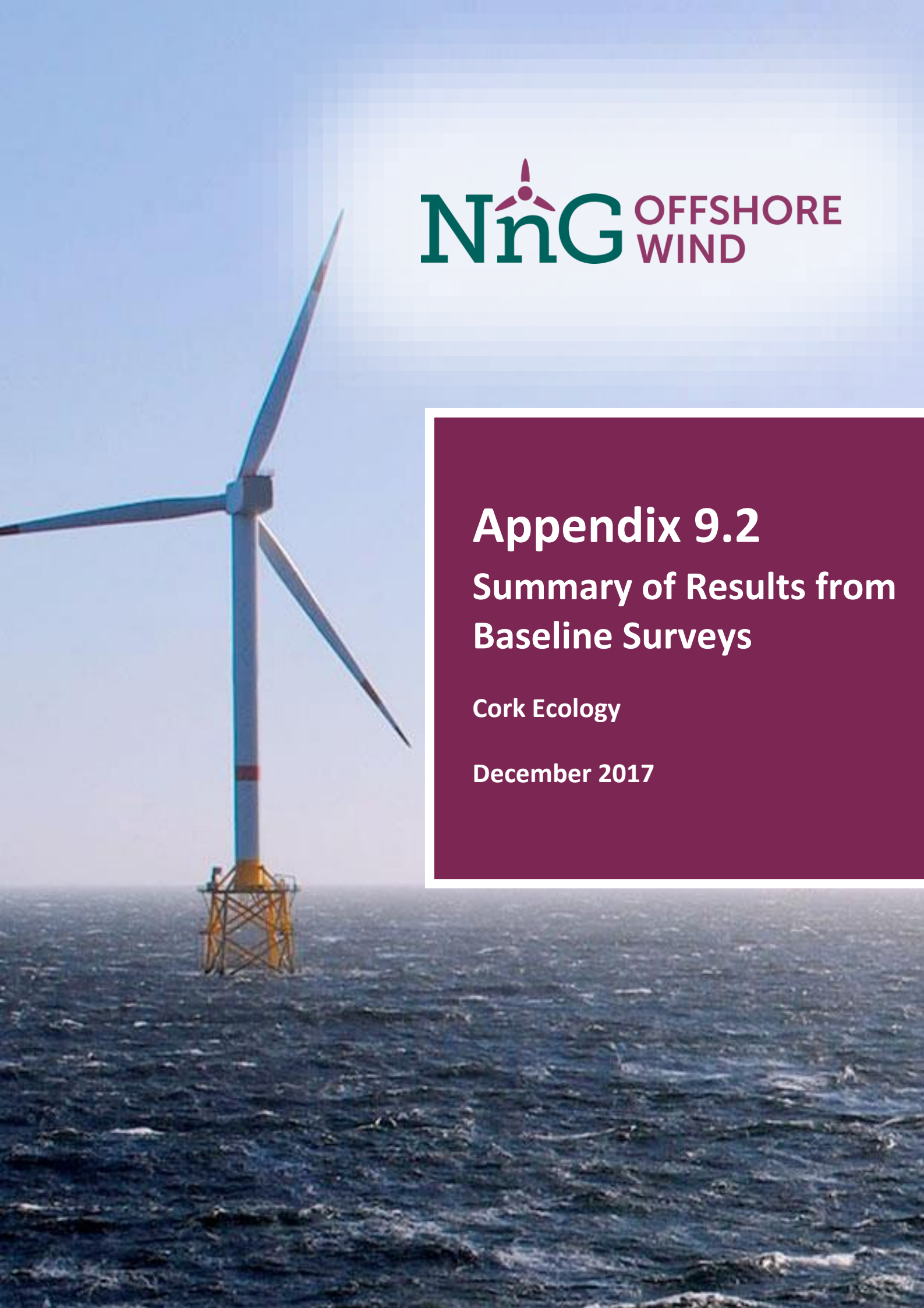


NnG OFFSHORE WIND

Appendix 9.2

Summary of Results from Baseline Surveys

Cork Ecology

December 2017

1.1.1 Appendix 9.2 – Species Accounts

Species accounts summarising the main findings of the baseline surveys for each of these eight species are presented in below. In addition, summary species accounts are also provided for five additional species (Arctic skua, great skua, little gull, black-headed gull and common gull) which were recorded in low numbers on baseline surveys, but which are included in the collision risk modelling assessment.

1.1.1.1 Gannet

Gannets breed in a few, typically very large, colonies around the UK. The current UK breeding population is 293,200 pairs (JNCC, 2016) and the largest UK colony is at Bass Rock, in the outer Firth of Forth, with an estimated breeding population of 75,259 nests in 2014 (Murray, Harris and Wanless 2015).

The breeding season for gannet has been defined as mid-March to September (SNH 2017). During the breeding season birds from the Bass Rock colony range widely across the North Sea, at times travelling as far as the Norwegian coast (Hamer *et al*., 2007). Regular feeding movements occur to the north-east of the colony with concentrations of feeding locations off North-east Scotland (Hamer *et al*., 2011). Outwith the breeding period, gannets disperse widely across the North Sea and move southward with birds wintering in the Bay of Biscay and off West Africa.

Gannets feed by plunge diving for fish, typically from around 25 to 40 m above the surface (Robinson 2017).

Estimated numbers of gannets were derived from baseline survey data by applying Distance sampling techniques (Table 1).

Overall, mean estimated numbers of gannets in the Wind Farm Area on baseline surveys were lower than mean estimated numbers in the buffer area throughout the year (Figure 1). Mean estimated numbers in the Wind Farm Area were highest in the summer months, with peaks in April and September. Mean estimated numbers in the buffer area increased from March, and were highest in June, August and September, before decreasing again in October for the winter months.

Figure 1: Mean monthly estimated numbers of gannets in the Wind Farm Area & 8km buffer area on baseline surveys (Three-year mean)

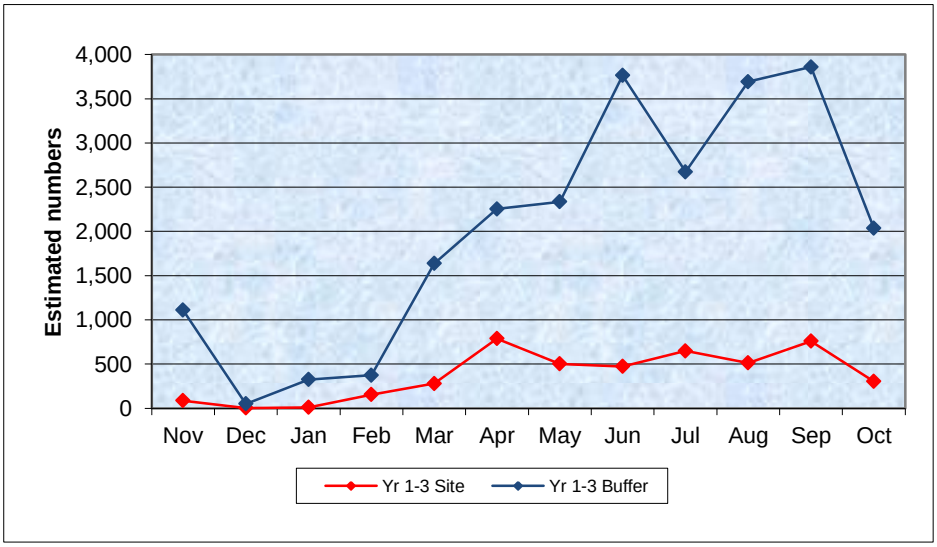


Table 1: Estimated numbers of gannets in the Wind Farm Area (and 1, 2 & 8 km buffer) in Years 1 to 3

Month	Wind Farm Area					Estimated total Wind Farm Area + 1 km	Estimated total Wind Farm Area + 2 km	Estimated total Wind Farm Area + 8 km
	Estimated nos on water	Lower 95 % C.L.	Upper 95 % C.L.	Estimated nos flying	Estimated total			
Yr1 Nov	0	0	0	20	20	20	27	435
Yr1 Dec	0	0	0	0	0	9	9	30
Yr1 Jan	0	0	0	7	7	7	7	20
Yr1 Feb	0	0	0	20	20	20	49	394
Yr1 Mar	15	7	33	462	477	504	538	1,562
Yr1 Apr	7	4	14	129	137	137	177	959
Yr1 May	7	2	23	150	157	327	484	1,522
Yr1 Jun	118	55	254	237	355	404	530	1,714
Yr1 Jul	0	0	0	89	89	159	276	1,217
Yr1 Aug	64	33	123	177	241	445	692	3,113
Yr1 Sep	381	277	523	353	734	1,159	1,648	4,081
Yr1 Oct	7	4	14	163	170	248	360	1,234
Yr2 Nov	-	-	-	-	-	-	-	-
Yr2 Dec	0	0	0	7	7	7	7	77
Yr2 Jan	0	0	0	14	14	75	75	562
Yr2 Feb	35	15	81	374	409	526	696	955
Yr2 Mar	14	6	30	79	93	263	323	1,279
Yr2 Apr	1,936	782	4,790	177	2,113	2,614	2,867	6,060
Yr2 May	15	5	41	800	814	1,003	1,407	4,151
Yr2 Jun	45	22	92	603	648	1,003	1,346	5,918
Yr2 Jul	291	196	432	1,248	1,539	1,764	2,089	4,402
Yr2 Aug	44	21	92	731	775	1,027	1,376	6,009
Yr2 Sep	303	191	483	628	932	1,765	3,113	6,588
Yr2 Oct	106	53	211	305	410	513	626	3,926
Yr3 Nov	109	57	206	42	150	244	850	1,953
Yr3 Dec	-	-	-	-	-	-	-	-
Yr3 Jan	0	0	0	7	7	55	55	417
Yr3 Feb	16	5	49	21	37	59	97	239
Yr3 Mar	21	4	112	248	269	359	744	2,909
Yr3 Apr	23	10	53	89	113	254	537	2,107
Yr3 May	67	37	122	467	534	769	970	2,838
Yr3 Jun	165	53	518	248	413	606	1,172	5,076
Yr3 Jul	37	15	89	282	319	494	735	4,347
Yr3 Aug	119	47	301	406	524	598	881	3,495
Yr3 Sep	77	50	118	533	611	907	1,200	3,184

Month	Wind Farm Area					Estimated total Wind Farm Area + 1 km	Estimated total Wind Farm Area + 2 km	Estimated total Wind Farm Area + 8 km
	Estimated nos on water	Lower 95 % C.L.	Upper 95 % C.L.	Estimated nos flying	Estimated total			
Yr3 Oct	67	43	103	260	327	503	670	1,852

In the Year 1 non-breeding season, (October to mid-March), gannets were widespread at mostly low densities across the Wind Farm Area and 8 km buffer area (Figure 2).

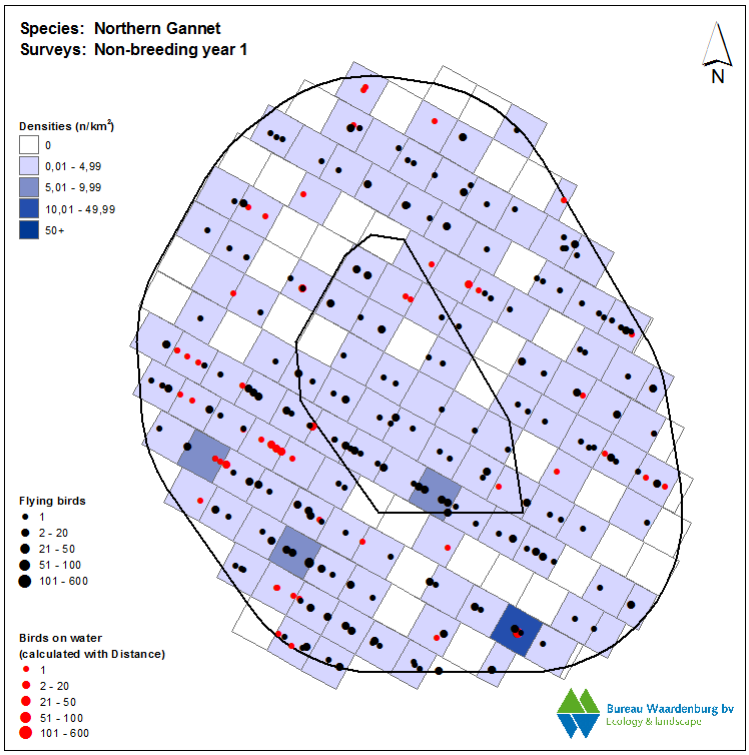


Figure 2: Gannet density in the Year 1 non-breeding season

Gannets were slightly more widespread at low to moderate densities across the Wind Farm Area and 8 km buffer area between October and mid-March of Year 2 compared to Year 1 (Figure 3). Highest densities were recorded in the south-east of the buffer area at this time.

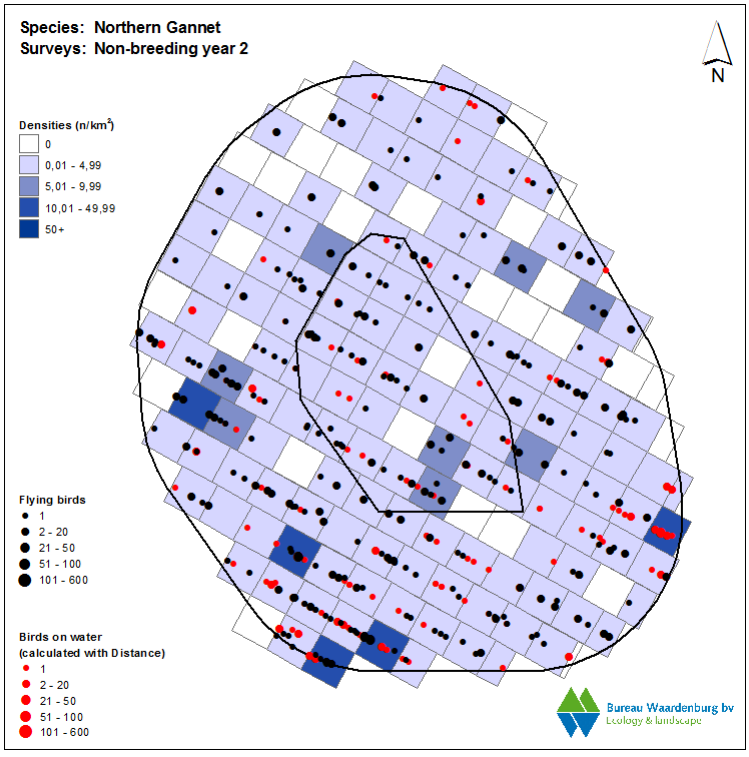


Figure 3: Gannet density in the Year 2 non-breeding season

Gannet distribution between October and mid-March of Year 3 was similar to the two previous years, with mostly low densities across the Wind Farm Area and 8 km buffer area (Figure 4).

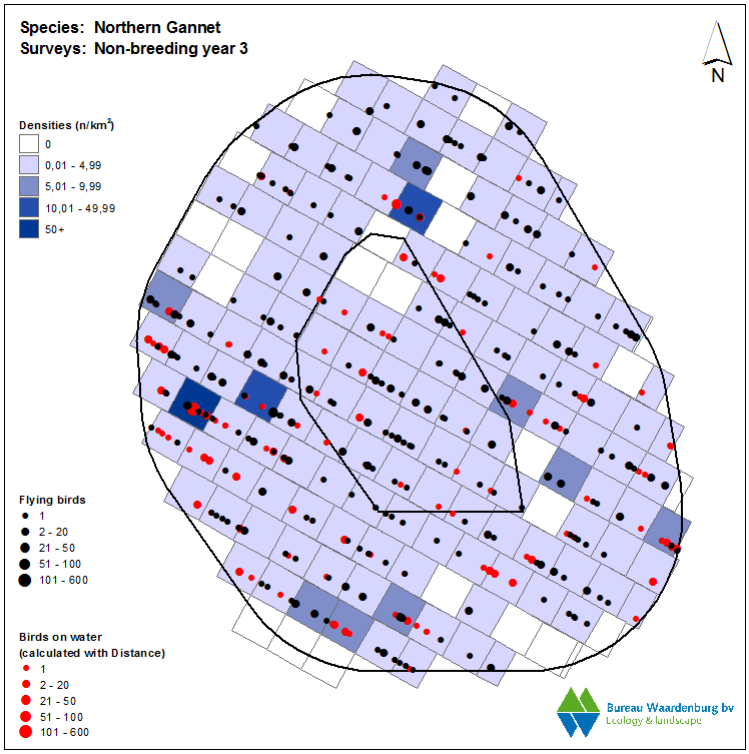


Figure 4: Gannet density in the Year 3 non-breeding season

Gannets were numerous and widespread in the Year 1 breeding season (mid-March to September), with low to moderate, occasionally high densities recorded across the Wind Farm Area and 8 km buffer area over the period (Figure 5).

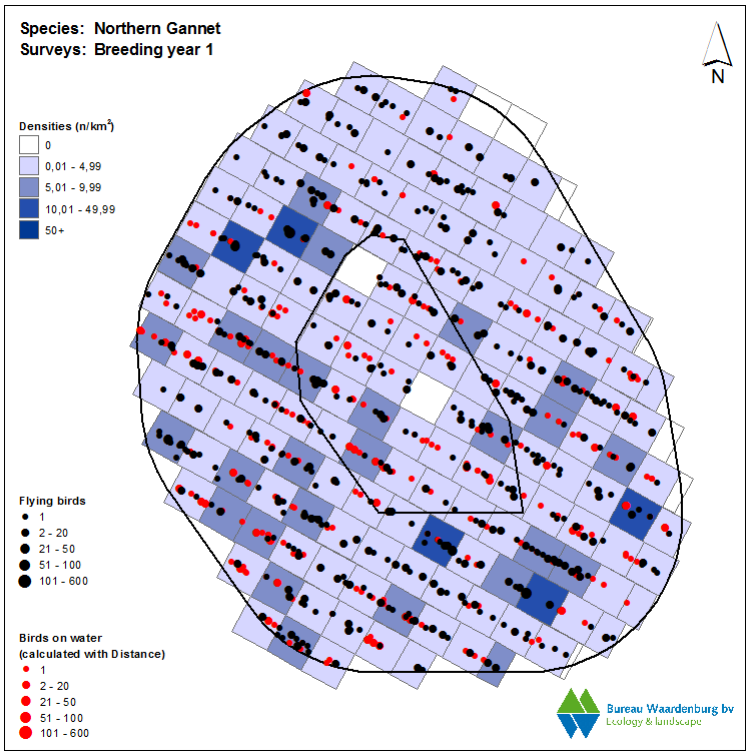


Figure 5: Gannet density in the Year 1 breeding season

Gannet density in the Wind Farm Area and 8 km buffer area in the Year 2 breeding season (mid-March to September) was generally higher than recorded in the same period in Year 1, with moderate to high densities recorded in the western half of the Wind Farm Area and buffer area, and mostly low to moderate densities recorded in the eastern half (Figure 6).

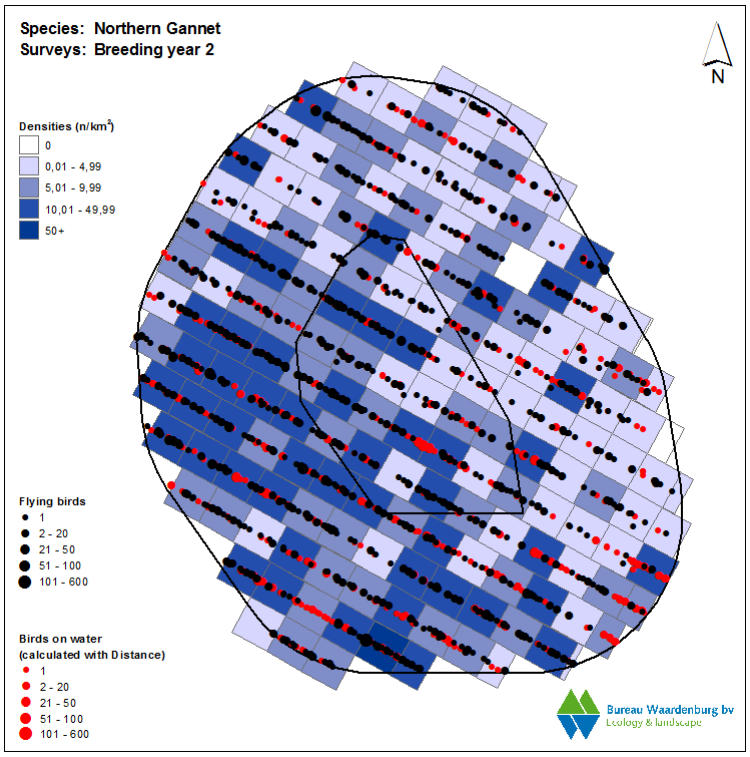


Figure 6: Gannet density in the Year 2 breeding season

Gannet density in the Wind Farm Area and 8 km buffer area in the Year 3 breeding season was slightly lower than in the same period in Year 2, with mostly low to moderate densities recorded in the Wind Farm Area. Higher densities were recorded in the west and south of the buffer area at this time (Figure 7).

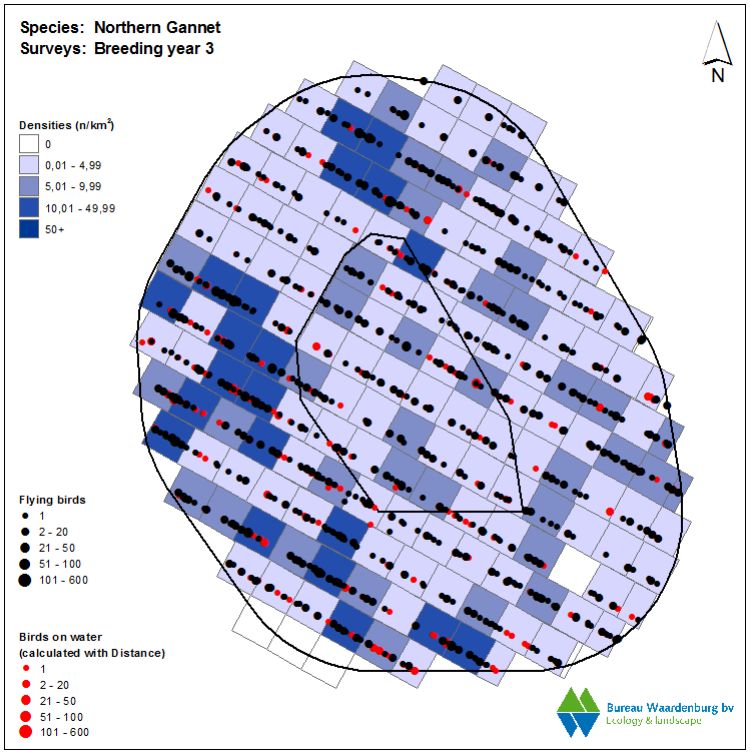
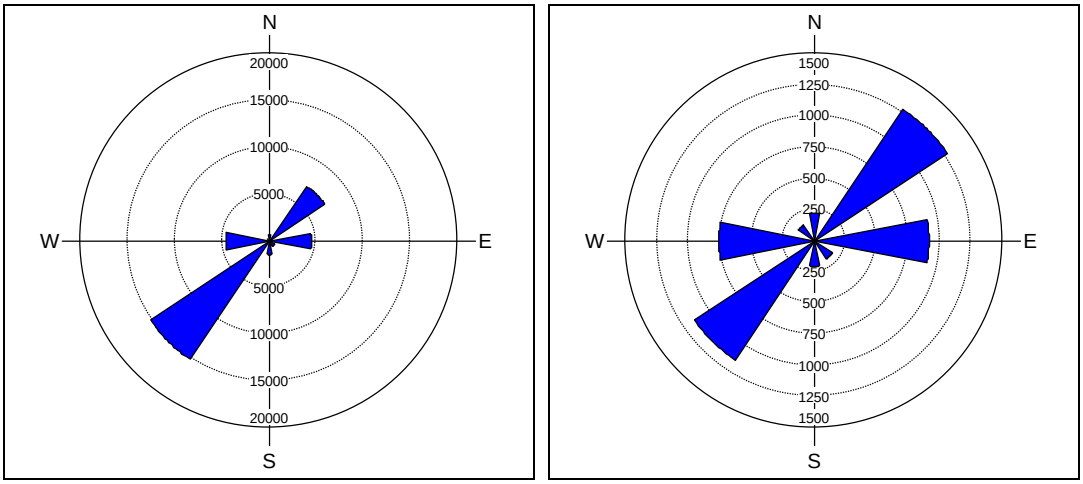


Figure 7: Gannet density in the Year 3 breeding season

A total of 41,250 gannets were recorded in flight on baseline surveys, with 95.2% of birds flying below 27.5 m MSL in height. A total of 1,989 gannets (4.8%) were recorded flying above 27.5 m MSL on baseline surveys in the Wind Farm Area and 8 km buffer area.

Flight direction was recorded for 34,296 gannets in the breeding season (mid-March to September), with direction recorded for 4,831 birds in the non-breeding season (October to mid-March) (Figure 8). The number of gannets recorded in March was split equally between the breeding and non-breeding season, as recommended by SNH (Marine Scotland, 2017).

Figure 8: Flight direction of gannets in the Wind Farm Area and 8 km buffer area on baseline surveys



Breeding season (n=34,296 birds) Non-breeding season (n=4,831 birds)

Numbers shown on figures are number of birds recorded

In the breeding season, slightly less than half of all birds recorded were flying south-west (44.1%) in the general direction of the Bass Rock breeding colony, with 20.5% of birds flying north-east (Table 2). In the non-breeding period, just under a quarter of birds (23.6%) were recorded flying south-west, with 26.2% flying north-east. An additional 2,113 birds were recorded as circling in Years 1 to 3 (not shown).

Table 2: Comparison of flight height and direction of flying adult gannets in the Wind Farm Area and 8 km buffer area between March and September, from baseline survey data

Direction	Below 7.5m	Above 7.5m	Total	Percentage of birds below 7.5m
West	3,859	523	4,382	88.1%
South-west	12,141	1,112	13,253	91.6%
South	1,147	118	1,265	90.7%
Total	**17,147**	**1,753**	**18,900**	**90.7%**
North	457	190	647	70.6%
North-east	5,299	1,737	7,036	75.3%
East	3,159	1,277	4,436	71.2%
Total	**8,915**	**3,204**	**12,119**	**73.6%**

A comparison of flight direction and flight height of adult gannets between March and September within the Wind Farm Area and 2 km buffer is presented in Table 2. The majority of adult gannets recorded flying in the direction of the Bass Rock during baseline surveys (recorded as flying west, south-west or south) were recorded flying below 7.5m in height (90.7%) (n=18,900 birds). In comparison, just under three quarters of adult gannets recorded flying away from the Bass Rock (recorded as flying north, north-east or

east) were recorded flying below 7.5m in height (73.6%%) (n=12,119 birds). Although a relatively crude assessment, these results indicate that the majority of birds returning to the breeding colony fly through the Wind Farm Area and 2 km buffer well below the rotor swept area.

