codling wind park

Environmental Impact Assessment Report

Volume 4

Appendix 10.5 Offshore Ornithology Baseline Characterisation Report

Baseline Characterisation Report

Codling Wind Park Limited: Offshore and intertidal Ornithology

codling wind park

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Codling Wind Park Limited

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1. Introduction

Codling Wind Park Ltd. ('the Applicant') is proposing to develop the Codling Wind Park (CWP) Offshore Wind Farm (OWF) (the Project). The Project would comprise up to 75 turbines, three offshore substation structures, inter-array cables, interconnector cables and offshore export and onshore export cables taking power to an onshore substation. The array site would be located approximately 13 km at its nearest point from the County Wicklow coast, Ireland, and cover an area of approximately 125 km^2 (Figure 1.1) The proposed landfall location of the Project export cable route would be at Poolbeg, South Dublin Bay (Figure 1.3).

Figure 1.1: Project location

The aim of this report is to present and describe the ornithological interests within each of the following areas, their immediate surroundings and the wider region:

- The Project array area (hereafter referred to as the 'array site');
- The Project export cable route offshore corridor area (hereafter referred to as the 'Offshore Export Cable Corridor – OECC'; and
- The Project export cable route intertidal landfall area (hereafter referred to as the 'OECC intertidal landfall').

These findings are used to determine those ornithology receptors within offshore and intertidal areas that characterise the baseline environment and are of relevance to the assessment of potential impacts from the Project within **Chapter 10: Ornithology**.

Those ornithological receptors within the array site and OECC consist primarily of species that are collectively called seabirds. Those ornithological receptors within the OECC intertidal landfall area consist primarily of species that are collectively called wildfowl and waders, however also within this area occur notable populations of breeding and staging migratory seabirds.

Baseline characterisation for the array site relates to contemporary records derived from 24 Digital Aerial Surveys (DAS), undertaken approximately monthly between May 2020 and April 2022 and 15 boat-based European Seabirds At Sea (ESAS) surveys undertaken between October 2018 and August 2020. These baseline characterisation surveys were used to describe the following;

- Bird abundance and density estimates (monthly and for bio-seasons);
- Behaviour of birds (numbers flying and sitting on the water); and
- Flight height distributions of key seabird species (from boat-based ESAS surveys).

Baseline characterisation data from these contemporary surveys are contextualised by reference to additional information from relevant desk-based studies of the array site and OECC and their immediate surrounding areas and wider region.

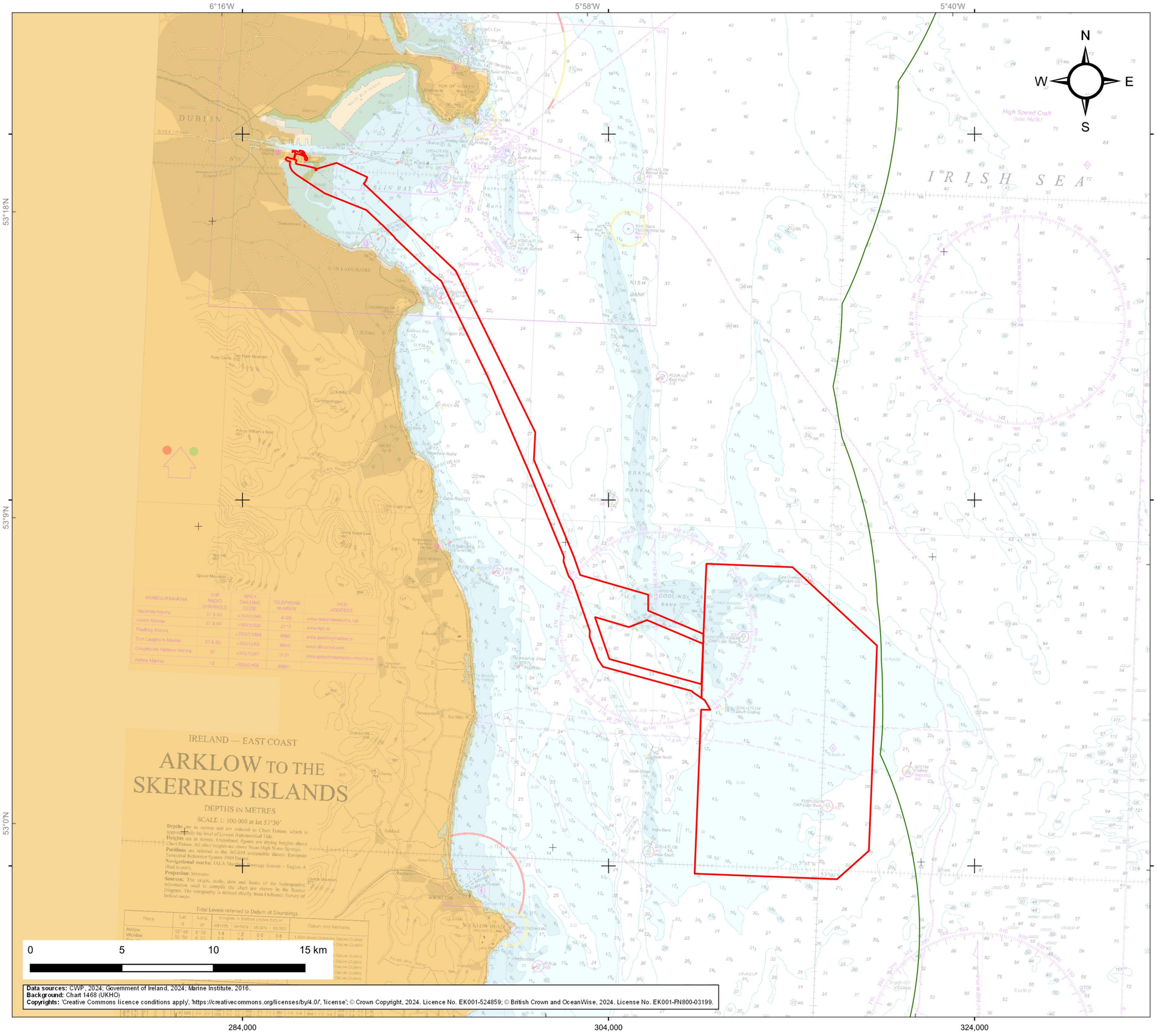
Baseline characterisation for the OECC intertidal landfall area relates to contemporary records from 81 intertidal diurnal landfall surveys undertaken approximately twice per month between October 2019 and March 2023 (excluding April and first half of May 2020, on account of restrictions related to the Covid 19 pandemic). These surveys were used to determine the following:

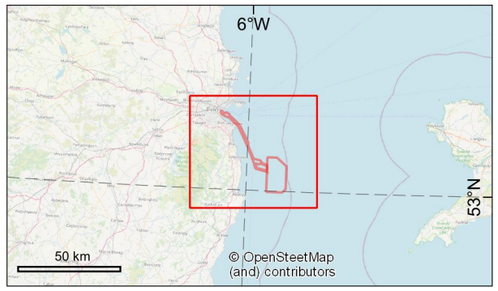
- Species abundances and distributions during daylight periods;
- Behaviour of birds (foraging or roosting/loafing) during daylight periods; and
- Background levels of anthropogenic and natural disturbance during daylight periods.

Additionally, 4 intertidal crepuscular dusk surveys were undertaken each year during the period between mid-July and mid-September in 2020 and 2021. These surveys specifically inform about:

- Post breeding tern roosting abundances and distributions.

Baseline characterisation from these contemporary surveys are contextualised by reference to additional information from relevant desk-based studies of the OECC intertidal landfall area and its immediate surrounding areas and wider region.





Legend

- Planning Application Boundary (PAB)
- 12 nautical mile limit

Data sources: CWP, 2024; Government of Ireland, 2024; Marine Institute, 2016.
Background: Chart 1468 (UKHO)

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 1.1 Project location

CWP doc. number: CWP-NPC-ENG-08-01-MAP-0672

Internal descriptive code: WE - PAB - SEA.LIMs - (EIAR.Vol.04.Ch.10.Ap.05.FIG. 01.01)

Size: A3

Scale: 1:200,000

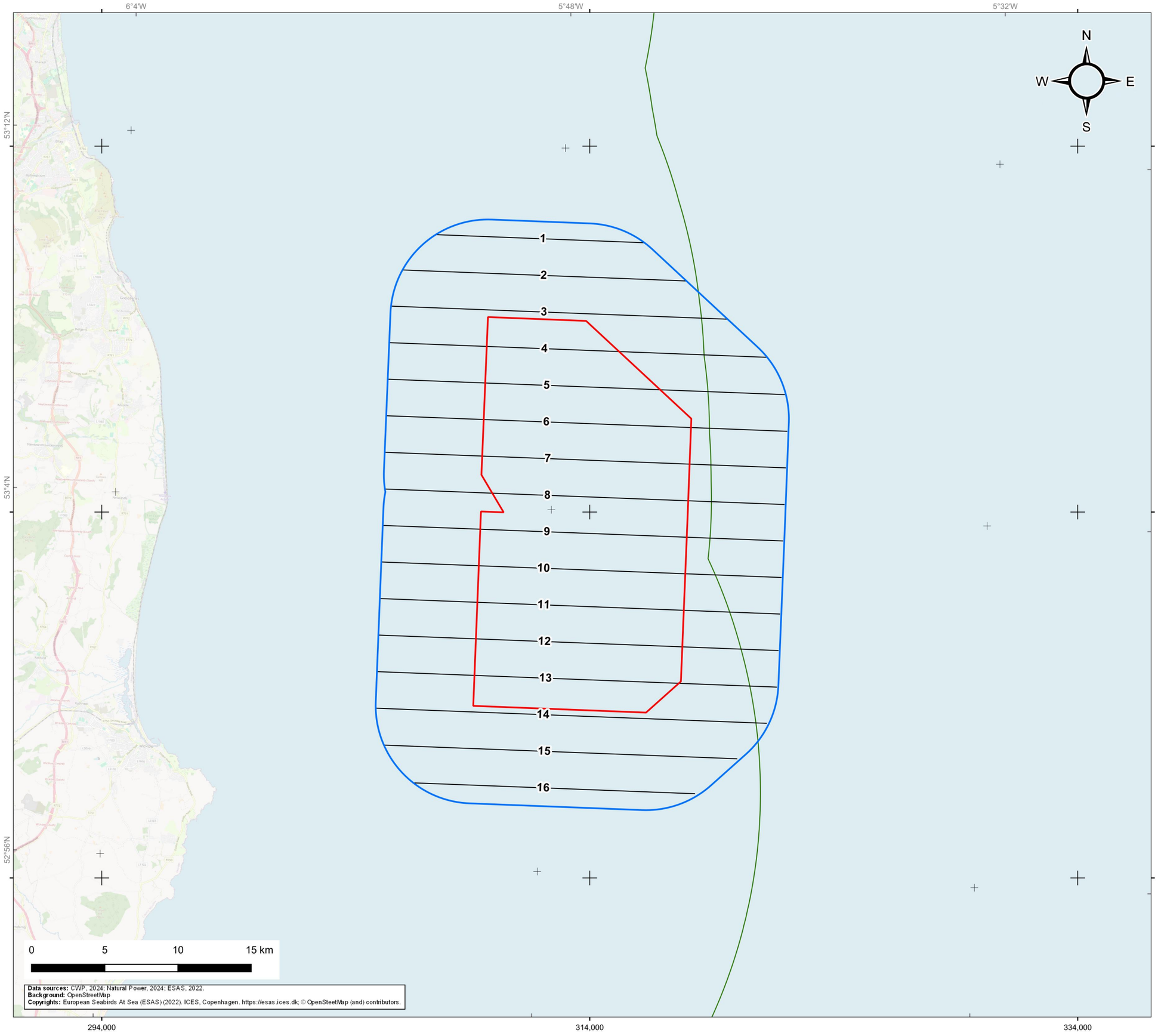
CRS: EPSG 25830

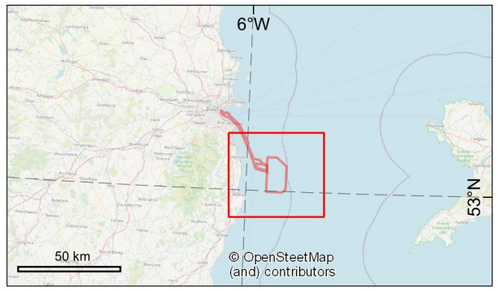
Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

1.1. Study area

Contemporary DAS and boat-based ESAS surveys for offshore ornithological receptors were undertaken within the array site and surrounding 4 km buffer (Figure 1.2). Both survey methodologies utilised the same 16 east-west orientated transects for data collection.

Contemporary surveys for intertidal ornithological receptors were undertaken within the OECC intertidal landfall area and a wider area within South Dublin Bay between the Great South Wall of Dublin Port and the north-west wall of Dun Laoghaire Harbour (Figure 1.3).





Legend

- Array site
- Survey area
  (4 km buffer of development area)
- Survey transects (1.5 km spacing)
- 12 nautical mile limit

Data sources: CWP, 2024; Natural Power, 2024; ESAS, 2022.
Background: OpenStreetMap
Copyrights: European Seabirds At Sea (ESAS) (2022). ICES, Copenhagen. https://esas.ices.dk; © OpenSteetMap (and) contributors.

codling wind park

Project: Codling Wind Park

Contractor: www.naturalpower.com natural power

Figure 1.2
Area covered and transects used during contemporary digital aerial and boat-based European Seabirds At Sea (ESAS) surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-0673

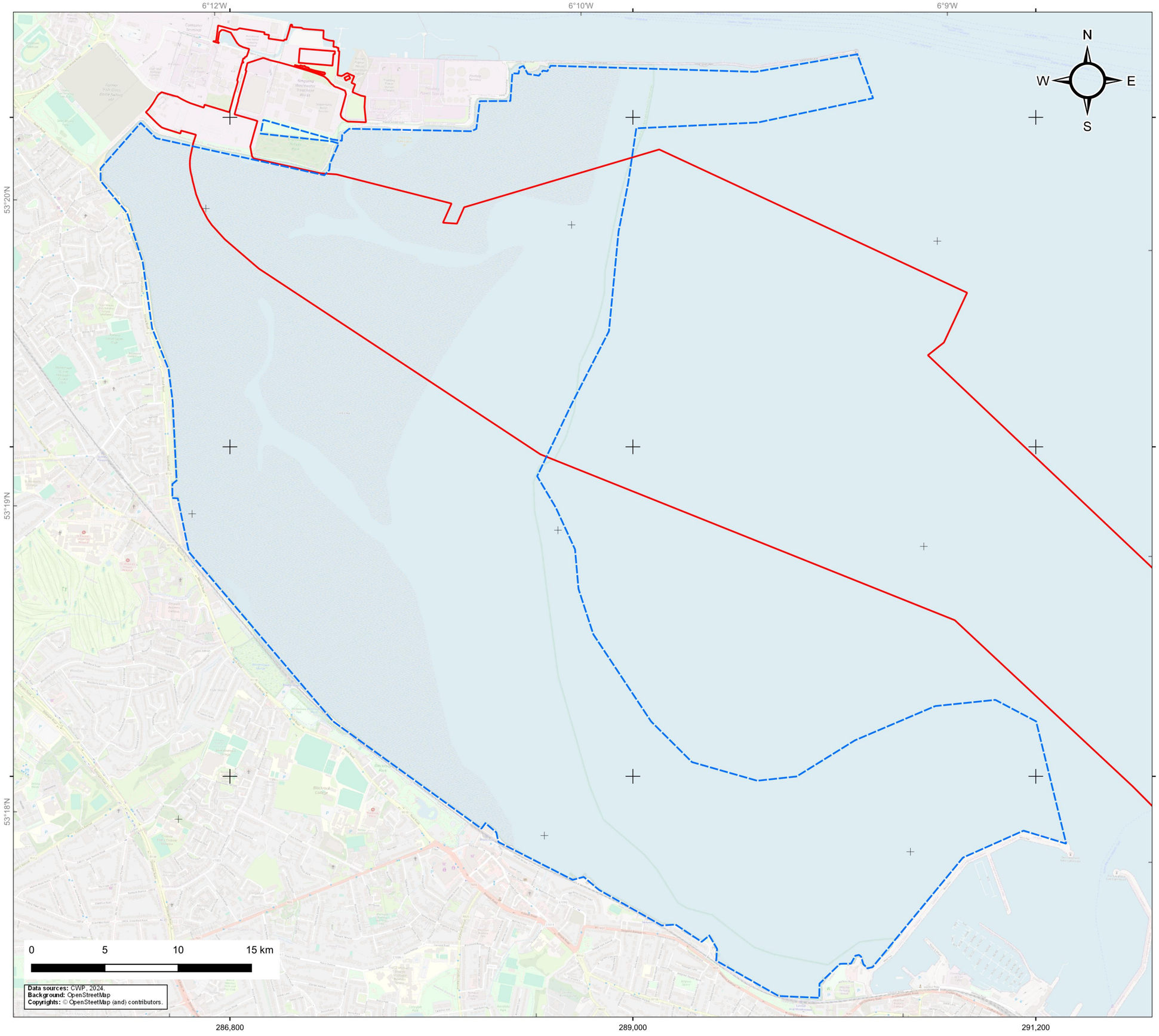
Internal descriptive code: WF - WF.RLB..BUFF.4km..S.TRANSECTS - SEA.LIMs - (EIAR.Vol.04.Ch.10.Ap.05.FIG.01.02)

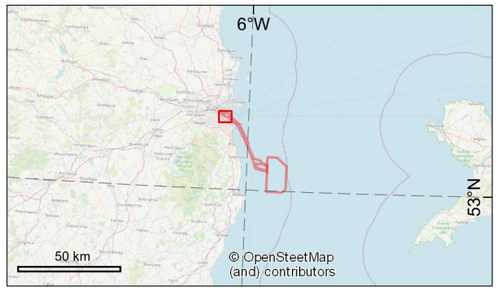
Size: A3

Scale: 1:150,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP





Legend

- Planning Application Boundary (PAB)
- Intertidal landfall survey area

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 1.3
Area covered during contemporary baseline intertidal landfall waterbird surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-0674

Internal descriptive code: PB..DLH - PAB - S.BIRD.INTERTIDAL - (EIAR.Vol.04. Ch.10.Ap.05.FIG.01.03)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

2. Offshore ornithology

This section describes the data sources and approach to baseline characterisation of offshore ornithological receptors.

2.1. Summary of data sources

Summary information relating to contemporary site-specific surveys to characterise use of the array site by offshore ornithological receptors is provided in Table 2.1, along with equivalent information for historic site-specific surveys relating to the array site and other appropriate contextual literature and data sources identified.

Table 2.1 Data sources for offshore ornithology baseline characterisation for the Project

Source	Date	Summary	Coverage of study area
Contemporary site-specific baseline characterisation surveys			
DAS data	2020 - 2022	Twenty-four digital aerial surveys conducted, approximately monthly, by HiDef Ltd. between May 2020 and April 2022.	Array site plus a 4 km buffer. Same survey transect lines as ESAS surveys undertaken 2018-2020.
ESAS survey data	2018 - 2020	Fifteen boat-based surveys conducted by Natural Power between October 2018 and August 2020.	Array site plus a 4 km buffer. Same survey transect lines as DAS undertaken 2020-2022.
Historic site-specific baseline characterisation surveys			
ESAS survey data	2013 - 2014	Twelve boat-based surveys conducted by Natural Power between April 2013 and April 2014.	Array site plus a 4 km buffer and additionally northern and southern reference areas. Transects within the array site and 4 km buffer are the same as those used for contemporary DAS and ESAS surveys.
Additional data sources			
Jessopp *et al.* (2018)	2016 - 2017	Project carried out as part of the ObSERVE programme, comprising aerial surveys of 55 transects within the western Irish Sea carried out in summer and autumn 2016 and winter 2016/2017.	Survey area covered by ObSERVE encompassed western Irish Sea at a regional scale and was inclusive of array site plus 4 km buffer and OECC. No finer resolution available.
Camphuysen *et al.*, 2004	1983, 1991, 1993 and 1995	Observations collected through aerial visual and boat-based surveys recorded in the ESAS database.	Raw counts of records within array site plus 4 km buffer and OECC.

2.2. Historic site-specific baseline characterisation surveys

Twelve boat-based ESAS surveys were undertaken between April 2013 and April 2014. These covered an area which included the array site, a 4 km buffer and additional reference areas to the north and south (Figure 2.1).

provides a summary of the total number of each species recorded in each area during all surveys within this period and a break-down of records of each species in each area per survey is provided in Table 2.22.

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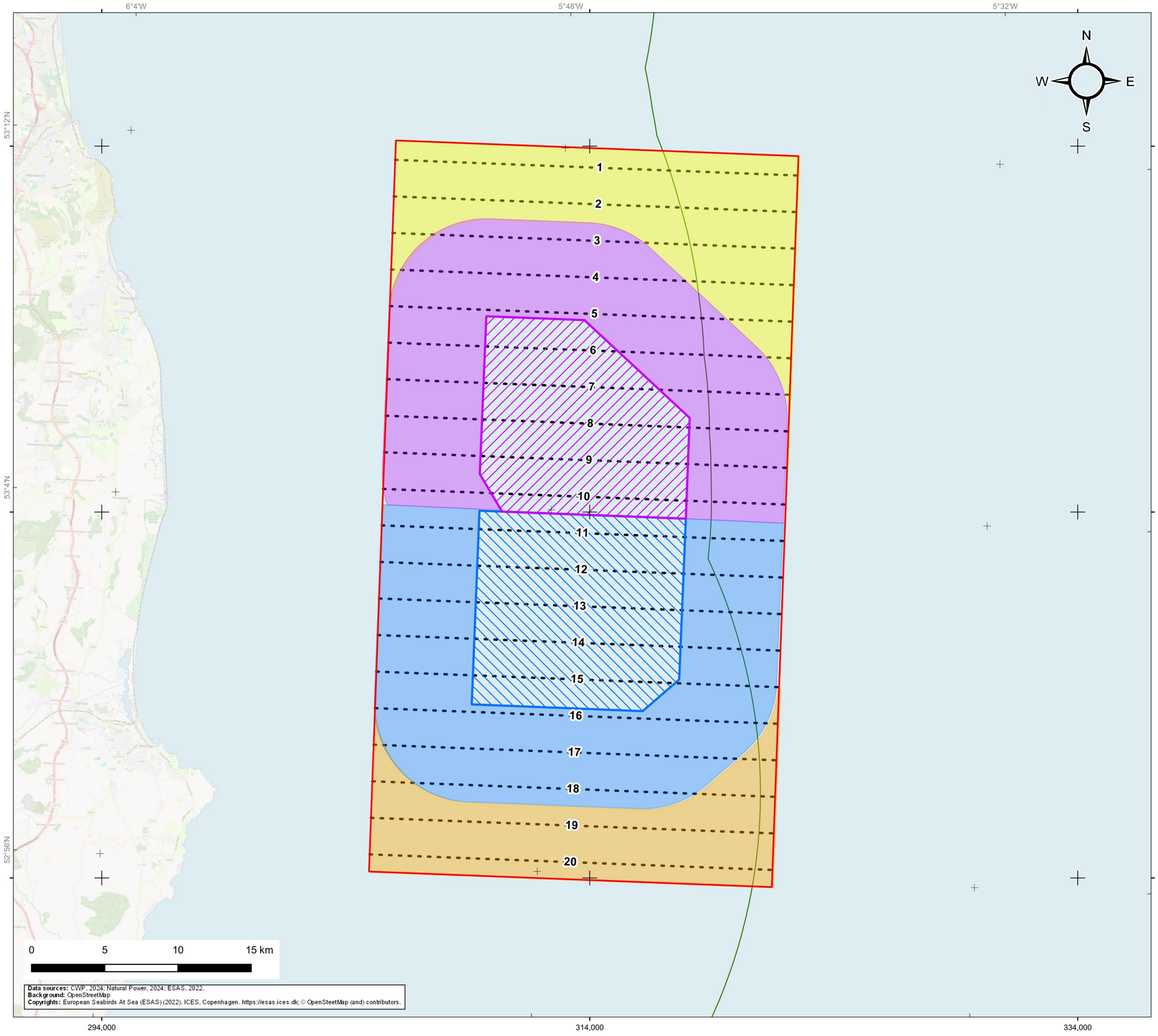
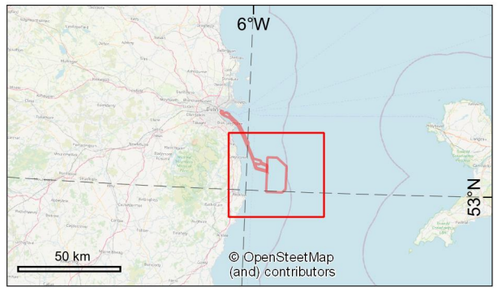




Legend

- Codling Wind Park (CWP)
- 4 km buffer of CWP
- European Seabirds At Sea (ESAS) survey reference area – north
- Codling Wind Park (CWP) extension
- 4 km buffer of CWP extension
- European Seabirds At Sea (ESAS) survey reference area – south
- Survey transects (1.5 km spacing)
- 12 nautical mile limit

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 2.1
Area covered by boat-based European Seabirds at Sea (ESAS) surveys undertaken between April 2013 and April 2014

CWP doc. number: CWP-NPC-ENG-08-01-MAP-0675

Internal descriptive code:	*Size:*	*CRS:*
WF - WF.RLB.N..WF.RLB.S..BUFF.4km..S.TRANSECTS - SEA.LiMs..S.BIRD - (EIAR.Vol.04.Ch.10.Ap.05.FIG.02.01)	A3	EPSG 25830
	Scale: 1:150,000	

Rev.	*Updates*	*Date*	*By*	*Chk'd*	*App'd*
A	Final version	2024/08/06	AC	FM/EA	CP

Table 2.2: Summed totals of each species recorded during boat-based ESAS surveys undertaken between April 2013 and April 2014

Species / Species group	array site	4 km buffer area	Northern and southern reference areas
Arctic or common tern	0	28	17
Arctic skua	4	2	3
Arctic tern	9	22	35
Arctic, common or roseate tern	0	20	40
Black guillemot	28	37	1
Black-headed gull	6	6	7
Common gull	12	35	10
Common scoter	2	2	1
Common tern	33	30	17
Cormorant	6	10	0
Cormorant or shag	1	0	0
Fulmar	15	38	21
Gannet	50	95	49
Great black-backed gull	24	107	14
Great northern diver	2	2	1
Great skua	0	0	3
Guillemot	1362	3221	2951
Guillemot or razorbill	34	246	308
Herring gull	17	100	18
Herring or lesser black-backed gull	3	2	0
Kittiwake	757	1392	499
Lesser black-backed gull	4	19	6
Little gull	21	31	5
Manx shearwater	548	1986	1005
Puffin	4	16	13
Razorbill	621	2298	1284
Red-throated diver	10	30	1
Roseate tern	0	15	5
Sabine's gull	0	1	0
Sandwich tern	0	2	0
Shag	50	115	7
Storm petrel	4	22	3
Unidentified gull species	1	0	0
Unidentified large gull species	0	8	0

Source: Natural Power

2.3. Existing data sources

Offshore ornithological data have been collected for multiple purposes within the western Irish Sea that provide regional and national generic and species-specific information on the distribution, abundance, biological seasons, behaviour and characteristics of birds in the offshore environment. These data sources were considered to characterise the wider region and for the purpose of impact assessments.

2.3.1. ObSERVE data

Ornithological data obtained during the ObSERVE survey programme (Jessopp *et al.* 2018) were collected via a suite of low-level aerial transect surveys carried out during summer, autumn and winter 2016. The survey area covered the entire western Irish Sea (from Dundalk in the north, to south of Wexford Harbour in the south), and was inclusive of the array site and OECC.

A total of fifty-five east-west orientated survey transects were spaced at 2 nm (3.7 km) apart and observers recorded all seabirds within a 200 m fixed strip-width from either side of the aircraft. Full details on the survey methodology are available in Jessopp *et al.* 2018.

Table 2.3 gives a summary of the species recorded in the full survey area during summer, autumn and winter 2016, while Table 2.4 summarises estimated total abundances for each season within the western Irish Sea area covered. These results provide regional information on species present within the western Irish Sea and are considered indicative of those species likely to be present within the vicinity of the array site and OECC during the breeding and non-breeding seasons.

Some individuals were not identified to species level and were instead assigned to species categories (e.g. ‘guillemot/razorbill’ or ‘small gull sp.’).

Table 2.3: Summed totals of species recorded during low level aerial surveys of the western Irish Sea during summer and autumn 2016 and winter 2016/17 (Jessopp *et al.* 2018)

Species	Summer		Autumn		Winter	
	Sightings	Individuals	Sightings	Individuals	Sightings	Individuals
Auk sp.	20	135	2	31	0	0
Black guillemot	5	6	2	3	0	0
Black-backed gull sp.	55	77	42	88	72	171
Black-headed gull	6	17	12	67	79	214
Common or Arctic tern	299	498	144	737	0	0
Common scoter	0	0	31	855	41	328
Cormorant or Shag	53	255	50	182	71	106
Diver sp.	4	4	115	879	170	252
Fulmar	41	59	571	1337	75	137
Gannet	194	331	445	828	27	33
Great black-backed gull	0	0	74	95	34	48
Great skua	0	0	3	4	1	1
Guillemot or Razorbill	100	3849	3496	16444	2245	4470
Herring or Common gull	207	568	145	890	412	1268
Kittiwake	309	499	326	1355	310	567
Large gull sp.	9	43	41	724	62	579
Lesser black-backed gull	0	0	25	31	8	8
Little gull	0	0	0	0	37	80
Little tern	52	72	23	65	0	0
Manx shearwater	790	3669	80	1062	2	5
Petrel sp.	1	1	7	9	0	0
Puffin	23	26	1	1	0	0

Species	Summer		Autumn		Winter	
	Sightings	Individuals	Sightings	Individuals	Sightings	Individuals
Roseate tern	66	131	13	34	0	0
Sandwich tern	39	60	21	30	0	0
Scoter sp.	0	0	6	45	4	11
Shearwater sp.	3	7	0	0	2	4
Small gull sp.	38	63	31	763	97	144
Tern sp.	7	8	1	4	0	0
Velvet scoter	0	0	6	9	9	30

Source: ObSERVE

Table 2.4: Estimated total abundances of each species within the western Irish Sea area covered by ObSERVE surveys during summer and autumn 2016 and winter 2016/17 (Jessopp *et al.* 2018)

Species	Total abundance (95% confidence intervals)		
	Summer	Autumn	Winter
Auk sp.	1360 (801-2310)	311 (109-889)	0
Black guillemot	52 (29-93)	60 (23-156)	0
Black-backed gull sp.	895 (680-1177)	1019 (700-1485)	1580 (1135-2200)
Black-headed gull	266 (120-593)	1332 (591-3002)	1804 (1287-2529)
Common or Arctic tern	4514 (3883-5247)	7268 (5178-10202)	0
Common scoter	0	8616 (4200-17677)	3089 (1962-4863)
Cormorant or Shag	2805 (1730-4546)	2796 (1422-5495)	1321 (N/A)
Diver sp.	47 (23-95)	8916 (5049-15745)	2942 (2440-3548)
Fulmar	628 (425-929)	13892 (11314-17057)	1453 (908-2326)
Gannet	3228 (2425-4296)	8059 (6396-10154)	315 (226-438)
Great black-backed gull	N/A	2243 (1081-4650)	498 (361-688)
Great skua	0	40 (19-83)	10 (3-29)
Guillemot or Razorbill	36255 (32869-39990)	159503 (143540-177241)	42296 (37122-48190)
Herring or Common gull	6916 (5303-9019)	35015 (14829-82680)	16110 (11489-22590)
Kittiwake	5255 (4307-6410)	13501 (9659-18871)	5255 (4104-6728)
Large gull sp.	511 (215-1217)	12926 (8111-20599)	6841 (4564-1025)
Lesser black-backed gull	N/A	316 (228-440)	75 (48-118)
Little gull	0	0	1539 (822-2880)
Little tern	652 (470-905)	642 (386-1065)	0
Manx shearwater	30928 (26815-35671)	10566 (5462-20441)	114 (47-278)
Petrel sp.	6 (2-19)	71 (41-121)	0
Puffin	229 (169-309)	6 (2-18)	0
Roseate tern	1260 (724-2190)	347 (198-608)	0
Sandwich tern	642 (450-917)	331 (230-476)	0
Scoter sp.	0	426 (233-780)	110 (46-259)
Shearwater sp.	70 (30-164)	0	40 (16-99)
Small gull sp.	747 (514-1086)	10789 (4625-25163)	1524 (1039-2236)
Tern sp.	61 (37-102)	31 (11-91)	0
Velvet scoter	0	101 (58-177)	265 (109-640)

Source: ObSERVE

2.3.2. ESAS Database

The ESAS database (Camphuysen *et al.*, 2004) consists of observations collected through aerial visual and boat-based surveys between 1979 and 1996. Table 2.5 shows the combined raw count of birds recorded in the ESAS database within the array site plus 4 km buffer. Note that this total number is compiled from numerous different surveys carried out across several years, and in various months. The data shown in the table below were collected in the years 1983, 1991, 1993 and 1995. It is therefore recognised that these data are by no means contemporary, but contextually useful nonetheless in terms of showing the relative abundances of common species.

Table 2.5: Total number of birds of each species recorded by ESAS surveys in the array site plus 4 km buffer

Species	Number of birds (array site)	Number of birds (4 km buffer)	Total number of birds (array site + 4 km buffer)
Arctic tern	0	2	2
Common or Arctic tern	3	0	3
Common tern	0	1	1
Fulmar	0	5	5
Gannet	2	0	2
Guillemot	3	80	83
Guillemot or Razorbill	0	2	2
Kittiwake	4	246	250
Lesser black-backed gull	0	2	2
Manx shearwater	8	51	59
Puffin	0	1	1
Razorbill	0	36	36

Source: ESAS database

2.4. Contemporary site-specific baseline characterisation surveys

2.4.1. Digital Aerial Surveys (DAS)

Twenty-four digital aerial surveys of the array site, plus a 4 km buffer were undertaken approximately monthly between May 2020 and April 2022 inclusive, by HiDef. Analysis of the imagery collected was also undertaken by HiDef. Survey dates, start and finish times and conditions are provided in Table 2.6.

Table 2.6: Dates, times and survey conditions for contemporary DAS of the array site plus 4 km buffer

Survey no.	Survey date	Survey flight times	Survey conditions
1	29/05/2020	06:47 - 08:29	Windspeed: 10kts; Cloud base: 2000ft
2	21/06/2020	06:40 - 08:15	Windspeed: 30kts; Cloud base: 2300ft; Other: Strong crosswind conditions persisted for the whole survey
3	10/07/2020	06:35 - 08:09	Windspeed: 20-25kts; Cloud base: 2000+ft
4	03/08/2020	05:51 - 07:30	Windspeed: 10kts; Cloud base: 2000ft+
5	18/09/2020	08:11 - 09:50	Windspeed: 10-20kts; Cloud base: N/A
6	15/10/2020	09:55 - 11:32	Windspeed: 10-20kts; Cloud base: N/A
7	13/11/2020	10:10 - 11:53	Windspeed: 10-20kts; Cloud base: N/A
8	20/12/2020	10:45 - 12:20	Windspeed: 10-20kts; Cloud base: N/A
9	15/02/2021	12:46 - 14:25	Windspeed: 15kts; Cloud base: N/A
10	06/03/2021	11:07 - 12:42	Windspeed: 0kts; Cloud base: N/A
11	17/03/2021	09:26 - 11:15	Windspeed: 28kts at height; Cloud base: 2000ft+

Survey no.	Survey date	Survey flight times	Survey conditions
12	19/04/2021	08:29 - 10:07	Windspeed: 5kts; Cloud base: N/A
13	06/05/2021	08:07 - 09:53	Windspeed: 15 - 25kts; Cloud base: 1800ft+
14	07/06/2021	12:16 - 15:39	Windspeed: 20kts; Cloud base: 8000+ft
15	23/07/2021	15:09 - 16:49	Windspeed: 15-25kts; Cloud base: 2000+ft
16	02/08/2021	15:13 - 16:49	Windspeed: 5-10kts; Cloud base: 2000+ft
17	11/09/2021	07:29 - 09:12	Windspeed: 5-10kts; Cloud base: 20222+ft
18	23/10/2021	09:11 - 10:51	Windspeed: 10kts; Cloud base: 1800+ft
19	10/11/2021	10:03 - 11:32	Windspeed: 5kts; Cloud base: 1800+ft
20	02/12/2021	12:19 - 13:59	Windspeed: 15kts; Cloud base: 1800+ft
21	13/01/2022	10:18 - 11:49	Windspeed: 5-15kts; Cloud base: 1700ft
22	11/02/2022	09:29 - 10:56	Windspeed: 5-20kts; Cloud base: 2000+ft
23	12/03/2022	08:51 - 10:35	Windspeed: 10kts; Cloud base: N/A
24	12/04/2022	08:44 - 10:16	Windspeed: 5-10kts; Cloud base: N/A

Source: Natural Power

2.4.1.1. **Survey design**

DAS surveys followed the same transects as utilised for the boat-based survey campaign (See Figure 1.2; Section 1.1 Study area). Surveys followed a total of sixteen east-west orientated transects spaced at 1.5 km apart and covered the array site plus a 4 km buffer. Video imagery was captured from aircraft travelling at an average altitude of 1,800 feet and an average speed of 120 kn.

Images were captured at a Ground Sampling Density (GSD) of 2 cm and the total percentage of site coverage was 16.69% (greater than the current industry threshold standard of 12.5%).

2.4.1.2. **Image analysis and species identification**

Raw video data were converted into a format for further analysis using digital data review stations. Survey images were viewed by HiDef contracted reviewers using high resolution viewing screens and an image management software package that allows the reviewer to adjust and control the appearance of the images to allow identification to a higher level.

Images marked as requiring further analysis were passed on to marine ornithologists who identified birds down to species level where possible, and also recorded any other information available (behaviour, flight or swimming direction, sex, age).

Parameters recorded include:

- Date and time of observation;
- Location (latitude and longitude) (and accuracy);
- Real number (proxy for transect number);
- Species group (e.g. tern species, large auk species);
- Confidence in species group identification (possible, probable and definite);
- BTO code;
- Behaviour and direction of travel (e.g., flying NW, sitting, loafing (on land) and if possible, feeding behaviour, fish-carrying behaviour);
- Age class;
- Sex;
- Additional information, including feeding behaviour where visible and association with vessels; and

- Information on the environmental conditions for every minute of footage, recording sea-state, sun glare, water turbidity and visibility.

The presence of other anthropogenic features which might influence the behaviour of birds was also recorded and assessed in the image analysis.

A randomly selected sample of at least 20% of material was identified independently by a separate group of ornithologists and requiring a no more than 10% disagreement with the first identification. In the case of any significant discrepancies (i.e., more than 10%), images were re-reviewed by a third ornithologist, acting as an adjustor.

2.4.1.3. **Apportioning of species identified to higher taxonomic level**

For records that were not identified to species level (e.g., Arctic tern/common tern), ratios of records that were identified to species level (in this example, those identified as either Arctic tern or common tern) were used to adjust density estimates to account for these records. For each grouping, ratios were calculated separately for each year, broadly defined season (breeding: April to August, non-breeding: September to March) and behaviour (in flight and on sea), but not for area. This allowed differences in ratios among seasons and behaviours to be captured. The calculations were carried out hierarchically so that smaller groupings were assigned first and then used to calculate the ratios for the larger groups. For example, observations of Arctic tern/common tern were divided according to the ratio of Arctic tern and common tern records and added to the numbers of Arctic tern and common tern to give adjusted numbers which were then used alongside the observations of roseate terns to calculate the ratios for the Arctic/common/roseate tern species grouping. This methodology assumes that all species within groupings are equally likely to be assigned to an unidentified species group and that the ratio of different species within groupings did not vary within season/behaviour combinations. The apportionment proportions used to assign records not identified to species level shown in Table A.1, Appendix A, at the end of this document.

2.4.1.4. **Abundance and density estimation**

The abundance and density of each species observed is estimated separately using a design-based strip transect analysis. In strip transect analysis each transect is treated as an independent analysis unit and the assumption is made that transects can be treated as statistically independent random sample from the site. The length of each transect and its breadth (i.e. the fieldview of the camera) multiplied together give the area of the transect, dividing the number of observations on the transect by the transect area gives a point estimate of the density of that species. The density of animals at the site, the standard deviation, 95% confidence intervals and coefficient of variance are then estimated using a non-parametric bootstrap method with replacement (Buckland *et al.*, 2001). The bootstrapping technique uses total length of transect to limit their selection rather than total number of transects.

The density estimate is expressed as the average number of animals per square kilometre surveyed over the whole site, and the abundance estimate is simply the average density multiplied up to the area of the whole site. The standard deviation is a measure of the variance of the population estimate, standardised by the number of samples (transects). The upper and lower confidence intervals define the range that the population estimate falls within with 95% certainty.

2.4.1.5. **Correction for availability bias**

For species that make foraging dives underwater such as divers and auks, a proportion of birds present within the study area will not be detectable at the surface during the analysis of the survey images. Density and abundance estimates need to be adjusted to allow for this 'availability bias'.

A fixed species-specific correction factor was applied to the number of each auk and diver species recorded on the sea surface. The correction factors for auks are derived from time spent under water (during the chick-rearing stage) from Thaxter *et al.* (2010) for guillemots and razorbills and from records from data loggers from Spencer (2012) for

puffins. A species-specific correction factor for black guillemots is currently unavailable and therefore this species has not been adjusted. The correction factors used to multiply the relative abundance estimate of guillemots, razorbills and puffins sitting on the sea surface are 1.311, 1.211 and 1.165, respectively.

No species-specific correction factor is currently available for red-throated diver. However, a correction factor of 1.3 is applicable to the great northern diver (Winiarski *et al.*, 2014) and as such the value applied to this species is herein used as a proxy. Abundance and density estimates in Section 5.1 Offshore ornithology are the corrected monthly abundance and density estimates, having been subjected to this process.

2.4.2. Boat-based ESAS surveys

Fifteen boat-based ESAS surveys of the array site plus a 4 km buffer were undertaken by Natural Power, between October 2018 and August 2020, inclusive. Survey dates, start and finish times and conditions are provided in Table 2.7 below.

Table 2.7: Dates, times and survey conditions for contemporary boat-based ESAS surveys of the array site plus 4 km buffer

Survey no.	Survey date	Survey flight times	Survey conditions
1	24/10/2018	07:00-17:45	F3-4, NW, dry
	25/10/2018	08:57-18:02	F3-4, NW, dry
2	03/01/2019	08:30-16:35	F3-4, S, overcast, drizzle at times
	04/01/2019	08:35-14:00	F1-2, S, overcast, dry
3	26/02/2019	08:30-17:09	F2-3, S, overcast, dry
	27/02/2019	07:25-12:45	F2-3, SW, overcast, dry
4	25/03/2019	09:10-17:31	F3, NE, overcast, dry
	26/03/2019	08:15-13:20	F3, NW, dry
5	18/04/2019	09:00-17:01	F2-3, E, dry
	19/04/2019	07:27-16:04	F2-3, E, dry
6	21/05/2019	08:52-17:03	F1-2, SE, dry
	22/05/2019	07:21-13:20	F2, NW, dry
7	27/06/2019	08:33-17:34	F3, NE, dry
	28/06/2019	08:45-17:01	F1, SE, dry
8	01/08/2019	07:49-16:05	F1, ENE, overcast, dry
	02/08/2019	07:20-12:46	F3, NE, dry
9	07/09/2019	10:04-16:39	F3, NW, dry
	08/09/2019	07:30-14:17	F1, SW, overcast, dry
10	18/09/2019	08:54-17:18	F2, SE, dry
	19/09/2019	08:18-13:17	F1, SE, dry
11	21/10/2019	10:37-18:12	F4, NNW, dry
	22/10/2019	09:17-17:02	F2, SSW, overcast, dry
12	02/12/2019	08:10-16:21	F3, NW, overcast, dry
	03/12/2019	08:04-13:00	F3, SSW, dry
13	18/01/2020	08:15-15:07	F2, S, dry
	19/01/2020	08:10-14:30	F1, W, dry
14	15/07/2020	07:40-15:54	F1, SW, overcast, dry
	16/07/2020	06:59-15:31	F1-2, W, overcast, dry
15	17/08/2020	08:23-16:37	F1, Variable, overcast, rain
	18/08/2020	06:38-11:47	F2, SW, overcast, rain

2.4.2.1. **Survey design**

Boat-based surveys utilised the same 16 east-west orientated transects as the DAS, covering the array site, plus a 4 km buffer (see Figure 1.2; Section 1.1 Study area). The full length of the 16 transect lines was followed on each survey, with the start and end point varied between surveys to ensure coverage of different parts of the site at different times of day. Whilst following transects, surveyors recorded all birds encountered onto survey forms.

The following methods were adapted in early 2020 in order to minimise the risk of Covid-19 transmission between survey personnel and crew. Two surveyors were used during each survey: one to act as observer and a second to act as a scribe, each alternating roles between transects so as to prevent fatigue and maintain high levels of visual acuity. Both surveyors maintained separation distances of over two metres wherever practicable. All surveyors were highly experienced in survey recording methods and bird identification, including familiarity with all relevant common and scarce marine species, some knowledge of rarities and a full understanding of plumages and moults.

Key components of the ESAS methods utilised are as follows:

- Bird detection was undertaken by naked eye, but binoculars were used to confirm identity and to occasionally look ahead for easily flushed species, such as divers and sea ducks;
- The survey is based on a line transect method with a strip width of 300 m; surveys monitored each transect on one side of the survey vessel using a 90° viewing angle;
- The 300 m transect is sub-divided into the following five bands into which all birds on the water are allocated: 0-50 m (band A), 50-100 m (B), 100-200 m (C), 200-300 m (D), 300+ m (E). Distances are perpendicular to the survey vessel. Only birds within 300 m (bands A-D) are considered to be 'in transect';
- For each observation, time was recorded to the nearest minute. At a speed of 10 knots, this allows the position of birds to be determined to the nearest 300 m. The time piece used for recording sightings was matched to a hand-held GPS used for recording survey tracks;
- All birds in flight were recorded, but only those 'in snapshot' were considered to be 'in transect'. Snapshots were made every 300 m of distance travelled (estimated based on time and adjusted to take into account the speed of the vessel, where 60 seconds approximately equals 300 m distance covered at a speed of 10 knots). A timed repeat alarm marked the location of snapshots and was adjusted to the speed of the survey vessel. At the time of each snapshot, all birds in flight within a 300 x 300 m 'box' extending 300 m to the front and 300 m perpendicular to the survey vessel were noted as being 'in transect';
- Birds in flight had their heights estimated at the time of first observation. DCCAE guidance (2018) recommends that flight heights should be recorded as accurately as possible rather than as a generic height band, in order to ensure the data can be used for CRM should the turbine dimensions change. However, flight heights of birds over the sea are often difficult to gauge and this can lead to false accuracy if this approach is used. The following approach to height recording was undertaken for 2018 to 2020 boat-based surveys:
  - to the nearest metre for birds below 5 m in height;
  - to the nearest five metres for birds 5 - 50 m in height;
  - to the nearest 10 m for birds 50 - 100 m in height; and
  - to the nearest 20 m for birds more than 100 m in height.

For each observation made during each of the boat-based surveys, the following information was also recorded where possible:

- Species (using BTO two letter codes);
- Number (count);
- Distance from vessel (see above);
- Height of flight (see above);
- Direction (where applicable); and

- Additional information regarding, age, sex, plumage and behaviour wherever possible.

Surveys were only undertaken when suitable conditions were forecast for recording seabirds; i.e. sea state 4 or less, and with good visibility (minimum of 300 m).

A number of environmental variables affecting visibility, and thus survey efficiency (e.g. rain, glare, wind speed and sea state), was also recorded. These abiotic factors were recorded at the start of each transect and when any changes to them are noted, as per MacLean *et al.* (2009).

2.4.2.2. **Abundance and density estimation**

Densities and abundances of seabird species were calculated for the array site (specifically flight densities, to inform DAS data in relation to birds at risk of collision), the array site plus a 2 km buffer (to inform DAS data in relation to birds at risk of displacement for the majority of potentially sensitive species) and the array site plus a 4 km buffer (to inform DAS data in relation to birds at risk of displacement for the most sensitive species – i.e. divers). Densities of seabirds were calculated by multiplying the number of observations of each species during boat-based transect surveys by the average cluster size for that species (calculated based all records recorded in the survey area within transect and calculated separately for in flight and on sea) and dividing by the area surveyed ("Survey effort") within the relevant region. Survey effort was calculated by multiplying the length of the indicative transects falling within the relevant region by a 300 m strip width. Abundances were calculated by multiplying densities by the total area of the corresponding region. Indicative survey effort and the total area of each region is presented in Table 2.8.

Table 2.8: Survey effort per survey for all sites

Area	Survey effort within area (km^2)	Area of polygon (km^2)
array site	23.97	125.12
array site plus 2 km buffer	47.27	229.58
array site plus 4 km buffer	71.66	358.56
4 km buffer only	47.69	233.44

Source: Natural Power

2.4.2.2.1. **Species assignment - accounting for records not identified to species level**

The methodology used to apportion individuals not identified to species level is the same as that used for the apportionment of unidentified individuals during the analysis of DAS imagery (See Section 2.4.1.3 Apportioning of species assigned to higher taxonomic level, above). The apportionment proportions used to assign records not identified to species level are presented in Table A.2, Appendix A.

2.4.2.2.2. **Distance sampling**

Where possible, the density of birds recorded on the sea surface was calculated using 'design-based' Distance analysis. Distance analysis is used to correct the numbers of birds observed for imperfect detectability. Distance sampling operates on the principal that randomly distributed targets (e.g. birds) become more difficult to detect with increasing distance from the observer (Buckland *et al.* 2001). As a result, an increasing proportion of targets that are present will go undetected with increasing distance from the observer. In order to account for this decline in detectability, a detection function is fitted to the data. This function allows the estimation of the proportion of individuals within the surveyed area that remain undetected. These 'undetected' individuals are then incorporated into the density calculation for each species.

At least 60-80 observations are required for Distance analysis to ensure that a reliable detection function can be fitted (Buckland *et al.* 2001). Species with sufficient observations to allow for Distance analysis to be undertaken were guillemot (n = 2,940), razorbill (n = 1,060), kittiwake (n = 446), Manx shearwater (n = 102), herring gull (n =

66), gannet (n = 65) and red-throated diver (n = 64). A half-normal cosine detection function was fitted to guillemot and kittiwake and a hazard rate cosine detection function was for fitted to razorbill and red-throated diver. Distance analysis indicated that there was no drop-off in detectability within 300 m for gannet, herring gull and Manx shearwater. Analysis was undertaken using Distance Version 7.3 (Thomas *et al.* 2010).

Birds recorded in distance band E (> 300 m from the survey vessel) were excluded from the analysis, because the average distance of counts within an unbounded category cannot be calculated. This truncation is routinely utilised for accurate density estimation using the Distance sampling technique.

For each species, a global detection function was fitted, based on all data combined across surveys and regions. The function used to model the decrease in detectability with distance was selected by minimising Akaike's Information Criterion (AIC). This metric assesses the suitability of a model based on a trade-off between the goodness-of-fit of the model to the data and the complexity of the model. Estimates of species density were then calculated per visit for each of the three 'zones' (i.e. the site, the site plus a 2 km buffer and the 4 km buffer of the site), using the global detection function to incorporate undetected individuals. Cluster size was also incorporated at a global level whilst encounter rate was incorporated at the stratum level (i.e. separately for each survey and zone).

For species with fewer than 60 observations, Distance analysis was not undertaken and so density was calculated as for birds in flight (see Section 2.4.2.2). These densities are minimum estimates only since drop-off in detectability with increasing distance from the observer has not been accounted for.

2.4.3. Consideration of biological seasons

Bird behaviour and abundance is recognised to differ across a calendar year dependent upon the species-specific biological seasons (hereafter referred to as 'bio-seasons'). Separate bio-seasons are recognised in this baseline characterisation report in order to describe differing regional seabird populations around the array site and OECC areas across each annual cycle. Species specific bio-season definitions are based on those from Furness (2015) where available (Table 2.9). Furness (2015) also provides UK regional non-breeding population estimates associated with these bio-seasons (Biologically Defined Minimum Population Scale [BDMPS] populations) and these values have been adapted as a basis to define regional populations for the purpose of impact assessment (as described in Section 2.5, below).

Bio-seasons are defined within this baseline technical report as: return migration, migration-free breeding, post-breeding, migration-free winter, breeding and non-breeding. These six bio-seasons can be applied to different periods within the annual cycle for most species, though not all six are applicable for all seabird species, with different combinations used depending on the biology and life history of a species:

- Return migration: when birds are migrating to breeding grounds;
- Migration-free breeding: when birds are attending colonies, nesting and provisioning young;
- Post-breeding migration: when birds are migrating to wintering areas or dispersing from colonies;
- Migration-free winter: when non-breeding birds are over-wintering in an area;
- Breeding: from modal arrival to the colony at the beginning of breeding to modal departure from the colony; and
- Non-breeding: from modal departure from the colony at the end of breeding to modal return to the colony the following year.

Table 2.9: Bio-seasons used as the basis for the detailed species accounts presented in Section 5, based on Furness (2015), unless specified otherwise

Species	Return migration (RM)	Migration-free breeding season (MFBS)	Post-breeding migration (PBM)	Migration-free winter (MFW)	Breeding (B)	Non-breeding (NB)
Common scoter*[1]					May – Aug	Sep – Apr
Kittiwake	Jan – Apr	May – Jul	Aug – Dec			
Little gull*[2]	Mar – Apr	May – Sep	Oct – Dec	Jan – Feb		
Common gull*[3]	Jan – Apr	May – Jul	Aug – Dec			
Black-headed gull*[3]	Jan – Apr	May – Jul	Aug – Dec			
Great black-backed gull					Apr – Aug	Sep – Mar
Herring gull					Apr – Aug	Sep – Mar
Lesser black-backed gull	Mar – Apr	May – Jul	Aug – Oct	Nov – Feb		
Common tern*[4] (adjusted)	Apr – May	Jun	Jul – Sep			
Arctic tern*[4] (adjusted)	Apr – May	Jun	Jul – Sep			
Roseate tern*[4] (adjusted)	Apr - May	Jun	Jul – Sep			
Little tern*[4] (Adjusted)	Apr – May	Jun	Jul – Sep			
Sandwich tern	Mar – May	Jun	Jul – Sep			
Guillemot					Mar – Jul	Aug – Feb
Razorbill	Jan – Mar	Apr – Jul	Aug - Oct	Nov – Dec		
Puffin*[5] (adjusted)	Mar – Apr	May – Jul	Aug	Sep – Feb		
Black guillemot					Apr - Aug	Sep - Mar
Red-throated diver	Feb – Apr	May – Aug	Sep – Nov	Dec – Jan		
Great northern diver	Mar – May		Sep – Nov	Dec – Feb		
Fulmar	Dec – Mar	Apr – Aug	Sep – Oct	Nov		
Manx shearwater	Mar – May	Jun – Jul	Aug – Oct	Nov – Feb		
Gannet	Dec – Mar	Apr – Aug	Sep – Nov			
Cormorant*[6]					Apr – Aug	Sep – Mar
Shag	Dec – Feb	Mar – Jul	Aug – Oct	Nov		

*Table notes: *1 from Cramp & Simmons (1977); *2 from Robinson (2005); *3Common gull and black-headed gull are not included in Furness (2015) - based on kittiwake; *4 Tern species bioseasons adjusted from Furness (2015) to correspond with whole months and reflect that post-breeding aggregations in the region begin to be used from mid-July onwards; *5 Puffin bioseasons adjusted from Furness (2015) to correspond with whole months; *6 from Royal HaskoningDHV (2019).*

2.5. Regional population estimates

To assess impacts to seabird receptors for impacts within each bio-season and annually it is necessary to define regional populations for each receptor for each relevant bio-season. In the absence of published bio-seasonal regional populations for ornithological seabird species occurring within Irish waters and, specifically the Irish Sea region surrounding the CWP development area, approaches from the UK were adapted to generate regional bio-seasonal populations for impact assessment.

Bio-seasonal regions are considered in two broad groups: Non-breeding season regions, where individuals from all demographic groups are considered not to act as central place foragers, with individuals dispersing widely through geographic regions, and breeding season regions, where breeding adults act as central place foragers within species-specific foraging ranges around nesting locations.

2.5.1. Defining non-breeding season regional populations

Within UK waters the general approach taken to define non-breeding season regional populations for OWF impact assessment is to refer to Biologically Defined Minimum Population Scale (BDMPS) populations referenced for species-specific areas around the UK coast, in Furness (2015). From this paper it was possible to select the most appropriate UK BDMPS region for each receptor (typically the BDMPS region which included coverage of the eastern side of the Irish Sea) and adapt its non-breeding season population(s) to include greater connectivity with seabird breeding populations within and around the Irish (west) side of the Irish Sea, so as to arrive at equivalent non-breeding season regional populations for use by projects on the west side of the Irish Sea.

The process by which UK BDMPS non-breeding regional populations were adapted is as follows:

1. The most appropriate UK BDMPS regional populations from Furness (2015) for each species were selected. These regions, and their estimated population sizes, are shown for each species in Table 2.10.
2. The Irish (ROI) component of Furness (2015), with limited connectivity to Irish breeding populations and based upon less recent Irish seabird breeding population estimates, was removed from each of the selected UK BDMPS regional populations. To remove the Irish (RoI) component of a UK BDMPS region population the total number of immatures and adults in that BDMPS region deriving from Irish source populations were calculated with reference to Tables in Appendix A of Furness (2015). The parameters used to calculate the total numbers of immatures and adults from the relevant BDMPS region for each species are presented in Table 2.11.
   The Irish (RoI) component of the Furness (2015) BDMPS population was calculated as a sum of adult and immature birds where:

   No. of adults = Irish pop (ad) * Proportion in BDMPS (Ad)
   No. of immatures = Irish pop (ad) * Proportion in BDMPS (Imm) * Imm:Ad

   This treatment resulted in the removal of the number of individuals shown in Table 2.12 from each BDMPS bio-seasonal population.
3. An adapted Irish (ROI) BDMPS component was calculated based upon updated Irish (ROI) breeding seabird populations from Seabird Count data (Burnell et al., 2023), the proportions of those breeding birds at Irish east and south coast colonies (Burnell et al., 2023) and immature to adult ratios calculated using species-specific demographic parameters. These parameters are provided in Table 2.13, with separate derivation of immature to adult ratios presented in Table 2.14. Immature to adult ratios were calculated from stable age structure population compositions derived from demographic parameters presented in Horswill and Robinson, 2015. These ratios were used over those presented in Furness, 2015, on account that they are derived from more recently collected demographic data and this data has also been used to calculate average population mortality rates, which have been used in EIA assessment to contextualise impact magnitude assessments.
   The adapted Irish (ROI) component was calculated as:

   Adapted No of adults + immatures =
   [No of breeding adults + (No of breeding adults * proportion of imm)] * East & South coast proportion

   A notable exception to this approach to calculating adapted BDMPS components relates to the estimation of red-throated and great northern diver populations. For diver species, which are not included in Cummins et al., 2019 (as largely or entirely absent as breeding species), estimations of the additional Western Irish Sea population were taken from Jessopp et al., 2018 (Table 2.15). As surveys undertaken in Jessopp et al., 2018 did not cover the Return Migration period of diver species (i.e. spring), it was assumed that abundances during the return migration period were the same as those calculated for the Post Breeding Migration period (i.e. autumn). These surveys were unable to differentiate between diver species, as such it was assumed that all divers recorded were either red-throated or great northern (as a third species, black

throated diver, is scarce in the region). Ratios of red throated to great northern diver for each season were calculated by comparison of bio-seasonal populations of each for appropriate relevant BDMPS regions.

The resultant adapted Irish (ROI) BDMPS components are shown in Table 2.16.

4. Adapted Irish (ROI) BDMPS components were added to the UK BDMPS populations from which the Irish component had been removed. Updated regional BDMPS non-breeding populations including an adapted Irish component are provided in Table 2.17.

For a number of species, which were not included in Furness, 2015, and for which UK BDMPS non-breeding population information is not available alternative approaches were followed to estimate regional non-breeding populations. These are:

- Little gull: Non-breeding season regional populations were considered to be the estimated winter abundance within the western Irish Sea region from Jessopp *et al*., 2018; a total of 1,539 individuals. As the western Irish Sea represents only a fraction of the total Irish Sea area and wider western UK and Irish waters which may be utilised by the species during non-breeding periods, this regional population estimate is considered an underestimate.
- Common gull: Non-breeding season regional populations were taken as 'all Ireland' non-breeding population estimates from Appendix 4 of Stroud *et al*., 2016; a total of 67,500 individuals.
- Black-headed gull: Non-breeding season regional populations were taken as 'all Ireland' non-breeding population estimates from Appendix 4 of Stroud *et al.*, 2016; a total of 100,000 individuals.
- Black guillemot: The regional non-breeding population for this typically relatively sedentary, non-migratory species were assumed to be the same as regional breeding population, where the regional breeding population was taken as the sum of all most recent colony counts from Dublin and Wicklow Counties from the Seabird Count dataset (389 breeding adults – JNCC, 2023), plus an estimated number of immatures associated with this number of adults (654 immature birds, from immature to adult ratio of 1.681 – Table 2.14); a total of 1,043 individuals.

