C: (Addendum) Modelling for species rarely observed within collision risk airspace

C.1. Introduction

The following has been included as an amendment to the previously prepared CRM report following the observations and comments from the Developments Applications Unit (DAU) and An Bord Pleanála (ABP) in relation to the use of thresholds for determining collision risk.

Natural Power generally use a standard threshold of 3 flights or 10 individuals observed passing through the collision risk zone (CRZ) at potential collision height (PCH) to determine which species to take forward for collision risk modelling (see Section 2). This threshold is implemented to help keep assessments concise, because species observed less often that this are considered not to be common users of the airspace and because modelling of these species will invariably result in very low predicted mortality rates.

This threshold approach has been used by Natural Power and other consultancies in the UK and Ireland for a large number of projects (e.g. Infinenergy (2022) [11]; MacArthur Green (2020) [12]; and Arcus projects (2021/2022) [13,14]), including several consented sites (e.g. Pauls Hill II[15], Golticlay[16], Seven Hills[17]). However, due to the precedent in Ireland to run collision risk modelling for all species observed within the CRZ at PCH and based observations from the DAU and ABP, results of collision risk modelling for those species that occurred within the collision risk airspace but were observed below this threshold are presented within this appendix.

C.2. Methods

Collision risk modelling was carried out according to the methods presented in Section 2 of this report.

Additional species analysed were all those for which fewer than 3 flights and 10 individuals were observed within the CRZ at PCH (see Tables 3.1 and 3.2), with the exception of meadow pipit. These species were:

- buzzard
- cormorant
- common gull
- golden eagle
- grey heron
- merlin
- sparrowhawk
- peregrine falcon
- ringed plover, and,
- teal

Bird attributes used in the modelling are presented in Table C1.

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[11] Infinenergy Report (2022) - *Appendix 11.3: Collision Risk Modelling Torrance Wind Farm Extension II*: TA11.3-Collision-Risk-Modelling.pdf (torrancewindfarmextension2.co.uk)

[12] MacArthur Green Report (2020) - *Cumberhead West Wind Farm Ornithology Appendix 8.1*: Appendix 8.1 Ornithology.pdf (scottishpowerrenewables.com)

[13] Arcus Report (2022) - *Appendix A8.5: Collision Risk Modelling Armadale Wind Farm* - https://armadalewindfarm.co.uk/wp-content/uploads/2022/04/3262_A8.5_Collision-Risk-Modelling_v2-0_MR_20220324.pdf

[14] Arcus Report (2021) – *Appendix 8.5: Collision Risk Modelling Carrick Wind Farm* - Appendix_8-5_Collision_Risk_Modelling.pdf (scottishpowerrenewables.com)

[15] Natural Power Report (2017) - *Paul's Hill II Wind Farm Environmental Statement Chapter 8: Ornithology Assessment*: https://fredolsenrenewables.com/windfarm-collection/united-kingdom/paul-s-hill-ii/?dl=0

[16] Natural Power Report (2023) - *Golticlay Wind Farm s.36 Variation - Environmental Impact Assessment Report 0.1: Ornithology Technical Appendix* - ES_A3_TMPL_NP (golticlaywindfarm.com)

[17] SLR Report (2022) - *SEVEN HILLS WIND FARM Avian Collision Risk Modelling Report*: SLR Report Template_Blank (pleanala.ie)

Table C.1: Bird attributes used in the collision risk analysis

Species	Bird length (metres)*	Wingspan (metres)*	Bird speed (metres/ second)**	Estimated nocturnal activity	Calculated individual collision risk
Buzzard	0.54	1.21	11.60	0	0.060
Cormorant	1.00	1.60	15.20	0	0.067
Common gull	0.41	1.20	13.40	0	0.052
Golden eagle	0.88	2.20	11.90	0	0.075
Grey heron	0.98	1.95	12.50	0	0.076
Merlin	0.30	0.62	10.10	0	0.054
Sparrowhawk	0.38	0.70	11.30	0	0.054
Hen harrier	0.52	1.20	9.10	0	0.07
Peregrine	0.48	1.10	12.10	0	0.056
Ringed plover	0.19	0.52	19.50	0.25	0.038
Teal	0.38	0.64	19.70	0	0.042

*Sources: *Snow and Perrins (1998)[4]; **Alerstam et al.(2007)[5]*

C.3. Results

The total number of target species flight lines recorded across all breeding seasons and non-breeding seasons are shown in Table 3.1 and Table 3.2 respectively. The number of flights and individuals observed passing through the CRZ at PCH are also shown.

