
GUNFLEET SANDS OFFSHORE WIND FARM: ORNITHOLOGICAL MONITORING 2009-10

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INTRODUCTION

1. This report presents the results of the third winter of bird surveys that are being undertaken as part of the Gunfleet Sands I & II offshore wind farm FEPA monitoring programme and the second winter of the construction phase monitoring. The surveys reported here cover the monitoring work carried out between October 2009 and March 2010.
2. The main aim of the FEPA monitoring program is to determine the distribution and abundance of seabirds using the Gunfleet Sands offshore wind farm site and its surrounds before, during and after the construction phase of the wind farm. Standard survey methodologies have been used, following Camphuysen et al. (2004) and will remain consistent throughout the pre, during and post-construction monitoring.
3. The FEPA Licence conditions relevant to ornithological monitoring are summarised in Section 2.10 of The Environmental Monitoring Plan for Gunfleet Sands I and II (DONG Energy 2007). Ornithological monitoring must be carried out as outlined in Annex 2 of the FEPA licences 31919 and 33723, reproduced below.

ANNEX 2: ORNITHOLOGICAL MONITORING

“Monitoring will commence with at least a year of baseline, pre-construction data gathering and monitoring during the year of construction. Post-construction monitoring will be undertaken annually for three years. The level of subsequent monitoring, during the lifetime of the wind farm’s operation, will be determined, in agreement with English Nature, by the magnitude of change in bird populations observed in the initial monitoring period. The ornithological monitoring programme may have to be adapted and amended as new technologies and research findings become available.

Monitoring should be linked, where appropriate, with the benthic monitoring.

Monitoring reports will be provided to English Nature annually or more frequently, where the results of the data may trigger further monitoring work. Monitoring of an agreed reference site will also be carried out in parallel to the wind farm site.

Monitoring will need to fulfil the following objectives:

- *OBJECTIVE 1: Assess changes in usage of area by feeding birds and birds on passage.*
- *OBJECTIVE 2: Assess collision risk prior to construction of the wind farm and any actual collisions during and post construction.*
- *OBJECTIVE 3: Survey benthos to inform reasons for possible changes in bird distribution and density on site.”*

Previous surveys

4. A programme of baseline bird surveys was undertaken for the ornithological impact assessment of the project that was reported in the Environmental Statement for the first Gunfleet Sands application GE Energy (2002). Further surveys of the Gunfleet Sands 1 site and adjacent areas continued following submission of that ES and were summarised in an interim report (RPS 2005). Subsequent surveys were undertaken to support the application for the Gunfleet Sands 2 application (DONG Energy Ltd 2007). An additional year of pre-construction monitoring was


carried out during 2007-08 (RPS 2008). Surveys were then conducted during the first winter of the construction phase during 2008-09 and were reported by RPS (2009).

5. This report presents the ornithological data collected during the second winter of monitoring during the construction phase completed over the period October 2009 to March 2010.

Study Area

6. The 2009-10 surveys reported here used the same study area as that used for the pre-construction and previously completed construction phase surveys. This included the area in which the wind farm is being constructed (17,5km²), plus a buffer area 3-5km around this. The total survey area was 142km². Its extent is shown in Figure 1, together with the wind farm site and 1km and 2km buffers around that site.

Survey Methods

7. Boat-based surveys were undertaken to provide the data for the construction phase monitoring. The same vessel was used for these surveys as for the ES and the subsequent surveys, the 'Arie Dirk'. This vessel cruises the transects at about 8 knots and has a viewing height of about 5m above the level of the sea. It is ideal for the work being of a size and a manoeuvrability (with an experienced local crew) to enable safe operation close inshore and around busy shipping channels.
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8. The same survey transects were used as reported the baseline surveys and previously completed construction phase surveys (Figure 1). The survey route was designed to provide approximately a 2km interval between transects; a total of 6 transects were surveyed, 5 of about 18km length running approximately SW-NE and one approximately SE-NW. This separation distance was chosen to ensure that an adequate sample of the study area was covered for all species, whilst minimising the likelihood that birds may be displaced from one transect to the adjacent one (and hence double-counted).
 9. A GPS record of the precise route was taken on each trip, so that the location at all times was known. The GPS tracks for each survey are shown in Figure 1. A total of 10 surveys were undertaken during the 2009-10 winter on the following dates:
 - 14/10/2009
 - 05/11/2009
 - 01/12/2009
 - 11/12/2009
 - 06/01/2010
 - 13/01/2010

- 04/02/2010
 - 18/02/2010
 - 24/02/2010
 - 05/03/2010
10. The observation team in 2009-10 comprised Jon Ford and Peter Dodds, who were each involved in both observation and recording. The team are experienced ornithologists, well able to identify all the species encountered accurately. Both observers also have a good knowledge of the area and its ornithological interests.
 11. All birds encountered, their behaviour, flight height and approximate distance from the boat were recorded. Following the JNCC Seabirds at Sea recommendations, birds were recorded into five distance bands (0-50m, 50-100m, 100-200m, 200-300m and 300+m). Birds were recorded continuously, at a steady speed of approximately 8 knots, with the precise time of each observation recorded where possible to give as accurate a position as possible (linking to the GPS position information being recorded simultaneously). All records of birds observed flying as well as those on the sea were recorded.
 12. The approximate height above the sea of all flying birds was recorded. The same height categories that were used in previous surveys were used again to maintain consistency. Flying birds were recorded using snapshot counts at one-minute intervals. Whilst all birds observed were recorded, a note of those “in transect” was made to facilitate later analysis. The flight height categories were as follows:
 - <5m
 - 5-15m
 - 15-100m
 - >100m
 13. The raw survey data (raw totals for each survey visit) are given in Appendix A. Brief survey reports are included for each of these surveys in Appendix B.
 14. As in 2008-09, no aerial surveys were conducted over the 2009-10 winter, thus no comparisons can be made with the pre-construction aerial survey results, as agreed with the regulators and their advisers.

Data Analysis

15. The data processing and analysis followed the same method as for previous reports in order to maintain consistency. The same correction factors were applied to the raw data as previously to take into account the survey coverage and differences in bird detection at distance (detailed in Appendix 2, Table 4 of the previous monitoring report, RPS 2009). The survey focused on a 300m width transect sampled from each 2km width of study area, giving a coverage correction factor of 2000/300.

Survey Results

Study Area Population Estimates

16. The total population estimates within the study area for each survey, based on 'in-transect' counts corrected for distance sampling and survey coverage, are shown in Table 1.

Table 1. Survey Area total population estimates based on 'in-transect' counts corrected for distance sampling and survey coverage.

Species	14/10/09	05/11/09	01/12/09	11/12/09	06/01/10	13/01/10	04/02/10	18/02/10	24/02/10	05/03/10
Red throated Diver	0	13	13	78	0	0	7	0	0	13
Black-throated Diver	0	0	7	0	0	0	0	0	0	0
Great Crested Grebe	0	0	0	7	0	0	0	0	0	0
Brent Goose	433 [†]	0	60	0	0	0	0	0	0	13
Shelduck	0	0	53 [†]	0	0	0	0	0	0	0
Arctic Skua	7	0	0	0	0	0	0	0	0	0
Mediterranean Gull	0	0	0	7	0	7	0	0	0	0
Little Gull	0	0	13	0	0	0	0	0	0	0
Black-headed Gull	0	0	13	74	20	0	0	0	0	0
Common Gull	47	147	80	208	260	193	113	107	80	80
Lesser Black-backed Gull	20	13	40	13	27	7	7	0	68	27
Herring Gull	0	75	7	80	225	53	33	13	128	53
Great Black-backed Gull	0	20	0	7	20	48	14	34	7	7
Kittiwake	0	0	47	7	40	7	20	7	7	0
Guillemot	0	0	7	0	0	0	0	0	0	0
Unidentified gulls	0	0	0	0	0	0	0	300	0	0
Unidentified large gulls	0	0	0	7	0	0	0	0	0	0
Unidentified small waders	0	0	0	0	0	0	0	0	0	7

[†] - corrected count based on small number of 'in-transect' flocks likely to have over-estimated actual numbers.

17. The distribution of the birds in relation to the wind farm area has been summarised into 1km bands in Table 2. This Table gives the mean and peak counts recorded during 2009-10 within the

wind farm site, within a 1km buffer around the site, within the 1-2km zone and further than 2km from the wind farm. These areas cover 13, 22, 28 and 99 km² respectively.

18. Bird numbers within and in proximity to the wind farm were generally very low, with no species other than gulls being recorded 'in-transect' within 1km of the wind farm. The only diver records 'in-transect' were more than 2km from the wind farm.

Table 2. Mean and peak population estimates for zones within and around the wind farm based on 'in-transect' counts corrected for distance sampling and survey coverage in 2009-10.