Table 2.10: Non-breeding season BDMPS region selections and bio-seasonal populations

Species	BDMPS region(s)	BDMPS population (breeding adults and immatures)			
		Differentiated non-breeding season			Non-differentiated non-breeding season (not split into distinct periods)
		Return migration (RM)	Post-breeding migration (PBM)	Migration-free winter (MFW)	(NB)
Kittiwake	UK western waters plus Channel	691,526	911,586		
Great black-backed gull	UK South-west & Channel + UK West of Scotland				52,122
Herring gull	UK Western waters				173,299
Lesser black-backed gull	UK Western waters	163,304	163,304	41,159	
Common tern	UK Western waters	64,659	64,659		
Arctic tern	UK Western waters	71,398	71,398		
Roseate tern	West England & Wales	2,100	2,100		
Sandwich tern	UK Western waters	10,761	10,761		
Guillemot	UK Western waters				1,139,220
Razorbill	UK Western waters	606,914	606,914	341,422	
Puffin	UK Western waters	304,557	304,557	304,557	
Red-throated diver	UK western waters plus Channel	4,373	4,373		
	NW England & Wales			1,657	
Great northern diver	NW England & Wales	300	300	300	
Fulmar	UK western waters plus Channel	828,194	828,194	556,367	
Manx shearwater	UK western waters plus Channel	1,580,895	1,580,895		

Species	BDMPS region(s)	BDMPS population (breeding adults and immatures)			
		Differentiated non-breeding season			Non-differentiated non-breeding season (not split into distinct periods)
		Return migration (RM)	Post-breeding migration (PBM)	Migration-free winter (MFW)	(NB)
Gannet	UK Western waters	661,888	545,954		
Cormorant	SW England and Wales				9602

Table 2.11 Parameters used to calculate Irish component of BDMPS population in Furness (2015)

Species	BDMPS region(s)	Irish population (Adults)	Proportion of Irish population occurring within UK BDMPS region (Adults/Immatures)	Immature to adult ratio (Imm:Ad – from Furness, 2015)
Kittiwake	UK western waters plus Channel	40,000	(0.3/0.2)	0.88
Great black-backed gull	UK South-west & Channel + UK West of Scotland	4000	(0.1/0.3)	1.26
Herring gull	UK Western waters	10000	(0.3/0.4)	1.09
Lesser black-backed gull	UK Western waters	7600	PBM & RM: (0.4/0.2), MFW: (0.2/0.05)	0.68
Common tern	UK Western waters	5400	(0.4/0.4)	0.67
Arctic tern	UK Western waters	5000	(0.3/0.3)	0.58
Roseate tern	West England & Wales	1500	(0.95/0.6)	0.75
Sandwich tern	UK Western waters	3600	(0.3/0.3)	0.63
Guillemot	UK Western waters	NA	0	0.74
Razorbill	UK Western waters	34000	(0.1/0.1	0.75
Puffin	UK Western waters	40000	(0.1/0.1)	1.04
Red-throated diver	UK western waters plus Channel	NA	0	0.74
	NW England & Wales	NA	0	0.74

Species	BDMPS region(s)	Irish population (Adults)	Proportion of Irish population occurring within UK BDMPS region (Adults/Immatures)	Immature to adult ratio (Imm:Ad – from Furness, 2015)
Great northern diver	NW England & Wales	NA – No BDMPS pop source table provided in Furness, 2015		1.1
Fulmar	UK western waters plus Channel	NA	0	Fulmar
Manx shearwater	UK western waters plus Channel	NA – UK BDMPS pop only used in assessment		0.84
Gannet	UK Western waters	72000	PBM: (0.2/0.3), RM: (0.3/0.3)	0.81
Cormorant	SW England and Wales	8200	(0/0.02)	1.17
Shag	SW England and Wales	4000	(0/0.03)	1.31

Table 2.12: Irish (RoI) component of BDMPS population (removed from Furness, 2015, BDMPS population)

Species	BDMPS region(s)	Irish component of UK BDMPS population (adults and immatures)			
		RM	PBM	MFW	NB
Kittiwake	UK western waters plus Channel	19,040	19,040		
Great black-backed gull	UK South-west & Channel + UK West of Scotland				3,320
Herring gull	UK Western waters				7,360
Lesser black-backed gull	UK Western waters	4,074	4,074	1,778	
Common tern	UK Western waters	3,607	3,607		
Arctic tern	UK Western waters	2,370	2,370		
Roseate tern	West England & Wales	2,100	2,100		
Sandwich tern	UK Western waters	1,760	1,760		
Guillemot	UK Western waters				0
Razorbill	UK Western waters	5950	5,950	5,950	
Puffin	UK Western waters	8,160	8,160	8,160	
Red-throated diver	UK western waters plus Channel	0	0		
	NW England & Wales			0	

Species	BDMPS region(s)	Irish component of UK BDMPS population (adults and immatures)			
		RM	PBM	MFW	NB
Great northern diver	NW England & Wales	0	0	0	
Fulmar	UK western waters plus Channel	0	0	0	
Manx shearwater	UK western waters plus Channel	0	0		
Gannet	UK Western waters	39,096	31,896		
Cormorant	SW England and Wales				192
Shag	SW England and Wales	157	157	157	

Table 2.13: Parameters used to calculate Irish component of adapted BDMPS population

Species	Irish (RoI) population (adults) (Burnell et al., 2023)	East and South coast ROI population (adults) (Colony totals from Seabird Count (Burnell et al., 2023) for County Louth to Mizen Head in County Cork)	*Proportion of RoI population to be added to BDMPS population (RoI pop / E & S coast pop)*	Immature to adult ratio (Horswill and Robinson, 2015)
Kittiwake	49,446	21,418	0.433	0.898
Great black-backed gull	5,650	1,814	0.321	1.538
Herring gull	19,404	8,926	0.460	1.370
Lesser black-backed gull	14,048	6,540	0.466	0.876
Common tern	9,456	7,612	0.805	0.701
Arctic tern	5,416	2,120	0.391	0.511
Roseate tern	3,748	3,748	1.000	0.701
Sandwich tern	4,928	3,598	0.730	0.538
Guillemot	178,090	100,941	0.567	0.916
Razorbill	32,904	16,785	0.510	0.876
Puffin	28,464	2,188	0.077	0.842
Red-throated diver	Jessopp et al., 2018, data used to determine additional Western Irish Sea populations (see			
Great northern diver				

Species	Irish (RoI) population (adults) (Burnell et al., 2023)	East and South coast ROI population (adults) (Colony totals from Seabird Count (Burnell et al., 2023) for County Louth to Mizen Head in County Cork)	*Proportion of RoI population to be added to BDMPS population (RoI pop / E & S coast pop)*	Immature to adult ratio (Horswill and Robinson, 2015)
	Table 2.15)			
Fulmar	64,262	Fulmar	64,262	Fulmar
Manx shearwater	268,440	Manx shearwater	268,440	Manx shearwater
Gannet	96,064	11,996	0.125	0.761
Cormorant	8,248	3,672	0.445	1.451
Shag	9,496	2,340	0.246	0.792

Table 2.14 Demographic rates (from Horswill and Robinson, 2015) used to calculate stable age population age class proportions, immature to adult ratios and average mortality rates

Species	Parameter	Survival (Age class)										Productivity (chicks per pair)	Immature to adult ratio	Average mortality
		0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	Adult			
Kittiwake	Demographic Rate	0.790	0.854	0.854	0.854						0.854	0.69	0.898	0.156
	Population Age Ratio	0.155	0.123	0.105	0.090						0.527			
Black-headed gull	Demographic Rate	0.825	0.825								0.825	0.625	0.471	0.175
	Population Age Ratio	0.175	0.145								0.680			
Little gull	Demographic Rate	0.800	0.800								0.800	0.625	0.471	0.200
	Population Age Ratio	0.175	0.145								0.680			
Great black-backed gull	Demographic Rate	0.798	0.930	0.930	0.930	0.930					0.930	1.139	1.538	0.095

Species	Parameter	Survival (Age class)										Productivity (chicks per pair)	Immature to adult ratio	Average mortality
		0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	Adult			
	Population Age Ratio	0.188	0.134	0.112	0.094	0.078					0.394			
Common gull	Demographic Rate	0.410	0.710	0.828							0.828	0.543	0.452	0.253
	Population Age Ratio	0.172	0.078	0.061							0.689			
Herring gull	Demographic Rate	0.798	0.834	0.834	0.834	0.834					0.834	0.92	1.37	0.172
	Population Age Ratio	0.163	0.132	0.111	0.094	0.079					0.422			
Lesser black-backed gull	Demographic Rate	0.820	0.885	0.885	0.885	0.885					0.885	0.53	0.876	0.123
	Population Age Ratio	0.125	0.102	0.090	0.080	0.070					0.533			
Sandwich tern	Demographic Rate	0.358	0.741	0.741							0.898	0.702	0.538	0.238
	Population Age Ratio	0.212	0.078	0.060							0.650			
Roseate tern	Demographic Rate	0.664	0.664	0.850							0.883	0.764	0.701	0.191
	Population Age Ratio	0.197	0.130	0.086							0.588			
Common tern	Demographic Rate	0.664	0.664	0.850							0.883	0.764	0.701	0.191
	Population Age Ratio	0.197	0.130	0.086							0.588			
Arctic tern	Demographic Rate	0.664	0.837	0.837	0.837						0.837	0.38	0.511	0.183
	Population Age Ratio	0.114	0.082	0.074	0.068						0.662			
Guillemot	Demographic Rate	0.560	0.792	0.917	0.939	0.939	0.939				0.939	0.672	0.916	0.136
	Population Age Ratio	0.160	0.087	0.067	0.060	0.055	0.050				0.522			
Razorbill	Demographic Rate	0.794	0.794	0.895	0.895	0.895					0.895	0.57	0.876	0.129
	Population Age Ratio	0.135	0.107	0.084	0.075	0.066					0.533			
Black guillemot	Demographic Rate	0.731	0.870	0.870	0.870	0.870					0.870	1.298	1.681	0.158
	Population Age Ratio	0.200	0.139	0.115	0.095	0.078					0.373			

Species	Parameter	Survival (Age class)										Productivity (chicks per pair)	Immature to adult ratio	Average mortality
		0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	Adult			
Puffin	Demographic Rate	0.709	0.709	0.709	0.760	0.805					0.906	0.617	0.842	0.177
	Population Age Ratio	0.156	0.113	0.082	0.060	0.047					0.543			
Red-throated diver	Demographic Rate	0.600	0.620	0.840							0.840	0.571	0.534	0.224
	Population Age Ratio	0.168	0.108	0.072							0.652			
Great northern diver	Demographic Rate	0.770	0.770	0.770	0.870	0.870	0.870				0.870	0.543	0.947	0.161
	Population Age Ratio	0.126	0.101	0.081	0.065	0.059	0.053				0.514			
Fulmar	Demographic Rate	0.861	0.861	0.861	0.861	0.861	0.861	0.861	0.861	0.861	0.936	0.419	1.083	0.103
	Population Age Ratio	0.095	0.083	0.072	0.062	0.054	0.047	0.041	0.035	0.031	0.480			
Manx shearwater	Demographic Rate	0.870	0.870	0.870	0.870	0.870					0.870	0.697	1.132	0.130
	Population Age Ratio	0.141	0.121	0.104	0.089	0.077					0.469			
Gannet	Demographic Rate	0.424	0.829	0.891	0.895	0.919					0.919	0.7	0.761	0.181
	Population Age Ratio	0.183	0.077	0.064	0.057	0.051					0.568			
Cormorant	Demographic Rate	0.540	0.540	0.868							0.868	1.985	1.451	0.297
	Population Age Ratio	0.334	0.171	0.088							0.408			
Shag	Demographic Rate	0.513	0.737								0.858	1.303	0.792	0.262

Table 2.15: Calculating Western Irish Sea diver populations from Jessopp *et al*., 2018

Bio-season	Total estimated Western Irish Sea abundance (all divers)	Proportion (from equivalent Furness, 2015 BDMPS)		Estimated abundance	
		Red-throated diver	Great northern diver	Red-throated diver	Great northern diver
PBM (+RM)	8,916	0.9358	0.0642	8,344	572
MFW	2,942	0.8467	0.1533	2,491	451

Table 2.16: Adapted Irish component of BDMPS population

Species	Adapted Irish component of BDMPS population (Adults and immatures)			
	RM	PBM	MFW	NB
Kittiwake	40,626	40,626		
Great black-backed gull				4,603
Herring gull				21,151
Lesser black-backed gull	12,282	12,282	12,282	
Common tern	12,946	12,946		
Arctic tern	3,199	3,199		
Roseate tern	6,374	6,374		
Sandwich tern	5,535	5,535		
Guillemot				193,443
Razorbill	31,484	31,484	31,484	
Puffin	4,036	4,036	4,036	
Red-throated diver	8,344	8,344	2,491	
Great northern diver	572	572	451	
Fulmar	15,530	15,530	15,530	
Manx shearwater	4,579	4,579		

Species	Adapted Irish component of BDMPS population (Adults and immatures)			
	RM	PBM	MFW	NB
Gannet	20,921	20,921		
Cormorant				8,996
Shag	4,186	4,186	4,186	

Table 2.17: Updated regional populations including adapted Irish components

Species	BDMPS region(s)	Adapted BDMPS population (Adults and immatures)			
		RM	PBM	MFW	NB
Kittiwake	UK western waters plus Channel	713,112	933,172		
Great black-backed gull	UK South-west & Channel + UK West of Scotland				53,405
Herring gull	UK Western waters				187,090
Lesser black-backed gull	UK Western waters	171,513	171,513	51,663	
Common tern	UK Western waters	73,998	73,998		
Arctic tern	UK Western waters	72,227	72,227		
Roseate tern	West England & Wales	6,374	6,374		
Sandwich tern	UK Western waters	14,535	14,535		
Guillemot	UK Western waters				1,332,663
Razorbill	UK Western waters	632,448	632,448	366,956	
Puffin	UK Western waters	300,433	300,433	300,433	
Red-throated diver	UK western waters plus Channel	12,717	12,717		
	NW England & Wales			4,148	
Great northern diver	NW England & Wales	872	872	751	
Fulmar	UK western waters plus Channel	836,419	836,419	564,592	

Species	BDMPS region(s)	Adapted BDMPS population (Adults and immatures)			
		RM	PBM	MFW	NB
Manx shearwater	UK western waters plus Channel	1,585,474	1,585,474		
Gannet	UK Western waters	643,713	534,979		
Cormorant	SW England and Wales				18,406
Shag	SW England and Wales	17,104	17,104	17,104	

2.5.2. Defining breeding season regional populations

The general approach followed to determine regional reference populations for seabird species in the breeding season has been to firstly determine the number of breeding adults within mean-maximum foraging range plus one standard deviation (Woodward *et al.,* 2019: Table 2.18) of the array site using data from the Seabird Monitoring Programme (SMP) online database (JNCC, 2023); or Seabird Count 4 data (Burnell *et al.,* 2023), where these sources do not align. For each species, a list of breeding colonies within foraging range of the array site is provided in Appendix B, with lists referenced in Table 2.18. For breeding herring gull and lesser black-backed gull regional populations, in the absence of robust population estimates for urban nesting birds within the SMP database, Irish urban gull breeding population estimates from the NPWS 2021 National Urban Gull Survey (Keogh and Lauder, 2021) were included within regional breeding season population estimates.

Table 2.18: Mean-maximum foraging range + 1 Standard Deviation (SD) for seabird species (from Woodward *et al*., 2019) and resultant estimates of numbers of breeding adults withing foraging range

Species	Mean-max foraging range (km)	SD (km)	Mean-max foraging range + 1 SD (km)	Summary of colonies included in regional breeding population	Number of breeding adults within foraging range
Kittiwake	156.1	144.5	300.6	See Table B-1	67,280
Black-headed gull	18.5	-	18.5	No colonies in range	
Little gull	NA – Not a breeding species in Ireland or UK – Any individuals observed during MFBS (May-Sep) considered non-breeders.				
Common gull	50	-	50	No colonies in range	
Great black-backed gull	73 (Max)	NA	73	See Table B-2	982
Herring gull	58.8	26.8	85.6	See Table B-3	9,102
Lesser black-backed gull	127	109	236	See Table B-4	34,945
Sandwich tern	34.3	23.2	57.5	No colonies in range	
Roseate tern	12.6	10.6	23.2	No colonies in range	
Common tern	18.0	8.9	26.9	See Table B-5	1,018
Arctic tern	25.7	14.8	40.5	See Table B-6	22
Guillemot	73.2	80.5	153.7	See Table B-7	175,072
Razorbill	88.7	75.9	164.6	See Table B-8	23,634
Black guillemot	4.8	4.3	9.1	No colonies in range	
Puffin	137.1	128.3	265.4	See Table B-9	54,480
Red-throated diver	9	-	9	No breeding in region	
Great northern diver	NA – Not a breeding species in Ireland or UK – Absent during MFBS (Jun-Aug)				

Species	Mean-max foraging range (km)	SD (km)	Mean-max foraging range + 1 SD (km)	Summary of colonies included in regional breeding population	Number of breeding adults within foraging range
Fulmar	542.3	657.9	1200.2	NA – All breeding Ireland total (Burnell *et al*., 2023)	69,394
Manx shearwater	1,346.8	1,018.7	2365.5	See Table B-10	1,283,319
Gannet	315.2	194.2	509.4	See Table B-11	238,718
Cormorant	25.6	8.3	33.9	See Table B-12	124
Shag	13.2	10.5	23.7	See Table B-13	128

During the breeding season, in addition to birds associated with breeding colonies, there will also be immature (non-breeding) birds present within the region. To incorporate immature birds into regional breeding season population estimates, two methods have been used:

Method 1: Carry over of immature proportion from previous bio-season. If it assumed that immature birds may spend the summer in their wintering areas, then the regional breeding season population is calculated as the number of breeding adults within foraging range plus the number of immature individuals present in the regional population of the previous bio-season. Regional breeding season populations estimated in this way are shown in Table 2.19.

Table 2.19: Regional breeding season population estimates using Method 1

Species	Adults within foraging range	Immatures from previous bio-season	Total
Kittiwake	67,280	337,302	404,582
Black-headed gull	0	32,000	32,000
Little gull	NA – absent during breeding period		
Common gull	0	21,012	21,012
Great black-backed gull	982	32,364	33,346
Herring gull	9,102	108,138	117,240
Lesser black-backed gull	34,945	80,096	115,041
Sandwich tern	0	5,087	5,087
Roseate tern	0	2,626	2,626
Common tern	1,018	30,487	31,505
Arctic tern	22	24,413	24,435
Guillemot	175,072	637,013	812,085
Razorbill	23,634	295,353	318,987

Method 2: Number of immatures derived from number of breeding adults. If it is assumed that the number of immature birds within a regional breeding population is associated with the number of adults breeding within that region, then the regional breeding season population is calculated as:

The number of breeding adults within foraging range plus the number of immatures associated with that number of adults within a stable population structure. (i.e. Regional population = Breeding adults + (Breeding adults * Immature to adult ratio [Table 2.14, above]))

Regional breeding season populations estimated in this way are shown in Table 2.20.

Table 2.20: Regional breeding season population estimates using Method 2

Species	Adults within foraging range	Number of immatures estimated from number of adults and stable age structure imm:ad ratio	Total
Kittiwake	67,280	60,386	127,666
Black-headed gull	NA - no breeding colonies within foraging range		
Little gull	NA – absent during breeding period		
Common gull	NA - no breeding colonies within foraging range		
Great black-backed gull	982	1,510	2,492
Herring gull	9,102	12,467	21,569
Lesser black-backed gull	34,945	30,618	65,563
Sandwich tern	NA - no breeding colonies within foraging range		
Roseate tern	NA - no breeding colonies within foraging range		
Common tern	1,018	713	1,731
Arctic tern	22	11	33
Guillemot	175,072	160,315	335,387
Razorbill	23,634	20,707	44,341
Black guillemot	194	326	520
Puffin	51,609	43,435	95,044
Red-throated diver	NA - no breeding colonies within foraging range		
Great northern diver	NA - absent during breeding period		
Fulmar	69,394	75,177	144,571
Manx shearwater	1,283,319	1,452,969	2,736,288
Gannet	238,718	181,560	420,278
Cormorant	124	180	304
Shag	128	101	229

2.5.3. Regional population estimates used in impact assessment

Table 2.21 presents the non-breeding and breeding season regional populations used for impact assessment for each species as determined following the processes outlined in sections 2.5.1 and 2.5.2.

Table 2.21: Species specific bio-seasonal population estimates used for impact assessment

Species	Estimated population within region in each bio-season (Adults + immatures)							
	RM	MFB		PBM	MFW	B		NB
		Method 1	Method 2			Method 1	Method 2	
Kittiwake	713,112	404582	127666	933,172				
Little gull	1,539			1,539	1,539			
Black-headed gull	100,000	32,000		100,000				
Great black-backed gull						33,346	2,492	53,405
Common gull	67,500	21,012		67,500				
Herring gull						117,240	21,569	187,090
Lesser black-backed gull	171,513	115,041	65,563	171,513	51,663			
Sandwich tern	14,535	5,087		14,535				
Roseate tern	6,374	2,626		6,374				
Common tern	73,998	31,505	1,731	73,998				
Arctic tern	72,227	24,435	33	72,227				
Guillemot						812,085	335,387	1,332,663

Species	Estimated population within region in each bio-season (Adults + immatures)							
	RM	MFB		PBM	MFW	B		NB
		Method 1	Method 2			Method 1	Method 2	
Razorbill	632,448	318,987	44,341	632,448	366,956			
Puffin	300,433	188,907	95,044	300,433	300,433			
Black guillemot							1,043	1,043
Red-throated diver	12,717	4,472		12,717	4,148			
Great northern diver	872			872	751			
Fulmar	843,724	508,130	144,571	843,724	571,897			
Manx shearwater	1,585,474	2,125,206	2,736,288	1,585,474				
Gannet	643,713	516,802	420,278	534,979				
Cormorant						11,020	304	18,406
Shag	17,104	7,688	229	17,104	17,104			

3. Intertidal ornithology

This section describes the approach to baseline characterisation of intertidal ornithological receptors.

3.1. Summary of data sources

A desk-based review was carried out in relation to intertidal ornithology. Table 3.1 below shows the literature and data sources used for baseline characterisation of the landfall survey area.

Table 3.1: Data sources for intertidal ornithology baseline characterisation for the Project

Source	Date	Summary	Coverage of study area
Contemporary site-specific baseline characterisation surveys			
Diurnal tidal landfall bird survey data	2019 – 2023	Eighty-one diurnal surveys using an adapted I-WeBS methodology conducted approximately twice monthly (excluding April 2020 and early May 2020) between October 2019 and March 2023.	Covers the OECC intertidal landfall area and a wider area within South Dublin Bay between the Great South Wall of Dublin Port and the north-west wall of Dun Laoghaire Harbour
Post-breeding tern aggregation survey data	2020 and 2021	Eight dusk surveys during mid-July to mid-September (four surveys each year) to record the distribution and number of terns using post-breeding roost sites.	
Additional data sources			
I-WeBS (Irish Wetland Bird Survey)	2016/17 – 2020/21	Seasonal peak abundances of species within intertidal habitats in Dublin Bay site from monthly I-WeBS coverage between September and March each year. Mean monthly abundances (September to March) of species in intertidal habitats within Dublin Bay I-WeBS sub-sites collectively covering area congruous to the contemporary diurnal tidal landfall and post-breeding tern aggregation survey	The wider Dublin Bay I-WeBS site covers all intertidal habitats surrounding Dublin Bay. Several Dublin Bay I-WeBS sub-sites collectively cover an area which is the same as the area covered during contemporary diurnal tidal landfall and post-breeding tern aggregation surveys.

Source	Date	Summary	Coverage of study area
		area [2017/18 to 2020/21 non-breeding seasons only].	
Post-breeding tern survey data	2013 – 2018	Roosting tern numbers, site use timings, distributions and sources of disturbance from summaries of survey data collected during each post-breeding period (mid-July to mid-September) within South Dublin Bay each year.	Focus upon intertidal habitat within South Dublin Bay between the Great South Wall of Dublin Port and the north-west wall of Dun Laoghaire Harbour.

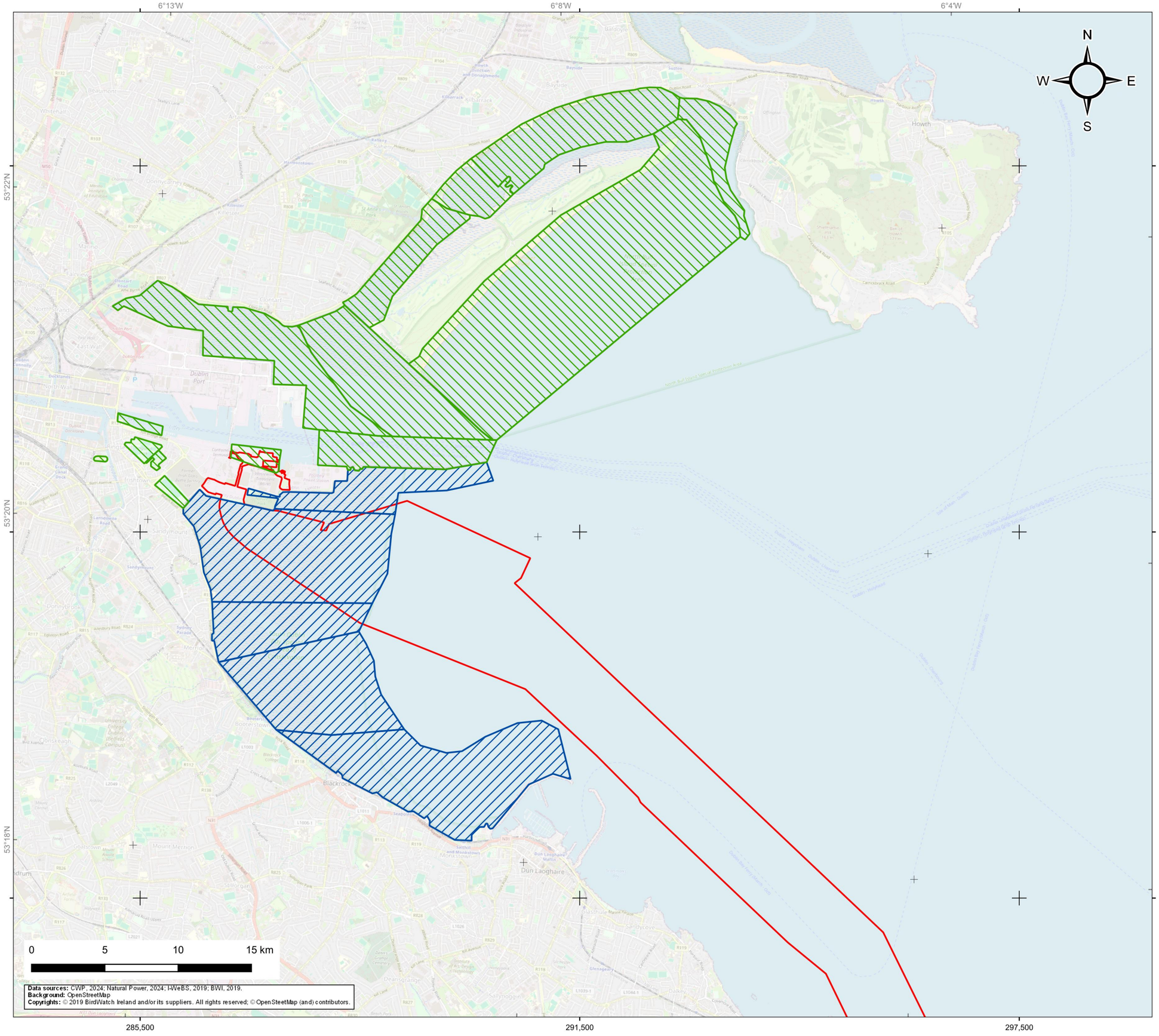
3.2. Existing data sources

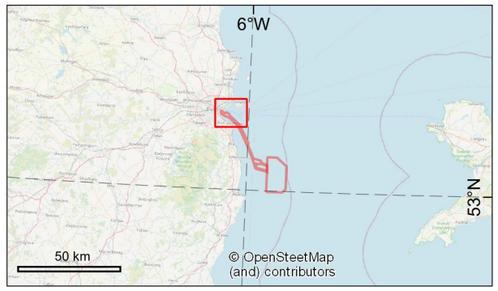
3.2.1. I-WeBS counts of South Dublin Bay

Irish Wetland Bird Survey (I-WeBS) information is collected for a number of subsites throughout the Dublin Bay area during each non-breeding period (September to March). Annual peak counts of the wider Dublin Bay I-WeBS sites for the most recently available five years (2016/17 to 2020/21) were obtained from the BirdWatch Ireland website (BWI) (Site Summary Tables_S27 (caspio.com)) and are summarised in Table 3.2.

As the OECC and OECC intertidal landfall passes through South Dublin Bay, additional I-WeBS data from subsites within this area were obtained directly from BWI [email received from B. Burke, BWI, 12/12/2022]. Figure 3.1 shows the areas covered within the wider Dublin Bay I-WeBS site, and the subsites within South Dublin Bay for which additional I-WeBS data were obtained.

From the more detailed I-WeBS data obtained for subsites within South Dublin Bay (for which information for the 2017/18 to 2020/21 non-breeding seasons were provided), mean monthly total counts between September and March across all sub-sites are provided in Table 3.3.





Legend

- Planning Application Boundary (PAB)

Irish Wetland Bird Survey (I-WeBS) and BirdWatch Ireland (BWI) monitoring and survey area

- Included
- Not included

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 3.1
Area and monitoring subsites covered by Irish Wetland Bird Survey (I-WeBS) and BirdWatch Ireland (BWI) at Dublin/South Dublin Bay

CWP doc. number: CWP-NPC-ENG-08-01-MAP-0676

Internal descriptive code: PB..DLH - PAB - S.BIRD.WET - (EIAR.Vol.04.Ch.10.Ap.05.FIG.03.01)

Size: A3

Scale: 1:50,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

Table 3.2: All Dublin Bay I-WeBS data: annual peak counts 2016/17-2020/21

Species	Peak count						1% national population (Burke *et al.*, 2018)	Peak months
	2016/17	2017/18	2018/19	2019/20	2020/21	Mean		
Mute Swan	5*	11	9*	32*	7*	13	90	Oct
Whooper Swan	0	0	11*	1	0	2	150	Jan, Oct
Light-bellied Brent Goose	4420*	3331	3662	5848	1472	3747	350	Dec
Shelduck	1811	1241	1632	1619	2586	1778	100	Dec
Wigeon	1839	918	1314	1833	1082	1397	560	Nov
Teal	1654	1030	2187	1392	930*	1439	360	Dec
Mallard	64*	82	221*	133*	96	119	280	Sep
Pintail	190	214	318	192*	252	233	20	Jan
Shoveler	116	144	122	124	81	117	20	Dec
Long-tailed Duck	2	0	0	0	1	1	-	Dec
Common Scoter	19	0	24	10	0	11	110	Oct
Goldeneye	1*	0	2	0	0	1	40	Feb, Mar
Red-breasted Merganser	80*	37	40*	96	36*	58	25	Mar, Oct
Red-throated Diver	6	5	4	1	0	3	20	Feb
Great Northern Diver	1*	1	1*	2	1	1	20	Mar, Nov, Dec
Little Grebe	4	1*	3*	8	6	4	20	Dec
Great Crested Grebe	192	34	388	106*	262	196	30	Nov
Cormorant	95*	112*	100*	157*	183*	129	110	Sep
Shag	19*	10	10	22*	1*	12	-	Nov
Little Egret	70*	57	71*	130*	140*	94	20	Sep
Grey Heron	28*	24	27*	82*	19*	36	25	Oct
Moorhen	3*	2	4	6	1	3	-	Nov
Oystercatcher	4042	2375	3378	3313	2466*	3115	610	Jan, Oct, Dec
Ringed Plover	208	285	148	131	70	168	120	Dec
Golden Plover	1010*	1322	1430*	1610	95*	1093	920	Oct
Grey Plover	245*	198	499*	560*	208*	342	30	Feb
Lapwing	25*	32	31*	775*	30	179	850	Sep, Dec
Knot	5850*	6554	7256*	5781*	5946	6277	160	Feb
Sanderling	374*	301*	736*	588*	748*	549	85	Sep, Oct
Curlew Sandpiper	0	0	0	1*	0	0	-	Oct
Purple Sandpiper	0	0	0	1	1	0	20	Jan, Oct
Dunlin	8280	5884	7474	6017	10362	7603	460	Jan, Mar
Snipe	53*	10	43	15*	5	25	-	Jan
Black-tailed Godwit	1274*	1474*	3369*	2987*	1499	2121	200	Feb, Mar, Sep, Oct
Bar-tailed Godwit	2653*	1599*	1773	2736*	1833*	2119	170	Mar
Whimbrel	0	0	2*	2*	1*	1	-	Sep
Curlew	750*	494	1323*	1162*	715*	889	350	Sep
Redshank	1430*	2274	2312*	2299*	2517*	2166	240	Sep
Greenshank	35	14	44*	51*	48*	38	20	Oct
Turnstone	286*	334	216	445*	259	308	95	Oct
Kingfisher	0	0	4	1*	1	1	-	Nov
Black-headed Gull	2393*	1375*	3243*	3803	4842*	3131	-	Sep
Common Gull	213*	141*	387*	538*	286*	313	-	Mar
Lesser Black-backed Gull	5*	2*	69*	8	135*	44	-	Sep, Oct
Herring Gull	450*	607*	483*	374*	694*	522	-	Sep
Great Black-backed Gull	151	108	138*	145	119*	132	-	Sep
Mediterranean Gull	68*	6	14*	32*	7*	25	-	Oct
Sandwich Tern	0	8*	75*	3*	12*	20	-	Sep

Species	Peak count						1% national population (Burke *et al.*, 2018)	Peak months
	2016/17	2017/18	2018/19	2019/20	2020/21	Mean		
Common Tern	0	0	102*	10*	2*	23	-	Sep
Kittiwake	0	40*	0	0	0	8	-	Mar
Ring-billed Gull	1*	0	0	0	0	0	-	Mar, Sep
Glaucous Gull	1	0	0	0	0	0	-	Jan
Iceland Gull	1*	0	1	0	0	0	-	Feb, Mar, Dec
Yellow-legged Gull	1	0	0	0	0	0	-	Dec

Source: Dublin Bay I-WeBS site counts: Site Summary Tables_S27 (caspio.com)

Peak counts recorded outside the midwinter period (Nov, Dec, Jan) are marked with an asterisk (*). This may indicate that higher numbers occurred during passage periods, or may be due to a lack of counts in the midwinter months. Blank cells indicate that a species was absent.

South Dublin Bay I-WeBS site counts corresponding with contemporary tidal landfall bird survey area are given in Table 3.3, below.

Table 3.3: South Dublin Bay I-WeBS data: Mean monthly counts

Species	Mean monthly count (2016/17 to 2020/21)							1% national population (Burke *et al.*, 2018)
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
Light-bellied brent goose	5.50	156.75	166.00	167.75	1011.33	682.00	206.75	350
Mute swan	0	0	4.00	2.00	0	0	0	90
Whooper swan	0	6.00	0	0	0	0	0	150
Shelduck	0	2.00	0	1.00	0	10.50	8.67	100
Wigeon	0	10	0	0	2.00	17.00	0	560
Mallard	0	4.00	2.00	4.00	0	0	2.00	280
Teal	0	1.00	2.00	13.00	62.00	44.00	128.00	360
Common scoter	0	4.00	10	0	14.00	60	6.00	110
Red-breasted merganser	24.50	28.33	15.00	8.00	4.50	11.00	31.50	25
Moorhen	0	0	3.00	3.00	0	0	1.00	-
Little grebe	0	0	1.00	1.00	0	0	1.00	20
Great crested grebe	41.00	12.50	148.00	74.00	86.00	32.00	53.67	30
Oystercatcher	846.50	1315.00	928.50	1112.50	1577.25	986.00	444.25	610
Lapwing	0	0	0	3.00	0	0	0	850
Golden plover	0	0	3500	1425.00	0	500	0	920
Grey plover	0	2.50	12.50	12.25	21.33	4.50	0	30
Ringed plover	39.50	4.33	95.00	84.33	12.50	88.33	27.50	120
Curlew	57.00	54.75	39.25	20.67	22.33	12.50	23.00	350
Bar-tailed godwit	106.50	21.67	253.00	229.50	298.00	778.00	20.25	170
Black-tailed godwit	43.50	136.67	18.00	188.50	12.75	2.00	40	200
Turnstone	9.00	63.00	80	31.00	22.00	25.00	10.50	95
Knot	161.00	60.33	1027.00	2257.00	22.00	4650.50	187.67	160

Species	Mean monthly count (2016/17 to 2020/21)							1% national population (Burke *et al.*, 2018)
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
Sanderling	4.00	440	77.33	184.00	215.75	301.00	27.00	85
Dunlin	42.25	83.00	1036.25	1193.50	2295.00	3399.00	1520	460
Redshank	284.50	203.50	165.75	230.50	171.50	107.33	72.75	240
Greenshank	6.50	5.25	2.50	8.00	2.33	2.33	1.50	20
Kittiwake	0	0	0	0	0	0	40	-
Black-headed gull	1323.50	608.75	504.00	515.25	1131.50	848.00	370	-
Mediterranean gull	0	0	0	1.00	2.50	1.00	7.00	-
Common gull	14.25	9.67	29.00	26.00	13.00	17.33	30.75	-
Great black-backed gull	7.75	11.67	9.67	12.00	22.75	20.67	4.67	-
Herring gull	50.75	19.00	20.50	11.75	60.50	16.67	140.50	-
Lesser black-backed gull	5.00	1.50	1.33	4.00	2.50	0	3.33	-
Sandwich tern	27.00	1.50	0	0	0	0	1.00	-
Common tern	2.00	0	0	0	0	0	0	-
Red-throated diver	0	0	1.50	5.00	2.00	3.00	1.00	20
Great Northern diver	0	0	1.00	0	0	0	1.00	20
Cormorant	48.50	32.25	47.00	15.00	22.50	14.00	7.67	110
Shag	21.00	9.00	5.50	10	0	11.00	1.00	-
Little egret	1.00	4.67	2.00	1.33	5.00	1.00	2.00	20
Grey heron	12.00	10	4.25	1.00	2.50	1.67	6.00	25
Kingfisher	1.00	0	0	0	0	0	0	-

Source: BirdWatch Ireland

3.2.2. Post-breeding tern aggregation survey summaries

South Dublin Bay, specifically the Sandymount Strand and Merrion Gate areas, are the largest post-breeding tern aggregation site in Ireland and may be the most important tern staging site in north-west Europe (Burke *et al.*, 2020). Consequently, considerable survey effort has been undertaken within this area to describe the numbers, distributions and timing of the usage of this site. Post-breeding tern surveys in South Dublin Bay have been organised as part of a wider programme of surveys around Ireland since 2016 under the auspices of I-WeBS (Burke *et al.*, 2020). Prior to this, numerous surveys to gather information on the use of South Dublin Bay by terns in the post-breeding period have been undertaken since the importance of this site was first noted in 1959 (Merne *et al.*, 2008).

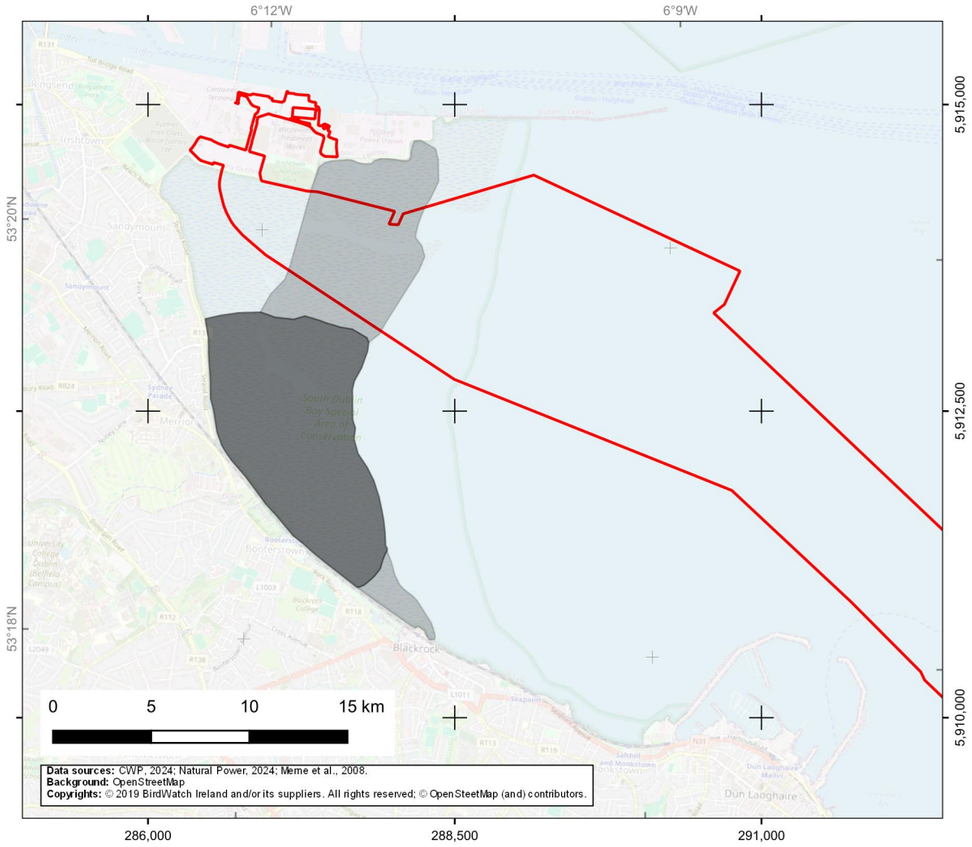
Five species of tern, namely black tern, sandwich tern, common tern, roseate tern and Arctic tern, have been regularly recorded during surveys of post-breeding tern roosting aggregations within South Dublin Bay. Typically, the vast majority of birds within roosting aggregations are common terns, with Arctic and roseate terns the next most prevalent and sandwich and black terns less frequently and in smaller numbers (Tierney *et al.*, 2016). Common tern, Arctic tern and roseate tern all belong to the genus Sterna. Due to the similar appearance of these Sterna species and low light levels during the crepuscular periods in which roosting tern counts are typically undertaken, differentiation of these species is frequently not possible. Furthermore, due to the large number of densely aggregated roosting birds which frequently occur within South Dublin Bay, obtaining accurate counts of sandwich and black tern at such times may also not be possible. For this reason, peak counts of all tern species collectively within South Dublin Bay between 2013 and 2018 are provided in Table 3.4.

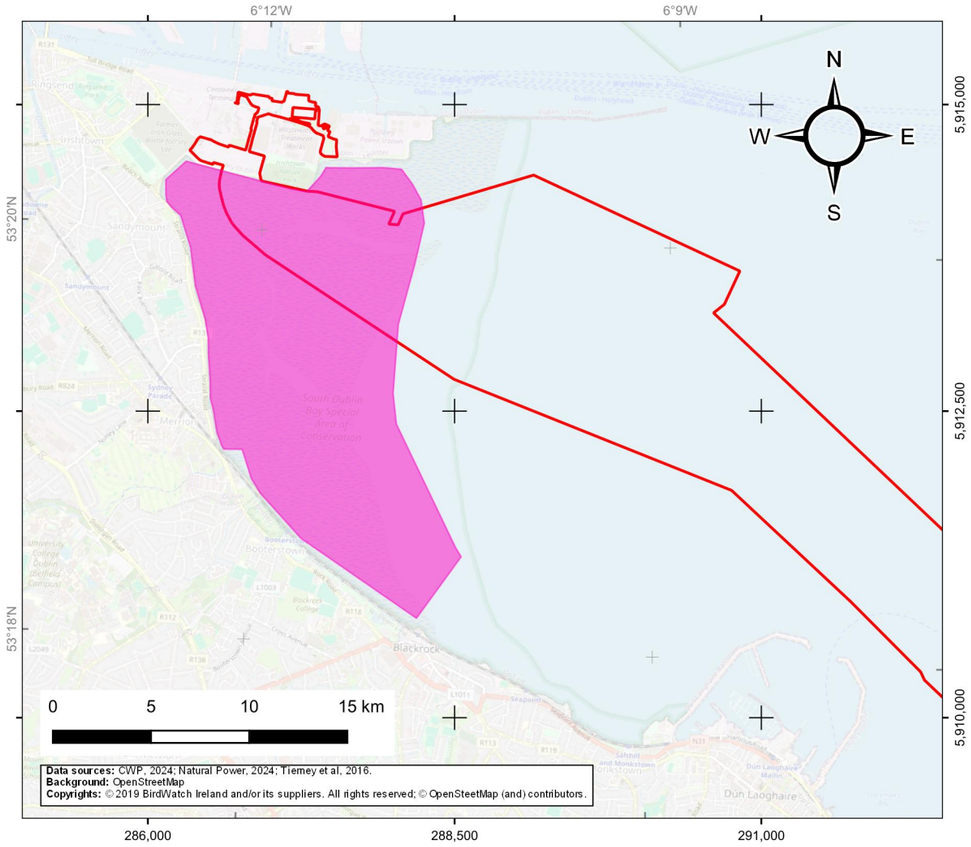
Table 3.4: Peak counts from post-breeding tern aggregation surveys in South Dublin Bay 2013 – 2018

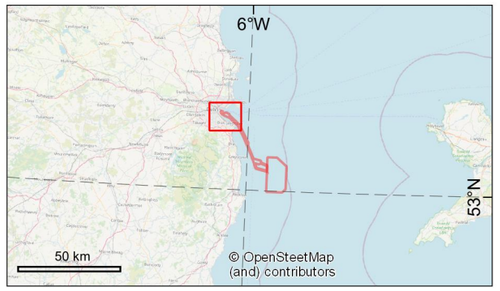
	Year						Mean
	2013	2014	2015	2016	2017	2018	
Peak count	6,645	2,264	4,035	17,440	7,000	c.6,800	c.7,364
Month of peak count	Sep	Aug	Aug	Aug	Aug	Aug	-
Source	Tierney *et al.*, 2016			Tierney *et al.*, 2016 Burke and Crowe, 2016	Burke *et al.*, 2017	Burke *et al.*, 2020 (taken from graph)	-

Typically, the number of terns using South Dublin Bay builds from late July onwards when birds disperse from the breeding colonies (Tierney *et al.*, 2016). Highest peak counts are usually observed within South Dublin Bay in August (Table 3.4), with peak activity occurring between mid-August and mid-September (Merne *et al.*, 2008; Merne, 2010). There are roosting terns present at South Dublin Bay for up to two months each year (late July to late September), building reserves for migration and commencing their moult (Cabot & Nisbet 2013, Ginn & Melville 1983). Although principally used as a night roost, birds begin to roost at least one hour before sunset during this period (Merne *et al.*, 2008; Merne, 2010).

Merne *et al.*, 2008 describe the primary roosting area used by post-breeding tern aggregations within South Dublin Bay as exposed sandbanks between the Martello Towers at Sandymount (GR 319524, 232021) and Williamstown (GR 320796, 229979). This area is highlighted in Figure 3.2. Merne *et al.*, 2008 also note that terns are less frequently recorded outside this area on adjacent sandflats extending north to Irishtown and the South Bull Wall and south to Blackrock (also highlighted in Figure 3.2), but that these birds typically join birds within the primary roosting area. The summary of areas used by roosting terns provided in Merne *et al.*, 2008, is broadly consistent with usage of the area observed in surveys during 2013 to 2017, as highlighted in Figure 3.2.

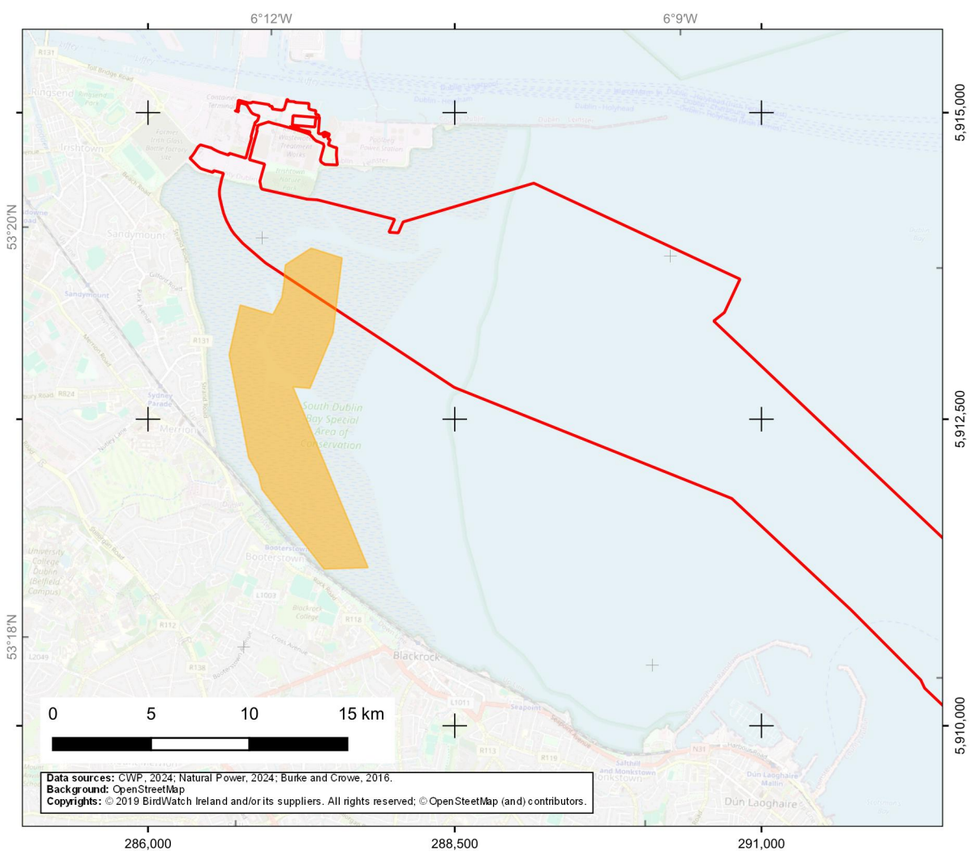


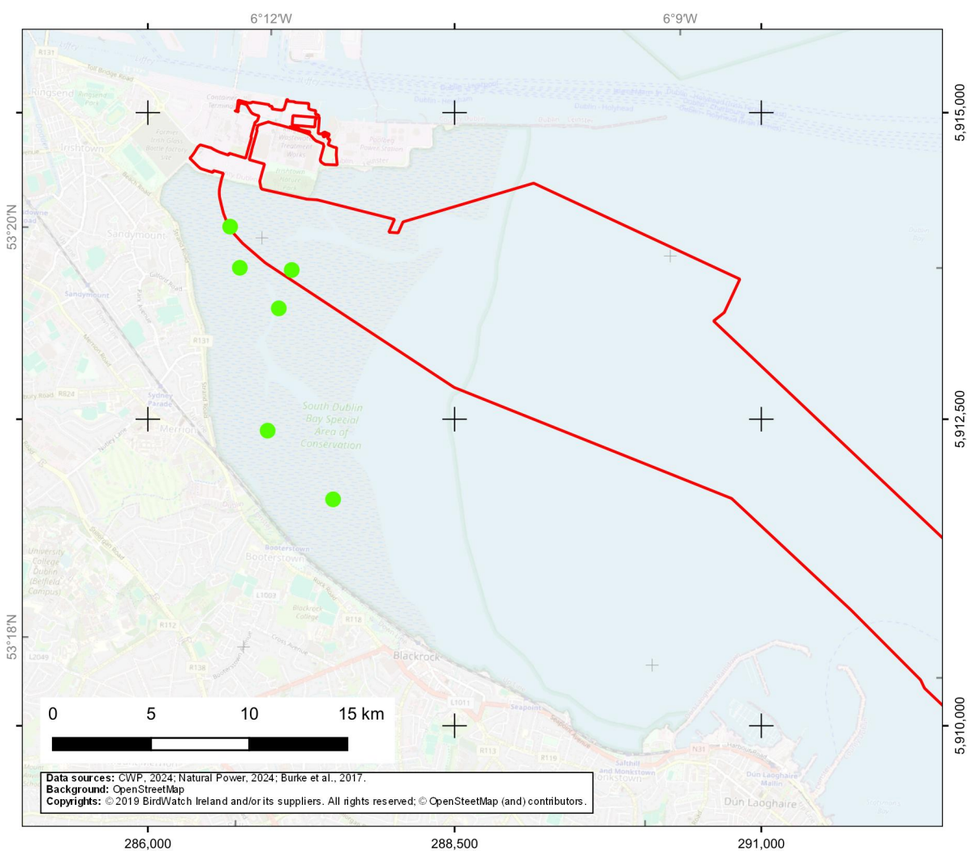




Legend

- Planning Application Boundary (PAB)
- Indicative locations of core areas used by roosting terns
  Merne et al. (2008)
- Indicative locations of peripheral areas used by roosting terns
  Merne et al. (2008)
- Area used by roosting terns 2013–2016
  Teirney et al. (2016)
- Area used by roosting terns 2016
  Burke and Crowe (2016)
- Area used by roosting terns 2017
  Burke et al. (2018)





codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 3.2
Post-breeding tern roosts as described in Merne et al. (2008) and during 2013-16, 2016 and 2017 surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-0677

Internal descriptive code: PB..DLH - PAB - ROOST.TERNs - (EIAR.Vol.04.Ch.10.Ap.05.FIG.03.02)

Size: A3

Scale: 1:50,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

Disturbance events impacting roosting tern aggregations within South Dublin Bay are characterised as occurring frequently (Tierney *et al.*, 2016). This disturbance is identified as primarily a consequence of recreational activities within the intertidal area in the form of walkers, joggers and dog walkers (Burke *et al.*, 2018), with non-leashed dogs and watersports also mentioned in this regard by Merne, 2010. Recreational disturbance is identified among potential impacts within the conservation objectives of South Dublin Bay and River Tolka Estuary SPA (NPWS, 2015) and the importance of nearby alternative roosting areas has been highlighted to ensure that disturbed birds are not required to travel far if disturbed (Burke *et al.*, 2018).

3.3. Contemporary site-specific baseline characterisation surveys

3.3.1. Tidal landfall bird surveys

Table 3.5 and Table 3.6 below show the dates, times and environmental conditions recorded during tidal landfall bird surveys and post-breeding tern aggregation surveys.

Table 3.5: Tidal landfall bird survey details

Survey number	Survey date	Survey times		Tidal state	Survey conditions
		Start	End		
1	17/10/19	15:40	18:20	Falling	Wind: SW-SSE Force 2-4; Cloud cover: 6-7/8; No precipitation
2	29/10/19	10:32	13:25	High	Wind: E Force 4-5; Cloud cover: 2-6/8; No precipitation
3	14/11/19	10:55	12:32	Rising	Wind: N-NE Force 4-6; Cloud cover: 5-8/8; No precipitation
4	20/11/19	12:50	15:40	Rising	Wind: SE-SSE Force 4-5; Cloud cover: 8/8; No precipitation
5	04/12/19	08:12	11:35	Low	Wind: SW-SSW Force 1-2; Cloud cover: 1-7/8; No precipitation
6	17/12/19	13:42	15:30	High	Wind: SW-WSW Force 1-2; Cloud cover: 0-1/8; No precipitation
7	09/01/20	11:54	15:58	Falling	Wind: N-NW Force 1-2; Cloud cover: 5-8/8; No precipitation
8	20/01/20	12:01	14:23	Low	Wind: SW-WSW Force 0-1; Cloud cover: 0/8; No precipitation
9	18/02/20	08:45	11:24	Falling	Wind: W-SW Force 3-4; Cloud cover: 3-5/8; No precipitation
10	24/02/20	10:48	12:35	High	Wind: SE-ESE Force 2-4; Cloud cover: 8/8; No precipitation
11	02/03/20	11:47	14:12	Rising	Wind: W-WNW Force 2-3; Cloud cover: 0-3/8; No precipitation
12	26/03/20	11:14	13:57	High	Wind: W Force 1-2; Cloud cover: 6-8/8; No precipitation
13	30/05/20	04:33	08:33	High	Wind: N/A Force 0; Cloud cover: 0/8; No precipitation
14	04/06/20	06:17	09:17	Rising	Wind: W-WNW Force 2-3; Cloud cover: 7-8/8; No precipitation
15	25/06/20	07:16	10:16	Low	Wind: E-NE Force 1-2; Cloud cover: 0/8; No precipitation
16	03/07/20	06:03	09:25	Rising	Wind: SW Force 4; Cloud cover: 6-7/8; No precipitation
17	28/07/20	07:47	10:46	Falling	Wind: NW-WNW Force 3-4; Cloud cover: 2-3/8; No precipitation
18	21/08/20	09:12	12:32	Rising	Wind: SW Force 4; Cloud cover: 4/8; Light rain
19	31/08/20	06:48	10:11	Low	Wind: S Force 3; Cloud cover: 3/8; Light rain
20	08/09/20	08:04	11:22	Low	Wind: SW Force 3; Cloud cover: 7/8; No precipitation
21	24/09/20	06:56	09:48	Falling	Wind: SW Force 5; Cloud cover: 5/8; Heavy rain
22	12/10/20	09:45	12:46	Falling	Wind: NW Force 3; Cloud cover: 8/8; Heavy rain
23	29/10/20	14:29	17:47	Low	Wind: SW Force 4; Cloud cover: 7/8; Heavy rain
24	05/11/20	09:17	12:44	Rising	Wind: W Force 2; Cloud cover: 2/8; No precipitation
25	23/11/20	07:37	10:00	Falling	Wind: S Force 2; Cloud cover: 4/8; No precipitation
25	02/12/20	11:06	13:56	High	Wind: SW Force 3; Cloud cover: 6/8; Light rain
27	08/12/20	12:45	16:07	Rising	Wind: W Force 4; Cloud cover: 7/8; Light rain
28	18/01/21	14:14	16:32	High	Wind: SW Force 3; Cloud cover: 5/8; Heavy rain
29	22/01/21	10:41	14:03	Low	Wind: W Force 2; Cloud cover: 7/8; no precipitation
30	02/02/21	09:50	13:40	Rising	Wind: SW Force 3; Cloud cover: 7/8; Rain
31	23/02/21	10:28	13:26	Falling	Wind: SE Force 5; Cloud cover: 8/8; Rain
32	08/03/21	11:42	15:10	Low	Wind: SW Force 1; Cloud cover: 3/8; no precipitation
33	16/03/21	08:32	10:35	Rising	Wind: NW Force 2; Cloud cover: 6/8; No precipitation
34	13/04/21	11:59	14:13	High	Wind: E Force 1; Cloud cover: 6/8; Rain
35	22/04/21	10:13	12:36	Falling	Wind: NE Force 3; Cloud cover: 1/8: No precipitation
36	13/05/21	11:42	14:45	High	Wind: N Force 3; Cloud cover: 8/8; Precipitation: None

Survey number	Survey date	Survey times		Tidal state	Survey conditions
		Start	End		
37	25/05/21	13:19	15:10	Falling	Wind: SW Force 4; Cloud cover: 6/8; Light rain
38	15/06/21	11:03	12:12	Rising	Wind: E Force 3; Cloud cover: 3/8; No precipitation
39	28/06/21	19:07	19:50	Low	Wind: W Force 3; Cloud cover: 2/8; No precipitation
40	07/07/21	19:07	20:30	Falling	Wind: S Force 2; Cloud cover: 6/8; Light rain
41	12/07/21	12:48	14:34	High	Wind: W Force 2; Cloud cover: 6/8; Rain
42	17/08/21	05:38	08:05	Low	Wind: S Force 4; Cloud cover: 8/8; Rain
43	24/08/21	09:01	11:40	Rising	Wind: W Force 2; Cloud cover: 6/8; Rain
44	15/09/21	08:26	14:14	Low	Wind: E Force 4; Cloud cover: 7/8; Rain
45	21/09/21	14:07 11:32	17:30 15:52	Falling High	Wind: Variable Force 1; Cloud cover: 3/8; No precipitation
46	15/10/21	09:45	12:00	Falling	Wind: WNW Force 1; Cloud cover: 0-1; No precipitation
47	27/10/21	15:10	17:40	High	Wind: S-SSW Force 3; Cloud cover: 8; Light showers
48	09/11/21	09:47	12:30	Rising	Wind: WNW Force 1-2; Cloud cover: 5-6; Drizzle/Mist
49	19/11/21	09:55	12:35	High	Wind: SW-WSW Force 1; Cloud cover: 5-6; No precipitation
50	10/12/21	08:02	11:02	Low	Wind: W Force 3; Cloud cover: 0; No precipitation
51	20/12/21	13:42	16:10	Falling	Wind E-ENE Force 3; Cloud cover: 8; No precipitation
52	12/01/22	09:26	12:26	Falling	Wind NW-NNW Force 2; Cloud cover: 1; No precipitation
53	19/01/22	11:18	14:00	High	Wind NE Force 4; Cloud cover: 6-7; No precipitation
54	09/02/22	09:35	12:20	Low	Wind: WNW Force 1-2; Cloud cover: 1-2; No precipitation
55	21/02/22	09:46	12:05	Rising	Wind: WNW Force 4-5; Cloud cover: 1-2; No precipitation
56	03/03/22	10:39	13:10	High	Wind: W-NW Force 2-3; Cloud cover: 5-6; No precipitation
57	14/03/22	10:27	13:05	Falling	Wind: SW Force 2; Cloud cover: 6-7; Light showers
58	05/04/22	06:52	10:00	Low	Wind: W Force 2-3; Cloud cover: 6-7/8; No precipitation/Dizzle/Mist
59	26/04/22	17:05	19:30	Rising	Wind: E Force 1; Cloud cover: 1-2; No precipitation
60	10/05/22	12:03	14:40	Low	Wind: SW Force 3; Cloud cover: 2-3, No precipitation
61	24/05/22	18:59	21:35	High	Wind: W-WSW Force 2-3; Cloud cover: 7-8; Light showers
62	13/06/22	12:43	15:40	Falling	Wind: SW-Var Force 1; Cloud cover: 4-5; No precipitation
63	20/06/22	10:35	13:35	Rising	Wind: WNW-Var Force 1-2; Cloud cover: 1-2; No precipitation
64	14/07/22	08:04	11:04	Rising	Wind: NNE Force 2-3; Cloud cover 4-5; No precipitation
65	28/07/22	10:59	13:45	High	Wind: E-ENE Force 1-2; Cloud cover: 5; No precipitation
66	11/08/22	10:28	13:28	High	Wind SE Force 2; Cloud cover 0; No precipitation
67	24/08/22	12:08	15:08	Falling	Wind ENE-NNE Force 4; Cloud cover 1-2; No precipitation
68	13/09/22	09:36	12:30	Rising	Wind: E-ESE Force 2-3; Cloud cover 1/8; No precipitation
69	27/09/22	11:55	14:40	High	Wind: NW-WNW Force 3; Cloud cover: 8/8; Drizzle/Mist
70	11/10/22	14:37	17:30	Falling	Wind: SW-SSW Force 1-2; Cloud cover: 6-7/8; No precipitation
71	18/10/22	10:30	13:30	Low	Wind: E-ESE Force 2-3; Cloud cover: 6-7/8; No precipitation
72	16/11/22	11:57	14:45	Rising	Wind: VAR-ESE Force 1-2; Cloud cover: 0-1/8; No precipitation
73	28/11/22	13:09	16:09	High	Wind: NW Force 2-3; Cloud cover: 7-8/8; Drizzle/Mist
74	12/12/22	12:19	15:20	High	Wind: VAR-N Force 0-1; Cloud cover: 8/8; Drizzle/Mist
75	20/12/22	12:54	15:55	Low	Wind: SW Force 2; Cloud cover: 1/8; No precipitation
76	16/01/23	13:24	16:20	Rising	Wind: NW-WNW Force 3; Cloud cover: 2-3/8; No precipitation
77	23/01/23	11:13	14:10	High	Wind: SSE-VAR Force 0-1; Cloud cover: 4-5/8; No precipitation
78	14/02/23	09:24	12:20	Low	Wind: SE-ESE Force 2-3; Cloud cover: 5-7/8; No precipitation
79	22/02/23	11:41	14:40	High	Wind: NW-WNW Force 4; Cloud cover: 5-7/8; No precipitation
80	08/03/23	10:44	13:44	High	Wind: E-ENE Force 3-4; Cloud cover: 6-7/8; Light showers
81	21/03/23	09:52	12:30	High	Wind: SW-WSW Force 3; Cloud cover: 5-6/8; Heavy showers

Source: Natural Power

Table 3.6: Post-breeding tern aggregation surveys

Survey number	Survey date	Survey times		Sunset	Tidal state	Survey conditions
		Start	End			
1	17/07/20	19:41	21:56	21:42	Rising	Wind: WSW Force 3; Cloud cover: 3/8; No precipitation
2	14/08/20	18:53	21:08	20:54	Rising	Wind: NNE Force 3; Cloud cover: 6/8; No precipitation
3	26/08/20	18:26	20:41	20:27	High	Wind: variable Force 2; Cloud cover: 7/8; No precipitation

Survey number	Survey date	Survey times		Sunset	Tidal state	Survey conditions
		Start	End			
4	25/09/20	17:14	19:30	19:15	Rising	Wind: NW Force 5; Cloud cover: 3/8; No precipitation
5	30/07/21	20:09	22:36	21:23	Falling	Wind: S Force 3; Cloud cover: 6/8; No precipitation
6	04/08/21	19:50	21:50	21:14	Rising	Wind: SE Force 1; Cloud cover: 5/8; No precipitation
7	18/08/21	19:09	21:05	20:46	Rising	Wind: S Force 3; Cloud cover: 7/8; No precipitation
8	14/09/21	18:20	21:11	19:42	High	Wind: E Force 3; Cloud cover: 7/8; Light rain

Source: Natural Power

3.3.2. Survey methodology

3.3.2.1. Adapted I-WeBS

Point counts of intertidal habitats and inshore waters were undertaken in line with standard I-WeBS methodology (I-Webs), altered to account for spatial distributions and behaviours as per the Low Tide Waterbird Survey Method developed by Bird Watch Ireland and the NPWS (Lewis & Tierney, 2014). Counts were timed to provide approximately equal survey effort coverage during all tidal states.

Surveys were undertaken on a twice-monthly basis throughout the year (as opposed to once-monthly counts taking place during the winter months only, as per standard I-WeBS methodology), commencing in October 2019 and continuing until March 2023.

Counts were visited twice per month, with coverage alternating between high/low tide one month and rising/falling tide the next in order to provide approximately equal survey effort coverage during all tidal states.

Counts were conducted from suitable vantage points in supra-tidal areas by two surveyors, with both surveyors coordinating survey coverage to ensure complete coverage of the survey, while minimising the potential for double counting. In most diurnal surveys and all post-breeding tern aggregation surveys surveyors worked concurrently for the duration of the survey.

The species, numbers and behaviours of birds within the survey area was noted, and the locations of flocks and individuals mapped onto high resolution field maps.

In addition, surveyors collected information relating to any disturbance events observed during adapted I-WeBS counts and weather the conditions during surveys. Surveys were not conducted where conditions were considered to prevent proper counts being undertaken, specifically during high wind speeds (> Beaufort 5) or periods of low visibility.

3.3.2.2. Post-breeding tern aggregation surveys

During the periods in which staging terns were present within South Dublin Bay (mid-July to mid-September 2020 and 2021), additional surveys timed to coincide with dusk were undertaken; four in each year.

4. Species recorded

4.1. Offshore ornithology

Seabird species shown in Table 4.1 were recorded within the array site plus a 4 km buffer during contemporary digital aerial and/or boat-based ESAS survey. A number of species were only recorded in the study area in numbers determined by expert judgement to be too low to warrant detailed species accounts (these species are shown purple cells in italic font within the table). Instead, data for these species are presented in the form of raw counts within Table 2.2, Section 2.2 Historic site-specific baseline characterisation surveys. Those species highlighted in bold in Table 4.1 form the basis of detailed accounts for this baseline technical report.

Table 4.1: Seabird species recorded during site-specific digital aerial and boat-based surveys of the array site and 4 km buffer

Species	Recorded during DAS surveys (May 2020 to April 2022)	Recorded during boat-based surveys (Oct 2018 to Aug 2020)
Common scoter	✓	✓
Red-breasted merganser	✓	-
Kittiwake	✓	✓
Sabine's gull	-	✓
Black-headed gull	✓	✓
Little gull	✓	✓
Common gull	✓	✓
Great black-backed gull	✓	✓
Herring gull	✓	✓
Lesser black-backed gull	✓	✓
Sandwich tern	✓	-
Little tern	✓	-
Roseate tern	✓	✓
Common tern	✓	✓
Arctic tern	✓	✓
Great skua	✓	✓
Pomarine skua	✓	✓
Arctic skua	✓	✓
Guillemot	✓	✓
Razorbill	✓	✓
Black guillemot	✓	✓
Puffin	✓	✓
Red-throated diver	✓	✓
Black-throated diver	✓	-
Great Northern diver	✓	✓
European storm petrel	✓	✓
Fulmar	✓	✓
Great shearwater	-	✓
Manx shearwater	✓	✓
Balearic shearwater	✓	-
Gannet	✓	✓
Cormorant	✓	✓
Shag	✓	✓

4.2. Intertidal ornithology

Bird species shown in Table 4.2 were recorded within the area of the OECC intertidal landfall in South Dublin Bay during intertidal landfall surveys undertaken between October 2019 and March 2023. A number of species were only recorded in the study area in maximum numbers considered to be too low to warrant detailed species accounts (these species are shown in grey cells in italic font within the table). The threshold for this distinction was generally considered to be species for which the maximum count during any survey was less than 0.5% of the national population of wintering waterbirds in Ireland (i.e., half of the 1% national population value presented in Burke *et al.*, 2018). As this threshold value is not available for the majority of seabird species which may occur in estuarine habitats, expert opinion in relation to regional populations (Table 2.21) was used to determine whether numbers were too low to warrant detailed species accounts. Decisions to this effect were made on the basis of maximum numbers recorded being very low, and/or the frequency of species being recorded being low.

An exception to the selection criteria outlined above was made in relation to Qualifying Interests of South Dublin Bay and River Tolka Estuary SPA or North Bull Island SPA. Detailed species accounts are provided for these species (highlighted in underlined text) regardless of the numbers recorded during landfall survey works. Those species highlighted in bold in **Table 4.2** from the basis of detailed accounts for this baseline technical report.