Eleven species did not fulfil the criteria generally used by Natural Power to determine which species to take forward for CRM, but were observed within the CRZ at PCH. These species are summarised in Section C.2 above.

The risk of collision for each of these eleven species, calculated with avoidance factors of 95%, 98%, 99%, 99.2% and 99.8%, are presented in Table C.2. Values shown in bold represent species-specific avoidance levels recommended for collision risk analysis by NatureScot[3,6]. For those species for which a species-specific avoidance rate is not available (cormorant, grey heron, teal, buzzard, merlin, sparrow hawk, peregrine and ringed plover) the recommended default avoidance rate of 98% has been used.

Details of the calculations used to produce these estimates are provided in Tables C.3 – C.14.

The estimated number of collisions provided in table C.2 demonstrates that collision mortality will be less than one for all the modelled species over the 30-year life span of the Proposed Development. Based on this, the outcomes and impacts examined in chapter 8 (Ornithology) of the EIAR remain unchanged for all the species discussed and no collision risk impacts are anticipated.

Table C.2: Estimated number of collisions during the breeding season (Apr to Sept) and non-breeding season (Oct to Mar). Bold, shaded cells represent avoidance rates recommended by NatureScot (SNH, 2017[3]; Furness, 2019[6]). Annual estimates are sums of breeding and non-breeding estimates.

			Estimated mortality assuming avoidance of:				
Species	**Model type**	**Season**	**95%**	**98%**	**99%**	**99.2%***	**99.8%**
Cormorant	Commuting	Breeding	0.02296	**0.00919**	0.00459	0.00367	0.00092
		Non-breeding	0	**0**	0	0	0
		Annual	0.02296	**0.00919**	0.00459	0.00367	0.00092
Common gull	Commuting	Breeding	0.04314	0.01726	0.00863	**0.00690**	0.00173
		Non-breeding	0	0	0	**0**	0
		Annual	0.04314	0.01726	0.00863	**0.00690**	0.00173
Grey heron	Commuting	Breeding	0.02717	**0.01087**	0.00543	0.00435	0.00109
		Non-breeding	0.02210	**0.00884**	0.00442	0.00354	0.00088
		Annual	0.04927	**0.01971**	0.00985	0.00789	0.00197
Teal	Commuting	Breeding	0	**0**	0	0	0
		Non-breeding	0.06449	**0.02580**	0.01290	0.01032	0.00258
		Annual	0.06449	**0.02580**	0.01290	0.01032	0.00258
Buzzard	Non-directional	Breeding	0.00179	**0.00072**	0.00036	0.00029	0.00007
		Non-breeding	0	**0**	0	0	0
		Annual	0.00179	**0.00072**	0.00036	0.00029	0.00007
Golden eagle	Non-directional	Breeding	0.00480	0.00192	**0.00096**	0.00077	0.00019
		Non-breeding	0	0	**0**	0	0
		Annual	0.00480	0.00192	**0.00096**	0.00077	0.00019
Merlin	Non-directional	Commuting	0.00055	**0.00022**	0.00011	0.00009	0.00002
		Non-breeding	0.00112	**0.00045**	0.00022	0.00018	0.00004
		Annual	0.00167	**0.00067**	0.00033	0.00027	0.00006
Sparrowhawk	Non-directional	Breeding	0.00016	**0.00007**	0.00003	0.00003	0.00001
		Non-breeding	0	**0**	0	0	0
		Annual	0.00016	**0.00007**	0.00003	0.00003	0.00001
Hen harrier	Non-directional	Breeding	0	0	**0**	0	0
		Non-breeding	0.00087	0.00035	**0.00017**	0.00014	0.00003
		Annual	0.00087	0.00035	**0.00017**	0.00014	0.00003
Peregrine	Non-directional	Breeding	0	**0**	0	0	0
		Non-breeding	0.00267	**0.00107**	0.00053	0.00043	0.00011
		Annual	0.00267	**0.00107**	0.00053	0.00043	0.00011
Ringed plover	Non-directional	Breeding	0	**0**	0	0	0
		Non-breeding	0.00180	**0.00072**	0.00036	0.00029	0.00007
		Annual	0.00180	**0.00072**	0.00036	0.00029	0.00007