Species	Mean estimate for each zone				Peak estimate for each zone			
	Wind farm site	0-1km	1-2km	>2km	Wind farm site	0-1km	1-2km	>2km
Red throated Diver	0	0	0	9.3	0	0	0	60
Black-throated Diver	0	0	0	0.7	0	0	0	7
Great Crested Grebe	0	0	0	0.7	0	0	0	7
Brent Goose	0	0	1.3	49.3	0	0	13	433 [†]
Shelduck	0	0	0	5.3	0	0	0	53 [†]
Arctic Skua	0	0	0	0.7	0	0	0	7
Mediterranean Gull	0	0	1.3	0	0	0	7	0
Little Gull	0	0	0	1.3	0	0	0	13
Black-headed Gull	0.7	2.0	1.3	4.7	7	20	13	20
Common Gull	9.3	26.0	22.7	70.0	27	107	60	133
Lesser Black-backed Gull	0.7	2.0	2.7	13.3	7	13	13	33
Herring Gull	7.3	2.7	11.3	29.3	33	13	40	120
Great Black-backed Gull	0	2.0	2.7	5.3	0	13	13	13
Kittiwake	1.3	2.0	0	8.7	7	13	0	33
Guillemot	0	0	0	0.7	0	0	0	7
Unidentified gulls	0	0	0	0.7	0	0	0	7
Unidentified large gulls	0	0	0	30.0	0	0	0	300
Unidentified small waders	0	0	0.7	0	0	0	7	0

[†] - corrected counts based on small number of 'in-transect' flocks likely to have over-estimated actual numbers.

19. The bird densities recorded in each of these zones are compared in Table 3. This is only a preliminary analysis but it does take into account the differing extents of these zones (standardising for area by presenting the data as mean densities).

Table 3. Mean and peak bird densities for zones within and around the wind farm based on ‘in-transect’ counts corrected for distance sampling and survey coverage.

Species	Mean density for each zone				Peak density for each zone			
	Wind farm site	0-1km	1-2km	>2km	Wind farm site	0-1km	1-2km	>2km
Red throated Diver	0	0	0	0.09	0	0	0	0.6
Black-throated Diver	0	0	0	0.0	0	0	0	0.1
Great Crested Grebe	0	0	0	0.0	0	0	0	0.1
Brent Goose	0	0	0.05	0.50	0	0	0.48	4.4
Shelduck	0	0	0	0.05	0	0	0	0.5
Arctic Skua	0	0	0	0.01	0	0	0	0.1
Mediterranean Gull	0	0	0.05	0	0	0	0.24	0.0
Little Gull	0	0	0	0.01	0	0	0	0.1
Black-headed Gull	0.05	0.09	0.05	0.05	0.52	0.90	0.48	0.2
Common Gull	0.73	1.17	0.81	0.71	2.10	4.78	2.15	1.3
Lesser Black-backed Gull	0.05	0.09	0.10	0.13	0.52	0.60	0.48	0.3
Herring Gull	0.58	0.12	0.41	0.30	2.62	0.60	1.43	1.2
Great Black-backed Gull	0	0.09	0.10	0.05	0	0.60	0.48	0.1
Kittiwake	0.10	0.09	0	0.09	0.52	0.60	0	0.3
Guillemot	0	0	0	0.01	0	0	0	0.1
Unidentified gulls	0	0	0	0.01	0	0	0	0.1
Unidentified large gulls	0	0	0	0.30	0	0	0	3.0
Unidentified small waders	0	0	0.02	0	0	0	0.24	0.0

Comparison with Previous Survey Results

20. The mean and peak population estimates for the wind farm site plus a 1km buffer were reported in both the 2007-08 and 2008-09 survey reports, so this parameter has been used to compare these with the 2009-10 survey data. These are shown in Table 4.

Table 4. Mean and peak population estimates for the wind farm plus 1km based on ‘in-transect’ counts corrected for distance sampling and survey coverage, for 2007-08 (pre-construction), 2008-09 (construction phase year 1) and 2009-10 (construction phase year 2).

	Mean count for each winter			Peak count for each winter		
	2007-08	2008-09	2009-10	2007-08	2008-09	2009-10
Red throated Diver	21.1	3.3	0	115	20	0
Great Crested Grebe	3.3	1.0	0	10	10	0
Black-headed Gull	0.7	1.3	2.7	7	7	27
Common Gull	16.5	73.3	35.3	89	402	127
Lesser Black-backed Gull	9.7	6	2.7	21	20	13
Herring Gull	11.9	7.4	10.0	47	27	33

	Mean count for each winter			Peak count for each winter		
	2007-08	2008-09	2009-10	2007-08	2008-09	2009-10
Great Black-backed Gull	16.6	2.0	2.0	82	7	13
Kittiwake	8.2	0.7	3.3	34	7	13
Guillemot/auk sp	9	1.1	0	82	11	0

Seabird Distributions

21. The distributions of the main birds species observed during the 2009-10 surveys are shown in Figures 2-10. These show all of the data obtained during the surveys, not just those that were 'in-transect' (which were used to derive all of the population estimates presented above). They also show the extent of the wind farm site, the 1km and 2km buffers and the study area as a whole. Each of the main species is discussed in turn.
22. **Divers** (Figure 2): divers were widely distributed across most of the study area apart from within the wind farm site plus a 1km buffer. As in previous years numbers were highest along the southern edge of the study area, though numbers overall were lower in 2009-10 than in the previous surveys (as detailed in Table 4).
23. **Common Scoter** (Figure 3): there were only five records of common scoter in 2009-10, all of small numbers in the southern part of the study area. None were 'in transect', so this species is not included in the population estimate table.
24. **Black-headed Gull** (Figure 4): this species was widely scattered over the whole study area at low density, including within the wind farm site.
25. **Common Gull** (Figure 5): this was the most abundant species within the study area in 2009-10 and was found in all parts of that area. The largest flock was seen within the wind farm site.
26. **Herring Gull** (Figure 6): this gull species was also found across the whole of the study area. As for common gulls, the largest flock was seen within the wind farm site.
27. **Lesser Black-backed Gull** (Figure 7): another widely distributed gull species, found in all parts of the study area including the wind farm site.
28. **Great Black-backed Gull** (Figure 8): another widely distributed gull species, found in all parts of the study area including the wind farm site.
29. **Kittiwake** (Figure 9): another widely distributed gull species, found in all parts of the study area including the wind farm site.
30. **Auks** (Figure 10): auks (which were predominantly guillemots but also a smaller number of records of razorbill; 'unidentified auks' may also have included little auk) were found across most of the study area apart from the wind farm site and its surrounds.
31. As in previous surveys a small number of records of land-based species were also seen over-flying the study area, including brent goose, shelduck, buzzard, sparrowhawk, ringed plover, meadow pipit, wheatear, blackbird and starling.

Flight Heights

32. The flight heights recorded during the 2009-10 surveys are summarised in Table 5. This Table gives the flight height distribution (by band) for each species seen over-flying, and the percentage of flights at rotor height (taken conservatively as all flights above 15m – none were recorded above 100m). The sample unit was taken as the flock rather than the individual as individuals within a flock do not provide an independent sample. These results were broadly similar to those from previous years, though the percentage of divers at rotor height was rather higher than in 2008-09 (22% compared with 17% in 2007-08 and 7% in 2008-09). Notwithstanding this, the very low numbers of divers flying in proximity still meant that the collision risk for these species would be negligible, as previously concluded.

Table 5. Flock flight height distribution observed in 2009-10. Values indicate the number of flocks in each category and the percentage of flying flocks at rotor height (15-100m).

	On sea	<5m	5-15m	15-100m	% at rotor height
Red throated Diver	12	9	19	8	22%
Black-throated Diver	0	0	1	0	0%
Great Crested Grebe	3	2	0	0	0%
Gannet	0	3	0	0	0%
Cormorant	0	0	2	0	0%
Brent Goose	0	9	2	6	35%
Shelduck	0	3	0	1	25%
Mallard	0	0	0	2	100%
Common Scoter	0	5	0	0	0%
Goosander	0	0	0	1	100%
Sparrowhawk	0	0	1	0	0%
Buzzard	0	1	0	0	0%
Ringed Plover	0	1	0	0	0%
Arctic Skua	0	0	1	0	0%
Mediterranean Gull	0	0	3	0	0%
Little Gull	0	3	0	0	0%
Black-headed Gull	1	8	13	5	19%
Common Gull	11	32	292	209	39%
Lesser Black-backed Gull	4	9	50	67	53%
Herring Gull	13	29	113	79	36%
Great Black-backed Gull	9	7	18	11	31%
Kittiwake	2	8	43	8	14%
Guillemot	4	6	0	0	0%
Razorbill	0	1	0	0	0%
Meadow Pipit	0	1	0	0	0%
Wheatear	0	1	0	0	0%
Blackbird	0	0	0	1	100%

	On sea	<5m	5-15m	15-100m	% at rotor height
Starling	0	1	0	0	0%

Note: no birds were observed flying at a height greater than 100m above the sea.