Table 4.2: Bird species recorded during site-specific intertidal landfall surveys of the OECC intertidal landfall location in South Dublin Bay

Species	Peak count (Number of surveys)							0.5% of the national population of wintering waterbirds in Ireland (Burke *et al.*, 2018)
	Non-breeding 2019/20 Oct 19 to Mar 20 (12 surveys)	Breeding 2020 May 20 to Sep 20 (9 surveys)	Non-breeding 2020/21 Oct 19 to Mar 20 (12 surveys)	Breeding 2021 Apr 21 to Sep 21 (12 surveys)	Non-breeding 2021/22 Oct 21 to Mar 22 (12 surveys)	Breeding 2022 April to Sep 22 (10 surveys)	Non-breeding 2022/23 Oct 22 to Mar 23 (14 surveys)	
Light-bellied brent goose	**446 (12)**	**164 (1)**	**602 (10)**	**45 (2)**	**346 (12)**	**412 (2)**	**470 (13)**	**175**
Pink-footed goose	*49 (1)*	*0*	*0*	*0*	*0*	*0*	*0*	*-*
Mute swan	*1 (1)*	*2 (1)*	*1 (1)*	*0*	*0*	*0*	*0*	*45*
Shelduck	**18 (6)**	**45 (7)**	**5 (3)**	**9 (7)**	**27 (10)**	**12 (6)**	**20 (12)**	**50**
Wigeon	*4 (1)*	*0*	*0*	*0*	*1 (1)*	*0*	*4 (2)*	*280*
Mallard	*8 (2)*	*0*	*6 (1)*	*6 (7)*	*7 (2)*	*0*	*7 (3)*	*140*
Shoveler	**0**	**0**	**6 (1)**	**0**	**1 (1)**	**0**	**0**	**10**
Gadwall	*0*	*0*	*0*	*0*	*0*	*0*	*4 (1)*	*10*
Eider	*8 (1)*	*0*	*0*	*0*	*0*	*0*	*0*	*27*
Teal	**71 (5)**	**0**	**6 (3)**	**0**	**0**	**0**	**17 (8)**	**180**
Common scoter	**99 (4)**	**13 (1)**	**8 (2)**	**14 (3)**	**66 (4)**	**0**	**50 (9)**	**55**
Long-tailed duck	*3 (1)*	*0*	*3 (3)*	*1 (1)*	*1 (1)*	*0*	*1 (1)*	*-*
Goldeneye	*1 (4)*	*0*	*0*	*0*	*0*	*0*	*5 (1)*	*20*
Red-breasted merganser	**33 (12)**	**35 (5)**	**60 (11)**	**151 (8)**	**44 (11)**	**14 (6)**	**56 (14)**	**12**
Red-throated diver	**19 (8)**	**0**	**9 (11)**	**71 (2)**	**15 (10)**	**0**	**15 (11)**	**10**
Great northern diver	*5 (6)*	*0*	*3 (3)*	*2 (1)*	*1 (2)*	*0*	*4 (4)*	*10*
Manx shearwater	*0*	*9 (1)*	*0*	*0*	*0*	*0*	*0*	*-*
Great crested grebe	**912 (11)**	**120 (4)**	**347 (12)**	**14 (7)**	**239 (11)**	**52 (7)**	**228 (12)**	**15**
Red-necked grebe	*0*	*0*	*0*	*0*	*1 (1)*	*0*	*0*	*-*
Little grebe	*1 (1)*	*0*	*1 (1)*	*0*	*1 (2)*	*0*	*2 (3)*	*10*
Grey heron	**4 (8)**	**16 (8)**	**10 (12)**	**25 (11)**	**5 (10)**	**3 (9)**	**11 (12)**	**12**
Gannet	*3 (2)*	*16 (3)*	*0*	*23 (6)*	*2 (2)*	*6 (6)*	*9 (3)*	*-*
Little egret	**7 (8)**	**22 (9)**	**8 (10)**	**50 (12)**	**20 (8)**	**21 (10)**	**90 (9)**	**5**
Shag	**83 (12)**	**36 (9)**	**30 (11)**	**5 (8)**	**6 (8)**	**5 (9)**	**6 (14)**	**-**
Cormorant	*12 (9)*	*21 (7)*	*16 (11)*	*26 (12)*	*16 (10)*	*11 (10)*	*37 (14)*	*55*
Oystercatcher	**2,790 (12)**	**1,240 (9)**	**3,677 (12)**	**1,033 (12)**	**2386 (12)**	**1195 (9)**	**2497 (14)**	**305**
Lapwing	*4 (1)*	*53 (2)*	*41 (2)*	*9 (1)*	*23 (1)*	*0*	*24 (4)*	*425*
Golden plover	**475 (3)**	**140 (2)**	**125 (3)**	**0**	**375 (2)**	**0**	**140 (5)**	**460**
Grey plover	**10 (4)**	**15 (2)**	**45 (8)**	**0**	**38 (4)**	**0**	**13 (5)**	**15**
Ringed plover	**124 (9)**	**99 (4)**	**398 (12)**	**127 (4)**	**84 (7)**	**69 (5)**	**77 (14)**	**60**
Ruff	*0*	*6 (1)*	*0*	*0*	*0*	*1 (1)*	*3 (1)*	*-*
Whimbrel	*4 (3)*	*6 (2)*	*2 (1)*	*2 (2)*	*1 (1)*	*4 (2)*	*0*	*-*
Curlew	**237 (12)**	**189 (8)**	**138 (11)**	**81 (10)**	**182 (9)**	**116 (8)**	**191 (11)**	**175**
Bar-tailed godwit	**1,260 (11)**	**92 (7)**	**691 (12)**	**1,164 (6)**	**1103 (8)**	**116 (6)**	**398 (13)**	**85**
Black-tailed godwit	**366 (11)**	**533 (5)**	**550 (12)**	**589 (7)**	**830 (8)**	**174 (3)**	**198 (11)**	**100**
Common sandpiper	*0*	*2 (1)*	*0*	*2 (2)*	*1 (1)*	*0*	*0*	*-*
Turnstone	**248 (12)**	**222 (8)**	**169 (11)**	**262 (9)**	**117 (10)**	**45 (9)**	**310 (14)**	**47**
Curlew sandpiper		*7 (1)*	*0*	*0*	*0*	*0*	*3 (2)*	*-*
Knot	**583 (7)**	**158 (2)**	**8,590 (11)**	**82 (1)**	**10890 (4)**	**0**	**6600 (11)**	**80**
Sanderling	**408 (10)**	**144 (4)**	**241 (10)**	**57 (1)**	**156 (8)**	**39 (3)**	**293 (11)**	**42**
Dunlin	**1,529 (12)**	**730 (5)**	**5,495 (12)**	**422 (5)**	**2363 (9)**	**208 (1)**	**3081 (13)**	**230**
Purple sandpiper	*6 (7)*	*0*	*4 (5)*	*0*	*2 (1)*	*0*	*3 (3)*	*-*
Little stint	*0*	*0*	*1 (1)*	*0*	*0*	*0*	*0*	*-*
Snipe	*2 (1)*	*3 (1)*	*2 (1)*	*0*	*0*	*0*	*2 (1)*	*-*
Redshank	**709 (12)**	**407 (8)**	**463 (12)**	**367 (7)**	**1337 (11)**	**58 (5)**	**462 (13)**	**120**
Greenshank	**12 (9)**	**10 (3)**	**9 (8)**	**21 (2)**	**9 (9)**	**5 (1)**	**109 (7)**	**10**
Lesser yellowlegs	*0*	*1 (2)*	*0*	*0*	*0*	*0*	*0*	*-*
Kittiwake	*34 (1)*	*0*	*6 (1)*	*7 (4)*	*11 (3)*	*3 (1)*	*5 (2)*	*-*

Species	Peak count (Number of surveys)							0.5% of the national population of wintering waterbirds in Ireland (Burke *et al.*, 2018)
	Non-breeding 2019/20	Breeding 2020	Non-breeding 2020/21	Breeding 2021	Non-breeding 2021/22	Breeding 2022	Non-breeding 2022/23	
	Oct 19 to Mar 20 (12 surveys)	May 20 to Sep 20 (9 surveys)	Oct 19 to Mar 20 (12 surveys)	Apr 21 to Sep 21 (12 surveys)	Oct 21 to Mar 22 (12 surveys)	April to Sep 22 (10 surveys)	Oct 22 to Mar 23 (14 surveys)	
Black-headed gull	**3,192 (12)**	**1,671 (9)**	**1,418 (12)**	**3,826 (11)**	**1044 (12)**	**2128 (10)**	**2040 (14)**	**-**
Little gull	*2 (1)*	*0*	*2 (1)*	*0*	*0*	*0*	*0*	-
Mediterranean gull	**54 (11)**	**87 (8)**	**6 (8)**	**67 (7)**	**4 (4)**	**52 (7)**	**41 (10)**	**-**
Common gull	**220 (12)**	**77 (7)**	**133 (12)**	**58 (12)**	**142 (11)**	**65 (10)**	**512 (14)**	**-**
Great black-backed gull	**241 (12)**	**227 (9)**	**130 (11)**	**99 (12)**	**87 (10)**	**74 (9)**	**113 (13)**	**-**
Herring gull	**5,646 (12)**	**2,058 (9)**	**1,323 (11)**	**940 (12)**	**341 (11)**	**562 (10)**	**836 (14)**	**-**
Yellow-legged gull	*0*	*1 (1)*	*1 (1)*	*1 (1)*	*0*	*0*	*0*	-
Lesser black-backed gull	**48 (8)**	**150 (8)**	**24 (7)**	**81 (11)**	**11 (8)**	**93 (10)**	**16 (9)**	**-**
Sandwich tern	**13 (1)**	**168 (7)**	**0**	**231 (9)**	**0**	**174 (8)**	**53 (3)**	**-**
Common tern	**0**	**35 (3)**	**0**	**45 (8)**	**0**	**35 (8)**	**0**	**-**
Arctic tern	**0**	**16 (1)**	**0**	**3 (2)**	**0**	**19 (5)**	**1 (1)**	**-**
Common or Arctic tern	**0**	**490 (5)**	**0**	**120 (4)**	**0**	**120 (6)**	**0**	**-**
Roseate tern	**0**	**0**	**0**	**1 (1)**	**0**	**1 (2)**	**0**	**-**
Arctic skua	*0*	*0*	*0*	*0*	*0*	*0*	*1 (1)*	
Guillemot	*9 (2)*	*4 (1)*	*27 (4)*	*5 (9)*	*14 (9)*	*5 (5)*	*15 (7)*	-
Razorbill	*0*	*4 (1)*	*3 (2)*	*32 (4)*	*4 (4)*	*5 (2)*	*28 (6)*	-
Black guillemot	**14 (10)**	**18 (7)**	**32 (8)**	**10 (10)**	**8 (9)**	**7 (9)**	**10 (9)**	**-**
Fulmar	*0*	*0*	*0*	*0*	*1 (1)*	*0*	*0*	-
Kingfisher	*1 (1)*	*1 (1)*	*1 (1)*	*0*	*1 (1)*	*1 (1)*	*0*	-
Hooded crow	*53 (6)*	*0*	*0*	*0*	*0*	*0*	*0*	-
Starling	*129 (3)*	*0*	*0*	*0*	*0*	*0*	*0*	-

Source: Natural Power

Bird species shown in **Table 4.2** were recorded within the area of the OECC intertidal landfall in South Dublin Bay during intertidal landfall surveys to record the number and distribution of terns within roosting aggregations during post-breeding periods between July and September in 2020 and 2021.

One species, black tern, was only recorded once within the study area, with numbers considered to be too low to warrant detailed species accounts (this species is shown in grey cells in italic font within the table).

Common, Arctic and roseate terns are three species of similar appearance belonging to the genus *Sterna*, which can be difficult to accurately distinguish under low the light levels of the crepuscular periods during which roosting tern counts were undertaken. Differentiation of these species was therefore not generally possible. Consequently, these species are treated here collectively as *Sterna* species.

Those species highlighted in bold in Table 4.2 form the basis of detailed accounts for this baseline technical report.

Table 4.2: Tern species recorded during site-specific intertidal landfall surveys of the Project landfall location in South Dublin Bay

Species	Peak count (number of surveys)	
	Post-breeding 2020	Post-breeding 2021
	Jul 20 to Sep 20 (4 surveys)	Jul 21 to Sep 21 (4 surveys)
Sandwich tern	**307 (4)**	**462 (2)**
***Sterna* tern species**	**1,756 (4)**	**4,868 (4)**
Black tern	0	4 (1)

Source: Natural Power

5. Species accounts

5.1. Offshore ornithology

The below species accounts present abundance and density estimates within the array site and appropriate buffers, with records apportioned to species level and corrected to incorporate availability bias (where applicable).

Treated counts of each species for each survey, in each area and for each behaviour (on sea or in flight) are presented in Table 5.1 to Table 5.62. Treated counts incorporate records not apportioned to species level during survey and subsequently apportioned to species level based on seasonal species observed ratios as described in section 2.4.1.3 Apportioning of species identified to higher taxonomic level. For diving bird species, treated counts for digital aerial surveys also incorporate availability bias correction factors (as described in section 2.4.1.5 Availability bias) to account for birds which may have been submerged at the time survey images were captured.

Abundance and density estimates of birds in flight and on the sea are presented for all species for the array site and the array site plus a 2 km buffer area. For diver species, considered highly sensitive to disturbance and displacement effects, abundance and density estimates are considered at the widest spatial scale at which data was collected, with information relating to the array site plus a 4 km buffer also presented.

Mean monthly flight densities (and standard deviation) within the array site are summarised for each species, as these values are key input parameters to Collision Risk Modelling, where quantification of collision mortality is determined to be required in impact assessment.

Mean peak bio-seasonal abundances within the array site and the array site plus a 2 km buffer are summarised. Where quantification of displacement mortality is determined to be required in impact assessment, mean peak bio-seasonal abundances within the array area plus a 2 km buffer (or 4 km buffer for diver species) are key input parameters to displacement modelling approaches.

5.1.1. Kittiwake

5.1.1.1. Survey data

Treated counts of kittiwake in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.1.

Table 5.1: Kittiwake treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
	array site								
May 20	54.000	2.703	338.147	32.000	1.601	200.383	22.000	1.101	137.764
Jun 20	14.000	0.701	87.668	14.000	0.701	87.668	0.000	0.000	0.000
Jul 20	18.611	0.931	116.544	18.611	0.931	116.544	0.000	0.000	0.000
Aug 20	20.567	1.029	128.792	17.567	0.879	110.006	3.000	0.150	18.786
Sep 20	0.119	0.006	0.745	0.000	0.000	0.000	0.119	0.006	0.745
Oct 20	15.000	0.751	93.930	14.000	0.701	87.668	1.000	0.050	6.262
Nov 20	56.988	2.852	356.860	46.000	2.302	288.051	10.988	0.550	68.809
Dec 20	102.357	5.123	640.957	98.000	4.905	613.674	4.357	0.218	27.283

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
Feb 21	4.000	0.200	25.048	4.000	0.200	25.048	0.000	0.000	0.000
March 21 (1)	12.848	0.643	80.455	11.000	0.551	68.882	1.848	0.092	11.573
March 21 (2)	30.119	1.507	188.604	20.000	1.001	125.240	10.119	0.506	63.365
April 21	35.000	1.752	219.169	14.000	0.701	87.668	21.000	1.051	131.502
May 21	25.685	1.285	160.839	24.000	1.201	150.288	1.685	0.084	10.551
Jun 21	21.000	1.051	131.502	13.000	0.651	81.406	8.000	0.400	50.096
Jul 21	16.041	0.803	100.451	15.000	0.751	93.930	1.041	0.052	6.522
Aug 21	83.784	4.193	524.651	26.784	1.340	167.719	57.000	2.853	356.933
Sep 21	8.908	0.446	55.779	8.908	0.446	55.779	0.000	0.000	0.000
Oct 21	25.000	1.251	156.550	23.000	1.151	144.026	2.000	0.100	12.524
Nov 21	55.720	2.789	348.915	34.887	1.746	218.461	20.833	1.043	130.454
Dec 21	54.891	2.747	343.728	52.772	2.641	330.460	2.119	0.106	13.269
Jan 22	25.000	1.251	156.550	22.000	1.101	137.764	3.000	0.150	18.786
Feb 22	31.000	1.551	194.121	28.000	1.401	175.335	3.000	0.150	18.786
Mar 22	16.000	0.801	100.192	15.000	0.751	93.930	1.000	0.050	6.262
Apr 22	21.000	1.051	131.502	9.000	0.450	56.358	12.000	0.601	75.144
array site + 2 km buffer									
May 20	109.021	2.766	635.206	69.000	1.751	402.026	40.021	1.016	233.179
Jun 20	40.989	1.040	238.818	33.000	0.837	192.273	7.989	0.203	46.545
Jul 20	42.632	1.082	248.395	41.611	1.056	242.447	1.021	0.026	5.947
Aug 20	75.567	1.917	440.290	34.567	0.877	201.405	41.000	1.040	238.885
Sep 20	1.119	0.028	6.520	0.000	0.000	0.000	1.119	0.028	6.520
Oct 20	36.848	0.935	214.695	35.000	0.888	203.926	1.848	0.047	10.768
Nov 20	243.107	6.169	1416.457	169.000	4.288	984.673	74.107	1.880	431.784
Dec 20	282.714	7.174	1647.222	186.000	4.720	1083.723	96.714	2.454	563.499
Feb 21	15.000	0.381	87.397	11.000	0.279	64.091	4.000	0.101	23.306
March 21 (1)	38.848	0.986	226.348	31.000	0.787	180.620	7.848	0.199	45.727
March 21 (2)	101.782	2.583	593.027	63.814	1.619	371.813	37.967	0.963	221.214
April 21	124.000	3.146	722.482	80.000	2.030	466.117	44.000	1.116	256.365
May 21	77.384	1.964	450.873	59.628	1.513	347.421	17.755	0.451	103.451
Jun 21	29.000	0.736	168.968	20.000	0.507	116.529	9.000	0.228	52.438
Jul 21	33.041	0.838	192.515	30.000	0.761	174.794	3.041	0.077	17.721
Aug 21	125.784	3.192	732.874	49.784	1.263	290.063	76.000	1.928	442.812
Sep 21	19.908	0.505	115.991	18.908	0.480	110.164	1.000	0.025	5.826
Oct 21	109.000	2.766	635.085	101.000	2.563	588.473	8.000	0.203	46.612
Nov 21	101.727	2.581	592.710	77.549	1.968	451.838	24.178	0.614	140.872
Dec 21	185.137	4.698	1078.696	176.587	4.481	1028.878	8.550	0.217	49.818
Jan 22	77.000	1.954	448.638	71.000	1.802	413.679	6.000	0.152	34.959
Feb 22	60.000	1.522	349.588	53.000	1.345	308.803	7.000	0.178	40.785
Mar 22	46.000	1.167	268.017	35.000	0.888	203.926	11.000	0.279	64.091
Apr 22	43.994	1.116	256.331	21.000	0.533	122.356	22.994	0.583	133.975

Source: Natural Power

Treated counts of kittiwake (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.2.

Table 5.2: Kittiwake treated counts and estimated densities and abundances within the array site and array site plus a 2 km buffer for each boat-based ESAS survey.

Survey	Oct - 18	Jan - 19	Feb - 19	Mar - 19	Apr - 19	May - 19	Jun - 19	Aug - 19	Sep - 19 (1)	Sep - 19 (2)	Oct - 19	Sec - 19	Jan - 20	Jul - 20	Aug - 20
array site															
Count	19	5	7	29	217	10	8	61	3	6	8	7	216	25	8
Abundance	99	26	36	151	1132	53	41	318	16	31	41	36	1127	130	41
Density	0.79	0.21	0.29	1.21	9.05	0.42	0.33	2.54	0.13	0.25	0.33	0.29	9.01	1.04	0.33
array site + 2 km buffer															
Count	38	11	182	88	615	14	21	82	8	20	16	14	4630	187	559
Abundance	184	53	884	427	2985	69	101	397	39	96	78	69	22480	907	2714
Density	0.8	0.23	3.85	1.86	13	0.3	0.44	1.73	0.17	0.42	0.34	0.3	97.9	3.95	11.82

Source: Natural Power

5.1.1.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of kittiwake within the array site for each month, calculated for DAS data, are presented in Table 5.3.

Table 5.3: Kittiwake monthly estimated flight densities within array site from DAS data

Density (ind/km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	1.101	0.801	0.767	0.576	1.401	0.676	0.841	1.110	0.223	0.926	2.024	3.773
S.D.	-	0.849	0.226	0.177	0.283	0.035	0.128	0.326	0.315	0.318	0.393	1.601

5.1.1.3. **Biological season mean peak abundance estimates**

Bio-seasonal mean peak abundance estimates of kittiwake within the array site and array site plus 2 km buffer calculated from digital aerial and boat-based ESAS survey datasets are Presented in Table 5.4.

Table 5.4: Kittiwake bio-seasonal mean peak abundances (individuals) in array site and array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	DAS		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
RM (Jan – Apr)	206.645	543.039	1,129.5	12,732.5
MFBS (May – Jul)	249.493	1362.959	91.5	504
PBM (Aug – Dec)	582.804	585.560	208.5	155.5

Source: Natural Power

5.1.2. Common gull

5.1.2.1. Survey data

Treated counts of common gull in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.5.

Table 5.5: Common gull treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.004	0.000	0.023	0.004	0.000	0.023	0.000	0.000	0.000
Aug 20	0.010	0.000	0.060	0.010	0.000	0.060	0.000	0.000	0.000
Sep 20	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.003
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	2.003	0.100	12.546	2.000	0.100	12.524	0.003	0.000	0.022
Dec 20	1.001	0.050	6.270	1.000	0.050	6.262	0.001	0.000	0.008
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	2.003	0.100	12.543	2.000	0.100	12.524	0.003	0.000	0.019
March 21 (2)	2.000	0.100	12.527	2.000	0.100	12.524	0.000	0.000	0.003
April 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
May 21	0.002	0.000	0.012	0.000	0.000	0.000	0.002	0.000	0.012
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
Aug 21	0.005	0.000	0.030	0.005	0.000	0.030	0.000	0.000	0.000
Sep 21	0.044	0.002	0.277	0.044	0.002	0.277	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	1.046	0.052	6.550	1.043	0.052	6.532	0.003	0.000	0.018
Dec 21	3.135	0.157	19.633	3.135	0.157	19.631	0.000	0.000	0.003
Jan 22	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
Feb 22	6.000	0.300	37.572	6.000	0.300	37.572	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
array site + 2 km buffer									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.006	0.000	0.033	0.000	0.000	0.000	0.006	0.000	0.033
Jul 20	0.004	0.000	0.022	0.004	0.000	0.022	0.000	0.000	0.000
Aug 20	0.010	0.000	0.056	0.010	0.000	0.056	0.000	0.000	0.000
Sep 20	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.002
Oct 20	1.003	0.025	5.844	1.000	0.025	5.826	0.003	0.000	0.017
Nov 20	3.004	0.076	17.502	3.000	0.076	17.479	0.004	0.000	0.023
Dec 20	4.003	0.102	23.320	4.000	0.101	23.306	0.003	0.000	0.015
Feb 21	2.000	0.051	11.653	2.000	0.051	11.653	0.000	0.000	0.000

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
March 21 (1)	4.003	0.102	23.323	4.000	0.101	23.306	0.003	0.000	0.017
March 21 (2)	3.092	0.078	18.014	3.088	0.078	17.994	0.003	0.000	0.020
April 21	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000
May 21	0.035	0.001	0.205	0.010	0.000	0.058	0.025	0.001	0.147
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
Aug 21	0.005	0.000	0.028	0.005	0.000	0.028	0.000	0.000	0.000
Sep 21	0.044	0.001	0.257	0.044	0.001	0.257	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	1.083	0.027	6.310	1.075	0.027	6.266	0.008	0.000	0.045
Dec 21	14.232	0.361	82.923	14.223	0.361	82.871	0.009	0.000	0.052
Jan 22	6.000	0.152	34.959	6.000	0.152	34.959	0.000	0.000	0.000
Feb 22	10.000	0.254	58.265	9.000	0.228	52.438	1.000	0.025	5.826
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	3.003	0.076	17.496	2.000	0.051	11.653	1.003	0.025	5.843

Source: Natural Power

Treated counts of common gull (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.6.

Table 5.6: Common gull treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct - 18	Jan - 19	Feb - 19	Mar - 19	Apr - 19	May - 19	Jun - 19	Aug - 19	Sep - 19 (1)	Sep - 19 (2)	Oct - 19	Sec - 19	Jan - 20	Jul - 20	Aug - 20
array site															
Count	1	0	1	2	0	0	0	0	0	0	1	1	11	0	0
Abundance	5	0	5	10	0	0	0	0	0	0	5	5	58	0	0
Density	0.04	0	0.04	0.08	0	0	0	0	0	0	0.04	0.04	0.46	0	0
array site + 2 km buffer															
Count	2	0	3	5	1	0	0	0	0	0	2	4	13	0	0
Abundance	9	0	14	25	5	0	0	0	0	0	9	18	62	0	0
Density	0.04	0	0.06	0.11	0.02	0	0	0	0	0	0.04	0.08	0.27	0	0

Source: Natural Power

5.1.2.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of common gull within the array site for each month, calculated for DAS data, are presented in Table 5.7.

Table 5.7: Common gull monthly estimated flight densities within array site from DAS data

Density (indiv./ km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	0.050	0.150	0.067	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.076	0.103
S.D.	-	0.212	0.058	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.034	0.076

Source: Natural Power

5.1.2.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of common gull within the array site and array site plus 2 km buffer calculated from digital aerial and boat-based ESAS survey datasets are Presented in Table 5.8.

Table 5.8: Common gull bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
RM (Jan – Apr)	25.057	40.794	34	43.5
MFBS (May – Jul)	0.018	0.119	0	0
PBM (Aug – Dec)	16.089	53.122	5	13.5

Source: Natural Power

5.1.3. Black-headed gull

5.1.3.1. Survey data

Treated counts of black-headed gull in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.9.

Table 5.9: Black-headed gull treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.001	0.000	0.005	0.001	0.000	0.005	0.000	0.000	0.000
Aug 20	0.002	0.000	0.012	0.002	0.000	0.012	0.000	0.000	0.000
Sep 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
April 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
May 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.001	0.000	0.006	0.001	0.000	0.006	0.000	0.000	0.000
Sep 21	0.011	0.001	0.069	0.011	0.001	0.069	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.011	0.001	0.068	0.011	0.001	0.068	0.000	0.000	0.000
Dec 21	1.034	0.052	6.473	1.034	0.052	6.473	0.000	0.000	0.000
Jan 22	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	3.000	0.150	18.786	3.000	0.150	18.786	0.000	0.000	0.000
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
array site + 2 km buffer									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.001	0.000	0.004	0.001	0.000	0.004	0.000	0.000	0.000
Aug 20	0.002	0.000	0.011	0.002	0.000	0.011	0.000	0.000	0.000
Sep 20	2.000	0.051	11.653	2.000	0.051	11.653	0.000	0.000	0.000
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (2)	0.022	0.001	0.129	0.022	0.001	0.129	0.000	0.000	0.000
April 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
May 21	0.002	0.000	0.012	0.002	0.000	0.012	0.000	0.000	0.000
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.001	0.000	0.006	0.001	0.000	0.006	0.000	0.000	0.000
Sep 21	0.011	0.000	0.064	0.011	0.000	0.064	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.019	0.000	0.110	0.019	0.000	0.110	0.000	0.000	0.000
Dec 21	2.056	0.052	11.978	2.056	0.052	11.978	0.000	0.000	0.000
Jan 22	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	3.000	0.076	17.479	3.000	0.076	17.479	0.000	0.000	0.000
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Natural Power

Treated counts of black-headed gull (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.10.

Table 5.10: Black-headed gull treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct - 18	Jan - 19	Feb - 19	Mar - 19	Apr - 19	May - 19	Jun - 19	Aug - 19	Sep - 19 (1)	Sep - 19 (2)	Oct - 19	Sec - 19	Jan - 20	Jul - 20	Aug - 20
array site															
Count	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Abundance	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0
Density	0	0	0	0	0	0	0	0	0	0	0	0	0.04	0	0
array site + 2 km buffer															
Count	16	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Abundance	78	0	0	0	0	0	0	0	0	0	0	0	5	0	0
Density	0.34	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0

Source: Natural Power

5.1.3.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of black-headed gull within the array site for each month, calculated for DAS data, are presented in Table 5.11.

Table 5.11: Common gull monthly estimated flight densities within array site from DAS data

Density (indiv./ km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	0.050	0.000	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.026
S.D.	-	0.000	0.087	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.037

Source: Natural Power

5.1.3.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of black-headed gull within the array site and array site plus 2 km buffer calculated from digital aerial and boat-based ESAS survey datasets are Presented in Table 5.12.

Table 5.12: Black-headed gull bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
RM (Jan – Apr)	9.393	8.804	2.5	2.5
MFBS (May – Jul)	0.002	0.008	0	0
PBM (Aug – Dec)	6.485	11.815	0	39

Source: Natural Power

5.1.4. Little gull

5.1.4.1. Survey data

Treated counts of little gull in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.13.

Table 5.13: Little gull treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.001	0.000	0.009	0.001	0.000	0.009	0.000	0.000	0.000
Aug 20	0.004	0.000	0.024	0.004	0.000	0.024	0.000	0.000	0.000
Sep 20	0.001	0.000	0.006	0.000	0.000	0.000	0.001	0.000	0.006
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	1.008	0.050	6.313	1.000	0.050	6.262	0.008	0.000	0.051
Dec 20	0.003	0.000	0.018	0.000	0.000	0.000	0.003	0.000	0.018
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	0.007	0.000	0.043	0.000	0.000	0.000	0.007	0.000	0.043
March 21 (2)	0.001	0.000	0.006	0.000	0.000	0.000	0.001	0.000	0.006
April 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
May 21	0.002	0.000	0.012	0.000	0.000	0.000	0.002	0.000	0.012
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
Aug 21	0.002	0.000	0.012	0.002	0.000	0.012	0.000	0.000	0.000
Sep 21	0.019	0.001	0.121	0.019	0.001	0.121	0.000	0.000	0.000
Oct 21	4.000	0.200	25.048	1.000	0.050	6.262	3.000	0.150	18.786
Nov 21	4.026	0.201	25.209	4.019	0.201	25.166	0.007	0.000	0.043
Dec 21	12.060	0.604	75.519	12.059	0.604	75.513	0.001	0.000	0.006
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
array site + 2 km buffer									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.006	0.000	0.033	0.000	0.000	0.000	0.006	0.000	0.033
Jul 20	0.002	0.000	0.009	0.001	0.000	0.009	0.000	0.000	0.000
Aug 20	0.004	0.000	0.022	0.004	0.000	0.022	0.000	0.000	0.000
Sep 20	5.001	0.127	29.138	5.000	0.127	29.132	0.001	0.000	0.006
Oct 20	0.007	0.000	0.040	0.000	0.000	0.000	0.007	0.000	0.040
Nov 20	2.009	0.051	11.706	2.000	0.051	11.653	0.009	0.000	0.053
Dec 20	0.006	0.000	0.034	0.000	0.000	0.000	0.006	0.000	0.034
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
March 21 (1)	0.007	0.000	0.040	0.000	0.000	0.000	0.007	0.000	0.040
March 21 (2)	0.047	0.001	0.271	0.039	0.001	0.225	0.008	0.000	0.046
April 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
May 21	0.029	0.001	0.170	0.004	0.000	0.023	0.025	0.001	0.147
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
Aug 21	0.002	0.000	0.011	0.002	0.000	0.011	0.000	0.000	0.000
Sep 21	0.019	0.000	0.113	0.019	0.000	0.113	0.000	0.000	0.000
Oct 21	4.000	0.101	23.306	1.000	0.025	5.826	3.000	0.076	17.479
Nov 21	4.051	0.103	23.602	4.033	0.102	23.498	0.018	0.000	0.104
Dec 21	18.119	0.460	105.567	17.098	0.434	99.619	1.021	0.026	5.948
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
Apr 22	0.003	0.000	0.017	0.000	0.000	0.000	0.003	0.000	0.017

Source: Natural Power

Treated counts of little gull (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.14.

Table 5.14: Little gull treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct - 18	Jan - 19	Feb - 19	Mar - 19	Apr - 19	May - 19	Jun - 19	Aug - 19	Sep - 19 (1)	Sep - 19 (2)	Oct - 19	Sec - 19	Jan - 20	Jul - 20	Aug - 20
array site															
Count	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abundance	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Density	0.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
array site + 2 km buffer															
Count	20	0	0	0	1	0	0	0	0	0	3	0	7	0	0
Abundance	96	0	0	0	5	0	0	0	0	0	14	0	34	0	0
Density	0.42	0	0	0	0.02	0	0	0	0	0	0.06	0	0.15	0	0

Source: Natural Power

5.1.4.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of little gull within the array site for each month, calculated for DAS data, are presented in Table 5.15.

Table 5.15: Little gull monthly estimated flight densities within array site from DAS data

Density (indiv./ km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.025	0.126	0.302
S.D.	-	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.035	0.107	0.427

Source: Natural Power

5.1.4.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of little gull within the array site and array site plus 2 km buffer calculated from digital aerial and boat-based ESAS survey datasets are Presented in Table 5.16.

Table 5.16: Little gull bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
RM (Mar – Apr)	0.022	3.049	0	5
MFBS (May – Sep)	0.072	14.654	0	0
PBM (Oct – Dec)	40.916	58.636	26.5	55
MFW (Jan – Feb)	0.000	0.000	0	17

Source: Natural Power

5.1.5. Great black-backed gull

5.1.5.1. Survey data

Treated counts of great black-backed gull in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.17.

Table 5.17: Great black-backed gull treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	2.111	0.106	13.220	1.111	0.056	6.958	1.000	0.050	6.262
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	5.373	0.269	33.644	0.000	0.000	0.000	5.373	0.269	33.644
March 21 (2)	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
April 21	0.151	0.008	0.945	0.000	0.000	0.000	0.151	0.008	0.945
May 21	14.603	0.731	91.441	6.556	0.328	41.051	8.047	0.403	50.390
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.004	0.000	0.026	0.004	0.000	0.026	0.000	0.000	0.000
Dec 21	3.000	0.150	18.786	1.000	0.050	6.262	2.000	0.100	12.524
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
array site + 2 km buffer									
May 20	2.111	0.054	12.300	1.111	0.028	6.474	1.000	0.025	5.826
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	0.151	0.004	0.879	0.000	0.000	0.000	0.151	0.004	0.879
Sep 20	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000
Oct 20	4.373	0.111	25.477	0.000	0.000	0.000	4.373	0.111	25.477
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	3.000	0.076	17.479	1.000	0.025	5.826	2.000	0.051	11.653

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	7.373	0.187	42.957	1.000	0.025	5.826	6.373	0.162	37.130
March 21 (2)	2.050	0.052	11.946	0.004	0.000	0.024	2.046	0.052	11.923
April 21	2.373	0.060	13.827	0.222	0.006	1.295	2.151	0.055	12.532
May 21	20.594	0.523	119.991	9.683	0.246	56.418	10.911	0.277	63.573
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 21	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.115	0.003	0.671	0.115	0.003	0.671	0.000	0.000	0.000
Dec 21	4.050	0.103	23.599	2.004	0.051	11.677	2.046	0.052	11.923
Jan 22	1.326	0.034	7.728	0.000	0.000	0.000	1.326	0.034	7.728
Feb 22	3.000	0.076	17.479	0.000	0.000	0.000	3.000	0.076	17.479
Mar 22	3.000	0.076	17.479	1.000	0.025	5.826	2.000	0.051	11.653
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Natural Power

Treated counts of great black-backed gull (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.18.

Table 5.18: Great black-backed gull treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct - 18	Jan - 19	Feb - 19	Mar - 19	Apr - 19	May - 19	Jun - 19	Aug - 19	Sep - 19 (1)	Sep - 19 (2)	Oct - 19	Sec - 19	Jan - 20	Jul - 20	Aug - 20
array site															
Count	0	0	2	8	1	2	0	0	1	0	2	1	1	2	0
Abundance	0	0	10	41	5	10	0	0	5	0	10	5	5	10	0
Density	0	0	0.08	0.33	0.04	0.08	0	0	0.04	0	0.08	0.04	0.04	0.08	0
array site + 2 km buffer															
Count	1	1	3	9	14	2	0	0	2	0	2	4	2	2	10
Abundance	5	5	14	44	69	9	0	0	9	0	9	18	9	9	48
Density	0.02	0.02	0.06	0.19	0.3	0.04	0	0	0.04	0	0.04	0.08	0.04	0.04	0.21

Source: Natural Power

5.1.5.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of great black-backed gull within the array site for each month, calculated for DAS data, are presented in Table 5.19.

Table 5.19: Great black-backed gull monthly estimated flight densities within array site from DAS data

Density (indiv./ km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	0.000	0.000	0.000	0.000	0.192	0.000	0.000	0.000	0.000	0.000	0.000	0.025
S.D.	-	0.000	0.000	0.000	0.193	0.000	0.000	0.000	0.000	0.000	0.000	0.035

Source: Natural Power

5.1.5.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of great black-backed gull within the array site and array site plus 2 km buffer calculated from digital aerial and boat-based ESAS survey datasets are Presented in Table 5.20.

Table 5.20: Great black-backed gull bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
B (Apr – Aug)	52.330	66.909	10	58.5
NB (Sep – Mar)	26.215	33.278	25.5	31

Source: Natural Power

5.1.6. Herring gull

5.1.6.1. Survey data

Treated counts of herring gull in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.21.

Table 5.21: Herring gull treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	5.833	0.292	36.528	0.833	0.042	5.218	5.000	0.250	31.310
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	3.000	0.150	18.786	0.000	0.000	0.000	3.000	0.150	18.786
Sep 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 21	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
March 21 (1)	20.714	1.037	129.709	1.000	0.050	6.262	19.714	0.987	123.447
March 21 (2)	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
April 21	1.843	0.092	11.539	0.000	0.000	0.000	1.843	0.092	11.539
May 21	39.429	1.973	246.902	34.167	1.710	213.951	5.262	0.263	32.951
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
Aug 21	6.000	0.300	37.572	6.000	0.300	37.572	0.000	0.000	0.000
Sep 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.031	0.002	0.192	0.031	0.002	0.192	0.000	0.000	0.000
Dec 21	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	3.000	0.150	18.786	3.000	0.150	18.786	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
array site + 2 km buffer									
May 20	6.833	0.173	39.814	0.833	0.021	4.855	6.000	0.152	34.959
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	7.843	0.199	45.696	1.000	0.025	5.826	6.843	0.174	39.869
Sep 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 20	3.714	0.094	21.638	1.000	0.025	5.826	2.714	0.069	15.811
Nov 20	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
Dec 20	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
Feb 21	3.000	0.076	17.479	2.000	0.051	11.653	1.000	0.025	5.826

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
March 21 (1)	27.714	0.703	161.473	4.000	0.101	23.306	23.714	0.602	138.167
March 21 (2)	22.119	0.561	128.875	12.030	0.305	70.094	10.089	0.256	58.781
April 21	7.509	0.191	43.753	5.667	0.144	33.017	1.843	0.047	10.737
May 21	89.209	2.264	519.776	60.123	1.526	350.303	29.087	0.738	169.472
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000
Aug 21	17.000	0.431	99.050	9.000	0.228	52.438	8.000	0.203	46.612
Sep 21	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.858	0.022	4.998	0.858	0.022	4.998	0.000	0.000	0.000
Dec 21	1.119	0.028	6.519	1.030	0.026	6.002	0.089	0.002	0.517
Jan 22	2.625	0.067	15.294	2.000	0.051	11.653	0.625	0.016	3.642
Feb 22	10.000	0.254	58.265	6.000	0.152	34.959	4.000	0.101	23.306
Mar 22	4.000	0.101	23.306	4.000	0.101	23.306	0.000	0.000	0.000
Apr 22	2.000	0.051	11.653	2.000	0.051	11.653	0.000	0.000	0.000

Source: Natural Power

Treated counts of herring gull (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.22.

Table 5.22: Herring gull treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct - 18	Jan - 19	Feb - 19	Mar - 19	Apr - 19	May - 19	Jun - 19	Aug - 19	Sep - 19 (1)	Sep - 19 (2)	Oct - 19	Sec - 19	Jan - 20	Jul - 20	Aug - 20
array site															
Count	9	2	4	8	2	0	3	13	0	0	2	2	9	11	0
Abundance	48	10	21	41	10	0	16	68	0	0	10	10	48	58	0
Density	0.38	0.08	0.17	0.33	0.08	0	0.13	0.54	0	0	0.08	0.08	0.38	0.46	0
array site + 2 km buffer															
Count	20	17	20	13	8	2	7	14	0	0	4	3	53	64	6
Abundance	96	83	96	62	39	9	34	69	0	0	18	14	257	310	30
Density	0.42	0.36	0.42	0.27	0.17	0.04	0.15	0.3	0	0	0.08	0.06	1.12	1.35	0.13

Source: Natural Power

5.1.6.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of herring gull within the array site for each month, calculated for DAS data, are presented in Table 5.23.

Table 5.23: Herring gull monthly estimated flight densities within array site from DAS data

Density (indiv / km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	0.000	0.100	0.033	0.025	0.876	0.000	0.025	0.150	0.000	0.000	0.001	0.025
S.D.	-	0.071	0.029	0.035	1.180	0.000	0.035	0.212	0.000	0.000	0.001	0.035

Source: Natural Power

5.1.6.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of herring gull within the array site and array site plus 2 km buffer calculated from digital aerial and boat-based ESAS survey datasets are Presented in Table 5.24.

Table 5.24: Herring gull bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
B (Apr – Aug)	141.715	282.736	63	189.5
NB (Sep – Mar)	74.247	109.869	48	176.5

Source: Natural Power

5.1.7. Lesser black-backed gull

5.1.7.1. Survey data

Treated counts of lesser black-backed gull in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.25.

Table 5.25: Lesser black-backed gull treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	0.056	0.003	0.348	0.056	0.003	0.348	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	0.056	0.003	0.348	0.000	0.000	0.000	0.056	0.003	0.348
March 21 (2)	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
April 21	1.006	0.050	6.301	1.000	0.050	6.262	0.006	0.000	0.039
May 21	1.280	0.064	8.014	1.278	0.064	8.001	0.002	0.000	0.012
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.002	0.000	0.014	0.002	0.000	0.014	0.000	0.000	0.000
Dec 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
array site + 2 km buffer									
May 20	0.056	0.001	0.324	0.056	0.001	0.324	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	0.006	0.000	0.037	0.000	0.000	0.000	0.006	0.000	0.037
Sep 20	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000
Oct 20	0.056	0.001	0.323	0.000	0.000	0.000	0.056	0.001	0.323
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	0.056	0.001	0.323	0.000	0.000	0.000	0.056	0.001	0.323
March 21 (2)	2.009	0.051	11.706	1.002	0.025	5.840	1.007	0.026	5.867
April 21	2.117	0.054	12.337	2.111	0.054	12.300	0.006	0.000	0.037
May 21	1.379	0.035	8.037	1.342	0.034	7.816	0.038	0.001	0.221
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.064	0.002	0.373	0.064	0.002	0.373	0.000	0.000	0.000
Dec 21	0.009	0.000	0.053	0.002	0.000	0.013	0.007	0.000	0.040
Jan 22	0.049	0.001	0.283	0.000	0.000	0.000	0.049	0.001	0.283
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000

Source: Natural Power

Treated counts of lesser black-backed gull (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.26.

Table 5.26: Lesser black-backed gull treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct - 18	Jan - 19	Feb - 19	Mar - 19	Apr - 19	May - 19	Jun - 19	Aug - 19	Sep - 19 (1)	Sep - 19 (2)	Oct - 19	Sec - 19	Jan - 20	Jul - 20	Aug - 20
array site															
Count	0	0	0	0	0	1	1	0	0	0	0	0	0	2	0
Abundance	0	0	0	0	0	5	5	0	0	0	0	0	0	10	0
Density	0	0	0	0	0	0.04	0.04	0	0	0	0	0	0	0.08	0
array site + 2 km buffer															
Count	0	0	0	0	1	3	2	0	0	0	0	0	1	4	4
Abundance	0	0	0	0	5	14	9	0	0	0	0	0	5	18	18
Density	0	0	0	0	0.02	0.06	0.04	0	0	0	0	0	0.02	0.08	0.08

Source: Natural Power

5.1.7.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of lesser black-backed gull within the array site for each month, calculated for DAS data, are presented in Table 5.27.

Table 5.27: Lesser black-backed gull monthly estimated flight densities within array site from DAS data

Density (indiv./ km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	0.000	0.000	0.017	0.025	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.000
S.D.	-	0.000	0.029	0.035	0.043	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Natural Power

5.1.7.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of lesser black-backed gull within the array site and array site plus 2 km buffer calculated from digital aerial and boat-based ESAS survey datasets are Presented in Table 5.28.

Table 5.28: Lesser black-backed gull bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
RM (Mar – Apr)	3.151	9.082	0	5
MFBS (May – Jul)	4.181	4.181	7.5	16
PBM (Aug – Oct)	0.000	2.913	0	9
MFW (Nov – Feb)	0.007	0.187	0	2.5

Source: Natural Power

5.1.8. Roseate tern

5.1.8.1. Survey data

A single roseate tern was recorded in flight during DAS surveys within the 2 km buffer area of Project in August 2020 (Table 5.29), with an extrapolated abundance of n = 5.826. The flight density was calculated as being 0.025 individuals per km^2. No roseate terns were recorded within the array area during baseline DAS surveys.

No roseate terns were recorded within the array site during boat-based ESAS surveys. Treated counts of roseate tern (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.29.

Table 5.29: Roseate tern treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct - 18	Jan - 19	Feb - 19	Mar - 19	Apr - 19	May - 19	Jun - 19	Aug - 19	Sep - 19 (1)	Sep - 19 (2)	Oct - 19	Sec - 19	Jan - 20	Jul - 20	Aug - 20
array site + 2 km buffer															
Count	0	0	0	0	0	0	0	0	0	0	0	0	0	5	4
Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	25	18
Density	0	0	0	0	0	0	0	0	0	0	0	0	0	0.11	0.08

Source: Natural Power

5.1.8.2. Monthly mean flight density estimates

No roseate terns were recorded in flight within the array site during digital aerial surveys.

5.1.8.3. Biological seasonal mean peak estimates

Bio-seasonal mean peak abundance estimates of roseate tern within the array site and array site plus 2 km buffer calculated from digital aerial and boat-based ESAS survey datasets are Presented in Table 5.30.

Table 5.30: Roseate tern bio-seasonal mean peak abundance (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
RM (Apr – May)	0	0	0	0
MFBS (Jun)	0	0	0	0
PBM (Jul – Sep)	0	2.913	0	12.5
MFW (Oct – Mar)	0	0	0	0

Source: Natural Power

5.1.9. Common tern

5.1.9.1. Survey data

Treated counts of common tern in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.31.

Table 5.31: Common tern treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.684	0.034	4.281	0.684	0.034	4.281	0.000	0.000	0.000
Jul 20	1.684	0.084	10.543	1.684	0.084	10.543	0.000	0.000	0.000
Aug 20	23.847	1.193	149.330	20.316	1.017	127.216	3.532	0.177	22.114
Sep 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
April 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
May 21	5.367	0.269	33.611	5.367	0.269	33.611	0.000	0.000	0.000
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	1.677	0.084	10.498	1.677	0.084	10.498	0.000	0.000	0.000
Aug 21	56.142	2.810	351.561	52.611	2.633	329.446	3.532	0.177	22.114
Sep 21	34.052	1.704	213.234	29.052	1.454	181.924	5.000	0.250	31.310
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
array site + 2 km buffer									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	1.367	0.035	7.967	1.367	0.035	7.967	0.000	0.000	0.000
Jul 20	2.367	0.060	13.794	2.367	0.060	13.794	0.000	0.000	0.000
Aug 20	108.427	2.751	631.745	99.951	2.536	582.362	8.476	0.215	49.383
Sep 20	11.417	0.290	66.521	10.417	0.264	60.695	1.000	0.025	5.826
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
April 21	2.684	0.068	15.637	2.684	0.068	15.637	0.000	0.000	0.000
May 21	30.910	0.784	180.094	30.910	0.784	180.094	0.000	0.000	0.000
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	4.044	0.103	23.562	4.044	0.103	23.562	0.000	0.000	0.000
Aug 21	121.878	3.093	710.118	78.794	1.999	459.088	43.084	1.093	251.029
Sep 21	40.052	1.016	233.362	35.052	0.889	204.230	5.000	0.127	29.132
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Natural Power

Treated counts of common tern (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.32.

Table 5.32: Common tern treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct - 18	Jan - 19	Feb - 19	Mar - 19	Apr - 19	May - 19	Jun - 19	Aug - 19	Sep - 19 (1)	Sep - 19 (2)	Oct - 19	Sec - 19	Jan - 20	Jul - 20	Aug - 20
array site															
Count	0	0	0	0	1	0	0	4	0	0	0	0	0	0	2
Abundance	0	0	0	0	5	0	0	21	0	0	0	0	0	0	10
Density	0	0	0	0	0.04	0	0	0.17	0	0	0	0	0	0	0.08
array site + 2 km buffer															
Count	0	0	0	0	3	0	0	12	34	2	0	0	0	19	60
Abundance	0	0	0	0	14	0	0	57	165	9	0	0	0	92	292
Density	0	0	0	0	0.06	0	0	0.25	0.72	0.04	0	0	0	0.4	1.27

Source: Natural Power

5.1.9.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of common tern within the array site for each month, calculated for DAS data, are presented in Table 5.33.

Table 5.33: Common tern monthly estimated flight densities within array site from DAS data

Density (indiv./ km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	0.000	0.000	0.000	0.000	0.134	0.017	0.084	1.825	0.727	0.000	0.000	0.000
S.D.	-	0.000	0.000	0.000	0.190	0.024	0.000	1.143	1.028	0.000	0.000	0.000

Source: Natural Power

5.1.9.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of common tern within the array site and array site plus 2 km buffer calculated from digital aerial and boat-based ESAS survey datasets are Presented in Table 5.34.

Table 5.34: Common tern bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
RM (Apr – May)	16.805	97.865	5	14
MFBS (Jun)	2.141	3.984	0	0
PBM (Jul – Sep)	250.445	670.931	15.5	228.5

Source: Natural Power

5.1.10. Arctic tern

5.1.10.1. Survey data

Treated counts of Arctic tern in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.35.

Table 5.35: Arctic tern treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.316	0.016	1.981	0.316	0.016	1.981	0.000	0.000	0.000
Jul 20	0.316	0.016	1.981	0.316	0.016	1.981	0.000	0.000	0.000
Aug 20	14.478	0.725	90.664	13.010	0.651	81.468	1.469	0.073	9.196
Sep 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
April 21	2.000	0.100	12.524	2.000	0.100	12.524	0.000	0.000	0.000
May 21	1.633	0.082	10.223	1.633	0.082	10.223	0.000	0.000	0.000
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	1.313	0.066	8.222	1.313	0.066	8.222	0.000	0.000	0.000
Aug 21	7.989	0.400	50.027	6.521	0.326	40.831	1.469	0.073	9.196
Sep 21	0.691	0.035	4.326	0.691	0.035	4.326	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
array site + 2 km buffer									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	1.633	0.041	9.512	1.633	0.041	9.512	0.000	0.000	0.000
Jul 20	0.633	0.016	3.686	0.633	0.016	3.686	0.000	0.000	0.000
Aug 20	57.509	1.459	335.072	53.984	1.370	314.537	3.524	0.089	20.535
Sep 20	2.401	0.061	13.990	2.401	0.061	13.990	0.000	0.000	0.000
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
March 21 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
April 21	3.316	0.084	19.322	3.316	0.084	19.322	0.000	0.000	0.000
May 21	19.285	0.489	112.362	19.285	0.489	112.362	0.000	0.000	0.000
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	4.946	0.125	28.815	4.946	0.125	28.815	0.000	0.000	0.000
Aug 21	31.222	0.792	181.911	13.306	0.338	77.526	17.916	0.455	104.385
Sep 21	0.691	0.018	4.025	0.691	0.018	4.025	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Natural Power

Treated counts of Artic tern (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.36.

Table 5.36: Arctic tern treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct - 18	Jan - 19	Feb - 19	Mar - 19	Apr - 19	May - 19	Jun - 19	Aug - 19	Sep - 19 (1)	Sep - 19 (2)	Oct - 19	Sec - 19	Jan - 20	Jul - 20	Aug - 20
array site															
Count	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Abundance	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
Density	0	0	0	0	0	0	0	0	0	0	0	0	0	0.04	0
array site + 2 km buffer															
Count	0	0	0	0	1	0	0	0	0	0	0	0	0	8	47
Abundance	0	0	0	0	5	0	0	0	0	0	0	0	0	39	227
Density	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0.17	0.99

Source: Natural Power

5.1.10.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of Arctic tern within the array site for each month, calculated for DAS data, are presented in Table 5.37.

Table 5.37: Arctic tern monthly estimated flight densities within array site from DAS data

Density (indiv./ km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	0.000	0.000	0.000	0.050	0.041	0.008	0.041	0.489	0.017	0.000	0.000	0.000
S.D.	-	0.000	0.000	0.071	0.058	0.011	0.035	0.230	0.024	0.000	0.000	0.000

Source: Natural Power

5.1.10.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of Arctic tern within the array site and array site plus 2 km buffer calculated from digital aerial and boat-based ESAS survey datasets are Presented in Table 5.38.

Table 5.38: Arctic tern bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
RM (Apr – May)	11.374	65.842	0	5
MFBS (Jun)	0.990	4.756	0	0
PBM (Jul – Sep)	70.345	258.492	2.5	113.5

Source: Natural Power

5.1.11. Sandwich tern

5.1.11.1. Survey data

Treated counts of Sandwich tern in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.39.

Table 5.39: Sandwich tern treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	1.092	0.055	6.838	1.092	0.055	6.838	0.000	0.000	0.000
Sep 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
April 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
May 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.011	0.001	0.066	0.011	0.001	0.066	0.000	0.000	0.000
Aug 21	0.078	0.004	0.486	0.078	0.004	0.486	0.000	0.000	0.000
Sep 21	0.275	0.014	1.722	0.275	0.014	1.722	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
array site + 2 km buffer									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	1.482	0.038	8.635	1.482	0.038	8.635	0.000	0.000	0.000
Sep 20	1.182	0.030	6.886	1.182	0.030	6.886	0.000	0.000	0.000
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
April 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
May 21	0.014	0.000	0.084	0.014	0.000	0.084	0.000	0.000	0.000
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.011	0.000	0.061	0.011	0.000	0.061	0.000	0.000	0.000
Aug 21	0.109	0.003	0.636	0.109	0.003	0.636	0.000	0.000	0.000
Sep 21	1.275	0.032	7.429	1.275	0.032	7.429	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Natural Power

No Sandwich tern were recorded within the array site or array site plus 2 km during boat-based ESAS surveys.

5.1.11.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of Sandwich tern within the array site for each month, calculated for DAS data, are presented in Table 5.40.

Table 5.40: Sandwich tern monthly estimated flight densities within array site from DAS data

Density (indiv./ km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.029	0.007	0.000	0.000	0.000
S.D.	-	0.000	0.000	0.000	0.000	0.000	0.000	0.036	0.010	0.000	0.000	0.000

Source: Natural Power

5.1.11.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of Sandwich tern within the array site and array site plus 2 km buffer calculated from digital aerial and boat-based ESAS survey datasets are Presented in Table 5.41.

Table 5.41: Sandwich tern bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
RM (Apr – May)	0.000	0.042	0	0
MFBS (Jun)	0.000	0.000	0	0

PBM (Jul – Sep)	4.280	8.032	0	0

Source: Natural Power

5.1.12. Guillemot

5.1.12.1. Survey data

Treated counts of guillemot in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.42.

Table 5.42: Guillemot treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km^2)	Abundance	Treated count	Density (indiv/km^2)	Abundance	Treated count	Density (indiv/km^2)	Abundance
array site									
May 20	121.818	6.097	762.822	2.452	0.123	15.357	119.366	5.974	747.466
Jun 20	138.523	6.933	867.431	4.000	0.200	25.048	134.523	6.732	842.383
Jul 20	28.550	1.429	178.779	3.328	0.167	20.840	25.222	1.262	157.938
Aug 20	432.774	21.659	2710.023	0.905	0.045	5.665	431.869	21.613	2704.357
Sep 20	112.686	5.640	705.638	1.000	0.050	6.262	111.686	5.589	699.376
Oct 20	62.369	3.121	390.550	7.000	0.350	43.834	55.369	2.771	346.717
Nov 20	28.680	1.435	179.592	5.000	0.250	31.310	23.680	1.185	148.282
Dec 20	113.471	5.679	710.554	9.879	0.494	61.860	103.592	5.184	648.694
Feb 21	24.039	1.203	150.533	1.000	0.050	6.262	23.039	1.153	144.271
March 21 (1)	43.359	2.170	271.516	24.000	1.201	150.288	19.359	0.969	121.229
March 21 (2)	42.194	2.112	264.216	10.551	0.528	66.073	31.642	1.584	198.143
April 21	213.212	10.670	1335.131	39.000	1.952	244.217	174.212	8.719	1090.914
May 21	112.969	5.654	707.412	24.000	1.201	150.288	88.969	4.453	557.125
Jun 21	8.000	0.400	50.096	0.000	0.000	0.000	8.000	0.400	50.096
Jul 21	91.411	4.575	572.416	0.452	0.023	2.833	90.959	4.552	569.584
Aug 21	2034.512	101.820	12740.077	0.000	0.000	0.000	2034.512	101.820	12740.077
Sep 21	312.112	15.620	1954.440	1.000	0.050	6.262	311.112	15.570	1948.178
Oct 21	21.916	1.097	137.235	0.776	0.039	4.858	21.140	1.058	132.378
Nov 21	34.844	1.744	218.195	1.000	0.050	6.262	33.844	1.694	211.933
Dec 21	113.794	5.695	712.576	3.551	0.178	22.239	110.242	5.517	690.336
Jan 22	74.680	3.737	467.643	45.000	2.252	281.789	29.680	1.485	185.854
Feb 22	53.680	2.686	336.141	43.000	2.152	269.265	10.680	0.534	66.876
Mar 22	14.655	0.733	91.772	3.000	0.150	18.786	11.655	0.583	72.986
Apr 22	23.000	1.151	144.026	4.000	0.200	25.048	19.000	0.951	118.978
array site + 2 km buffer									
May 20	359.415	9.120	2094.122	9.357	0.237	54.519	350.058	8.883	2039.603
Jun 20	325.300	8.254	1895.352	11.452	0.291	66.727	313.848	7.964	1828.625
Jul 20	98.357	2.496	573.076	9.328	0.237	54.350	89.029	2.259	518.727
Aug 20	1007.283	25.559	5868.903	1.357	0.034	7.907	1005.926	25.525	5860.997
Sep 20	276.068	7.005	1608.500	4.551	0.115	26.519	271.516	6.890	1581.981
Oct 20	128.060	3.249	746.139	12.000	0.304	69.918	116.060	2.945	676.221

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
Nov 20	61.955	1.572	360.978	9.000	0.228	52.438	52.955	1.344	308.540
Dec 20	225.434	5.720	1313.482	17.430	0.442	101.556	208.004	5.278	1211.926
Feb 21	52.054	1.321	303.291	1.000	0.025	5.826	51.054	1.295	297.465
March 21 (1)	126.612	3.213	737.701	47.000	1.193	273.844	79.612	2.020	463.857
March 21 (2)	225.630	5.725	1314.626	58.551	1.486	341.148	167.079	4.240	973.478
April 21	910.630	23.107	5305.754	151.904	3.854	885.062	758.726	19.252	4420.692
May 21	333.277	8.457	1941.826	57.857	1.468	337.104	275.419	6.989	1604.722
Jun 21	12.000	0.304	69.918	0.000	0.000	0.000	12.000	0.304	69.918
Jul 21	260.956	6.622	1520.452	1.452	0.037	8.462	259.504	6.585	1511.990
Aug 21	3571.877	90.634	20811.425	0.000	0.000	0.000	3571.877	90.634	20811.425
Sep 21	807.424	20.488	4704.429	4.000	0.101	23.306	803.424	20.386	4681.123
Oct 21	50.563	1.283	294.603	4.040	0.103	23.540	46.523	1.180	271.063
Nov 21	77.274	1.961	450.232	2.220	0.056	12.933	75.054	1.904	437.299
Dec 21	201.037	5.101	1171.334	6.551	0.166	38.172	194.485	4.935	1133.162
Jan 22	201.036	5.101	1171.331	126.000	3.197	734.135	75.036	1.904	437.196
Feb 22	107.357	2.724	625.509	60.000	1.522	349.588	47.357	1.202	275.921
Mar 22	60.012	1.523	349.658	7.000	0.178	40.785	53.012	1.345	308.873
Apr 22	74.611	1.893	434.718	16.000	0.406	93.223	58.611	1.487	341.494

Source: Natural Power

Treated counts of guillemot (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.43.

Table 5.43: Guillemot treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct - 18	Jan - 19	Feb - 19	Mar - 19	Apr - 19	May - 19	Jun - 19	Aug - 19	Sep - 19 (1)	Sep - 19 (2)	Oct - 19	Sec - 19	Jan - 20	Jul - 20	Aug - 20
array site															
Count	62	34	119	120	325	22	24	401	27	131	30	127	171	206	57
Abundance	325	178	621	624	1695	115	125	2091	141	682	156	663	892	1075	298
Density	2.6	1.42	4.96	4.99	13.55	0.92	1	16.71	1.13	5.45	1.25	5.3	7.13	8.59	2.38
array site + 2 km buffer															
Count	134	114	345	259	1192	53	68	592	73	301	50	208	445	1193	536
Abundance	650	553	1674	1261	5786	257	331	2873	354	1460	243	1008	2161	5793	2602
Density	2.83	2.41	7.29	5.49	25.2	1.12	1.44	12.51	1.54	6.36	1.06	4.39	9.41	25.23	11.33

Source: Natural Power

5.1.12.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of guillemot within the array site for each month, calculated for DAS data, are presented in Table 5.44.

Table 5.44: Guillemot monthly estimated flight densities within array site from DAS data

Density (indiv./ km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	2.252	1.101	0.626	1.076	0.662	0.100	0.095	0.023	0.050	0.195	0.150	0.336
S.D.	-	1.486	0.532	1.239	0.763	0.142	0.102	0.032	0.000	0.220	0.142	0.224

Source: Natural Power

5.1.12.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of guillemot within the array site and array site plus 2 km buffer calculated from digital aerial and boat-based ESAS survey datasets are Presented in Table 5.45.

Table 5.45: Guillemot bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
B (Mar – Jul)	1021.272	3623.790	1385	5789.5
NB (Aug – Feb)	7725.050	13340.164	1491.5	2737.5

Source: Natural Power

5.1.13. **Razorbill**

5.1.13.1. **Survey data**

Treated counts of razorbill in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.46.

Table 5.46: Razorbill treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	34.484	1.726	215.941	2.048	0.103	12.826	32.436	1.623	203.115
Jun 20	8.267	0.414	51.765	1.000	0.050	6.262	7.267	0.364	45.503
Jul 20	0.813	0.041	5.092	0.035	0.002	0.219	0.778	0.039	4.873
Aug 20	139.471	6.980	873.367	0.096	0.005	0.603	139.375	6.975	872.764
Sep 20	16.093	0.805	100.772	1.000	0.050	6.262	15.093	0.755	94.510
Oct 20	2.587	0.129	16.201	0.000	0.000	0.000	2.587	0.129	16.201
Nov 20	8.320	0.416	52.101	2.000	0.100	12.524	6.320	0.316	39.577
Dec 20	17.112	0.856	107.157	6.121	0.306	38.332	10.991	0.550	68.825
Feb 21	6.961	0.348	43.589	1.000	0.050	6.262	5.961	0.298	37.327
March 21 (1)	46.641	2.334	292.062	26.000	1.301	162.811	20.641	1.033	129.251
March 21 (2)	29.636	1.483	185.579	2.449	0.123	15.333	27.187	1.361	170.246
April 21	33.158	1.659	207.632	9.000	0.450	56.358	24.158	1.209	151.275
May 21	2.959	0.148	18.528	0.000	0.000	0.000	2.959	0.148	18.528
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	35.971	1.800	225.248	0.048	0.002	0.302	35.923	1.798	224.946
Aug 21	672.525	33.657	4211.341	0.000	0.000	0.000	672.525	33.657	4211.341
Sep 21	173.717	8.694	1087.813	2.000	0.100	12.524	171.717	8.594	1075.289
Oct 21	21.002	1.051	131.514	1.224	0.061	7.666	19.778	0.990	123.848
Nov 21	4.283	0.214	26.818	0.000	0.000	0.000	4.283	0.214	26.818
Dec 21	109.986	5.504	688.733	0.449	0.022	2.809	109.538	5.482	685.924
Jan 22	7.320	0.366	45.839	0.000	0.000	0.000	7.320	0.366	45.839
Feb 22	16.320	0.817	102.197	16.000	0.801	100.192	0.320	0.016	2.006
Mar 22	2.309	0.116	14.458	0.000	0.000	0.000	2.309	0.116	14.458
Apr 22	4.000	0.200	25.048	0.000	0.000	0.000	4.000	0.200	25.048
array site + 2 km buffer									
May 20	62.444	1.584	363.827	4.145	0.105	24.148	58.299	1.479	339.679
Jun 20	24.775	0.629	144.350	1.048	0.027	6.107	23.727	0.602	138.243
Jul 20	3.974	0.101	23.157	2.035	0.052	11.856	1.940	0.049	11.300
Aug 20	341.626	8.669	1990.472	0.145	0.004	0.842	341.481	8.665	1989.630
Sep 20	76.587	1.943	446.229	2.449	0.062	14.266	74.138	1.881	431.963
Oct 20	17.855	0.453	104.034	14.000	0.355	81.571	3.855	0.098	22.464
Nov 20	18.921	0.480	110.243	12.000	0.304	69.918	6.921	0.176	40.325
Dec 20	54.765	1.390	319.084	7.570	0.192	44.106	47.195	1.198	274.979
Feb 21	9.910	0.251	57.741	1.000	0.025	5.826	8.910	0.226	51.915

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
March 21 (1)	91.356	2.318	532.284	41.000	1.040	238.885	50.356	1.278	293.398
March 21 (2)	112.852	2.864	657.526	12.449	0.316	72.531	100.403	2.548	584.995
April 21	122.557	3.110	714.074	17.096	0.434	99.611	105.461	2.676	614.463
May 21	10.574	0.268	61.611	2.091	0.053	12.185	8.483	0.215	49.426
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	109.001	2.766	635.090	0.048	0.001	0.281	108.953	2.765	634.809
Aug 21	1155.039	29.308	6729.797	0.000	0.000	0.000	1155.039	29.308	6729.797
Sep 21	496.192	12.591	2891.049	2.000	0.051	11.653	494.192	12.540	2879.396
Oct 21	66.251	1.681	386.007	4.879	0.124	28.427	61.372	1.557	357.580
Nov 21	11.743	0.298	68.421	2.064	0.052	12.023	9.680	0.246	56.398
Dec 21	165.053	4.188	961.677	0.449	0.011	2.613	164.605	4.177	959.064
Jan 22	8.959	0.227	52.202	0.000	0.000	0.000	8.959	0.227	52.202
Feb 22	27.639	0.701	161.039	20.000	0.507	116.529	7.639	0.194	44.509
Mar 22	8.948	0.227	52.135	2.000	0.051	11.653	6.948	0.176	40.482
Apr 22	5.389	0.137	31.399	0.000	0.000	0.000	5.389	0.137	31.399

Source: Natural Power

Treated counts of razorbill (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.47.

Table 5.47: Razorbill treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct - 18	Jan - 19	Feb - 19	Mar - 19	Apr - 19	May - 19	Jun - 19	Aug - 19	Sep - 19 (1)	Sep - 19 (2)	Oct - 19	Sec - 19	Jan - 20	Jul - 20	Aug - 20
array site															
Count	21	13	11	56	39	5	2	362	7	36	15	13	9	48	44
Abundance	108	68	58	294	204	26	10	1891	36	190	79	68	48	250	230
Density	0.86	0.54	0.46	2.35	1.63	0.21	0.08	15.11	0.29	1.52	0.63	0.54	0.38	2	1.84
array site + 2 km buffer															
Count	62	22	26	127	94	7	8	493	29	85	24	49	32	495	1282
Abundance	301	108	126	615	457	34	39	2395	142	416	117	239	156	2402	6225
Density	1.31	0.47	0.55	2.68	1.99	0.15	0.17	10.43	0.62	1.81	0.51	1.04	0.68	10.46	27.11

Source: Natural Power

5.1.13.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of razorbill within the array site for each month, calculated for DAS data, are presented in Table 5.48.

Table 5.48: Razorbill monthly estimated flight densities within array site from DAS data

Density (indiv./ km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	0.000	0.425	0.475	0.225	0.051	0.025	0.002	0.002	0.075	0.031	0.050	0.164
S.D.	-	0.531	0.718	0.318	0.072	0.035	0.000	0.003	0.035	0.043	0.071	0.201

Source: Natural Power

5.1.13.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of razorbill within the array site and array site plus 2 km buffer calculated from digital aerial and boat-based ESAS survey datasets are Presented in Table 5.49.

Table 5.49: Razorbill bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
RM (Jan – Mar)	197.130	409.282	171	385.5
MFBS (Apr – Jul)	220.594	674.582	227	1429.5
PBM (Aug – Oct)	2542.354	4360.134	1060.5	4310
MFW (Nov – Dec)	397.945	640.381	68	239

Source: Natural Power

5.1.14. **Black guillemot**

5.1.14.1. **Survey data**

Treated counts of black guillemot in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.50.

Table 5.50: Black guillemot treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
April 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
May 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 21	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
array site + 2 km buffer									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 20	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (2)	3.000	0.076	17.479	0.000	0.000	0.000	3.000	0.076	17.479
April 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
May 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 21	3.000	0.076	17.479	1.000	0.025	5.826	2.000	0.051	11.653
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	3.000	0.076	17.479	0.000	0.000	0.000	3.000	0.076	17.479
Jan 22	2.000	0.051	11.653	0.000	0.000	0.000	2.000	0.051	11.653
Feb 22	3.000	0.076	17.479	2.000	0.051	11.653	1.000	0.025	5.826
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000

Source: Natural Power

Treated counts of black guillemot (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.51.