A total of 40,500 gannets were aged on baseline surveys in the Wind Farm Area and 8 km buffer area. In the breeding season (mid-March to September) age was recorded for 35,085 gannets, with 877 immature (non-breeding) birds (2.5%) and 34,208 adults (97.5%) aged on surveys. In the non-breeding season, (October to mid-March), age was recorded for 5,415 gannets, with 193 immature (non-breeding) birds (3.6%) and 5,222 adults (96.4%) aged on surveys (Table 3). The number of immature and adult birds recorded in March was split equally between the breeding and non-breeding season, as recommended by SNH (Marine Scotland, 2017).

Table 3: Monthly breakdown of immature and adult gannets in the Wind Farm Area and 8 km buffer area from baseline survey data

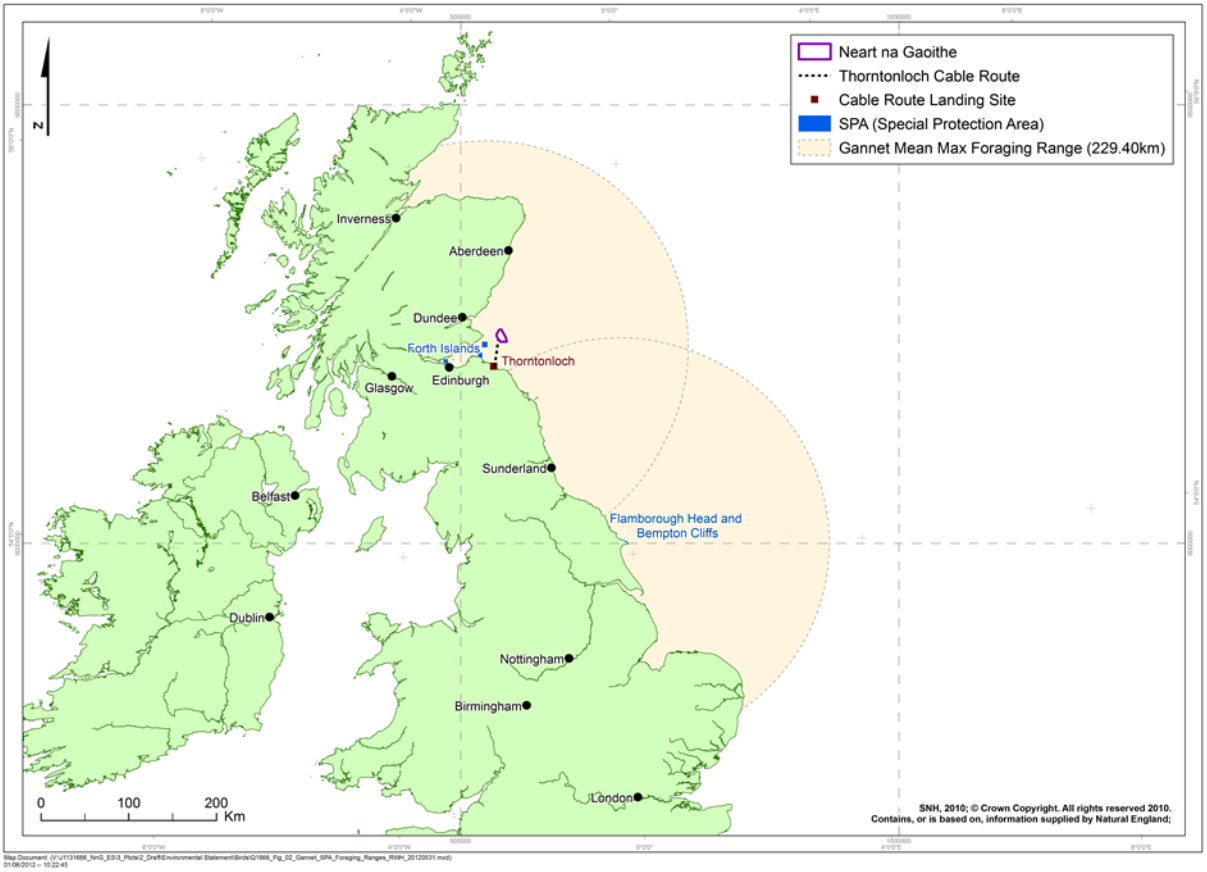
Month	No of immature birds	Number of adult birds	Number of aged birds	Percentage of immature birds
January	18	154	172	10.47
February	5	1,175	1,180	0.42
March	0	2,642	2,642	0
April	8	3,805	3,813	0.21
May	32	5,528	5,560	0.58
June	115	7,829	7,944	1.45
July	123	5,342	5,465	2.25
August	80	5,641	5,721	1.4
September	519	4,742	5,261	9.87
October	81	2,286	2,367	3.42
November	66	263	329	20.06
December	23	23	46	50.0

Gannet is currently amber-listed on the UK Birds of Conservation Concern list, as more than 50% of the UK gannet breeding population is found at less than ten colonies, and also because the UK holds more than 20% of the European breeding population (Eaton *et al*., 2015).

One SPA for breeding gannets (Forth Islands SPA) was highlighted in the Scoping Opinion as being of possible risk of collision impact arising from the Project (Marine Scotland, 2017). This SPA held 21,600 pairs of gannets on the Bass Rock at the time of designation, and at the last census (2014), the breeding population was estimated to be 75,259 pairs, the largest colony in the UK (Figure 9).

The distance between the Wind Farm Area and the Bass Rock colony is approximately 16 km, which is within the mean maximum foraging range of 229.4 ± 124.3 km (Thaxter *et al.*, 2012). The next closest SPA for breeding gannet is Flamborough Head and Bempton Cliffs SPA, which is approximately 259 km from the Wind Farm Area (Figure 9).

Figure 9 SPAs for breeding Gannets within mean maximum foraging range of the Project



In addition to the SPA breeding colonies, the Scottish Government is currently considering the designation of a new suite of marine SPAs. This includes the Outer Firth of Forth & St Andrews Bay pSPA. Gannet is listed as a qualifying interest for this pSPA in the breeding season (SNH 2016).

1.1.1.2 Kittiwake

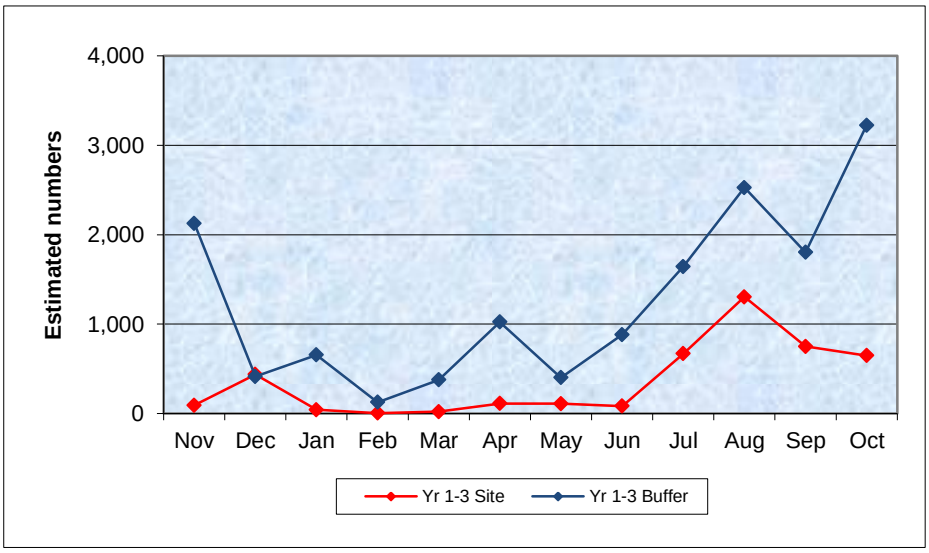
Kittiwakes are one of the commonest seabird species in the UK, breeding in large colonies on suitable coastal cliff habitat. Largest numbers occur on the east coast, and 366,835 breeding pairs were recorded in Britain during Seabird 2000 (Mitchell *et al.,* 2004). The closest large colonies to the NnG development are the Isle of May, St Abb's Head and Fowlsheugh. Kittiwakes mostly prey on small fish species such as lesser sandeels and clupeids, as well as fishery discards (Forrester *et al.,* 2007).

Estimated numbers of kittiwakes were derived from baseline survey data by applying Distance sampling techniques (Table 4). The breeding season for kittiwake has been defined as mid-April to August (Table 4) (SNH 2017).

Table 4: Estimated numbers of kittiwakes in the Wind Farm Area (and 1, 2 & 8 km buffer) in Years 1 to 3

Month	Wind Farm Area					Estimated total Wind Farm Area + 1 km	Estimated total Wind Farm Area + 2 km	Estimated total Wind Farm Area + 8 km
	Estimated nos on water	Lower 95 % C.L.	Upper 95 % C.L.	Estimated nos flying	Estimated total			
Yr1 Nov	18	5	67	20	38	45	45	740
Yr1 Dec	22	6	87	14	36	43	72	388
Yr1 Jan	0	0	0	0	0	0	0	0
Yr1 Feb	0	0	0	0	0	0	0	119
Yr1 Mar	0	0	0	0	0	0	7	40
Yr1 Apr	0	0	0	7	7	20	20	2,044
Yr1 May	0	0	0	41	41	61	68	168
Yr1 Jun	35	17	71	20	55	55	151	505
Yr1 Jul	0	0	0	41	41	41	48	196
Yr1 Aug	77	17	351	7	83	407	620	741
Yr1 Sep	2,048	948	4,424	163	2,211	2,513	3,405	6,006
Yr1 Oct	1,688	995	2,864	136	1,824	2,302	4,440	7,322
Yr2 Nov	-	-	-	-	-	-	-	-
Yr2 Dec	101	43	239	736	837	882	936	1,314
Yr2 Jan	0	0	0	7	7	14	20	1,352
Yr2 Feb	0	0	0	14	14	71	71	135
Yr2 Mar	0	0	0	7	7	33	59	820
Yr2 Apr	256	116	567	48	304	369	444	1,079
Yr2 May	132	49	356	81	213	319	361	691
Yr2 Jun	0	0	0	27	27	47	68	1,427
Yr2 Jul	1,228	485	3,113	223	1,451	1,641	1,708	4,727
Yr2 Aug	18	7	52	27	46	62	149	545
Yr2 Sep	0	0	0	20	20	20	387	716
Yr2 Oct	0	0	0	88	88	115	165	4,161
Yr3 Nov	0	0	0	146	146	191	440	3,697
Yr3 Dec	-	-	-	-	-	-	-	-
Yr3 Jan	76	34	171	41	117	135	185	735
Yr3 Feb	0	0	0	0	0	14	14	140
Yr3 Mar	0	0	0	55	55	76	90	329
Yr3 Apr	10	2	41	14	24	38	72	281
Yr3 May	0	0	0	76	76	103	117	677
Yr3 Jun	137	71	267	28	165	228	341	962
Yr3 Jul	480	216	1,066	34	515	952	980	2,014
Yr3 Aug	3,763	1,795	7,890	20	3,783	3,903	4,165	10208
Yr3 Sep	0	0	0	21	21	42	672	938
Yr3 Oct	0	0	0	34	34	34	48	135

Figure 10: Mean monthly estimated numbers of kittiwakes in the Wind Farm Area & 8km buffer area on baseline surveys (Three-year mean)



Estimated numbers of kittiwakes in the Wind Farm Area were very low between January and June, based on the three-year monthly mean (Figure 10). Mean estimated numbers increased in July and peaked in August as adults and juveniles left the breeding colonies and moved out to sea. Mean estimated numbers then decreased again in September and October.

In the buffer area, mean estimated numbers were generally higher than in the Wind Farm Area, and showed a similar pattern, increasing from June onwards, with highest numbers recorded in October.

Between September and mid-April of Year 1, low densities of kittiwakes were recorded sporadically in the Wind Farm Area (Figure 11). In the buffer area, kittiwakes were scattered at low to moderate densities, with highest densities in the north and south of the buffer area.

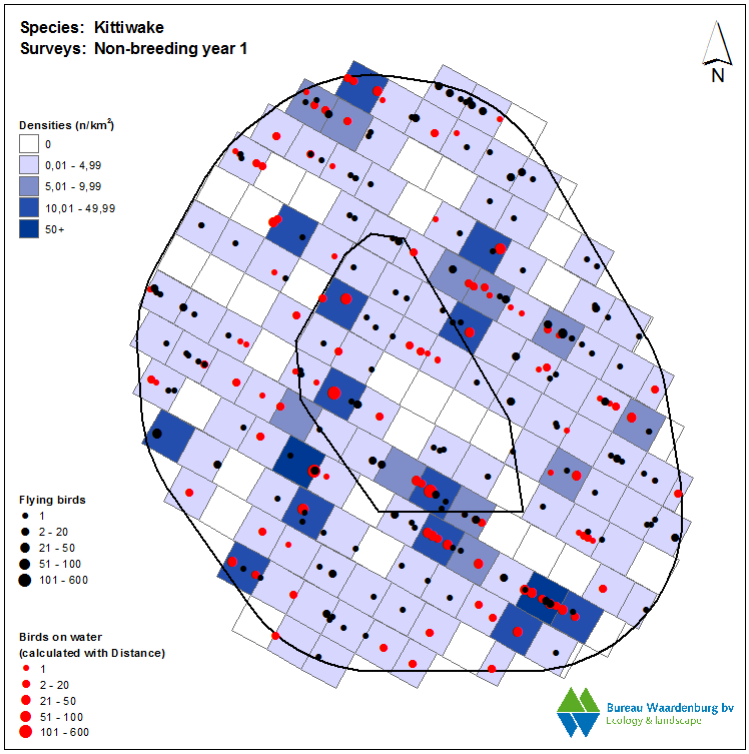


Figure 11: Kittiwake density in the Year 1 non-breeding season

Over the same period in Year 2, moderate to high densities of kittiwakes were recorded in the north of the Wind Farm Area, with low densities elsewhere (Figure 12). In the buffer area, kittiwakes were again scattered at mostly low to moderate densities, with highest densities in the south-east of the buffer area.

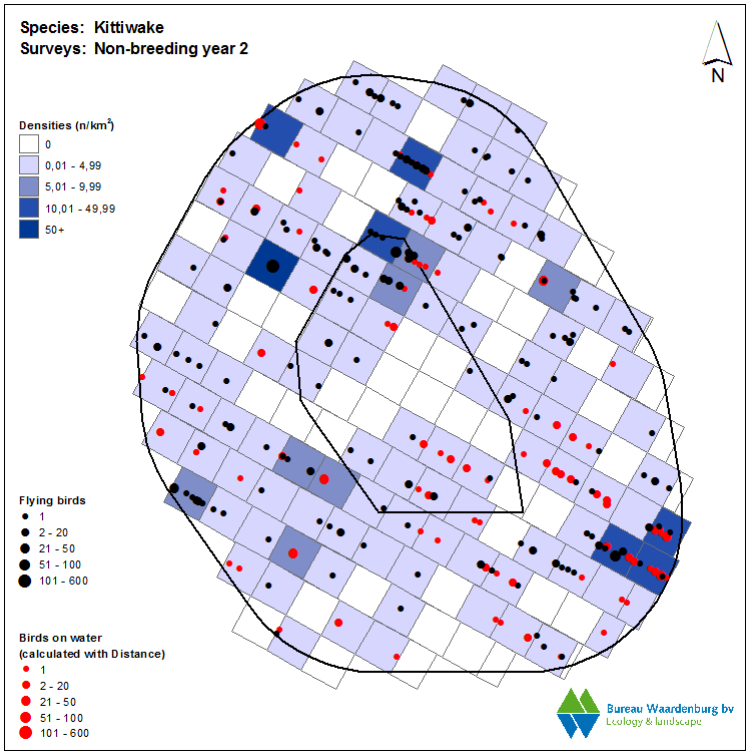


Figure 12: Kittiwake density in the Year 2 non-breeding season

Between September and mid-April of Year 3, kittiwakes were more widespread in the Wind Farm Area, although densities were mostly low (Figure 13). In the buffer area, kittiwakes were again widespread at mostly low densities, with highest densities in the south-west of the buffer area.

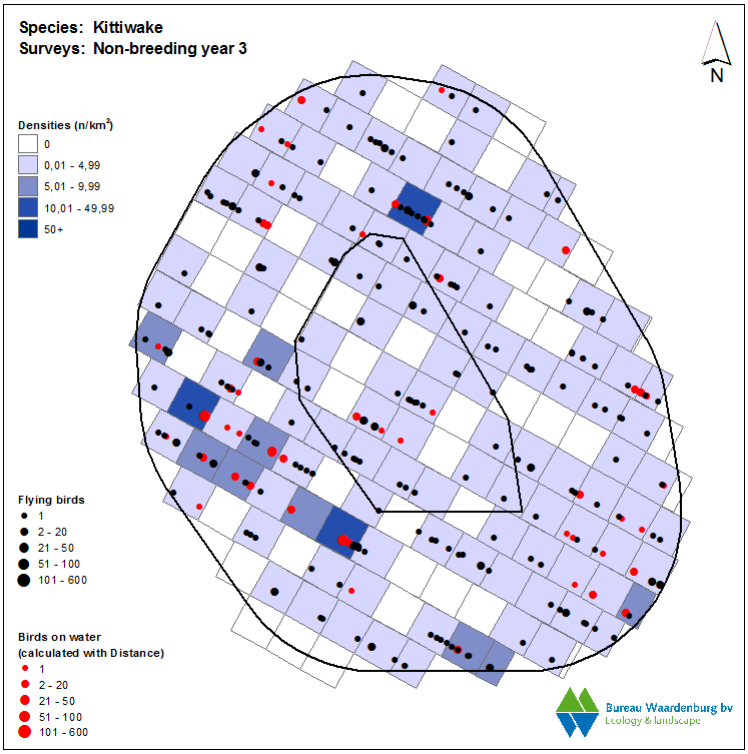


Figure 13: Kittiwake density in the Year 3 non-breeding season

Between mid-April and August of Year 1, kittiwakes were widespread across the Wind Farm Area and the buffer area, at mostly low to moderate densities (Figure 14). Highest densities were recorded to the south of the Wind Farm Area at this time.

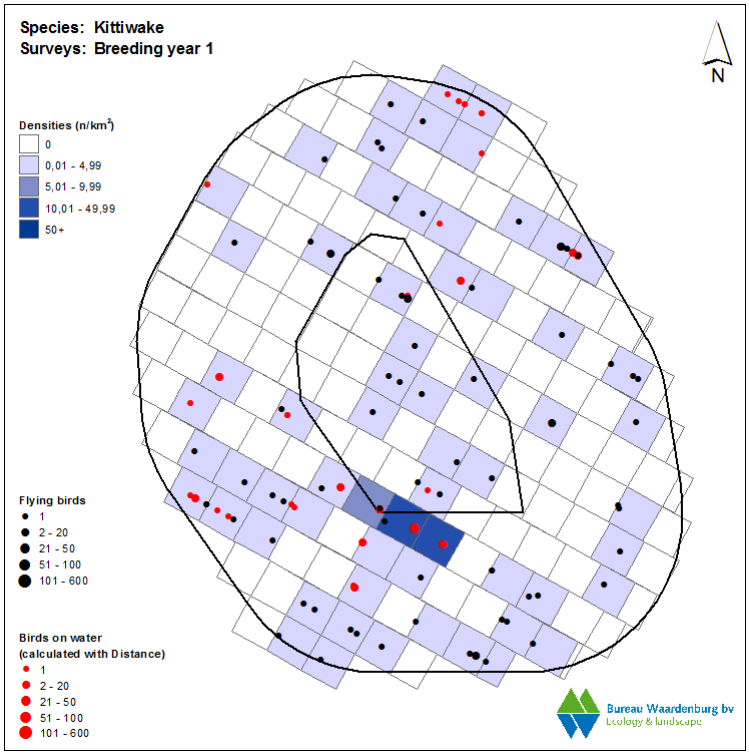


Figure 14: Kittiwake density in the Year 1 breeding season

Kittiwakes were more widespread between mid-April and August of Year 2 than in Year 1, with high densities scattered throughout the Wind Farm Area and buffer area (Figure 15).

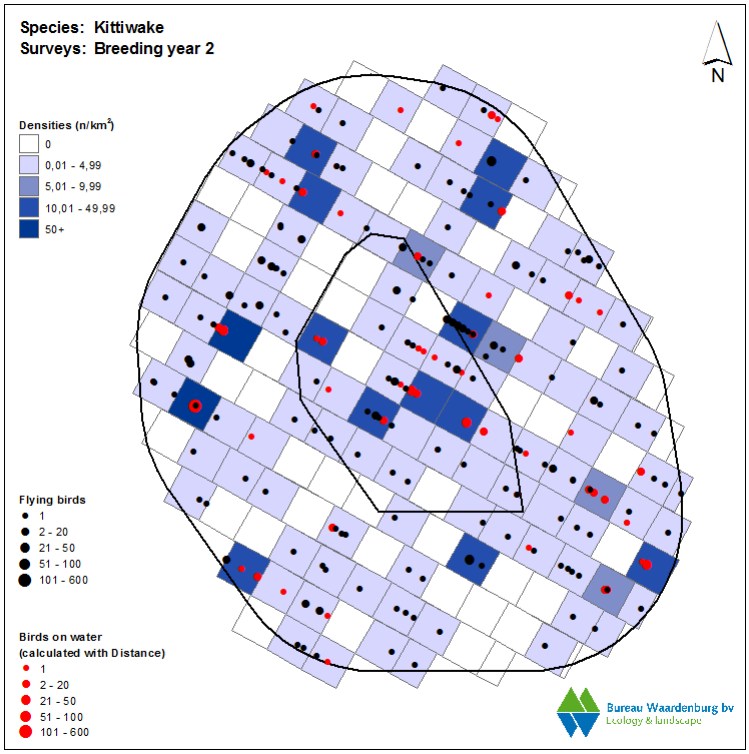


Figure 15: Kittiwake density in the Year 2 breeding season

Between mid-April and August of Year 3, kittiwakes were less widespread in the Wind Farm Area than in Year 2 (Figure 16). Birds were widespread across the buffer area at this time, with high densities mainly in the south-east of the buffer area at this time.

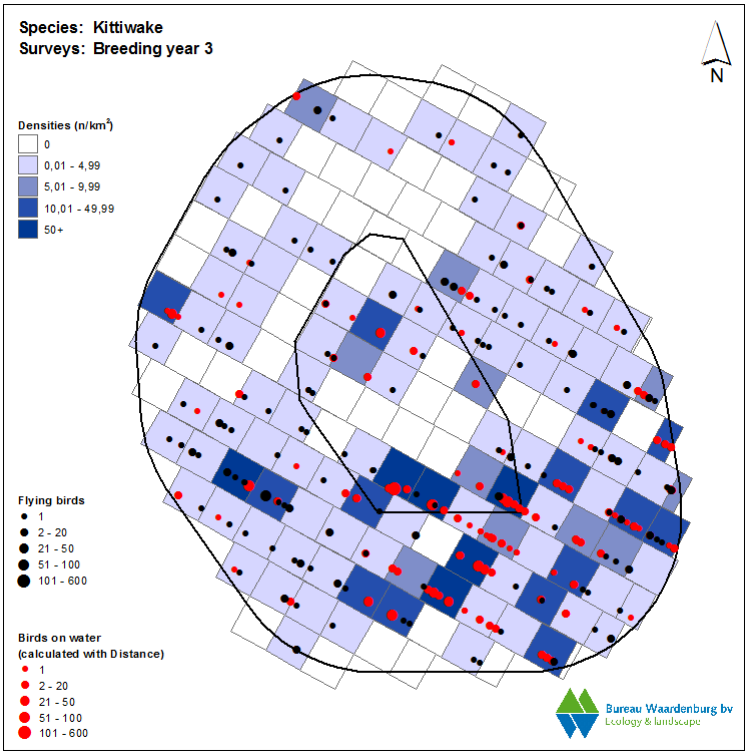


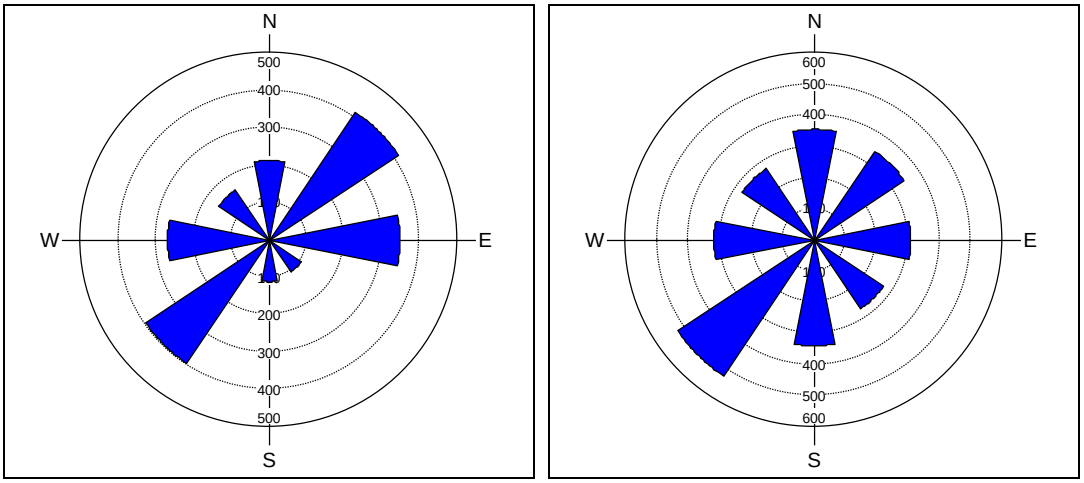
Figure 16: Kittiwake density in the Year 3 breeding season

A total of 6,945 kittiwakes were recorded in flight, with the majority of birds (95.2%) recorded flying below 27.5 m MSL in height. A total of 333 birds (4.8%) were recorded flying above 27.5 m MSL on baseline surveys in the Wind Farm Area and 8 km buffer area.

Flight direction was recorded for 2,004 kittiwakes in the breeding season (mid-April to August), and 2,719 kittiwakes in the non-breeding season (September to mid-March) (Figure 17). The number of kittiwakes recorded in April was split equally between the breeding and non-breeding season, as recommended by SNH (Marine Scotland, 2017).

In the breeding season, the majority of kittiwakes were recorded flying on a south-west - north-east axis, with just over a fifth of all birds recorded flying north-east (20.5%), and 19.7% of birds flying south-west. In the non-breeding season, there was a more even spread of directions recorded, although highest numbers were recorded flying south-west (19.1%). An additional 2,183 birds were recorded as circling (not shown).

