	8566337561	0.730176	0.269824	0.000592	9.223384778	0.03867		0.000211121	0.0002	
Burn of Daff	20	54915.72873	3015737262	0.60106	0.39894	0.000154	26.19944	0.057175		0.000230303	0.0002	
Catterline to Inverbervie	344	43038.03175	1852272177	0.559098	0.440902	0.002644	42.65605695	0.063189		0.007127727	0.0073	
Crawton - Stonehaven (Fowlsheugh)	214	47762.38494	2281245415	0.580225	0.419775	0.001645	34.6348652	0.060161		0.00342779	0.0035	
Crawton to Catterline	90	44793.5629	2006463277	0.573082	0.426918	0.000692	39.37805807	0.061185		0.001666908	0.0017	
Eyemouth to Burnmouth	21	84078.57628	7069206989	0.535299	0.464701	0.000161	11.17673136	0.0666		0.000120165	0.0001	
Findon Ness - Hare Ness	103	57635.83836	3321889864	0.618776	0.381224	0.000792	23.78484257	0.054636		0.001028934	0.0011	
Forth Islands - Bass Rock to Haystack	1681	112743.2209	12711033866	0.20794	0.79206	0.012922	6.215908815	0.113516		0.009118018	0.0094	
Girdle Ness to Hare Ness	3	60618.98284	3674661080	0.631833	0.368167	2.31E-05	21.5014734	0.052764		2.6164E-05	0.0000	
Lunan Bay to Arbroath	190	47703.42579	2275616832	0.438093	0.561907	0.001461	34.72053218	0.080531		0.004083892	0.0042	
Newton Hill	17	53150.66489	2824993178	0.593626	0.406374	0.000131	27.96843124	0.05824		0.000212869	0.0002	
Newtonhill - Hall Bay	3	54255.71385	2943682486	0.596816	0.403184	2.31E-05	26.84074381	0.057783		3.57676E-05	0.0000	
	3977										0.0323	
	130085	1065417.131	79010627461	9.022456	6.977544	1.00	374.5568648	1.00	0	0.974584134	1.00	

Puffin Colony Name	Pop (Individs)	Distance	Distance ^2	Proportion Sea	1-Psea	Colpop/sumpop	Sum dist2/col dist2	colsea/sumsea	Year Counted	SNHWeighting	SNH prop
Forth Islands	45005	67631.56469	4574028542	0.413622	0.586378	0.529676	3.493108566	0.613329		1.134790714	0.816633
Farne Is	39962	106787.4044	11403549741	0.630319	0.369681	0.470324	1.401105677	0.386671		0.25480614	0.183367
	84967	174418.9691	15977578283	1.043941	0.956059	1.00	4.894214243	1.00	0	1.389596853	1.00