Table 5.51: Black guillemot treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct - 18	Jan - 19	Feb - 19	Mar - 19	Apr - 19	May - 19	Jun - 19	Aug - 19	Sep - 19 (1)	Sep - 19 (2)	Oct - 19	Sec - 19	Jan - 20	Jul - 20	Aug - 20
array site															
Count	4	0	1	1	2	0	0	0	0	0	7	0	0	0	0
Abundance	21	0	5	5	10	0	0	0	0	0	36	0	0	0	0
Density	0.17	0	0.04	0.04	0.08	0	0	0	0	0	0.29	0	0	0	0
array site + 2 km buffer															
Count	6	0	1	1	2	0	0	1	0	1	12	0	0	0	0
Abundance	30	0	5	5	9	0	0	5	0	5	57	0	0	0	0
Density	0.13	0	0.02	0.02	0.04	0	0	0.02	0	0.02	0.25	0	0	0	0

Source: Natural Power

5.1.14.2. **Monthly mean flight density estimates**

No black guillemot were recorded in flight within the array site during digital aerial surveys.

5.1.14.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of black guillemot within the array site and array site plus 2 km buffer calculated from digital aerial and boat-based ESAS survey datasets are Presented in Table 5.52.

Table 5.52: Black guillemot bio-seasonal mean peak abundances (individuals) and density in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
B (Apr – Aug)	0.000	2.913	5	5
NB (Sep – Mar)	3.131	17.479	29	44

Source: Natural Power

5.1.15. **Puffin**

5.1.15.1. **Survey data**

Treated counts of puffin in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.53.

Table 5.53: Puffin treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	2.115	0.106	13.242	0.027	0.001	0.170	2.088	0.104	13.072
Jun 20	3.025	0.151	18.942	0.000	0.000	0.000	3.025	0.151	18.942
Jul 20	0.020	0.001	0.123	0.020	0.001	0.123	0.000	0.000	0.000
Aug 20	0.342	0.017	2.142	0.054	0.003	0.340	0.288	0.014	1.803
Sep 20	0.025	0.001	0.155	0.000	0.000	0.000	0.025	0.001	0.155
Oct 20	3.009	0.151	18.839	0.000	0.000	0.000	3.009	0.151	18.839
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.020	0.001	0.124	0.000	0.000	0.000	0.020	0.001	0.124
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (2)	0.012	0.001	0.076	0.000	0.000	0.000	0.012	0.001	0.076
April 21	2.075	0.104	12.993	0.000	0.000	0.000	2.075	0.104	12.993
May 21	0.010	0.001	0.063	0.000	0.000	0.000	0.010	0.001	0.063
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	15.042	0.753	94.194	11.027	0.552	69.052	4.015	0.201	25.142
Aug 21	9.235	0.462	57.827	0.000	0.000	0.000	9.235	0.462	57.827
Sep 21	3.038	0.152	19.023	0.000	0.000	0.000	3.038	0.152	19.023
Oct 21	0.025	0.001	0.159	0.000	0.000	0.000	0.025	0.001	0.159
Nov 21	1.031	0.052	6.453	0.000	0.000	0.000	1.031	0.052	6.453
Dec 21	0.064	0.003	0.398	0.000	0.000	0.000	0.064	0.003	0.398
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
array site + 2 km buffer									
May 20	3.297	0.084	19.209	0.081	0.002	0.474	3.216	0.082	18.735
Jun 20	6.082	0.154	35.438	1.027	0.026	5.984	5.055	0.128	29.453
Jul 20	0.030	0.001	0.174	0.020	0.000	0.115	0.010	0.000	0.060
Aug 20	6.615	0.168	38.542	2.081	0.053	12.127	4.534	0.115	26.415
Sep 20	1.054	0.027	6.143	0.000	0.000	0.000	1.054	0.027	6.143
Oct 20	3.013	0.076	17.554	0.000	0.000	0.000	3.013	0.076	17.554
Nov 20	0.004	0.000	0.022	0.000	0.000	0.000	0.004	0.000	0.022
Dec 20	0.044	0.001	0.256	0.000	0.000	0.000	0.044	0.001	0.256
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
March 21 (1)	0.013	0.000	0.074	0.000	0.000	0.000	0.013	0.000	0.074
March 21 (2)	0.075	0.002	0.437	0.000	0.000	0.000	0.075	0.002	0.437
April 21	2.209	0.056	12.873	0.000	0.000	0.000	2.209	0.056	12.873
May 21	0.087	0.002	0.509	0.051	0.001	0.299	0.036	0.001	0.210
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	26.097	0.662	152.055	19.027	0.483	110.861	7.070	0.179	41.194
Aug 21	12.370	0.314	72.071	0.000	0.000	0.000	12.370	0.314	72.071
Sep 21	12.281	0.312	71.556	0.000	0.000	0.000	12.281	0.312	71.556
Oct 21	0.030	0.001	0.172	0.000	0.000	0.000	0.030	0.001	0.172
Nov 21	1.063	0.027	6.194	0.000	0.000	0.000	1.063	0.027	6.194
Dec 21	0.116	0.003	0.678	0.000	0.000	0.000	0.116	0.003	0.678
Jan 22	0.004	0.000	0.025	0.000	0.000	0.000	0.004	0.000	0.025
Feb 22	0.004	0.000	0.025	0.000	0.000	0.000	0.004	0.000	0.025
Mar 22	0.004	0.000	0.025	0.000	0.000	0.000	0.004	0.000	0.025
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Natural Power

Treated counts of puffin (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.54.

Table 5.54: Puffin treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct - 18	Jan - 19	Feb - 19	Mar - 19	Apr - 19	May - 19	Jun - 19	Aug - 19	Sep - 19 (1)	Sep - 19 (2)	Oct - 19	Sec - 19	Jan - 20	Jul - 20	Aug - 20
array site															
Count	0	0	0	0	1	1	3	0	0	0	0	0	0	2	1
Abundance	0	0	0	0	5	5	16	0	0	0	0	0	0	10	5
Density	0	0	0	0	0.04	0.04	0.13	0	0	0	0	0	0	0.08	0.04
array site + 2 km buffer															
Count	0	0	0	2	1	1	3	0	0	0	0	0	0	2	1
Abundance	0	0	0	9	5	5	14	0	0	0	0	0	0	9	5
Density	0	0	0	0.04	0.02	0.02	0.06	0	0	0	0	0	0	0.04	0.02

Source: Natural Power

5.1.15.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of puffin within the array site for each month, calculated for DAS data, are presented in Table 5.55.

Table 5.55: Puffin monthly estimated flight densities within array site from DAS data

Density (indiv./ km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	0.000	0.000	0.000	0.000	0.001	0.000	0.276	0.001	0.000	0.000	0.000	0.000
S.D.	-	0.000	0.000	0.000	0.001	0.000	0.390	0.002	0.000	0.000	0.000	0.000

Source: Natural Power

5.1.15.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of puffin within the array site and array site plus 2 km buffer calculated from digital aerial and boat-based ESAS survey datasets are Presented in Table 5.56.

Table 5.56: Puffin bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
RM (Mar – Apr)	6.496	6.449	5	9
MFBS (May – Jul)	56.568	93.746	13	11.5
PBM (Aug)	29.985	55.306	3	2.5
MFW (Sep – Feb)	18.931	44.555	0	0

Source: Natural Power

5.1.16. **Red-throated diver**

5.1.16.1. **Survey data**

Treated counts of red-throated diver in flight and on the sea surface, with associated estimated densities and abundances, within the array site, the array site plus a 2 km buffer and the array site plus a 4 km buffer, derived from DAS data, are presented in Table 5.57.

Table 5.57: Red-throated diver treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 20	6.034	0.302	37.784	0.000	0.000	0.000	6.034	0.302	37.784
Nov 20	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
Dec 20	2.982	0.149	18.674	0.000	0.000	0.000	2.982	0.149	18.674
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	4.000	0.200	25.048	0.000	0.000	0.000	4.000	0.200	25.048
March 21 (2)	4.948	0.248	30.986	0.000	0.000	0.000	4.948	0.248	30.986
April 21	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
May 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 21	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
Nov 21	5.000	0.250	31.310	0.000	0.000	0.000	5.000	0.250	31.310
Dec 21	4.034	0.202	25.260	0.000	0.000	0.000	4.034	0.202	25.260
Jan 22	35.000	1.752	219.169	0.000	0.000	0.000	35.000	1.752	219.169
Feb 22	13.000	0.651	81.406	0.000	0.000	0.000	13.000	0.651	81.406
Mar 22	16.034	0.802	100.404	0.000	0.000	0.000	16.034	0.802	100.404
Apr 22	4.000	0.200	25.048	0.000	0.000	0.000	4.000	0.200	25.048
array site + 2 km buffer									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 20	4.000	0.101	23.306	1.000	0.025	5.826	3.000	0.076	17.479
Oct 20	12.068	0.306	70.313	0.000	0.000	0.000	12.068	0.306	70.313
Nov 20	2.000	0.051	11.653	0.000	0.000	0.000	2.000	0.051	11.653
Dec 20	18.982	0.482	110.599	0.000	0.000	0.000	18.982	0.482	110.599

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
Feb 21	3.034	0.077	17.677	0.000	0.000	0.000	3.034	0.077	17.677
March 21 (1)	13.000	0.330	75.744	0.000	0.000	0.000	13.000	0.330	75.744
March 21 (2)	18.897	0.479	110.100	0.000	0.000	0.000	18.897	0.479	110.100
April 21	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
May 21	2.000	0.051	11.653	0.000	0.000	0.000	2.000	0.051	11.653
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 21	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
Nov 21	6.000	0.152	34.959	0.000	0.000	0.000	6.000	0.152	34.959
Dec 21	11.068	0.281	64.486	0.000	0.000	0.000	11.068	0.281	64.486
Jan 22	45.000	1.142	262.191	2.000	0.051	11.653	43.000	1.091	250.538
Feb 22	28.000	0.710	163.141	0.000	0.000	0.000	28.000	0.710	163.141
Mar 22	22.034	0.559	128.380	0.000	0.000	0.000	22.034	0.559	128.380
Apr 22	9.000	0.228	52.438	0.000	0.000	0.000	9.000	0.228	52.438
array site + 4 km buffer									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	1.000	0.017	5.989	0.000	0.000	0.000	1.000	0.017	5.989
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 20	8.034	0.134	48.118	2.000	0.033	11.979	6.034	0.101	36.139
Oct 20	12.068	0.202	72.279	0.000	0.000	0.000	12.068	0.202	72.279
Nov 20	4.000	0.067	23.958	0.000	0.000	0.000	4.000	0.067	23.958
Dec 20	21.982	0.367	131.660	1.000	0.017	5.989	20.982	0.350	125.671
Feb 21	6.034	0.101	36.139	0.000	0.000	0.000	6.034	0.101	36.139
March 21 (1)	16.034	0.268	96.033	1.000	0.017	5.989	15.034	0.251	90.044
March 21 (2)	26.897	0.449	161.094	0.000	0.000	0.000	26.897	0.449	161.094
April 21	3.000	0.050	17.968	0.000	0.000	0.000	3.000	0.050	17.968
May 21	2.000	0.033	11.979	0.000	0.000	0.000	2.000	0.033	11.979
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 21	1.000	0.017	5.989	0.000	0.000	0.000	1.000	0.017	5.989
Nov 21	9.000	0.150	53.905	0.000	0.000	0.000	9.000	0.150	53.905
Dec 21	14.068	0.235	84.258	0.000	0.000	0.000	14.068	0.235	84.258
Jan 22	47.000	0.785	281.502	3.000	0.050	17.968	44.000	0.735	263.533
Feb 22	33.000	0.551	197.650	0.000	0.000	0.000	33.000	0.551	197.650
Mar 22	31.034	0.518	185.874	0.000	0.000	0.000	31.034	0.518	185.874
Apr 22	13.000	0.217	77.862	0.000	0.000	0.000	13.000	0.217	77.862

Source: Natural Power

Treated counts of red-throated diver (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site, the array site plus a 2 km buffer and the array site plus a 4 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.58.

Table 5.58: Red-throated diver treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct - 18	Jan - 19	Feb - 19	Mar - 19	Apr - 19	May - 19	Jun - 19	Aug - 19	Sep - 19 (1)	Sep - 19 (2)	Oct - 19	Sec - 19	Jan - 20	Jul - 20	Aug - 20
array site															
Count	0	7	6	5	1	0	0	0	0	0	0	0	10	0	0
Abundance	0	36	31	26	5	0	0	0	0	0	0	0	53	0	0
Density	0	0.29	0.25	0.21	0.04	0	0	0	0	0	0	0	0.42	0	0
array site + 2 km buffer															
Count	0	9	16	17	2	0	0	0	0	0	0	4	20	0	0
Abundance	0	44	78	83	9	0	0	0	0	0	0	18	96	0	0
Density	0	0.19	0.34	0.36	0.04	0	0	0	0	0	0	0.08	0.42	0	0
array site + 4 km buffer															
Count	0	15	19	21	2	0	0	0	0	0	0	4	33	0	0
Abundance	0	75	93	104	11	0	0	0	0	0	0	22	165	0	0
Density	0	0.21	0.26	0.29	0.03	0	0	0	0	0	0	0.06	0.46	0	0

Source: Natural Power

5.1.16.2. **Monthly mean flight density estimates**

No red-throated diver were recorded in flight within the array site during digital aerial surveys.

5.1.16.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of red-throated diver within the array site, array site plus 2 km buffer and the array site plus 4 km buffer, calculated from digital aerial and boat-based ESAS survey datasets, are presented in Table 5.59.

Table 5.59: Red-throated diver bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type					
	Digital aerial			Boat-based ESAS		
	Array	Array + 2 km	Array + 4 km	Array	Array + 2 km	Array + 4 km
RM (Feb – Apr)	65.695	136.621	179.372	31	83	104
MFBS (May – Aug)	0.000	5.826	8.984	0	0	0
PBM (Sep – Nov)	34.547	52.636	63.092	0	0	0
MWF (Dec – Jan)	118.922	186.395	206.581	44.5	70	120

Source: Natural Power

5.1.17. Great northern diver

5.1.17.1. Survey data

Treated counts of great northern diver in flight and on the sea surface, with associated estimated densities and abundances, within the array site, the array site plus a 2 km buffer and the array site plus a 4 km buffer, derived from DAS data, are presented in Table 5.60.

Table 5.60: Great northern diver treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 20	0.002	0.000	0.012	0.000	0.000	0.000	0.002	0.000	0.012
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.054	0.003	0.335	0.000	0.000	0.000	0.054	0.003	0.335
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
March 21 (2)	1.052	0.053	6.586	0.000	0.000	0.000	1.052	0.053	6.586
April 21	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
May 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	0.002	0.000	0.012	0.000	0.000	0.000	0.002	0.000	0.012
Jan 22	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	1.002	0.050	6.274	0.000	0.000	0.000	1.002	0.050	6.274
Apr 22	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
array site + 2 km buffer									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 20	0.004	0.000	0.022	0.000	0.000	0.000	0.004	0.000	0.022
Nov 20	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
Dec 20	4.054	0.103	23.618	0.000	0.000	0.000	4.054	0.103	23.618

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
Feb 21	0.002	0.000	0.011	0.000	0.000	0.000	0.002	0.000	0.011
March 21 (1)	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
March 21 (2)	1.103	0.028	6.429	0.000	0.000	0.000	1.103	0.028	6.429
April 21	3.000	0.076	17.479	0.000	0.000	0.000	3.000	0.076	17.479
May 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	0.004	0.000	0.022	0.000	0.000	0.000	0.004	0.000	0.022
Jan 22	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
Feb 22	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
Mar 22	1.002	0.025	5.837	0.000	0.000	0.000	1.002	0.025	5.837
Apr 22	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
array site + 4 km buffer									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 20	0.002	0.000	0.011	0.000	0.000	0.000	0.002	0.000	0.011
Oct 20	0.004	0.000	0.022	0.000	0.000	0.000	0.004	0.000	0.022
Nov 20	2.000	0.033	11.979	0.000	0.000	0.000	2.000	0.033	11.979
Dec 20	4.054	0.068	24.278	0.000	0.000	0.000	4.054	0.068	24.278
Feb 21	0.002	0.000	0.011	0.000	0.000	0.000	0.002	0.000	0.011
March 21 (1)	1.002	0.017	6.000	0.000	0.000	0.000	1.002	0.017	6.000
March 21 (2)	1.103	0.018	6.609	0.000	0.000	0.000	1.103	0.018	6.609
April 21	3.000	0.050	17.968	0.000	0.000	0.000	3.000	0.050	17.968
May 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	0.004	0.000	0.022	0.000	0.000	0.000	0.004	0.000	0.022
Jan 22	1.000	0.017	5.989	0.000	0.000	0.000	1.000	0.017	5.989
Feb 22	2.000	0.033	11.979	0.000	0.000	0.000	2.000	0.033	11.979
Mar 22	1.002	0.017	6.000	0.000	0.000	0.000	1.002	0.017	6.000
Apr 22	1.000	0.017	5.989	0.000	0.000	0.000	1.000	0.017	5.989

Source: Natural Power

Treated counts of great northern diver (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site, the array site plus a 2 km buffer and the array site plus a 4 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.61.

Table 5.61: Great northern diver treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct – 18	Jan – 19	Feb – 19	Mar – 19	Apr – 19	May – 19	Jun – 19	Aug – 19	Sep – 19 (1)	Sep – 19 (2)	Oct – 19	Sec – 19	Jan – 20	Jul – 20	Aug – 20
array site															
Count	0	1	3	1	0	0	0	0	0	1	0	1	2	0	0
Abundance	0	5	16	5	0	0	0	0	0	5	0	5	10	0	0
Density	0	0.04	0.13	0.04	0	0	0	0	0	0.04	0	0.04	0.08	0	0
array site + 2 km buffer															
Count	0	2	6	1	0	0	0	0	0	1	0	1	2	0	0
Abundance	0	9	30	5	0	0	0	0	0	5	0	5	9	0	0
Density	0	0.04	0.13	0.02	0	0	0	0	0	0.02	0	0.02	0.04	0	0
array site + 4 km buffer															
Count	0	3	9	2	0	0	0	0	0	3	0	2	5	0	0
Abundance	0	16	45	9	0	0	0	0	0	16	0	9	24	0	0
Density	0.00	0.04	0.13	0.03	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.03	0.07	0.00	0.00

Source: Natural Power

5.1.17.2. **Monthly mean flight density estimates**

No great northern diver were recorded in flight within the array site during digital aerial surveys.

5.1.17.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of great northern diver within the array site, array site plus 2 km buffer and the array site plus 4 km buffer, calculated from digital aerial and boat-based ESAS survey datasets, are presented in Table 5.62.

Table 5.62: Great northern diver bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type					
	Digital aerial			Boat-based ESAS		
	Array	Array + 2 km	Array + 4 km	Array	Array + 2 km	Array + 4 km
RM (Mar – May)	6.430	11.658	11.984	5	5	9
MFBS (Jun – Aug)	0.000	0.000	0.000	0	0	0
PBM (Sep – Nov)	0.006	2.913	5.989	2.5	2.5	8
MFW (Dec – Feb)	3.299	14.722	18.129	13	19.5	34.5

Source: Natural Power

5.1.18. **Fulmar**

5.1.18.1. **Survey data**

Treated counts of fulmar in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.63.

Table 5.63: Fulmar treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	2.000	0.100	12.524	2.000	0.100	12.524	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
Aug 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 20	2.000	0.100	12.524	2.000	0.100	12.524	0.000	0.000	0.000
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
March 21 (2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
April 21	3.000	0.150	18.786	1.000	0.050	6.262	2.000	0.100	12.524
May 21	2.000	0.100	12.524	1.000	0.050	6.262	1.000	0.050	6.262
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	2.000	0.100	12.524	1.000	0.050	6.262	1.000	0.050	6.262
Aug 21	4.000	0.200	25.048	2.000	0.100	12.524	2.000	0.100	12.524
Sep 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.003	0.000	0.020	0.003	0.000	0.020	0.000	0.000	0.000
Dec 21	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
array site + 2 km buffer									
May 20	3.000	0.076	17.479	3.000	0.076	17.479	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	3.000	0.076	17.479	3.000	0.076	17.479	0.000	0.000	0.000
Aug 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 20	2.000	0.051	11.653	2.000	0.051	11.653	0.000	0.000	0.000
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
March 21 (1)	2.000	0.051	11.653	1.000	0.025	5.826	1.000	0.025	5.826
March 21 (2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
April 21	3.000	0.076	17.479	1.000	0.025	5.826	2.000	0.051	11.653
May 21	3.158	0.080	18.403	2.000	0.051	11.653	1.158	0.029	6.750
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	2.000	0.051	11.653	1.000	0.025	5.826	1.000	0.025	5.826
Aug 21	6.000	0.152	34.959	3.000	0.076	17.479	3.000	0.076	17.479
Sep 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.003	0.000	0.018	0.003	0.000	0.018	0.000	0.000	0.000
Dec 21	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000

Source: Natural Power

Treated counts of fulmar (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.64.

Table 5.64: Fulmar treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct – 18	Jan – 19	Feb – 19	Mar – 19	Apr – 19	May – 19	Jun – 19	Aug – 19	Sep – 19 (1)	Sep – 19 (2)	Oct – 19	Sec – 19	Jan – 20	Jul – 20	Aug – 20
array site															
Count	0	1.00	0	0	0	1.00	2.00	0	1.00	0	0	1.00	0	0	3.00
Abundance	0	5.22	0	0	0	5.22	10.44	0	5.22	0	0	5.22	0	0	15.66
Density	0	0.04	0	0	0	0.04	0.08	0	0.04	0	0	0.04	0	0	0.13
array site + 2 km buffer															
Count	0	3.00	0	0	1.00	1.00	4.00	1.00	3.00	0	0	1.00	0	1.00	6.00
Abundance	0	14.57	0	0	4.86	4.86	19.43	4.86	14.57	0	0	4.86	0	4.86	29.14
Density	0	0.06	0	0	0.02	0.02	0.08	0.02	0.06	0	0	0.02	0	0.02	0.13

Source: Natural Power

5.1.18.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of fulmar within the array site for each month, calculated for DAS data, are presented in Table 5.65.

Table 5.65: Fulmar monthly estimated flight densities within array site from DAS data

Density (indiv./ km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	0	0	0.017	0.05	0.075	0	0.05	0.05	0.05	0	0	0
S.D.	-	0	0.029	0	0.035	0	0	0.071	0.071	0	0	0

Source: Natural Power

5.1.18.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of fulmar within the array site and array site plus 2 km buffer, calculated from digital aerial and boat-based ESAS survey datasets, are presented in Table 5.66.

Table 5.66: Fulmar bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
RM (Dec – Mar)	3.131	8.74	2.610	4.856
MFBS (Apr – Aug)	4.870	26.219	6.524	12.141
PBM (Sep – Oct)	3.131	5.826	1.305	3.642
MFW (Nov)	0.005	0.009	NA*	NA*

*Source: Natural Power. *No boat-based ESAS surveys undertaken in migration-free winter bio-season (November)*

5.1.19. Manx shearwater

5.1.19.1. Survey data

Treated counts of Manx shearwater in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.67.

Table 5.67: Manx shearwater treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	79.583	3.983	498.346	23.472	1.175	146.983	56.110	2.808	351.363
Jun 20	9.185	0.460	57.517	5.000	0.250	31.310	4.185	0.209	26.207
Jul 20	2.000	0.100	12.524	2.000	0.100	12.524	0.000	0.000	0.000
Aug 20	122.412	6.126	766.544	53.945	2.700	337.801	68.468	3.427	428.743
Sep 20	20.076	1.005	125.716	13.000	0.651	81.406	7.076	0.354	44.310
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (2)	2.038	0.102	12.762	2.000	0.100	12.524	0.038	0.002	0.238
April 21	33.555	1.679	210.122	4.000	0.200	25.048	29.555	1.479	185.074
May 21	29.062	1.454	181.984	1.000	0.050	6.262	28.062	1.404	175.722
Jun 21	40.000	2.002	250.479	18.000	0.901	112.716	22.000	1.101	137.764
Jul 21	7.534	0.377	47.178	7.472	0.374	46.792	0.062	0.003	0.386
Aug 21	50.727	2.539	317.654	15.000	0.751	93.930	35.727	1.788	223.724
Sep 21	11.133	0.557	69.715	8.000	0.400	50.096	3.133	0.157	19.619
Oct 21	2.057	0.103	12.881	2.000	0.100	12.524	0.057	0.003	0.357
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
array site + 2 km buffer									
May 20	184.823	4.690	1076.866	48.417	1.229	282.101	136.406	3.461	794.765
Jun 20	12.843	0.326	74.827	8.472	0.215	49.364	4.370	0.111	25.463
Jul 20	7.000	0.178	40.785	6.000	0.152	34.959	1.000	0.025	5.826
Aug 20	300.476	7.624	1750.713	89.417	2.269	520.986	211.059	5.355	1229.727
Sep 20	48.171	1.222	280.667	23.000	0.584	134.009	25.171	0.639	146.658
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
Feb 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (1)	0.019	0.000	0.111	0.000	0.000	0.000	0.019	0.000	0.111
March 21 (2)	9.323	0.237	54.321	5.000	0.127	29.132	4.323	0.110	25.188
April 21	89.604	2.274	522.075	29.000	0.736	168.968	60.604	1.538	353.107
May 21	83.062	2.108	483.956	5.000	0.127	29.132	78.062	1.981	454.824
Jun 21	49.000	1.243	285.497	20.000	0.507	116.529	29.000	0.736	168.968
Jul 21	19.904	0.505	115.971	12.472	0.316	72.670	7.432	0.189	43.301
Aug 21	85.714	2.175	499.412	32.000	0.812	186.447	53.714	1.363	312.965
Sep 21	47.102	1.195	274.440	15.000	0.381	87.397	32.102	0.815	187.043
Oct 21	3.157	0.080	18.394	2.081	0.053	12.124	1.076	0.027	6.269
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000

Source: Natural Power

Treated counts of Manx shearwater (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.68.

Table 5.68: Manx shearwater treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct – 18	Jan – 19	Feb – 19	Mar – 19	Apr – 19	May – 19	Jun – 19	Aug – 19	Sep – 19 (1)	Sep – 19 (2)	Oct – 19	Sec – 19	Jan – 20	Jul – 20	Aug – 20
array site															
Count	0	0	0	1	44	39	8	3	11	13	0	0	0	65	24
Abundance	0	0	0	5	230	204	41	16	58	68	0	0	0	339	125
Density	0	0	0	0.04	1.84	1.63	0.33	0.13	0.46	0.54	0	0	0	2.71	1
array site + 2 km buffer															
Count	0	0	0	1	279	63	15	31	15	17	0	0	0	425	316
Abundance	0	0	0	5	1355	305	73	152	73	83	0	0	0	2064	1534
Density	0	0	0	0.02	5.9	1.33	0.32	0.66	0.32	0.36	0	0	0	8.99	6.68

Source: Natural Power

5.1.19.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of Manx shearwater within the array site for each month, calculated for DAS data, are presented in Table 5.69.

Table 5.69: Manx shearwater monthly estimated flight densities within array site from DAS data

Density (indiv./ km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	0.000	0.000	0.033	0.125	0.612	0.576	0.237	1.725	0.525	0.050	0.000	0.000
S.D.	-	0.000	0.058	0.106	0.795	0.460	0.194	1.378	0.177	0.071	0.000	0.000

Source: Natural Power

5.1.19.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of Manx shearwater within the array site and array site plus 2 km buffer, calculated from digital aerial and boat-based ESAS survey datasets, are presented in Table 5.70.

Table 5.70: Manx shearwater bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
RM (Mar – May)	340.165	780.411	230	1,355
MFBS (Jun – Jul)	153.998	180.162	190	1,068.5
PBM (Aug – Oct)	542.099	1125.063	96.5	843
MFW (Nov – Feb)	0.000	0.000	0	0

Source: Natural Power

5.1.20. **Gannet**

5.1.20.1. **Survey data**

Treated counts of gannet in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.71.

Table 5.71: Gannet treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	2.000	0.100	12.524	1.000	0.050	6.262	1.000	0.050	6.262
Sep 20	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	2.000	0.100	12.524	2.000	0.100	12.524	0.000	0.000	0.000
Dec 20	17.000	0.851	106.454	7.000	0.350	43.834	10.000	0.500	62.620
Feb 21	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
March 21 (1)	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
March 21 (2)	2.000	0.100	12.524	1.000	0.050	6.262	1.000	0.050	6.262
April 21	4.000	0.200	25.048	2.000	0.100	12.524	2.000	0.100	12.524
May 21	8.000	0.400	50.096	7.000	0.350	43.834	1.000	0.050	6.262
Jun 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 21	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
Aug 21	2.000	0.100	12.524	0.000	0.000	0.000	2.000	0.100	12.524
Sep 21	2.000	0.100	12.524	2.000	0.100	12.524	0.000	0.000	0.000
Oct 21	2.000	0.100	12.524	1.000	0.050	6.262	1.000	0.050	6.262
Nov 21	3.000	0.150	18.786	1.000	0.050	6.262	2.000	0.100	12.524
Dec 21	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
Jan 22	6.000	0.300	37.572	3.000	0.150	18.786	3.000	0.150	18.786
Feb 22	3.000	0.150	18.786	2.000	0.100	12.524	1.000	0.050	6.262
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
array site + 2 km buffer									
May 20	20.000	0.507	116.529	10.000	0.254	58.265	10.000	0.254	58.265
Jun 20	2.000	0.051	11.653	1.000	0.025	5.826	1.000	0.025	5.826
Jul 20	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000
Aug 20	9.000	0.228	52.438	5.000	0.127	29.132	4.000	0.101	23.306
Sep 20	12.000	0.304	69.918	7.000	0.178	40.785	5.000	0.127	29.132
Oct 20	3.000	0.076	17.479	0.000	0.000	0.000	3.000	0.076	17.479
Nov 20	4.000	0.101	23.306	4.000	0.101	23.306	0.000	0.000	0.000
Dec 20	26.000	0.660	151.488	11.000	0.279	64.091	15.000	0.381	87.397

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
Feb 21	2.000	0.051	11.653	0.000	0.000	0.000	2.000	0.051	11.653
March 21 (1)	2.000	0.051	11.653	2.000	0.051	11.653	0.000	0.000	0.000
March 21 (2)	5.000	0.127	29.132	2.000	0.051	11.653	3.000	0.076	17.479
April 21	15.000	0.381	87.397	6.000	0.152	34.959	9.000	0.228	52.438
May 21	16.000	0.406	93.223	12.000	0.304	69.918	4.000	0.101	23.306
Jun 21	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000
Jul 21	3.000	0.076	17.479	2.000	0.051	11.653	1.000	0.025	5.826
Aug 21	5.000	0.127	29.132	1.000	0.025	5.826	4.000	0.101	23.306
Sep 21	3.000	0.076	17.479	3.000	0.076	17.479	0.000	0.000	0.000
Oct 21	5.000	0.127	29.132	3.000	0.076	17.479	2.000	0.051	11.653
Nov 21	7.000	0.178	40.785	2.000	0.051	11.653	5.000	0.127	29.132
Dec 21	2.000	0.051	11.653	2.000	0.051	11.653	0.000	0.000	0.000
Jan 22	10.000	0.254	58.265	6.000	0.152	34.959	4.000	0.101	23.306
Feb 22	6.000	0.152	34.959	5.000	0.127	29.132	1.000	0.025	5.826
Mar 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Apr 22	2.000	0.051	11.653	2.000	0.051	11.653	0.000	0.000	0.000

Source: Natural Power

Treated counts of gannet (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.72.

Table 5.72: Gannet treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct – 18	Jan – 19	Feb – 19	Mar – 19	Apr – 19	May – 19	Jun – 19	Aug – 19	Sep – 19 (1)	Sep – 19 (2)	Oct – 19	Sec – 19	Jan – 20	Jul – 20	Aug – 20
array site															
Count	5	0	0	1	4	0	3	4	5	4	2	0	0	1	21
Abundance	26	0	0	5	21	0	16	21	26	21	10	0	0	5	110
Density	0.21	0	0	0.04	0.17	0	0.13	0.17	0.21	0.17	0.08	0	0	0.04	0.88
array site + 2 km buffer															
Count	10	0	1	2	26	4	5	6	14	13	2	0	0	5	32
Abundance	48	0	5	9	126	18	25	30	69	62	9	0	0	25	156
Density	0.21	0	0.02	0.04	0.55	0.08	0.11	0.13	0.3	0.27	0.04	0	0	0.11	0.68

Source: Natural Power

5.1.20.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of gannet within the array site for each month, calculated for DAS data, are presented in Table 5.73.

Table 5.73: Gannet monthly estimated flight densities within array site from DAS data

Density (indiv./ km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	0.150	0.050	0.033	0.075	0.175	0.025	0.025	0.025	0.075	0.025	0.075	0.200
S.D.	-	0.071	0.029	0.035	0.248	0.035	0.035	0.035	0.035	0.035	0.035	0.212

Source: Natural Power

5.1.20.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of gannet within the array site and array site plus 2 km buffer, calculated from digital aerial and boat-based ESAS survey datasets, are presented in Table 5.74.

Table 5.74: Gannet bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
RM (Dec – Mar)	72.013	104.876	10.5	63
MFBS (Apr – Aug)	37.572	104.876	65.5	93
PBM (Sep – Nov)	15.655	55.351	18	39

Source: Natural Power

5.1.21. Cormorant

5.1.21.1. Survey data

Treated counts of cormorant in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.75.

Table 5.75: Cormorant treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
array site									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	0.444	0.022	2.783	0.000	0.000	0.000	0.444	0.022	2.783
Sep 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 20	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
Nov 20	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
Dec 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 21	0.300	0.015	1.879	0.000	0.000	0.000	0.300	0.015	1.879
March 21 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
April 21	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
May 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 21	0.222	0.011	1.392	0.000	0.000	0.000	0.222	0.011	1.392
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	0.300	0.015	1.879	0.000	0.000	0.000	0.300	0.015	1.879
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
array site + 2 km buffer									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	1.444	0.037	8.416	1.000	0.025	5.826	0.444	0.011	2.590
Sep 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 20	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
Nov 20	3.000	0.076	17.479	0.000	0.000	0.000	3.000	0.076	17.479
Dec 20	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
Feb 21	2.300	0.058	13.401	0.000	0.000	0.000	2.300	0.058	13.401

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
March 21 (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
March 21 (2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
April 21	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000
May 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 21	0.444	0.011	2.590	0.000	0.000	0.000	0.444	0.011	2.590
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000
Sep 21	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
Oct 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jan 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Feb 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mar 22	1.300	0.033	7.574	0.000	0.000	0.000	1.300	0.033	7.574
Apr 22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Natural Power

Treated counts of cormorant (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.76.

Table 5.76: Cormorant treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct – 18	Jan – 19	Feb – 19	Mar – 19	Apr – 19	May – 19	Jun – 19	Aug – 19	Sep – 19 (1)	Sep – 19 (2)	Oct – 19	Sec – 19	Jan – 20	Jul – 20	Aug – 20
array site															
Count	0	1	0	0	0	1	0	9	0	0	0	0	0	2	10
Abundance	0	5	0	0	0	5	0	48	0	0	0	0	0	10	53
Density	0	0.04	0	0	0	0.04	0	0.38	0	0	0	0	0	0.08	0.42
array site + 2 km buffer															
Count	0	1	0	0	0	1	0	18	0	0	0	0	0	5	15
Abundance	0	5	0	0	0	5	0	87	0	0	0	0	0	25	73
Density	0	0.02	0	0	0	0.02	0	0.38	0	0	0	0	0	0.11	0.32

Source: Natural Power

5.1.21.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of cormorant within the array site for each month, calculated for DAS data, are presented in Table 5.77.

Table 5.77: Cormorant monthly estimated flight densities within array site from DAS data

Density (indiv./ km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	0.000	0.000	0.000	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
S.D.	-	0.000	0.000	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Natural Power

5.1.21.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of cormorant within the array site and array site plus 2 km buffer, calculated from digital aerial and boat-based ESAS survey datasets, are presented in Table 5.78.

Table 5.78: Cormorant bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
B (Apr – Aug)	3.827	7.121	50.5	80
NB (Sep – Mar)	4.070	12.527	2.5	2.5

Source: Natural Power

5.1.22. **Shag**

5.1.22.1. **Survey data**

Treated counts of shag in flight and on the sea surface, with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from DAS data, are presented in Table 5.79.

Table 5.79: Shag treated counts and estimated densities and abundances within the array site and array site plus 2 km buffer for each digital aerial survey

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km^2)	Abundance	Treated count	Density (indiv/km^2)	Abundance	Treated count	Density (indiv/km^2)	Abundance
array site									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	1.556	0.078	9.741	0.000	0.000	0.000	1.556	0.078	9.741
Sep 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nov 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 20	3.000	0.150	18.786	1.000	0.050	6.262	2.000	0.100	12.524
Feb 21	0.700	0.035	4.383	0.000	0.000	0.000	0.700	0.035	4.383
March 21 (1)	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
March 21 (2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
April 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
May 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 21	0.778	0.039	4.870	0.000	0.000	0.000	0.778	0.039	4.870
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 21	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
Jan 22	3.000	0.150	18.786	0.000	0.000	0.000	3.000	0.150	18.786
Feb 22	1.000	0.050	6.262	1.000	0.050	6.262	0.000	0.000	0.000
Mar 22	0.700	0.035	4.383	0.000	0.000	0.000	0.700	0.035	4.383
Apr 22	1.000	0.050	6.262	0.000	0.000	0.000	1.000	0.050	6.262
array site + 2 km buffer									
May 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jul 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 20	1.556	0.039	9.063	0.000	0.000	0.000	1.556	0.039	9.063
Sep 20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Oct 20	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000
Nov 20	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
Dec 20	11.000	0.279	64.091	3.000	0.076	17.479	8.000	0.203	46.612
Feb 21	2.700	0.069	15.731	1.000	0.025	5.826	1.700	0.043	9.905

Survey	All behaviours			Flying			Sitting		
	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance	Treated count	Density (indiv/km²)	Abundance
March 21 (1)	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
March 21 (2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
April 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
May 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Jun 21	1.556	0.039	9.063	0.000	0.000	0.000	1.556	0.039	9.063
Jul 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Aug 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sep 21	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
Oct 21	1.000	0.025	5.826	0.000	0.000	0.000	1.000	0.025	5.826
Nov 21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dec 21	2.000	0.051	11.653	0.000	0.000	0.000	2.000	0.051	11.653
Jan 22	4.000	0.101	23.306	0.000	0.000	0.000	4.000	0.101	23.306
Feb 22	1.000	0.025	5.826	1.000	0.025	5.826	0.000	0.000	0.000
Mar 22	1.700	0.043	9.905	0.000	0.000	0.000	1.700	0.043	9.905
Apr 22	3.000	0.076	17.479	0.000	0.000	0.000	3.000	0.076	17.479

Source: Natural Power

Treated counts of shag (cumulative, including birds in flight and on the sea surface), with associated estimated densities and abundances, within the array site and the array site plus a 2 km buffer, derived from boat-based ESAS survey data, are presented in Table 5.80.

Table 5.80: Shag treated counts and estimated densities and abundances within the array site only and the array site plus a 2 km buffer for each boat-based ESAS survey

Survey	Oct – 18	Jan – 19	Feb – 19	Mar – 19	Apr – 19	May – 19	Jun – 19	Aug – 19	Sep – 19 (1)	Sep – 19 (2)	Oct – 19	Sec – 19	Jan – 20	Jul – 20	Aug – 20
array site															
Count	0	1	0	0	0	0	0	1	0	0	1	2	4	1	5
Abundance	0	5	0	0	0	0	0	5	0	0	5	10	21	5	26
Density	0	0.04	0	0	0	0	0	0.04	0	0	0.04	0.08	0.17	0.04	0.21
array site + 2 km buffer															
Count	0	2	1	0	0	0	1	1	2	4	3	12	6	1	8
Abundance	0	9	5	0	0	0	5	5	9	18	14	57	30	5	39
Density	0	0.04	0.02	0	0	0	0.02	0.02	0.04	0.08	0.06	0.25	0.13	0.02	0.17

Source: Natural Power

5.1.22.2. **Monthly mean flight density estimates**

Mean flight densities (and standard deviations) of shag within the array site for each month, calculated for DAS data, are presented in Table 5.81.

Table 5.81: Shag monthly estimated flight densities within array site from DAS data

Density (indiv./ km)	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	0.000	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.025
S.D.	-	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.035

Source: Natural Power

5.1.22.3. **Biological seasonal mean peak estimates**

Bio-seasonal mean peak abundance estimates of shag within the array site and array site plus 2 km buffer, calculated from digital aerial and boat-based ESAS survey datasets, are presented in Table 5.82.

Table 5.82: Shag bio-seasonal mean peak abundances (individuals) in array site and the array site plus a 2 km buffer from DAS data and boat-based ESAS survey data

Bio-season	Survey type			
	Digital aerial		Boat-based ESAS	
	Array	Array + 2 km	Array	Array + 2 km
RM (Dec – Feb)	18.786	43.699	13	33
MFBS (Mar – Jul)	6.262	11.653	13	22
PBM (Aug – Oct)	8.001	7.445	5	16
MFW (Nov)	0.000	2.913	NA*	NA*

*Source: Natural Power *No boat-based ESAS surveys undertaken in migration-free winter bio-season (November)*

5.1.23. **Other seabird species**

Table 5.83: Other seabird species recorded within the array site and buffers during DAS and boat-based ESAS surveys

Species	Survey	Notes
Common scoter	DAS	Single individual on sea within 2 km buffer area March 2021.
	Boat-based ESAS	Three individuals together within 2-4 km buffer area in flight January 2019.
Red-breasted merganser	DAS	Single individual in flight in array site September 2020.
	Boat-based ESAS	No records.
Sabine's gull	DAS	No records.
	Boat-based ESAS	Single individual in flight in array site September 2019. Single individual on sea within 2-4 km buffer area September 2019.
Little tern	DAS	Single individuals in flight within 2 km buffer area in May and August 2021. Two birds together in flight within the array site in September 2021.
	Boat-based ESAS	No records.
Great skua	DAS	Six individuals recorded • One in flight in 2 km buffer area September 2020

Species	Survey	Notes
		• One in flight in 2 km buffer area, two in flight in 2-4 km buffer area and one on the sea in the 2-4 km buffer area in November 2021 One on the sea in the 2-4 km buffer area in January 2022
	Boat-based ESAS	Five individuals recorded • One in flight and one on the sea in the 2 km buffer area in September 2019 • One in flight in the array site in October 2019 Two in flight in the 2-4 km buffer area in December 2019
Pomarine skua	DAS	Single individual on sea within 2 km buffer area in October 2021.
	Boat-based ESAS	Single individual in flight in the array site in April 2019.
Arctic skua	DAS	Single individual in flight within 2-4 km buffer area in July 2021.
	Boat-based ESAS	Ten individuals recorded • One in flight in the array site in April 2019 Eight in September 2019 (one in flight within array site, seven within buffer areas)
Black-throated diver	DAS	Single individual on sea within array site in January 2022.
	Boat-based ESAS	No records.
Storm petrel	DAS	Four individuals in flight within array site in August 2021.
	Boat-based ESAS	Seven individuals recorded • Two in flight in May 2019 (one within array site, one within buffer area) • One in flight in the buffer area in June 2019 • One in flight in the buffer area in August 2019 • One in flight in the buffer area in September 2019 • One in flight in the buffer area in July 2020 One in flight in array site in August 2020
Great shearwater	DAS	No records.
	Boat-based ESAS	Single individual in flight in the buffer area in August 2020.
Balearic shearwater	DAS	Single individual in flight within 2-4 km buffer area in September 2020.
	Boat-based ESAS	No records.

Source: Natural Power

5.2. Intertidal Ornithology

The below species accounts present information about the numbers of key species within the intertidal landfall survey area throughout the year and their distributions in relation to landfall infrastructure and the OECC through South Dublin Bay.

For tern species, which aggregate in internationally important numbers within South Dublin Bay during post-breeding periods, additional information is presented about the numbers and distributions of roosting birds.

5.2.1. Light-bellied brent goose

5.2.1.1. Survey data

Light-bellied brent geese were recorded within the Project landfall survey area in 52 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.84.

Table 5.84: Total counts of light-bellied brent goose per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	31	446	34	61	28	7	121	7
February	50	165	27	24	299	13	25	23
March	68	45	59	11	25	11	63	60
April	N/A	N/A	45	35	412	1	N/A	
May	0	N/A	0	0	0	0		
June	0	0	0	0	0	0		
July	0	0	0	0	0	0		
August	0	0	0	0	0	0		
September	0	164	0	0	0	65		
October	7	168	155	213	120	4	93	85
November	38	94	602	302	225	67	284	470
December	137	2	0	0	346	57	50	372

Source: Natural Power

5.2.1.2. Temporal variation in abundance

Monthly variation in average light-bellied brent goose counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.1, with shading to represent one standard error.

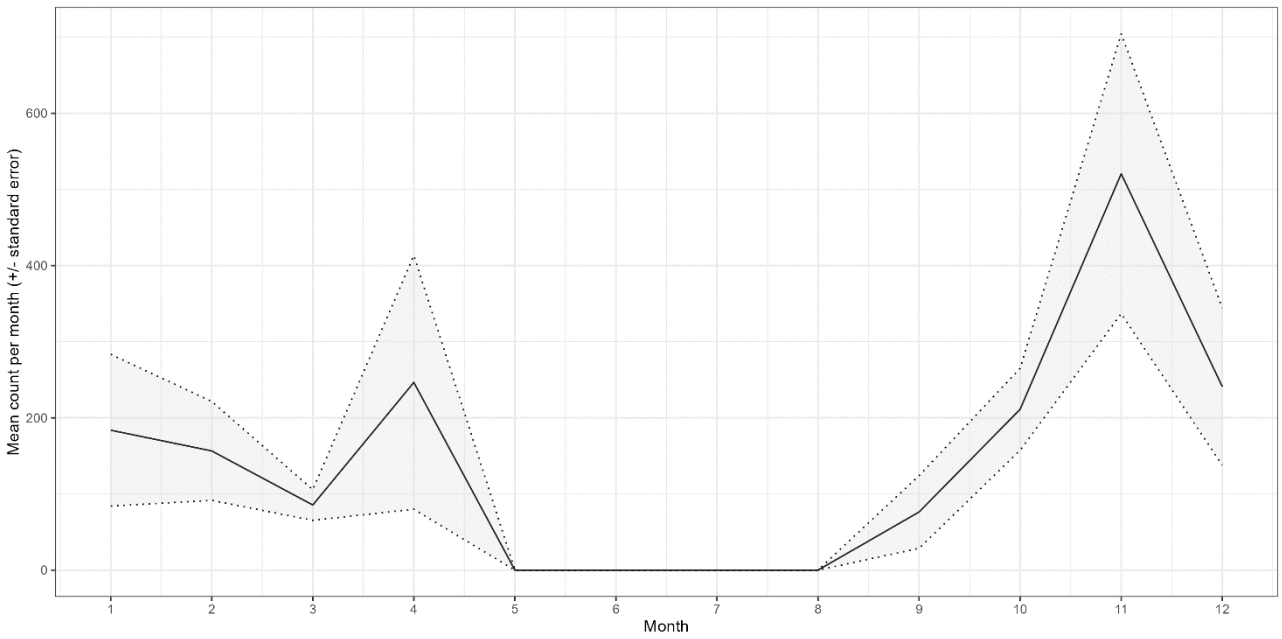
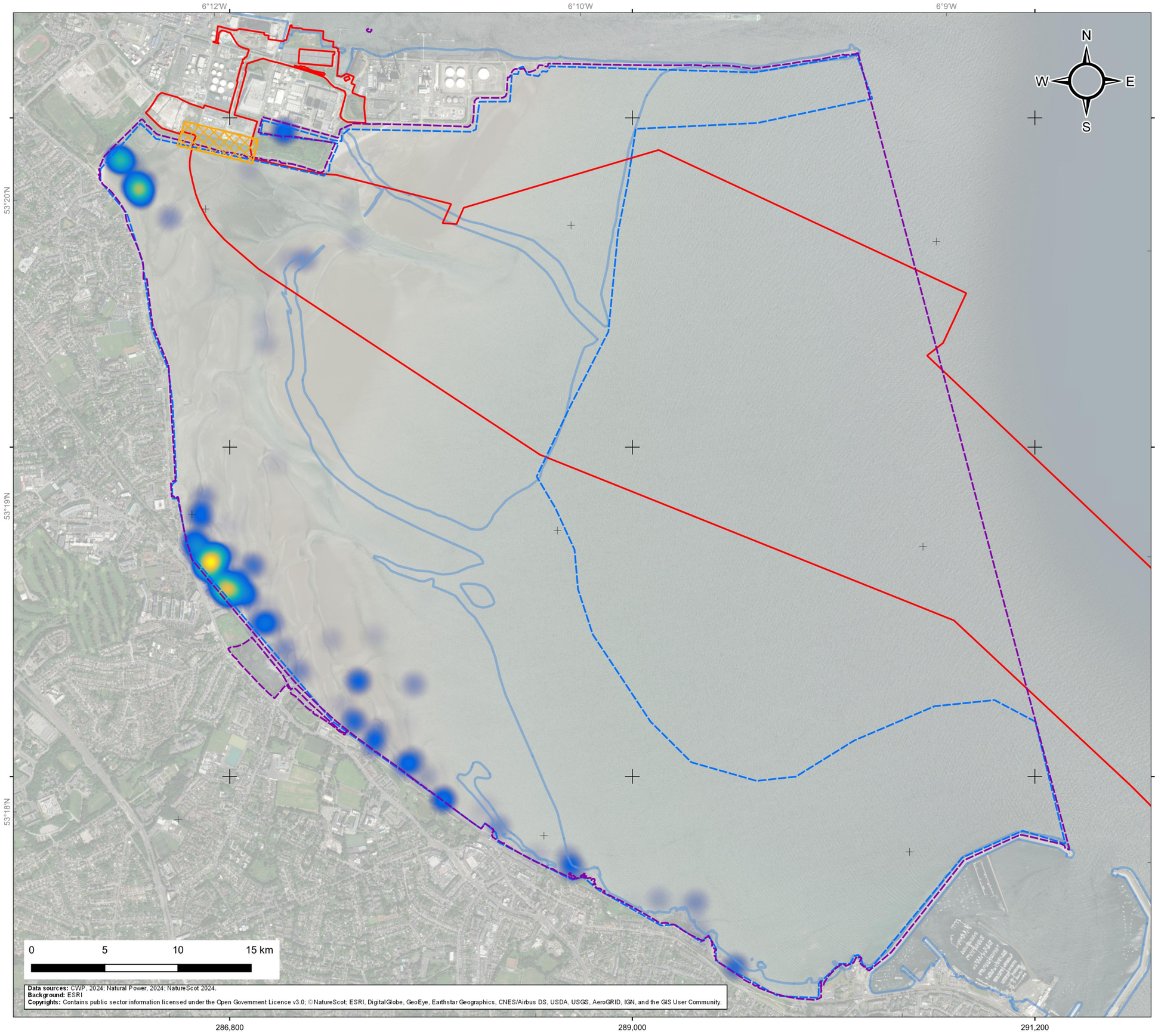
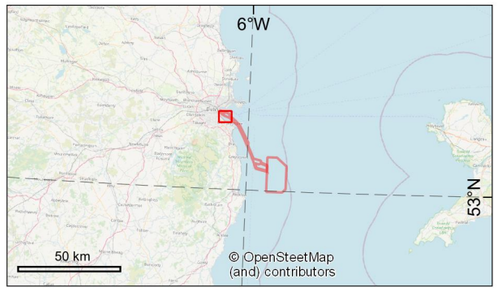


Figure 5.1: Annual variation in average counts of light-bellied brent geese

5.2.1.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by light-bellied brent geese during baseline landfall surveys is shown in Figure 5.2.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Light-bellied brent goose count density (total individuals per m²)

0.40

0.05

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.2
Spatial variation in frequency of landfall survey area site usage by light-bellied brent goose during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1620

Internal descriptive code: PB..DLH - PAB..LF4.IB - MLWS..LIGHT.BELL.BRENT.GOOSE.DENS..S.BIRD.INTERTIDAL..S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.02)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.2. Shelduck

5.2.2.1. Survey data

Shelduck were recorded within the Project landfall survey area in 51 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.85.

Table 5.85: Total counts of Shelduck per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	10	2	0	5	0	0	8	12
February	14	17	0	0	25	27	15	0
March	18	2	5	0	8	12	14	2
April	N/A	N/A	0	3	12	2	N/A	
May	2	N/A	2	9	10	0		
June	45	0	2	0	2	4		
July	7	0	0	0	4	0		
August	4	6	4	7	0	0		
September	10	6	4	0	4	0		
October	0	0	0	0	8	2	2	17
November	0	0	0	4	2	2	8	8
December	0	0	0	0	10	15	2	20

Source: Natural Power

5.2.2.2. Temporal variation in abundance

Monthly variation in average shelduck counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.3, with shading to represent one standard error.

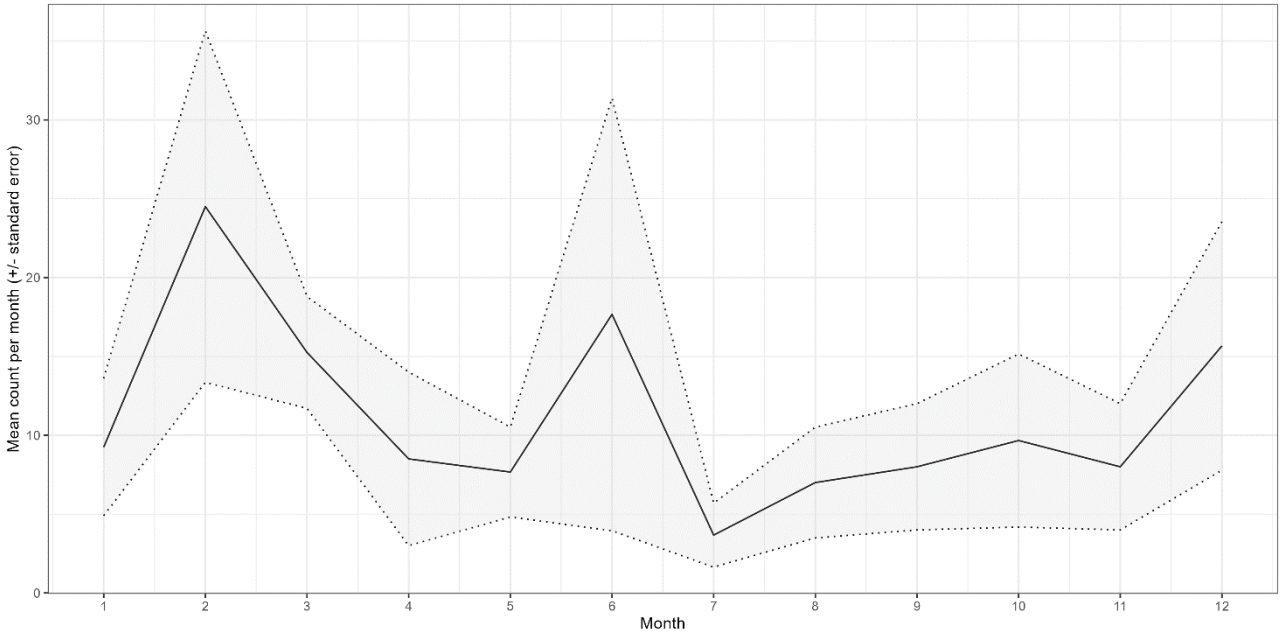
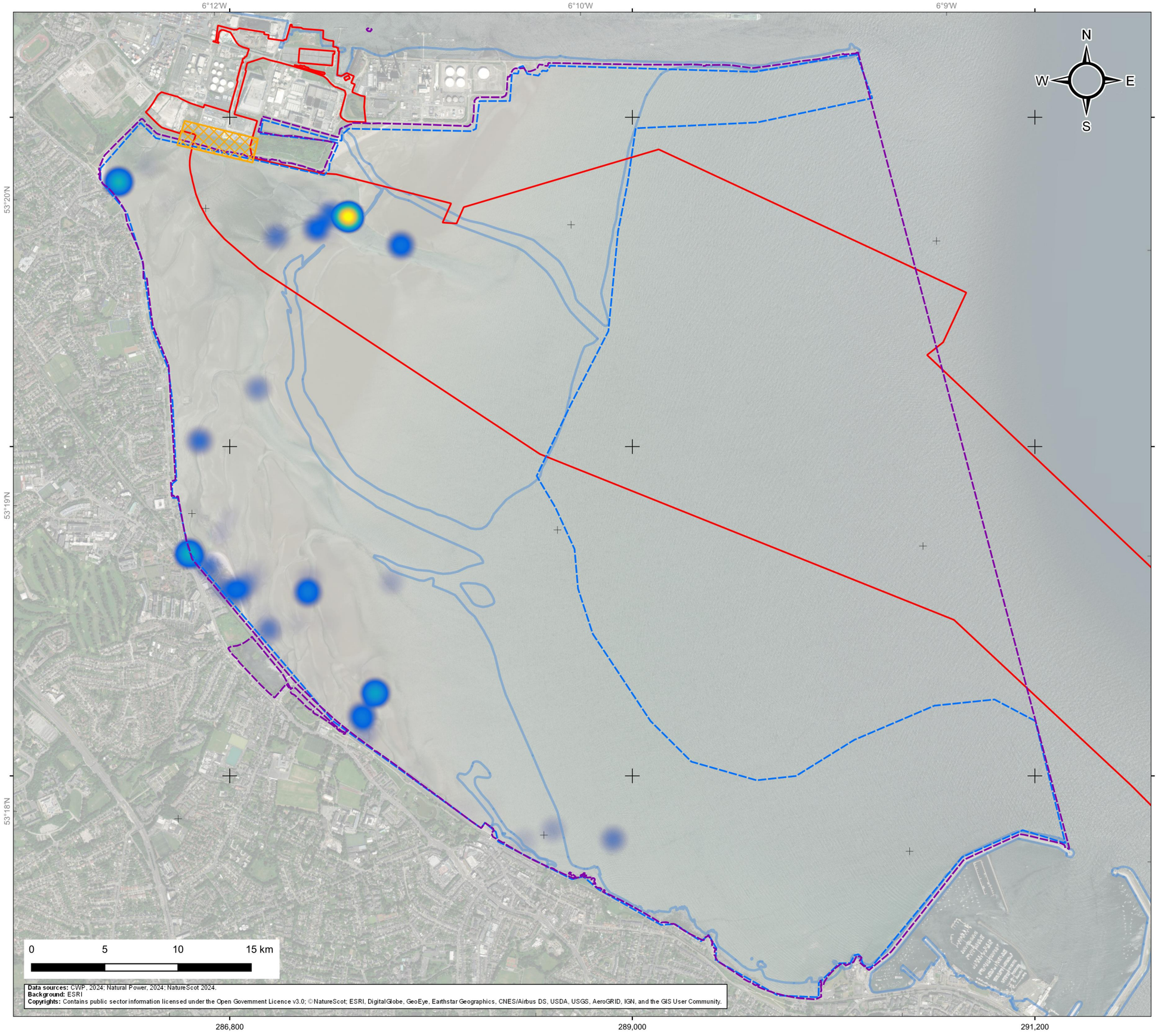
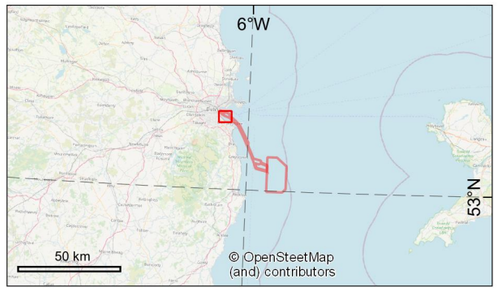


Figure 5.3: Annual variation in average counts of shelduck

5.2.2.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by shelduck during baseline landfall surveys is shown in Figure 5.4.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Shelduck count density (total individuals per m²)

0.054

0.007

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.4
Spatial variation in frequency of landfall survey area site usage by shelduck during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1631

Internal descriptive code: PB_DLH - PAB_LF4 IB -MLWS_SHELDUCK DENS_S.BIRD. INTERTIDAL_S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04. Ch.10.Ap.05.FIG.05.04)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.3. Pintail, shoveler and teal

5.2.3.1. Survey data

These three dabbling duck species are treated collectively as they occurred infrequently and in relatively small numbers during surveys of the intertidal landfall area and are all SCIs of the nearby North Bull Island SPA.

Pintail were each only recorded during one of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023, while shoveler were recorded during two surveys and teal were recorded during 9 surveys (Table 5.65). Pintail were recorded in flight over the survey area (one flock of 16 individuals only) and as such are not considered further. Total counts of each of these species on each survey are presented in Table 5.86.

Table 5.86: Shoveler (SV) and teal (T.) per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020				Year 2: October 2020 to September 2021				Year 3: October 2021 to September 2022				Year 4: October 2022 to March 2023			
	Monthly survey 1		Monthly survey 2		Monthly survey 1		Monthly survey 2		Monthly survey 1		Monthly survey 2		Monthly survey 1		Monthly survey 2	
	SV	T.	SV	T.	SV	T.	SV	T.	SV	T.	SV	T.	SV	T.	SV	T.
January	0	16	0	0	0	0	0	0	0	0	0	0	0	11	0	0
February	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0
March	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	17
April	N/A	N/A	N/A	N/A	0	0	0	0	0	0	0	0	N/A			
May	0	0	N/A	N/A	0	0	0	0	0	0	0	0				
June	0	0	0	0	0	0	0	0	0	0	0	0				
July	0	0	0	0	0	0	0	0	0	0	0	0				
August	0	0	0	0	0	0	0	0	0	0	0	0				
September	0	0	0	0	0	0	0	0	0	0	0	3				
October	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
November	0	43	0	71	6	0	0	0	0	0	0	0	0	4	0	6
December	0	19	0	49	0	6	0	3	1	0	0	0	0	0	0	5

Source: Natural Power

5.2.3.2. Temporal variation in abundance

Monthly variation in average shoveler and teal counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.5, with shading to represent one standard error.

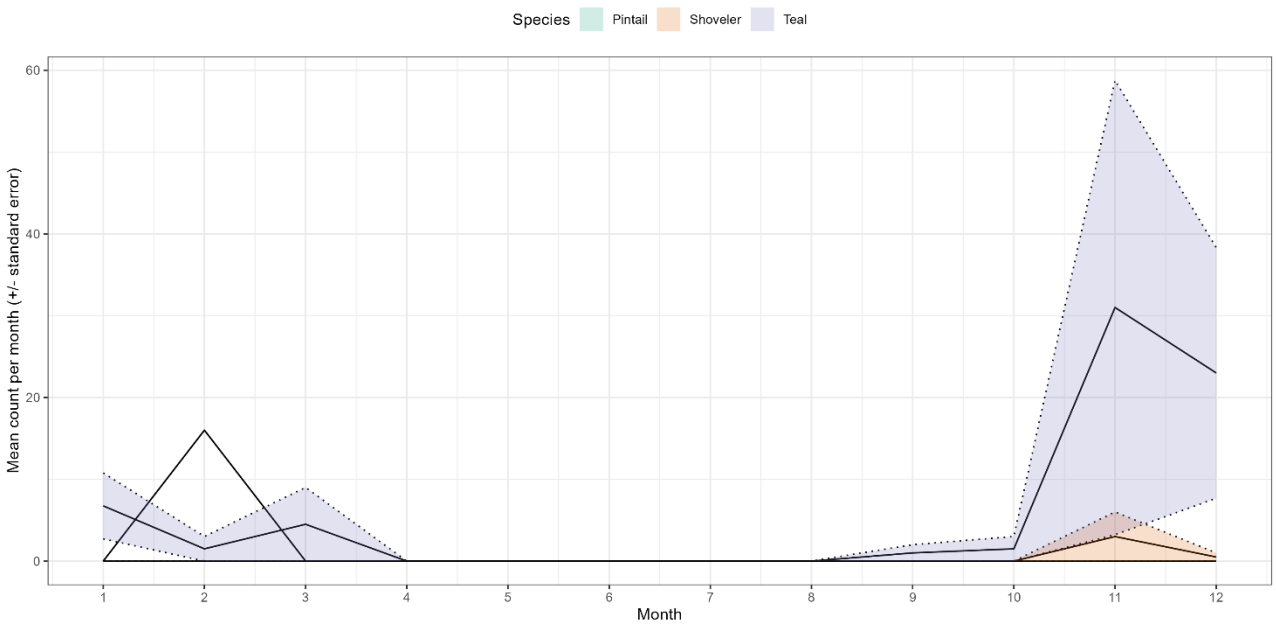
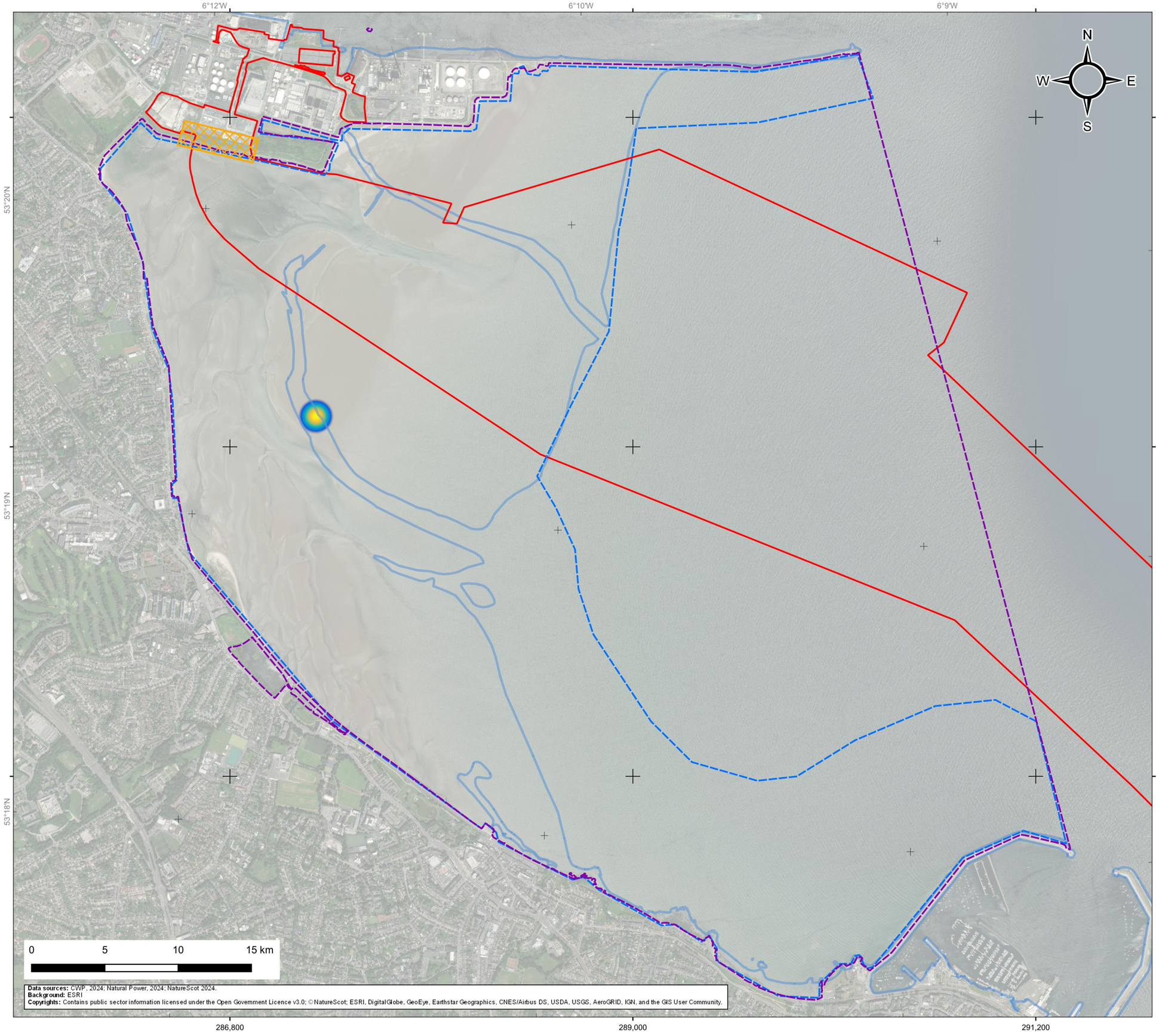
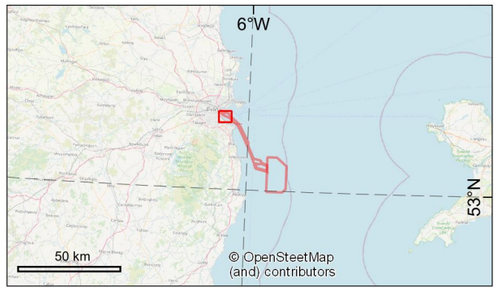


Figure 5.5: Annual variation in average counts of shoveler and teal

5.2.3.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by shoveler and teal during baseline landfall surveys is shown in Figure 5.6 (pintail were only recorded in flight).