Figure 17: Flight direction of kittiwakes in the Wind Farm Area and 8 km buffer area on baseline surveys



Mid-April to August (n=2,004 birds) September to mid-April (n=2,719 birds)

Numbers shown on figures are number of birds recorded

A total of 6,338 kittiwakes were aged during baseline surveys in the Wind Farm Area and 8 km buffer area. In the breeding season (mid-April to August) age was recorded for 3,255 kittiwakes, with 222 immature (non-breeding) birds (6.8%) and 3,033 adults (93.2%) (Table 5). The number of immature and adult birds recorded in April was split equally between the breeding and non-breeding season, as recommended by SNH (Marine Scotland, 2017).

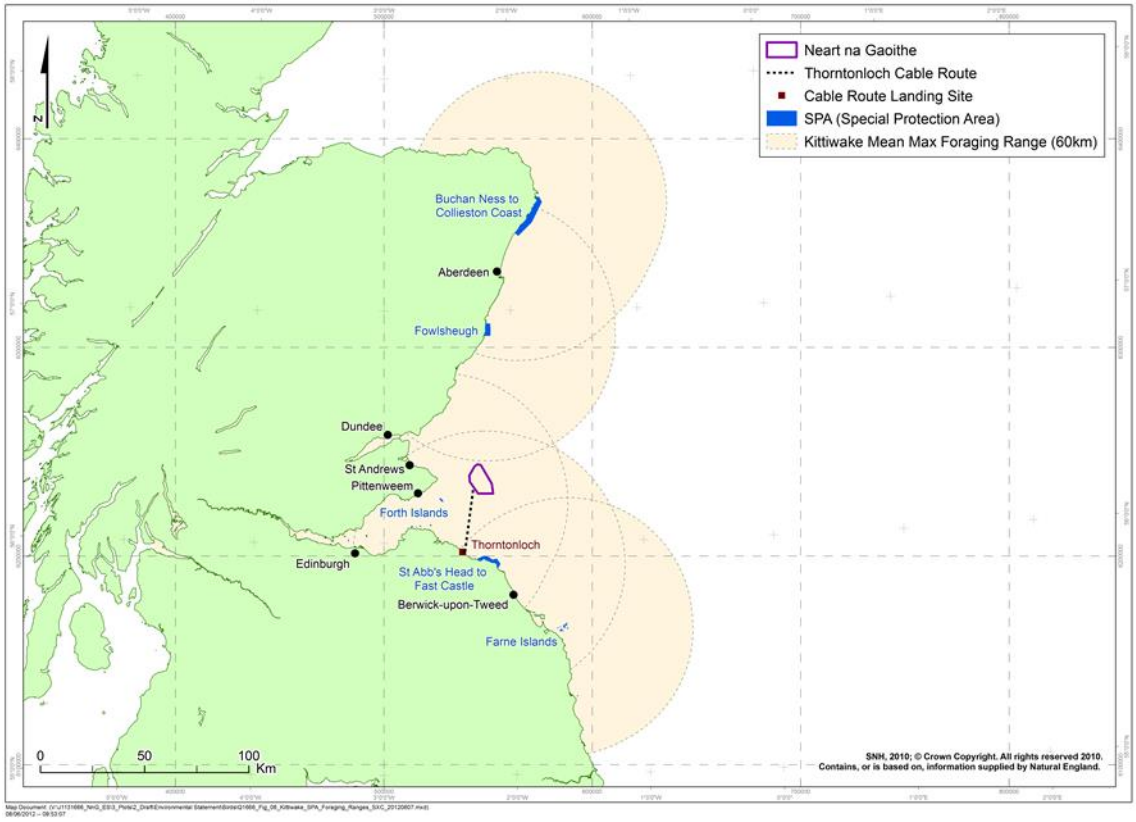
Table 5: Monthly breakdown of immature and adult kittiwakes in the Wind Farm Area and 8 km buffer area from baseline survey data

Month	No of immature birds	Number of adult birds	Number of aged birds	Percentage of immature birds
January	91	234	325	28.0%
February	56	106	162	34.6%
March	76	252	328	23.2%
April	10	552	562	1.8%
May	17	676	693	2.5%
June	17	742	759	2.2%
July	46	1,096	1,142	4.0%
August	137	243	380	36.1%
September	128	359	487	26.3%
October	385	510	895	43.0%
November	210	216	426	49.3%
December	133	46	179	74.3%

Kittiwake is currently red-listed on the UK Birds of Conservation Concern list, as there has been a severe decline in the UK breeding population size (>50%) over 25 years, and also in the longer term, since 1969 (Eaton *et al*., 2015).

Four SPAs for breeding kittiwakes (Buchan Ness to Collieston Coast, Forth Islands SPA, St Abb's Head to Fast Castle SPA and Fowlsheugh SPA) were highlighted in the Scoping Opinion as being of possible risk of impact

arising from the Project (Marine Scotland, 2017)(



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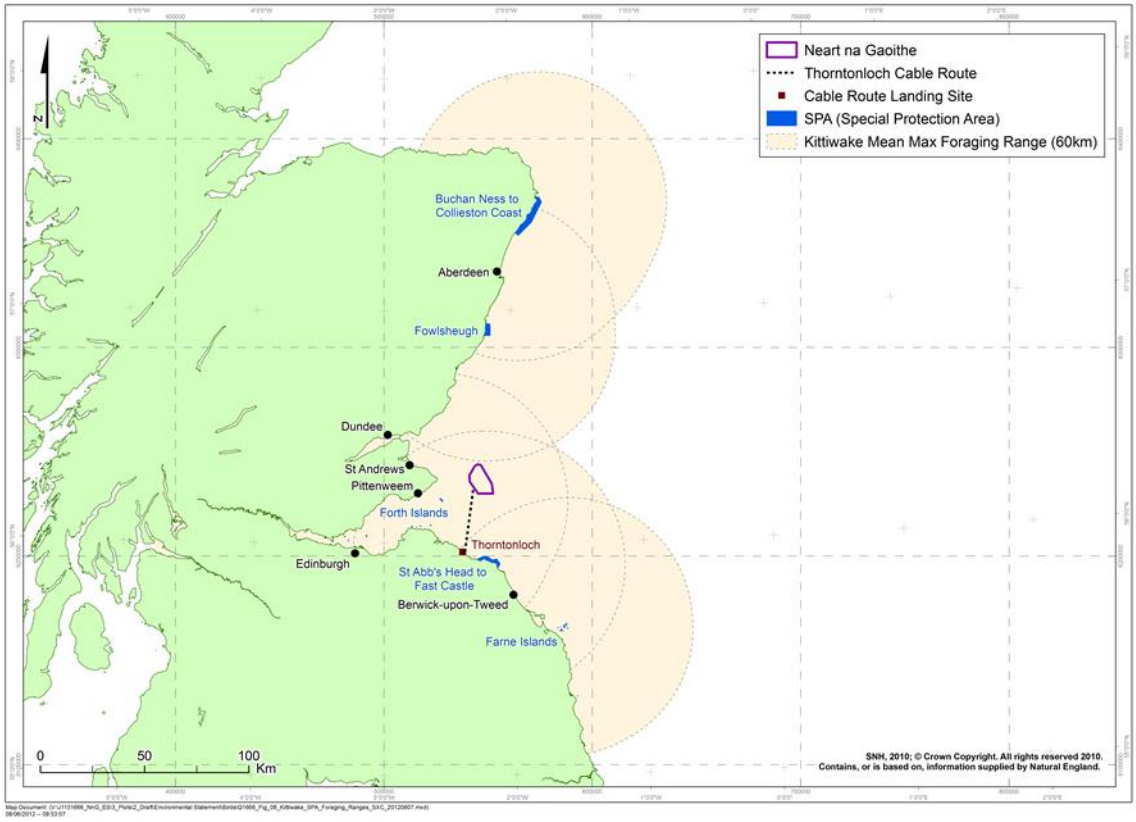
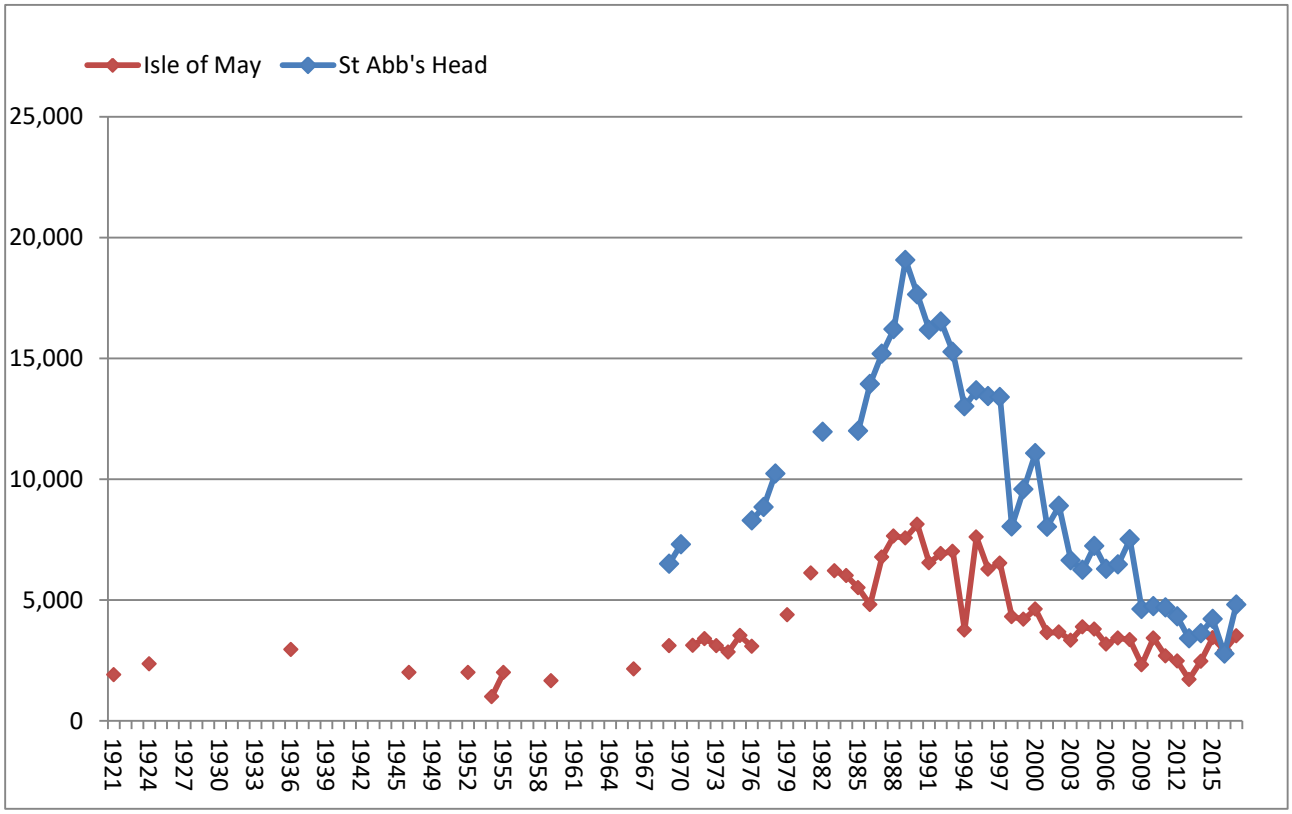
In addition to the SPA breeding colonies, the Scottish Government is currently considering the designation of a new suite of marine SPAs. This includes the Outer Firth of Forth & St Andrews Bay pSPA. Kittiwake is listed as a qualifying interest for this pSPA in the breeding and non-breeding seasons (SNH 2016).

Figure 18: SPAs for breeding Kittiwakes within mean maximum foraging range of the Project



Historical counts of kittiwakes from the Isle of May and St Abb's Head breeding colonies are shown in Figure 19. Although both colonies have been declining since around 1990, counts on the Isle of May and at St Abb's Head have both increased slightly since 2013.

Figure 19: Kittiwake numbers (pairs) at Isle of May and St Abb's Head since 1921

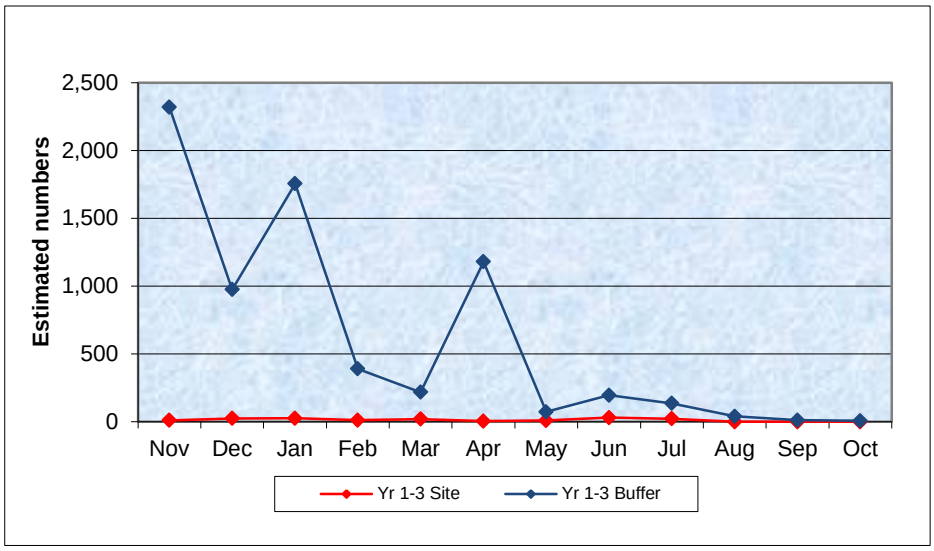


1.1.1.3 Herring gull

Herring gulls are resident, common and widespread, breeding in colonies in coastal and inland locations. There is a general movement southwards in winter months (Forrester et al 2007). Seabird 2000 recorded 142,942 breeding pairs in Britain (Mitchell et al., 2004). The closest large breeding colonies to the NnG development are on the islands in the Firth of Forth and the Isle of May. Herring gulls exploit a wide range of food sources, including scraps and offal from trawlers, as well as on land at refuse dumps and farm land (Forrester et al., 2007).

Mean estimated numbers of herring gulls in the Wind Farm Area were very low throughout the baseline surveys (Figure 20). In the buffer area, mean estimated numbers peaked at 2,319 birds in November, with a lower mean peak of 1,754 birds in January (three-year mean). However, these estimates were probably inflated by the presence of fishing vessels in the buffer area with large numbers of herring gulls associating with them, and should therefore be treated with caution as they may not reflect typical conditions.

Figure 20: Mean monthly estimated numbers of herring gulls in the Wind Farm Area and buffer area on baseline surveys (Three-year mean)



Estimated numbers of herring gulls were derived from baseline survey data by applying Distance sampling techniques (Table 6).

Table 6: Estimated numbers of herring gulls in the Wind Farm Area (and 1, 2 & 8 km buffer) in Years 1 to 3

Month	Wind Farm Area					Estimated total Wind Farm Area + 1 km	Estimated total Wind Farm Area + 2 km	Estimated total Wind Farm Area + 8 km
	Estimated nos on water	Lower 95 % C.L.	Upper 95 % C.L.	Estimated nos flying	Estimated total			
Yr1 Nov	0	0	0	20	20	20	61	3,710
Yr1 Dec	0	0	0	27	27	41	41	972
Yr1 Jan	0	0	0	20	20	736	784	3,836
Yr1 Feb	11	3	41	7	18	38	82	118
Yr1 Mar	12	3	44	27	39	46	46	98
Yr1 Apr	0	0	0	7	7	7	7	205
Yr1 May	0	0	0	0	0	0	0	14
Yr1 Jun	11	4	31	7	17	17	28	377
Yr1 Jul	0	0	0	0	0	0	0	7
Yr1 Aug	0	0	0	0	0	0	0	28
Yr1 Sep	0	0	0	0	0	7	7	7
Yr1 Oct	0	0	0	0	0	0	0	19
Yr2 Nov	-	-	-	-	-	-	-	-
Yr2 Dec	15	3	81	7	22	22	29	1,026
Yr2 Jan	0	0	0	41	41	88	116	625
Yr2 Feb	0	0	0	14	14	20	41	133
Yr2 Mar	8	1	42	13	21	34	40	307
Yr2 Apr	0	0	0	0	0	0	146	3,314
Yr2 May	0	0	0	0	0	0	0	13
Yr2 Jun	0	0	0	20	20	20	20	135
Yr2 Jul	50	9	290	0	50	50	50	226
Yr2 Aug	0	0	0	0	0	0	0	7
Yr2 Sep	0	0	0	0	0	0	0	27
Yr2 Oct	0	0	0	0	0	0	0	0
Yr3 Nov	0	0	0	0	0	0	0	947
Yr3 Dec	-	-	-	-	-	-	-	-
Yr3 Jan	0	0	0	14	14	14	14	877
Yr3 Feb	0	0	0	0	0	0	209	949
Yr3 Mar	0	0	0	0	0	0	252	309
Yr3 Apr	0	0	0	7	7	20	20	33
Yr3 May	0	0	0	27	27	27	34	219
Yr3 Jun	53	19	147	0	53	53	82	162
Yr3 Jul	0	0	0	14	14	21	21	237
Yr3 Aug	0	0	0	0	0	0	0	85
Yr3 Sep	0	0	0	0	0	0	0	0
Yr3 Oct	0	0	0	0	0	0	0	0

In the Year 1 non-breeding period (September to March), highest densities of herring gulls were recorded in the south-west of the buffer area (Figure 21). Densities in the Wind Farm Area were low at this time of year. Few birds were recorded in the east of the Wind Farm Area and buffer area at this time.

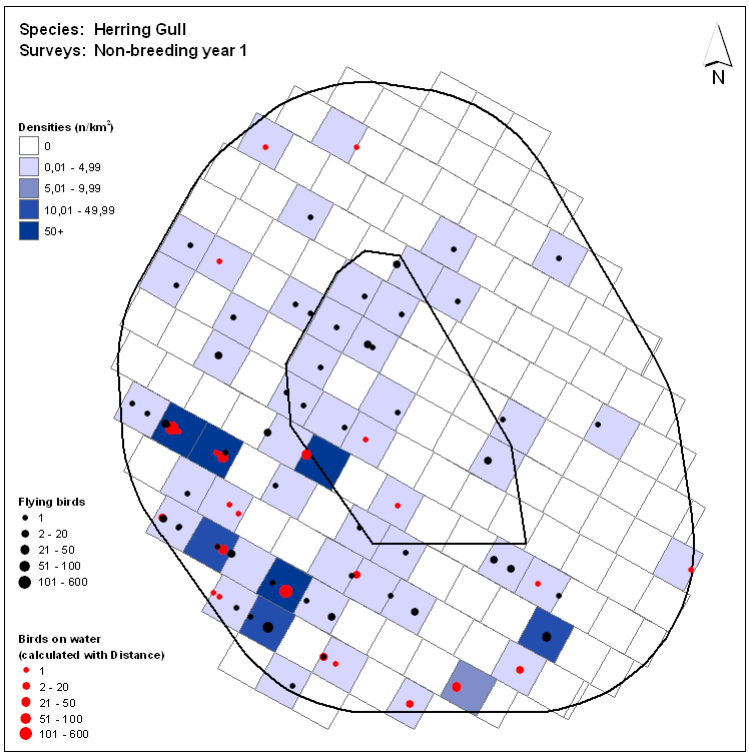


Figure 21: Herring gull density in the non-breeding season, Year 1

A similar distribution pattern was recorded in the Year 2 non-breeding period, with generally low densities of herring gulls recorded in the southern half of the Wind Farm Area and buffer area and fewer birds in the north (Figure 22). As in Year 1, herring gull densities in the Wind Farm Area at this time were low.

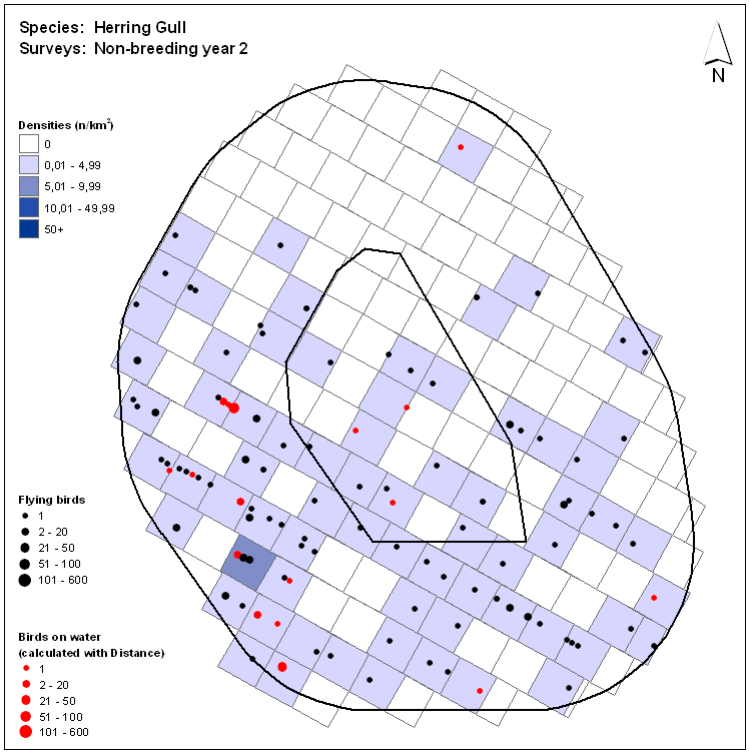


Figure 22: Herring gull density in the non-breeding season, Year 2

In the Year 3 non-breeding period, very few herring gulls were recorded in the Wind Farm Area (Figure 23). Birds were almost entirely restricted to the south-west of the buffer area where high densities were recorded.

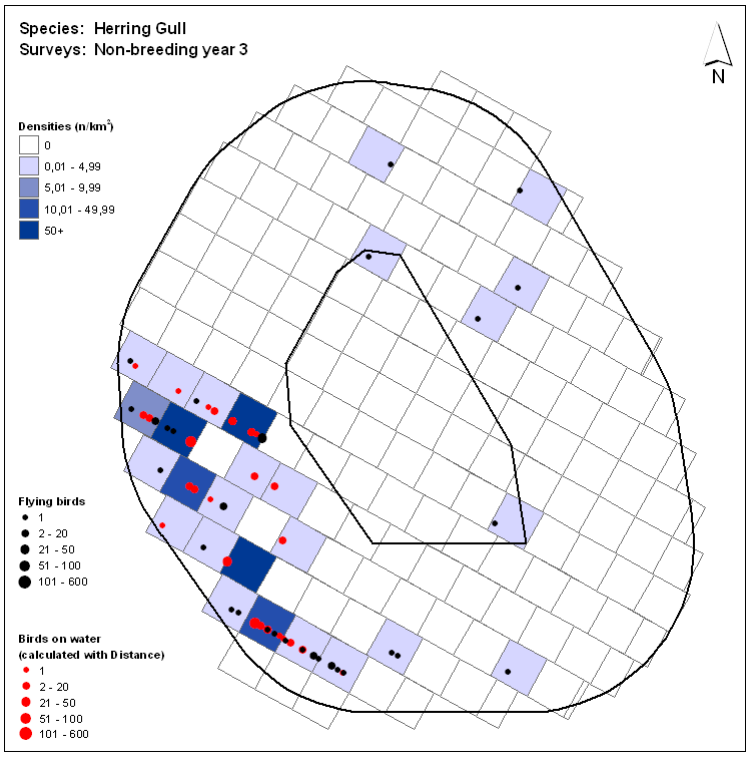


Figure 23: Herring gull density in the non-breeding season, Year 3

Herring gull density in the Year 1 breeding season (April to August) was very low in the Wind Farm Area, with few birds recorded over the period (Figure 24). Herring gulls were slightly more widespread in the buffer area at this time, with highest density recorded in the south of the buffer area.

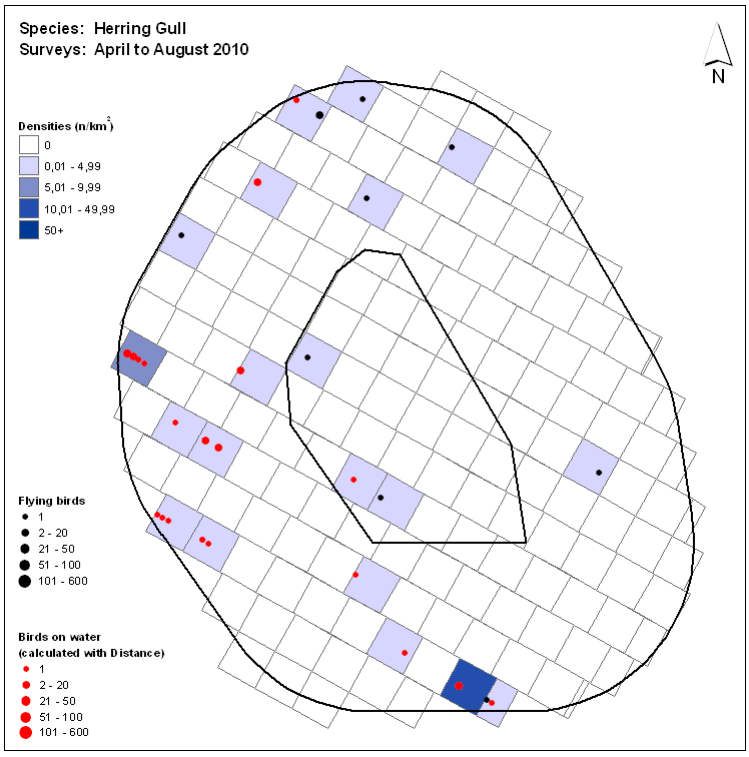


Figure 24: Herring gull density in the breeding season, Year 1

Herring gull distribution was similar between April and August of Year 2 and the same period in Year 1, with low densities and few birds recorded within the Wind Farm Area at this time. Highest densities were recorded in the west of the buffer area at this time (Figure 25).