**Note that this is different to the rate used in Table 3.3 due to the requirement to include the correct avoidance rate for common gull.*

Table C.3: Collision Risk Model run for cormorant (Commuting)*

Parameter	Unit	Breeding	Non-breeding
Total number of birds flying through wind farm polygon (a)	birds	1	0
Mean survey effort (b)	minutes	8637	6490
Daylight during survey period, based on civil twilight (c)	minutes	167194	102202
Estimate of nocturnal activity as a proportion of daytime activity (d)		0	0
Time of potential activity during survey period (e = c * (1+d))	minutes	167194	102202
Rate of birds recorded during survey period (f = a/b)	birds per minute	0.0001	0
Estimate of number of birds during season (g = e * f)	birds	19.36	0
Risk window length (h)	metres	5343.22	5343.22
Turbine blade length (i)	metres	79	79
Number of turbines (j)		18	18
Risk window (k = h * i * 2)	square metres	844228	844228
Rotor-swept area (l = pi * i^2 * j)	square metres	352920	352920
Proportion of risk area that is rotor-swept (m = l/k)		0.418	0.418
Estimate of number of birds flying through rotor-swept area during season (n = g * m)	birds	8.1	0
Probability of collision for a bird flying through rotors (estimated using SNH spreadsheet) (o)		0.067	0.067
Predicted mortality with no avoidance - turbines operational 85% of the time (p = n * o * 0.85)	collisions per season	0.46	0

** Figures have been rounded for presentation purposes. Following the calculations using rounded figures may yield slightly different results.*

Table C.4: Collision Risk Model run for common gull (Commuting)*

Parameter	Unit	Breeding	Non-breeding
Total number of birds flying through wind farm polygon (a)	birds	2	0
Mean survey effort (b)	minutes	8637	6490
Daylight during survey period, based on civil twilight (c)	minutes	167194	102202
Estimate of nocturnal activity as a proportion of daytime activity (d)		0	0
Time of potential activity during survey period (e = c * (1+d))	minutes	167194	102202
Rate of birds recorded during survey period (f = a/b)	birds per minute	0.0002	0
Estimate of number of birds during season (g = e * f)	birds	38.72	0
Risk window length (h)	metres	4409.34	4409.34
Turbine blade length (i)	metres	79	79
Number of turbines (j)		18	18
Risk window (k = h * i * 2)	square metres	696676	696676
Rotor-swept area (l = pi * i^2 * j)	square metres	352920	352920
Proportion of risk area that is rotor-swept (m = l/k)		0.507	0.507
Estimate of number of birds flying through rotor-swept area during season (n = g * m)	birds	19.6	0
Probability of collision for a bird flying through rotors (estimated using SNH spreadsheet) (o)		0.052	0.052
Predicted mortality with no avoidance – turbines operational 85% of the time (p = n * o * 0.85)	collisions per season	0.86	0

** Figures have been rounded for presentation purposes. Following the calculations using rounded figures may yield slightly different results.*

Table C.5: Collision Risk Model run for grey heron (Commuting)*

Parameter	Unit	Breeding	Non-breeding
Total number of birds flying through wind farm polygon (a)	birds	1	1
Mean survey effort (b)	minutes	8637	6490
Daylight during survey period, based on civil twilight (c)	minutes	167194	102202
Estimate of nocturnal activity as a proportion of daytime activity (d)		0	0
Time of potential activity during survey period (e = c * (1+d))	minutes	167194	102202
Rate of birds recorded during survey period (f = a/b)	birds per minute	0.0001	0.0002
Estimate of number of birds during season (g = e * f)	birds	19.36	15.75
Risk window length (h)	metres	5122.81	5122.81
Turbine blade length (i)	metres	79	79
Number of turbines (j)		18	18
Risk window (k = h * i * 2)	square metres	809403	809403
Rotor-swept area (l = pi * i^2 * j)	square metres	352920	352920
Proportion of risk area that is rotor-swept (m = l/k)		0.436	0.436
Estimate of number of birds flying through rotor-swept area during season (n = g * m)	birds	8.4	6.9
Probability of collision for a bird flying through rotors (estimated using SNH spreadsheet) (o)		0.076	0.076
Predicted mortality with no avoidance - turbines operational 85% of the time (p = n * o * 0.85)	collisions per season	0.54	0.44