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Shoveler count density (total individuals per m²)

0.0040

0.0003

codling wind park

Project: Codling Wind Park

Contractor: www.naturalpower.com

Figure 5.6
Spatial variation in frequency of landfall survey area site usage by shoveler during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1642

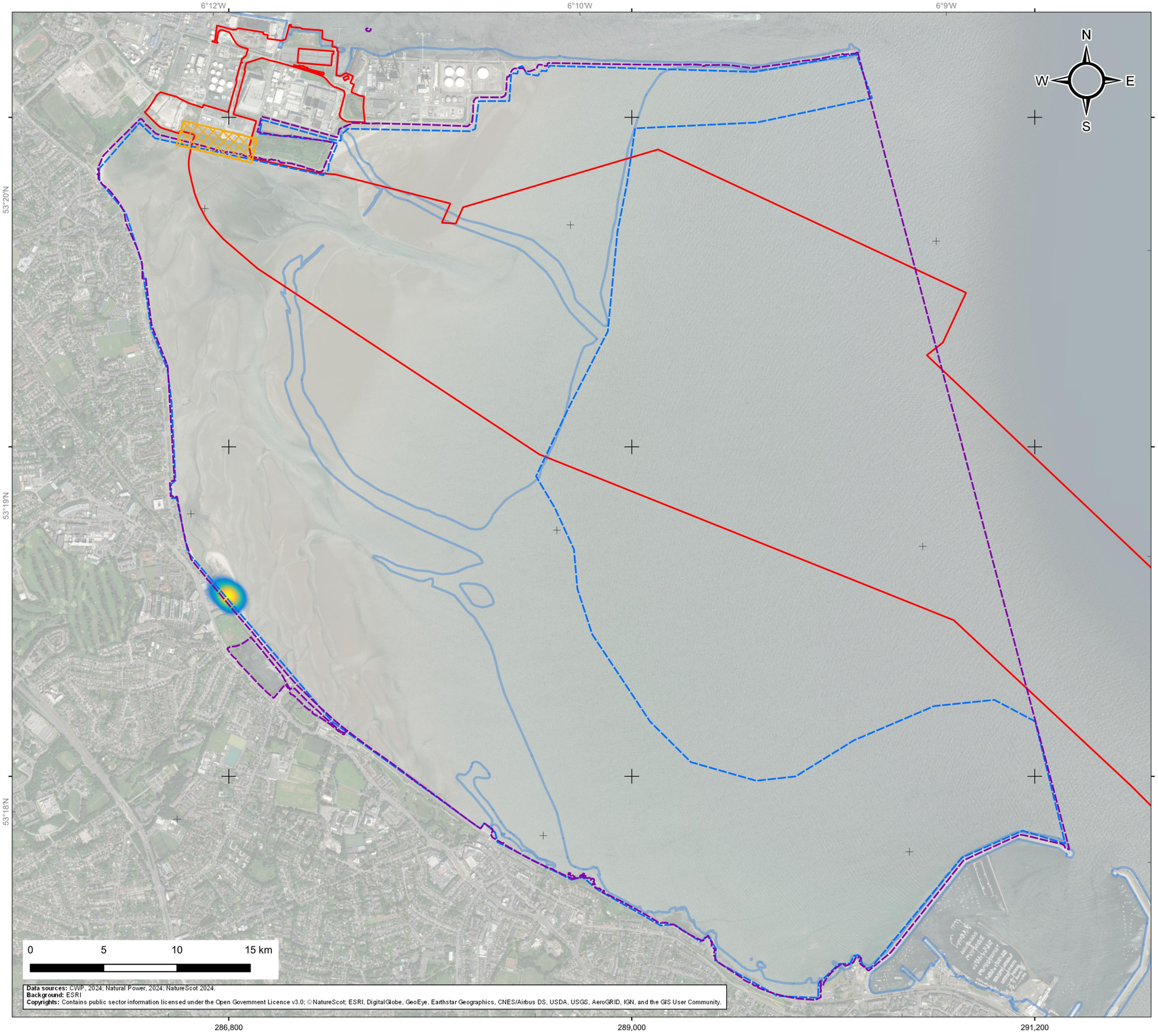
Internal descriptive code: PB_DLH - PAB_LF4_IB - MLWS_SHOVELER.DENS_S.BIRD. INTERTIDAL_S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04. Ch.10.Ap.05.FIG.05.06)

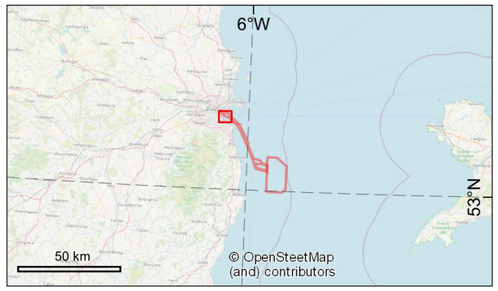
Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Teal count density (total individuals per m²)

0.40

0.06

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.7
Spatial variation in frequency of landfall survey area site usage by teal during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1646

Internal descriptive code: PB_DLH - PAB_LF4.IB - MLWS_TEAL DENS_S.BIRD.INTERTIDAL_S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.07)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.4. Common scoter

5.2.4.1. Survey data

Common scoter were recorded within the Project landfall survey area in 23 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.87.

Table 5.87: Total counts of common scoter per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	0	71	0	0	0	0	0	50
February	0	0	0	0	0	5	22	8
March	0	0	8	6	0	0	0	0
April	N/A	N/A	0	0	0	0	N/A	
May	0	N/A	0	0	0	0		
June	0	0	0	0	0	0		
July	0	0	0	0	0	0		
August	0	0	6	0	0	0		
September	0	13	14	2	0	8		
October	0	0	0	0	24	0	22	18
November	0	99	0	0	0	14	48	0
December	28	8	0	0	0	66	9	8

Source: Natural Power

5.2.4.2. Temporal variation in abundance

Monthly variation in average common scoter counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.8, with shading to represent one standard error.

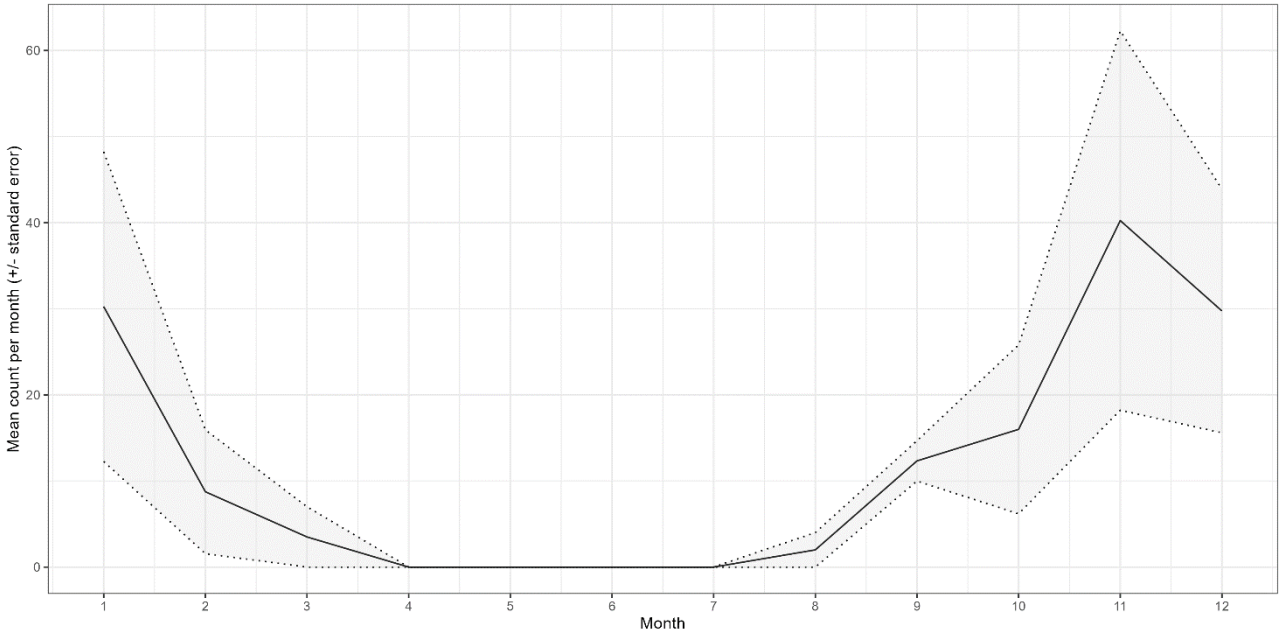
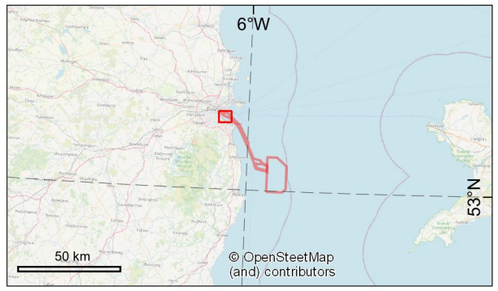


Figure 5.8: Annual variation in average counts of common scoter

5.2.4.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by common scoter during baseline landfall surveys is shown in Figure 5.9.

6°12'W
6°10'W
6°9'W
53°20'N
53°19'N
53°18'N
5,914,600
5,912,800
5,911,000
286,800
289,000
291,200
N
W
E
S
0 5 10 15 km
Data sources: CWP, 2024; Natural Power, 2024; NatureScot 2024.
Background: ESRI
Copyrights: Contains public sector information licensed under the Open Government Licence v3.0; © NatureScot; ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.



Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Common scoter count density (total individuals per m²)

0.08
0.01

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.9
Spatial variation in frequency of landfall survey area site usage by common scoter during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1648

Internal descriptive code: PB_DLH - PAB, LF4 /B - COMMON.SCOTER.DENS, MLWS, S.BIRD, INTERTIDAL, S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10. Ap.05.FIG.05.09)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.5. Red-breasted merganser

5.2.5.1. Survey data

Red-breasted merganser were recorded within the Project landfall survey area in 67 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.88.

Table 5.88: Total counts of red-breasted merganser per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	4	33	37	26	0	10	8	39
February	12	10	21	20	14	21	12	16
March	13	2	25	37	48	26	2	3
April	N/A	N/A	151	2	6	0	N/A	
May	23	N/A	0	3	0	0		
June	8	15	0	0	6	1		
July	0	3	0	10	0	1		
August	0	0	10	7	14	3		
September	0	35	16	19	56	29		
October	10	15	30	21	23	47	14	14
November	10	13	47	60	40	47	28	28
December	16	8	24	0	13	28	17	17

Source: Natural Power

5.2.5.2. Temporal variation in abundance

Monthly variation in average red-breasted merganser counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.10, with shading to represent one standard error.

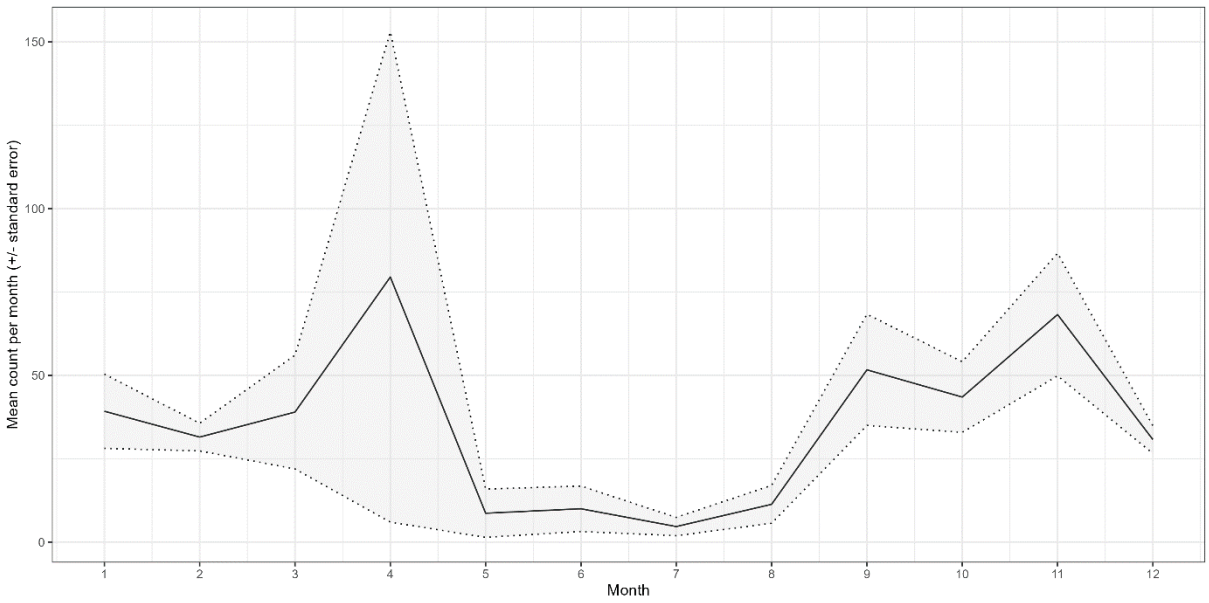
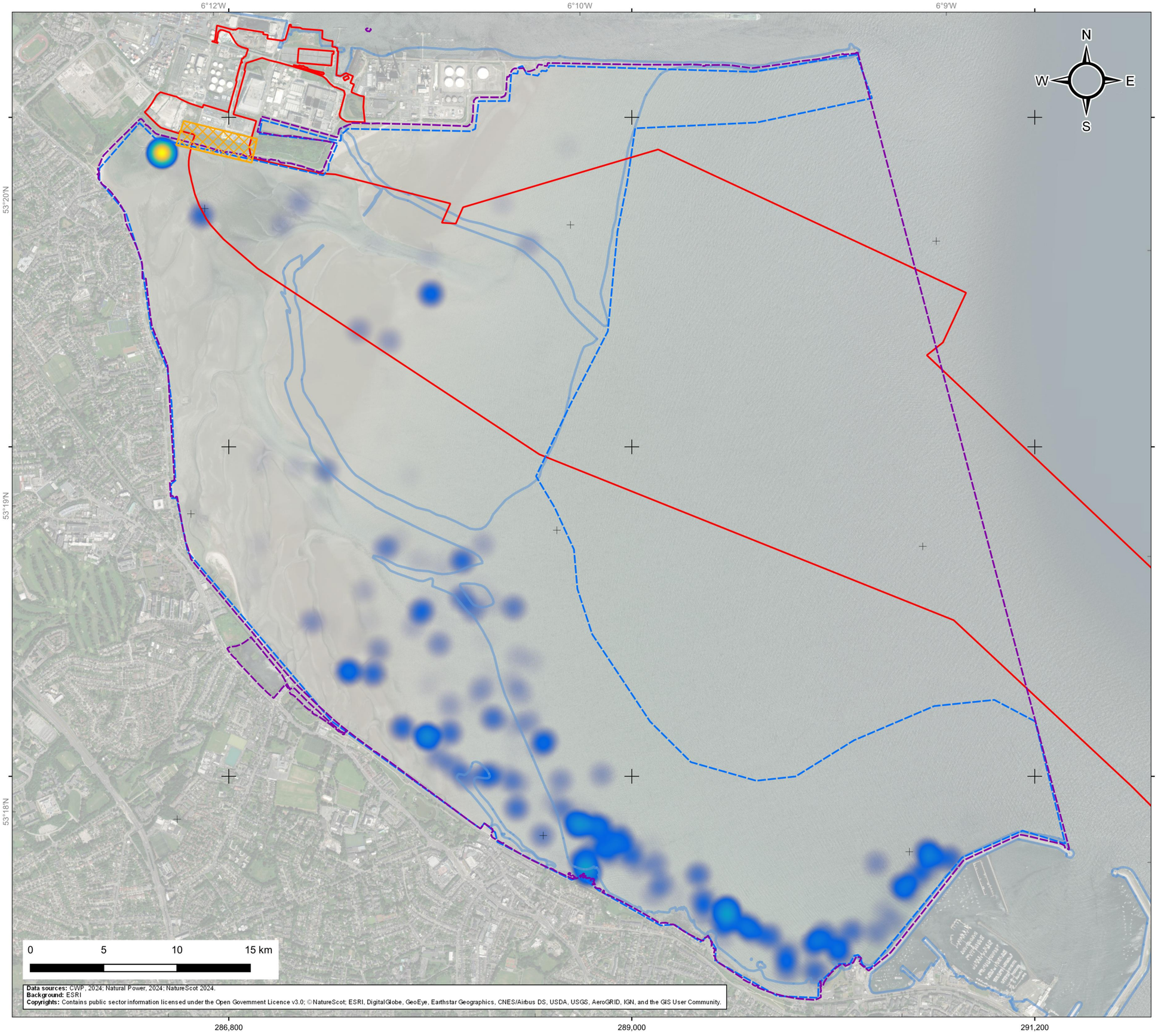
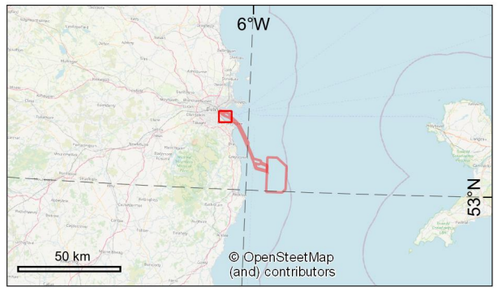


Figure 5.10: Annual variation in average counts of red-breasted merganser

5.2.5.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by red-breasted merganser during baseline landfall surveys is shown in Figure 5.11.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Red-breasted merganser count density (total individuals per m²)

0.14

0.02

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.11
Spatial variation in frequency of landfall survey area site usage by red-breasted merganser during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-0678

Internal descriptive code: PB_DLH - PAB_LF4 IB - MLWS_RED.BREAST.MERGANSER. DENS._S.BIRD.INTERTIDAL_S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.Fig.05.11)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.6. Red-throated diver

5.2.6.1. Survey data

Red-throated diver were recorded within the Project landfall survey area in 42 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.89.

Table 5.89: Total counts of red-throated diver per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	19	4	9	4	0	0	5	15
February	2	8	2	6	7	8	2	3
March	9	0	6	7	4	2	2	0
April	N/A	N/A	6	0	0	0	N/A	
May	0	N/A	0	0	0	0		
June	0	0	0	0	0	0		
July	0	0	0	0	0	0		
August	0	0	0	0	0	0		
September	0	0	71	0	0	0		
October	0	9	1	1	9	5	5	4
November	0	18	4	2	15	9	8	4
December	0	8	1	0	13	15	5	2

Source: Natural Power

5.2.6.2. Temporal variation in abundance

Monthly variation in average red-throated diver counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.12, with shading to represent one standard error.

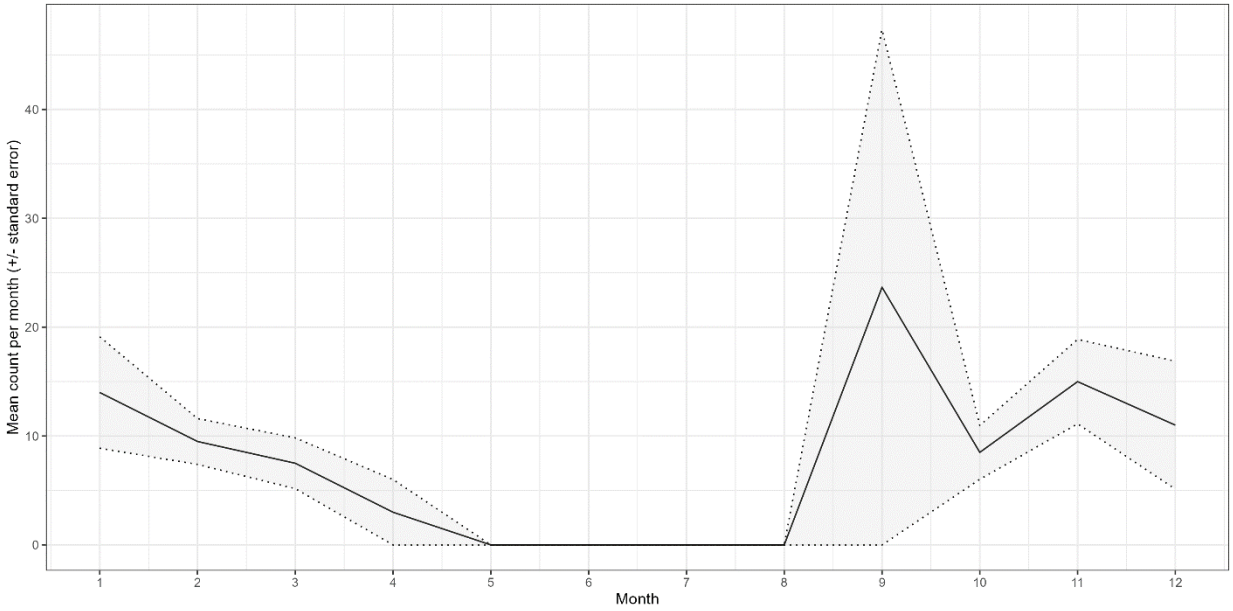
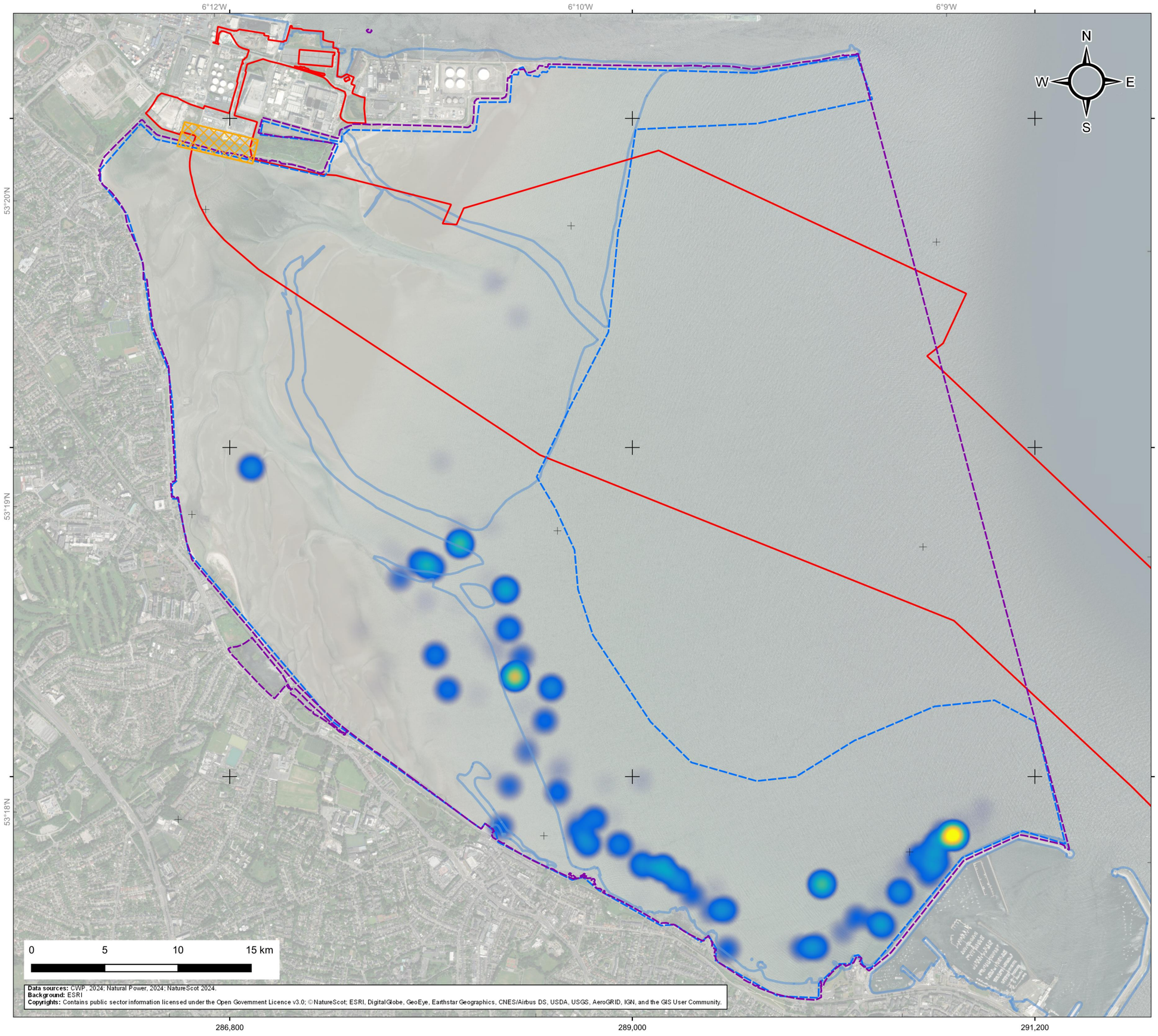
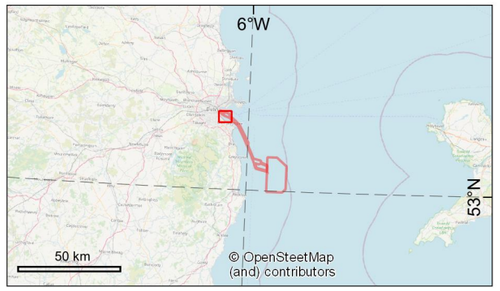


Figure 5.12: Annual variation in average counts of red-throated diver

5.2.6.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by red-throated diver during baseline landfall surveys is shown in Figure 5.13.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Red-throated diver count density (total individuals per m²)

0.026

0.003

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.13
Spatial variation in frequency of landfall survey area site usage by red-throated diver during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-0679

Internal descriptive code: PB..DLH - PAB..LF4.IB - MLWS..RED.THROAT.DIVER.DENS..S.BIRD.INTERTIDAL..S.D.BUY.and.RIV.TOLKA.SPA.-(EIAR.Vol.04.Ch.10.Ap.05.FIG.05.13)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.7. Great crested grebe

5.2.7.1. Survey data

Great crested grebe were recorded within the Project landfall survey area in 64 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.90.

Table 5.90: Total counts of great crested grebe per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	99	258	190	248	0	11	10	228
February	39	124	34	15	12	134	12	53
March	101	4	4	26	30	25	0	23
April	N/A	N/A	14	0	8	0	NA	
May	0	N/A	0	9	0	5		
June	0	0	1	0	8	0		
July	0	0	0	0	1	3		
August	120	35	4	1	52	42		
September	21	95	6	10	29	11		
October	1	22	18	17	64	239	19	79
November	0	912	48	29	106	208		
December	39	12	347	160	10	83	0	13

Source: Natural Power

5.2.7.2. Temporal variation in abundance

Monthly variation in average great crested grebe counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.14, with shading to represent one standard error.

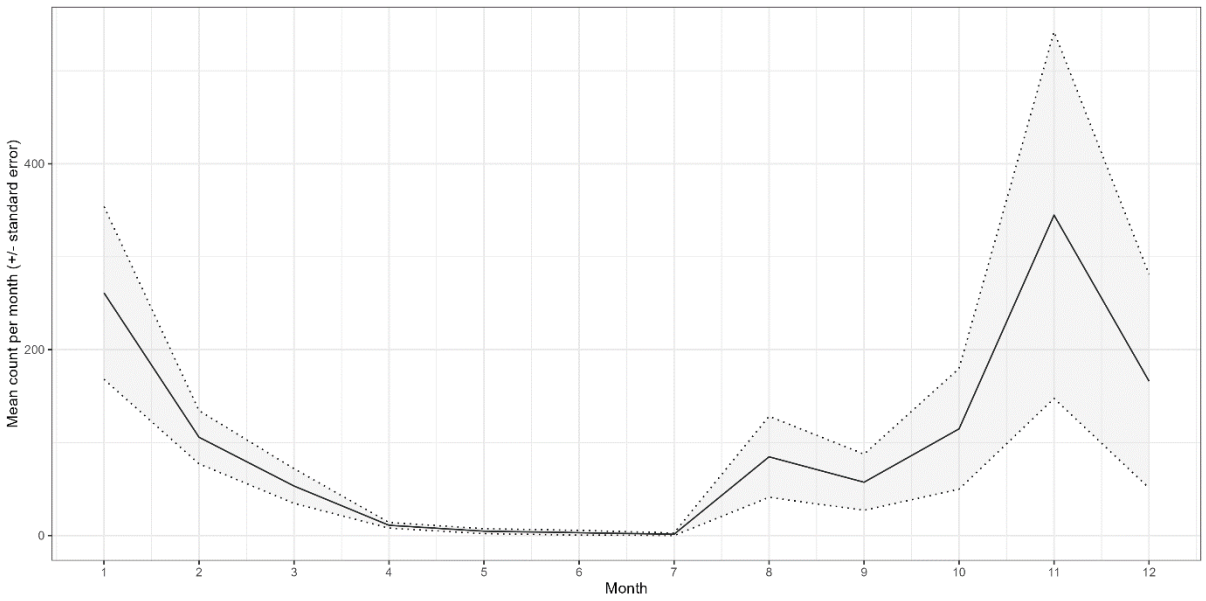
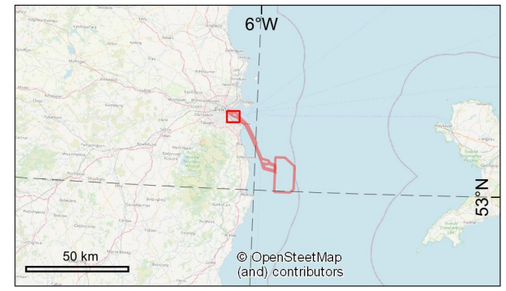


Figure 5.14: Annual variation in average counts of great crested grebe

5.2.7.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by great crested grebe during baseline landfall surveys is shown in Figure 5.15.

6°12'W
6°10'W
6°9'W
53°20'N
53°19'N
53°18'N
5,914,600
5,912,800
5,911,000
286,800
289,000
291,200
N
W
E
S
0 5 10 15 km



Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Great-crested grebe count density (total individuals per m²)

0.09

0.01

Data sources: CWP, 2024; Natural Power, 2024; NatureScot 2024.
Background: ESRI

codling wind park

Project: Codling Wind Park

Contractor: www.naturalpower.com natural power

Figure 5.15
Spatial variation in frequency of landfall survey area site usage by great crested grebe during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-0680

Internal descriptive code: PB..DLH - PAB..LF4.IB - GREAT.CREST.GREBE.DENS..MLWS..S.BIRD. INTERTIDAL..S.D.BUY.and.RIV.TOLKA.SPA.-(EIAR.Vol.04.Ch.10.Ap.05. FIG.05.15)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.8. Grey heron

5.2.8.1. Survey data

Grey heron were recorded within the Project landfall survey area in 70 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.91.

Table 5.91: Total counts of grey heron per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	0	4	3	10	0	0	0	2
February	2	0	2	4	2	2	5	1
March	0	2	1	1	1	3	0	3
April	N/A	N/A	1	1	2	2	N/A	
May	4	N/A	1	2	3	3		
June	2	14	6	1	3	3		
July	0	4	0	2	1	0		
August	2	16	2	13	2	1		
September	5	6	25	6	11	3		
October	2	2	2	3	3	2	3	8
November	1	1	1	4	2	5	4	3
December	3	0	2	1	4	2	3	4

Source: Natural Power

5.2.8.2. Temporal variation in abundance

Monthly variation in average grey heron counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.16, with shading to represent one standard error.

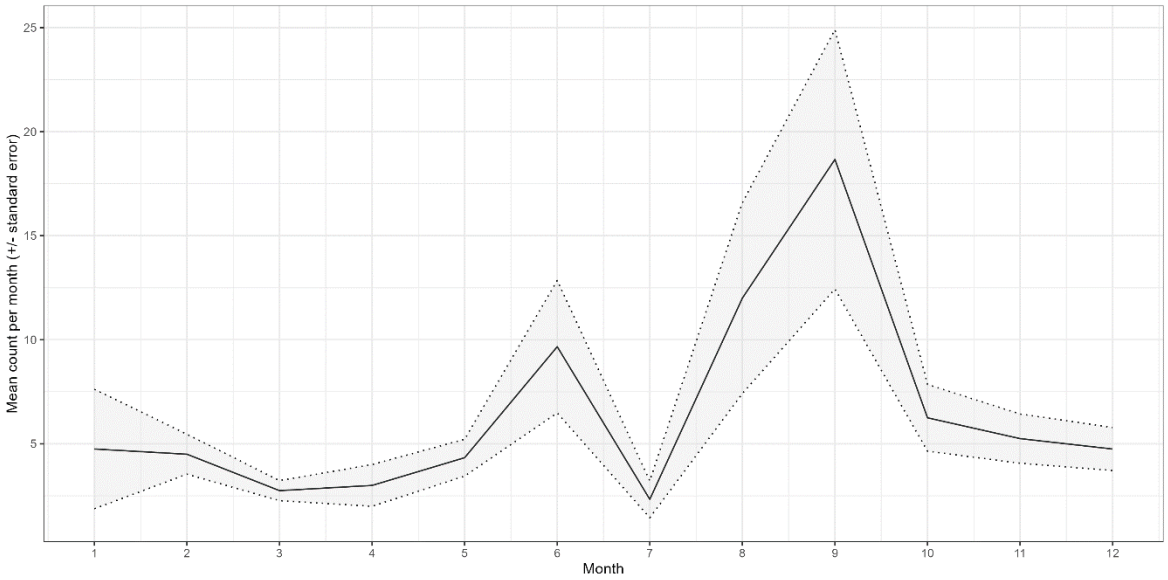
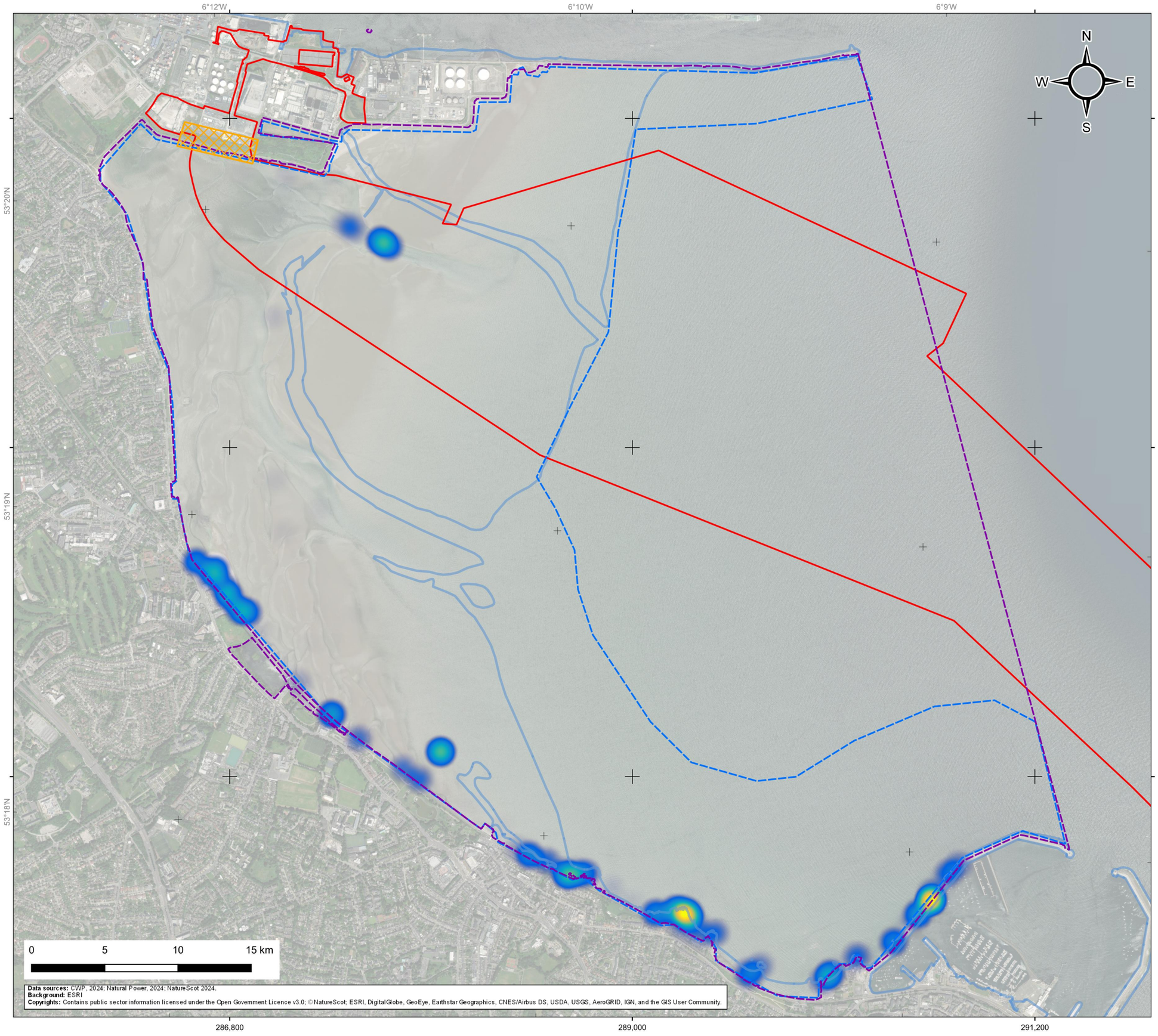
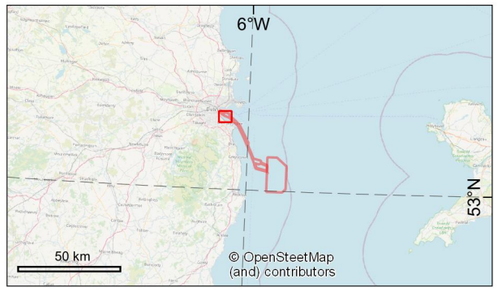


Figure 5.16: Annual variation in average counts of grey heron

5.2.8.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by grey heron during baseline landfall surveys is shown in Figure 5.16.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Grey heron count density (total individuals per m²)

0.030

0.004

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.17
Spatial variation in frequency of landfall survey area site usage by grey heron during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1618

Internal descriptive code: PR.DLH - PAB, LF4.IB - GREYHERON.DENS, MLWS, S.BIRD, INTERTIDAL, S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.17)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.9. Little egret

5.2.9.1. Survey data

Little egret were recorded within the Project landfall survey area in 66 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.92.

Table 5.92: Total counts of little egret per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	1	1	0	1	0	0	7	0
February	0	0	1	2	3	0	9	0
March	1	2	1	1	2	2	0	0
April	N/A	N/A	2	8	12	8	N/A	
May	14	N/A	7	15	6	14		
June	5	9	16	11	21	21		
July	10	2	12	3	3	4		
August	4	15	7	20	1	8		
September	19	22	50	1	90	2		
October	7	7	8	6	4	0	23	37
November	4	0	0	7	12	3	0	12
December	0	1	3	3	20	3	0	12

Source: Natural Power

5.2.9.2. Temporal variation in abundance

Monthly variation in average little egret counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.18, with shading to represent one standard error.

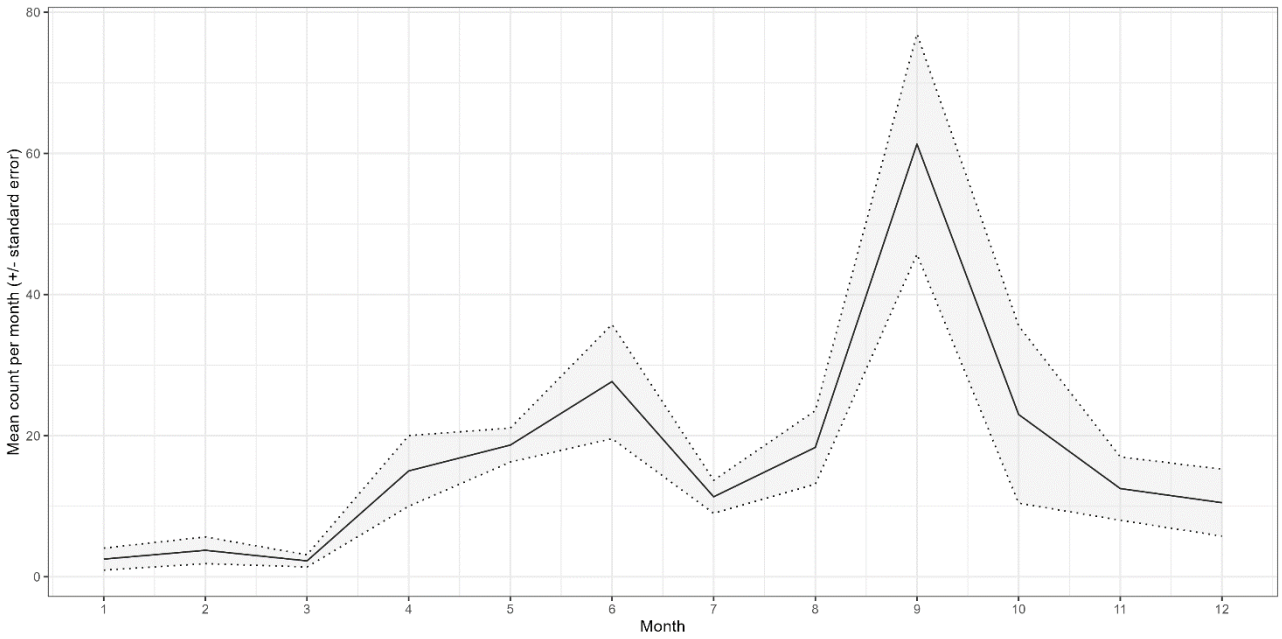
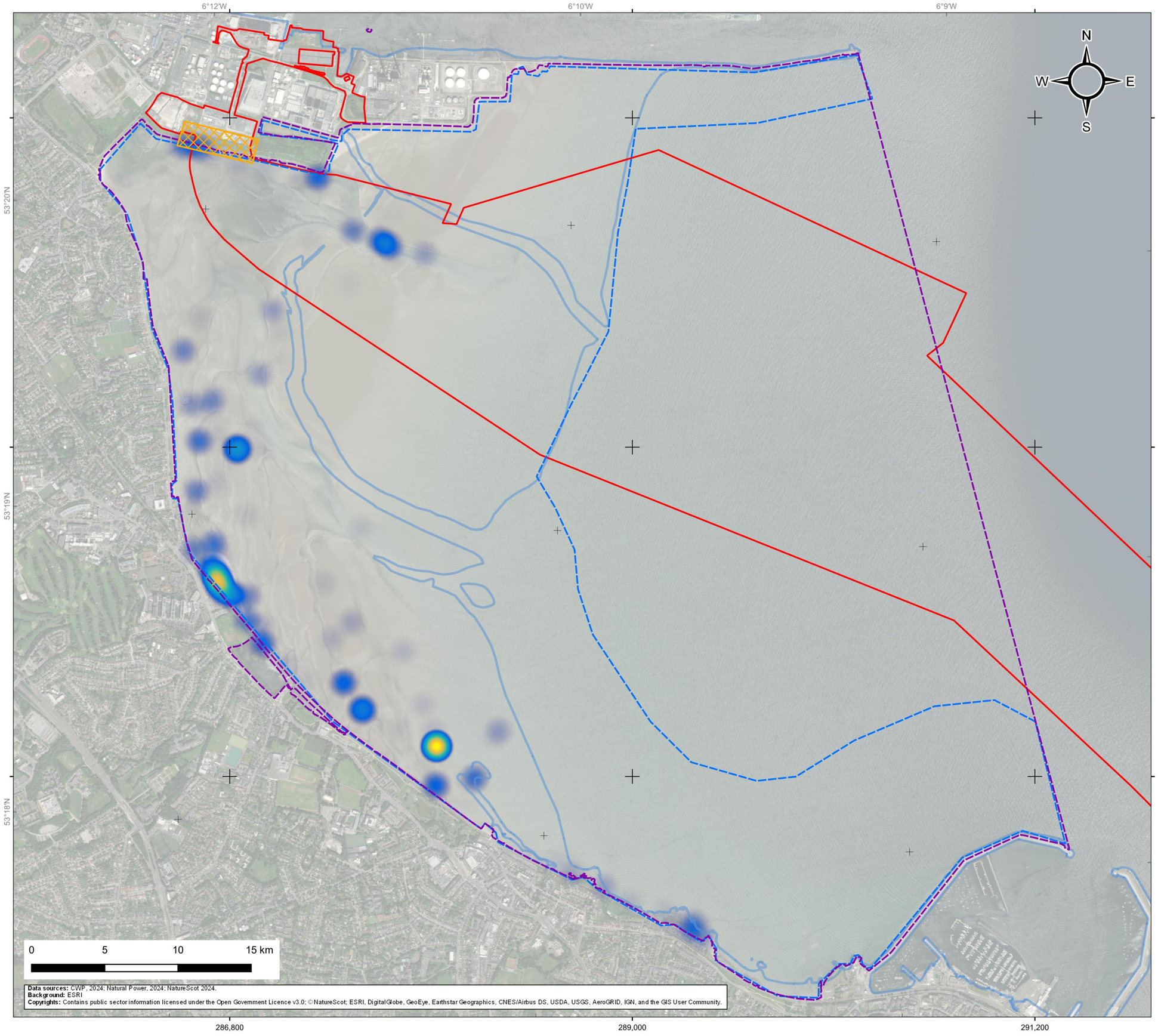
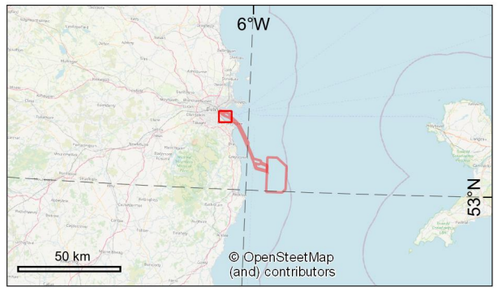


Figure 5.18: Annual variation in average counts of little egret

5.2.9.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by little egret during baseline landfall surveys is shown in Figure 5.19.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Little egret count density (total individuals per m²)

0.058

0.007

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.19
Spatial variation in frequency of landfall survey area site usage by little egret during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1619

Internal descriptive code: PB..DLH - PAB..LF4.IB - LITTLE.EGRET.DENS..MLWS..S.BIRD.INTERTIDAL..S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.19)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.10. **Shag**

5.2.10.1. **Survey data**

Shag were recorded within the Project landfall survey area in 71 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023March 2023. Total counts of this species on each survey are presented in Table 5.93.

Table 5.93: Total counts of shag per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	8	53	30	9	0	0	3	6
February	7	2	3	6	0	3	6	3
March	4	18	8	6	0	1	5	2
April	N/A	N/A	1	0	2	1	N/A	
May	10	N/A	3	4	3	5		
June	7	10	0	1	0	1		
July	1	16	0	0	5	5		
August	26	17	2	2	1	5		
September	36	28	5	4	3	1		
October	14	8	13	4	4	2	1	1
November	21	83	1	10	6	1	4	3
December	36	20	24	0	4	2	3	4

Source: Natural Power

5.2.10.2. **Temporal variation in abundance**

Monthly variation in average shag counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.20, with shading to represent one standard error.

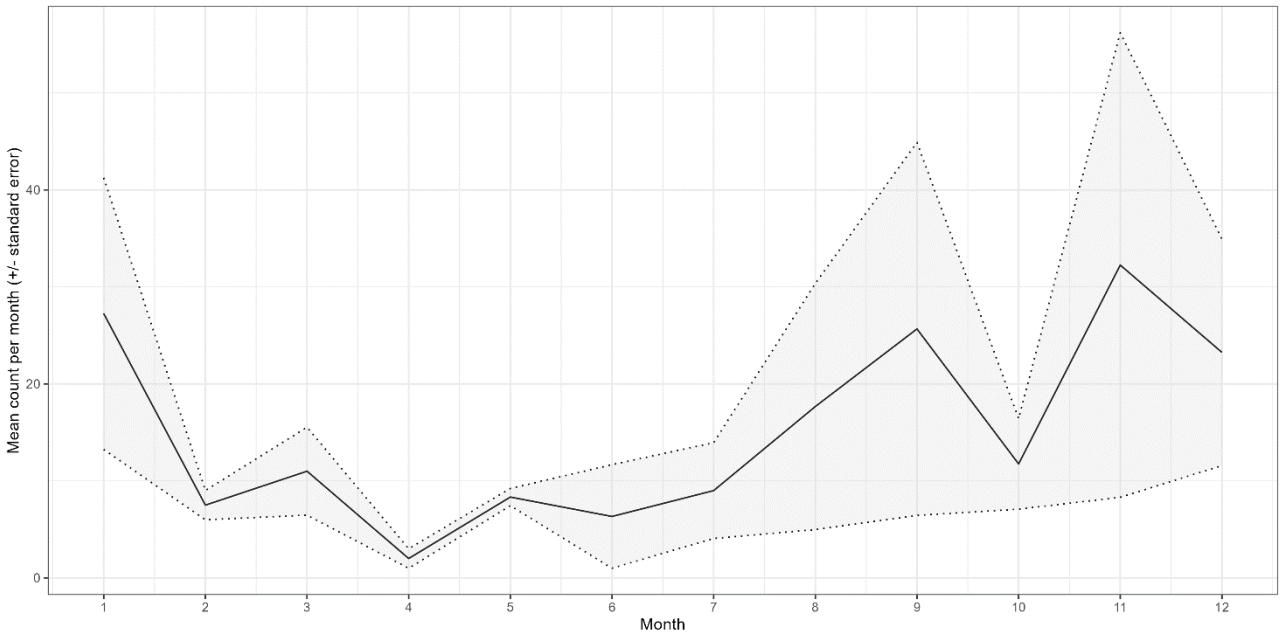
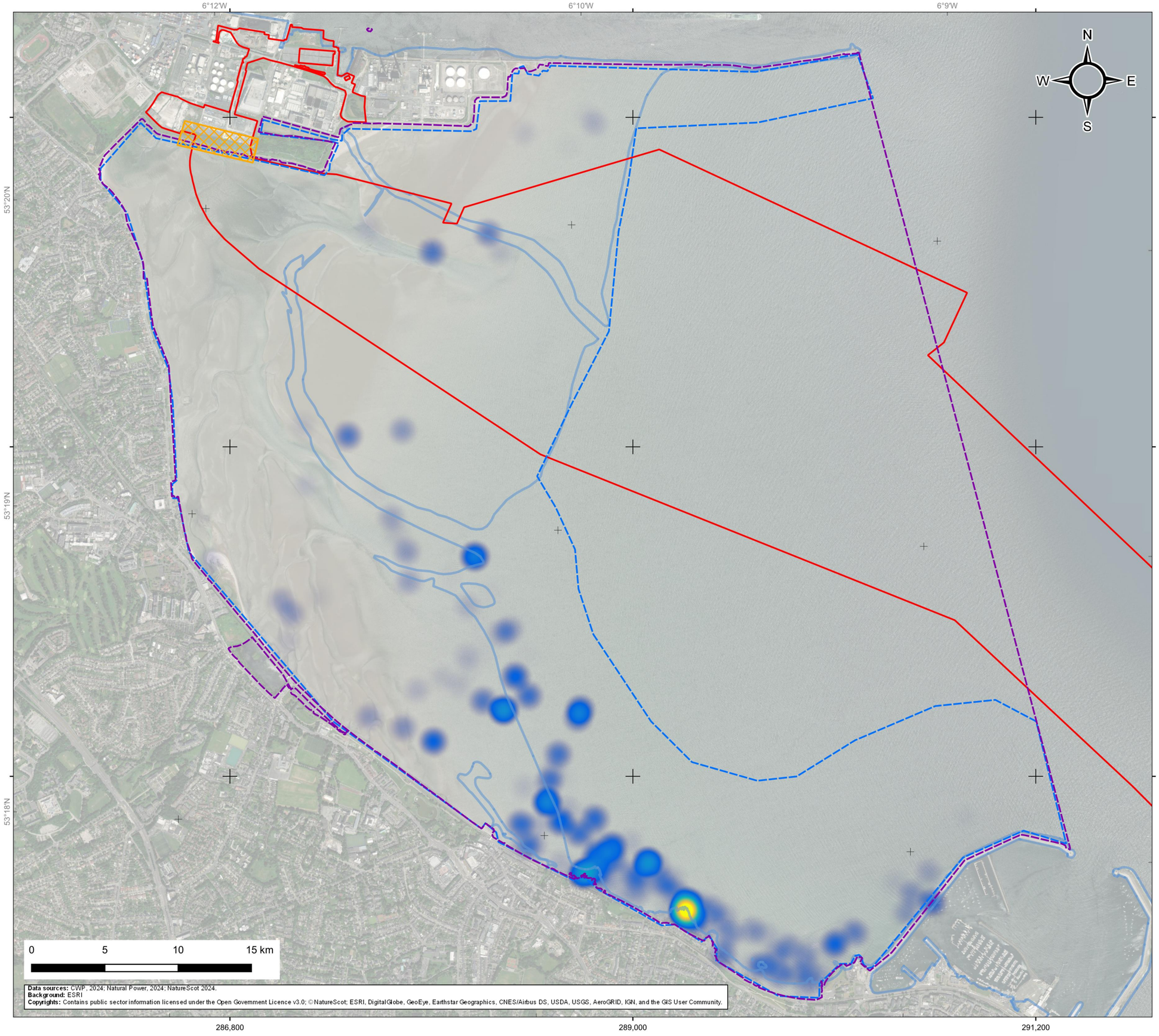
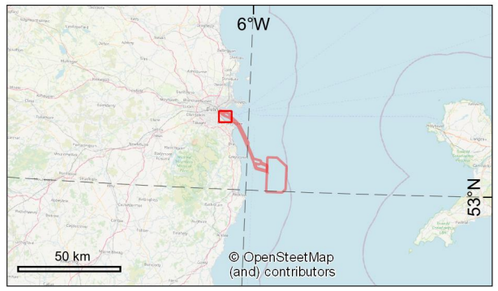


Figure 5.20: Annual variation in average counts of shag

5.2.10.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by shag during baseline landfall surveys is shown in Figure 5.21.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Shag count density (total individuals per m²)

0.15

0.02

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.21
Spatial variation in frequency of landfall survey area site usage by shag during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1621

Internal descriptive code: PB..DLH - PAB..LF4.IB - MLWS..SHAG.DENS..S.BIRD.INTERTIDAL..S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.21)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.11. Cormorant

5.2.11.1. Survey data

Cormorant were recorded within the Project landfall survey area in 73 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.94.

Table 5.94: Total counts of cormorant per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	1	0	4	8	0	0	17	3
February	1	3	2	7	2	2	21	37
March	0	4	3	9	6	1	12	9
April	N/A	N/A	2	4	6	3	N/A	
May	0	N/A	1	5	1	3		
June	0	4	11	5	8	7		
July	16	6	2	10	11	2		
August	21	16	4	26	3	4		
September	8	18	13	4	7	3		
October	12	3	15	1	7	11	2	5
November	0	5	3	8	11	16	4	11
December	2	3	16	0	4	2	18	17

Source: Natural Power

5.2.11.2. Temporal variation in abundance

Monthly variation in average cormorant counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.22, with shading to represent one standard error.

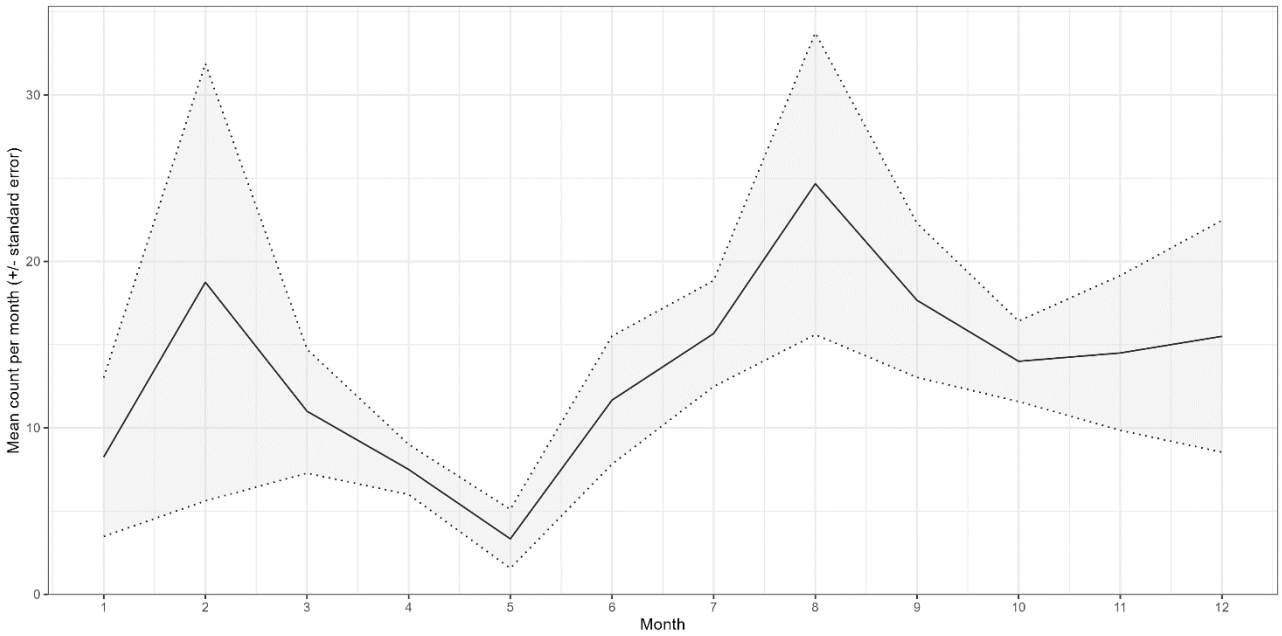
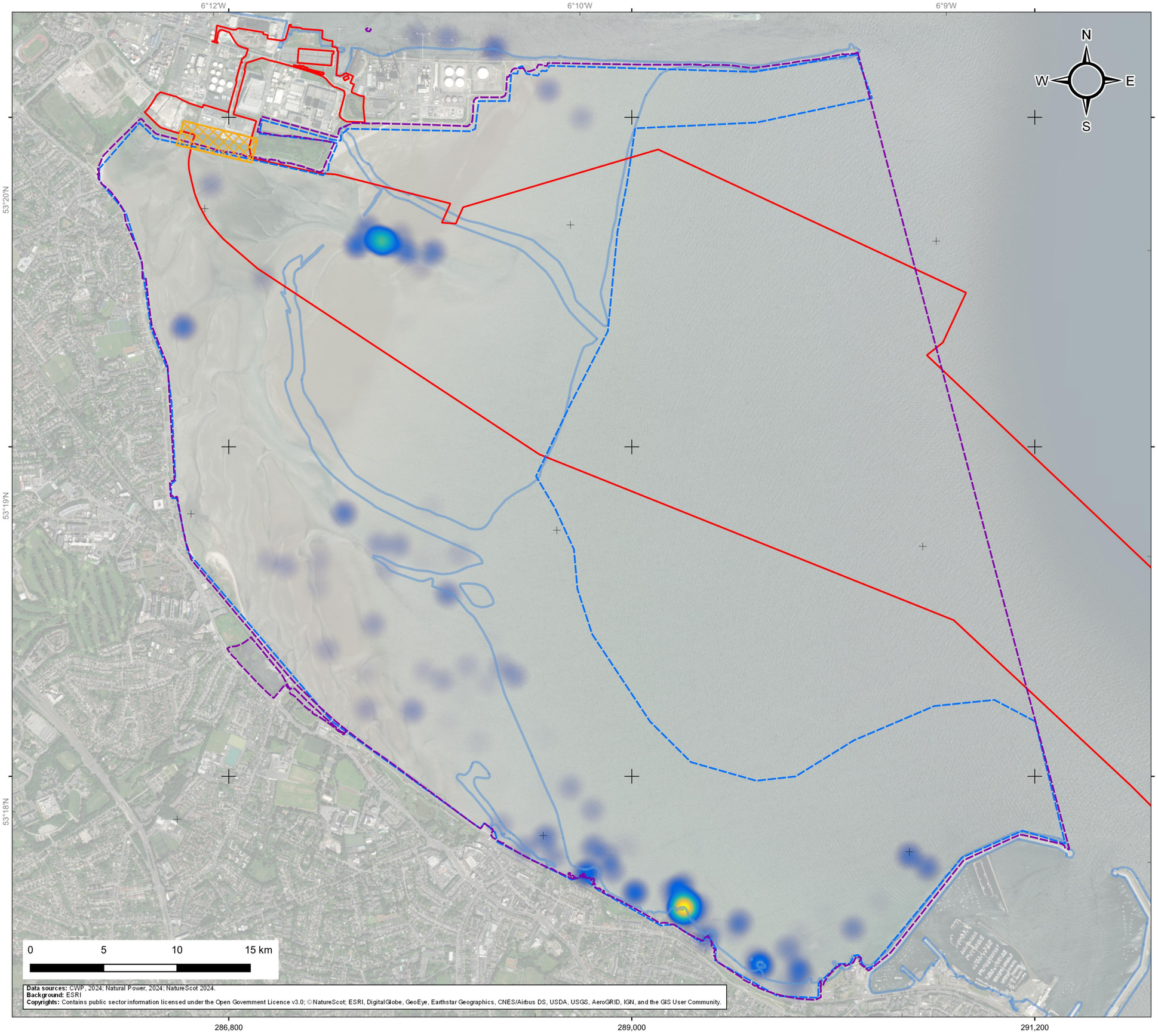
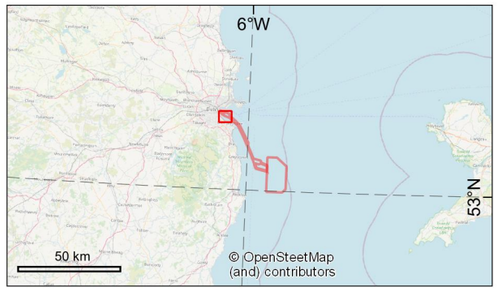


Figure 5.22: Annual variation in average counts of cormorant

5.2.11.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by cormorant during baseline landfall surveys is shown in Figure 5.23.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Cormorant count density (total individuals per m²)

0.08

0.01

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.23
Spatial variation in frequency of landfall survey area site usage by cormorant during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1622

Internal descriptive code: PB_DLH - PAB_LF4.IB - CORMORANT.DENS_MLWS_S.BIRD. INTERTIDAL_S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch. 10.Ap.05.FIG.05.23)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.12. Oystercatcher

5.2.12.1. Survey data

Oystercatcher were recorded within the Project landfall survey area in 80 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.95.

Table 5.95: Total counts of oystercatcher per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	1632	1283	1612	2576	566	480	1789	2060
February	493	249	3677	548	420	269	394	600
March	654	316	934	506	118	167	1704	1163
April	N/A	N/A	185	411	306	30	N/A	
May	175	N/A	118	39	325	0		
June	169	395	122	217	213	27		
July	419	234	100	154	83	89		
August	364	1071	240	474	827	1195		
September	858	1240	1029	1033	984	970		
October	962	2790	1131	881	343	1072	1741	1284
November	278	930	1088	1809	2276	148	1081	1381
December	1557	714	990	870	1877	2386	1364	2497

Source: Natural Power

5.2.12.2. Temporal variation in abundance

Monthly variation in average oystercatcher counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.24, with shading to represent one standard error.