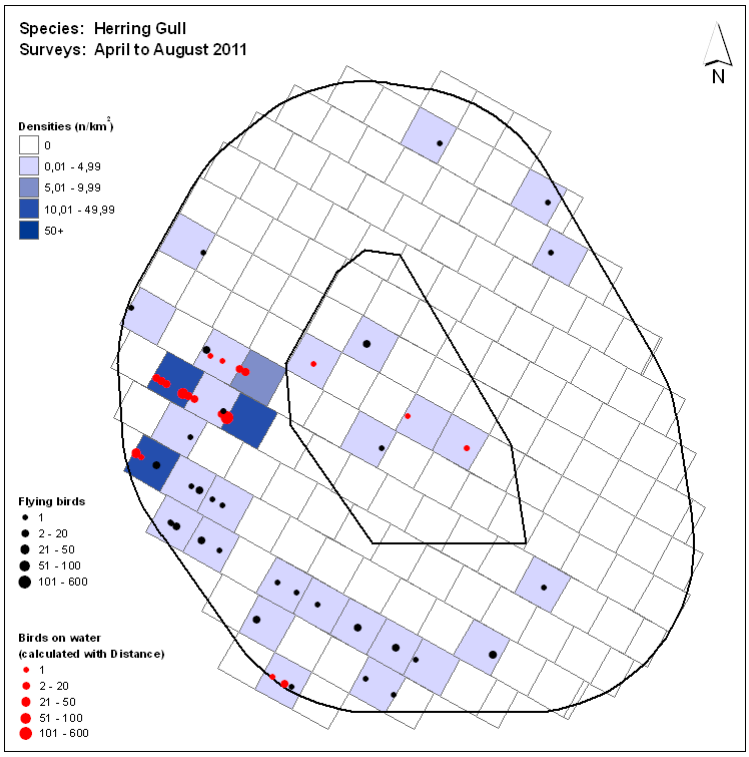


Figure 25: Herring gull density in the breeding season, Year 2

Herring gull distribution in the Year 3 breeding season was similar to the same period in Years 1 and 2, with low densities and few birds recorded within the Wind Farm Area at this time. Higher densities were recorded in the west and south of the buffer area at this time (Figure 26).

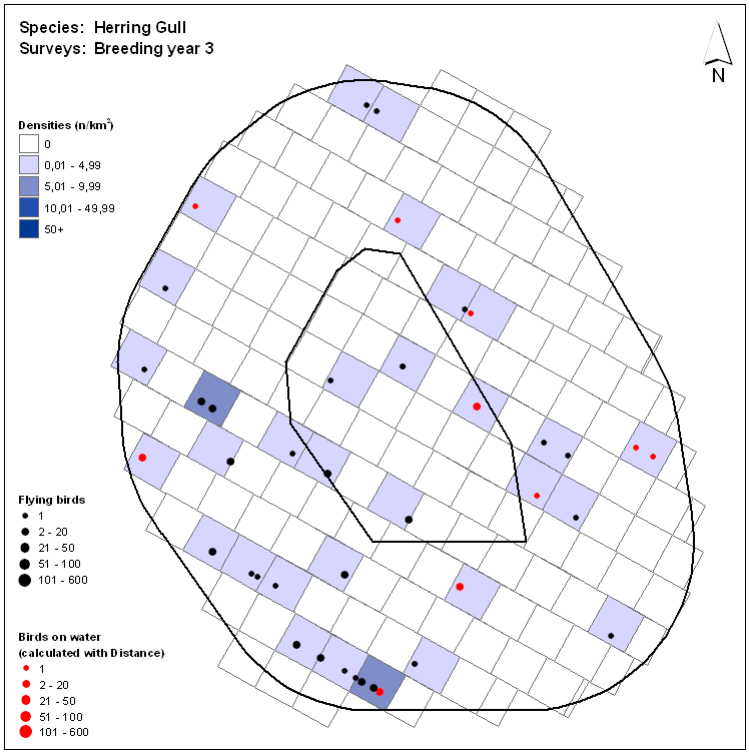


Figure 26: Herring gull density in the breeding season, Year 3

A total of 1,646 herring gulls were recorded in flight on baseline surveys, with 78.3% of birds flying below 27.5 m MSL. A total of 357 birds (21.7%) were recorded flying above 27.5 m MSL on baseline surveys in the Wind Farm Area and 8 km buffer area.

A total of 1,700 herring gulls were aged on baseline surveys in the Wind Farm Area and 8 km buffer area. In the breeding season (April to August) age was recorded for 610 herring gulls, with 138 immature (non-breeding) birds (22.6%) and 472 adults (77.4%) aged on surveys (Table 7).

Table 7: Monthly breakdown of immature and adult herring gulls in the Wind Farm Area and 8 km buffer area from baseline survey data

Month	No of immature birds	Number of adult birds	Number of aged birds	Percentage of immature birds
January	105	247	352	29.8
February	73	194	267	27.3
March	44	94	138	31.9
April	57	115	172	33.1
May	33	7	40	82.5
June	43	150	193	22.3
July	5	150	155	3.2
August	0	50	50	0.0
September	14	8	22	63.6
October	21	2	23	91.3
November	62	56	118	52.5
December	48	122	170	28.2
Total	**505**	**1,195**	**1,700**	**29.7**

Herring gull is currently red-listed on the UK Birds of Conservation Concern list, as there has been a severe long-term decline in the UK breeding population size (>50%) since 1969. In addition, numbers in the UK in the non-breeding season are of international importance (Eaton *et al*., 2015).

Four SPAs for breeding herring gulls (Buchan Ness to Collieston Coast, Forth Islands SPA, St Abb's Head to Fast Castle SPA and Fowlsheugh SPA) were highlighted in the Scoping Opinion as being of possible risk of

impact arising from the Project (Marine Scotland, 2017) (

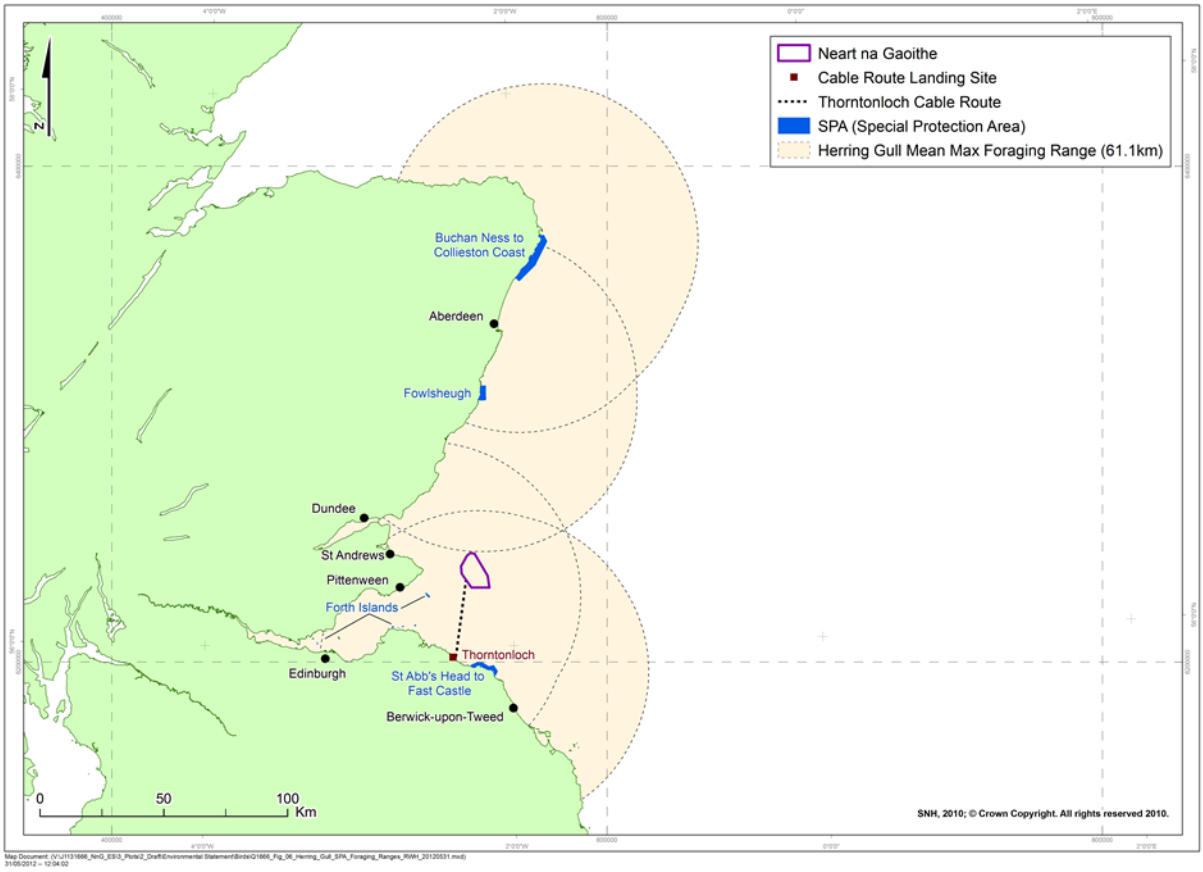


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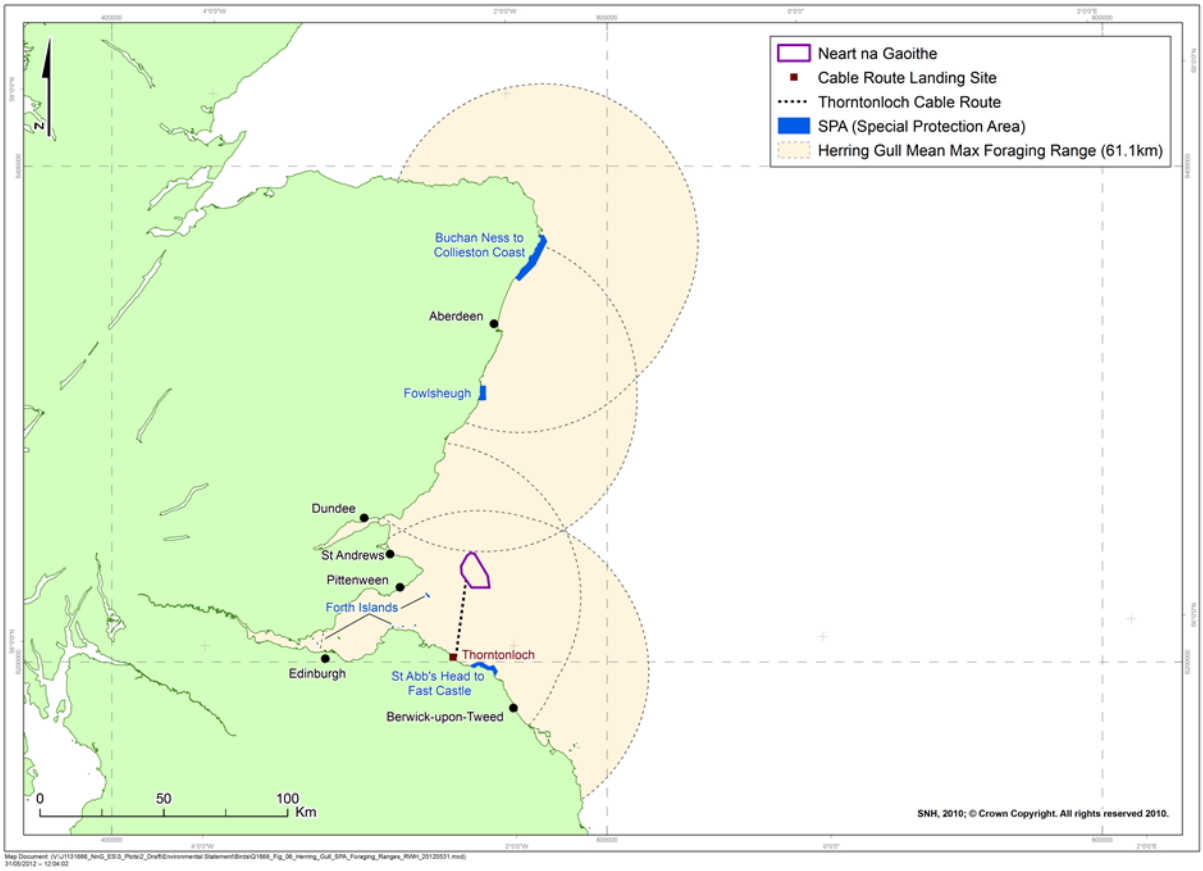
Figure 27: SPAs for breeding Herring gull within mean maximum foraging range of the Project



In addition to the SPA breeding colonies, the Scottish Government is currently considering the designation of a new suite of marine SPAs. This includes the Outer Firth of Forth & St Andrews Bay pSPA. Herring gull is listed as a qualifying interest for this pSPA in the breeding and non-breeding seasons (SNH 2016).

1.1.1.4 Lesser black-backed gull

Lesser black-backed gulls are common and widespread in summer, and breed in colonies in coastal and inland locations. In winter, many birds leave Scotland between November and March, although some remain all year, particularly in the south-west (Forrester *et al*., 2007). Seabird 2000 recorded 111,835 breeding pairs in Britain (Mitchell *et al*., 2004). The nearest large breeding colonies to the Project are on the islands in the Firth of Forth, and the Isle of May. Lesser black backed gulls take a wide variety of prey and scavenged food, both at sea, and on farmland and refuse sites (Forrester *et al*., 2007).

A monthly breakdown of the numbers of lesser black-backed gulls recorded on baseline surveys in the Wind Farm Area between April and September is shown in Table 8.

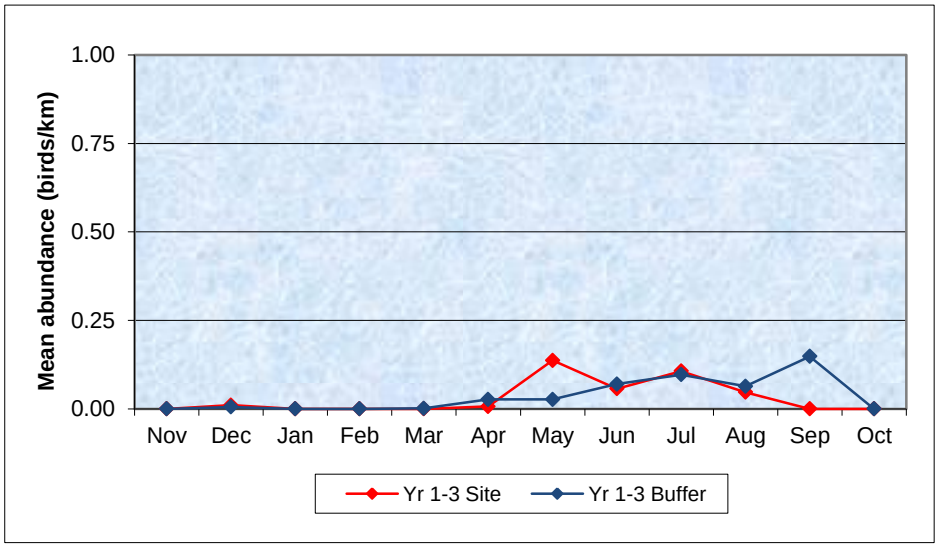
Table 8: Raw numbers of lesser black-backed gulls recorded on baseline surveys in the Wind Farm Area between April and September

Month	Year 1	Year 2	Year 3	Mean
April	1	0	0	1
May	1	0	20	7
June	4	2	3	3
July	2	8	8	6
August	1	1	6	3
September	0	0	0	0

Month	Year 1	Year 2	Year 3	Mean
Total	9	11	37	20

Due to the low sample size of lesser black-backed gulls recorded on baseline surveys, it was not possible to conduct Distance analysis on the data. Abundance rates (birds/km) were calculated instead. Mean monthly lesser black-backed gull abundance was low in the Wind Farm Area and the buffer area on baseline surveys, with a three-year mean peak of 0.14 birds/km in the Wind Farm Area in May, and a three-year mean peak of 0.15 birds/km in the buffer area in September (Figure 28).

Figure 28: Comparison of lesser black-backed gull monthly mean abundance in the Wind Farm Area & buffer area on baseline surveys (Three-year mean)



Lesser black-backed gulls were mainly scattered sporadically throughout the southern half of the Wind Farm Area and 8 km buffer area at low abundances between April and August of Year 1 (Figure 29). Few birds were recorded in the Wind Farm Area over the period.

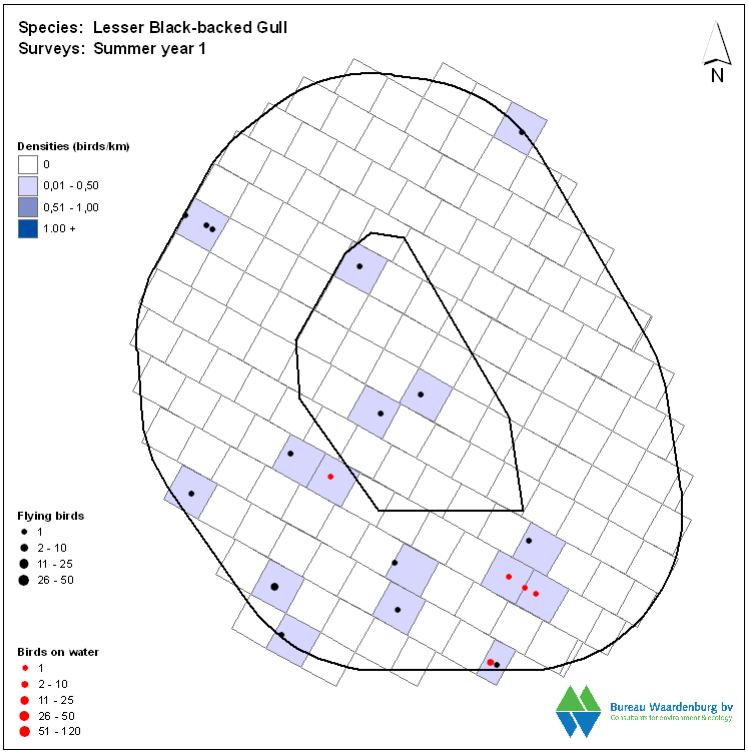


Figure 29: Lesser black-backed gull abundance between April and August, Year 1

A similar distribution pattern was recorded in Year 2 between April and August, with highest abundance of lesser black-backed gulls recorded in the south-west of the buffer area (Figure 30). Fewer lesser black-backed gulls were recorded in the Wind Farm Area over the period than in Year 1.

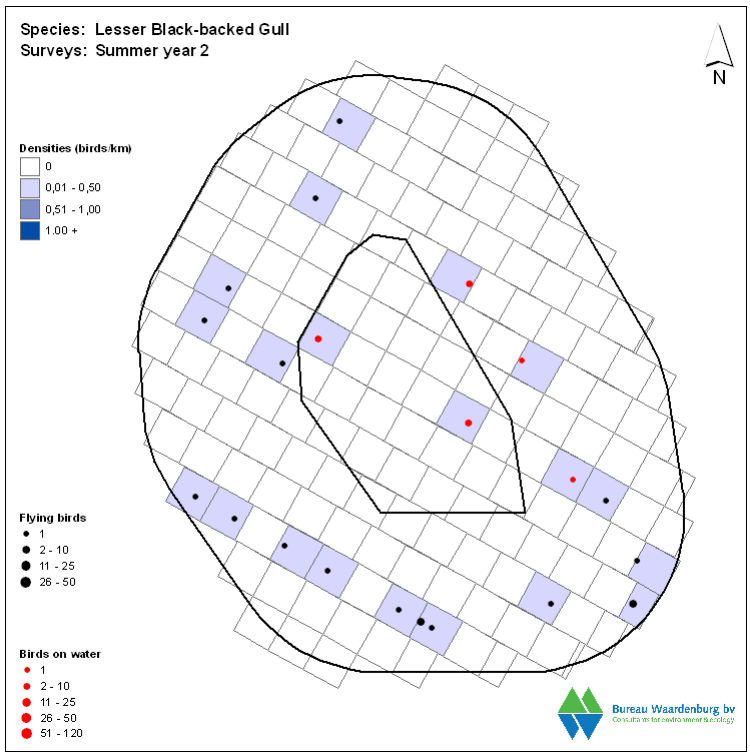


Figure 30: Lesser black-backed gull abundance between April and August, Year 2

Lesser black-backed gulls were more abundant between April and August of Year 3 compared to previous years, although numbers recorded in the Wind Farm Area were still low, (Figure 31). Most birds were recorded in the south of the buffer area at this time.

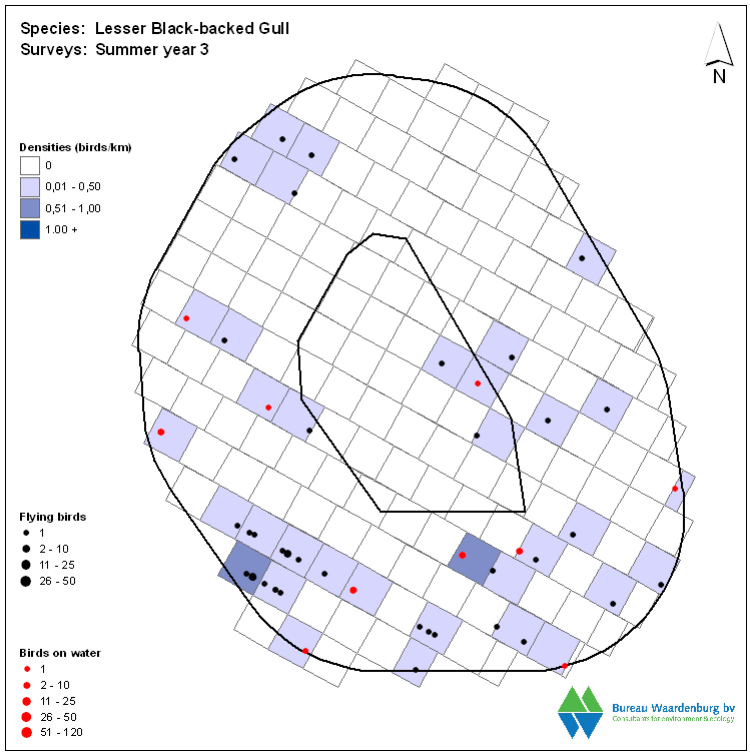


Figure 31: Lesser black-backed gull abundance between April and September, Year 3

A total of 358 lesser black-backed gulls were recorded in flight on baseline surveys, with 90.8% of birds flying below 27.5 m MSL. A total of 33 birds (9.2%) were recorded flying above 27.5 m MSL on baseline surveys in the Wind Farm Area and 8 km buffer area.

A total of 181 lesser black-backed gulls were aged on baseline surveys in the Wind Farm Area and 8 km buffer area. In the breeding season (April to August) age was recorded for 133 lesser black-backed gulls, with 20 immature (non-breeding) birds (15.0%) and 113 adults (85.0%) aged on surveys (Table 9).

Table 9: Monthly breakdown of immature and adult lesser black-backed gulls in the Wind Farm Area and 8 km buffer area from baseline survey data

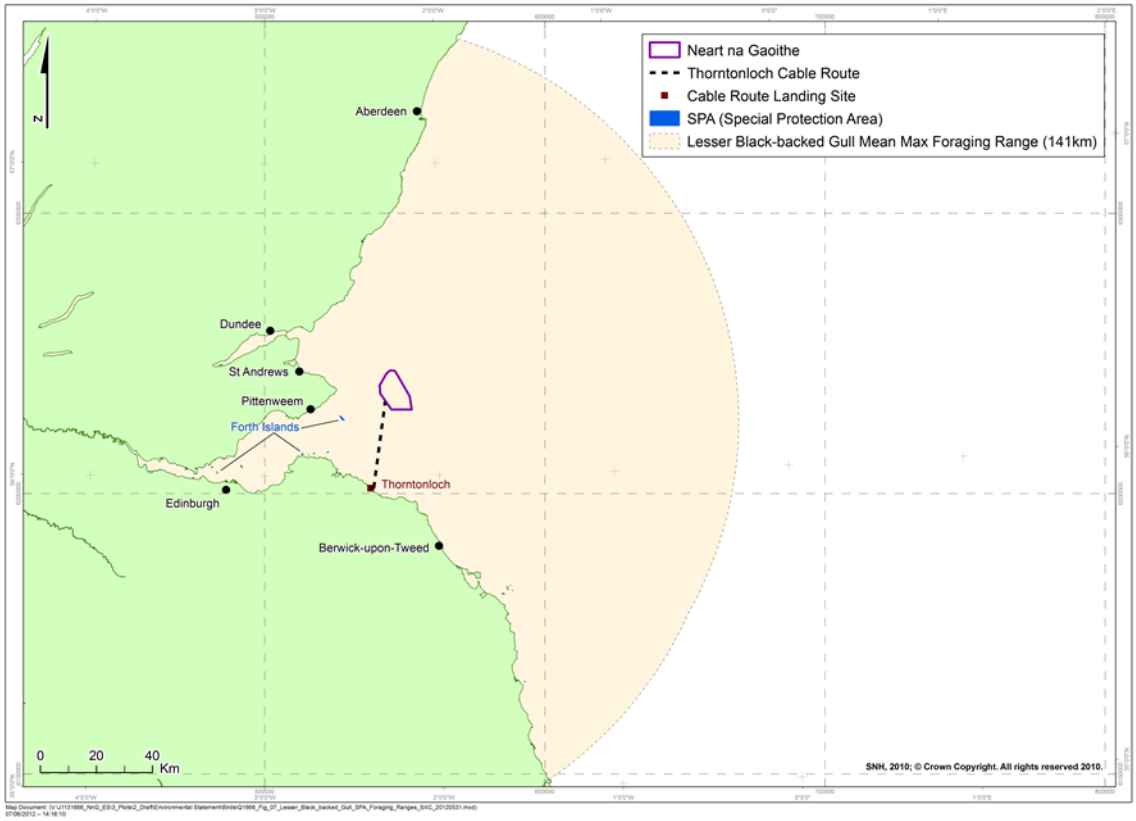
Month	No of immature birds	Number of adult birds	Number of aged birds	Percentage of immature birds
January	0	0	0	0
February	0	0	0	0
March	0	0	0	0
April	2	9	11	18.2%
May	1	8	9	11.1%
June	14	25	39	35.9%
July	3	54	57	5.3%
August	0	17	17	0%
September	7	38	45	15.6%
October	0	0	0	0
November	0	0	0	0
December	1	2	3	33.3%
Total	28	153	181	15.5%

Lesser black-backed gull is currently amber-listed on the UK Birds of Conservation Concern list, as more than 50% of the UK breeding population is found at less than ten colonies, and also because the UK holds more than 20% of the European breeding population (Eaton *et al*., 2015).

One SPA for breeding lesser black-backed gulls (Forth Islands SPA) was highlighted as being potentially at risk of collision impacts arising from the Project (Marine Scotland, 2017) (Figure 32).

Lesser black-backed gull is not listed as a qualifying interest for the Outer Firth of Forth & St Andrews Bay pSPA (SNH 2016).

Figure 32: SPAs for breeding lesser black-backed gulls within mean maximum foraging range of the Project



1.1.1.5 Great black-backed gull

Great black-backed gull is a common resident species, occurring in coastal areas. Largest numbers occur in western coasts, with a British population of 17,394 breeding pairs recorded during Seabird 2000 (Mitchell *et al*., 2004). The Isle of May is the closest colony to the Project, with 53 breeding pairs in 2015 (SMP, 2017). Great black-backed gulls are omnivorous, foraging at sea, estuaries and beaches, and less commonly at rubbish dumps (Forrester *et al*., 2007).