** Figures have been rounded for presentation purposes. Following the calculations using rounded figures may yield slightly different results.*

Table C.6: Collision Risk Model run for teal (Commuting)*

Parameter	Unit	Breeding	Non-breeding
Total number of birds flying through wind farm polygon (a)	birds	0	4
Mean survey effort (b)	minutes	8637	6490
Daylight during survey period, based on civil twilight (c)	minutes	167194	102202
Estimate of nocturnal activity as a proportion of daytime activity (d)		0	0
Time of potential activity during survey period (e = c * (1+d))	minutes	167194	102202
Rate of birds recorded during survey period (f = a/b)	birds per minute	0	0.0006
Estimate of number of birds during season (g = e * f)	birds	0	62.99
Risk window length (h)	metres	3867.42	3867.42
Turbine blade length (i)	metres	79	79
Number of turbines (j)		18	18
Risk window (k = h * i * 2)	square metres	611052	611052
Rotor-swept area (l = pi * i^2 * j)	square metres	352920	352920
Proportion of risk area that is rotor-swept (m = l/k)		0.578	0.578
Estimate of number of birds flying through rotor-swept area during season (n = g * m)	birds	0	36.4
Probability of collision for a bird flying through rotors (estimated using SNH spreadsheet) (o)		0.042	0.042
Predicted mortality with no avoidance - turbines operational 85% of the time (p = n * o * 0.85)	collisions per season	0	1.29

** Figures have been rounded for presentation purposes. Following the calculations using rounded figures may yield slightly different results.*

Table C.7: Collision Risk Model run for buzzard (Non-directional)

Parameter	Unit	Breeding	Non-breeding
Occupancy of risk volume (a)	seconds	13	0
Survey effort (b)	hectare-minutes	7997242	6020217
Observed occupancy rate for site (c = a / b)	seconds per hectare-minute	0	0
Daylight minutes (d)	minutes	167194	102202
Potentially active period (e = d*1)	minutes	167194	102202
Area of the wind farm polygon (f)	hectares	427.78	427.78
Total occupancy of risk volume during period of interest (g = c * e * f)	seconds	115	0
Rotor diameter (h)	metres	158	158
Risk volume (i = f * h * 10,000)	cubic metres	675886843	675886843
Number of turbines (j)	turbines	18	18
Rotor blade width (k)	metres	4.2	4.2
Length of bird of interest (l)	metres	0.54	0.54
Rotor-swept volume (m = j * pi * (h/2)^2 * (k + l))	cubic metres	1672842	1672842
Bird occupancy of rotor-swept volume (n = g * m / i)	seconds	0.3	0
Bird flight speed (o)	metres per second	11.6	11.6
Time taken for bird to transit rotor (p = (k + l) / o)	seconds	0.41	0.41
Number of rotor transits (q = n / p)	rotor transits	1	0
Probability of collision for a bird flying through rotors (estimated using SNH spreadsheet) (r)		0.06	0.06
Predicted mortality with no avoidance - turbines operational 85% of the time (y = q * r * 0.85)	collisions per season	0.04	0

** Figures have been rounded for presentation purposes. Following the calculations using rounded figures may yield slightly different results.*

Table C.8: Collision Risk Model run for golden eagle (Non-directional)

Parameter	Unit	Breeding	Non-breeding
Occupancy of risk volume (a)	seconds	27	0
Survey effort (b)	hectare-minutes	7997242	6020217
Observed occupancy rate for site (c = a / b)	seconds per hectare-minute	0	0
Daylight minutes (d)	minutes	167194	102202
Potentially active period (e = d*1)	minutes	167194	102202
Area of the wind farm polygon (f)	hectares	427.78	427.78
Total occupancy of risk volume during period of interest (g = c * e * f)	seconds	241	0
Rotor diameter (h)	metres	158	158
Risk volume (i = f * h * 10,000)	cubic metres	675886843	675886843
Number of turbines (j)	turbines	18	18
Rotor blade width (k)	metres	4.2	4.2
Length of bird of interest (l)	metres	0.88	0.88
Rotor-swept volume (m = j * pi * (h/2)^2 * (k + l))	cubic metres	1792835	1792835
Bird occupancy of rotor-swept volume (n = g * m / i)	seconds	0.6	0
Bird flight speed (o)	metres per second	11.9	11.9
Time taken for bird to transit rotor (p = (k + l) / o)	seconds	0.43	0.43
Number of rotor transits (q = n / p)	rotor transits	1	0
Probability of collision for a bird flying through rotors (estimated using SNH spreadsheet) (r)		0.075	0.075
Predicted mortality with no avoidance - turbines operational 85% of the time (y = q * r * 0.85)	collisions per season	0.1	0