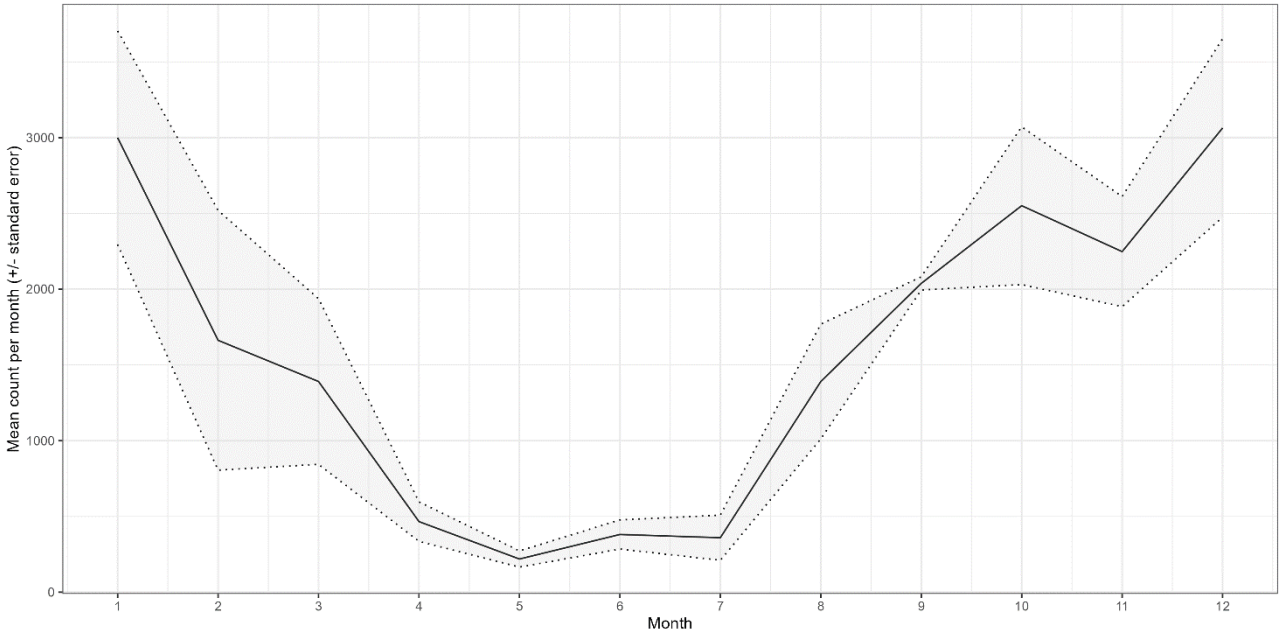
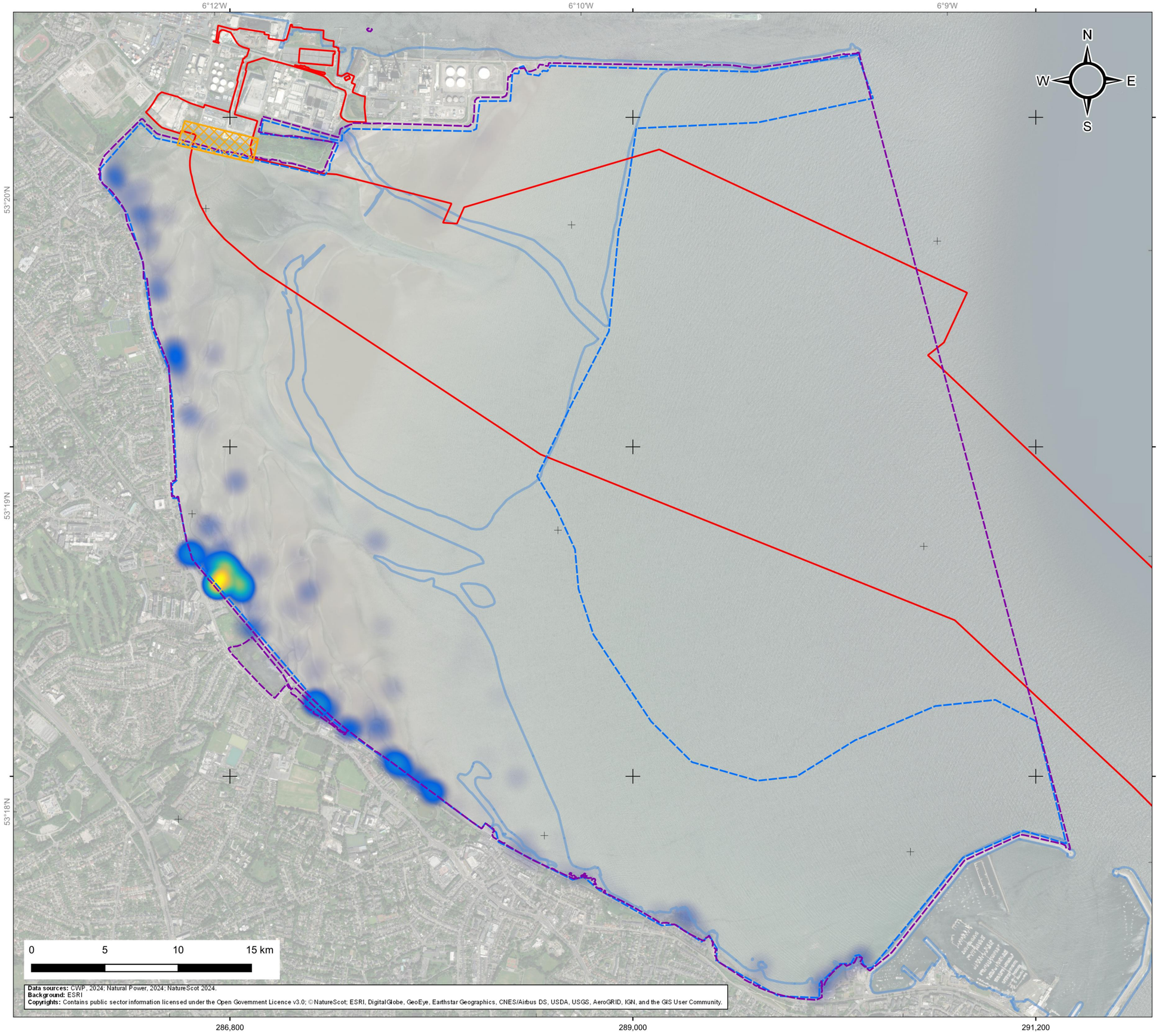
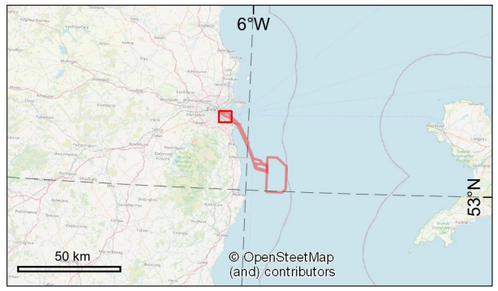


Figure 5.24: Annual variation in average counts of oystercatcher

5.2.12.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by oystercatcher during baseline landfall surveys is shown in Figure 5.25.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Oystercatcher count density (total individuals per m²)

3.0

0.4

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.25
Spatial variation in frequency of landfall survey area site usage by oystercatcher during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1623

Internal descriptive code: PB..DLH - PAB..LF4.IB - MLWS..OYSTERCATCHER.DENS..S.BIRD.INTERTIDAL..S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.25)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.13. Golden plover

5.2.13.1. Survey data

Golden plover were recorded within the Project landfall survey area in 15 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.96.

Table 5.96: Total counts of golden plover per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	0	0	0	26	0	0	0	0
February	0	0	72	0	0	0	0	0
March	0	0	0	0	0	0	53	140
April	N/A	N/A	0	0	0	0	N/A	
May	0	N/A	0	0	0	0		
June	0	0	0	0	0	0		
July	0	0	0	0	0	0		
August	0	0	0	0	0	0		
September	72	140	0	0	0	86		
October	0	0	0	0	0	0	38	16
November	42	475	0	0	0	0	0	0
December	270	0	125	0	25	375	0	0

Source: Natural Power

5.2.13.2. Temporal variation in abundance

Monthly variation in average golden plover counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.26, with shading to represent one standard error.

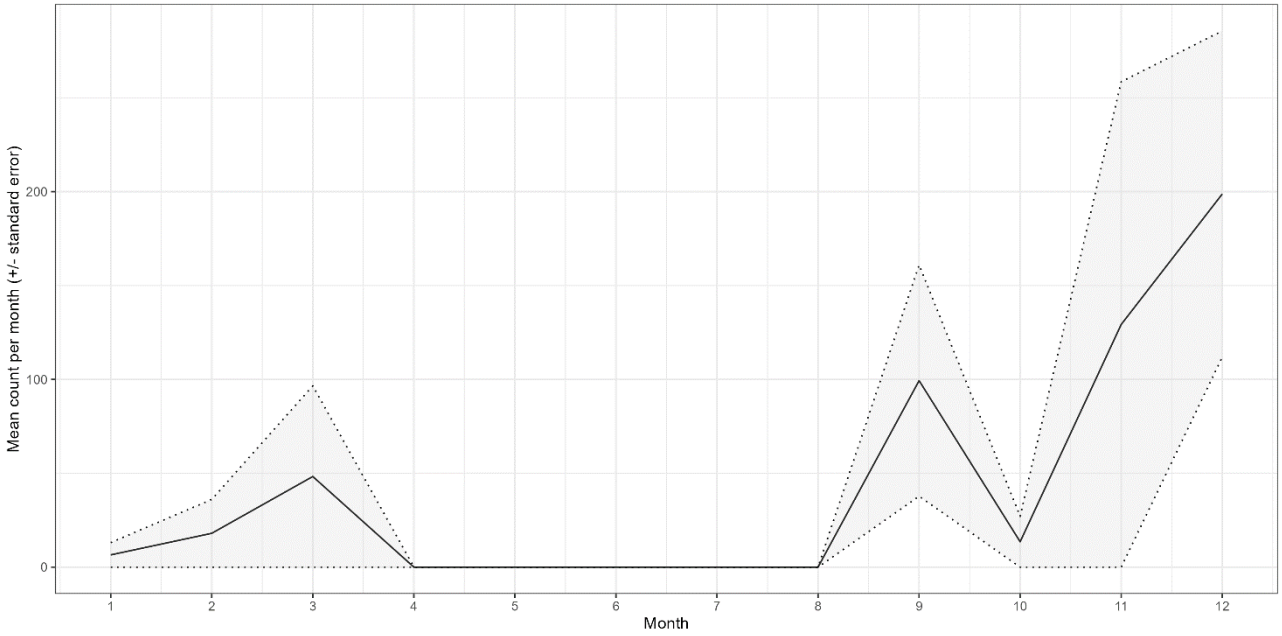
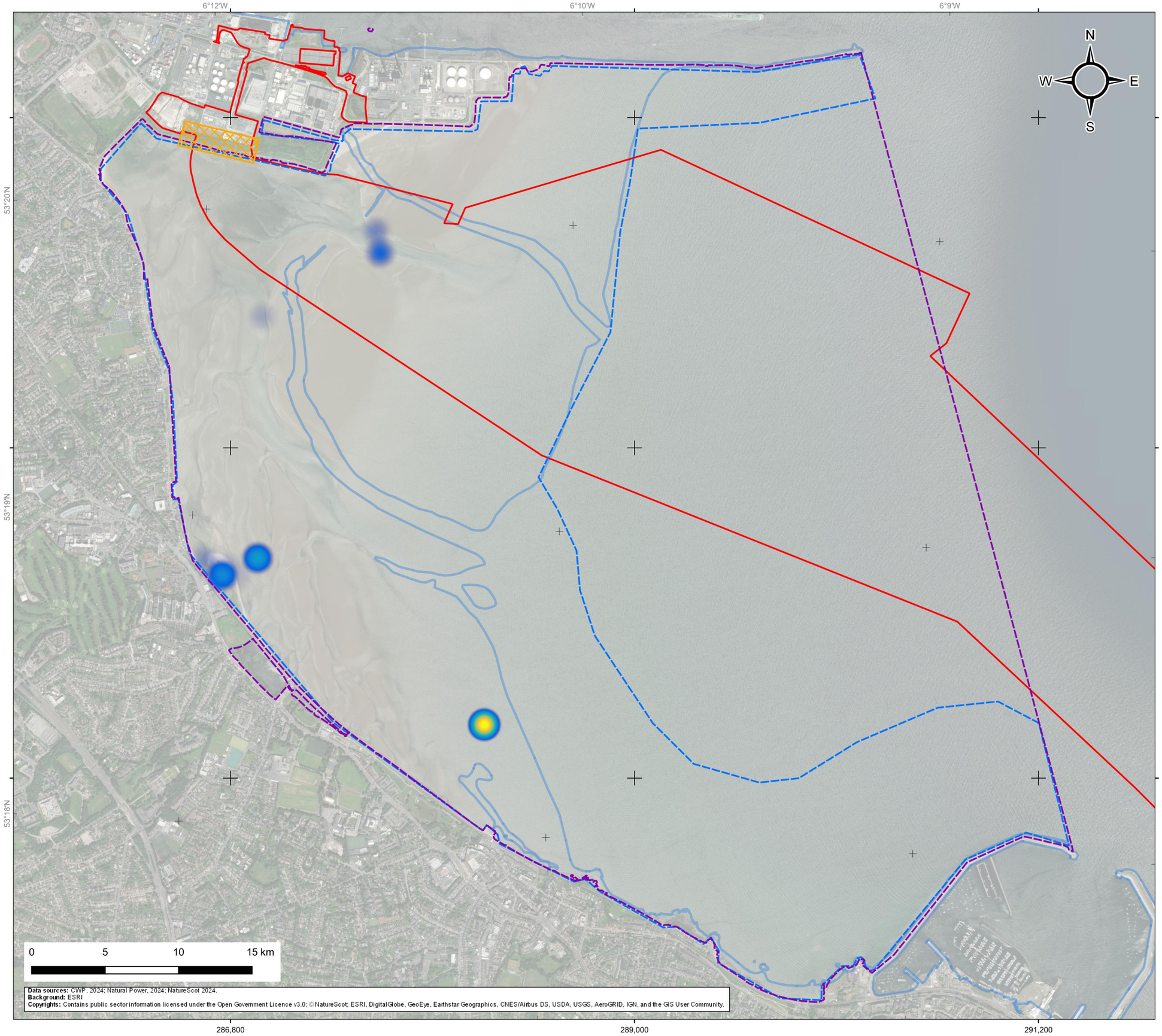
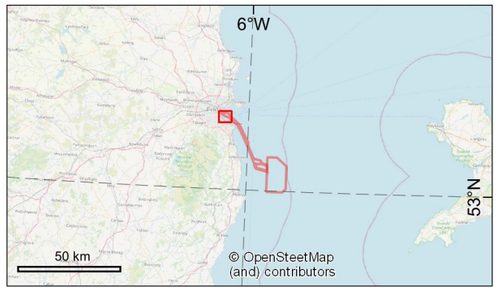


Figure 5.26: Annual variation in average counts of golden plover

5.2.13.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by golden plover during baseline landfall surveys is shown in Figure 5.27.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Golden plover count density (total individuals per m²)

0.57

0.07

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.27
Spatial variation in frequency of landfall survey area site usage by golden plover during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1624

Internal descriptive code: PB_DLH - PAB_LF4 IB - GOLD.PLOVER.DENS._MLWS_S.BIRD. INTERTIDAL_S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch. 10.Ap.05.FIG.05.27)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.14. Grey plover

5.2.14.1. Survey data

Grey plover were recorded within the Project landfall survey area in 23 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.97.

Table 5.97: Total counts of grey plover per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	9	0	0	7	38	0	13	0
February	3	0	9	4	10	0	7	0
March	10	0	0	0	0	7	0	0
April	N/A	N/A	0	0	0	0	N/A	
May	0	N/A	0	0	0	0		
June	0	0	0	0	0	0		
July	0	0	0	0	0	0		
August	0	0	0	0	0	0		
September	15	12	0	0	0	0		
October	0	0	5	0	0	0	0	5
November	0	0	14	10	0	0	5	0
December	1	0	45	7	12	0	0	1

Source: Natural Power

5.2.14.2. Temporal variation in abundance

Monthly variation in average grey plover counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.28, with shading to represent one standard error.

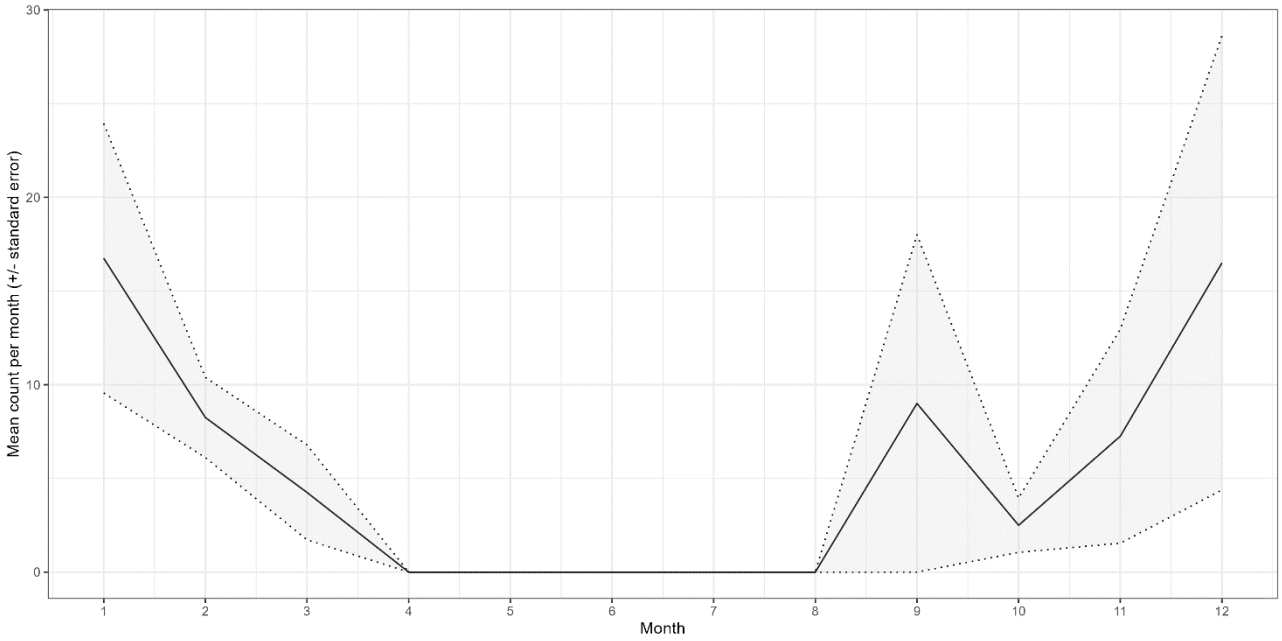
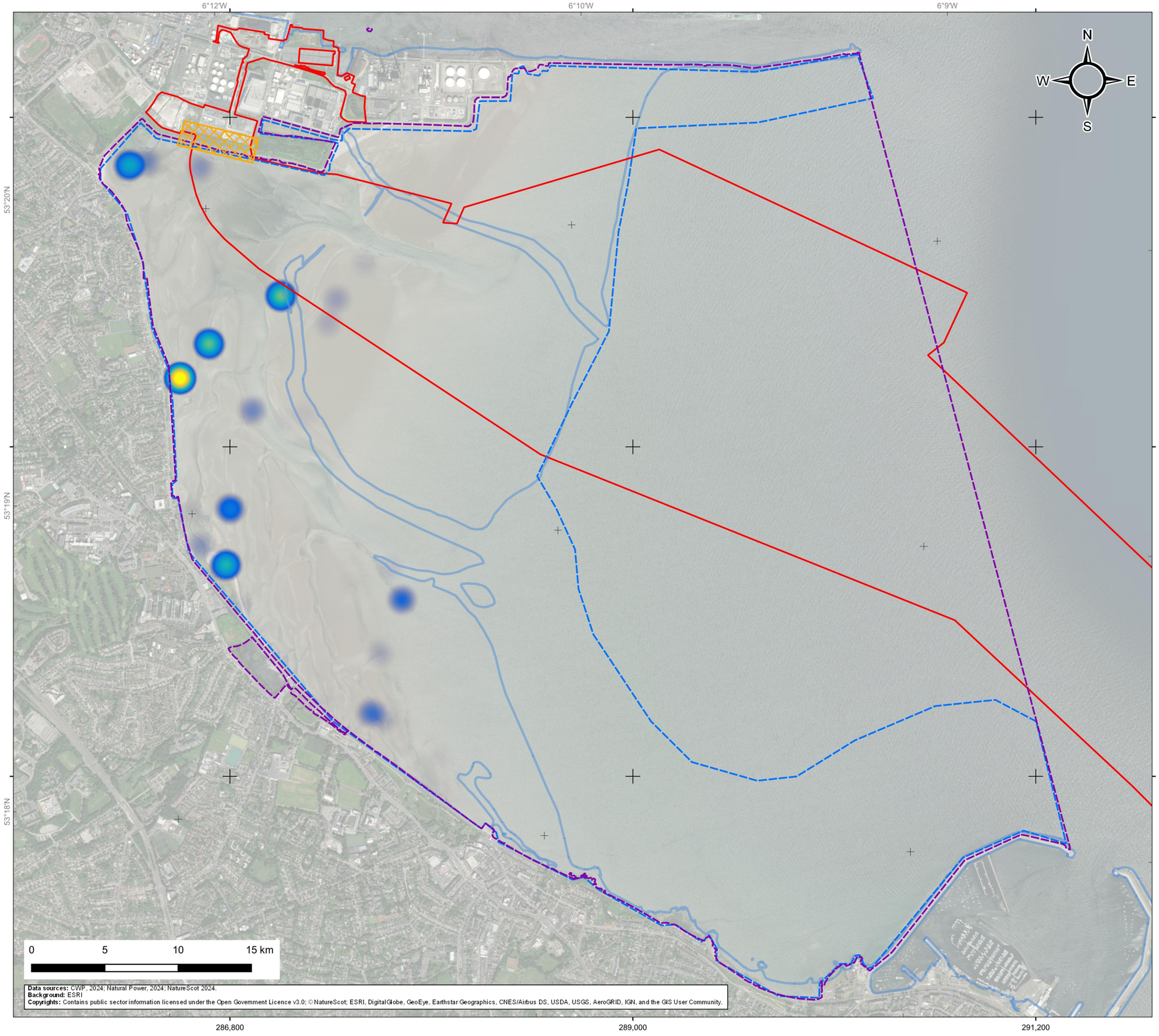
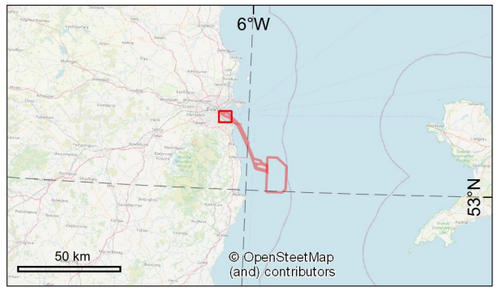


Figure 5.28: Annual variation in average counts of grey plover

5.2.14.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by grey plover during baseline landfall surveys is shown in Figure 5.29.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Grey plover count density (total individuals per m²)

0.017

0.002

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.29
Spatial variation in frequency of landfall survey area site usage by grey plover during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1625

Internal descriptive code: PB_DLH - PAB_LF4.IB - GREYPLOVER.DENS_MLWS_S.BIRD.INTERTIDAL_S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.29)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.15. **Ringed plover**

5.2.15.1. **Survey data**

Ringed plover were recorded within the Project landfall survey area in 55 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.98.

Table 5.98: Total counts of ringed plover per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	86	81	83	143	0	0	23	4
February	124	30	83	23	0	28	11	18
March	16	0	23	5	0	28	40	9
April	N/A	N/A	0	0	0	6	N/A	
May	0	N/A	0	2	0	0		
June	0	23	1	0	0	7		
July	6	0	0	0	3	1		
August	11	99	0	41	0	69		
September	0	0	127	0	77	38		
October	0	11	45	398	30	0	19	26
November	0	105	44	18	18	18	45	34
December	103	67	73	16	84	65	37	59

Source: Natural Power

5.2.15.2. **Temporal variation in abundance**

Monthly variation in average ringed plover counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.30, with shading to represent one standard error.

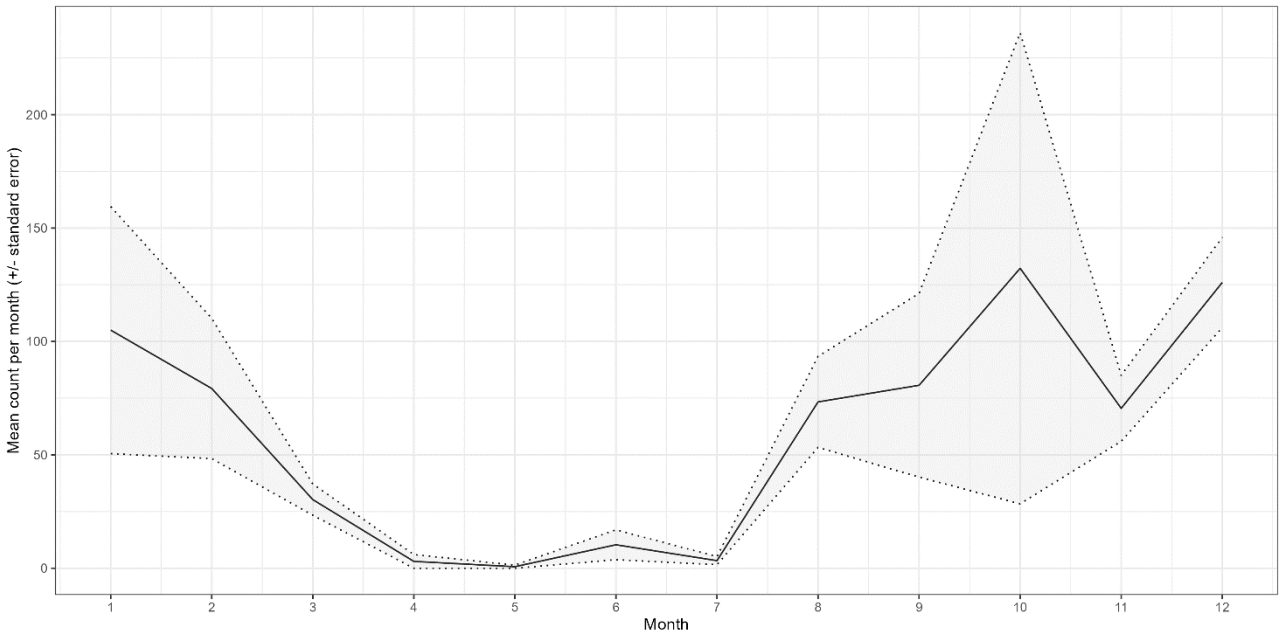
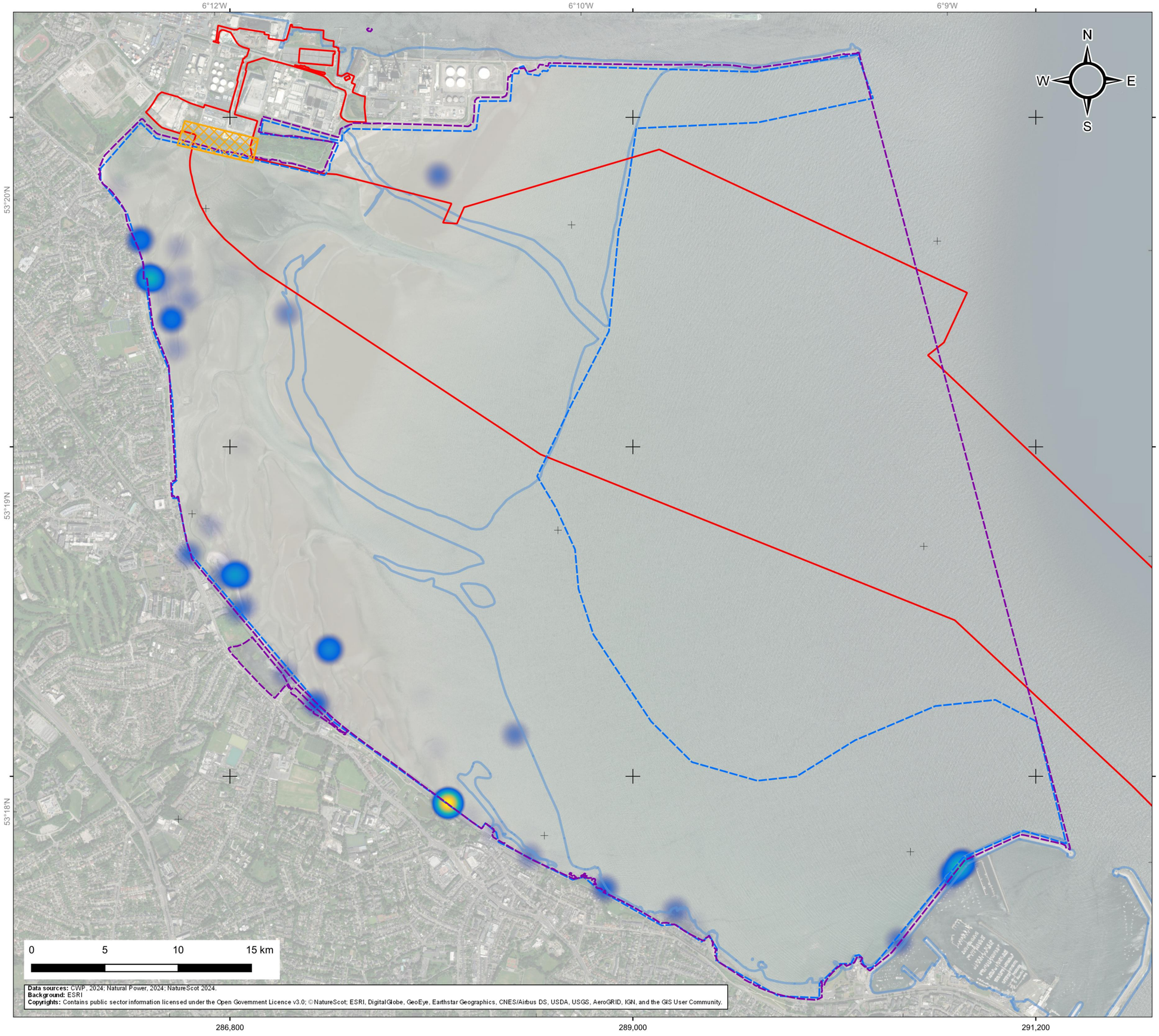
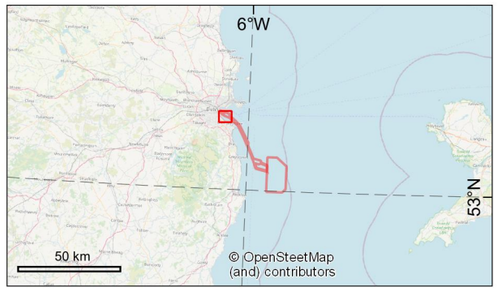


Figure 5.30: Annual variation in average counts of ringed plover

5.2.15.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by ringed plover during baseline landfall surveys is shown in Figure 5.31.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Ringed plover count density (total individuals per m²)

0.46

0.06

codling wind park

Project: Codling Wind Park

Contractor: www.naturalpower.com

Figure 5.31
Spatial variation in frequency of landfall survey area site usage by ringed plover during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1626

Internal descriptive code: PB_DLH - PAB_LF4_IB - MLWS_RING.PLOVER.DENS._S.BIRD. INTERTIDAL_S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch. 10.Ap.05.FIG.05.31)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.16. **Curlew**

5.2.16.1. **Survey data**

Curlew were recorded within the Project landfall survey area in 69 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.99.

Table 5.99: Total counts of curlew per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	90	50	135	138	12	0	30	2
February	24	8	24	40	59	13	92	0
March	91	18	41	13	0	46	0	0
April	N/A	N/A	11	2	32	3	N/A	
May	0	N/A	0	0	1	0		
June	1	41	3	33	0	3		
July	93	9	34	2	23	5		
August	41	189	25	81	6	116		
September	145	166	61	2	191	60		
October	114	50	77	116	14	0	103	59
November	32	161	18	52	182	21	149	12
December	237	14	0	11	38	2	9	90

Source: Natural Power

5.2.16.2. **Temporal variation in abundance**

Monthly variation in average curlew counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.32, with shading to represent one standard error.

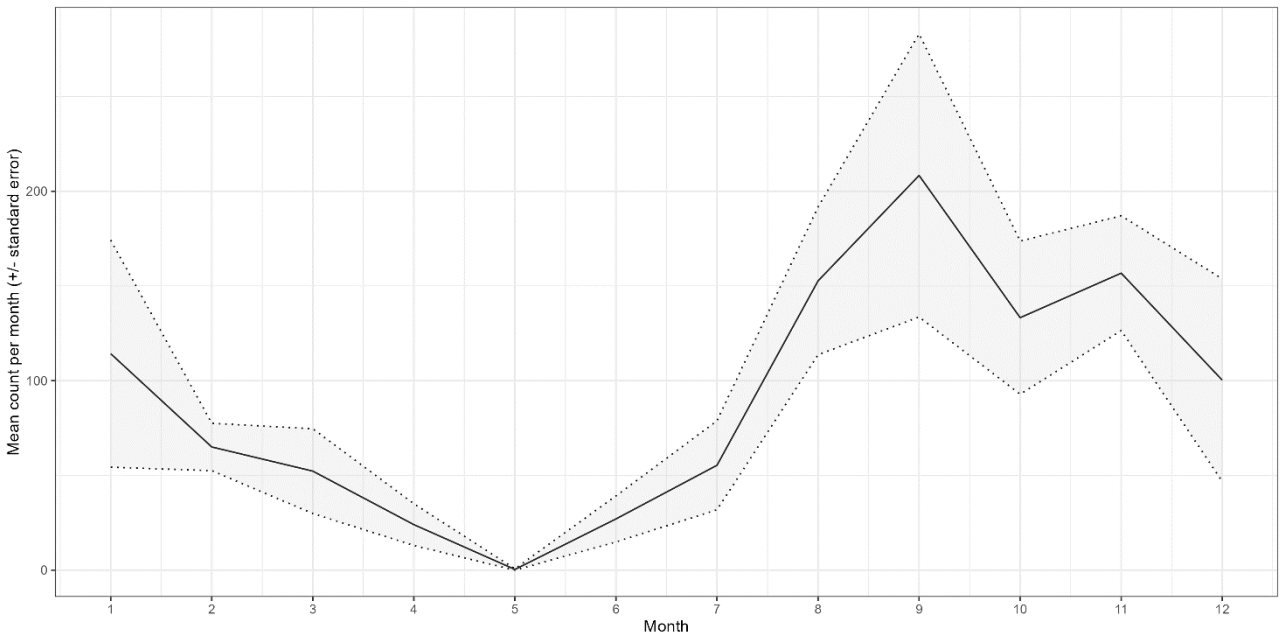
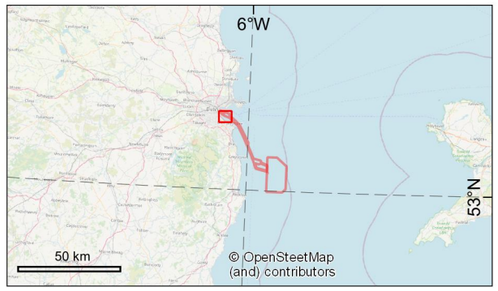


Figure 5.32: Annual variation in average counts of curlew

5.2.16.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by curlew during baseline landfall surveys is shown in Figure 5.33.

6°12'W
6°10'W
6°9'W
53°20'N
53°19'N
53°18'N
5,914,600
5,912,800
5,911,000
286,800
289,000
291,200
N
W
E
S
0
5
10
15 km
Data sources: CWP, 2024; Natural Power, 2024; NatureScot 2024.
Background: ESRI
Copyrights: Contains public sector information licensed under the Open Government Licence v3.0; ©NatureScot; ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.



Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Curlew count density (total individuals per m²)

0.08

0.02

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.33
Spatial variation in frequency of landfall survey area site usage by curlew during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1627

Internal descriptive code: PB_DLH - PAB_LF4_IB - CURLEW.DENS_MLWS_S.BIRD. INTERTIDAL_S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol. 04.Ch.10.Ap.05.FIG.05.33)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.17. **Bar-tailed godwit**

5.2.17.1. **Survey data**

Black-tailed godwit were recorded within the Project landfall survey area in 63 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.100.

Table 5.100: Total counts of bar-tailed godwit per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	107	161	210	373	235	0	197	100
February	8	0	475	691	246	154	108	0
March	741	20	659	47	0	101	48	84
April	N/A	N/A	6	20	71	4	N/A	
May	0	N/A	0	0	116	0		
June	19	0	0	0	0	0		
July	2	4	1	0	4	6		
August	42	80	109	405	3	0		
September	18	92	1164	0	94	47		
October	94	34	297	344	138	0	166	139
November	71	411	590	317	240	0	398	37
December	1260	480	625	88	339	1103	18	106

Source: Natural Power

5.2.17.2. **Temporal variation in abundance**

Monthly variation in average bar-tailed godwit counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.34, with shading to represent one standard error.

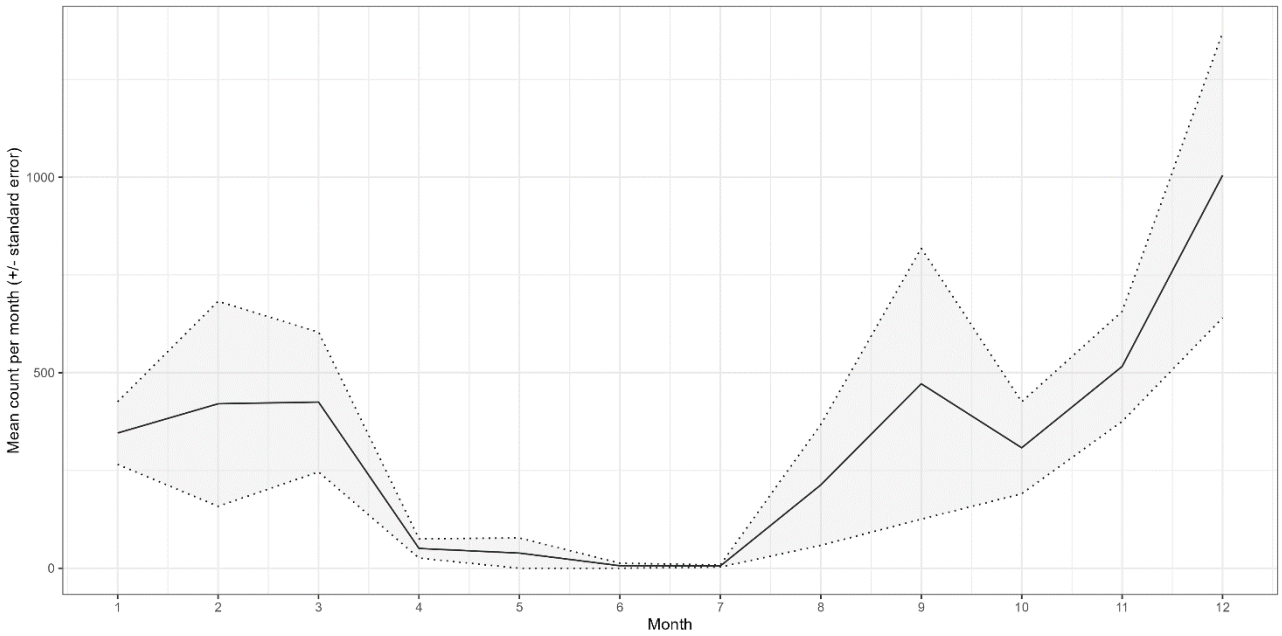
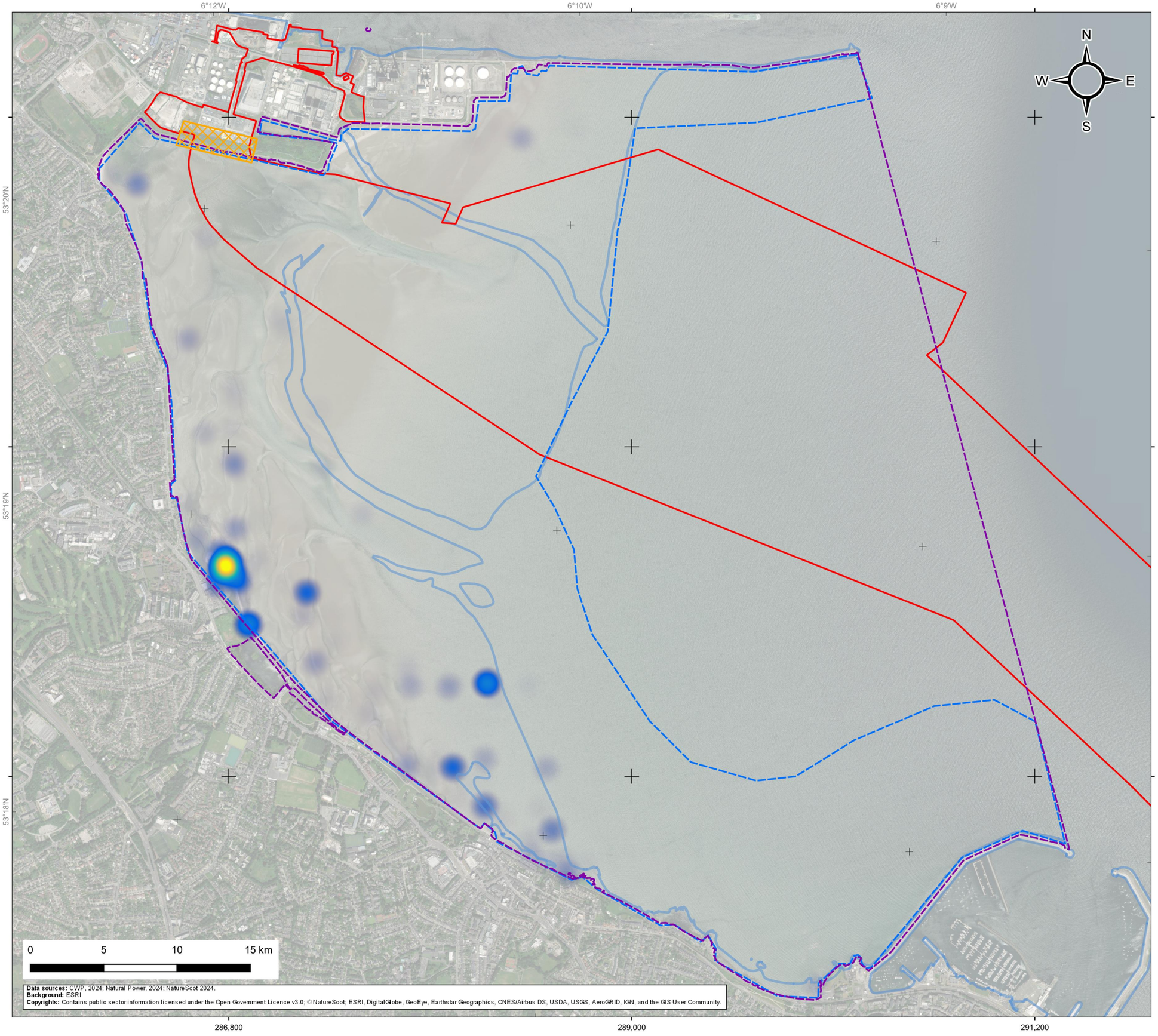
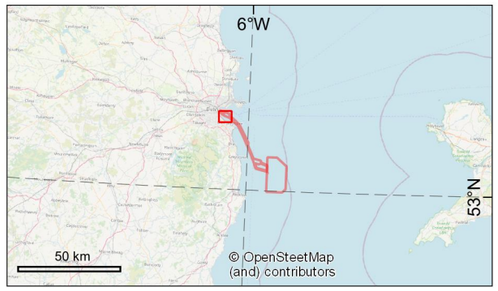


Figure 5.34: Annual variation in average counts of bar-tailed godwit

5.2.17.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by bar-tailed godwit during baseline landfall surveys is shown in Figure 5.35.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Bar-tailed godwit count density (total individuals per m²)

0.67

0.08

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.35
Spatial variation in frequency of landfall survey area site usage by bar-tailed godwit during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1628

Internal descriptive code: PB_DLH - PAB_LF4_IB - BAR.TAILED.GODWIT.DENS_MLWS_S.BIRD_INTERTIDAL_S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.35)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.18. **Black-tailed godwit**

5.2.18.1. **Survey data**

Black-tailed godwit were recorded within the Project landfall survey area in 57 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.101.

Table 5.101: Total counts of black-tailed godwit per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	366	254	120	502	0	0	161	0
February	84	0	317	16	140	19	60	0
March	332	18	148	9	0	17	26	17
April	N/A	N/A	15	18	22	0	N/A	
May	13	N/A	0	0	0	0		
June	4	0	0	0	174	0		
July	0	0	6	85	0	0		
August	0	319	40	587	0	55		
September	375	533	589	0	85	105		
October	15	8	218	198	212	0	110	84
November	31	17	34	369	94	31	60	0
December	310	6	550	22	830	89	12	34

Source: Natural Power

5.2.18.2. **Temporal variation in abundance**

Monthly variation in average black-tailed godwit counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.36, with shading to represent one standard error.

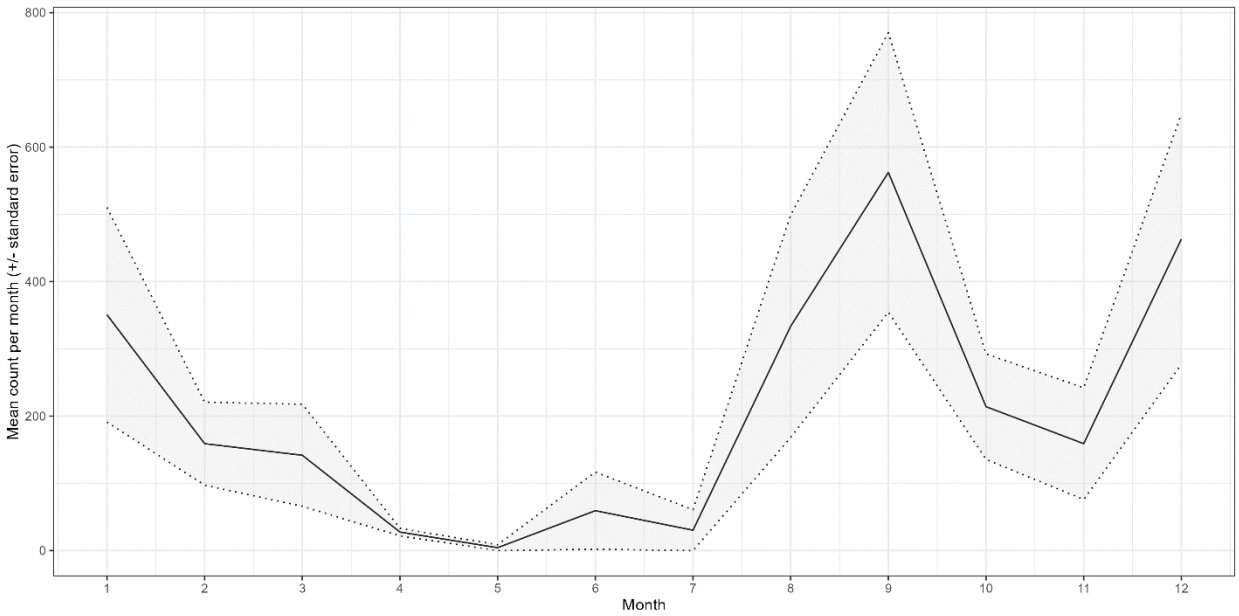
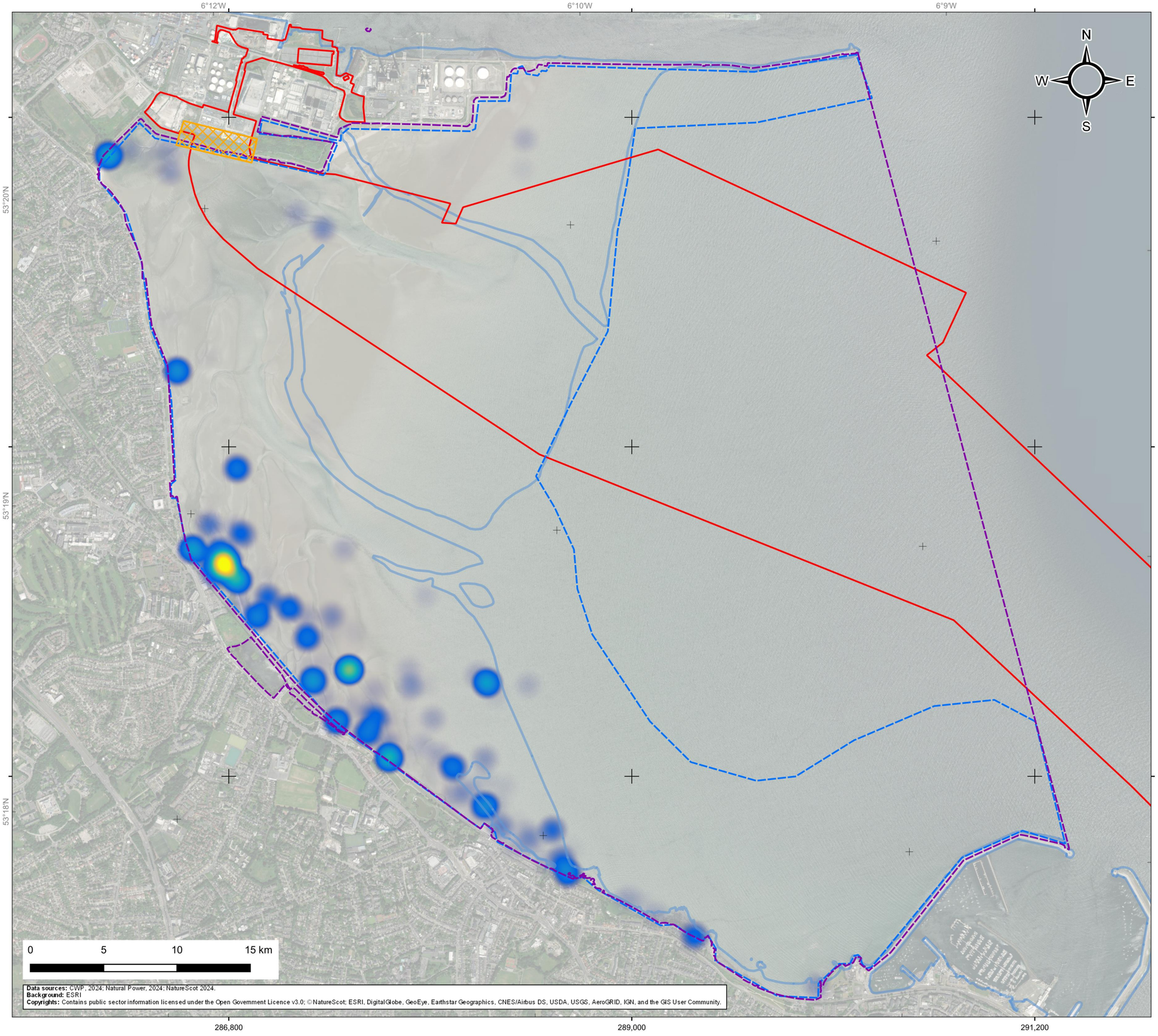
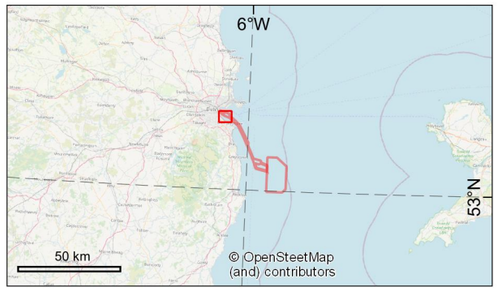


Figure 5.36: Annual variation in average counts of black-tailed godwit Annual variation in average counts of black-tailed godwit

5.2.18.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by black-tailed godwit during baseline landfall surveys is shown in Figure 5.37.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Black-tailed godwit count density (total individuals per m²)

0.16

0.02

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.37
Spatial variation in frequency of landfall survey area site usage by black-tailed godwit during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1629

Internal descriptive code: PB_DLH - PAB_LF4 IB - BLACK.TAILED.GODWIT.DENS_MLWS_S.BIRD.INTERTIDAL_S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.37)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.19. **Turnstone**

5.2.19.1. **Survey data**

Turnstone were recorded within the Project landfall survey area in 73 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.102.

Table 5.102: Total counts of turnstone per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	154	72	90	152	0	0	28	79
February	89	94	84	110	21	45	39	30
March	34	124	69	46	35	26	7	58
April	N/A	N/A	52	45	45	14	N/A	
May	16	N/A	11	8	4	0		
June	14	38	0	0	9	2		
July	5	0	0	2	28	4		
August	3	222	53	262	2	32		
September	59	24	110	96	54	58		
October	188	109	39	52	109	93	79	126
November	128	130	85	18	75	59	310	38
December	248	167	169	0	60	117	76	48

Source: Natural Power

5.2.19.2. **Temporal variation in abundance**

Monthly variation in average turnstone counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.38, with shading to represent one standard error.

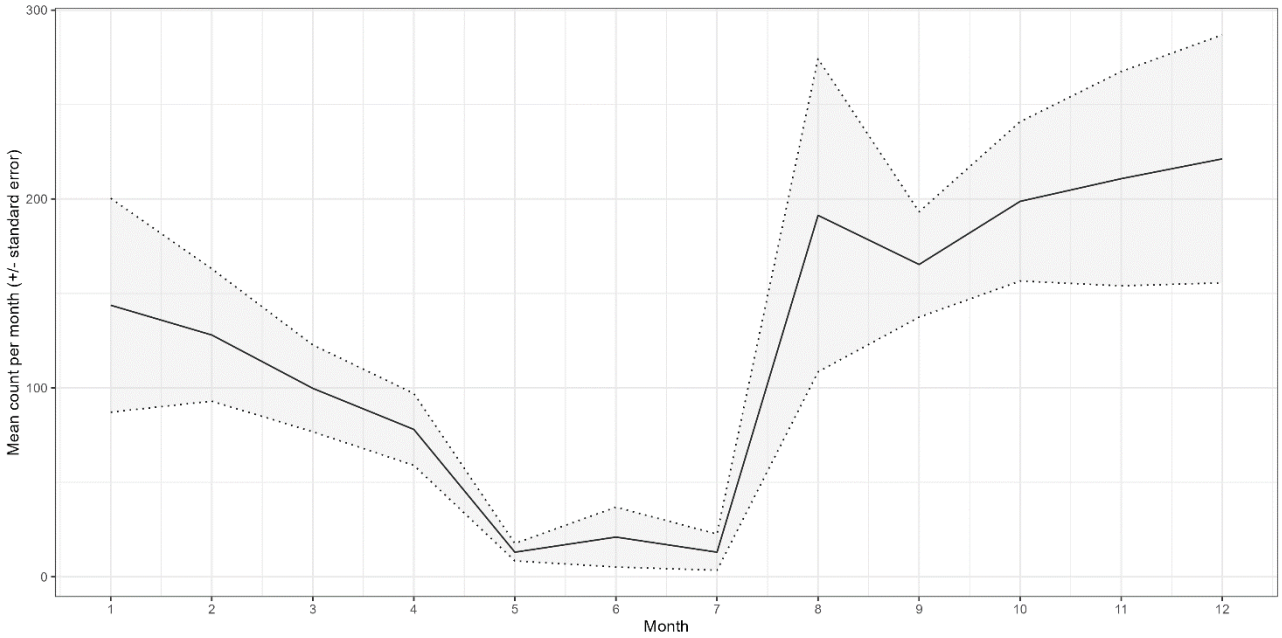
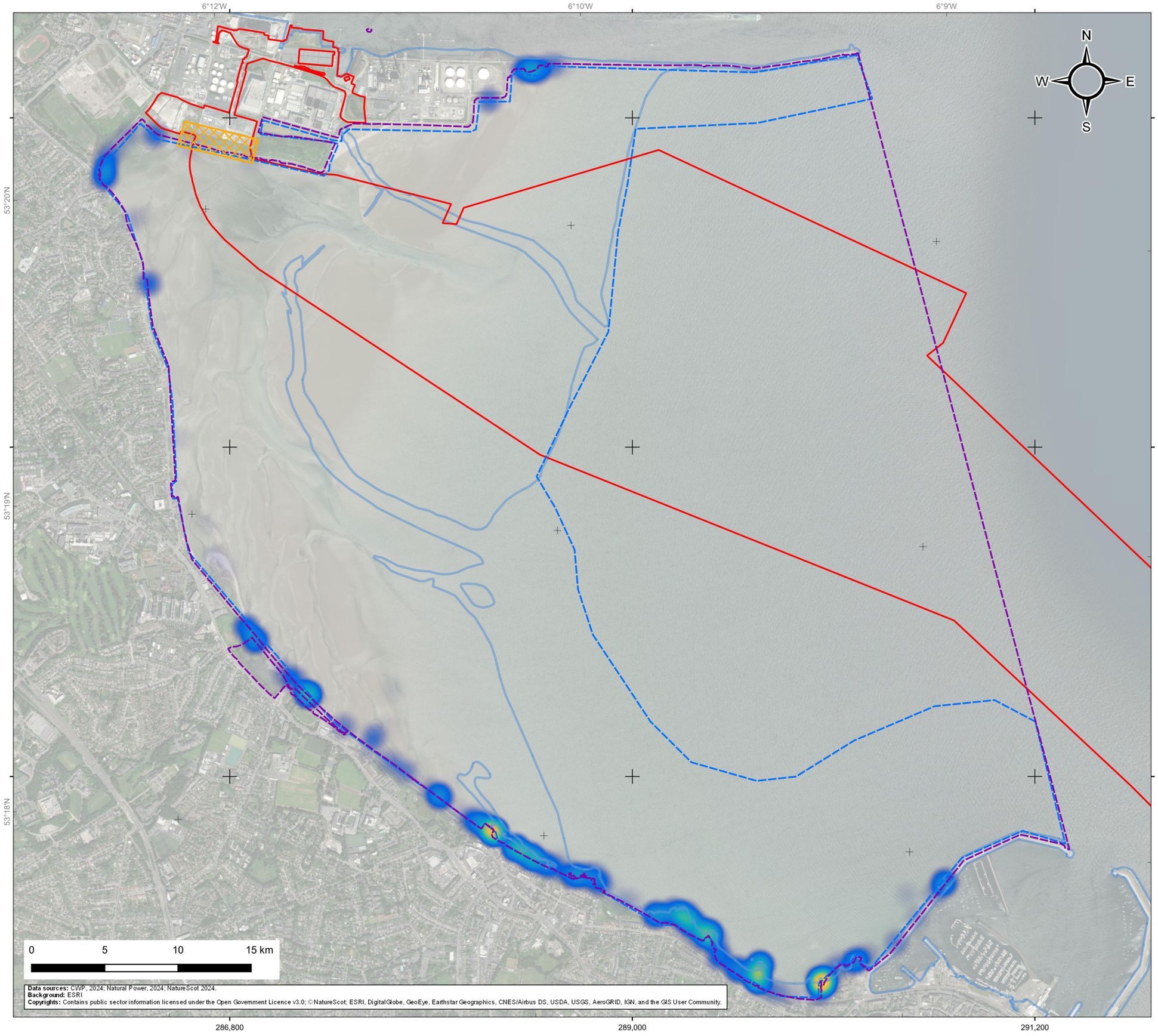
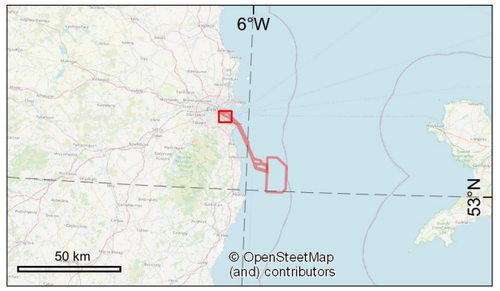


Figure 5.38: Annual variation in average counts of turnstone

5.2.19.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by turnstone during baseline landfall surveys is shown in Figure 5.39.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Turnstone count density (total individuals per m²)

0.61

0.08

codling wind park

Project: Codling Wind Park

Contractor: www.naturalpower.com natural power

Figure 5.39
Spatial variation in frequency of landfall survey area site usage by turnstone during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1630

Internal descriptive code: PB_DLH - PAB_LF4 IB -MLWS_S.BIRD.INTERTIDAL..S.D. BUY.and.RIV.TOLKA.SPA_TURNSTONE.DENS – (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.39)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.20. **Knot**

5.2.20.1. **Survey data**

Knot were recorded within the Project landfall survey area in 36 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.103.

Table 5.103: Total counts of knot per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	100	96	650	45	0	679	30	6600
February	0	0	5716	690	0	0	4	1000
March	13	0	5700	178	0	0	0	230
April	N/A	N/A	0	0	0	0	N/A	
May	0	N/A	0	0	0	0		
June	0	0	0	0	0	0		
July	0	0	0	0	0	0		
August	0	0	0	0	0	0		
September	99	158	82	0	0	193		
October	0	0	1077	8590	382	0	0	92
November	22	118	4500	2756	0	0	624	400
December	310	583	8500	0	1073	10890	275	343

Source: Natural Power

5.2.20.2. **Temporal variation in abundance**

Monthly variation in average knot counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.40, with shading to represent one standard error.

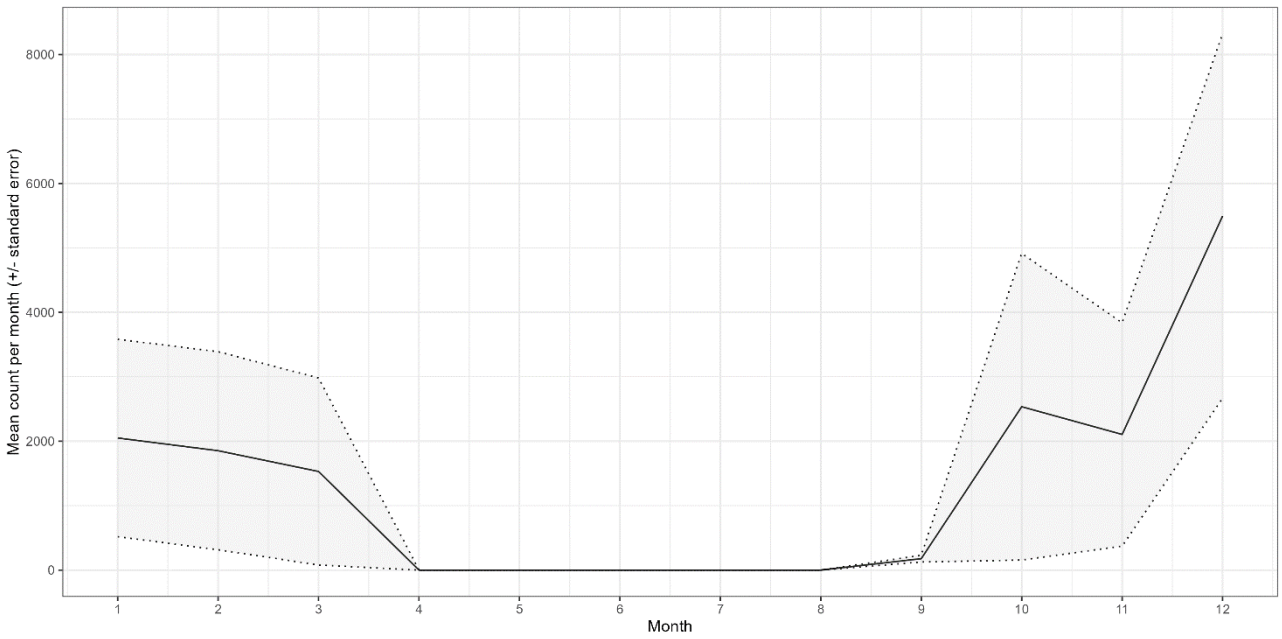
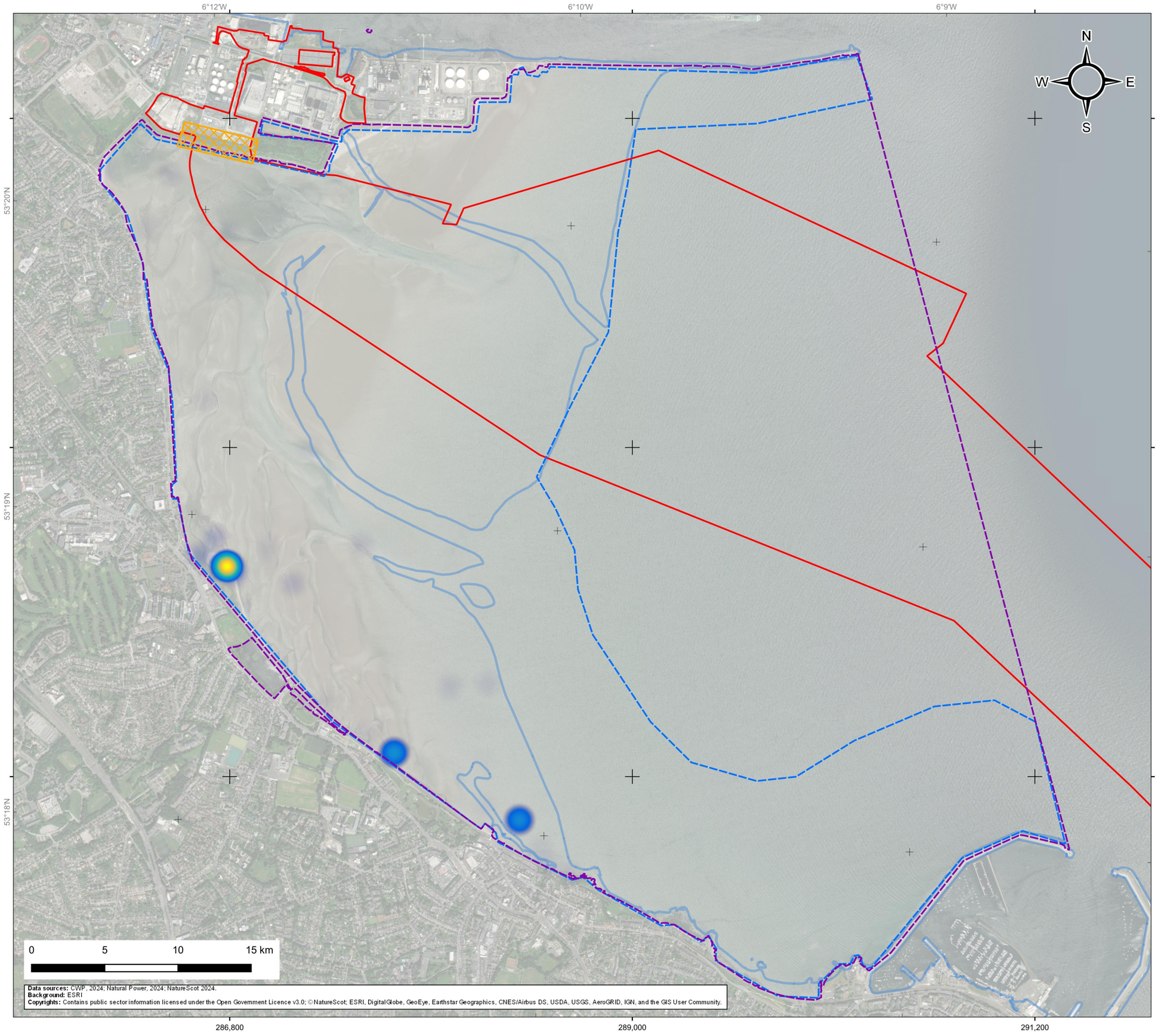
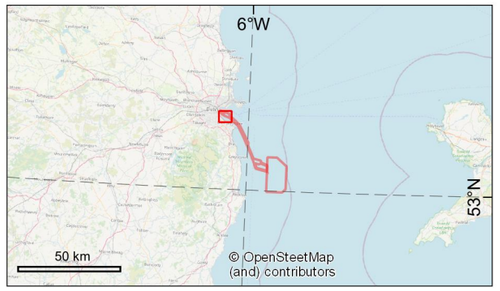


Figure 5.40 Annual variation in average counts of knot

5.2.20.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by knot during baseline landfall surveys is shown in Figure 5.41.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Knot count density (total individuals per m²)

3.8

0.5

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.41
Spatial variation in frequency of landfall survey area site usage by knot during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1632

Internal descriptive code: PB_DLH - PAB_LF4.IB - KNOT.DENS._MLWS_S.BIRD.INTERTIDAL_S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.41)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.21. **Sanderling**

5.2.21.1. **Survey data**

Sanderling were recorded within the Project landfall survey area in 47 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.104.

Table 5.104: Total counts of sanderling per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	269	156	46	241	0	0	60	0
February	20	21	38	15	54	11	143	0
March	23	0	42	0	0	36	60	18
April	N/A	N/A	0	0	39	21	N/A	
May	11	N/A	0	0	0	0		
June	6	0	0	0	0	0		
July	0	0	0	0	0	0		
August	0	0	0	0	0	19		
September	95	144	57	0	103	49		
October	0	40	0	147	18	0	0	16
November	156	11	14	86	100	3	226	293
December	328	408	141	78	156	88	40	152

Source: Natural Power

5.2.21.2. **Temporal variation in abundance**

Monthly variation in average sanderling counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.42, with shading to represent one standard error.