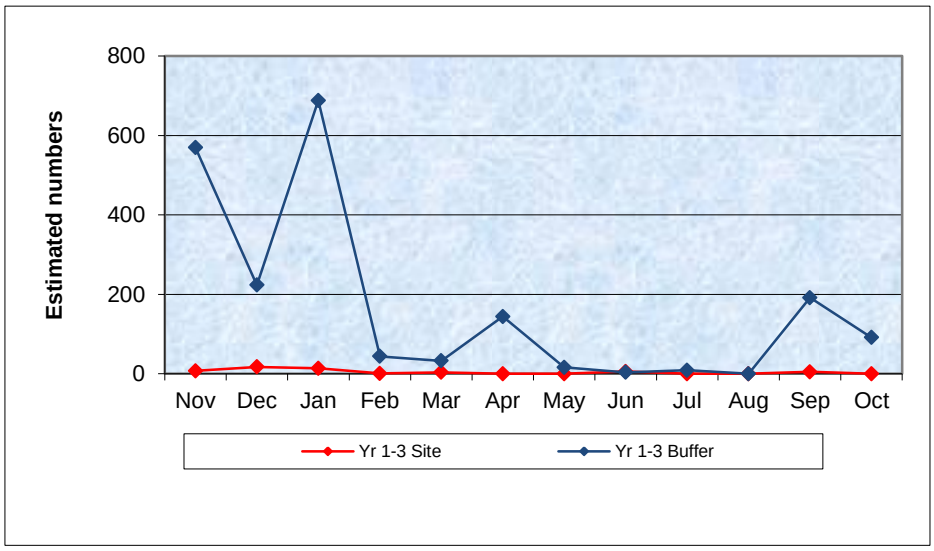
Estimated numbers of great black-backed gulls were derived from baseline survey data by applying Distance sampling techniques (Table 10).

Table 10: Estimated numbers of great black-backed gulls in the Wind Farm Area (and 1, 2 & 8 km buffer) in Years 1 to 3

Month	Wind Farm Area					Estimated total Wind Farm Area + 1 km	Estimated total Wind Farm Area + 2 km	Estimated total Wind Farm Area + 8 km
	Estimated nos on water	Lower 95 % C.L.	Upper 95 % C.L.	Estimated nos flying	Estimated total			
Yr1 Nov	0	0	0	7	7	7	8	512
Yr1 Dec	0	0	0	21	21	21	27	76
Yr1 Jan	0	0	0	14	14	355	355	1,737
Yr1 Feb	2	0	9	0	2	2	8	17
Yr1 Mar	10	3	40	0	10	10	10	21
Yr1 Apr	0	0	0	0	0	0	0	21
Yr1 May	0	0	0	0	0	0	0	0
Yr1 Jun	0	0	0	0	0	0	0	0
Yr1 Jul	0	0	0	0	0	0	0	0
Yr1 Aug	0	0	0	0	0	0	0	0

Month	Wind Farm Area					Estimated total Wind Farm Area + 1 km	Estimated total Wind Farm Area + 2 km	Estimated total Wind Farm Area + 8 km
	Estimated nos on water	Lower 95 % C.L.	Upper 95 % C.L.	Estimated nos flying	Estimated total			
Yr1 Sep	0	0	0	7	7	7	14	69
Yr1 Oct	0	0	0	0	0	0	27	208
Yr2 Nov	-	-	-	-	-	-	-	-
Yr2 Dec	6	1	29	7	13	20	20	404
Yr2 Jan	0	0	0	7	7	14	27	212
Yr2 Feb	0	0	0	0	0	0	0	7
Yr2 Mar	0	0	2	0	0	7	7	37
Yr2 Apr	0	0	0	0	0	0	21	411
Yr2 May	0	0	0	0	0	0	0	0
Yr2 Jun	0	0	0	7	7	7	7	7
Yr2 Jul	0	0	0	0	0	0	0	0
Yr2 Aug	0	0	0	0	0	0	0	0
Yr2 Sep	0	0	0	7	7	14	284	512
Yr2 Oct	0	0	0	0	0	14	14	51
Yr3 Nov	0	0	0	7	7	21	21	641
Yr3 Dec	-	-	-	-	-	-	-	-
Yr3 Jan	0	0	0	20	20	20	20	156
Yr3 Feb	0	0	0	0	0	0	21	109
Yr3 Mar	0	0	0	0	0	0	28	49
Yr3 Apr	0	0	0	0	0	0	0	0
Yr3 May	0	0	0	0	0	0	0	48
Yr3 Jun	9	2	56	0	9	9	13	19
Yr3 Jul	0	0	0	0	0	0	0	26
Yr3 Aug	0	0	0	0	0	0	0	0
Yr3 Sep	0	0	0	0	0	0	7	7
Yr3 Oct	0	0	0	0	0	0	0	14

Figure 33: Mean monthly estimated numbers of great black-backed gulls in the Wind Farm Area & buffer areas on baseline surveys (Three-year mean)



Overall, mean monthly estimated numbers in the Wind Farm Area were very low in all three baseline years (Figure 33). Estimated numbers in the buffer area were higher outside the breeding season, and peaked in November (570 birds) and January (688 birds). However, these estimates were probably inflated by the presence of fishing vessels in the buffer area with large numbers of great black backed gulls associating with them, and should therefore be treated with caution as they may not reflect typical conditions.

In the Year 1 non-breeding period (September to March), generally low densities of great black-backed gulls were recorded sporadically in the Wind Farm Area (Figure 34). Highest densities were recorded in the south-west of the buffer area, with fewer birds elsewhere.

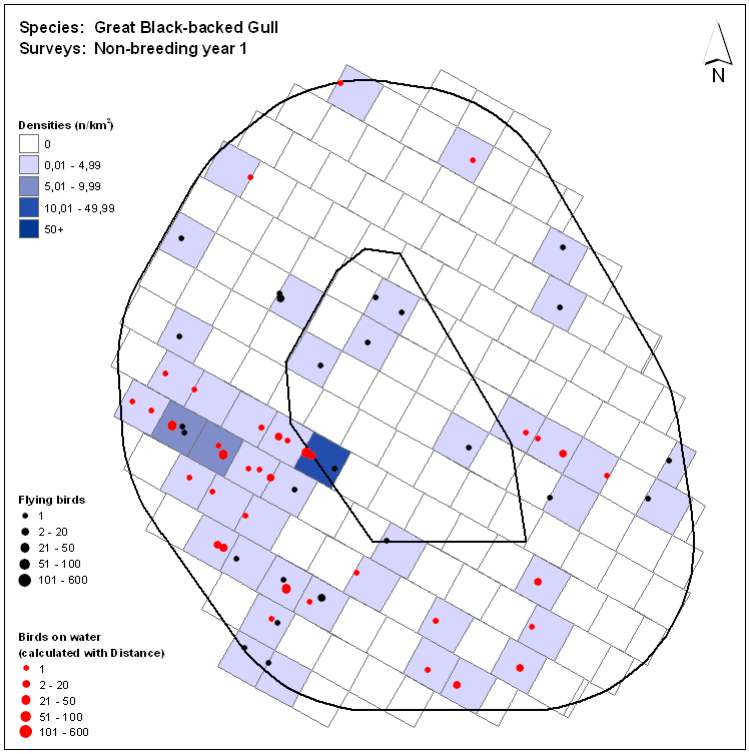


Figure 34: Great black-backed gull density in the non-breeding season, Year 1

A similar distribution pattern was recorded in the Year 2 non-breeding period, with the majority of great black-backed gulls recorded at low densities in the south-west of the buffer area (Figure 35). Low densities were recorded occasionally in the Wind Farm Area at this time.

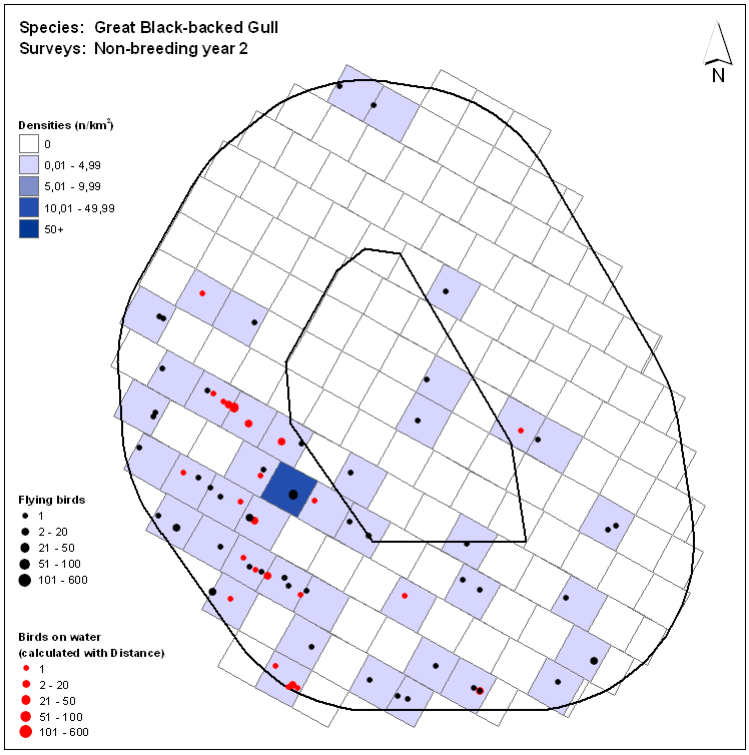


Figure 35: Great black-backed gull density in the non-breeding season, Year 2

The Year 3 distribution pattern of great black-backed gulls was similar to the same period of Years 1 and 2, with the majority of great black-backed gulls recorded at low densities in the south-west of the buffer area (Figure 36). Low densities were recorded occasionally in the Wind Farm Area at this time.

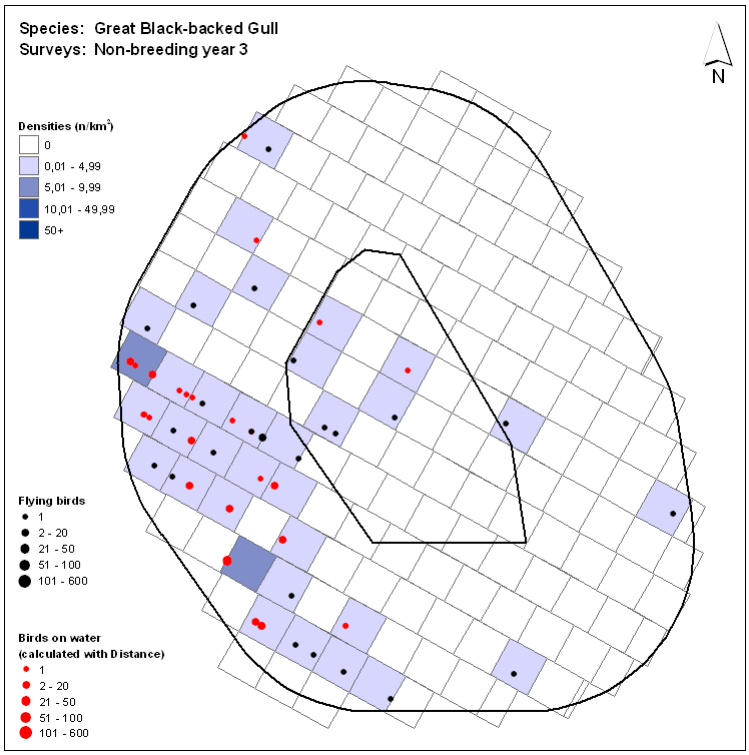


Figure 36: Great black-backed gull density in the non-breeding season, Year 3

Great black-backed gull distribution in the Year 1 breeding season (April to August) was very restricted, with no birds recorded in the Wind Farm Area, and few birds recorded at low densities in the eastern half of the buffer area over the period (Figure 37).

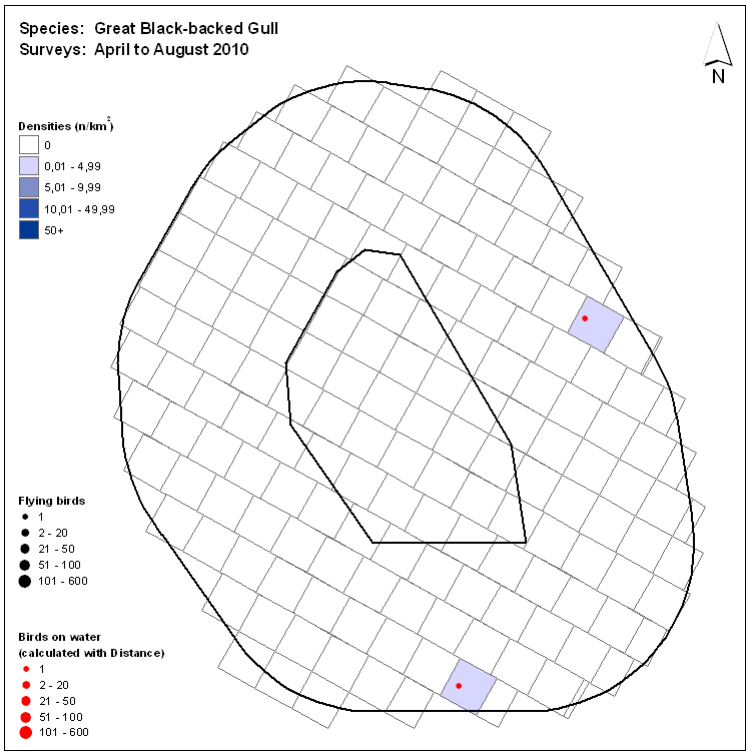


Figure 37: Great black-backed gull density in the breeding season, Year 1

Great black-backed gulls were more widely distributed between April and August of Year 2 compared to the same period in Year 1, with low densities and few birds recorded within the Wind Farm Area at this time. Highest densities were recorded in the west of the buffer area (Figure 38).

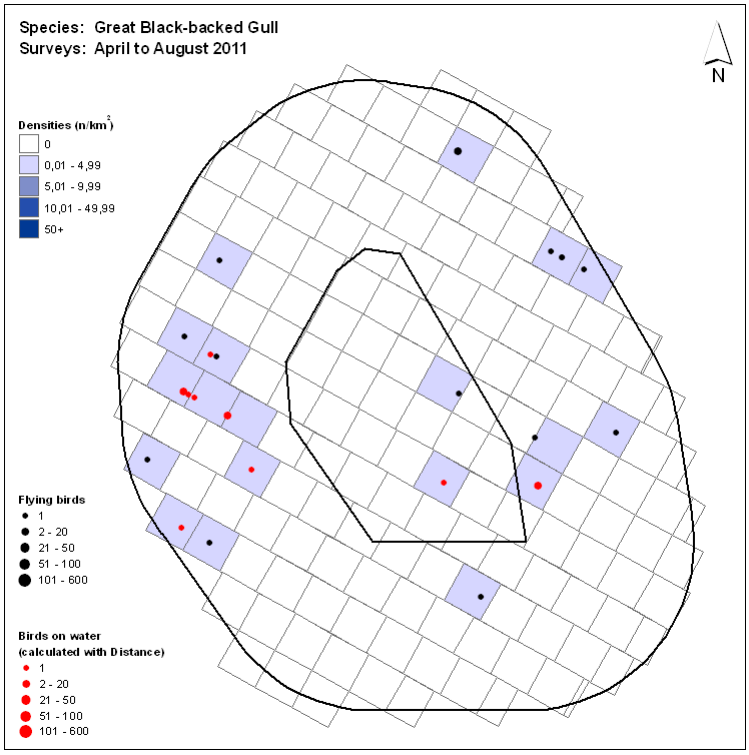


Figure 38: Great black-backed gull density in the breeding season, Year 2

The distribution of great black-backed gulls in the Year 3 breeding season was similar to the previous two years, with low densities and few birds recorded in the Wind Farm Area at this time. In the buffer area, birds were scattered at low densities (Figure 39).

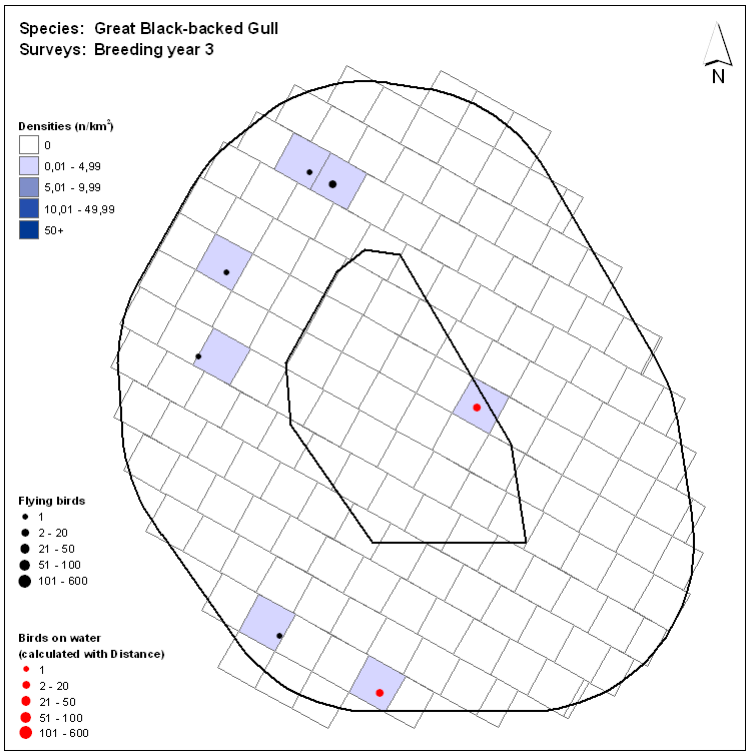


Figure 39: Great black-backed gull density in the breeding season, Year 3

A total of 553 great black-backed gulls were recorded in flight on baseline surveys, with 80.7% of birds flying below 27.5 m MSL. A total of 107 birds (19.3%) were recorded flying above 27.5 m MSL on baseline surveys in the Wind Farm Area and 8 km buffer area.

A total of 564 great black-backed gulls were aged during baseline surveys in the Wind Farm Area and 8 km buffer area. In the breeding season (April to August) age was recorded for 70 great black-backed gulls, with 40 immature (non-breeding) birds (57.1%) and 30 adults (42.9%) aged on surveys (Table 11).

Great black-backed gull is currently amber-listed on the UK Birds of Conservation Concern list, as there has been a moderate decline (>25%, but <50%) in the breeding population since 1969. In addition there has been a moderate decline in the non-breeding population over 25 years and since 1969 (Eaton *et al*., 2015).

Great black-backed gull is not listed as a qualifying interest species in the breeding season for any SPAs on the Scottish east coast south of Peterhead (JNCC, 2012). The nearest SPA for breeding great blacked-gulls is Copinsay SPA, approximately 297 km from the Project. The estimated maximum foraging distance for this species is less than 10 km (Furness & Tasker, 2000).

Great black-backed gull is not listed as a qualifying interest for the Outer Firth of Forth & St Andrews Bay pSPA (SNH 2016).

Table 11: Monthly breakdown of immature and adult great black-backed gulls in the Wind Farm Area and 8 km buffer area from baseline survey data

Month	No of immature birds	Number of adult birds	Number of aged birds	Percentage of immature birds
January	58	54	112	51.8%
February	35	13	48	72.%
March	21	11	32	65.6%
April	26	12	38	68.4%
May	11	3	14	78.6%
June	2	7	9	22.2%
July	1	2	3	33.3%
August	0	6	6	0.0%
September	51	27	78	65.4%
October	31	30	61	50.8%
November	37	50	87	42.5%
December	33	43	76	43.4%
Total	306	258	564	54.3%

1.1.1.6 Guillemot

Guillemots are one of the commonest seabird species in Britain, breeding in large colonies on suitable coastal cliff habitat. There are several large colonies on the east coast, and Seabird 2000 recorded 1,322,830 individuals at breeding colonies in Britain (Mitchell *et al.,* 2004). The closest large colonies to the Wind Farm Area and 8 km buffer area are the Isle of May, St Abb's Head and Fowlsheugh. Guillemots mostly prey on small fish species such as lesser sandeels, sprat and gadoid fish (Mitchell *et al.,* 2004).

Guillemots and razorbills are similar in their appearance and some individuals could not be identified to species level during surveys, for example birds seen in poor light in the outer parts of the survey strip (Table 12). In all survey visits the vast majority of individuals of these two species were positively identified.

Table 12: Raw numbers of unidentified guillemots, razorbills and auks recorded on baseline surveys in the Project study area in Years 1 to 3 (Raw numbers, all sea states)

Species	Year One		Year Two		Year Three	
	Wind Farm Area	Project Study Area	Wind Farm Area	Project Study Area	Wind Farm Area	Project Study Area
Guillemot/Razorbill	368	3,323	168	1,532	213	1,767
Unidentified auk species	155	1,348	56	827	7	186

For the purposes of assessment the unidentified birds in a survey visit were included in population estimates by apportioning them in accordance to the ratio of positively identified individuals on that survey visit. This was considered to be the best way of dealing with this issue as it makes best use of the available data without introducing obvious biases. It is also the method recommended by Maclean *et al.*, (2009) for dealing with the issue of unidentified individuals.

Estimated numbers of guillemots were derived from baseline survey data by applying Distance sampling techniques (Table 13). The breeding season for guillemot has been defined as April to mid-August (Table 13) (SNH 2017).

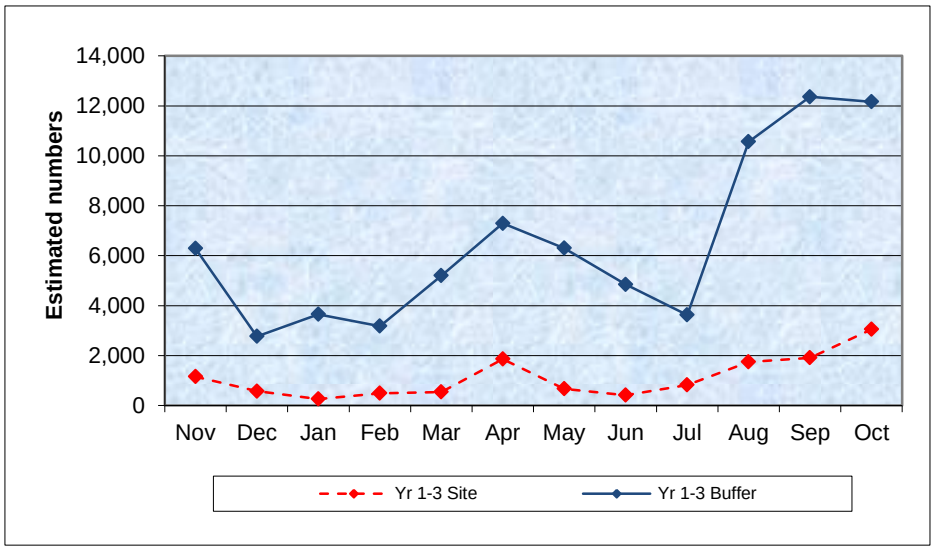
Table 13: Estimated numbers of guillemots in the Wind Farm Area (and 1, 2 & 8 km buffer) in Years 1 to 3

Month	Wind Farm Area					Estimated total Wind Farm Area + 1 km	Estimated total Wind Farm Area + 2 km	Estimated total Wind Farm Area + 8 km
	Estimated nos on water	Lower 95 % C.L.	Upper 95 % C.L.	Estimated nos flying	Estimated total			
Yr1 Nov	980	676	1,420	14	994	1,214	1,453	4,266
Yr1 Dec	270	160	456	7	277	317	337	1,774
Yr1 Jan	28	14	53	0	28	75	117	1,155
Yr1 Feb	68	40	116	34	102	129	176	1,641
Yr1 Mar	278	143	540	13	291	394	504	3,401
Yr1 Apr	129	67	250	143	272	542	924	3,418
Yr1 May	11	5	24	109	120	154	179	3,383
Yr1 Jun	380	273	529	7	387	461	698	5,256
Yr1 Jul	145	100	210	0	145	193	242	987
Yr1 Aug	27	14	52	0	27	40	174	1,522
Yr1 Sep	1,400	976	2,008	0	1,400	1,987	3,098	11,425
Yr1 Oct	6,986	5,406	9,027	34	7,020	9,491	11,174	24,017
Yr2 Nov	-	-	-	-	-	-	-	-
Yr2 Dec	847	600	1,196	21	868	1,277	1,708	4,911
Yr2 Jan	187	66	528	48	235	312	491	5,319
Yr2 Feb	535	268	1,070	20	555	756	1,079	3,657

Month	Wind Farm Area					Estimated total Wind Farm Area + 1 km	Estimated total Wind Farm Area + 2 km	Estimated total Wind Farm Area + 8 km
	Estimated nos on water	Lower 95 % C.L.	Upper 95 % C.L.	Estimated nos flying	Estimated total			
Yr2 Mar	635	333	1,210	33	667	1,001	1,573	8,410
Yr2 Apr	3,531	1,551	8,036	259	3,789	4,100	4,323	8,131
Yr2 May	314	175	565	94	409	746	917	8,840
Yr2 Jun	36	20	65	74	110	171	241	4,597
Yr2 Jul	1,095	742	1,617	34	1,129	1,436	1,827	7,530
Yr2 Aug	328	194	555	20	349	553	949	5,857
Yr2 Sep	2,222	1,485	3,325	0	2,222	3,839	7,140	22,042
Yr2 Oct	1,053	707	1,568	7	1,060	1,396	2,048	13,061
Yr3 Nov	1,268	960	1,676	49	1,317	2,140	2,958	10,621
Yr3 Dec	-	-	-	-	-	-	-	-
Yr3 Jan	377	263	541	130	507	702	1,020	5,259
Yr3 Feb	784	538	1,141	35	818	1,109	1,659	5,715
Yr3 Mar	657	423	1,019	14	670	957	1,374	5,415
Yr3 Apr	1,470	758	2,848	41	1,511	2,243	2,965	15,909
Yr3 May	1,381	740	2,575	96	1,477	1,979	2,445	8,683
Yr3 Jun	660	465	937	90	750	1,094	1,521	5,936
Yr3 Jul	1,186	909	1,546	0	1,186	1,581	1,758	4,824
Yr3 Aug	4,857	2,468	9,557	0	4,857	6,891	9,081	29,553
Yr3 Sep	2,108	1,153	3,853	0	2,108	2,739	3,610	9,348
Yr3 Oct	1,054	685	1,623	7	1,061	1,855	2,513	8,558

Mean estimated numbers of guillemots in the Wind Farm Area were highest in April at the start of the breeding season, and in the post-breeding period, with a three-year peak mean of 3,047 birds in October (Figure 40). Mean estimated numbers in the buffer zone were higher in all months, but showed a similar pattern, with a three-year peak mean in September (12,362 birds). The three-year mean estimates in the buffer area for September and October were slightly below 1% of the national breeding population based on Seabird 2000 data (13,228 birds) (Mitchell *et al.,* 2004).

Figure 40: Mean monthly estimated numbers of guillemots in the Wind Farm Area & 8km buffer area on baseline surveys (Three-year mean)



Between mid-August and March of Year 1, guillemots were widespread throughout the Wind Farm Area and buffer area, with high densities across the north-eastern half of the Study Area, and low to moderate densities in the south of the Wind Farm Area and south-east of the buffer area (Figure 41). Highest densities were recorded in October.