Conclusions

33. The 2009-10 surveys showed that there has been a continued very low use of the wind farm site and its vicinity by divers as was the case prior to commencement of the construction phase. The area within 1km of the wind farm held an estimated 115 divers in 2007-08, 20 in 2008-09 and none in 2009-10 (from the 'in-transect' survey data). Only a preliminary analysis has been undertaken to date, but it is clear that the apparent reduction in numbers in proximity to the wind farm noted in 2008-09 was seen again in 2009-10. There were also fewer divers recorded in study area as a whole in 2009-10 (estimated peak of 78 in 2008-09, compared with about 300-400 reported in the previous two winters, RPS 2009). This could be attributable to a reduced food supply in the area as well as the construction of the wind farm – unusually few 'fish marks' were seen on the survey vessel's echo sounder during the 2009/10 surveys, suggesting that the sprat shoals were scarce in this area this winter.
34. There appears to be a similar decline in auk numbers in both the wind farm site and the study area as a whole
35. The only other seabird species present in non-trivial numbers in the study area during these surveys were gulls. None of these species showed any suggestion of a decline following the start of wind farm construction, from either comparison of numbers within the wind farm site plus a 1km buffer between years or between densities observed in 2009-10 in the zones at increasing distances from the wind farm.
36. Numbers of birds observed over-flying through the wind farm site were again very low and not likely to constitute a significant collision risk.
37. A full analysis of the bird responses to the wind farm will be undertaken at the end of the 3-year post construction monitoring period when data will be analysed in detail to show trends in abundance and distribution.

References

- Camphuysen, C.J., Fox, A.D., Leopold, M.F. and Petersen, I.K. (2004). Towards standardised seabirds at sea census techniques in connection with environmental impact assessments for offshore wind farms in the U.K. A report commissioned by COWRIE. Royal Netherlands Institute for Sea Research.
- DONG Energy (2007). Gunfleet Sands 2: Environmental Statement. Prepared on behalf of DONG by RPS Energy. June 2007.
- DONG Energy Ltd (2007). Gunfleet Sands 1 and 2 Environmental Monitoring Plan v03. Report Number 02-04-00747. April 2008.

GE Energy (2002). Gunfleet Sands Offshore Wind Farm: Environmental Statement. Prepared on behalf of GE Energy by Hydrosearch, Woking. May 2002.

RPS (2005). Gunfleet Sands Ornithological Monitoring: Interim Report. RPS, St Ives, Cambridgeshire.

RPS (2008). Gunfleet Sands Monitoring Report 2007-08. Report to Dong Energy.

RPS (2009). Gunfleet Sands Monitoring Report 2008-09. Report to Dong Energy.

Appendix A: Raw Count Data for the 2009-10 Boat Surveys – daily survey totals

	14/10/09	05/11/09	01/12/09	11/12/09	06/01/10	13/01/10	04/02/10	18/02/10	24/02/10	05/03/10
Red throated Diver	1	2	9	27	23	2	4	2	1	3
Black-throated Diver	0	0	1	0	0	0	0	0	0	0
Unidentified diver	0	0	0	15	0	0	0	0	1	5
Great Crested Grebe	0	0	0	2	2	0	0	0	0	1
Gannet	3	0	0	1	0	0	0	0	0	0
Cormorant	1	0	0	0	0	0	0	0	0	2
Brent Goose	116	0	56	5	0	0	0	0	0	2
Shelduck	0	0	8	0	0	0	0	0	1	0
Mallard	0	0	0	3	0	0	0	0	0	0
Common Scoter	0	0	0	5	5	1	3	0	0	0
Goosander	0	0	9	0	0	0	0	0	0	0
Unidentified duck	2	0	22	0	0	7	0	0	0	0
Sparrowhawk	1	0	0	0	0	0	0	0	0	0
Buzzard	0	1	0	0	0	0	0	0	0	0
Ringed Plover	0	0	2	0	0	0	0	0	0	0
Unidentified small wader	0	0	0	0	0	15	0	0	0	1
Unidentified wader	0	0	8	0	0	0	0	0	0	0
Pomarine Skua	0	0	1	0	0	0	0	0	0	0
Arctic Skua	1	0	0	0	0	0	0	0	0	0
Mediterranean Gull	0	0	0	2	0	1	0	0	0	0
Little Gull	0	0	9	0	0	0	0	0	0	0
Black-headed Gull	0	1	3	11	8	1	3	2	5	10
Common Gull	30	100	53	90	114	123	71	47	42	54
Lesser Black-backed Gull	19	18	24	6	13	8	7	6	27	17
Herring Gull	7	31	9	50	38	22	21	24	89	31
Great Black-backed Gull	0	7	2	5	5	8	2	7	6	3
Kittiwake	3	3	39	6	14	4	5	4	1	0
Unidentified large gull	0	0	0	2	0	0	0	0	0	0
Unidentified gull	1	0	0	40	0	0	0	45	0	14
Guillemot	0	0	5	5	0	1	0	0	0	0
Razorbill	0	0	1	0	0	0	0	0	0	0
Unidentified auk	0	0	14	3	0	1	0	0	0	0

	14/10/09	05/11/09	01/12/09	11/12/09	06/01/10	13/01/10	04/02/10	18/02/10	24/02/10	05/03/10
Meadow Pipit	2	0	0	0	0	0	0	0	0	0
Wheatear	1	0	0	0	0	0	0	0	0	0
Blackbird	0	0	16	0	0	0	0	0	0	0
Starling	0	2	0	0	0	0	0	0	0	0
Unidentified small passerine	0	2	0	0	0	0	0	0	0	0
Common Seal	0	0	1	1	1	0	0	0	1	0
Harbour Porpoise	1	0	0	0	0	0	0	2	0	0
Unidentified seal	0	0	0	0	0	0	0	0	1	0

Appendix B: Surveyor Summary Reports for the 2009-10 Boat Surveys

14/10/09

A Force 3 south-easterly wind produced a sea state 2 – 3 for most of the survey which, together with good visibility, resulted in good survey conditions. It is unlikely that any large flying seabirds were missed within the A to D bands up to 500m ahead of the boat although small low flying migrating passerines and a small percentage of birds on the water may have been missed in the wave troughs. Construction work continues on the wind farm site with several works vessels involved. A few angling vessels were operating in the area but no commercial fishing vessels. High tides occurred at 08:57 (5.0m) and 21.47 (5.3m).

Very few birds were recorded today and a total count of 60 gulls is probably a 'record low'. Common gull were the most numerous with 30 recorded. Seven herring gull, 19 lesser black-backed gull, three kittiwake, and one gull that could not be identified to species were also recorded.

116 brent geese were recorded, generally on flocks of around 20 birds flying low through the site. Two of these flocks were accompanied by an unidentified duck species, one of which was thought to be a pintail. These geese will probably have been migrating into the country to over-winter, possibly on the Essex and North Kent marshes, from the Continent. Most will have bred on the Taimyr Peninsula in Arctic Russia.

An early-arrived red-throated diver, still in summer plumage, was seen close to the survey vessel, on the water just inside the wind farm site on Transect 12. It is very unusual to see this most 'skittish' of species so close to the vessel or within the boundaries of a wind farm. One cormorant was recorded flying to the south-east on Transect 5. Two gannet were also seen on Transect 5 and another on Transect 2. The gannet all appeared to be 'in transit' and not attempting to fish over the site. No auks were recorded. There are likely to be more fish-hunting birds such as auks, gannets, and divers recorded on these surveys as sprats move into the estuary, normally in vast shoals around the end of November. There were only a few scattered 'fish marks', probably whitebait, seen on the survey vessel's echo sounder today.

Regarding migrating passerines, a very weak looking juvenile wheatear attempting to migrate to Africa, possibly directly from the UK or more likely using the UK as a 'refuelling stop' from Greenland or Iceland, was seen at the north end of Transect 5. Two meadow pipits were recorded flying south-west, probably migrating to southern Europe

I have, on a number of occasions while on other offshore surveys, witnessed sparrow hawk, peregrine and kestrel within a few miles of shore in the autumn and spring preying on these often weak migrating passerines with nowhere to hide over the open sea. A sparrowhawk recorded flying along the edge of the wind farm on Transect 12 may have flown out to this area just for that reason although some do migrate south in the autumn. An adult light morph arctic skua recorded on Transect 6 may also have been preying on passerines although scavenging or acting piratically towards gulls and terns is the usual way arctic skuas obtain food.

Regarding marine mammals, a common seal was seen at the northern end of Transect 15.