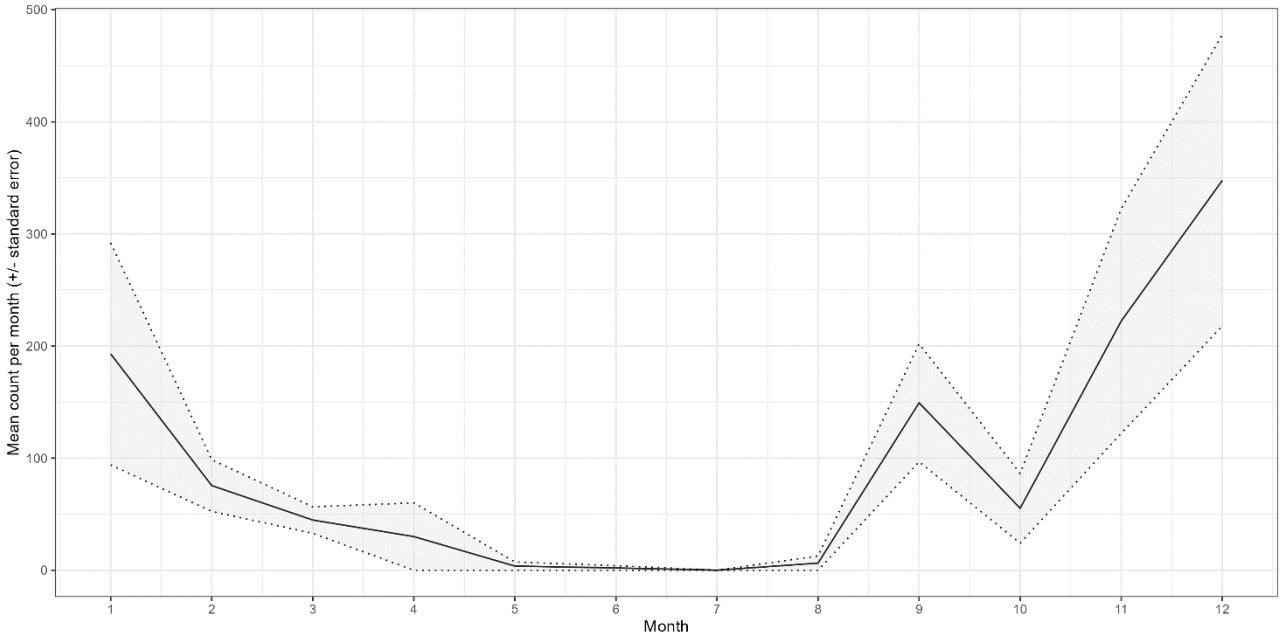
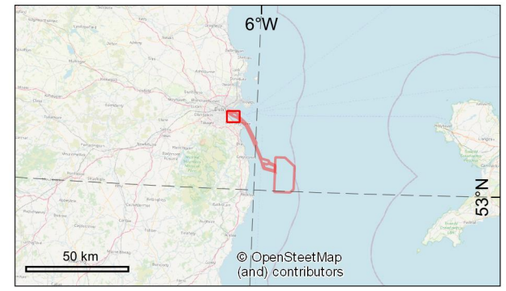


Figure 5.42: Annual variation in average counts of sanderling

5.2.21.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by sanderling during baseline landfall surveys is shown in Figure 5.43.

6°12'W
6°10'W
6°9'W
53°20'N
53°19'N
53°18N
5,914,600
5,912,800
5,911,000
286,800
289,000
291,200
N
W
E
S
0 5 10 15 km



Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Sanderling count density (total individuals per m²)

0.59
0.07

Data sources: CWP, 2024; Natural Power, 2024; NatureScot 2024.
Background: ESRI

codling wind park

Project: Codling Wind Park

Contractor: www.naturalpower.com natural power

Figure 5.43
Spatial variation in frequency of landfall survey area site usage by sanderling during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1633

Internal descriptive code: PB..DLH - PAB..LF4.IB - MLWS..SANDERLING.DENS..S.BIRD.INTERTIDAL..S.D.BUY.and.RIV.TOLKA.SPA -(EIAR.Vol.04.Ch.10.Ap.05.FIG.05.43)

Size: A3
Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.22. **Dunlin**

5.2.22.1. **Survey data**

Dunlin were recorded within the Project landfall survey area in 57 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.105.

Table 5.105: Total counts of dunlin per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	1529	1518	850	1483	1880	0	2018	3081
February	1092	12	5495	415	1037	1216	320	0
March	1095	31	478	19	0	600	373	162
April	N/A	N/A	0	0	0	0	N/A	
May	7	N/A	17	0	0	0		
June	0	0	0	0	0	0		
July	0	0	0	0	0	0		
August	294	222	38	422	0	208		
September	34	730	324	18	352	415		
October	101	145	296	1010	228	42	211	296
November	81	665	2004	2820	184	0	2475	909
December	1084	112	1700	2000	589	2363	73	1164

Source: Natural Power

5.2.22.2. **Temporal variation in abundance**

Monthly variation in average dunlin counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.44, with shading to represent one standard error.

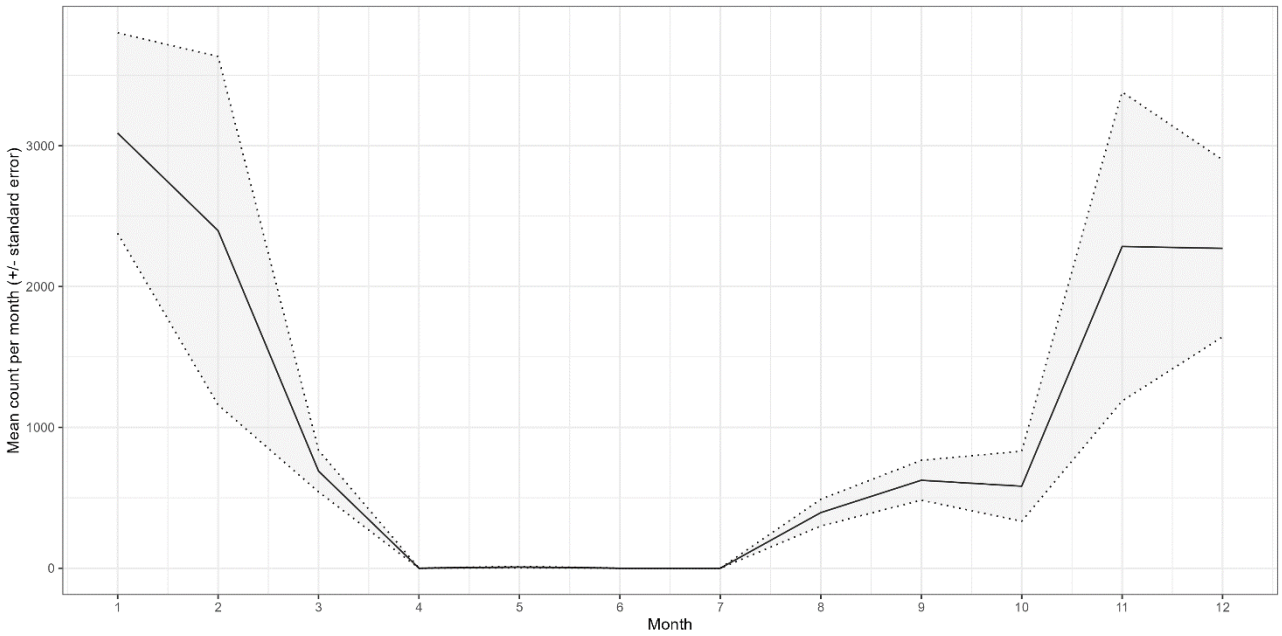
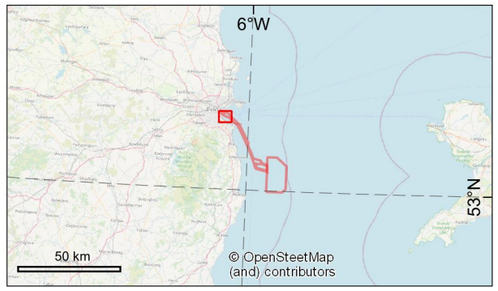


Figure 5.44 Annual variation in average counts of dunlin

5.2.22.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by dunlin during baseline landfall surveys is shown in Figure 5.45.

6°12'W
6°10'W
6°9'W
53°20'N
53°19'N
53°18'N
5,914,600
5,912,800
5,911,000
286,800
289,000
291,200
N
W
E
S
0 5 10 15 km
Data sources: CWP, 2024; Natural Power, 2024; NatureScot 2024.
Background: ESRI
Copyrights: Contains public sector information licensed under the Open Government Licence v3.0; © NatureScot; ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.



Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Dunlin count density (total individuals per m²)

0.9

0.1

codling wind park

Project: Codling Wind Park

Contractor: www.naturalpower.com natural power

Figure 5.45
Spatial variation in frequency of landfall survey area site usage by dunlin during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1634

Internal descriptive code: PB..DLH - PAB..LF4.IB - DUNLIN.DENS..MLWS..S.BIRD.INTERTIDAL..S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.45)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.23. **Redshank**

5.2.23.1. **Survey data**

Redshank were recorded within the Project landfall survey area in 68 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.106.

Table 5.106: Total counts of redshank per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	709	585	31	463	113	0	157	14
February	227	49	365	114	68	25	241	13
March	396	44	252	205	26	103	0	27
April	N/A	N/A	0	44	58	26	N/A	
May	9	N/A	0	0	0	0		
June	4	17	4	0	0	0		
July	0	5	4	0	21	0		
August	2	207	13	115	31	9		
September	64	407	367	12	462	49		
October	553	72	299	308	1337	208	459	277
November	154	301	57	451	301	23	235	145
December	346	103	234	77	385	498	317	206

Source: Natural Power

5.2.23.2. **Temporal variation in abundance**

Monthly variation in average redshank counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.46, with shading to represent one standard error.

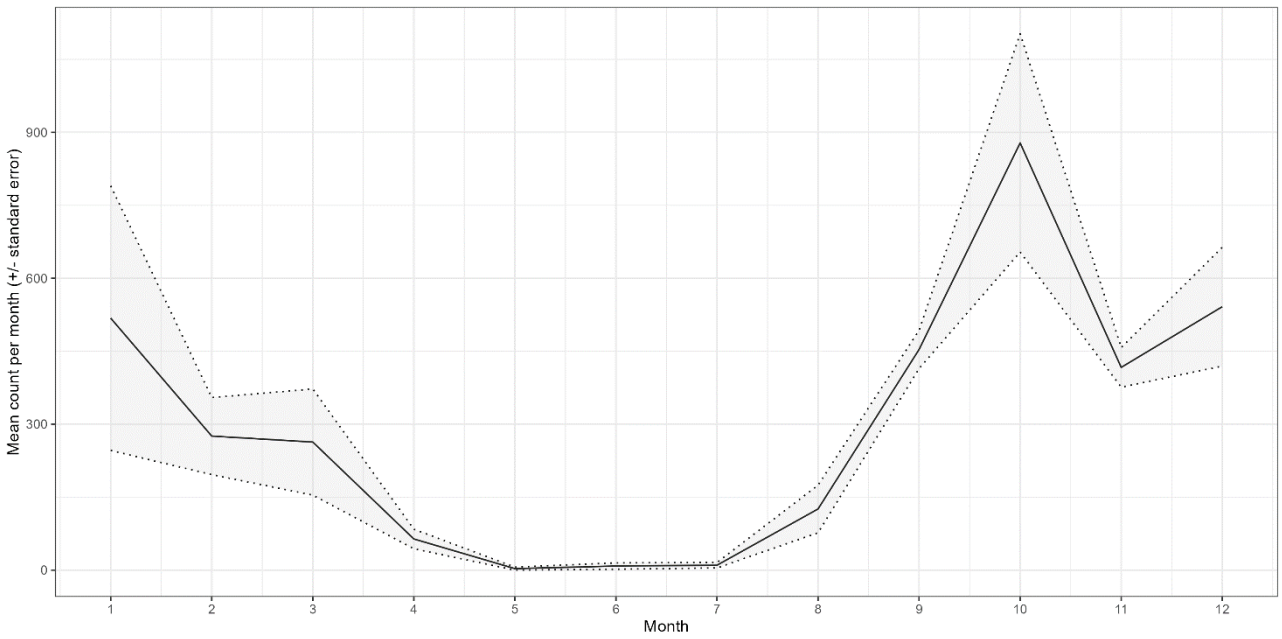
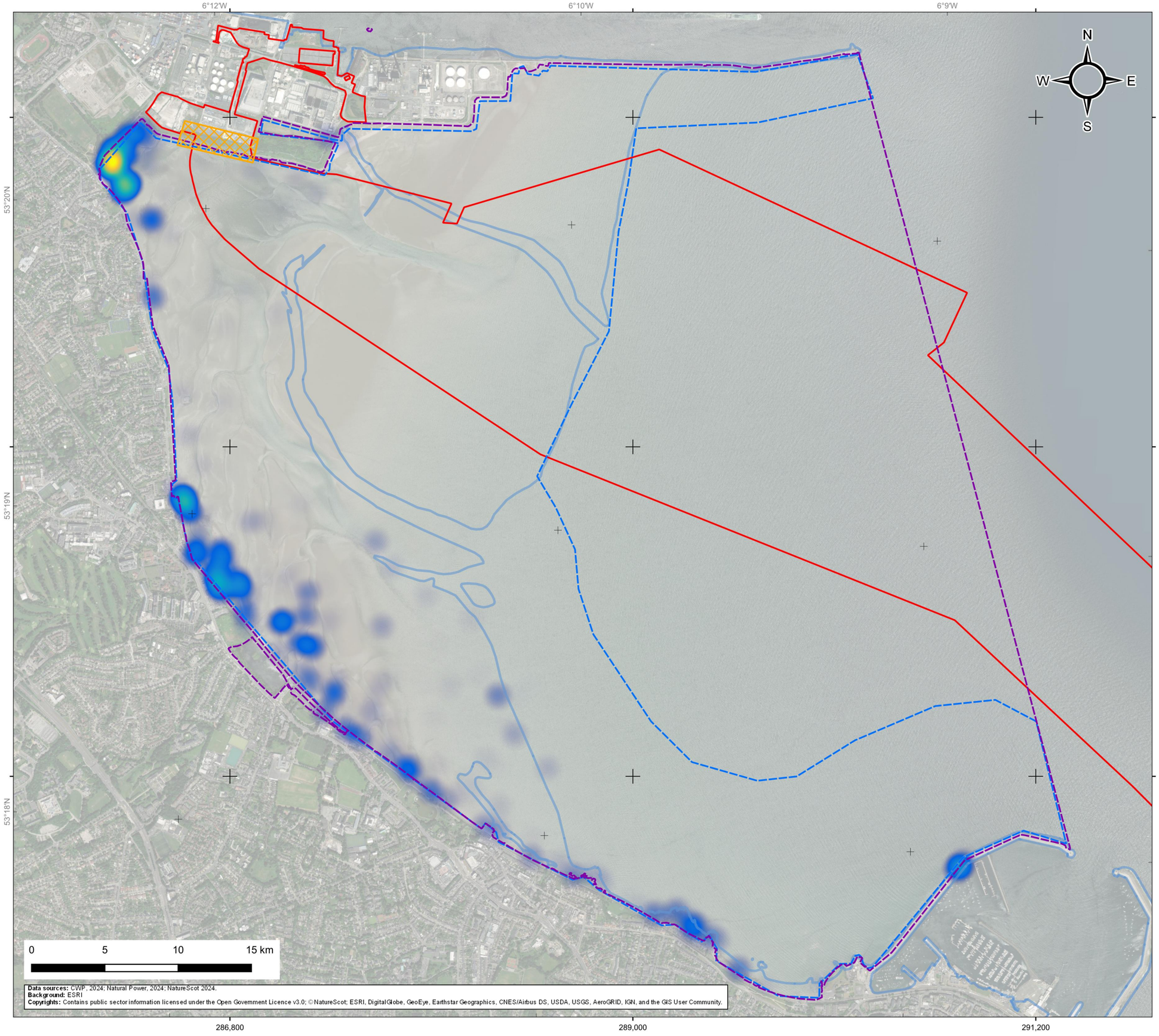
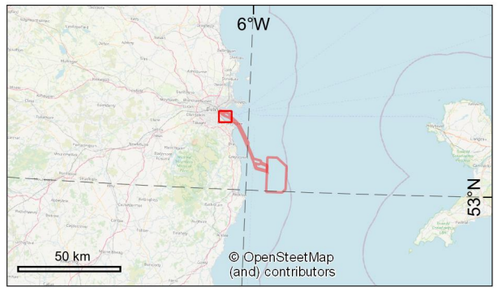


Figure 5.46: Annual variation in average counts of redshank

5.2.23.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by redshank during baseline landfall surveys is shown in Figure 5.47.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Redshank count density (total individuals per m²)

0.56

0.07

codling wind park

Project: Codling Wind Park

Contractor: www.naturalpower.com natural power

Figure 5.47
Spatial variation in frequency of landfall survey area site usage by redshank during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1635

Internal descriptive code: PB..DLH - PAB..LF4.IB - MLWS..REDSHANK.DENS..S.BIRD.INTERTIDAL..S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.47)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.24. **Greenshank**

5.2.24.1. **Survey data**

Greenshank were recorded within the Project landfall survey area in 39 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.107.

Table 5.107: Total counts of greenshank per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	8	8	0	4	3	0	109	0
February	1	0	4	3	4	5	5	0
March	8	1	6	5	0	1	0	0
April	N/A	N/A	0	0	5	0	N/A	
9	0	N/A	0	0	0	0		
June	0	3	0	0	0	0		
July	0	0	0	0	0	0		
August	0	4	0	8	0	0		
September	0	10	21	0	18	0		
October	12	0	0	9	9	2	9	14
November	1	6	0	8	3	0	12	0
December	7	0	0	5	4	5	0	12

Source: Natural Power

5.2.24.2. **Temporal variation in abundance**

Monthly variation in average greenshank counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.48, with shading to represent one standard error.

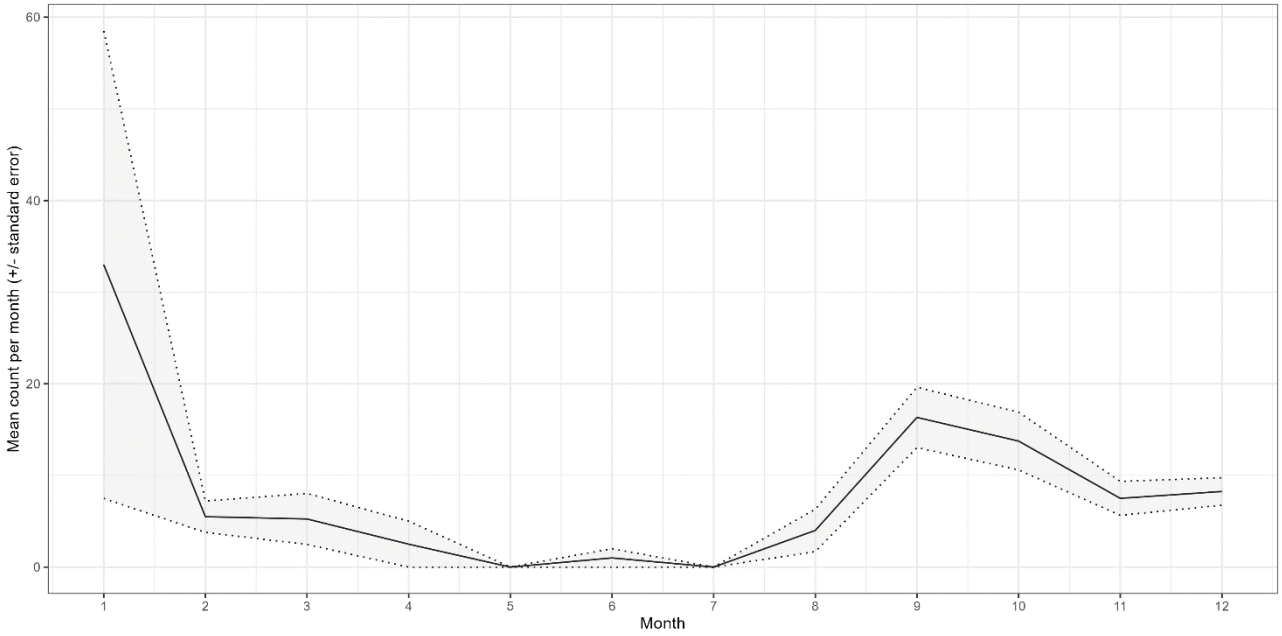
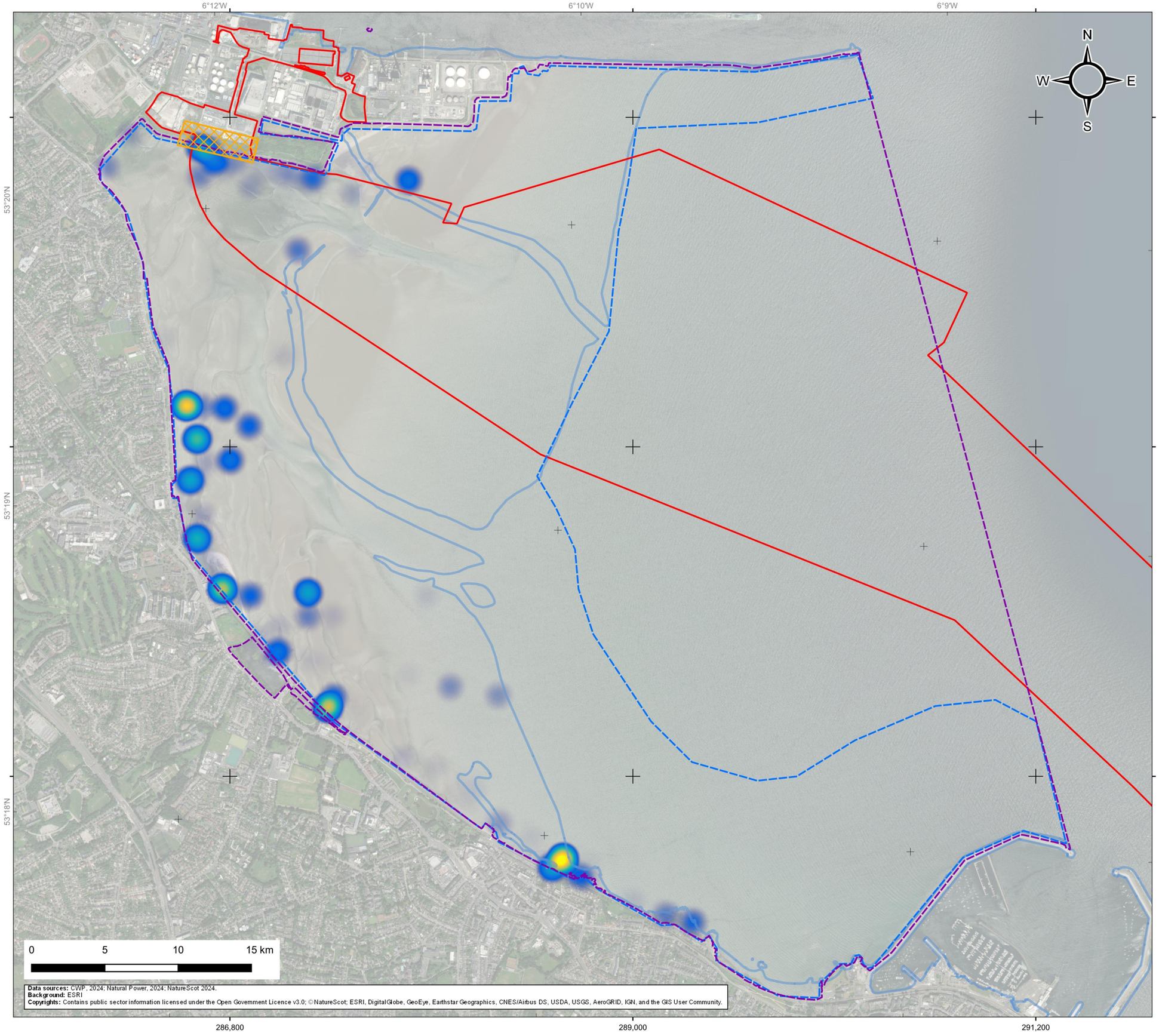
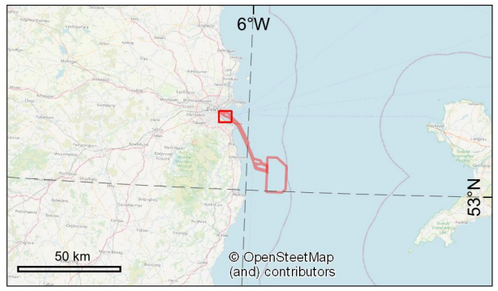


Figure 5.48: Annual variation in average counts of greenshank

5.2.24.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by greenshank during baseline landfall surveys is shown in Figure 5.49.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Greenshank count density (total individuals per m²)

0.13

0.02

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.49
Spatial variation in frequency of landfall survey area site usage by greenshank during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1636

Internal descriptive code: PB_DLH - PAB_LF4.IB - GREENSHANK.DENS_MLWS_S.BIRD. INTERTIDAL_S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch. 10.Ap.05.FIG.05.49)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.25. **Black-headed gull**

5.2.25.1. **Survey data**

Black-headed gull were recorded within the Project landfall survey area in 80 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.108.

Table 5.108: Total counts of black-headed gull per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	2249	1857	138	1365	558	167	1828	114
February	1648	419	471	517	462	1044	1491	1039
March	2460	387	390	211	160	548	1504	899
April	N/A	N/A	0	14	98	62	N/A	
May	50	N/A	7	2	4	2		
June	196	620	50	513	591	144		
July	801	418	649	361	2128	314		
August	323	1671	642	1173	386	950		
September	613	1237	3826	289	718	406		
October	3192	575	1052	1418	418	217	850	448
November	658	771	467	1125	841	143	873	397
December	1172	697	186	548	791	644	310	2040

Source: Natural Power

5.2.25.2. **Temporal variation in abundance**

Monthly variation in average black-headed gull counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.50, with shading to represent one standard error.

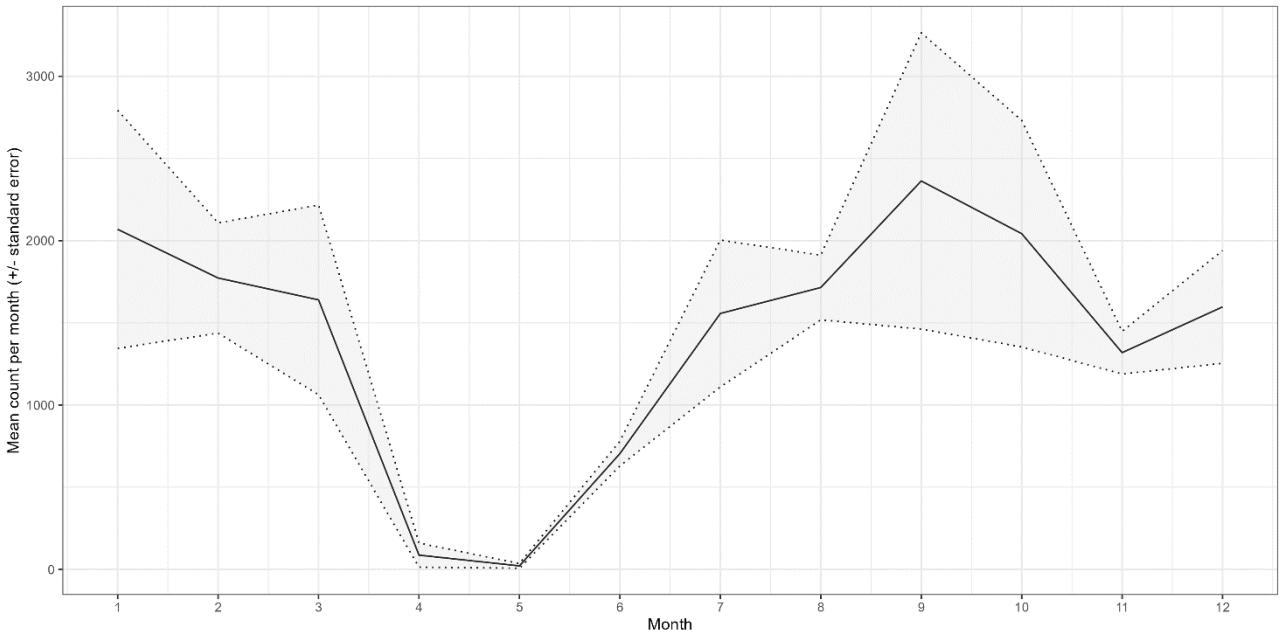
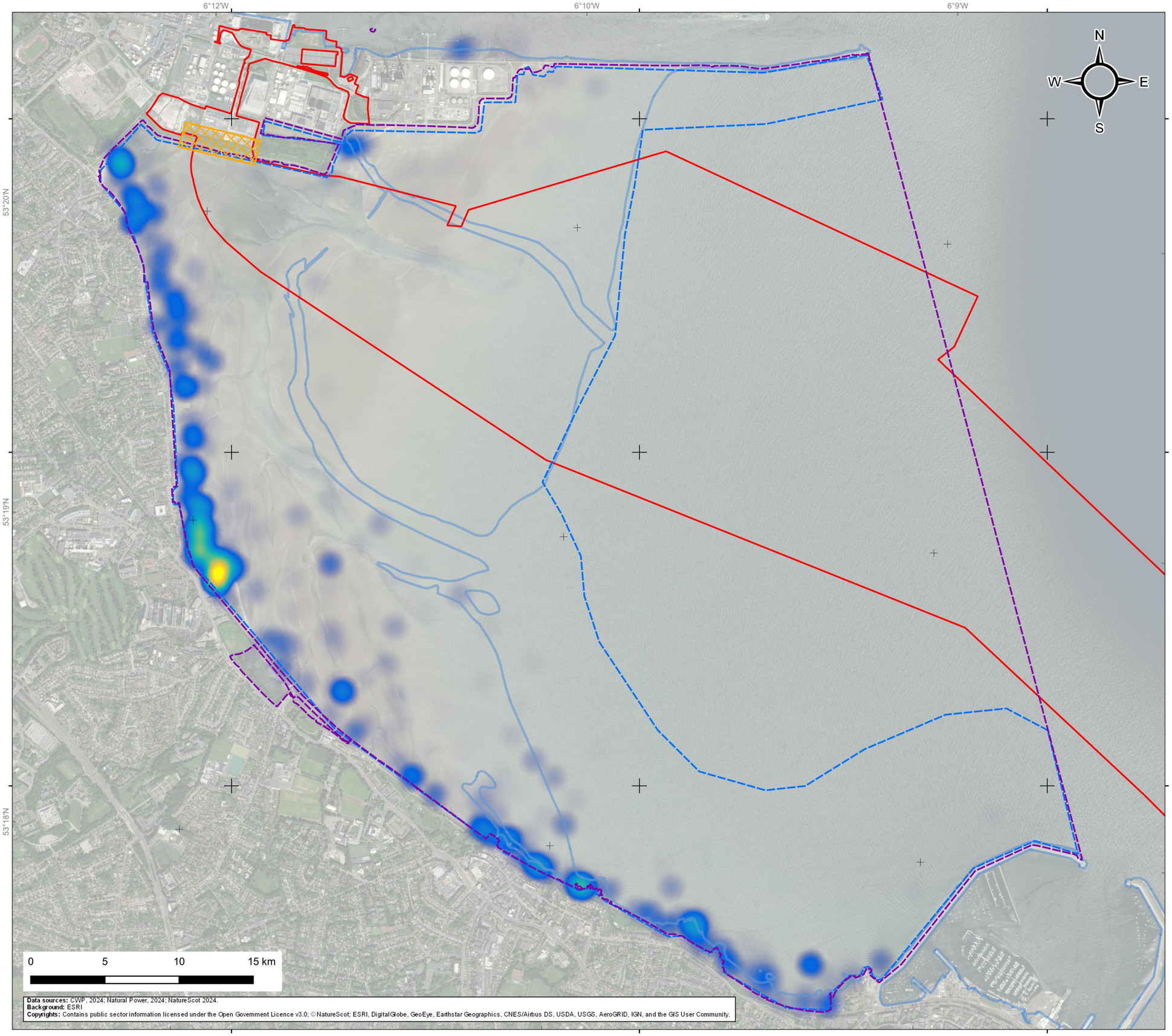
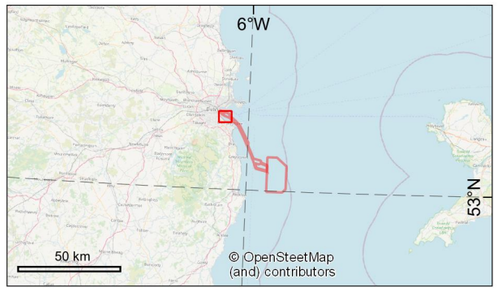


Figure 5.50: Annual variation in average counts of black-headed gull

5.2.25.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by black-headed gull during baseline landfall surveys is shown in Figure 5.51.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Black-headed gull count density (total individuals per m²)

0.7

0.1

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.51
Spatial variation in frequency of landfall survey area site usage by black-headed gull during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1637

Internal descriptive code: PB_DLH - PAB_LF4 IB - BLACK HEAD GULL DENS_MLWS_S.BIRD. INTERTIDAL_S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.51)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.26. **Mediterranean gull**

5.2.26.1. **Survey data**

Mediterranean gull were recorded within the Project landfall survey area in 55 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.109.

Table 5.109: Total counts of Mediterranean gull per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	10	33	1	0	0	0	2	1
February	0	1	2	2	1	1	4	0
March	7	16	5	3	0	0	0	2
April	N/A	N/A	0	0	4	0	N/A	
May	21	N/A	0	0	1	0		
June	23	51	3	45	21	0		
July	87	30	13	67	41	4		
August	56	72	29	50	52	20		
September	23	24	12	0	41	2		
October	54	5	1	1	4	0	6	29
November	3	6	6	0	0	1	2	0
December	4	19	0	0	0	0	0	4

Source: Natural Power

5.2.26.2. **Temporal variation in abundance**

Monthly variation in average Mediterranean gull counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.52, with shading to represent one standard error.

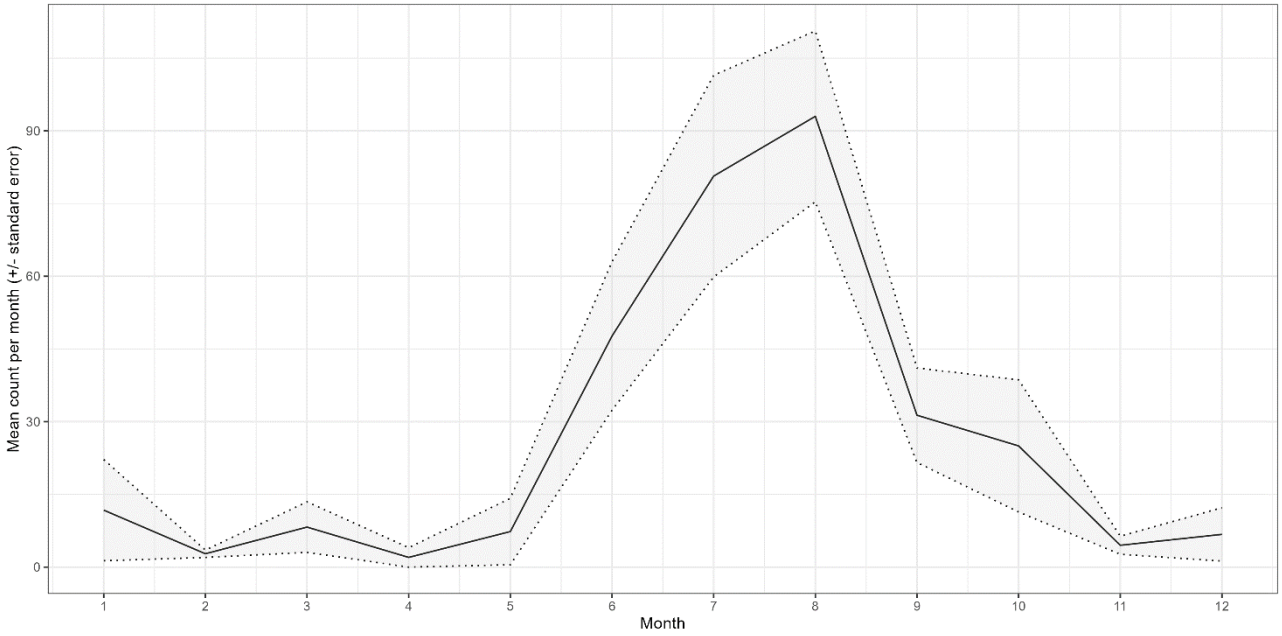
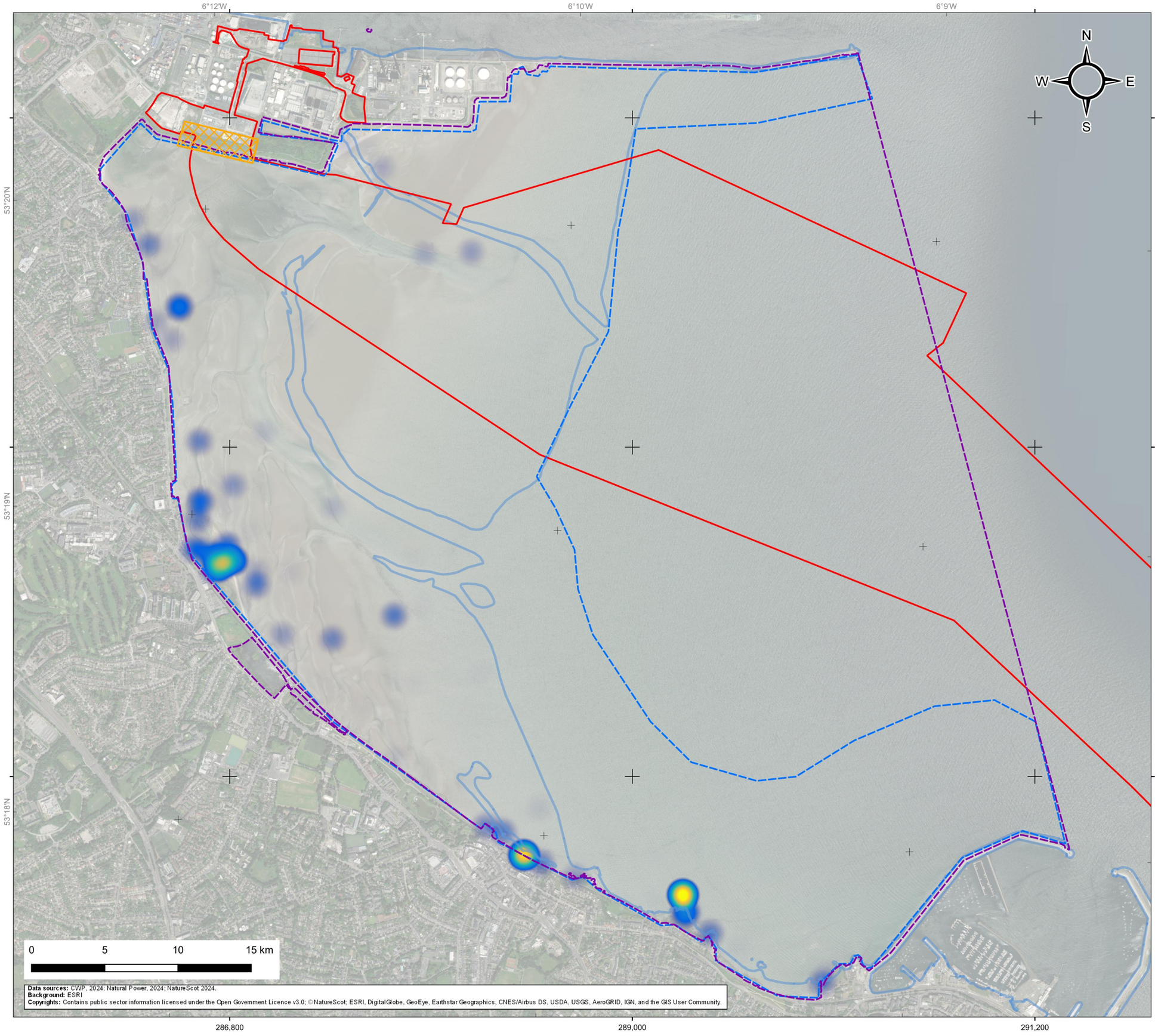
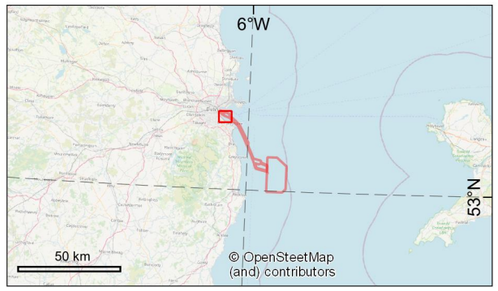


Figure 5.52 Annual variation in average counts of Mediterranean gull

5.2.26.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by Mediterranean gull during baseline landfall surveys is shown in Figure 5.53.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Mediterranean gull count density (total individuals per m²)

0.08

0.01

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.53
Spatial variation in frequency of landfall survey area site usage by Mediterranean gull during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1638

Internal descriptive code: PB..DLH - PAB..LF4.IB - MED.GULL.DENS..MLWS..S.BIRD.INTERTIDAL..S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.53)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.27. Common gull

5.2.27.1. Survey data

Common gull were recorded within the Project landfall survey area in 78 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.110.

Table 5.110: Total counts of common gull per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	101	81	15	133	6	0	213	7
February	13	28	33	85	27	64	302	164
March	207	53	57	59	11	43	389	29
April	N/A	N/A	46	13	27	1	N/A	
May	3	N/A	2	1	1	2		
June	3	25	5	8	7	4		
July	0	4	7	3	45	10		
August	7	77	8	58	26	65		
September	0	57	40	14	49	39		
October	220	20	13	127	11	66	51	113
November	23	83	9	24	28	31	57	44
December	53	156	11	88	142	27	114	512

Source: Natural Power

5.2.27.2. Temporal variation in abundance

Monthly variation in average common gull counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.54, with shading to represent one standard error.

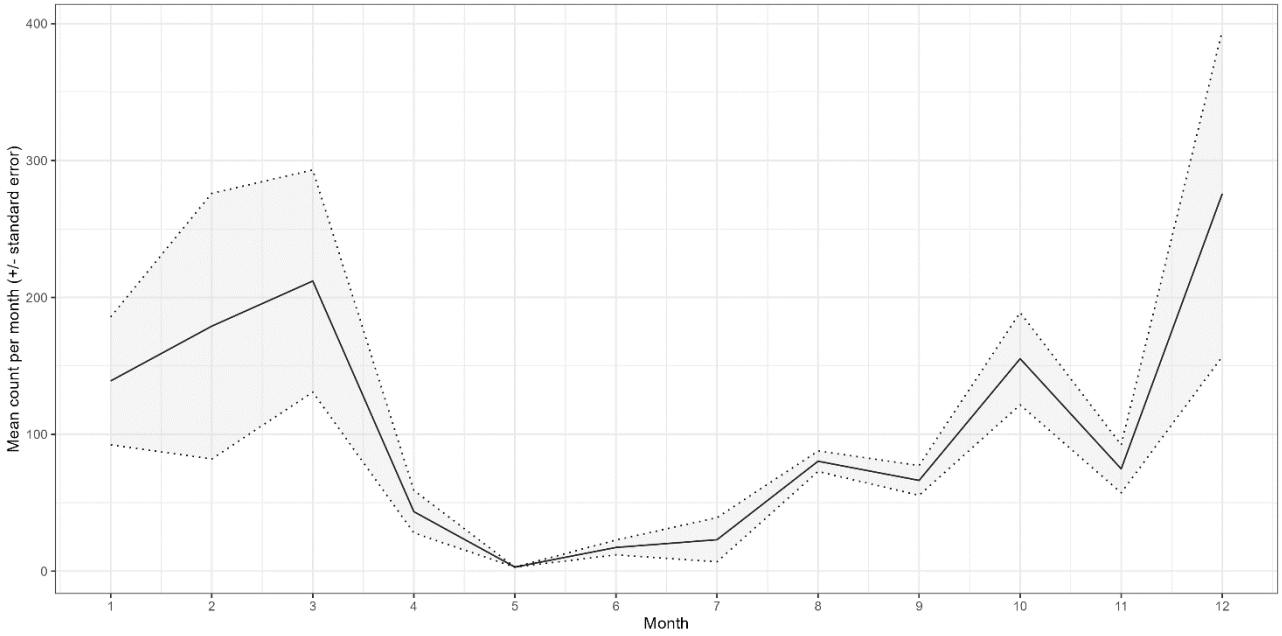
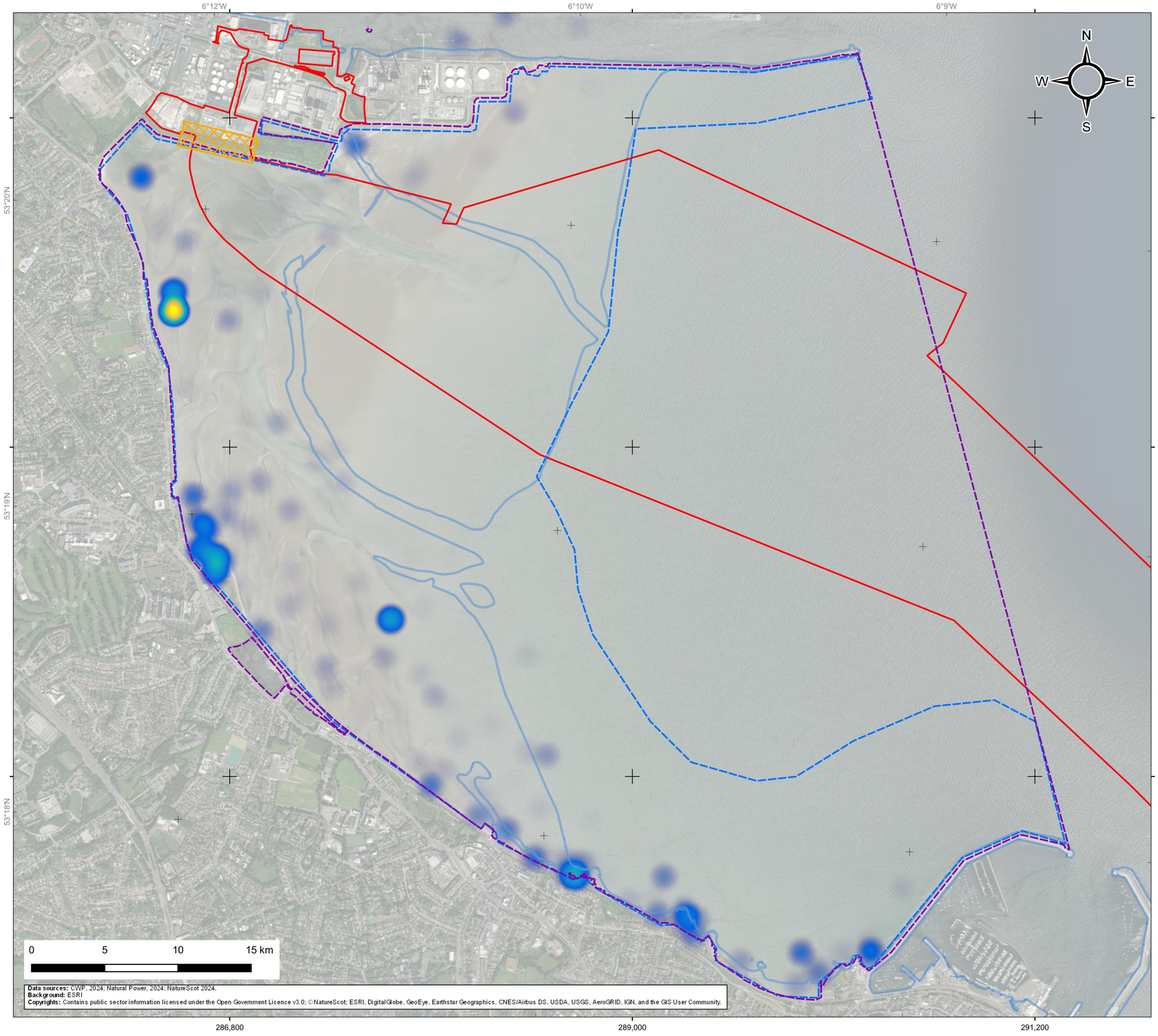
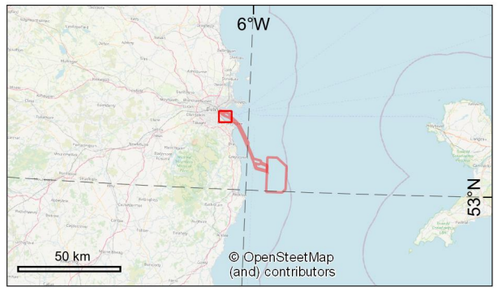


Figure 5.54 Annual variation in average counts of common gull

5.2.27.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by common gull during baseline landfall surveys is shown in Figure 5.55.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Common gull count density (total individuals per m²)

0.13

0.02

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.55
Spatial variation in frequency of landfall survey area site usage by common gull during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1639

Internal descriptive code: PB..DLH - PAB..LF4.IB - COMMON.GULL.DENS..MLWS..S.BIRD. INTERTIDAL..S.D.BUY.and.RIV.TOLKA.SPA - (EAR.Vol.04.Ch.10.Ap.05.FIG.05.55)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.28. Great black-backed gull

5.2.28.1. Survey data

Great black-backed gull were recorded within the Project landfall survey area in 76 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.111.

Table 5.111: Total counts of great black-backed gull per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	85	52	8	44	0	0	83	0
February	9	3	5	21	41	17	25	13
March	10	14	23	11	20	31	11	18
April	N/A	N/A	2	36	49	8	N/A	
May	4	N/A	6	10	35	6		
June	32	109	27	41	8	74		
July	22	5	7	3	19	0		
August	29	227	28	99	39	50		
September	47	100	80	23	84	17		
October	241	28	19	130	4	10	65	113
November	9	30	5	3	27	17	59	30
December	32	7	9	0	87	10	17	61

Source: Natural Power

5.2.28.2. Temporal variation in abundance

Monthly variation in average great black-backed gull counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.56, with shading to represent one standard error.

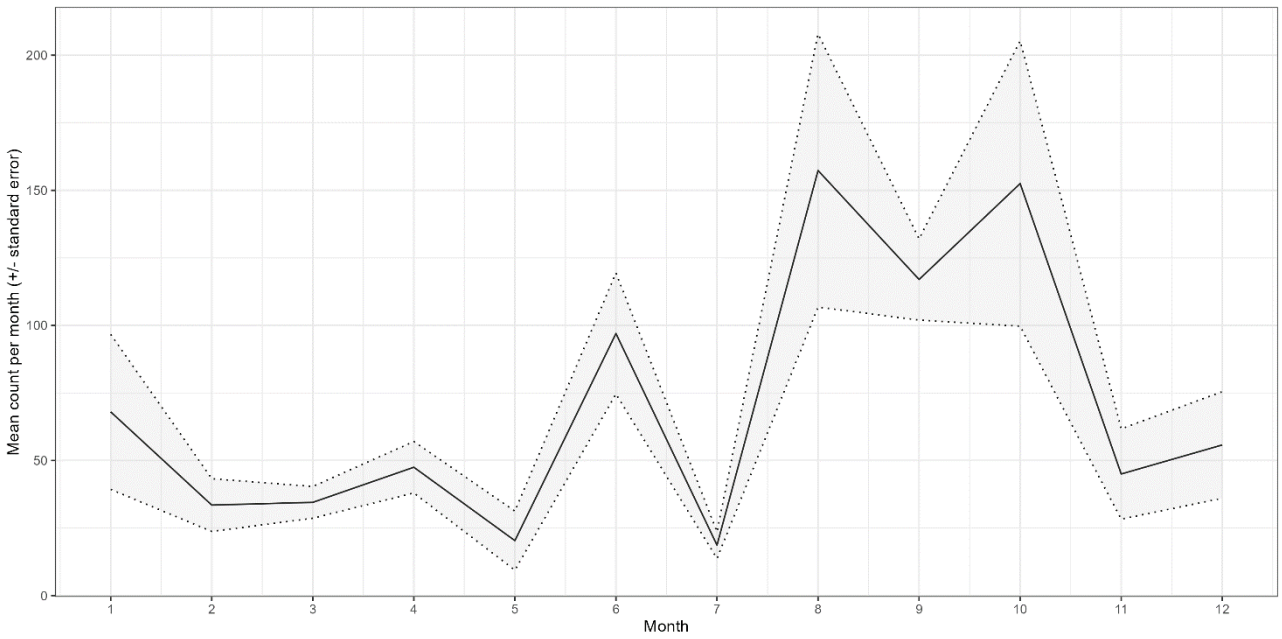
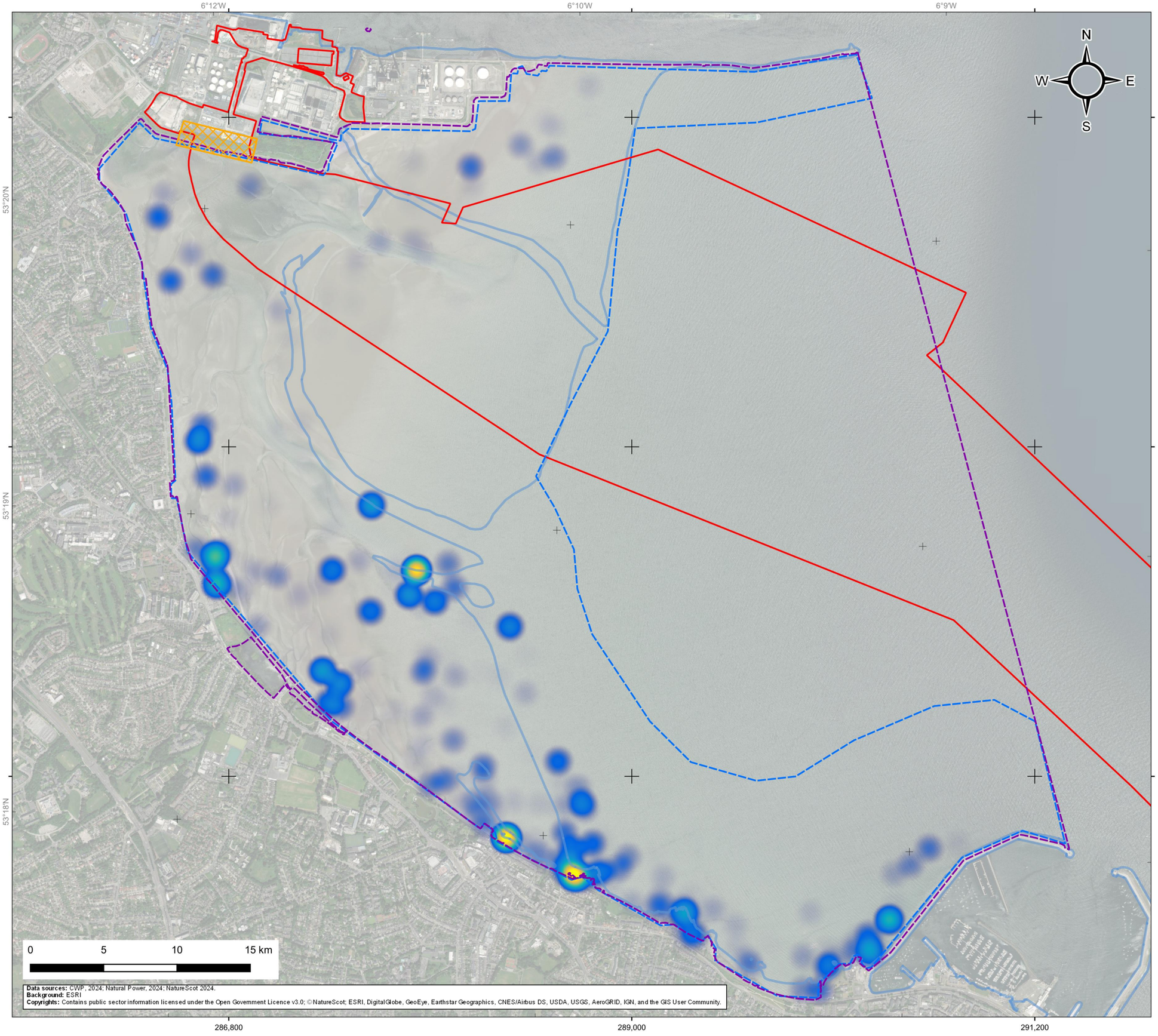
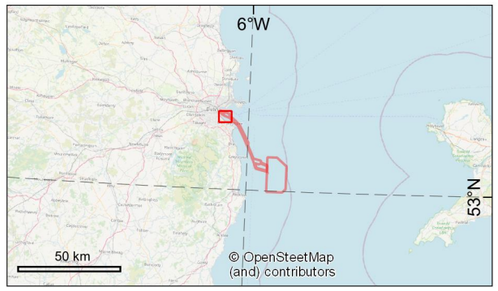


Figure 5.56 Annual variation in average counts of great black-backed gull

5.2.28.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by great black-backed gull during baseline landfall surveys is shown in Figure 5.57.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Great black-backed gull count density (total individuals per m²)

0.066

0.008

codling wind park

Project: Codling Wind Park

Contractor: www.naturalpower.com natural power

Figure 5.57
Spatial variation in frequency of landfall survey area site usage by great black-backed gull during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1640

Internal descriptive code: PB_DLH - PAB_LF4.IB - GREAT.BLACK.BACK.GULL.DENS._MLWS._S.BIRD.INTERTIDAL_S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04. Ch.10.Ap.05.FIG.05.57)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.29. **Herring gull**

5.2.29.1. **Survey data**

Herring gull were recorded within the Project landfall survey area in 79 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.112.

Table 5.112: Total counts of herring gull per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	421	442	39	431	33	0	250	1
February	106	73	289	1089	149	71	179	66
March	109	150	311	154	44	280	92	70
April	N/A	N/A	43	296	271	119	N/A	
May	145	N/A	14	116	501	240		
June	184	687	524	539	344	487		
July	219	152	315	113	562	111		
August	379	2058	146	499	244	553		
September	23	24	940	437	156	104		
October	5646	132	148	1323	114	66	836	609
November	30	119	69	91	236	80	353	77
December	247	57	29	0	341	45	60	263

Source: Natural Power

5.2.29.2. **Temporal variation in abundance**

Monthly variation in average herring gull counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.58, with shading to represent one standard error.

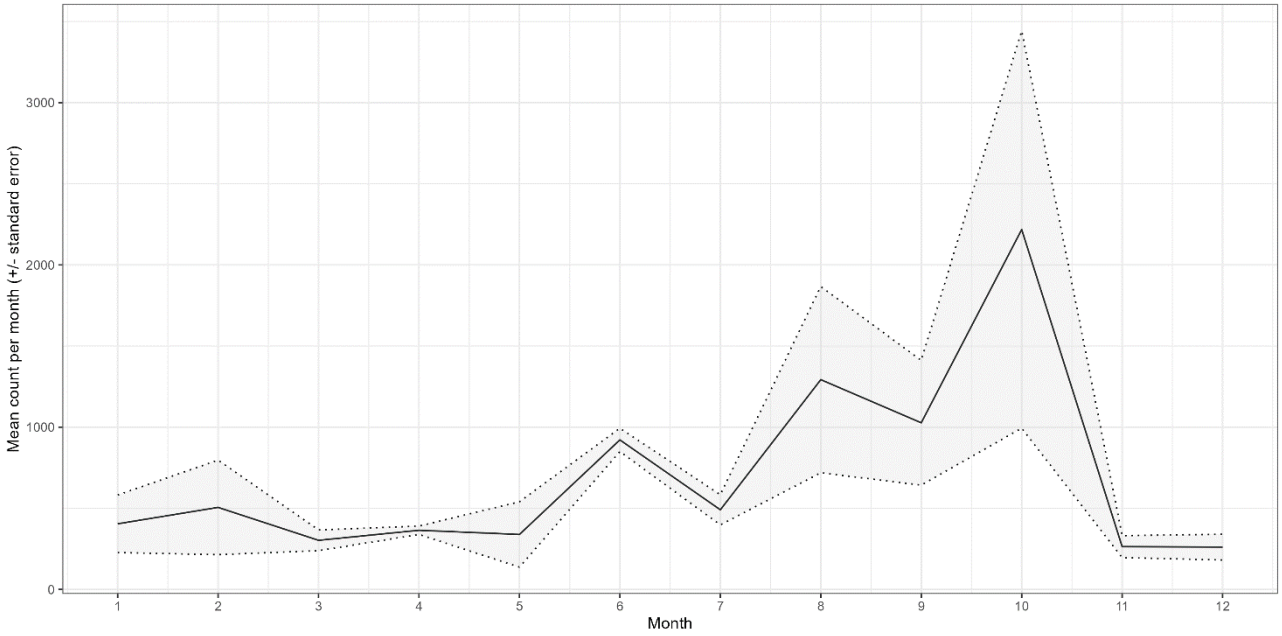
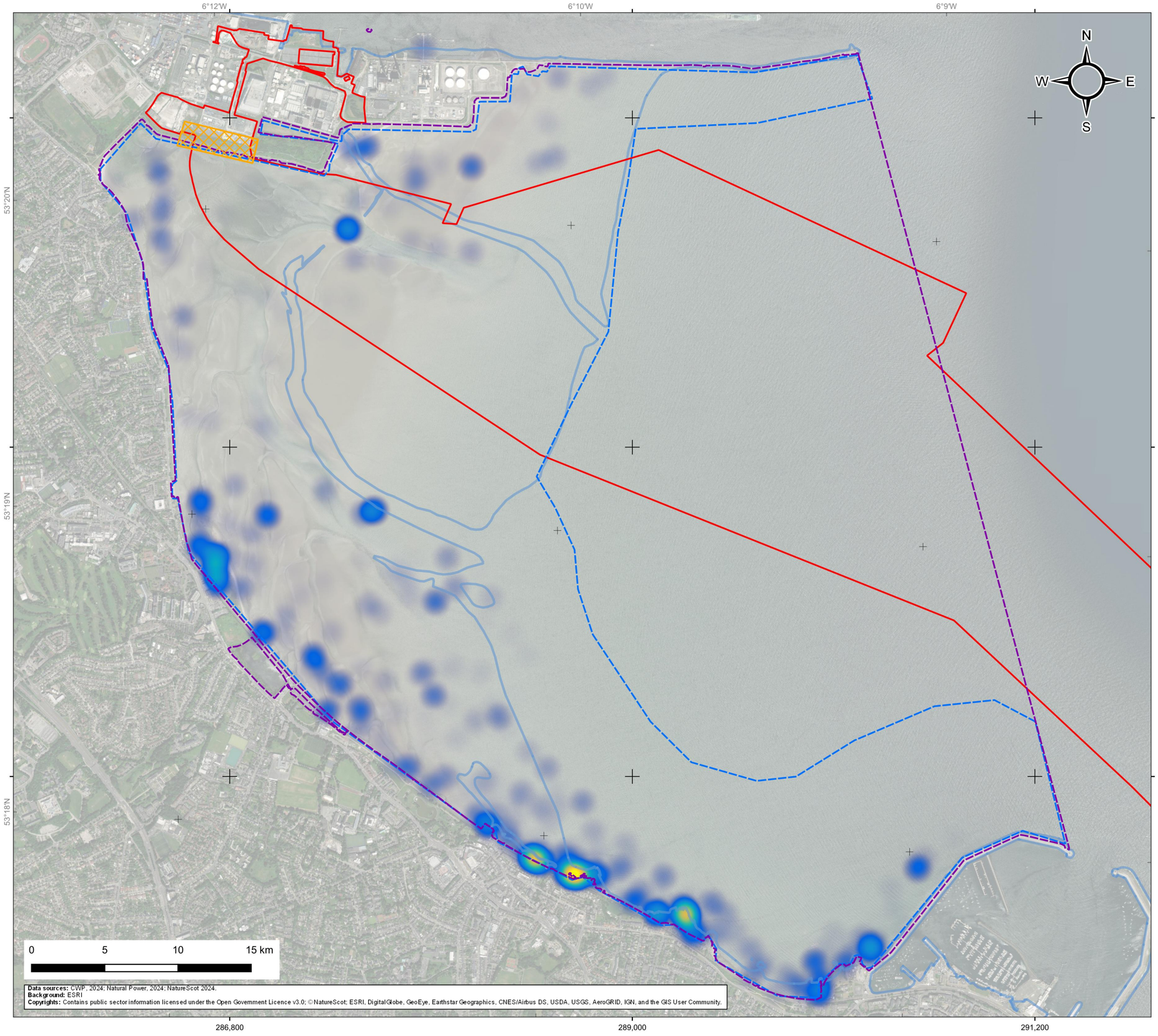
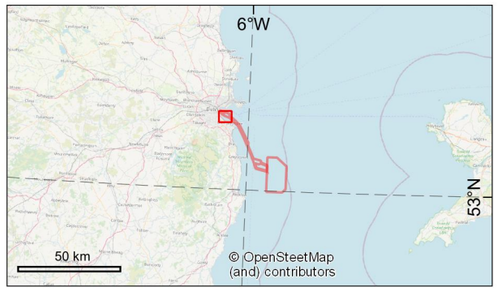


Figure 5.58: Annual variation in average counts of herring gull

5.2.29.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by herring gull during baseline landfall surveys is shown in Figure 5.59.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Herring gull count density (total individuals per m²)

0.40

0.05

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.59
Spatial variation in frequency of landfall survey area site usage by herring gull during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1641

Internal descriptive code: PB..DLH - PAB..LF4.IB - HERRING.GULL.DENS..MLWS..S.BIRD.INTERTIDAL..S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.59)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.30. Lesser black-backed gull

5.2.30.1. Survey data

Lesser black-backed gull were recorded within the Project landfall survey area in 61 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.113.

Table 5.113: Total counts of lesser black-backed gull per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	1	1	0	4	3	0	3	0
February	0	19	1	24	6	2	3	0
March	14	4	18	11	0	11	2	4
April	N/A	N/A	5	28	6	6	N/A	
May	3	N/A	0	10	12	6		
June	6	40	26	67	24	13		
July	9	7	46	2	5	3		
August	22	150	43	81	12	93		
September	23	24	28	2	16	1		
October	48	0	0	4	0	2	1	3
November	0	1	0	1	1	1	0	0
December	15	0	0	0	2	0	0	2

Source: Natural Power

5.2.30.2. Temporal variation in abundance

Monthly variation in average lesser black-backed gull counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.60, with shading to represent one standard error.