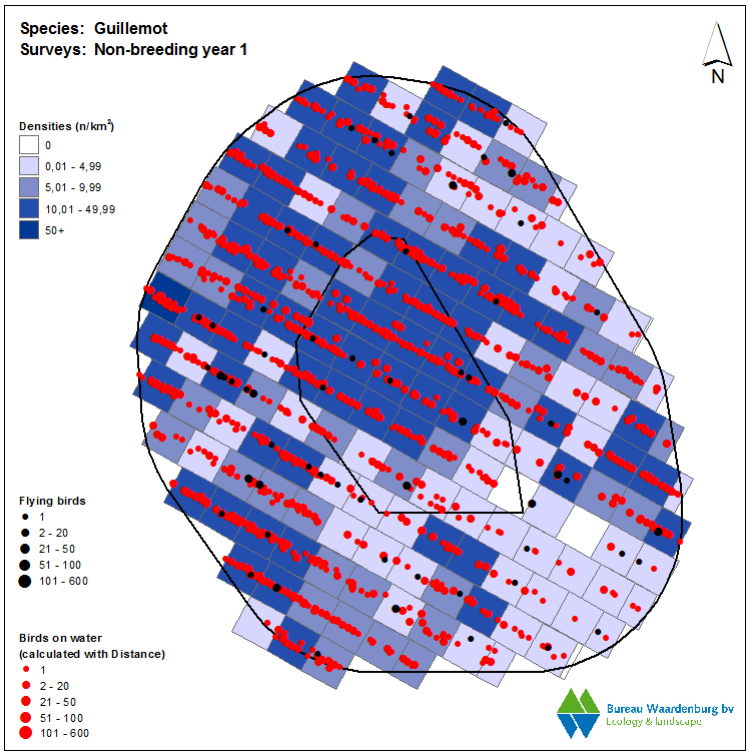


Figure 41: Guillemot density in the Year 1 non-breeding season

Over the same period in Year 2, high densities of guillemots were recorded in the south and west of the Wind Farm Area, with lower densities elsewhere (Figure 42). In the buffer area, guillemots were again widespread at moderate to high densities, with highest densities in the north-west of the buffer area. Highest densities were recorded in September and October.

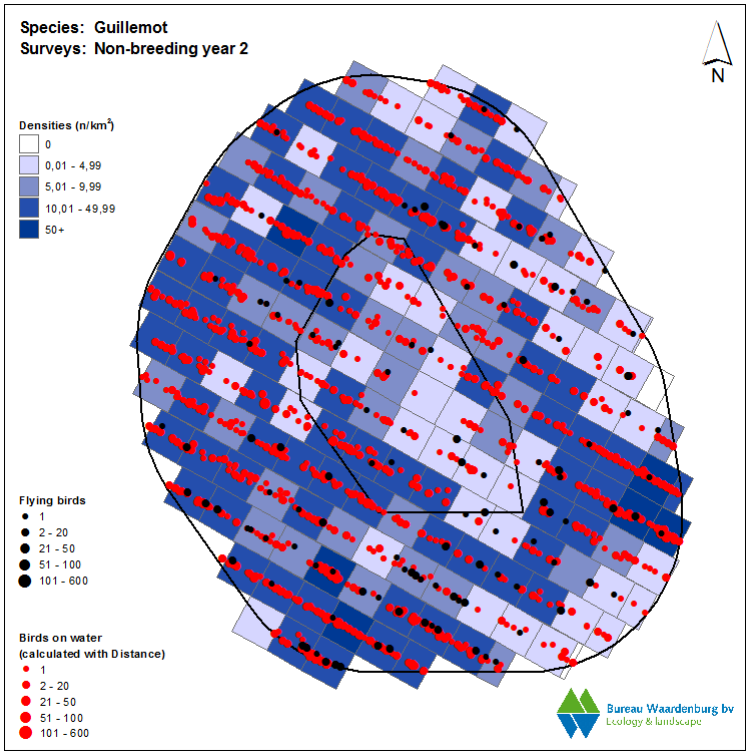


Figure 42: Guillemot density in the Year 2 non-breeding season

Between mid-August and March of Year 3, guillemots were widespread across the Wind Farm Area, at mostly moderate to high densities (Figure 43). Guillemots were also widespread at moderate to high densities throughout the buffer area, with lowest densities in the north of the buffer area. Highest densities were recorded in August and September.

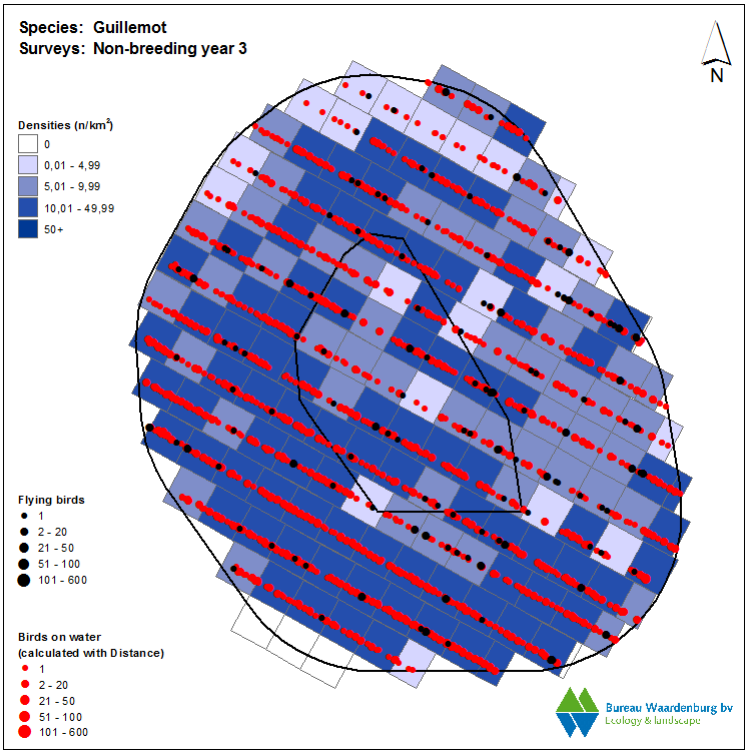


Figure 43: Guillemot density in the Year 3 non-breeding season

Between mid-April and August of Year 1, guillemots were widespread across the Wind Farm Area and the buffer area, at mostly low densities (Figure 44). Highest densities were recorded in the south-west and south-east of the buffer area at this time.

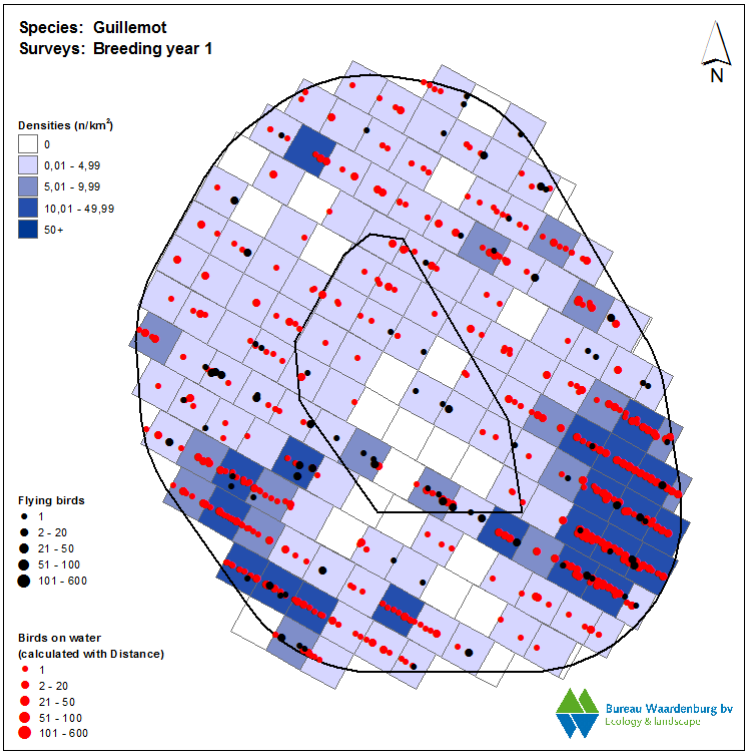


Figure 44: Guillemot density in the Year 1 breeding season

Guillemots were recorded at higher densities between mid-April and August of Year 2 than in Year 1 (Figure 45). Highest densities were recorded in the south-east of the Wind Farm Area and in the south-east of the buffer area at this time.

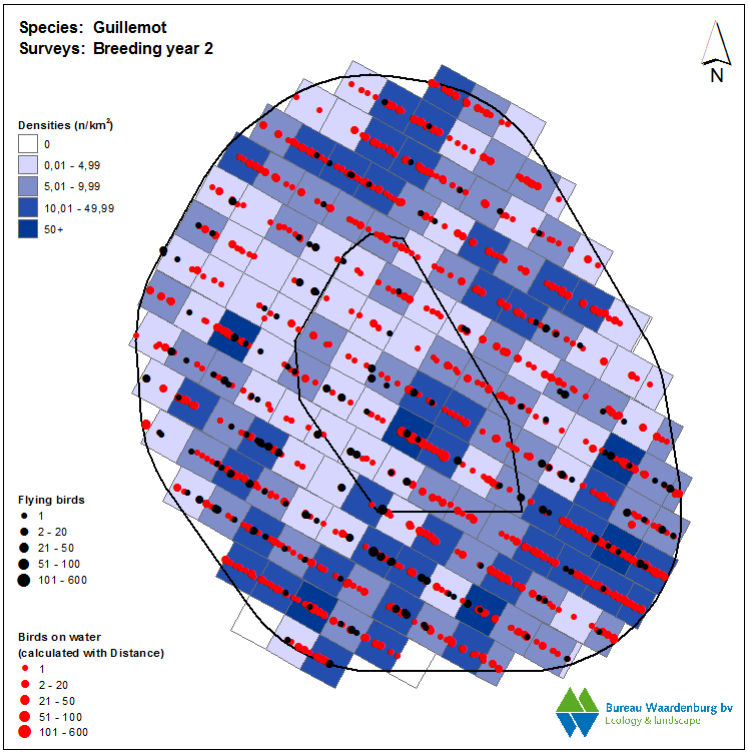


Figure 45: Guillemot density in the Year 2 breeding season

Between mid-April and August of Year 3, guillemots were widespread in the Wind Farm Area and Buffer Area (Figure 46). Highest densities were recorded in the south-west half of the Study Area, with lower densities in the north east of the Wind Farm Area and Buffer Area at this time.

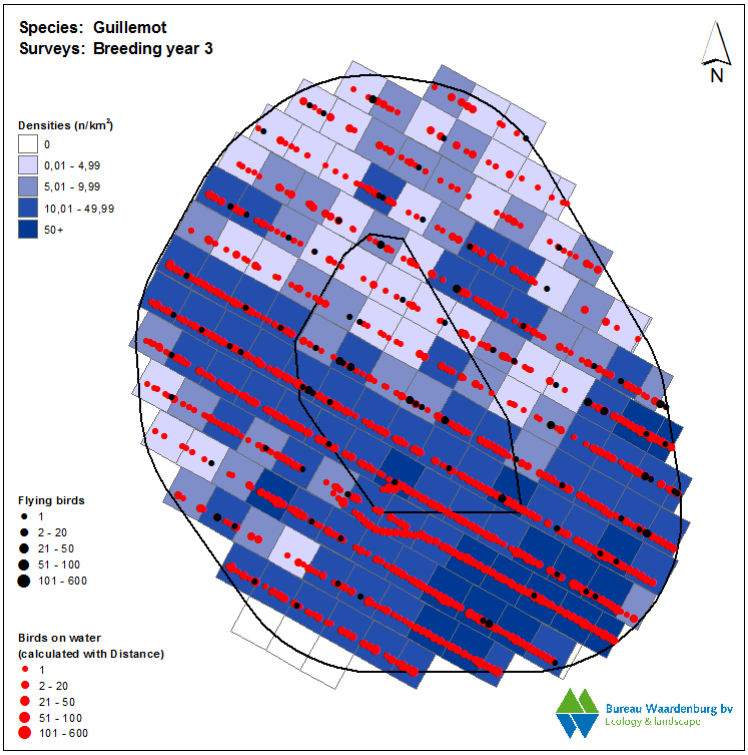


Figure 46: Guillemot density in the Year 3 breeding season

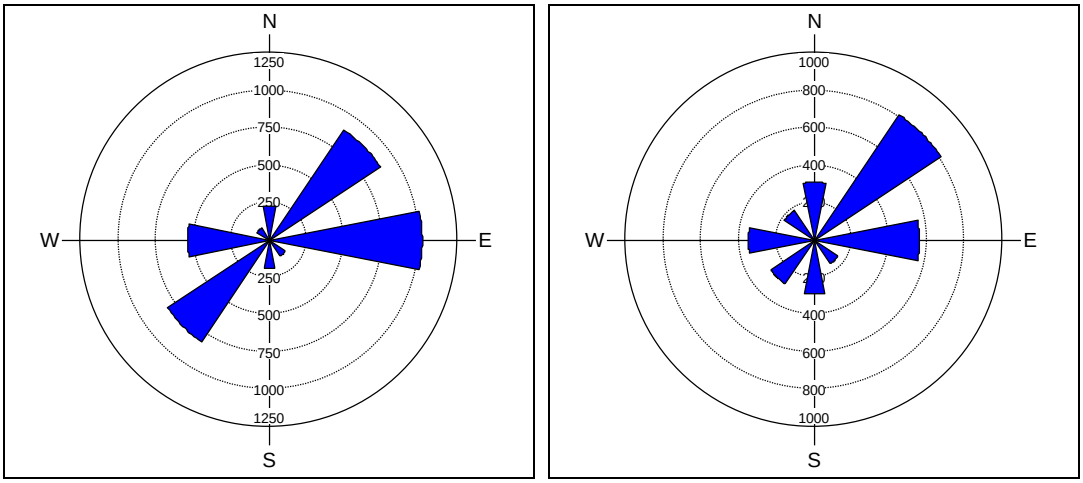
A total of 6,811 guillemots were recorded in flight on baseline surveys in the Wind Farm Area and 8 km buffer area, with all but one bird recorded flying below 27.5m MSL. The majority of birds (98.6%) were recorded flying below 7.5 m MSL in height.

A further 1,453 unidentified guillemots/razorbills and 141 unidentified auk species were also recorded in flight on baseline surveys. All birds were recorded flying below rotor height.

Flight direction was recorded for 3,883 guillemots in the breeding season (April to mid-August), with direction recorded for 2,928 guillemots in the non-breeding period (Mid-August to March) (Figure 47).

In the breeding season, just over a quarter of all birds recorded were flying east (26.0%), with 22.7% of birds flying north-east. In the non-breeding season, just over a quarter of birds were recorded flying north east (27.5%), with 19.0% flying east.

Figure 47: Flight direction of guillemots in the Wind Farm Area and 8 km buffer area in Years 1 to 3



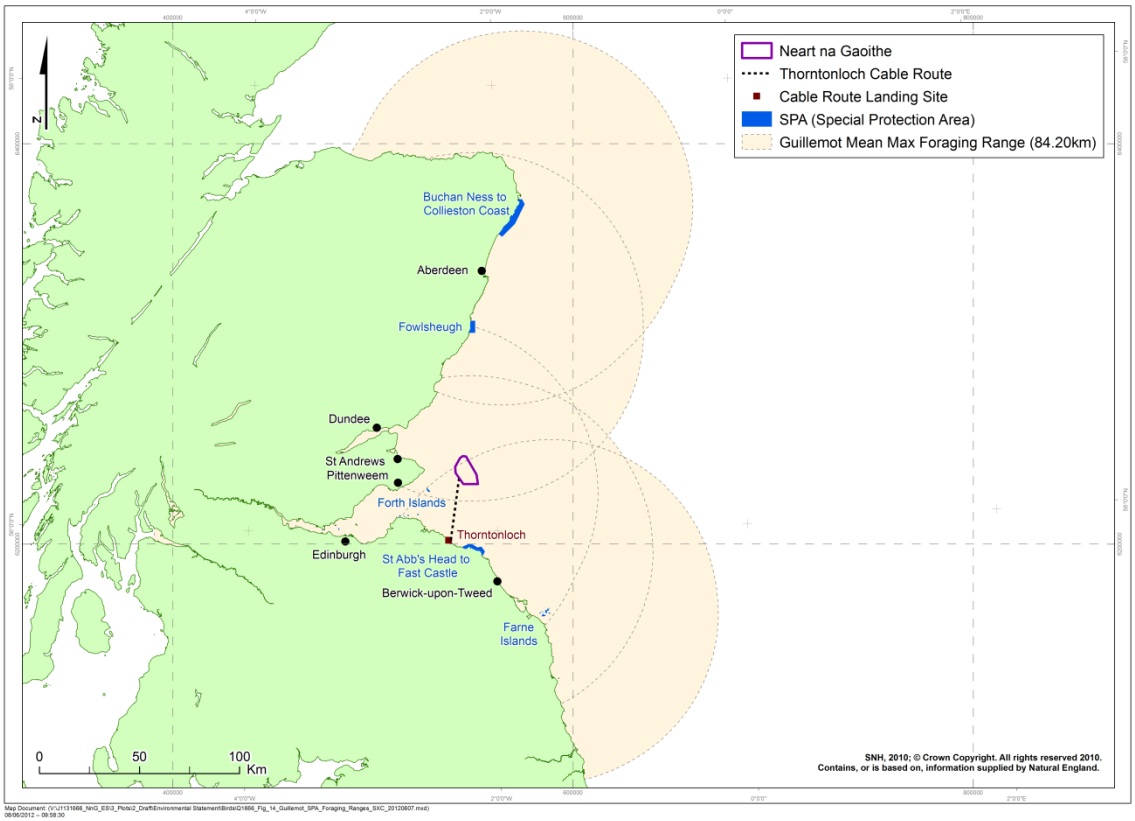
April to mid-August (n= 3,883 birds) Mid-August to March (n= 2,928 birds)

Numbers shown on figures are number of birds recorded

Guillemot is currently amber-listed on the UK Birds of Conservation Concern list, as more than 50% of the UK guillemot breeding population is found at less than ten colonies, and also because the UK holds more than 20% of the European breeding population (Eaton *et al.*, 2015).

Four SPAs for breeding guillemots (Forth Islands SPA, St Abb's Head to Fast Castle SPA and Fowlsheugh SPA) were highlighted in the Scoping Opinion as being of possible risk of displacement impact arising from the Project (Marine Scotland, 2017) (Figure 48).

Figure 48: SPAs for breeding guillemots within mean maximum foraging range of the Project



In addition to the SPA breeding colonies, the Scottish Government is currently considering the designation of a new suite of marine SPAs. This includes the Outer Firth of Forth & St Andrews Bay pSPA. Guillemot is listed as a qualifying interest for this pSPA in the breeding and non-breeding seasons (SNH 2016).

1.1.1.7 Razorbill

Razorbills are one of the commonest seabird species in Britain, breeding in large colonies of other seabirds on suitable coastal cliff habitat. There are several large colonies on the east coast, and Seabird 2000 recorded 164,557 individuals breeding in Britain (Mitchell *et al.,* 2004). The closest large colonies to the Wind Farm Area and 8 km buffer area are at the Isle of May, St Abb's Head and Fowlsheugh.

Razorbills prey on sandeels and other small fish species (Snow & Perrins 1998). A study in the Netherlands concluded that razorbills are probably more dependent on a specialised diet of small schooling fish such as herring, sprat or sandeels than guillemots, which have a much broader diet (Ouwehand *et al*., 2004).

Guillemots and razorbills are similar in their appearance and some individuals could not be identified to species level during surveys, for example birds seen in poor light in the outer parts of the survey strip (Table 12). In all survey visits the vast majority of individuals of these two species were positively identified.

For the purposes of assessment the unidentified birds in a survey visit were included in population estimates by apportioning them in accordance to the ratio of positively identified individuals on that survey visit. This was considered to be the best way of dealing with this issue as it makes best use of the available data without introducing obvious biases. It is also the method recommended by Maclean *et al*., (2009) for dealing with the issue of unidentified individuals.

Estimated numbers of razorbills were derived from baseline survey data by applying Distance sampling techniques (Table 14). The breeding season for razorbill has been defined as April to mid-August (Table 14) (SNH 2017).

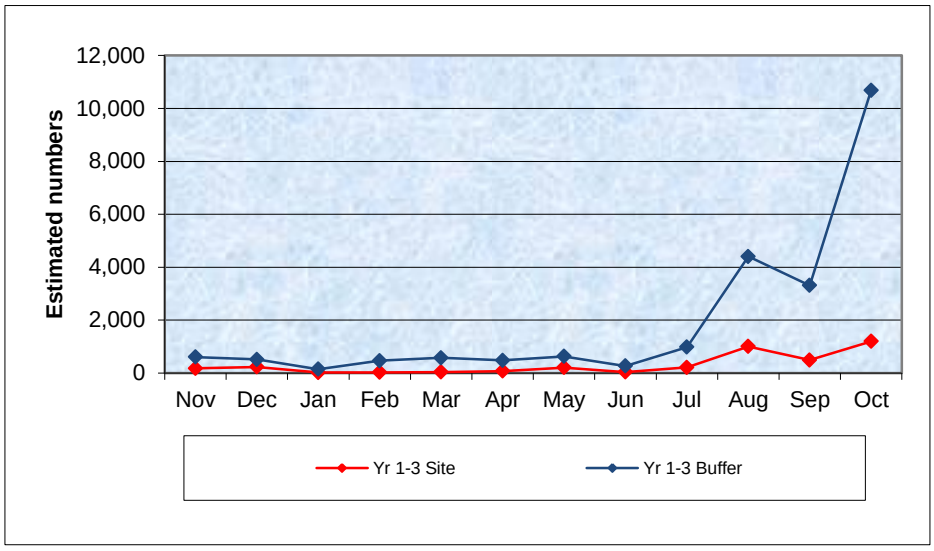
Table 14: Estimated numbers of razorbills in the Wind Farm Area (and 1, 2 & 8 km buffer) in Years 1 to 3

Month	Wind Farm Area					Estimated total Wind Farm Area + 1 km	Estimated total Wind Farm Area + 2 km	Estimated total Wind Farm Area + 8 km
	Estimated nos on water	Lower 95 % C.L.	Upper 95 % C.L.	Estimated nos flying	Estimated total			
Yr1 Nov	268	171	418	7	274	328	368	971
Yr1 Dec	142	74	275	0	142	168	227	597
Yr1 Jan	0	0	0	7	7	7	7	29
Yr1 Feb	15	7	32	0	15	46	46	362
Yr1 Mar	37	22	61	7	43	158	177	910
Yr1 Apr	0	0	0	20	20	20	61	437
Yr1 May	0	0	0	27	27	41	41	308
Yr1 Jun	44	20	98	0	44	44	65	282
Yr1 Jul	0	0	0	7	7	7	7	189
Yr1 Aug	1,529	1,184	1,975	0	1,529	2,388	2,919	5,972
Yr1 Sep	723	532	983	0	723	1,046	1,252	3,409
Yr1 Oct	2,655	1,479	4,765	0	2,655	3,316	4,664	19,985
Yr2 Nov	-	-	-	-	-	-	-	-
Yr2 Dec	320	194	529	7	327	632	632	906
Yr2 Jan	0	0	0	0	0	0	0	199
Yr2 Feb	42	22	78	0	42	139	174	872
Yr2 Mar	50	24	104	0	50	50	50	543
Yr2 Apr	107	46	250	14	120	187	214	655
Yr2 May	323	174	602	40	364	410	472	1,466
Yr2 Jun	15	6	36	20	35	42	63	455
Yr2 Jul	367	211	639	0	367	419	590	2,013
Yr2 Aug	78	41	149	0	78	104	143	611
Yr2 Sep	182	107	312	0	182	257	815	3,122
Yr2 Oct	770	590	1,006	81	852	1,785	2,944	14,578
Yr3 Nov	65	39	109	14	79	135	152	597
Yr3 Dec	-	-	-	-	-	-	-	-
Yr3 Jan	58	23	145	0	58	58	58	272
Yr3 Feb	16	7	34	0	16	55	71	248
Yr3 Mar	31	15	66	0	31	47	109	396
Yr3 Apr	84	43	167	0	84	205	229	579
Yr3 May	200	82	484	27	227	256	341	732
Yr3 Jun	15	7	35	21	36	36	65	186
Yr3 Jul	246	145	417	21	267	458	458	1,374

Month	Wind Farm Area					Estimated total Wind Farm Area + 1 km	Estimated total Wind Farm Area + 2 km	Estimated total Wind Farm Area + 8 km
	Estimated nos on water	Lower 95 % C.L.	Upper 95 % C.L.	Estimated nos flying	Estimated total			
Yr3 Aug	1,412	903	2,208	0	1,412	2,507	3,388	9,645
Yr3 Sep	571	340	961	0	571	800	1,231	4,879
Yr3 Oct	76	45	128	7	82	82	143	1,085

Estimated mean numbers of razorbills in the Wind Farm Area were low between November and July across all three baseline years (Figure 49). Numbers increased in August, and peaked in October (1,196 birds, three-year mean). Mean estimated numbers in the buffer zone showed a similar pattern, although estimated numbers between August and October were higher, especially the October peak (10,686 birds, three-year mean). Mean estimated numbers in the buffer zone between August and October exceeded 1% of the national breeding population, based on Seabird 2000 data (1,646 birds) (Mitchell *et al.,* 2004), while the three-year mean estimated number for the buffer zone in October exceeded 1% of the bio-geographic breeding population (10,600 birds) (Mitchell *et al.,* 2004).

Figure 49: Mean monthly estimated numbers of razorbills in the Wind Farm Area & 8km buffer area on baseline surveys (Three-year mean)



Between mid-August and March of Year 1, razorbills were widespread throughout the Wind Farm Area and buffer area at mostly low to moderate densities, with highest densities in the north-east of the Wind Farm Area and in the north-east of the buffer area (Figure 50).