5/11/09

A Force 5 north-westerly wind, falling to a Force 4, in the lee of the land, produced a sea state 3 throughout the day which, together with good visibility, resulted in quite good survey conditions. It is unlikely that any large flying seabirds were missed within the A to D bands up to 500m ahead of the boat although small low flying migrating passerines and a few birds on the water may have been missed in the wave troughs. Construction work continues on the wind farm site with a large jack-up rig and a number of smaller works vessels involved. High tides occurred at 00:50 (5.8m) and 13:06 (5.9m).

This was another quiet survey with very little variety in species and low numbers. A total of 130 gulls were recorded and as last month, common gull were the most numerous with 98 recorded. 18 lesser black-backed gulls, seven great black-backed gulls, 31 herring gulls, three kittiwakes, and one black-headed gull were also recorded. There appeared to be an early westerly/south-westerly movement of gulls. On the first Transect (no. 2), 47 gulls were recorded, 28 of which were seen flying in a westerly or south-westerly direction. But on the following Transect (no. 15) only six gulls were recorded with only two flying in a southerly/south-westerly direction. This early movement of gulls is often observed and as these Transects are less than two km apart I consider this more likely to be a temporal phenomenon as opposed to a tide-related or spatial phenomenon.

Two red-throated divers were recorded at the north-eastern end of Transect 2, one flushed about 300m ahead of the survey vessel and one flying south, although this bird may well have also been flushed but not seen taking off. This eastern end of the study area is usually the favourite area for divers on this site. Again, as last month no auks were recorded. There were only a few scattered 'fish marks' seen on the survey vessel's echo sounder today so it would seem that the sprat shoals that usually arrive around this time of year, or a little later, are yet to appear.

Regarding migrating passerines, two small, unidentified passerines (possibly chaffinch) were seen flying low over the water to the south-west; two starlings were seen heading to the west. A common buzzard was recorded to the north of the study area on Transect 6, flying low over the water to the west. This is likely to be migrating in to the UK from Eastern Europe for the winter or using it as a staging post before moving further south. I believe that this is the first buzzard recorded on these Gunfleet Sands surveys.

No marine mammals were recorded although the conditions were not ideal for spotting them.

1/12/09

A Force 4 northerly wind, falling to a Force 2 north-easterly, produced a sea state 3, reducing to sea state 2 which, together with good visibility, resulted in quite good survey conditions. It is unlikely that any large flying seabirds were missed within the A to D bands up to 500m ahead of the boat although small low flying migrating passerines and a few birds on the water may have been missed in the wave troughs. Construction work continues on the wind farm site with a several small transfer vessels etc. involved. High tides occurred at 11:42 (5.5m) and 23:09 (5.6m).

A total of 139 gulls were recorded of seven different species and as in October and November, common gull were the most numerous with 53 recorded. 24 lesser black-backed gull, two great black-backed gull, nine herring gull, 39 kittiwake, three black-headed gull, and nine little gull were also recorded. Little gull are rarely seen on this site, these birds will have been migrating to the south. There did not really appear to be any pattern in the other gull species' movements.

Nine red-throated diver and one black-throated diver were recorded today, most seen flying high over the site, very few appearing to be feeding on the site. Five guillemots and one razorbill were recorded, also a flock of 14 unidentified auks was distantly seen that may have been little auk. As last month, there were only a few scattered 'fish marks' seen on the survey vessel's echo sounder today so it would seem that the sprat shoals, that usually arrive around this time of year, are yet to appear. It is thought likely that these sprats, when in the shallow water of the Thames estuary, are a considerable food resource for birds such as divers and auks.

Regarding migrating passerines, a late migrating flock of 16 blackbirds was seen flying towards the coast at around 50m high.

Regarding waterfowl, 56 brent geese were recorded in groups of 19 to single birds, flying at a variety of heights in a general westerly direction. These are likely to be late-arriving winter migrants. Eight shelduck were recorded, seven seen flying low through the site in Transect 6 and one flying high with a flock of brent geese. A flock of 22 unidentified duck species, probably wigeon, was also recorded. A flock of nine goosander was recorded in Transect 15 flying to the north-west at around 80m high. This is a new species for this site.

Two ringed plover were seen flying low over Transect 6, heading north-west, and a flock of eight unidentified small waders was recorded flying low to the west. A very high flying pomarine skua was recorded on Transect 2 heading to the south-east.

No marine mammals were recorded today.

11/12/09

A Force 2 to 3 northerly wind, going north-easterly, produced a sea state 2, becoming 3 by 13:00. Visibility was moderate at first, reduced to around 2km by mist but this cleared giving 8km of good visibility by 10:00. This resulted in quite good survey conditions from 10:00. It is unlikely that any large flying seabirds were missed within the A to D bands up to 500m ahead of the boat after mid-morning although some may have been missed on the first two transects. Construction work continues on the wind farm site with a large jack-up rig and several small transfer vessels involved. High tides occurred at 06:54 (5.1m) and 21:44 (5.1m).

A total of 212 gulls were recorded of seven different species and as in October, November, and earlier in the month common gull were the most numerous with 90 recorded. This has not been the pattern on other sites in the Thames this year. Six lesser black-backed gull, five great black-backed gull, 50 herring gull, six kittiwake, eleven black-headed gull were also recorded, plus two sightings of an adult Mediterranean gull. This is a relatively rare species for the UK and the first time recorded on this site. Given the fact that both sightings were of an adult bird and the rarity of this species it is probable that this was the same individual. 42 gulls were not identified to species, most of which were associated with a distant small trawler near the northern end of Transect 15.

Regarding surface diving fishing species, twenty-seven red-throated diver and 15 divers unidentified to species were recorded, most on the outermost Transect 15. While only six divers were noted as on the water it is hard to be sure how many of these divers noted as 'in flight' were originally distantly flushed from the surface by the survey vessel. Two great-crested grebe were recorded. Five guillemot and three unidentified auk species were recorded, again, most seen on the outmost Transect. As last survey, there were only a few scattered 'fish marks' seen on the survey vessel's echo sounder today.

Regarding waterfowl, 5 brent geese were recorded on Transect 15 flying south-west – probably a local movement. Three mallard were seen flying high over the site to the north. A flock of five common scoters, all female/immature, was recorded flying low over the site to the north-east on Transect 2.

No marine mammals were recorded today.

6/1/10

A Force 2 variable wind produced a sea state 2 or less throughout the survey. Visibility was generally good although intermittent light snow showers reduced it at times. Conditions were good for seeing birds on the water and it is unlikely that more than a very few large flying seabirds were missed within the A to D bands up to 500m ahead of the boat. Construction work continues on the wind farm site with a large jack-up rig and a number of small transfer vessels involved. High tides occurred at 03:29 (5.8m) and 16:06 (5.7m).

Few birds of only nine species recorded today. A total of 190 gulls were recorded of six different species and as in all the surveys so far this season, common gull were the most numerous with 114 recorded – 60% of all the gulls recorded. 11 lesser black-backed gull, five great black-backed gull, 38 herring gull, 14 kittiwake, and eight black-headed gull were also recorded. There did not appear to be any real pattern to the gulls movements.

Regarding surface diving fishing species, twenty-three red-throated diver and two great-crested grebe were recorded. Most of the divers were seen towards the north-eastern end of Transect 4 including a tight group of seven birds that appeared to be actively feeding. No auks were recorded despite good

conditions for seeing them on the water. As the last two surveys, there were only a few scattered 'fish marks' seen on the survey vessel's echo sounder today.

Regarding waterfowl, a flock of five common scoters, all female/immature, was recorded flying low over the site to the south-west on Transect 15. An identical group was recorded last month. One can only speculate that these may be the same birds.

A common seal was recorded close to the feeding divers at the north-eastern end of Transect 4.

4/2/10

A Force 2 to 3 southerly wind produced a sea state 1 to 2 becoming sea state 2. There was light rain at times but survey conditions were generally very good for seeing birds on the water and it is probable that only a very few large flying seabirds were missed within the A to D bands up to 500m ahead of the boat. Construction work continues on the wind farm site with a large jack-up rig and a number of small transfer vessels and survey vessels involved. No fishing vessels were operating close enough to have a significant effect on the birds recorded in the study area. High spring tides occurred at 03:05 (6.0m) and 15:38 (5.7m).

This was a very quiet survey with little recorded in the way of numbers or species. A total of 109 gulls were recorded of six different species. As usual on this site common gull were the most numerous with 71 recorded. Seven lesser black-backed gull, two great black-backed gull, 21 herring gull, five kittiwake, and three black-headed gull were also recorded. There did not appear to be any real pattern to the gull's movements.

As on the last survey last month, there were surprisingly few divers recorded today with just four red-throated diver recorded, all towards the north-eastern boundary of the study area. Although these birds may have been flushed from the water by the survey vessel, they were not seen doing this so were recorded as 'in flight'. Three were flying above 15m which may indicate that they were 'in transit' but the flight height can vary a lot. Over the sea this seems to be mostly related to wind speed and the direction that they are flying in relation to the wind direction. There were no substantial 'fish marks' seen on the survey vessel's echo sounder today.