** Figures have been rounded for presentation purposes. Following the calculations using rounded figures may yield slightly different results.*

Table C.9: Collision Risk Model run for merlin (Non-directional)

Parameter	Unit	Breeding	Non-breeding
Occupancy of risk volume (a)	seconds	5	13
Survey effort (b)	hectare-minutes	7997242	6020217
Observed occupancy rate for site (c = a / b)	seconds per hectare-minute	0	0
Daylight minutes (d)	minutes	167194	102202
Potentially active period (e = d*1)	minutes	167194	102202
Area of the wind farm polygon (f)	hectares	427.78	427.78
Total occupancy of risk volume during period of interest (g = c * e * f)	seconds	46	93
Rotor diameter (h)	metres	158	158
Risk volume (i = f * h * 10,000)	cubic metres	675886843	675886843
Number of turbines (j)	turbines	18	18
Rotor blade width (k)	metres	4.2	4.2
Length of bird of interest (l)	metres	0.3	0.3
Rotor-swept volume (m = j * pi * (h/2)^2 * (k + l))	cubic metres	1588141	1588141
Bird occupancy of rotor-swept volume (n = g * m / i)	seconds	0.1	0.2
Bird flight speed (o)	metres per second	10.1	10.1
Time taken for bird to transit rotor (p = (k + l) / o)	seconds	0.45	0.45
Number of rotor transits (q = n / p)	rotor transits	0	0
Probability of collision for a bird flying through rotors (estimated using SNH spreadsheet) ®		0.054	0.054
Predicted mortality with no avoidan–e - turbines operational 85% of the time (y = q * r * 0.85)	collisions per season	0.01	0.02

** Figures have been rounded for presentation purposes. Following the calculations using rounded figures may yield slightly different results.*

Table C.10: Collision Risk Model run for sparrowhawk (Non-directional)

Parameter	Unit	Breeding	Non-breeding
Occupancy of risk volume (a)	seconds	1	0
Survey effort (b)	hectare-minutes	7997242	6020217
Observed occupancy rate for site (c = a / b)	seconds per hectare-minute	0	0
Daylight minutes (d)	minutes	167194	102202
Potentially active period (e = d*1)	minutes	167194	102202
Area of the wind farm polygon (f)	hectares	427.78	427.78
Total occupancy of risk volume during period of interest (g = c * e * f)	seconds	12	0
Rotor diameter (h)	metres	158	158
Risk volume (i = f * h * 10,000)	cubic metres	675886843	675886843
Number of turbines (j)	turbines	18	18
Rotor blade width (k)	metres	4.2	4.2
Length of bird of interest (l)	metres	0.38	0.38
Rotor-swept volume (m = j * pi * (h/2)^2 * (k + l))	cubic metres	1616375	1616375
Bird occupancy of rotor-swept volume (n = g * m / i)	seconds	0	0
Bird flight speed (o)	metres per second	11.3	11.3
Time taken for bird to transit rotor (p = (k + l) / o)	seconds	0.41	0.41
Number of rotor transits (q = n / p)	rotor transits	0	0
Probability of collision for a bird flying through rotors (estimated using SNH spreadsheet) (r)		0.054	0.054
Predicted mortality with no avoidance - turbines operational 85% of the time (y = q * r * 0.85)	collisions per season	<0.01	0

** Figures have been rounded for presentation purposes. Following the calculations using rounded figures may yield slightly different results.*

Table C.11: Collision Risk Model run for hen harrier (Non-directional)