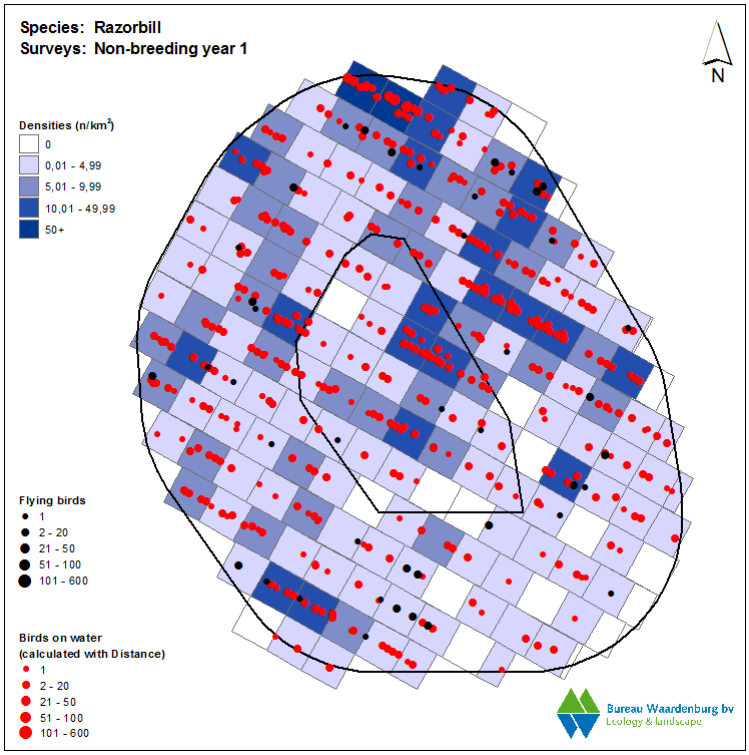


Figure 50: Razorbill density in the Year 1 non-breeding season

Over the same period in Year 2, low densities were recorded in the Wind Farm Area (Figure 51). Razorbills were widespread at mostly low to moderate densities in the southern half of the buffer area, with higher densities recorded in the west and north of the buffer area at this time.

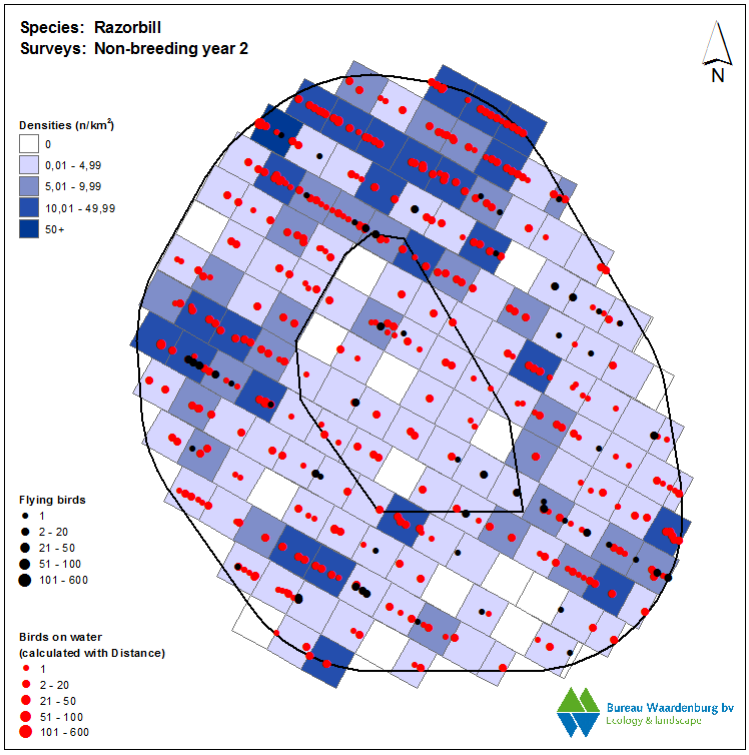


Figure 51: Razorbill density in the Year 2 non-breeding season

Between mid-August and March of Year 3, razorbills were again widespread at low densities in the Wind Farm Area (Figure 52). In the buffer area, razorbills were widespread but densities were generally lower than for the same period in Years 1 and 2, with some higher densities in the east of the buffer area.

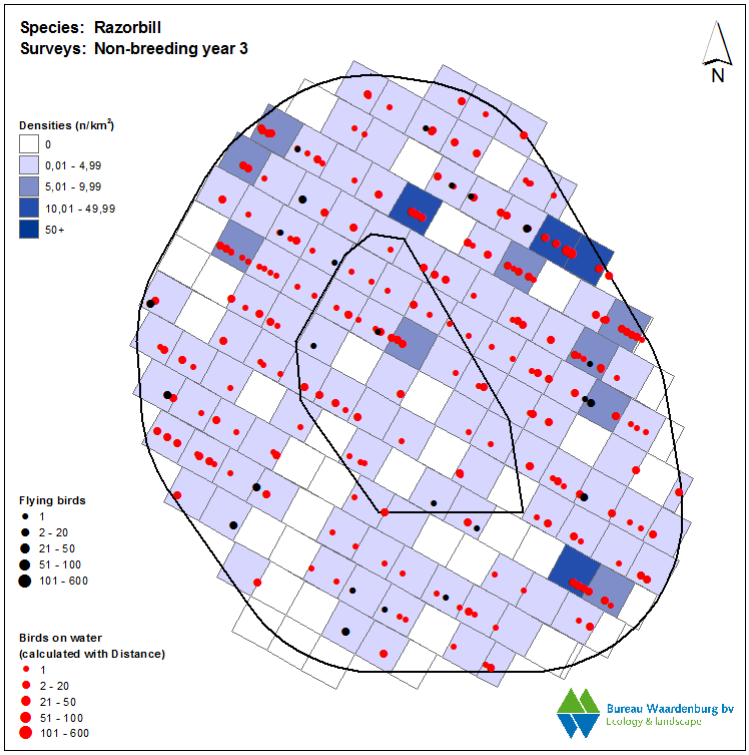


Figure 52: Razorbill density in the Year 3 non-breeding season

Between April and mid-August of Year 1, razorbills were widespread across the Wind Farm Area and the buffer area, at mostly low to moderate densities (Figure 53). Highest densities were recorded in the south of the Wind Farm Area and west of the buffer area at this time.

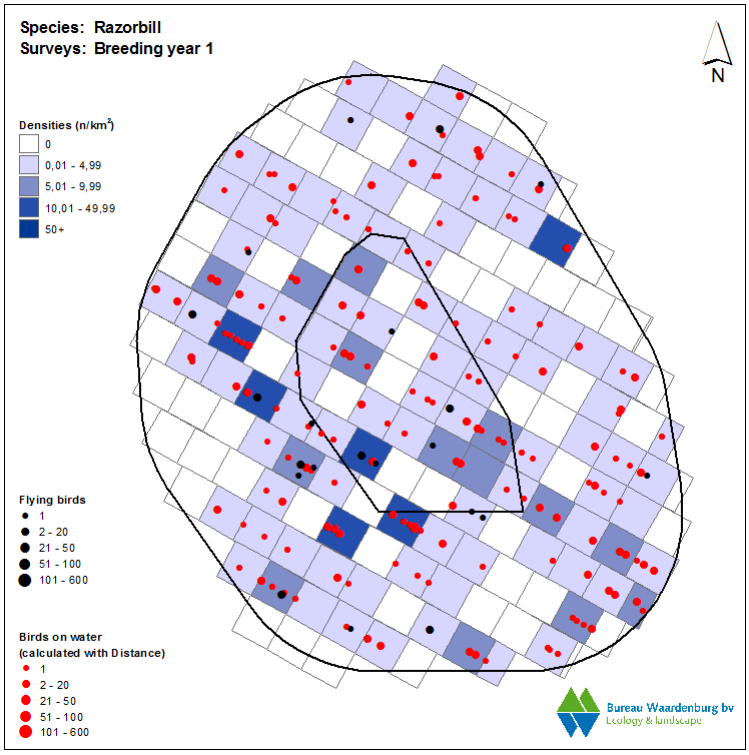


Figure 53: Razorbill density in the Year 1 breeding season

Razorbill distribution between April and mid-August of Year 2 was similar to the same period of Year 1, with mostly low densities throughout the Wind Farm Area and buffer area (Figure 54).

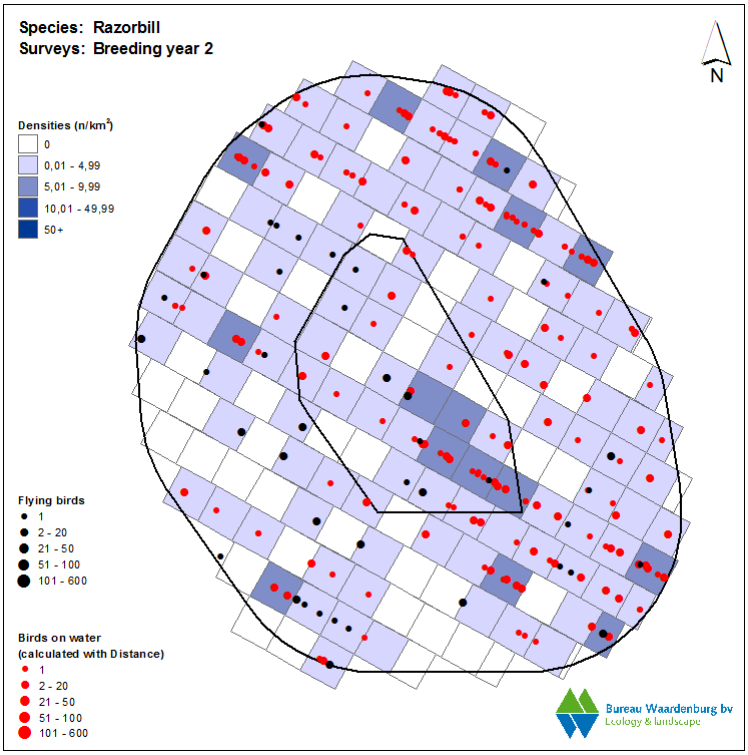


Figure 54: Razorbill density in the Year 2 breeding season

Between April and mid-August of Year 3, razorbill distribution was similar to previous years, although densities were higher (Figure 55). Highest densities in the Wind Farm Area were in the north and west at this time, with highest densities in the western half of the buffer area.

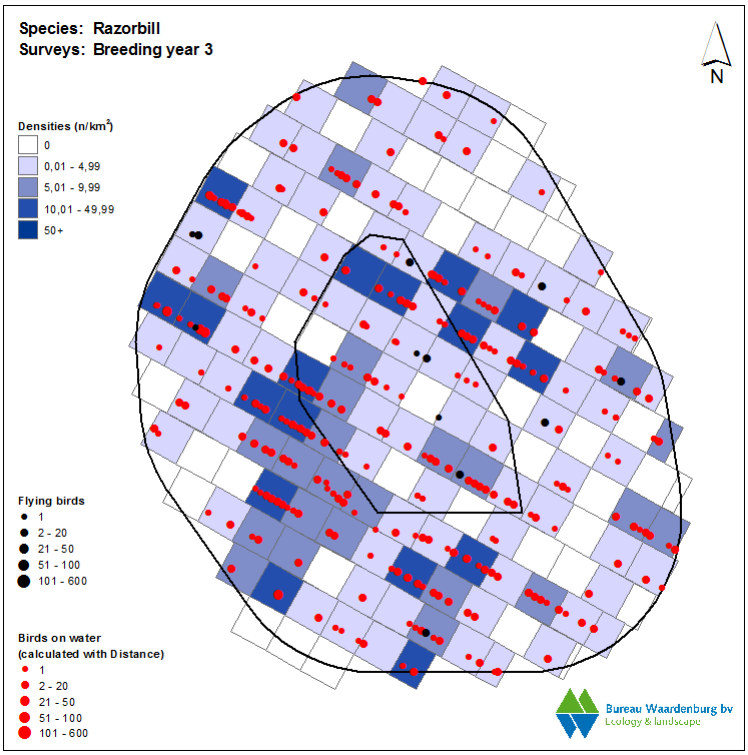


Figure 55: Razorbill density in the Year 3 breeding season

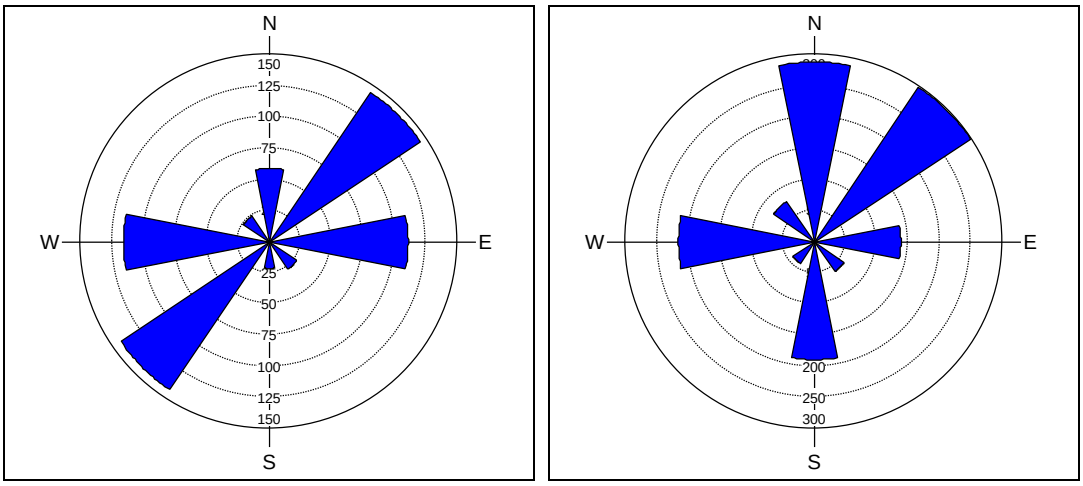
A total of 1,949 razorbills were recorded in flight on baseline surveys in the Wind Farm Area and 8 km buffer area, with all birds recorded flying below 27.5m MSL. The majority (98.2%) were recorded flying below 7.5 m MSL in height.

A further 1,453 unidentified guillemots/razorbills and 141 unidentified auk species were also recorded in flight on baseline surveys. All birds were recorded flying below rotor height.

Flight direction was recorded for 643 razorbills in the breeding season (April to mid-August), with direction recorded for 1,303 razorbills in the non-breeding period (mid-August to March) (Figure 56).

In the breeding season, just under a quarter of all birds recorded were flying north-east (22.4%), or south-west (22.1%), with 18.0% of birds flying west and 17.1% flying east. In the non-breeding season, just under a quarter of birds were recorded flying north east (22.8%) or north (22.1%).

Figure 56: Flight direction of razorbills in the Wind Farm Area and 8 km buffer area in Years 1 to 3



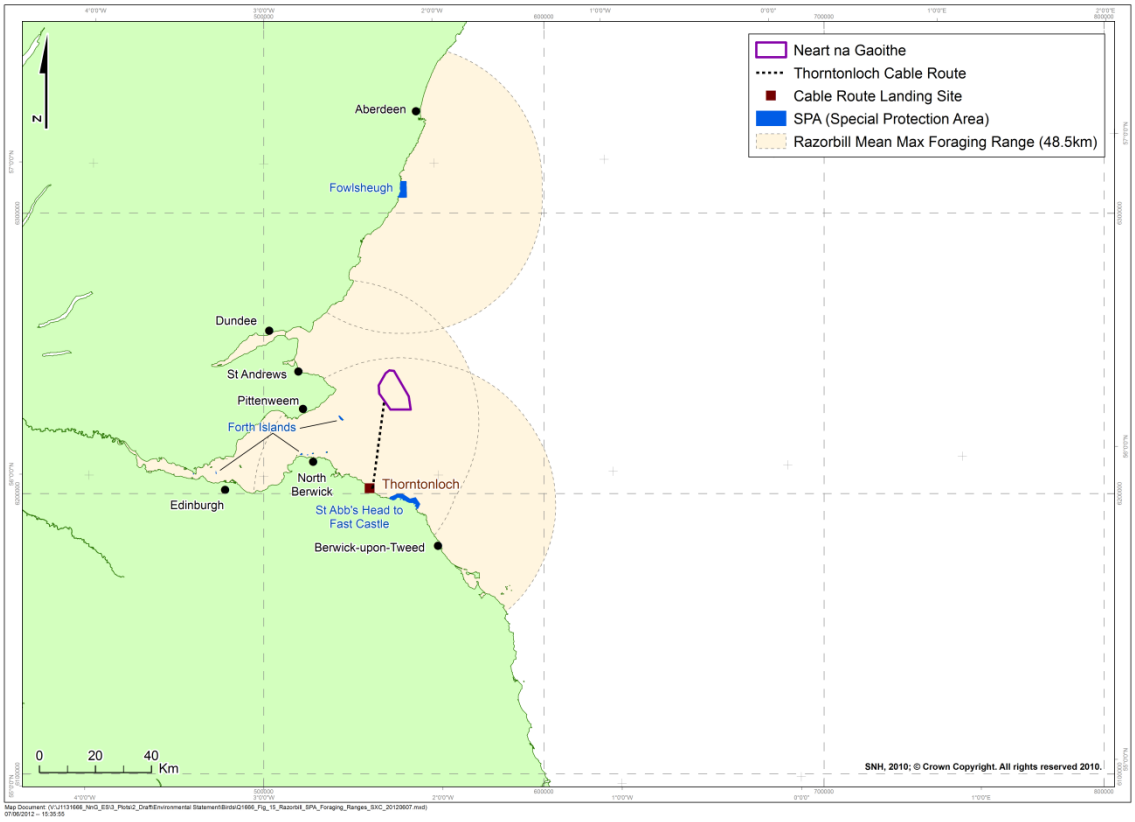
April to mid-August (n= 643 birds) Mid-August to March (n= 1,303 birds)

Numbers shown on figures are number of birds recorded

Razorbill is currently amber-listed on the UK Birds of Conservation Concern list, as more than 50% of the UK breeding population is found at less than ten colonies, and also because the UK holds more than 20% of the European breeding population (Eaton *et al*., 2015).

Three SPAs for breeding razorbills (Forth Islands SPA, Fowlsheugh SPA and St Abb's Head to Fast Castle SPA) were highlighted in the Scoping Opinion as being of possible risk of displacement impact arising from the Project (Marine Scotland, 2017) (Figure 57).

Figure 57: SPAs for breeding razorbills within mean maximum foraging range of the Project



In addition to the SPA breeding colonies, the Scottish Government is currently considering the designation of a new suite of marine SPAs. This includes the Outer Firth of Forth & St Andrews Bay pSPA. Razorbill is listed as a qualifying interest for this pSPA in the non-breeding season (SNH 2016).

1.1.1.8 Puffin

Puffins are one of the commonest seabird species in Britain, breeding in coastal colonies. There are several large colonies on the east coast of Scotland, and Seabird 2000 recorded 579,500 breeding pairs in Britain (Mitchell et al., 2004). The closest large colony to the Wind Farm Area is the Isle of May, with an estimated population of 46,200 pairs in 2013 (SMP, 2017). Lesser sandeel is the commonest prey item for puffins, but they also eat sprat, herring and a wide range of young gadoid fish (Harris 1984).

Estimated numbers of puffins were derived from baseline survey data by applying Distance sampling techniques (Table 15).

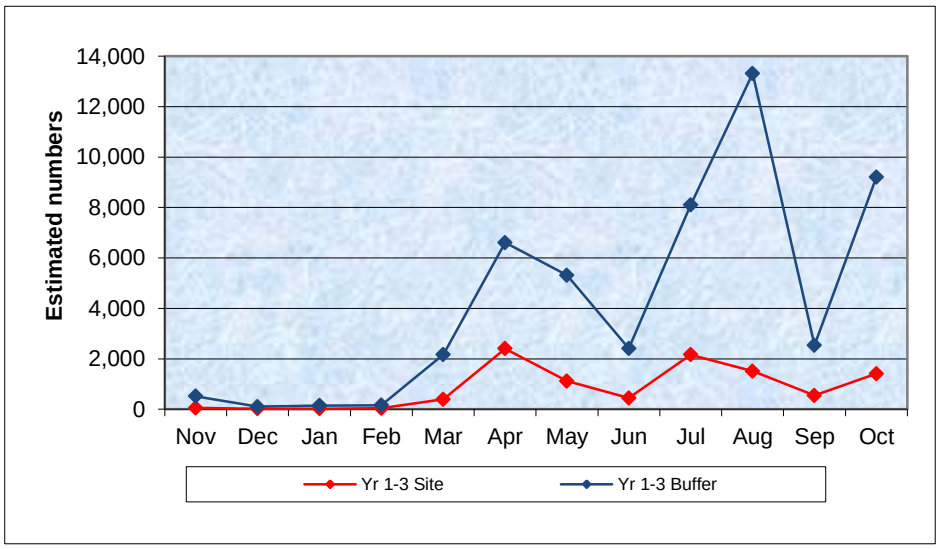
Table 15: Estimated numbers of puffins in the Wind Farm Area (and 1, 2 & 8 km buffer) in Years 1 to 3

Month	Wind Farm Area					Estimated total Wind Farm Area + 1 km	Estimated total Wind Farm Area + 2 km	Estimated total Wind Farm Area + 8 km
	Estimated nos on water	Lower 95 % C.L.	Upper 95 % C.L.	Estimated nos flying	Estimated total			
Yr1 Nov	0	0	0	0	0	39	39	79
Yr1 Dec	0	0	0	0	0	0	0	162
Yr1 Jan	0	0	0	0	0	0	0	0
Yr1 Feb	0	0	0	0	0	0	0	0
Yr1 Mar	241	167	347	0	241	289	422	1,136
Yr1 Apr	1,387	876	2,193	245	1,632	2,084	2,496	5,342
Yr1 May	188	100	354	20	208	373	625	3,428
Yr1 Jun	217	135	348	41	258	358	564	2,487
Yr1 Jul	242	161	364	41	284	544	620	2,565
Yr1 Aug	3,391	1,410	8,158	116	3,507	6,717	15,016	37,677
Yr1 Sep	465	300	720	0	465	719	794	1,513
Yr1 Oct	1,881	1,286	2,750	0	1,881	2,900	4,109	12,168
Yr2 Nov	-	-	-	-	-	-	-	-
Yr2 Dec	42	12	140	0	42	42	42	83
Yr2 Jan	0	0	0	0	0	0	17	137
Yr2 Feb	53	39	71	7	60	67	102	331
Yr2 Mar	27	15	48	0	27	27	53	332
Yr2 Apr	1,721	1,102	2,687	48	1,769	2,745	3,442	7,197
Yr2 May	1,734	1,199	2,509	108	1,842	2,479	3,002	9,720
Yr2 Jun	263	144	479	129	391	532	662	3,013
Yr2 Jul	2,279	1,300	3,995	202	2,481	2,831	3,288	9,199
Yr2 Aug	442	292	668	55	496	624	684	1,738
Yr2 Sep	336	206	550	0	336	537	874	3,541
Yr2 Oct	1,821	1,429	2,320	0	1,821	2,935	4,994	17,089
Yr3 Nov	112	73	173	0	112	168	243	1,067
Yr3 Dec	-	-	-	-	-	-	-	-
Yr3 Jan	72	45	114	0	72	90	126	377
Yr3 Feb	69	38	125	0	69	139	156	278
Yr3 Mar	904	628	1,302	7	911	1,363	1,864	6,228
Yr3 Apr	3,792	2,953	4,870	21	3,812	5,474	7,568	14,500
Yr3 May	1,244	820	1,888	69	1,313	1,726	2,158	6,167
Yr3 Jun	613	427	879	76	689	1,021	1,201	3,065
Yr3 Jul	3,526	2,449	5,078	193	3,719	4,899	6,175	19,018
Yr3 Aug	519	367	736	7	526	691	1,147	5,051
Yr3 Sep	832	530	1,304	0	832	1,104	1,739	4,188

Month	Wind Farm Area					Estimated total Wind Farm Area + 1 km	Estimated total Wind Farm Area + 2 km	Estimated total Wind Farm Area + 8 km
	Estimated nos on water	Lower 95 % C.L.	Upper 95 % C.L.	Estimated nos flying	Estimated total			
Yr3 Oct	498	362	685	27	525	710	950	2,579

Mean estimated numbers of puffins in the Wind Farm Area were low between November and March, increasing to a peak in April (2,404 birds) at the start of the breeding season, and again in July (2,161 birds), towards the end of the breeding season (Figure 58). A similar pattern was recorded in the buffer area, although mean estimated numbers were generally higher, with peaks in April, August and October. Mean estimated numbers of puffins in August (13,312 birds, three-year mean) exceeded the 1% threshold of national importance (11,590 birds) (Mitchell, *et al.*,2004).