Three common scoters were recorded; two flying low over the site to the south-east in Transect 15 and one flying low to the north-west in Transect 2.

No marine mammals were recorded today.

18/2/10

A Force 2 south-easterly wind, going southerly Force 3, produced a sea state 2 throughout the survey. Some intermittent rain was experienced and visibility was reduced to 2km for a while but survey conditions were generally good for seeing birds on the water and it is probable that only a very few large flying seabirds were missed within the A to D bands up to 500m ahead of the boat. Construction work continues on the wind farm site with several vessels on site or in transit to or from Brightlingsea. No fishing vessels were operating close enough to have a significant effect on the birds recorded in the study area. High tides occurred at 01:58 (5.6m) and 14:27 (5.5m).

This was another very quiet survey with little recorded in the way of numbers and very little in the way of species – only one non-gull bird species was recorded. A total of 135 gulls were recorded of six different species. As usual on this site common gull were the most numerous with 47 recorded. Six lesser black-backed gull, seven great black-backed gull, 24 herring gull, four kittiwake, and two black-headed gull were also recorded. A further 45 gulls that could not be identified to species were recorded feeding in the wake of a cargo vessel travelling near Line 15 otherwise there did not appear to be any real pattern to the gull's movements.

As on the last two surveys, there were surprisingly few divers recorded today with just two red-throated diver seen in the study area, one flying south-west around the mid-point of line 15, the other flying south near the southern end of Line 6. Neither bird appeared to have been flushed from the site although this is often hard to ascertain. Five other divers were observed just before the start of the survey at the northern end of Line 15. There were no substantial 'fish marks' seen on the survey vessel's echo sounder today.

A harbour porpoise was recorded around the mid-point of Line 2 quite close to the survey vessel.

24/2/10

A Force 3 south-easterly wind, going southerly, produced a sea state 2 which, combined with good visibility, gave good survey conditions throughout the day. It is probable that only a very few large seabirds were missed within the A to D bands up to 500m ahead of the boat. The main construction work has been completed on the wind farm site although two small crew transfer vessels were on site throughout the day. No fishing vessels were operating close enough to have a significant effect on the birds recorded in the study area. The north end of Line 12 had to be cut a little short to navigate shallow water. High neap tides occurred at 06:52 (4.6m) and 19:41 (4.6m).

This was another very quiet survey with little recorded in the way of numbers and very little in the way of species – 173 birds of eight identified species. 170 of the birds recorded were gulls, of six different species. For the first time since the first survey of the season, common gull were not most numerous gull. Herring gull had the highest count with 89 recorded. 42 common gull, 27 lesser black-backed gull, six great black-backed gull, one kittiwake, and five black-headed gull were also recorded. There did not appear to be any real pattern to the gull's movements.

Very few divers were recorded today with just one red-throated diver seen in the study area, flying north-west near the north-eastern end of line 4. This bird could have been flushed from the site by the approaching survey vessel but this was not witnessed so the diver was recorded as 'in flight'. A distantly flying, south-west heading diver that could not be identified to species was recorded around the mid-point of Line 15. Two more red-throats were observed off-site just before the start of Line 4 at the south-western end. There were no substantial 'fish marks' seen on the survey vessel's echo sounder today. A lone shelduck was seen flying low over the site to the south on Transect 2

Two harbour porpoise, an adult and juvenile/calf, were recorded towards the south-western end of Line 2 quite close to the survey vessel.

5/3/10

A steady Force 3 north-westerly, backing westerly wind, produced a sea state 2 which, combined with good visibility, gave good survey conditions throughout the day. It is probable that only a very few large seabirds were missed within the A to D bands up to 500m ahead of the boat. While main construction work has been completed, two small crew transfer vessels and two small survey vessels remained on site throughout the day. A small stern trawler in transit just north of Line 6 attracted a number of gulls. Due to a hand-held GPS malfunction or the loss of satellite reception, seven bird observations on Line 12 could not be assigned co-ordinates. High tides occurred at 03:48 (5.7m) and 16:21 (5.4m).

This last survey of the season was another with very low numbers of birds recorded – 143 birds of nine identified species. 129 of the birds recorded were gulls of five different species. Common gull were the most numerous with 54 counted. 31 herring gull, 17 lesser black-backed gull, three great black-backed and 10 black-headed gull were also recorded. There did not appear to be any real pattern to the gull's movements.

Regarding surface-diving birds, eight divers were recorded, three red-throats and five distant divers that could not be identified to species, (although thought to be red-throats). Six of the divers were seen near the north-eastern end of Line 15 and Line 2 – a consistently popular spot for divers. One

was seen to be flushed by the approaching survey vessel, the others were first seen flying, and so recorded as such. A great-crested grebe was flushed by the survey vessel around the mid-point of line 5. A cormorant was recorded flying through the wind farm site at rotor height on Line 4. There were no substantial 'fish marks' seen on the survey vessel's echo sounder today.

Two brent geese were recorded just to the southwest of the wind farm site flying low over the water to the north-west. This was probably a local movement as it is rather early brent geese migration. A small unidentified wader was seen flying low over the water on Line 2, again, probably a local movement.

Two seals were recorded just outside the wind farm on Line 4; one could not be positively identified, the other was identified as a common seal.

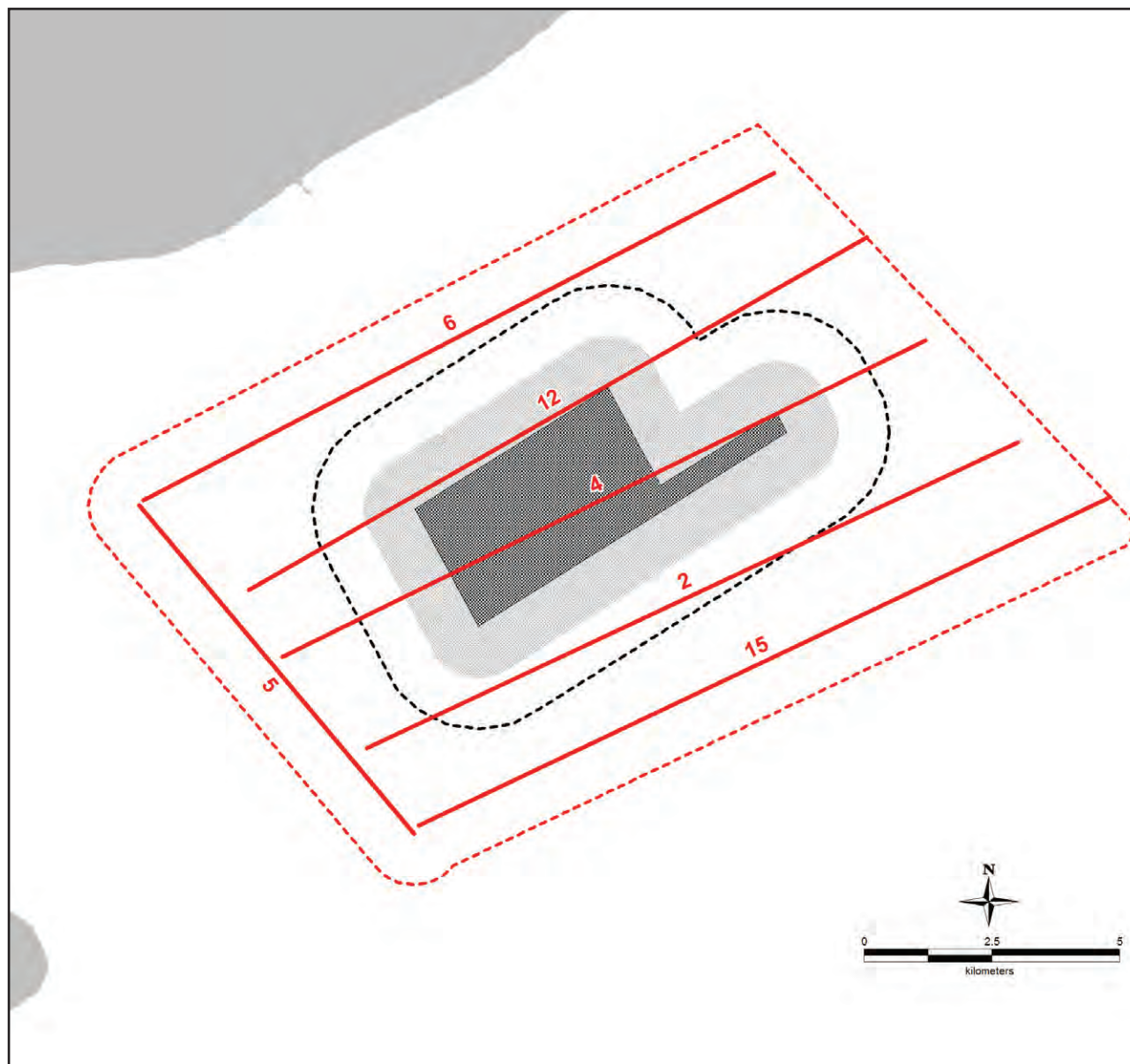


Figure 1. Gunfleet Sands
Boat Survey Area and
Transects

KEY:

— Boat survey transect
(no. = ID)

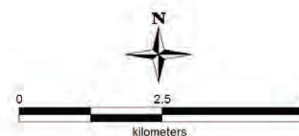
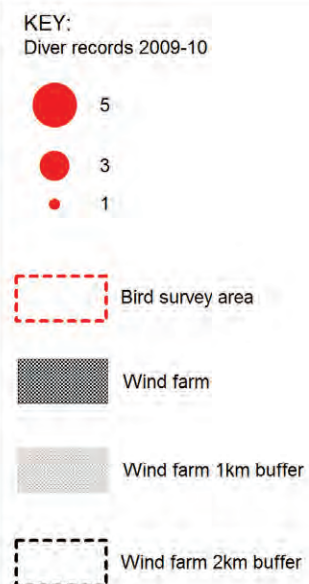
--- Bird survey area

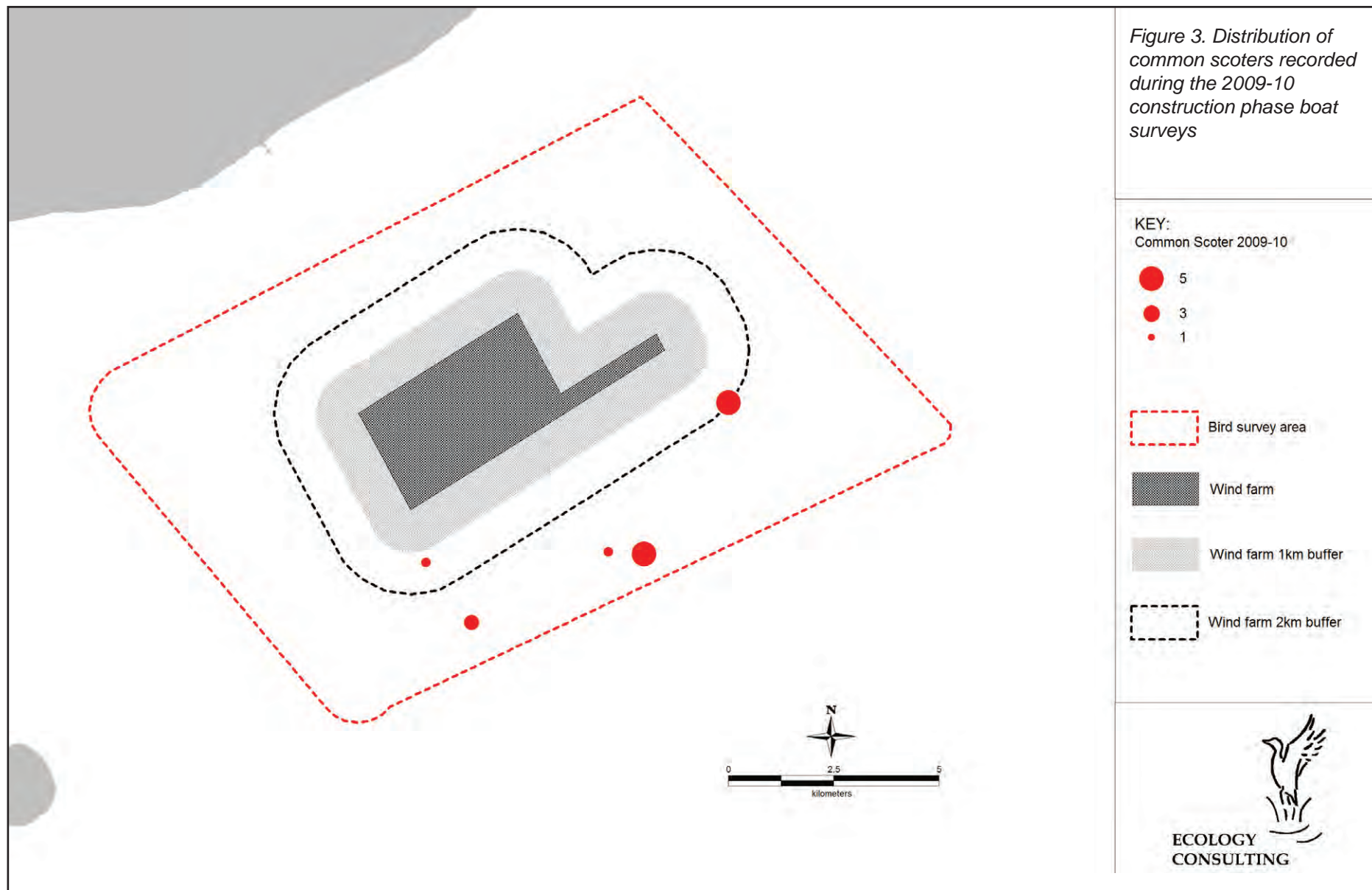
■ Wind farm

■ Wind farm 1km buffer

--- Wind farm 2km buffer

Figure 2. Distribution of divers recorded during the 2009-10 construction phase boat surveys





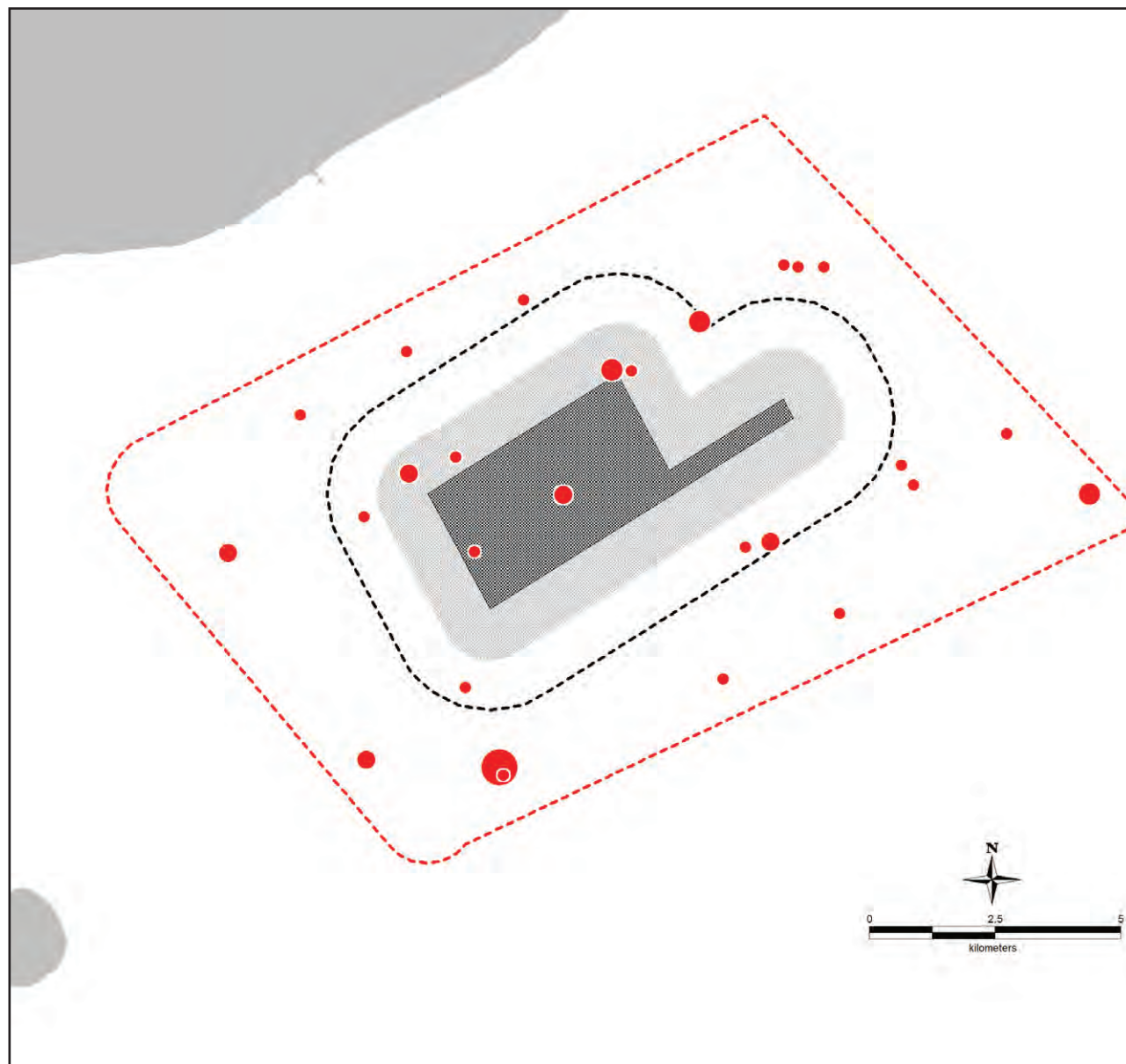


Figure 4. Distribution of black-headed gulls recorded during the 2009-10 construction phase boat surveys