Parameter	Unit	Breeding	Non-breeding
Occupancy of risk volume (a)	seconds	0	8
Survey effort (b)	hectare-minutes	7997242	6020217
Observed occupancy rate for site (c = a / b)	seconds per hectare-minute	0	0
Daylight minutes (d)	minutes	167194	102202
Potentially active period (e = d*1)	minutes	167194	102202
Area of the wind farm polygon (f)	hectares	427.78	427.78
Total occupancy of risk volume during period of interest (g = c * e * f)	seconds	0	61
Rotor diameter (h)	metres	158	158
Risk volume (i = f * h * 10,000)	cubic metres	675886843	675886843
Number of turbines (j)	turbines	18	18
Rotor blade width (k)	metres	4.2	4.2
Length of bird of interest (l)	metres	0.52	0.52
Rotor-swept volume (m = j * pi * (h/2)^2 * (k + l))	cubic metres	1665784	1665784
Bird occupancy of rotor-swept volume (n = g * m / i)	seconds	0	0.2
Bird flight speed (o)	metres per second	9.1	9.1
Time taken for bird to transit rotor (p = (k + l) / o)	seconds	0.52	0.52
Number of rotor transits (q = n / p)	rotor transits	0	0
Probability of collision for a bird flying through rotors (estimated using SNH spreadsheet) (r)		0.07	0.07
Predicted mortality with no avoidance - turbines operational 85% of the time (y = q * r * 0.85)	collisions per season	0	0.02

** Figures have been rounded for presentation purposes. Following the calculations using rounded figures may yield slightly different results.*

Table C.12: Collision Risk Model run for peregrine (Non-directional)

Parameter	Unit	Breeding	Non-breeding
Occupancy of risk volume (a)	seconds	0	24
Survey effort (b)	hectare-minutes	7997242	6020217
Observed occupancy rate for site (c = a / b)	seconds per hectare-minute	0	0
Daylight minutes (d)	minutes	167194	102202
Potentially active period (e = d*1)	minutes	167194	102202
Area of the wind farm polygon (f)	hectares	427.78	427.78
Total occupancy of risk volume during period of interest (g = c * e * f)	seconds	0	177
Rotor diameter (h)	metres	158	158
Risk volume (i = f * h * 10,000)	cubic metres	675886843	675886843
Number of turbines (j)	turbines	18	18
Rotor blade width (k)	metres	4.2	4.2
Length of bird of interest (l)	metres	0.48	0.48
Rotor-swept volume (m = j * pi * (h/2)^2 * (k + l))	cubic metres	1651667	1651667
Bird occupancy of rotor-swept volume (n = g * m / i)	seconds	0	0.4
Bird flight speed (o)	metres per second	12.1	12.1
Time taken for bird to transit rotor (p = (k + l) / o)	seconds	0.39	0.39
Number of rotor transits (q = n / p)	rotor transits	0	1
Probability of collision for a bird flying through rotors (estimated using SNH spreadsheet) (r)		0.056	0.056
Predicted mortality with no avoidance - turbines operational 85% of the time (y = q * r * 0.85)	collisions per season	0	0.05

** Figures have been rounded for presentation purposes. Following the calculations using rounded figures may yield slightly different results.*

Table C.13: Collision Risk Model run for ringed plover (Non-directional)

Parameter	Unit	Breeding	Non-breeding
Occupancy of risk volume (a)	seconds	0	12
Survey effort (b)	hectare-minutes	7997242	6020217
Observed occupancy rate for site (c = a / b)	seconds per hectare-minute	0	0
Daylight minutes (d)	minutes	167194	102202
Potentially active period (e = d*1.25)	minutes	208993	127752
Area of the wind farm polygon (f)	hectares	427.78	427.78
Total occupancy of risk volume during period of interest (g = c * e * f)	seconds	0	111
Rotor diameter (h)	metres	158	158
Risk volume (i = f * h * 10,000)	cubic metres	675886843	675886843
Number of turbines (j)	turbines	18	18
Rotor blade width (k)	metres	4.2	4.2
Length of bird of interest (l)	metres	0.19	0.19
Rotor-swept volume (m = j * pi * (h/2)^2 * (k + l))	cubic metres	1549320	1549320
Bird occupancy of rotor-swept volume (n = g * m / i)	seconds	0	0.3
Bird flight speed (o)	metres per second	19.5	19.5
Time taken for bird to transit rotor (p = (k + l) / o)	seconds	0.23	0.23
Number of rotor transits (q = n / p)	rotor transits	0	1
Probability of collision for a bird flying through rotors (estimated using SNH spreadsheet) (r)		0.038	0.038
Predicted mortality with no avoidance - turbines operational 85% of the time (y = q * r * 0.85)	collisions per season	0	0.04

** Figures have been rounded for presentation purposes. Following the calculations using rounded figures may yield slightly different results.*

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sayhello@naturalpower.com

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