Figure 58: Mean monthly estimated numbers of puffins in the Wind Farm Area and buffer area in Years 1 to 3 (Three-year mean)



In the Year 1 non-breeding season (mid-August to March), puffins were widespread in the Wind Farm Area, at mostly low densities (Figure 59). High densities were recorded in the east of the buffer area, mainly in August. Very few puffins were recorded in the Study Area between November and February of Year 1

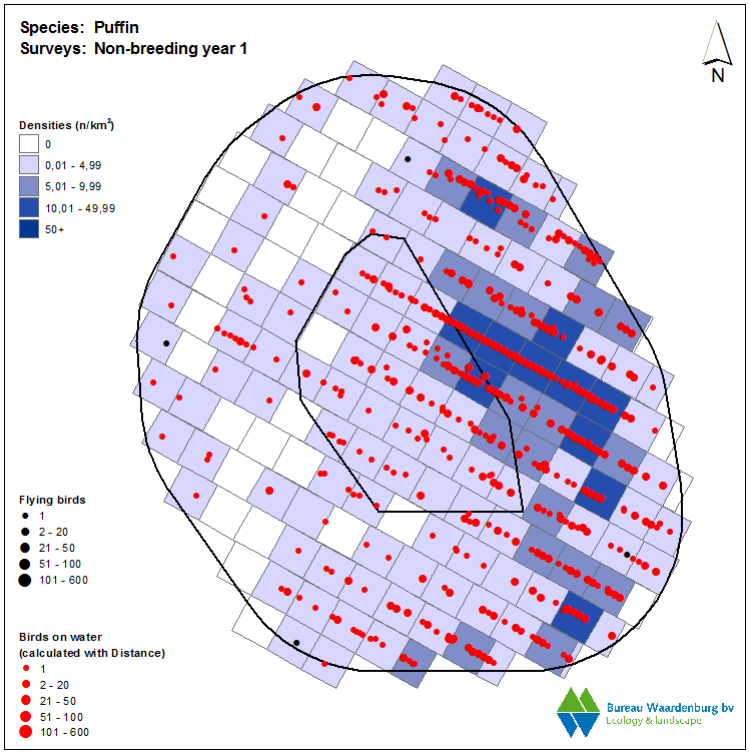


Figure 59: Puffin density in the non-breeding season, Year 1

Puffins were widespread throughout the Study Area over the same period in Year 2, with low to moderate densities in the Wind Farm Area (Figure 60). In the buffer area, distribution differed from the Year 1 non-breeding season, with highest densities in the north-east, and some areas of higher densities in the south. Highest densities were recorded in October, with few birds recorded between December and February

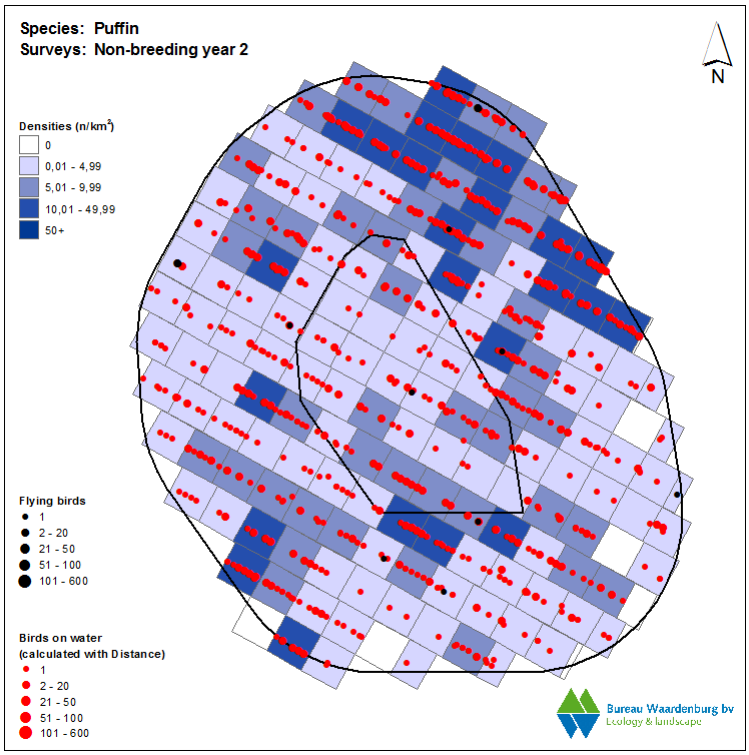


Figure 60: Puffin density in the non-breeding season, Year 2

Puffins were widespread across the Wind Farm Area in the Year 3 non-breeding season at slightly higher densities than the previous two years (Figure 61). In the buffer area, puffins were widespread at mostly low to moderate densities, with few high density areas compared to the previous two seasons. Few birds were recorded between November and February

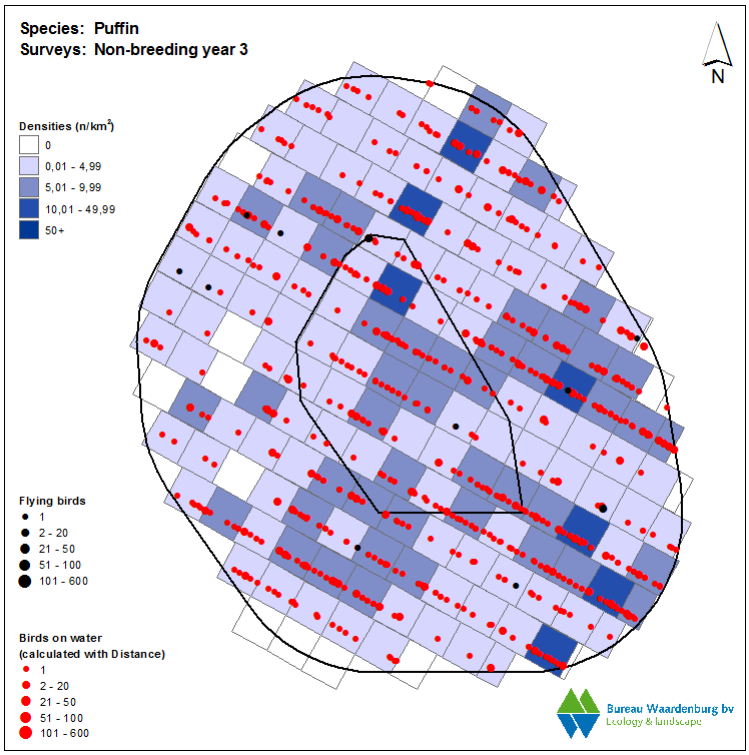


Figure 61: Puffin density in the non-breeding season, Year 3

During the Year 1 breeding season (April to mid-August), highest densities of puffins were recorded in the southern half of the Wind Farm Area and the buffer area, with lower densities recorded in the north (Figure 62). Peak numbers were recorded in April

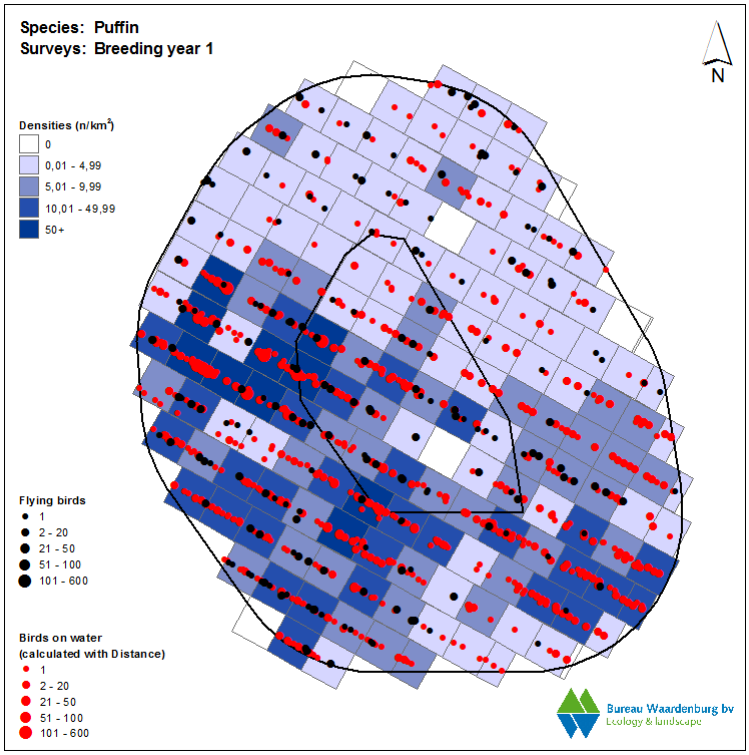


Figure 62: Puffin density in the breeding season, Year 1

A broadly similar distribution pattern was recorded in the Year 2 breeding season, with lowest densities of puffins in the north-east of the buffer area, and predominantly high densities elsewhere throughout the Wind Farm Area and buffer area at this time (Figure 63). Peak numbers were recorded in May and July

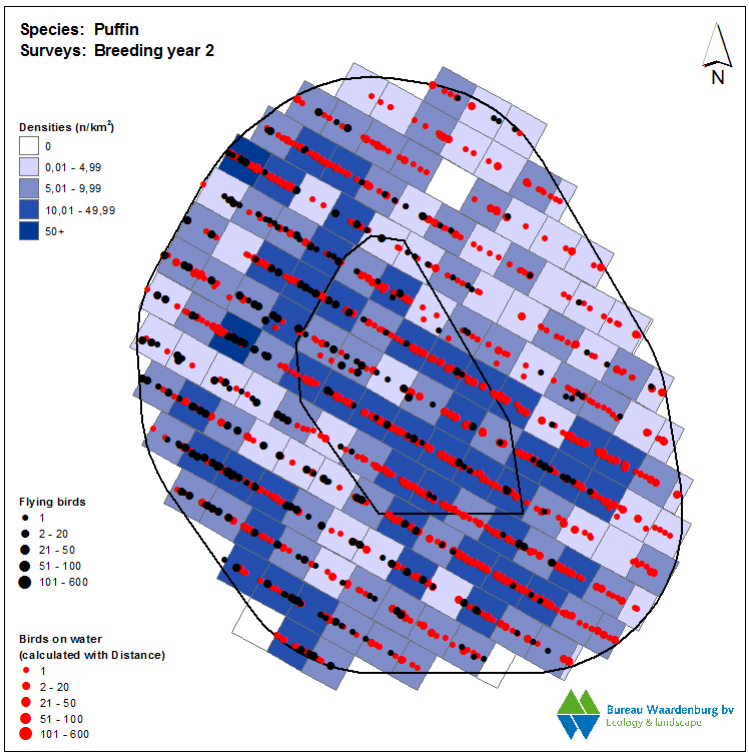


Figure 63: Puffin density in the breeding season, Year 2

In the Year 3 breeding season, puffins were more widespread than in previous years, with high densities recorded across the Wind Farm Area and the central buffer area, with lower densities in the south and north of the buffer area (Figure 64). Peak numbers were recorded in April and July

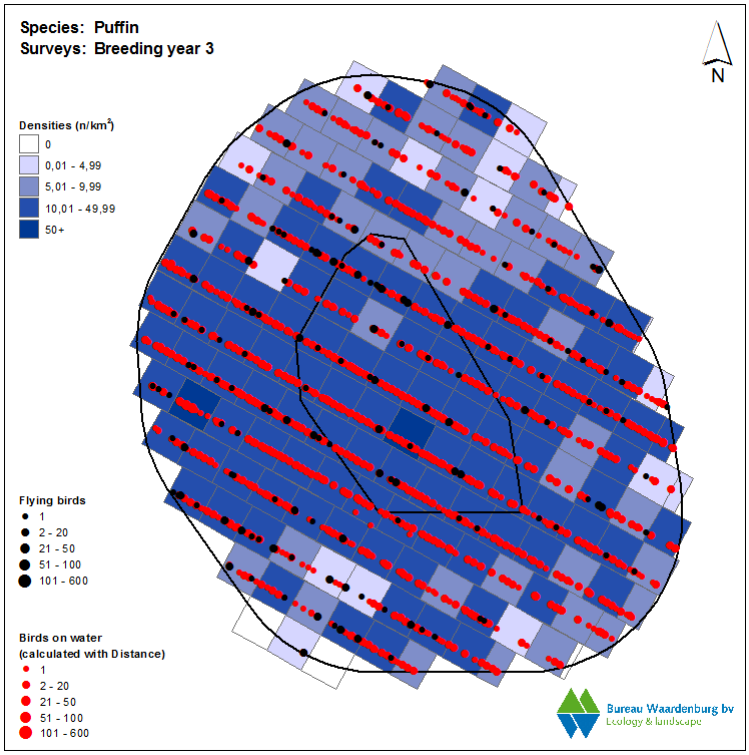


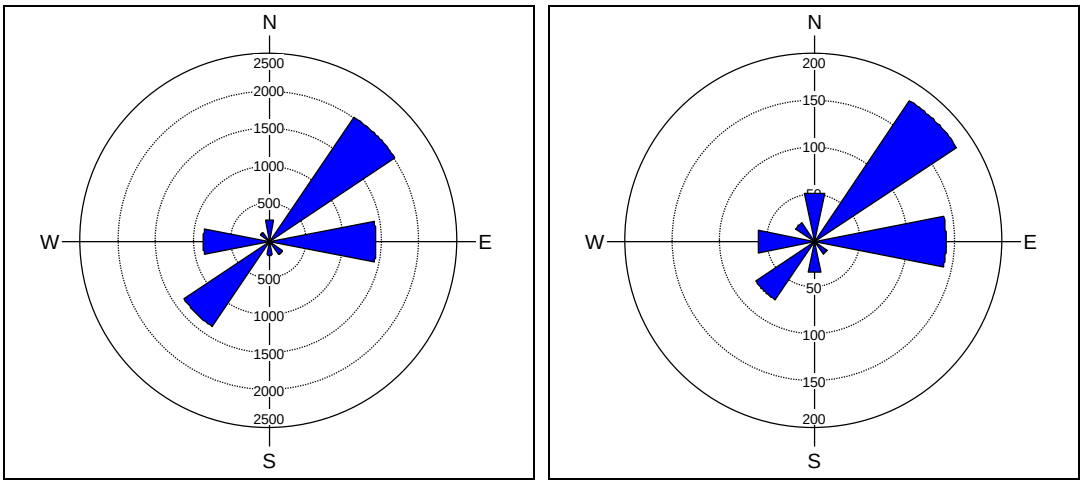
Figure 64: Puffin density in the breeding season, Year 3

A total of 7,048 puffins were recorded in flight on baseline surveys, with almost all birds recorded flying below 27.5 m MSL in height, and 98.8% of birds recorded flying below 7.5 m MSL in height. Three puffins (0.04%) were recorded flying above 27.5 m in the Wind Farm Area and 8 km buffer.

Flight direction was recorded for 6,467 puffins in the breeding season (April to mid-August), with direction recorded for 580 puffins in the non-breeding season (mid-August to March) (Figure 65).

In the breeding season, just over half of all birds recorded were flying north-east (30.9%) and east (21.8%), with just over one third of birds flying south-west (21.1%), and west (13.6%). In the non-breeding season, numbers of birds recorded were considerably lower, with just 580 puffins recorded in flight. Just over a half of all birds recorded were flying north-east (31.2%) and east (24.0%), with just under a quarter of birds flying south-west (12.9%) or west (10.3%).

Figure 65: Flight direction of puffins in the Wind Farm Area and 8 km buffer area in Years 1 to 3



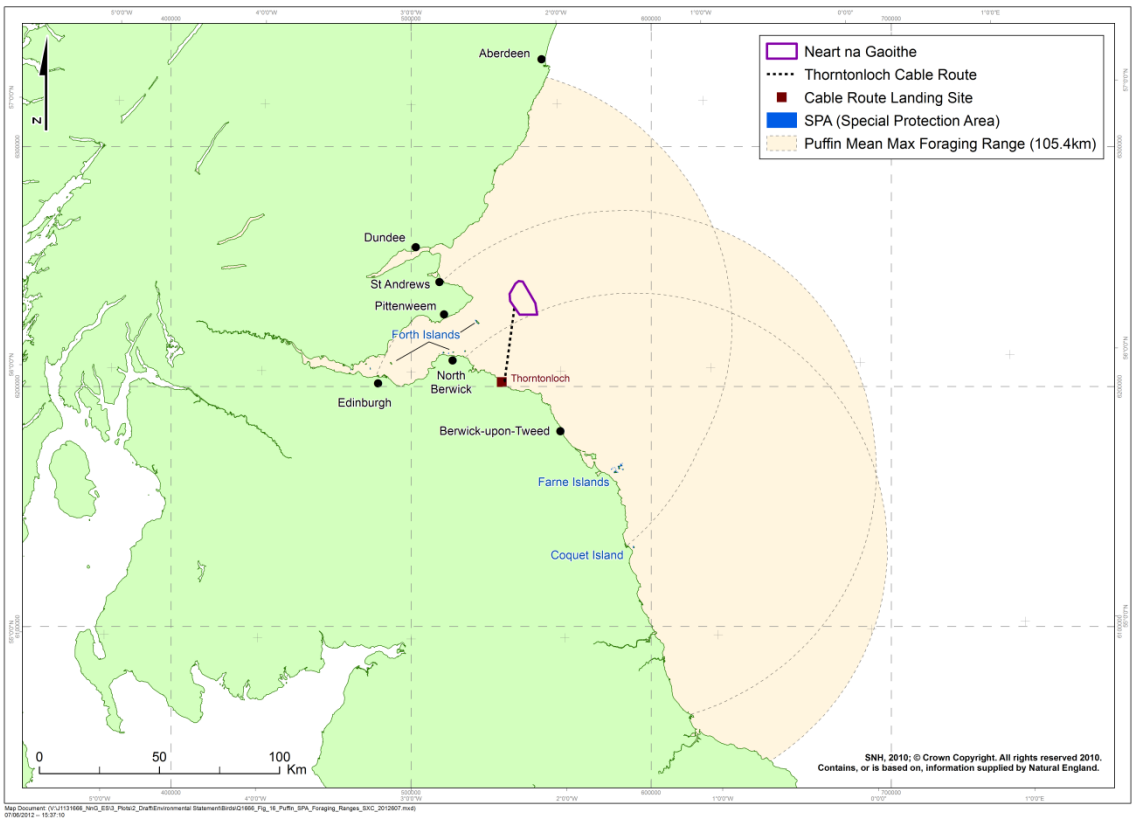
April to mid-August (n=6,467 birds) Mid-August to March (n=580 birds)

Numbers shown on figures are number of birds recorded

Puffin is currently red-listed on the UK Birds of Conservation Concern list, as there has been a moderate decline (>25% but <50%) in the species breeding range between 1968–71 and 2007–11, and because more than 50% of the UK breeding population is found at less than ten colonies (Eaton *et al.*, 2015). In addition, the global conservation status of puffin is classed as Vulnerable under IUCN guidelines, as assessed by BirdLife International in 2015, and the species is also classed as Endangered across Europe on the European Red List of Birds.

One SPA for breeding puffins (Forth Islands SPA) was highlighted in the Scoping Opinion as being of possible risk of impact arising from the Project (Marine Scotland, 2017) (Figure 66). The locations of Farne Islands SPA and Coquet Island SPA are also shown.

Figure 66: SPAs for breeding puffins within mean maximum foraging range of the Project



In addition to the SPA breeding colonies, the Scottish Government is currently considering the designation of a new suite of marine SPAs. This includes the Outer Firth of Forth & St Andrews Bay pSPA. Puffin is listed as a qualifying interest for this pSPA in the breeding season (SNH 2016).

1.1.1.9 Other species considered in collision risk modelling

Arctic Skua

Arctic Skua is a coastal passage migrant in both spring and autumn in Scotland, as well as a scarce breeding species, restricted to Shetland, Orkney, north Scotland and the Western Isles (Forrester *et al.*, 2007). Seabird 2000 recorded a breeding population of 2,136 pairs in Scotland (Mitchell *et al.*, 2004).

No Arctic skuas were recorded in the Wind Farm Area on baseline surveys. A total of six Arctic skuas were recorded in the buffer area in Year 1, between July and October, with a peak of four in September. In Year 2, a total of 18 Arctic skuas were recorded in the buffer area between August and October, with a peak of 11 in October. Birds were scattered widely across the buffer area in both years. Numbers of Arctic skuas were lower in Year 3, with two birds in the buffer in June and three in November.

A total of 22 Arctic skuas were recorded in flight on baseline surveys, with the majority of birds (95.5%) flying below 27.5 m MSL. One bird was recorded flying above 27.5 m MSL, at an estimated height of 30 m MSL.

The majority of Arctic skuas recorded during baseline surveys are likely to be migrating birds, probably from breeding sites in northern Scotland, Orkney and Shetland. Given the relatively small size of these breeding populations the potential for large numbers to migrate through the Wind Farm Area is probably small (Wernham *et al.*, 2002). This is corroborated by the small number of birds recorded in the Study Area in Years 1 to 3.

Great Skua

In addition to occurring in coastal waters on spring and autumn passage, great skuas are a localised breeding species in Britain, restricted to Shetland, Orkney and the Western Isles. Small numbers occur in Scottish waters in winter months (Forrester *et al.*, 2007). Great skuas breed close to other seabird colonies, in order to scavenge and parasitise food from other seabirds, as well as predating other birds and nests. Seabird 2000 recorded 9,634 pairs in Scotland (Mitchell *et al.*, 2004).

In Year 1 of the baseline surveys, 24 great skuas were recorded on surveys in the Wind Farm Area and 8 km buffer area, with one bird in the Wind Farm Area, and 23 birds scattered widely across the buffer area. One bird was seen in spring, and 26 were in the autumn and early winter months. Peak numbers were recorded in September (16 birds). Fewer great skuas were seen on surveys in Year 2, with 16 birds recorded in the buffer area. Most birds were recorded between August and October, with a peak of 9 birds in October. In Year 3, single birds were recorded in the Wind Farm Area in November and January, with 18 birds in the buffer area between July and November, peaking in November (10 birds).

A total of 49 great skuas were recorded in flight on baseline surveys, with the majority (95.9%) flying below 27.5 m MSL in height. Two birds were recorded flying above 27.5 m MSL, at estimated heights of 30 m MSL and 35 m MSL.

Most if not all great skuas recorded during baseline surveys are likely to be migrating birds, probably from breeding sites in northern Scotland, Orkney and Shetland. Given the relatively small size of these breeding populations, the potential for large numbers to migrate through the Wind Farm Area is probably small (Wernham *et al.*, 2002). This is corroborated by the small number of birds recorded on the baseline surveys.

Little gull

Little gulls occur on passage in Scottish waters, in spring, and more commonly in autumn (Forrester *et al.*, 2007). Off the Fife coast, it is considered a passage migrant, mainly in autumn, with small numbers also occurring in winter (Dickson 2002). There have been one, possible two breeding records of little gulls in Scotland in 1988 and 1991, and five unsuccessful breeding attempts in England up to 2007 (Holling *et al.*, 2010). Little gulls feed in flight or on the water, by pecking at the water surface for small items of food, often with other species such as kittiwakes.

Table 16: Estimated numbers of little gulls in the Wind Farm Area (and 1, 2 & 8 km buffer) in Years 1 to 3

Month	Wind Farm Area					Estimated total Wind Farm Area + 1 km	Estimated total Wind Farm Area + 2 km	Estimated total Wind Farm Area + 8 km
	Estimated nos on water	Lower 95 % C.L.	Upper 95 % C.L.	Estimated nos flying	Estimated total			
Yr1 Nov	0	0	0	0	0	0	19	57
Yr1 Dec	0	0	0	0	0	0	0	0
Yr1 Jan	0	0	0	0	0	0	0	0
Yr1 Feb	0	0	0	0	0	0	0	0
Yr1 Mar	0	0	0	0	0	0	0	0
Yr1 Apr	0	0	0	0	0	0	0	0
Yr1 May	0	0	0	0	0	0	0	0
Yr1 Jun	0	0	0	0	0	0	0	0
Yr1 Jul	0	0	0	0	0	0	0	0

Month	Wind Farm Area					Estimated total Wind Farm Area + 1 km	Estimated total Wind Farm Area + 2 km	Estimated total Wind Farm Area + 8 km
	Estimated nos on water	Lower 95 % C.L.	Upper 95 % C.L.	Estimated nos flying	Estimated total			
Yr1 Aug	18	6	58	0	18	18	37	112
Yr1 Sep	0	0	0	0	0	0	0	149
Yr1 Oct	303	157	584	7	309	410	457	1,756
Yr2 Nov	-	-	-	-	-	-	-	-
Yr2 Dec	0	0	0	0	0	0	0	0
Yr2 Jan	0	0	0	0	0	0	0	0
Yr2 Feb	0	0	0	0	0	0	0	0
Yr2 Mar	0	0	0	0	0	0	0	0
Yr2 Apr	0	0	0	0	0	0	0	0
Yr2 May	0	0	0	0	0	0	0	0
Yr2 Jun	0	0	0	0	0	0	0	0
Yr2 Jul	0	0	0	0	0	0	0	0
Yr2 Aug	0	0	0	0	0	0	0	0
Yr2 Sep	0	0	0	41	41	41	41	657
Yr2 Oct	0	0	0	0	0	0	0	1,352
Yr3 Nov	0	0	0	0	0	0	0	0
Yr3 Dec	-	-	-	-	-	-	-	-
Yr3 Jan	0	0	0	0	0	0	0	0
Yr3 Feb	0	0	0	0	0	0	0	7
Yr3 Mar	0	0	0	0	0	0	0	0
Yr3 Apr	0	0	0	0	0	0	0	0
Yr3 May	0	0	0	0	0	0	0	0
Yr3 Jun	0	0	0	0	0	0	0	0
Yr3 Jul	0	0	0	0	0	0	0	0
Yr3 Aug	0	0	0	0	0	0	0	40
Yr3 Sep	455	114	1,817	0	455	455	986	3,841
Yr3 Oct	0	0	0	0	0	0	0	275

Little gulls were mainly recorded on baseline surveys in the Wind Farm Area and 8 km buffer area in autumn, with a total of 298 birds in Year 1, 220 birds in Year 2 and 422 birds in Year 3 (raw numbers, all sea states). The majority of birds were recorded in the buffer area.

During the Year 1 autumn period (August to October), the mean estimated number of little gulls in the Wind Farm Area was 109 birds, with a peak of 309 birds in October (Table 16). In the same period of Year 2, the mean estimated number of little gulls in the Wind Farm Area was 14 birds, with a peak of 41 birds in September. In Year 3, the mean estimated number of little gulls during the autumn period was 152 birds, with a peak of 455 birds in September.

A total of 327 little gulls were recorded in flight, with 74.9% of all birds flying below 27.5 m MSL in height. A total of 82 birds (25.1%) were recorded flying above 27.5 m MSL, at an estimated height of 30 m MSL.

Little gulls were only recorded in the Wind Farm Area between August and October. This time of the year corresponds to the autumn passage. Little gulls do not regularly breed in the UK and the birds recorded in

the Wind Farm Area are most likely to be from breeding grounds in the Baltic region (Wernham et al., 2002).

Black-headed gull

Black-headed gulls are common and widespread in Britain and occur both inland and on the coast, although they are rarely found far offshore. In summer, birds breed at inland and coastal colonies. Seabird 2000 recorded 127,907 pairs of black-headed gulls breeding in Britain (Mitchell *et al.,* 2004). The nearest major breeding colony to the NnG site is inland, at Loch Leven in Fife, with a population of 6,832 pairs recorded during Seabird 2000 (Mitchell *et al.,* 2004).

No black-headed gulls were recorded in the Wind Farm Area on baseline surveys. A total of 27 black-headed gulls were recorded in the buffer area in Year 1, with a peak count of 25 in November. Fewer black-headed gulls were seen in Year 2, with 11 birds recorded between March and October, and a peak of 6 birds in August. In Year 3, just one black-headed gull was recorded, in the buffer area in November. The majority of birds were in the west of the study area, over shallower water. Due to the low sample size of black-headed gulls recorded on baseline surveys, it was not possible to conduct Distance analysis on the data.

A total of 38 black-headed gulls were recorded in flight, with 29 birds (76.3%) flying below 27.5 m MSL and nine birds (23.7%) flying above 27.5 m MSL, at an estimated height of 30 m MSL.

No black-headed gulls were recorded in the Wind Farm Area on baseline surveys.

Common gull

Common gulls are common and widespread in lowland, urban and coastal areas in winter, and breed in colonies in coastal and inland locations in summer. Seabird 2000 recorded 48,163 pairs of common gulls in Britain (Mitchell *et al.,* 2004). Common gulls typically feed on farmland, playing fields, estuaries and in coastal waters, and are comparatively uncommon offshore (Forrester *et al.,* 2007, Stone *et al.,* 1995).

In Year 1, 78 common gulls were recorded on surveys in the Wind Farm Area and 8 km buffer area, with a peak of 28 birds in October. Fewer common gulls were seen in Year 2, with 52 birds recorded, with a peak of 15 birds in December. In Year 3, a total of 22 common gulls were recorded in the study area, with a peak of 9 birds in November (raw numbers, all sea states). In all three years, numbers recorded in the Wind Farm Area on baseline surveys were very low, with six birds seen in Year 1, 12 in Year 2 and two birds in Year 3. Due to the low sample size of common gulls recorded on baseline surveys, it was not possible to conduct Distance analysis on the data.

A total of 123 common gulls were recorded in flight on baseline surveys, with 78.0% of birds flying below 27.5 m MSL, and 27 birds (22.0%) flying above 27.5 m MSL, at estimated heights of between 30 and 50 m MSL.

Numbers of common gulls recorded in the Wind Farm Area on baseline surveys were low.