KEY:

Black-headed Gull 2009-10



5



3



1



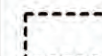
Bird survey area



Wind farm

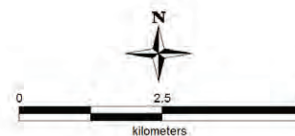
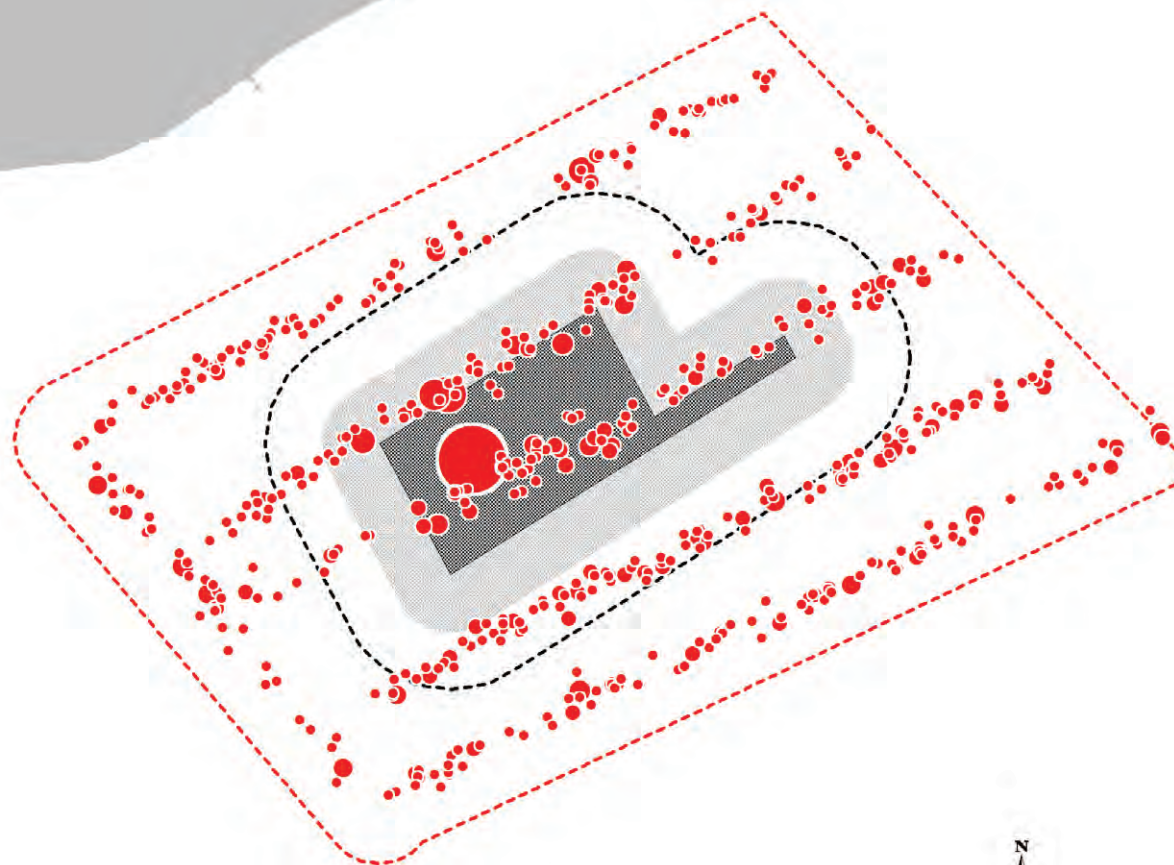


Wind farm 1km buffer



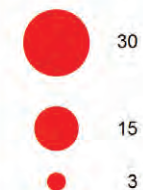
Wind farm 2km buffer

Figure 5. Distribution of common gulls recorded during the 2009-10 construction phase boat surveys




KEY:

Common Gull 2009-10



 Bird survey area

 Wind farm

 Wind farm 1km buffer


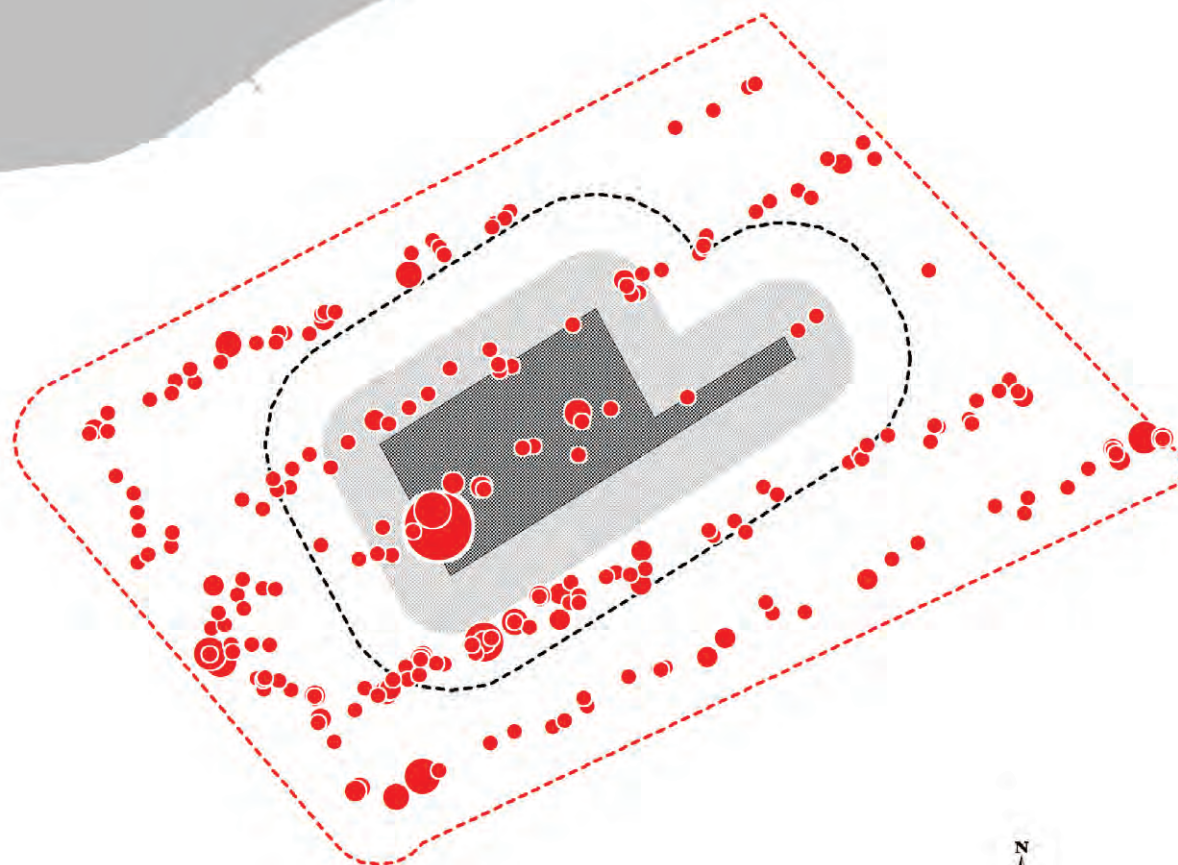
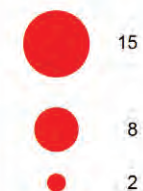
 Wind farm 2km buffer

Figure 6. Distribution of herring gulls recorded during the 2009-10 construction phase boat surveys



KEY:


Herring Gull 2009-10



 Bird survey area

 Wind farm

 Wind farm 1km buffer

 Wind farm 2km buffer

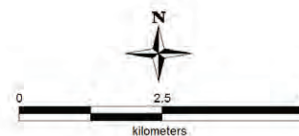



Figure 7. Distribution of lesser black-backed gulls recorded during the 2009-10 construction phase boat surveys


KEY:
Lesser Black-backed Gull 2009-10

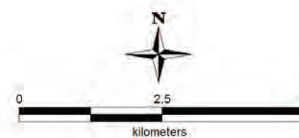


 Bird survey area

 Wind farm

 Wind farm 1km buffer

 Wind farm 2km buffer



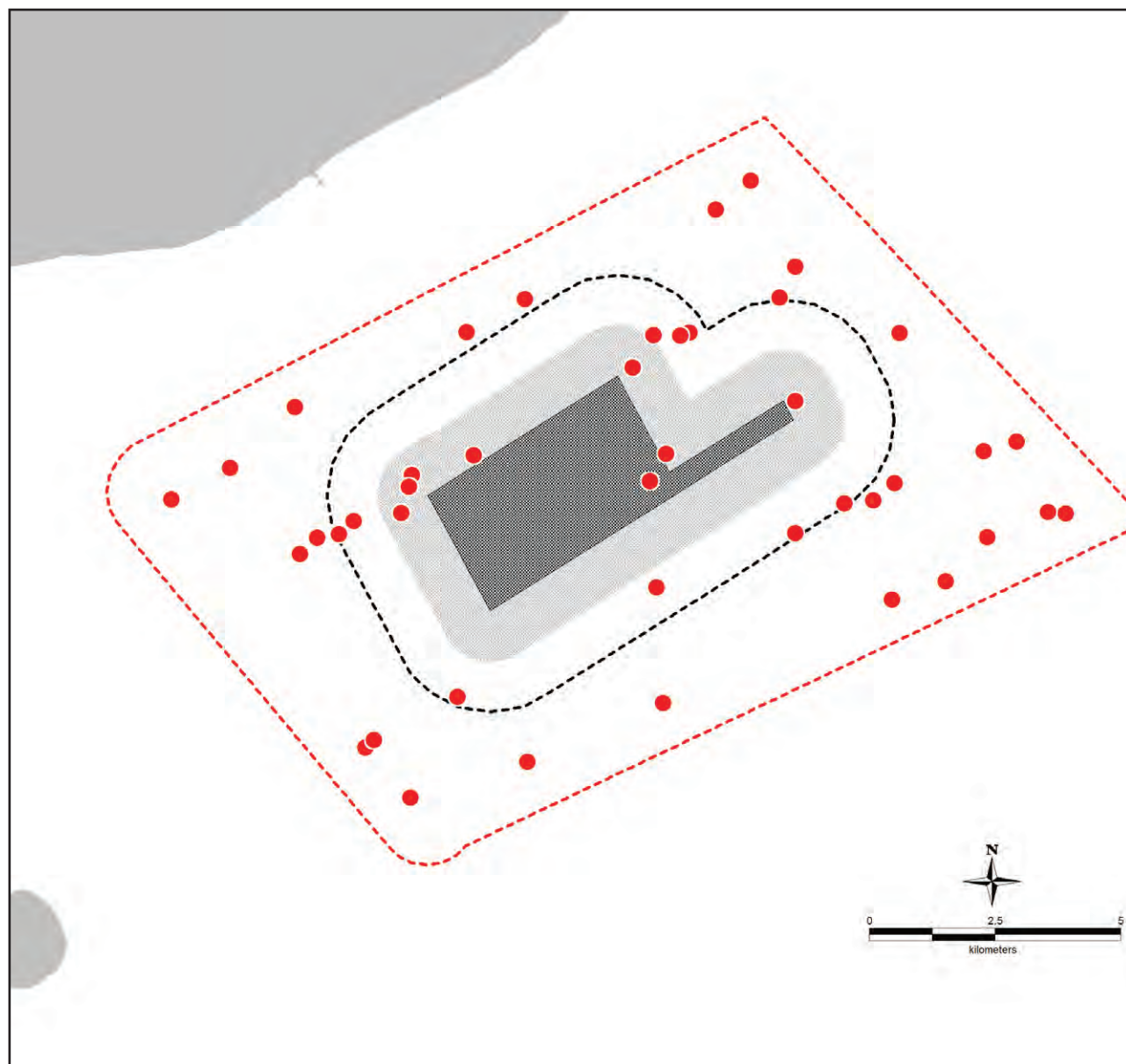


Figure 8. Distribution of great black-backed gulls recorded during the 2009-10 construction phase boat surveys

KEY:

Great Black-backed Gull 2009-10

● Locations (all records were of single birds)

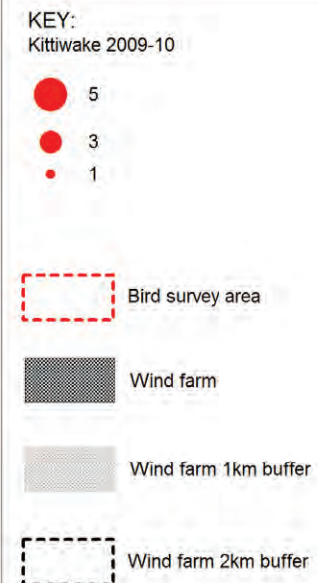
■ Bird survey area

■ Wind farm

■ Wind farm 1km buffer

■ Wind farm 2km buffer

Figure 9. Distribution of kittiwakes recorded during the 2009-10 construction phase boat surveys



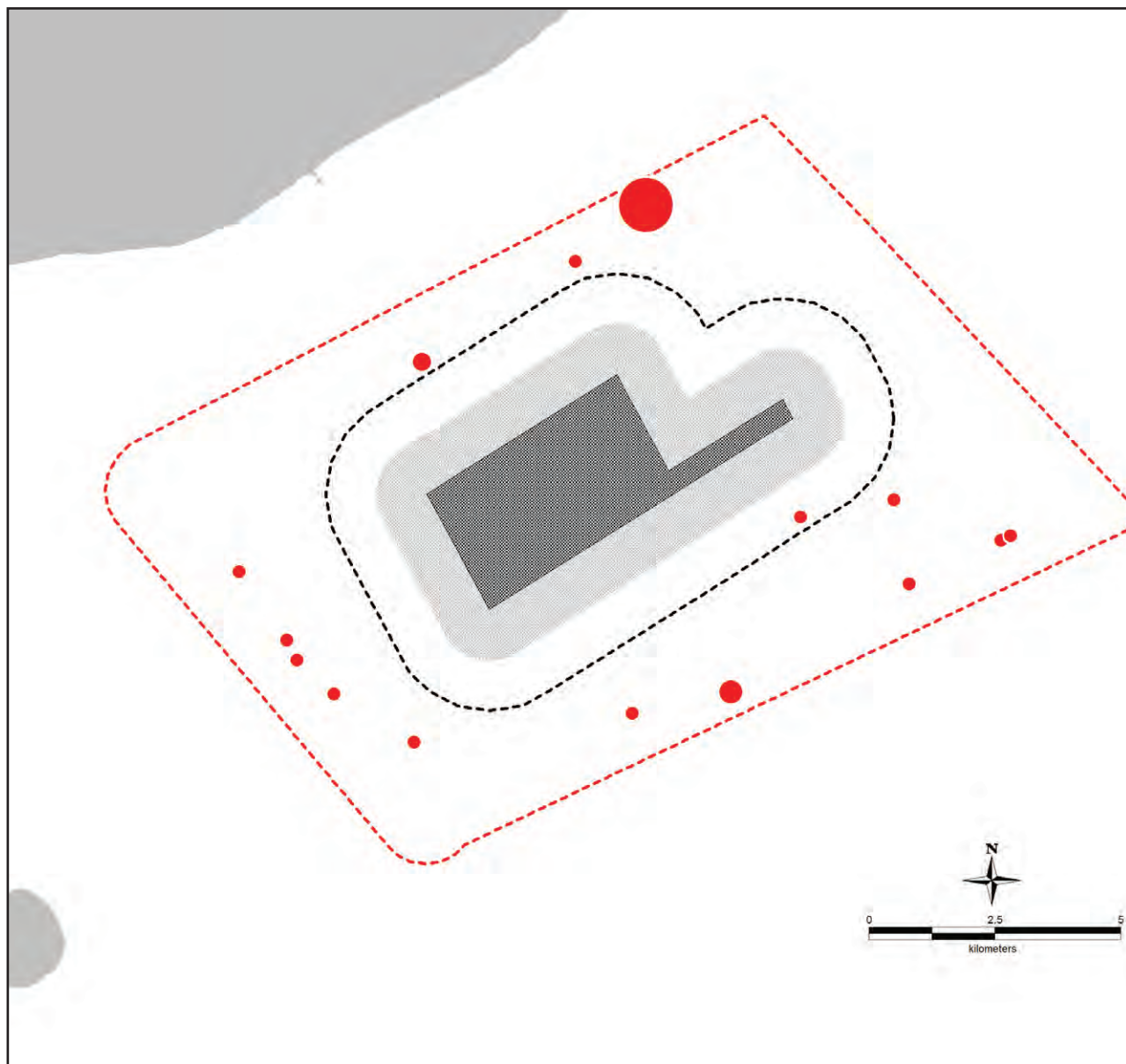
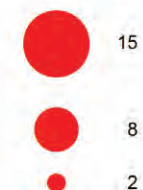


Figure 10. Distribution of auks recorded during the 2009-10 construction phase boat surveys

KEY:

Auks 2009-10



Bird survey area

Wind farm

Wind farm 1km buffer

Wind farm 2km buffer