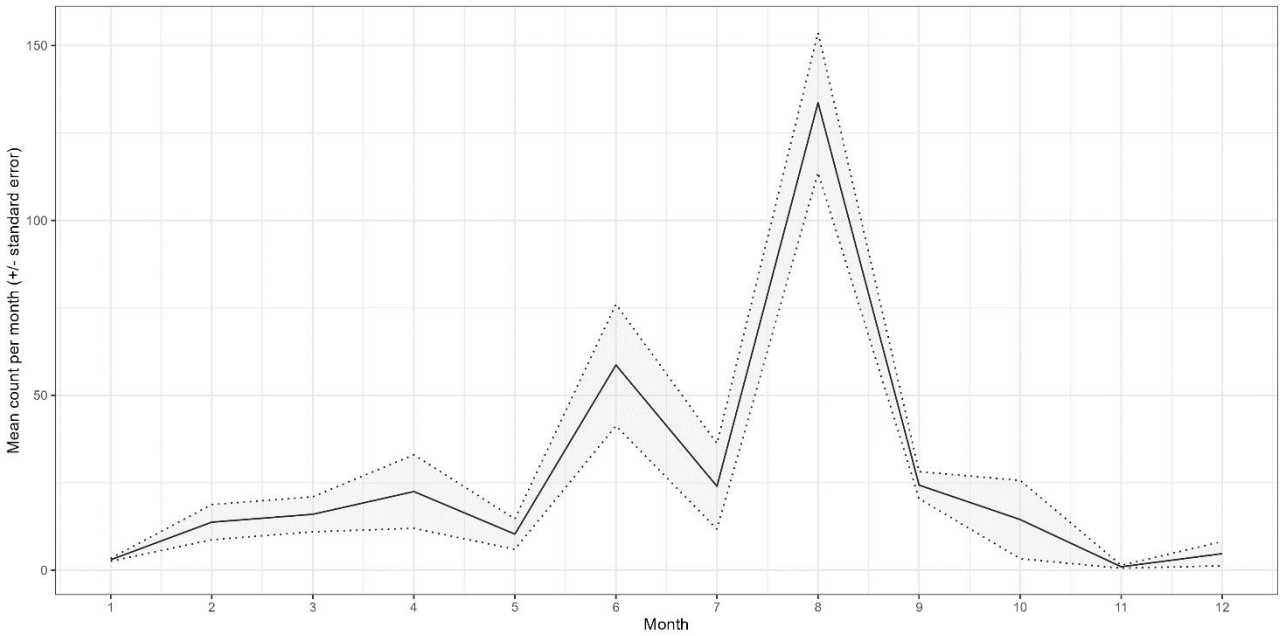
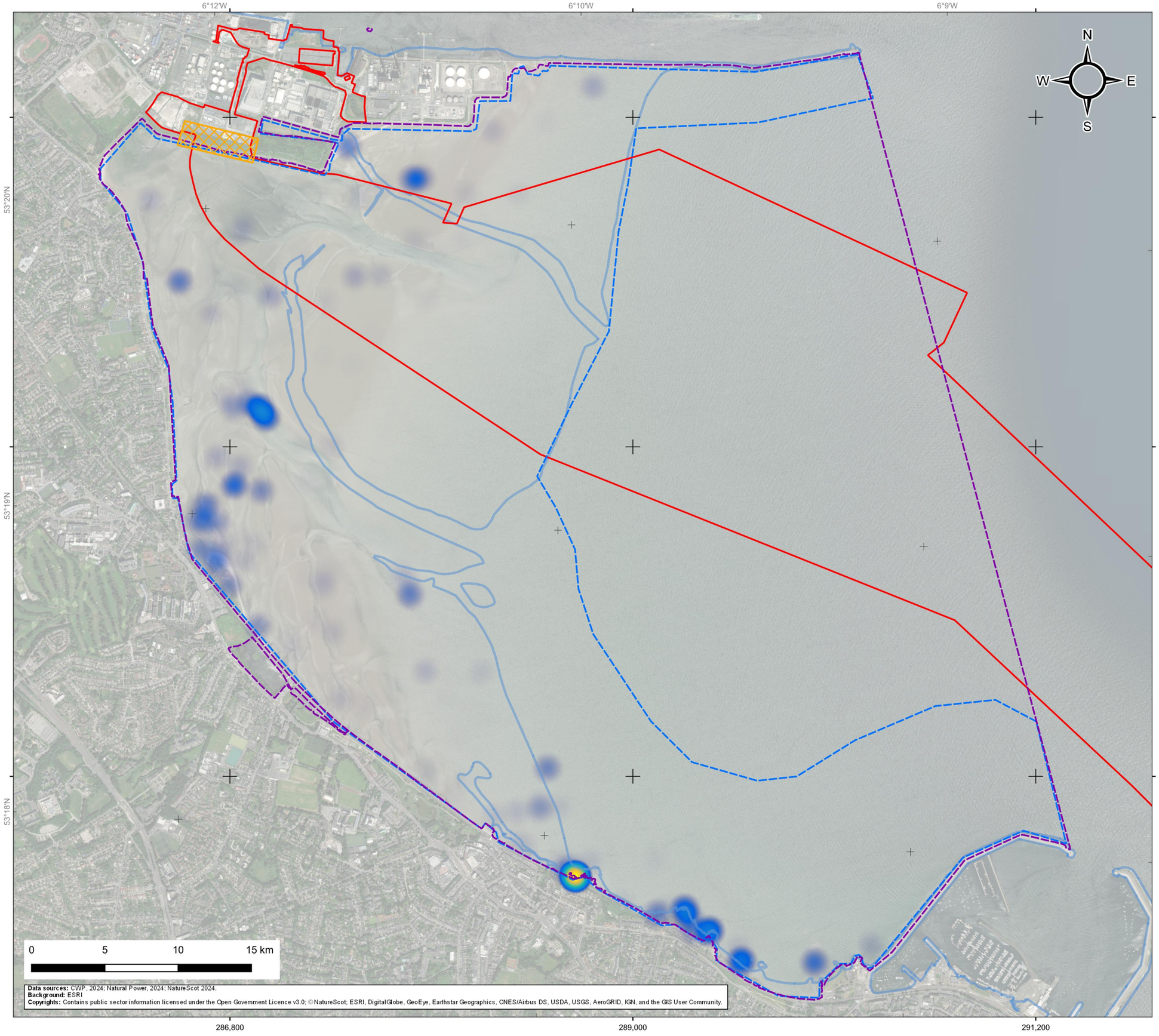
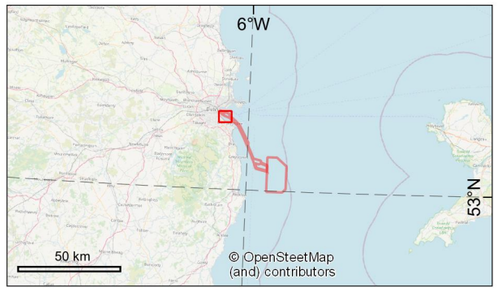


Figure 5.60 Annual variation in average counts of lesser black-backed gull

5.2.30.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by lesser black-backed gull during baseline landfall surveys is shown in Figure 5.61.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Lesser black-backed gull count density (total individuals per m²)

0.044

0.006

codling wind park

Project: Codling Wind Park

Contractor: www.naturalpower.com

Figure 5.61
Spatial variation in frequency of landfall survey area site usage by lesser black-backed gull during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1643

Internal descriptive code: PB_DLH - PAB_LF4.IB - LESSER.BLACK.BACK.GULL.DENS._MLWS._S.BIRD.INTERTIDAL_S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04. Ch.10.Ap.05.FIG.05.61)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.31. Sandwich tern

5.2.31.1. Survey data

Sandwich tern were recorded within the Project landfall survey area in 28 of the diurnal 81 intertidal landfall surveys undertaken between October 2019 and March 2023and six of the eight intertidal roosting tern surveys during mid-July to mid-September in 2020 and 2021. Total counts of this species on each survey are presented in Table 5.114.

Table 5.114: Total counts of Sandwich tern per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020				Year 2: October 2020 to September 2021				Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Diurnal surveys		Roost surveys		Diurnal surveys		Roost surveys		Diurnal surveys	Roost surveys	Diurnal surveys	Roost surveys
	V1	V2	V1	V2	V1	V2	V1	V2	Visit 1	Visit 2	Visit 1	Visit 2
January	0	0			0	0			0	0	0	0
February	0	0			0	0			0	0	0	0
March	0	13			0	0			0	0	0	0
April	N/A	N/A			172	53			0	14	N/A	
May	0	N/A			0	2			2	0		
June	0	13			0	20			9	11		
July	4	51	106		6	22	0		14	3		
August	168	89	210	307	84	231	462	0	42	174		
September	23	24	22		7	0	7		1	53		
October	0	0			0	0			0	0	38	0
November	0	0			0	0			0	0	0	0
December	0	0			0	0			0	0	0	0

Source: Natural Power

5.2.31.2. Temporal variation in abundance

Monthly variation in average Sandwich tern counts within the Project landfall survey area during baseline diurnal landfall surveys is shown in Figure 5.62, with shading to represent one standard error.

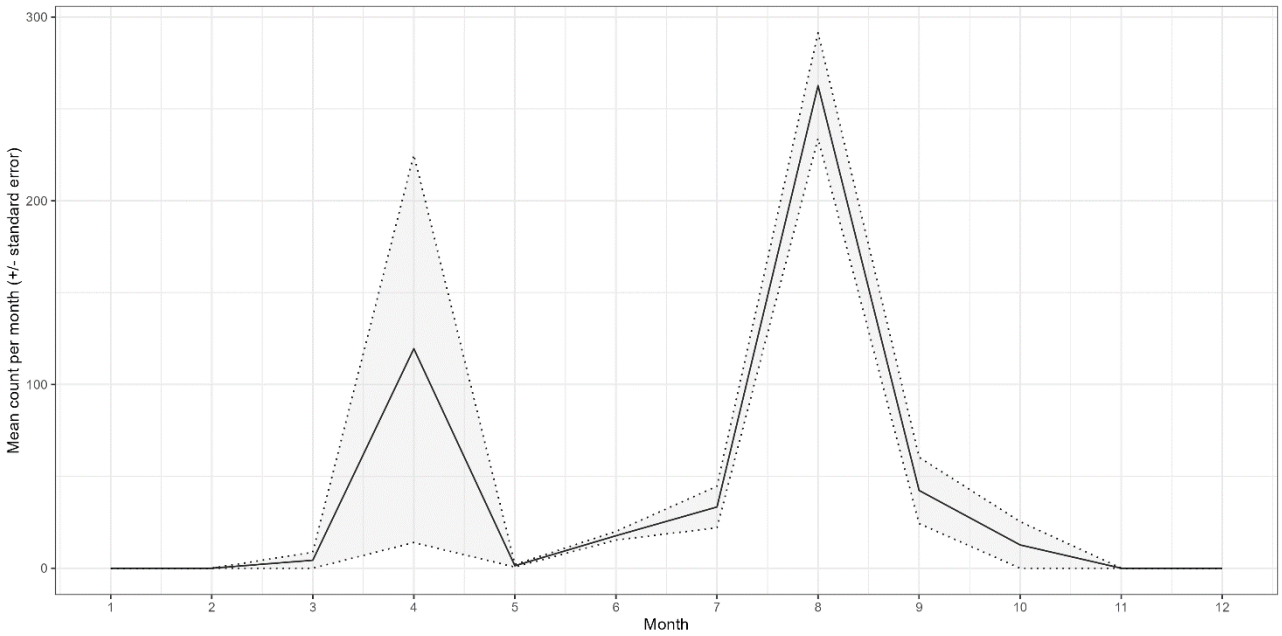


Figure 5.62: Annual variation in average counts of Sandwich tern (shading represents +/- one standard error)

Monthly variation in average Sandwich tern counts within the Project landfall survey area during intertidal roosting tern surveys is shown in Figure 5.63, with shading to represent one standard error.

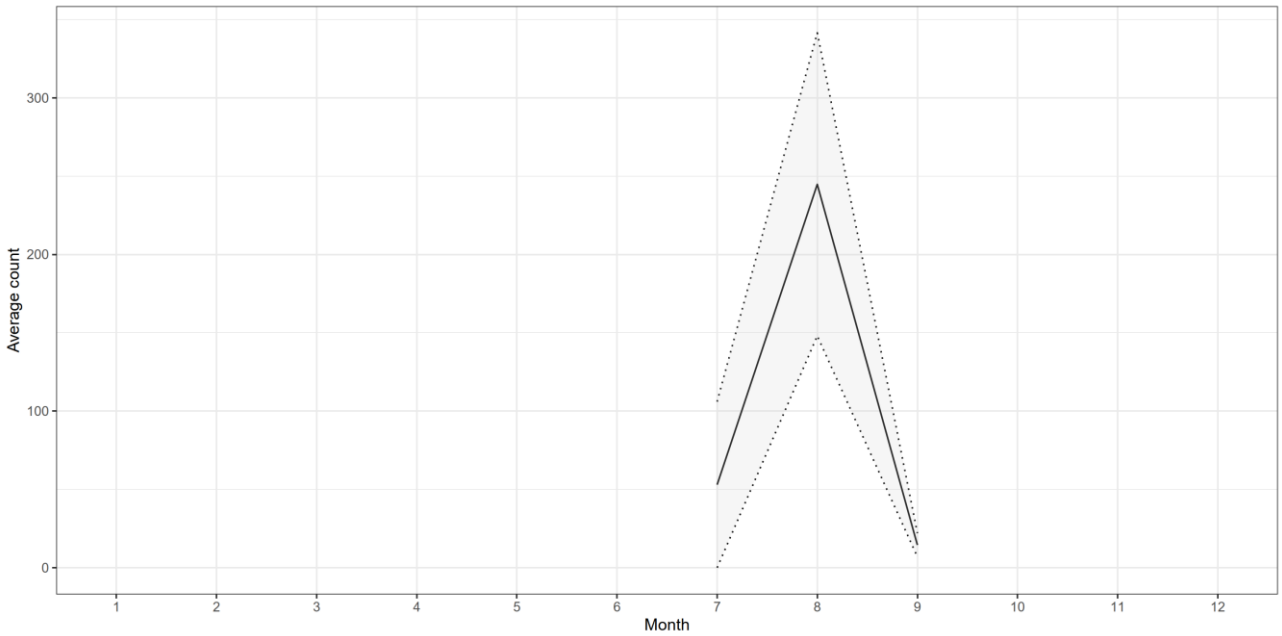
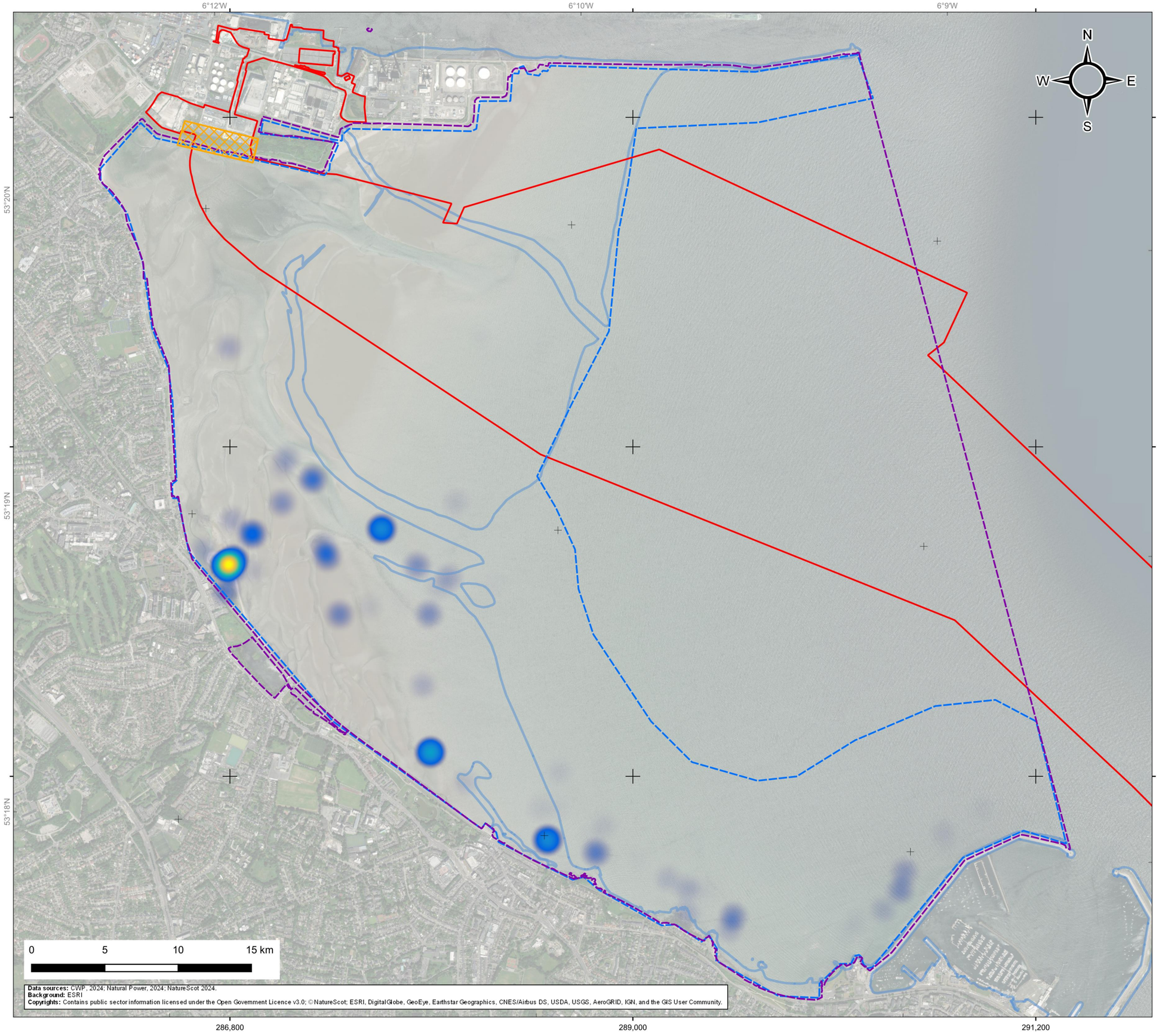
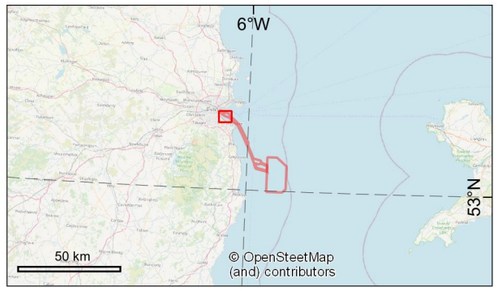


Figure 5.63 Variation in average counts of Sandwich tern during roosting tern surveys

5.2.31.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by Sandwich tern during baseline diurnal landfall surveys is shown in Figure 5.64. Areas were utilised within the Project landfall survey area by roosting Sandwich tern during intertidal roosting tern surveys are shown in Figure 5.65.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Sandwich tern count density (total individuals per m²)

0.21

0.03

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.64
Spatial variation in frequency of landfall survey area site usage by sandwich tern during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1644

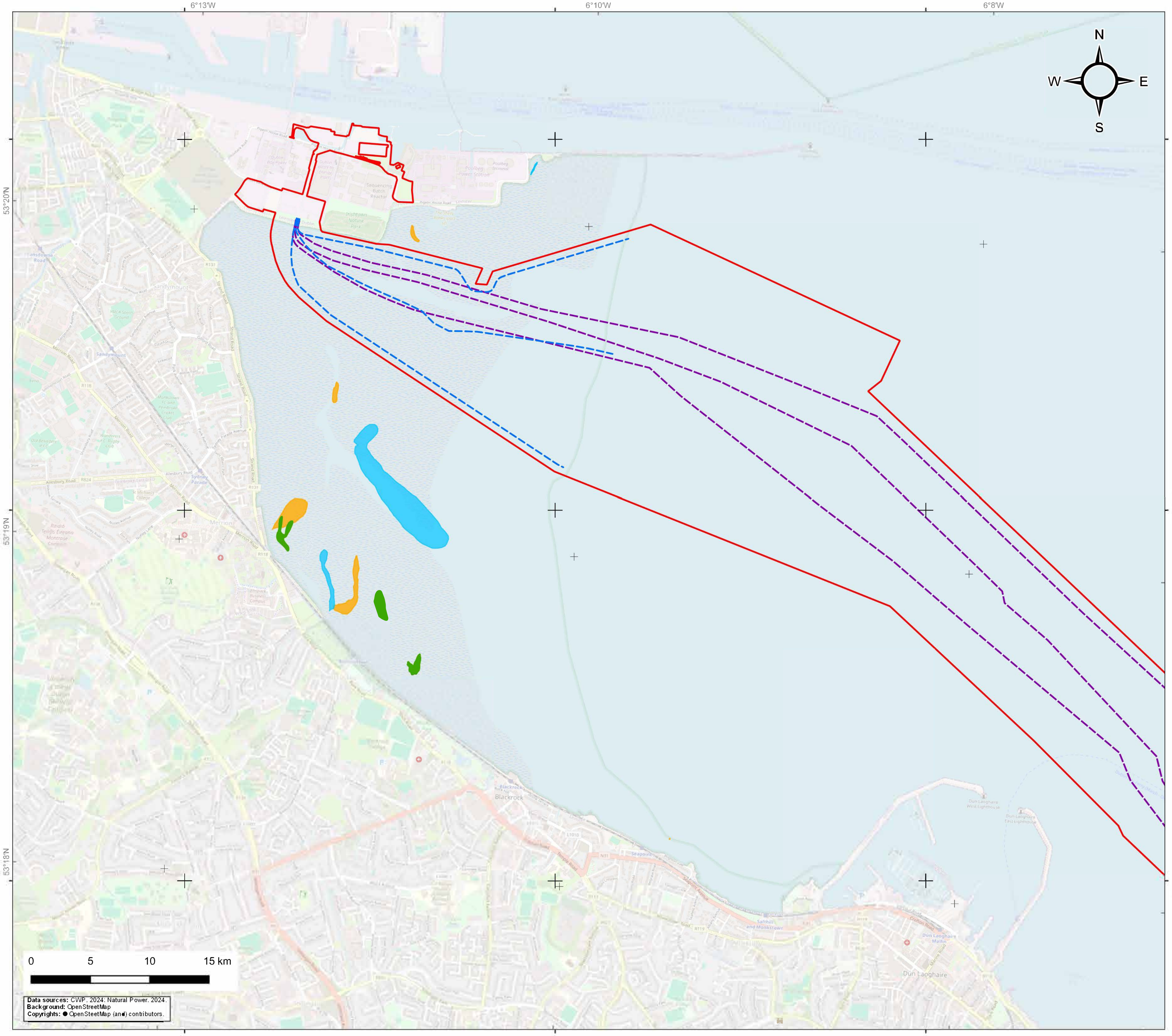
Internal descriptive code: PB..DLH - PAB..LF4.IB - MLWS..SANDWICH.TERN.DENS..S.BIRD.INTERTIDAL..S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.64)

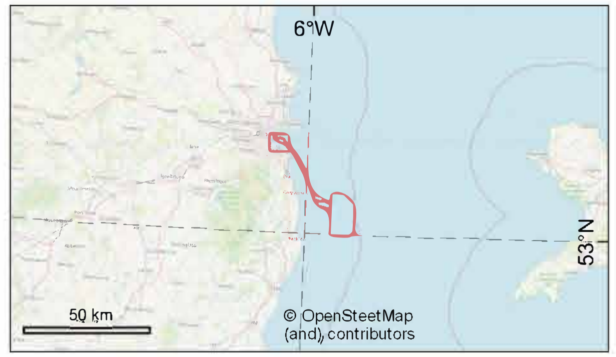
Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP





Legend

- Planning Application Boundary (PAB)
- Offshore export cable
- Offshore export cable – alternative alignment

Post-breeding tern roosting locations

- Sterna tern
- Sandwich tern
- Sterna and sandwich tern

Project: Codling Wind Park

Contractor: www.naturalpower.com

Figure 5.65
Distribution of post-breeding tern roosting locations recorded during baseline surveys (2021 – 22) relative to intertidal cable route scenarios

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1692

Internal descriptive code:	Size: A3	CRS:
	Scale: 1:25,000	EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
00	Final for issue	2024/08/15	AC	FM/EA	CP

5.2.32. Common, Arctic and roseate terns (*Sterna* sp. terns)

5.2.32.1. Survey data

Terns belonging to the *Sterna* genus (i.e. common, Arctic and roseate) were recorded within the Project landfall survey area in 23 of the 81 diurnal intertidal landfall surveys undertaken between October 2019 and March 2023 and all of the eight intertidal roosting tern surveys during mid-July to mid-September in 2020 and 2021. Total counts of this species group on each survey are presented in Table 5.115.

Table 5.115: Total counts of common, Arctic and roseate tern per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020				Year 2: October 2020 to September 2021				Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Diurnal surveys		Roost surveys		Diurnal surveys		Roost surveys		Diurnal surveys	Roost surveys	Diurnal surveys	Roost surveys
	V1	V2	V1	V2	V1	V2	V1	V2	Visit 1	Visit 2	Visit 1	Visit 2
January	0	0			0	0			0	0	0	0
February	0	0			0	0			0	0	0	0
March	0	0			0	0			0	0	0	0
April					0	2			0	11		
May	0				19	14			0	16		
June	0	0			0	4			6	23		
July	15	497	963		9	97	1,512		52	44	N/A	
August	265	19	1756	889	104	142	2770	4686	95	124		
September	64	8	31		0	0	796		0	0		
October	0	0			0	0			0	0	1	0
November	0	0			0	0			0	0	0	0
December	0	0			0	0			0	0	0	0

Source: Natural Power

5.2.32.2. Temporal variation in abundance

Monthly variation in average *Sterna* tern counts within the Project landfall survey area during baseline diurnal landfall surveys is shown in Figure 5.66, with shading to represent one standard error.

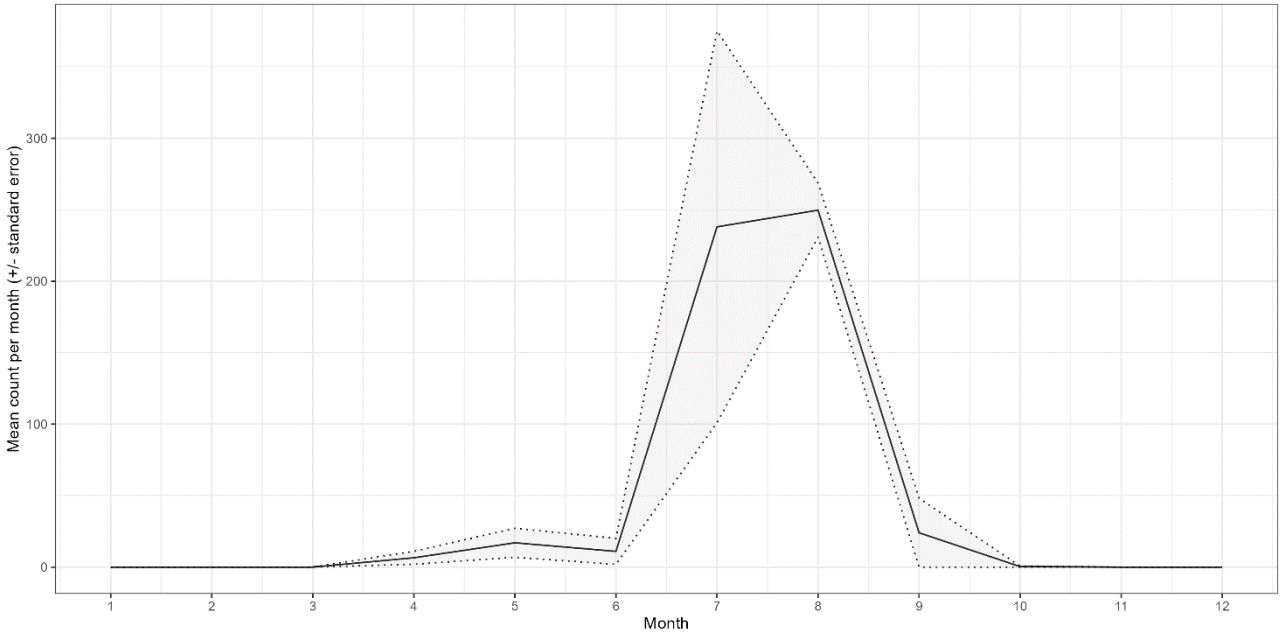


Figure 5.66 Annual variation in average counts of *Sterna* terns

Monthly variation in average *Sterna* tern counts within the Project landfall survey area during intertidal roosting tern surveys is shown in Figure 5.67, with shading to represent one standard error.

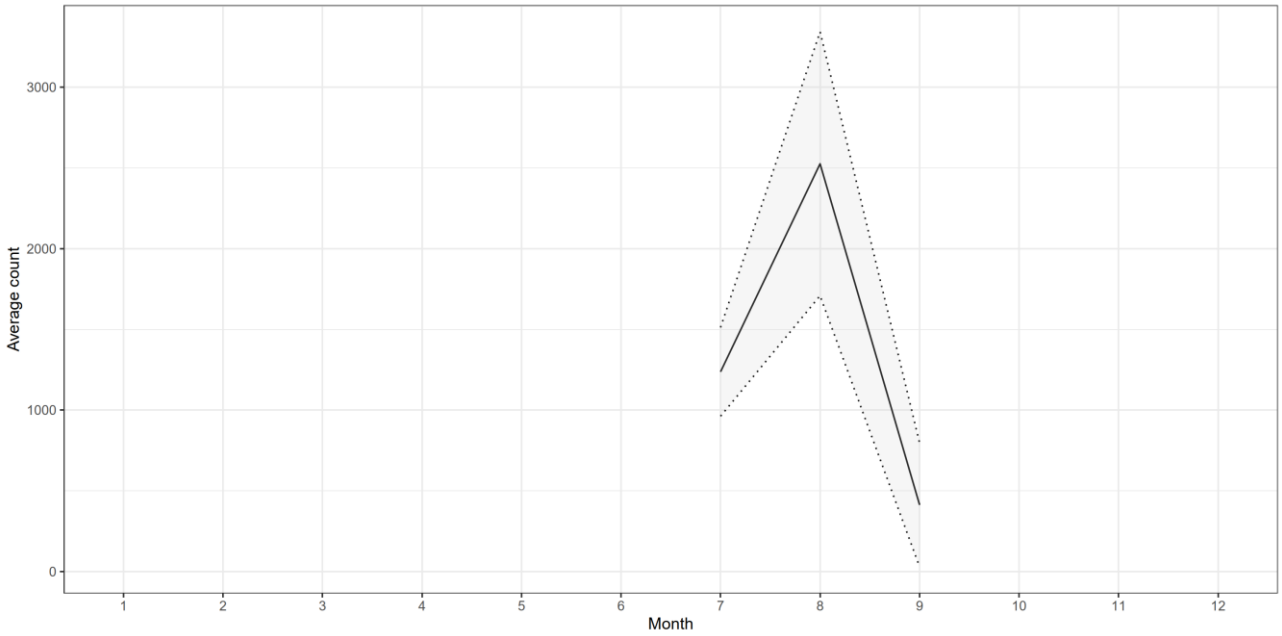
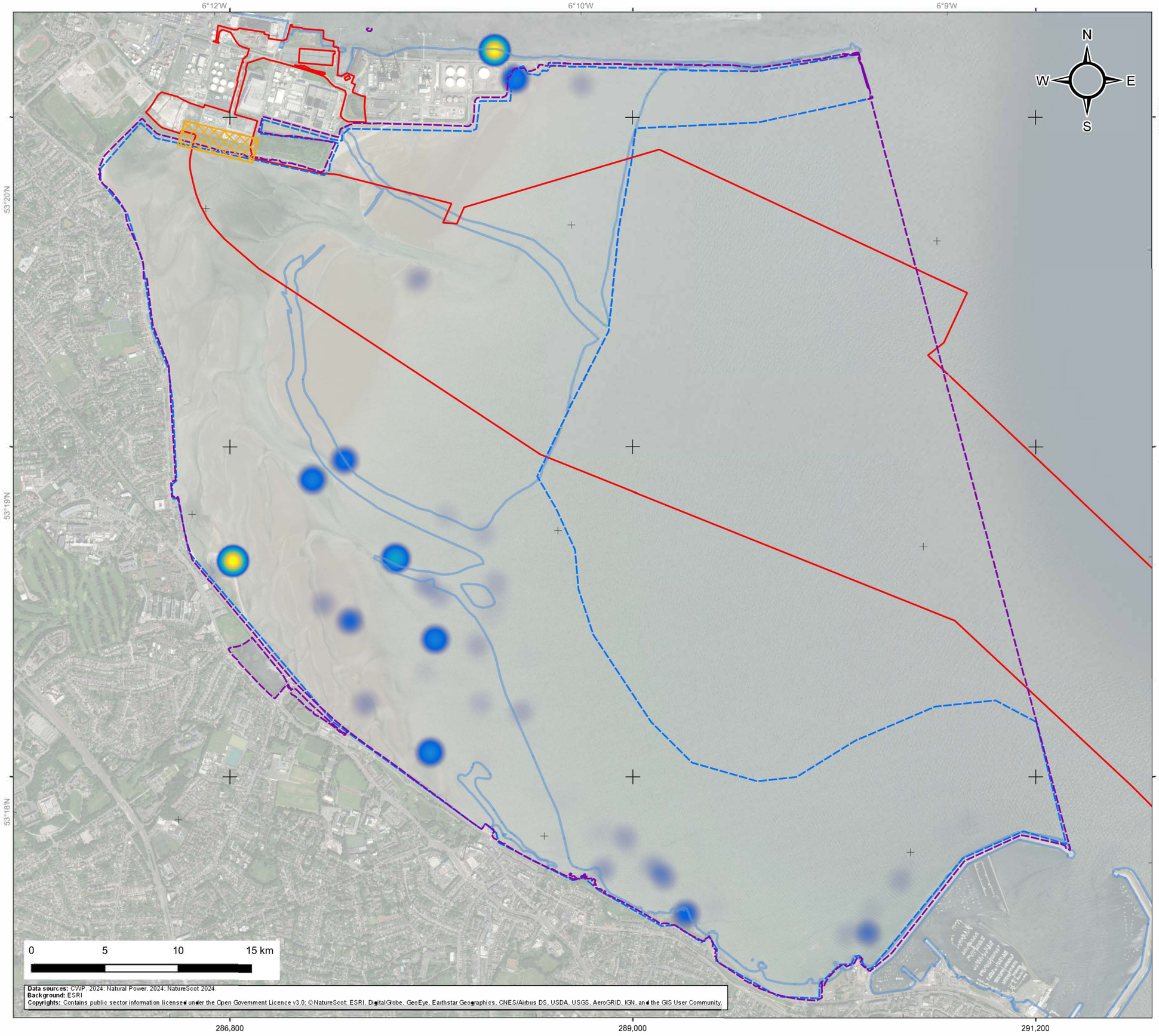
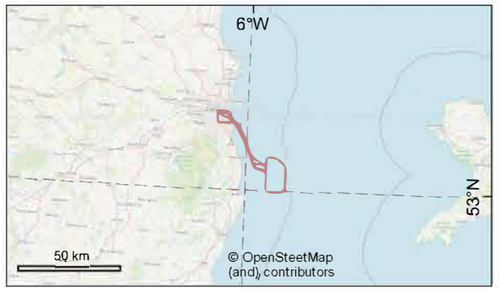


Figure 5.67: Variation in average counts of Sterna terns during roosting tern surveys

5.2.32.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by *Sterna* terns during baseline diurnal landfall surveys is shown in Figure 5.68. Areas which were utilised within the Project landfall survey area by roosting *Sterna* terns during intertidal roosting tern surveys are shown in Figure 5.65.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Sterna tern count density (total individuals per m²)

0.17

0.02

codling wind park

Project: Codling Wind Park

Contractor: www.naturalpower.com natural power

Figure 5.68
Spatial variation in frequency of landfall survey area site usage by Sterna terns during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1645

Internal descriptive code: PB_BLH - PAB_LF4/6 - MLWS_STERNA TERN DENS_S BIRD INTERTIDAL_S.D.B&R and R.IV TOLKA SPA - IE WR Vol 04 Ch 10 A#.05 FIG #5.67)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

5.2.33. **Black guillemot**

5.2.33.1. **Survey data**

Black guillemot were recorded within the Project landfall survey area in 62 of the 81 intertidal landfall surveys undertaken between October 2019 and March 2023. Total counts of this species on each survey are presented in Table 5.116.

Table 5.116: Total counts of black guillemot per survey – South Dublin Bay survey area

Month	Year 1: October 2019 to September 2020		Year 2: October 2020 to September 2021		Year 3: October 2021 to September 2022		Year 4: October 2022 to March 2023	
	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2	Monthly survey 1	Monthly survey 2
January	2	0	32	2	0	0	0	4
February	2	8	4	2	6	8	9	4
March	4	12	4	6	1	7	2	2
April	N/A	N/A	2	4	0	3	N/A	
May	7	N/A	5	6	6	6		
June	6	0	10	1	4	5		
July	4	5	0	4	7	3		
August	18	6	8	4	4	2		
September	23	24	0	4	4	0		
October	0	14	0	0	7	4	2	3
November	6	4	2	0	3	4	10	0
December	4	4	2	0	0	6	0	0

Source: Natural Power

5.2.33.2. **Temporal variation in abundance**

Monthly variation in average black guillemot counts within the Project landfall survey area during baseline landfall surveys is shown in Figure 5.69: Annual variation in average counts of black guillemot, with shading to represent one standard error.

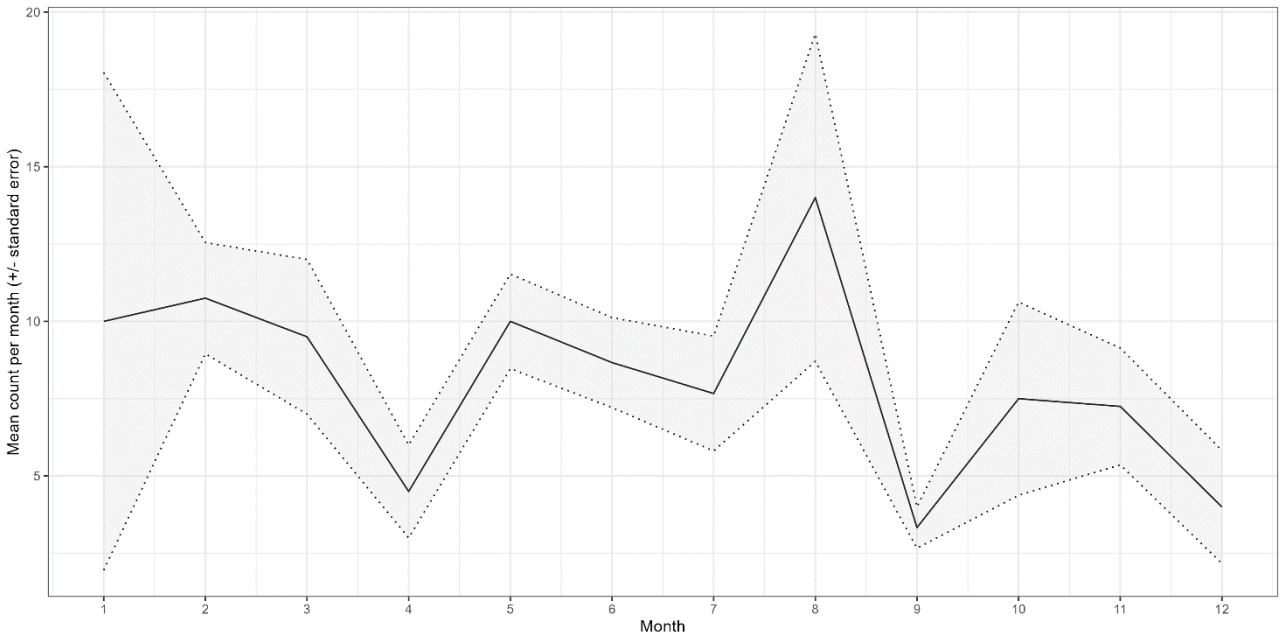
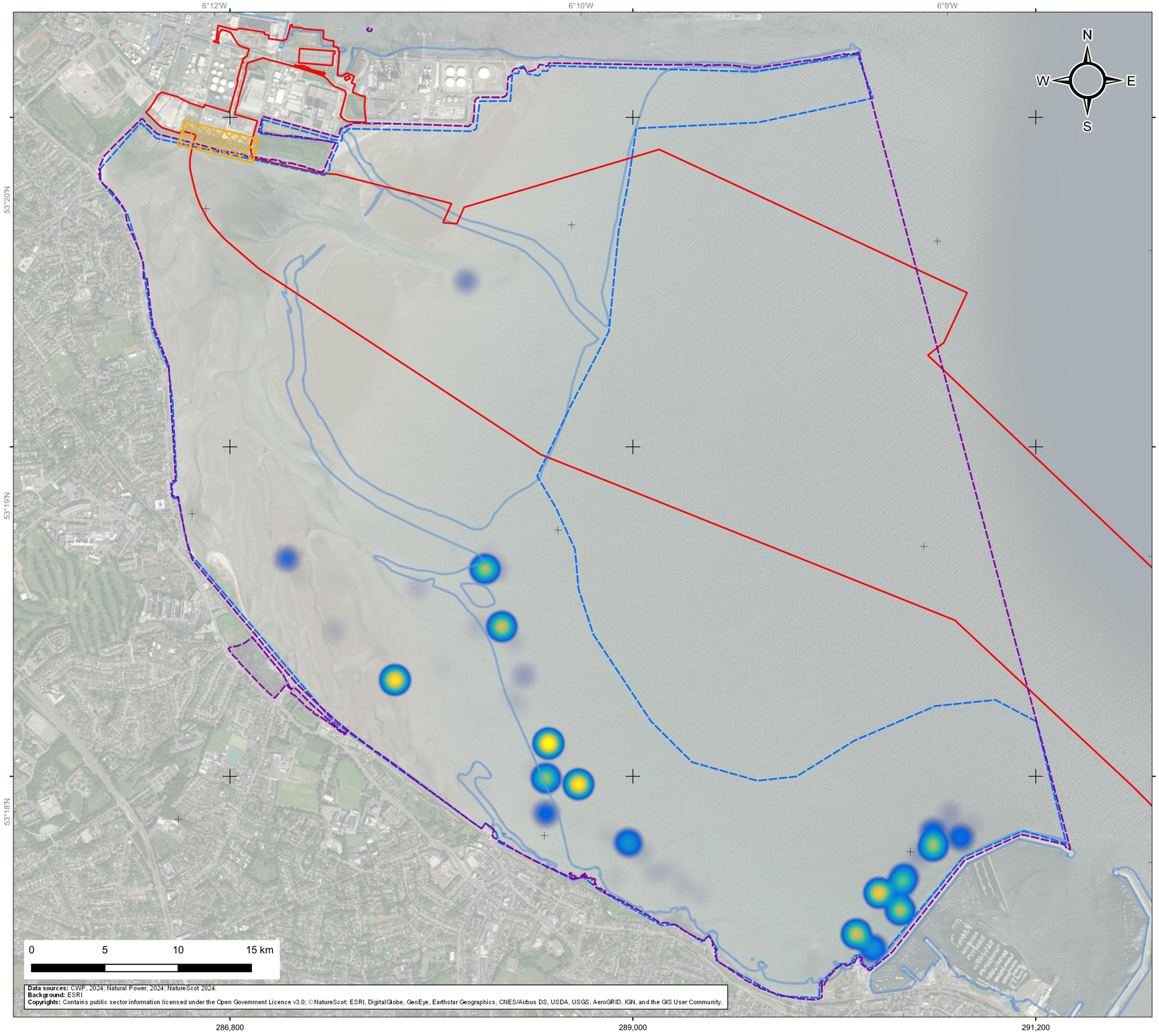
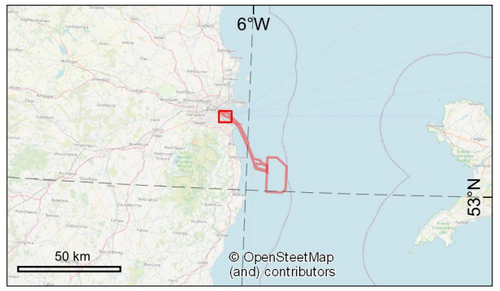


Figure 5.69: Annual variation in average counts of black guillemot

5.2.33.3. **Spatial variation in site use**

Spatial variation in the proportion of time that areas were utilised within the Project landfall survey area by black guillemot during baseline landfall surveys is shown in Figure 5.70.





Legend

- Planning Application Boundary (PAB)
- Indicative landfall location
- Intertidal landfall survey area
- South Dublin Bay and River Tolka Estuary Special Protection Area (SPA)
- Mean Low Water Springs (MLWS)

Black guillemot count density (total individuals per m²)

0.026

0.003

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 5.70
Spatial variation in frequency of landfall survey area site usage by black guillemot during baseline surveys

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1647

Internal descriptive code: PB..DLH - PAB..LF4.IB - BLACK.GUILLEMOT.DENS..MLWS..S.BIRD.INTERTIDAL..S.D.BUY.and.RIV.TOLKA.SPA - (EIAR.Vol.04.Ch.10.Ap.05.FIG.05.70)

Size: A3

Scale: 1:20,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
A	Final version	2024/08/06	AC	FM/EA	CP

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Appendices

A. Apportionment proportions used to assign records not identified to species level

A.1. Apportionment proportions used to assign DAS records not identified to species level

Table A.1: Apportionment proportions used to assign DAS records not identified to species level

Species grouping	Species	Breeding		Non-breeding	
		Flight	Sea	Flight	Sea
Arctic/common tern	Arctic tern	0.29	0.29	0.07	0.00
	Common tern	0.71	0.71	0.93	1.00
Auk/shearwater species	Guillemot	0.46	0.73	0.68	0.67
	Razorbill	0.05	0.20	0.23	0.31
	Puffin	0.04	0.00	0.00	0.01
	Manx shearwater	0.45	0.06	0.09	0.02
Auk/small gull	Guillemot	0.35	0.76	0.23	0.62
	Razorbill	0.04	0.21	0.08	0.29
	Puffin	0.03	0.00	0.00	0.00
	Black-headed gull	0.00	0.00	0.01	0.00
	Common gull	0.00	0.00	0.03	0.00
	Kittiwake	0.58	0.03	0.64	0.08
	Little gull	0.00	0.00	0.02	0.00
Auk species	Guillemot	0.84	0.78	0.75	0.68
	Razorbill	0.09	0.21	0.25	0.32
	Puffin	0.07	0.00	0.00	0.01
Cormorant/shag	Cormorant	1.00	0.00	0.00	0.31
	Shag	0.00	1.00	1.00	0.69
Diver species	Great northern diver	0.00	0.25	0.00	0.05
	Red-throated diver	0.00	0.75	1.00	0.95
Fulmar/gull species	Fulmar	0.03	0.02	0.00	0.01
	Herring gull	0.14	0.15	0.03	0.12
	Great black-backed gull	0.02	0.04	0.01	0.06
	Lesser black-backed gull	0.01	0.00	0.00	0.00
	Kittiwake	0.80	0.78	0.89	0.79
	Black-headed gull	0.00	0.00	0.01	0.00
	Common gull	0.01	0.00	0.04	0.00
	Little gull	0.00	0.00	0.03	0.01
	Herring gull	0.14	0.14	0.03	0.12
	Great black-backed gull	0.02	0.04	0.01	0.06
	Lesser black-backed gull	0.01	0.00	0.00	0.00
	Kittiwake	0.83	0.81	0.89	0.80

Species grouping	Species	Breeding		Non-breeding	
		Flight	Sea	Flight	Sea
Gull species	Black-headed gull	0.00	0.00	0.01	0.00
	Common gull	0.01	0.00	0.04	0.00
	Little gull	0.00	0.00	0.03	0.01
Large auk	Guillemot	0.91	0.79	0.75	0.68
	Razorbill	0.09	0.21	0.25	0.32

Source: Natural Power

A.2. Apportionment proportions used to assign boat-based records not identified to species level

Table A.2: Apportionment proportions used to assign boat-based records not identified to species level

Species grouping	Species	Breeding 2019		Breeding 2020		Winter 2018		Winter 2019	
		Flight	Sea	Flight	Sea	Flight	Sea	Flight	Sea
Arctic/common tern	Arctic tern	0.00	0.05	0.40	0.21	-	-	0.06	0.00
	Common tern	1.00	0.95	0.60	0.79	-	-	0.94	1.00
Arctic/common/ roseate tern	Arctic tern	0.00	0.04	0.37	0.19	-	-	0.06	0.00
	Common tern	1.00	0.91	0.57	0.68	-	-	0.90	0.71
	Roseate tern	0.00	0.04	0.06	0.13	-	-	0.05	0.29
Guillemot/razorbill	Guillemot	0.88	0.75	0.64	0.47	0.84	0.73	0.86	0.82
	Razorbill	0.12	0.25	0.36	0.53	0.16	0.27	0.14	0.18

Source: Natural Power

B. Colonies within mean-maximum foraging range plus 1 standard deviation of array site, which were used to define regional breeding populations

Table 6.1: Kittiwake colonies within mean-maximum forging range + 1 SD (300.6 km – Woodward *et al*., 2019) of array site

Colony name	Distance from array site (km)	Count date	Count (ind)
WICKLOW HEAD	11.24	2023	1,290
BRAY HEAD	17.49	2015	1,746
HOWTH HEAD	29.97	2018	3,546
IRELAND'S EYE	33.97	2015	802
LAMBAY	43.14	2015	6,640
ROCKABILL	49.66	2021	330
BARDSEY ISLAND	73.25	2019	242
SOUTH STACK CLIFFS RSPB	78.21	2021	20
CARREG Y LLAM	86.31	2021	1,228
PENYMYNYDD	90.01	2016	0
TRWYN CILIAN	90.01	2016	56
MURIAN	93.84	2016	0
PORTH CEIRIAD WEST	93.84	2016	0
PORTH CEIRIAD EAST	94.25	2016	0
TRWYN YR WYLFA 2	95.67	2016	0
TRWYN YR WYLFA 1	96.67	2016	0
ST TUDWAL'S ISLAND WEST	96.67	2016	0
ST TUDWAL'S ISLAND EAST	97.08	2016	620
MIDDLE MOUDE	100.25	2016	0
LYNAS TO FRESHWATER BAY	111.08	2016	0
FRESHWATER BAY	111.08	2016	0
MAGGY'S LEAP 1/DONNARD COVE	116.00	2017	152
MAGGY'S LEAP TO NEWCASTLE 1	116.00	2019	1,160
YNYS MOELFRE	119.74	2016	312
GREAT SALTEE ISLAND	126.05	2015	2,076
CALF OF MAN	127.58	2013	26
NEW QUAY HEAD	128.04	2018	664

Colony name	Distance from array site (km)	Count date	Count (ind)
PORT ST MARY - SOUND	130.65	2017	1,106
RAMSEY ISLAND RSPB	134.87	2022	92
GUNS ISLAND	135.70	2012	0
GREAT ORME	142.23	2021	1,796
LITTLE ORME	148.64	2021	648
ARDNAMULT	149.64	2018	52
SKOMER	150.53	2022	3,088
DUNMORE EAST TO RED HEAD	151.23	2018	802
PORTALLY TO BENLEA HEAD	156.05	2018	200
RAMSEY - PORT MOOAR	172.08	2017	156
PORT MONA	190.68	2021	50
HELVICK HEAD 1	190.88	2018	130
LYTHE MEAD TO CARRICK-KEE	191.17	2015	678
MULL OF GALLOWAY RSPB	191.17	2022	188
ST MARGARETS ISLAND	199.05	2022	452
BIG SCAR	199.31	2022	104
ST BEES HEAD	206.48	2022	1,144
BURROW HEAD	206.59	2020	0
GOBBINS	208.05	2019	2,290
RAM HEAD	208.44	2018	452
MUCK ISLAND	209.47	2019	1,038
ANTRIM	216.71	2021	544
MEIKLE ROSS	225.88	2021	0
WEST GLAMORGAN	229.47	2018	202
LUNDY	233.10	2021	568
FAIR HEAD	248.92	2016	0
AILSA CRAIG	251.54	2021	980
SANDA ISLANDS	252.50	2021	66
RATHLIN ISLAND	265.82	2021	27,412
OLD HEAD OF KINSALE	282.69	2015	1,442
NORTH CORNWALL COAST	290.15	2019	690

Colony name	Distance from array site (km)	Count date	Count (ind)
Total breeding adults			**67,280**

Table 6.2: Great black-backed gull colonies within mean-maximum forging range (73km – Woodward *et al*., 2019 – no S.D. value) of array site

Colony name	Distance from array site (km)	Count date	Count (ind)
WICKLOW HEAD	11.24	2019	2
BRAY HEAD	17.49	2010	2
DALKEY ISLANDS SPA	22.21	2016	120
IRELAND'S EYE	33.97	2015	308
LAMBAY	43.14	2015	360
SKERRIES ISLANDS	55.38	2010	190
Total breeding adults			**982**

Table 6.3: Herring gull colonies within mean-maximum forging range + 1 SD (85.6 km – Woodward *et al.*, 2019) of array site

Colony name	Distance from array site (km)	Count date	Count (ind)
WICKLOW HEAD	11.24	2023	28
BRAY HEAD	17.49	2015	4
BRAY TOWN	17.49	2021	124
HOWTH HEAD COAST	29.97	2015	18
IRELAND'S EYE	33.97	2015	636
DUBLIN CITY SOUTH	34.11	2021	36
HOWTH	34.97	2021	920
LAMBAY ISLAND SPA	41.73	2015	1,812
SKERRIES ISLAND SPA	53.38	2010	20
SKERRIES TOWN	55.80	2021	498
BALBRIGGAN TOWN	62.46	2021	2,970
BARDSEY ISLAND	73.25	2018	834
SOUTH STACK CLIFFS RSPB	78.21	2021	152
DROGHEDA	78.53	2021	720
(ABERDARON COAST NOT IN SPA)	79.43	2018	330
Total breeding adults			**9,102**

Table B.4: **Lesser black-backed gull colonies within mean-maximum foraging range + 1 SD (236 km – Woodward *et al.*, 2019) of array site**

Colony name	Distance from array site (km)	Count date	Count (ind)
DALKEY ISLAND	21.21	2016	70
IRELAND'S EYE	33.97	2015	4
LAMBAY (CUMMINS *ET AL*., 2019)	43.14	2018	690
BALBRIGGAN TOWN	62.46	2021	20
BARDSEY ISLAND	73.25	2019	328
SOUTH STACK CLIFFS RSPB	78.21	2022	8
DROGHEDA	78.53	2021	48
YNYS PIOD	79.43	2016	0
PORTH DIANA	79.80	2016	12
RHOSCOLYN BEACON	80.14	2016	12
YNYS TRAWS	80.14	2016	28
TRWYN PENRHYN	80.43	2016	0
VALLEY WETLANDS RSPB	83.14	2019	2
BODORGAN HEAD	85.83	2018	6
THE SKERRIES RSPB	88.84	2022	244
ST TUDWAL'S ISLAND WEST	96.67	2016	76
ST TUDWAL'S ISLAND EAST	97.08	2016	12
CAERNARFON (URBAN)	97.41	2019	34
MIDDLE MOUSE	100.25	2016	6
LYNAS TO FRESHWATER BAY	111.08	2016	0
FURNESS GENERAL HOSPITAL	113.50	2019	18
YNYS MOELFRE	119.74	2016	8
CRAIG YR ADERYN	125.98	2018	14
GREAT SALTEE (CUMMINS ET AL., 2019)	126.05	2018	502
CWTA ABER (INCL. YNYS MEICEL & ONNEN)	126.15	2018	22
MAENMELYN (INCL. PEN BRUSH ISLAND)	126.74	2018	16

Colony name	Distance from array site (km)	Count date	Count (ind)
CEMAES HEAD/POPPIT	127.10	2018	34
CARDIGAN ISLAND	127.34	2019	646
CALF OF MAN	127.58	2017	54
ABERPORTH 4	128.65	2018	0
PWLL DERI (INCL. YNYS: DDU, Y DINAS & MELYN)	129.15	2018	42
BISHOPS & CLERKS ISLANDS RSPB	130.04	2018	48
LLYN TRWSFYNYDD RESE	130.05	2018	158
CEIBWR2	130.27	2018	10
LLANGRANNOG 1	130.55	2018	0
YNYS BARRY - TREFIN	130.84	2017	10
E.OF ABER YW - ABER MAWR	131.08	2018	0
CASTELL COCH	131.60	2018	8
RAMSEY ISLAND	134.87	2018	200
RAMSEY ISLAND RSPB	134.87	2018	200
STRANGFORD LOUGH	137.11	2022	678
CARREG YR ESGOB	137.53	2018	38
PORTHLYSGI	137.53	2018	16
PENPLEIDAU	140.53	2018	12
KILLARD POINT	141.36	2022	20
GRASSHOLM	143.31	2018	76
GOAT ISLAND	143.65	2016	1
GREENSCAR	144.94	2018	78
BANGOR BUILDINGS (URBAN)	144.95	2019	0
CONWY TOWN (URBAN)	145.30	2019	0
CONWY RSPB	145.88	2019	2
LLANDUDNO TOWN (URBAN)	147.64	2019	4
PEEL - GLEN MOOAR	150.48	2017	2
SKOMER	150.53	2022	14,524
STACK ROCKS	150.84	2018	30
MIDLAND ISLAND (MIDDLEHOLM)	152.36	2022	10
SKOKHOLM	155.53	2022	1,666

Colony name	Distance from array site (km)	Count date	Count (ind)
WEST QUARRY	159.30	2017	6
PORT MOOAR - DHOON	164.84	2017	2
THORN ISLAND	166.67	2017	14
RHYL (URBAN)	169.05	2019	8
ESSO JETTY	169.67	2018	4
PEMBROKE DOCK	180.33	2022	50
THE AYRES NNR, ISLE OF MAN (POINT OF AYRE TO RUE POINT)	181.49	2017	2
LIGHTHOUSE ISLAND	186.50	2019	1,094
MULL OF GALLOWAY RSPB	191.17	2015	4
NETHERTON FACTORY ROOFS	194.08	2019	2
LIVERPOOL 3 (URBAN)	198.50	2019	12
ST MARGARET'S ISLAND	199.05	2022	94
LIVERPOOL 1 (URBAN)	200.91	2019	8
LIVERPOOL 2 (URBAN)	200.91	2019	10
CALDEY ISLAND	201.05	2022	830
ST BEES HEAD RSPB	206.48	2020	0
BELFAST CITY CENTRE	208.23	2019	442
WALNEY URBAN GULLS	208.66	2019	22
PADIAN	208.81	2022	300
PHIL ROE'S FLAT	208.81	2022	150
TOLAN'S FLAT	208.81	2022	120
HAVERIGG PRISON (URBAN)	209.63	2019	150
MARCHON CHEMICAL WORKS	210.30	2018	0
SOUTH WALNEY	211.59	2022	1,060
PARK ROAD IND. EST.	213.56	2019	194
RIBBLE ESTUARY	213.68	2021	8,978
HENSINGHAM	213.72	2018	46
MORESBY PARKS	213.72	2018	0
WHITEHAVEN TOWN CENTRE	213.72	2018	60

Colony name	Distance from array site (km)	Count date	Count (ind)
RAMPSIDE GAS TERMINAL	214.25	2022	300
BLACK LOCH 1	215.31	2021	4
FLEETWOOD TOWN	215.79	2019	18
ASKAM-IN-FURNESS (URBAN)	217.22	2019	76
WEST WALL TO W&SW OF WESTON POINT	220.64	2022	100
ARNABY MARSH	222.05	2018	0
MOSSBAY (URBAN)	222.13	2019	14
LITTLE ROSS	223.88	2018	8
ISLANDS OF FLEET	227.15	2018	16
CHAPEL ISLAND	229.74	2018	44
HODBARROW RSPB	232.15	2022	4
Total breeding adults			**34,945**

Table 6.5: Common tern colonies within mean-maximum forging range + 1 SD (26.9 km – Woodward *et al.*, 2019) of array site

Colony name	Distance from array site (km)	Count date	Count (ind)
DALKEY ISLAND SPA INCLUDING LAMB ISLAND AND MAIDEN ROCK	22.21	2017	30
SOUTH DUBLIN BAY AND RIVER TOLKA ESTUARY SPA / DUBLIN PORT	26.46	2016	988
Total breeding adults			**1,018**

Table 6.6: Arctic tern colonies within mean-maximum forging range + 1 SD (40.5 km – Woodward *et al*., 2019) of array site

Colony Name	Distance from array site (km)	Count date	Count (ind)
DALKEY ISLAND SPA INCLUDING LAMB ISLAND AND MAIDEN ROCK	22.21	2016	4
SOUTH DUBLIN BAY AND RIVER TOLKA ESTUARY SPA / DUBLIN PORT	26.46	2016	18
Total breeding adults			**22**

Source: <Insert Source or notes>

Table 6.7: Guillemot colonies within mean-maximum foraging range + 1 SD (153.7 km – Woodward *et al.*, 2019) of array site

Colony name	Distance from array site (km)	Count date	Count (ind)
WICKLOW HEAD	11.24	2023	897
BRAY HEAD	17.49	2015	1,413
HOWTH HEAD	29.97	2015	871
IRELAND'S EYE	33.97	2015	4,410
LAMBAY	43.14	2015	59,983
BARDSEY ISLAND	73.25	2019	2,826
MAEN DU (ABERDARON COAST NOT IN SPA)	73.77	2016	40
BRAICH ANELOG (ABERDARON COAST NOT IN SPA)	73.94	2016	10
LLEYN PENINSULA (INC. ST TUDWALLS ISLAND AND TRWYN CILAN, EXCLUDING CARREG Y LLAM)	76.46	2016	3,295
SOUTH STACK CLIFFS RSPB	78.21	2021	7,592
YNYSOEDD GWYLAN	79.43	2019	162
CARREG Y LLAM	86.31	2021	13,914
MIDDLE MOUSE	100.25	2016	5,550
GREAT SALTEE ISLAND	126.05	2015	25,851
CALF OF MAN	127.58	2017	124
BISHOP AND CLERKS ISLANDS	130.04	2018	48
PORT ST MARY - SOUND	130.65	2017	3,961
PUFFIN ISLAND SPA (WALES)	133.05	2022	4,200
RAMSEY ISLAND	134.87	2021	5,395
CARDIGAN COAST	136.07	2018	8,666
GREAT ORME	142.23	2022	1,029
LITTLE ORME	148.64	2022	2,322
SKOMER	150.53	2022	22,058
MIDLAND ISLE	152.36	2022	455
Total breeding adults			**175,072**

Table 6.8: Razorbill colonies within mean-maximum forging range + 1 SD (164.6 km – Woodward *et al.*, 2019) of array site

Colony name	Distance from array site (km)	Count date	Count (ind)
WICKLOW HEAD	11.24	2023	276
BRAY HEAD	17.49	2010	150
HOWTH HEAD	29.97	2015	279
IRELAND'S EYE	33.97	2015	1,600
LAMBAY	43.14	2015	7,353
BARDSEY ISLAND	73.25	2019	3,834
MAEN DU	73.77	2016	65
BRAICH ANELOG (ABERDARON COAST NOT IN SPA)	73.94	2016	25
GOGARTH	76.46	2016	18
LLEYN PENINSULA (INC. ST TUDWALLS ISLAND AND TRWYN CILAN, EXCLUDING CARREG Y LLAM)	76.46	2016	292
ABRAHAM'S BOSOM	77.04	2016	83
SOUTH STACK CLIFFS RSPB	78.21	2021	1,378
YNYSOEDD GWYLAN (FAWR AND BACH TOTAL)	79.43	2019	13
CARREG Y LLAM	86.31	2021	438
THE SKERRIES RSPB	88.84	2017	3
PANT YR EGLWYS	90.01	2016	0
MIDDLE MOUSE	100.25	2016	455
POINT LYNAS	110.50	2016	9
LITTLE SALTEE	123.81	2015	850
GREAT SALTEE ISLAND	126.05	2015	5,669
CALF OF MAN	127.58	2017	108
SOUND - PORT ERIN	127.58	2017	14
PORT ST MARY - SOUND	130.65	2017	293
BRADDA - FLESHWICK	131.41	2017	27
FLESHWICK - STROIN VUIGH	134.82	2017	3
PORT SODERICK - PORT GRENAUGH	141.04	2017	44

Colony name	Distance from array site (km)	Count date	Count (ind)
GREAT ORME	142.23	2022	254
MARINE DRIVE (IOM)	144.69	2017	56
LITTLE ORME	148.64	2022	40
ARDNAMULT	149.64	2018	5
Total breeding adults			**23,634**

Table 6.9: Puffin colonies within mean-maximum foraging range + 1 SD (265.4 km – Woodward *et al*., 2019) of array site

Colony name	Distance from array site (km)	Count date	Count (ind)
IRELAND'S EYE	33.97	2016	12
LAMBAY	43.14	2015	288
BARDSEY ISLAND	73.25	2019	282
SOUTH STACK CLIFFS RSPB	78.21	2022	10
YNYSOEDD GWYLAN (FAWR AND BACH TOTAL)	79.43	2019	1,238
THE SKERRIES RSPB	88.84	2023	584
LITTLE SALTEE ISLAND	123.81	2016	540
GREAT SALTEE ISLAND	126.05	2021	1,098
RAMSEY ISLAND	134.87	2021	55
SKOMER	150.53	2022	36,074
MIDLAND ISLAND	152.36	2022	262
SKOKHOLM	155.53	2023	12,192
COPELAND ISLANDS	183.08	2019	212
ST BEES HEAD	206.48	2023	2
GOBBINS	208.05	2019	54
LUNDY ISLAND	233.10	2023	1,335
Total breeding adults			**54,480**

Table 6.10: Manx shearwater colonies within mean-maximum foraging range + 1 SD (2365.5 km – Woodward *et al*., 2019) of array site (UK and Ireland only)

Colony name	Distance from array site (km)	Count date	Count (ind)
BARDSEY ISLAND	73.25	2001	16,183
CALF OF MAN	127.58	2014	848
CONNEMARA ISLANDS	649.14	2001	6,572
COPELAND ISLANDS	183.08	2007	9,700

Colony name	Distance from array site (km)	Count date	Count (ind)
EIGG	463.18	1999	500
GREAT BLASKET ISLAND	474.65	2001	7,168
GREAT SALTEE ISLAND	126.05	2002	300
GREAT SKELLIG	442.06	2001	1,476
INISHNABRO	473.13	2000	11,222
INISHSHARK	653.24	2001	102
INISHTOOSKERT	518.20	2000	19,392
INISHVICKILLANE	472.72	2001	1,286
LITTLE SALTEE	123.81	2001	200
LUNDY	233.10	2017	11,008
MIDLAND ISLAND	152.36	2018	33,096
PUFFIN ISLAND (KERRY)	442.16	2000	12,658
RAMSEY ISLAND	134.87	2022	12,450
SANDA ISLANDS	252.50	2006	600
SCARIFF ISLAND	425.85	2000	3,920
SKOKHOLM	155.53	2018	177,890
SKOMER	150.53	2018	699,326
ST KILDA	604.11	1999	9,606
TRESHNISH ISLES SPA	404.79	2018	3,984
AILSA CRAIG SPA	251.54	2018	40
ISLES OF SCILLY - GUGH	353.88	2022	160
ISLES OF SCILLY - ANNET	353.88	2015	458
ISLES OF SCILLY - BRYHER	353.88	2015	78
ISLES OF SCILLY - TRESCO	353.88	2015	92
ISLES OF SCILLY - ST AGNES	353.88	2022	130
ISLES OF SCILLY - ST HELENS	353.88	2022	248
ISLES OF SCILLY - ST MARTIN'S	353.88	2015	52
HIGH ISLAND	327.01	2015	1,636
ISLES OF SCILLY - ROUND ISLAND	353.88	2015	156
ISLES OF SCILLY - SHIPMAN HEAD	353.88	2015	78
ISLES OF SCILLY - GREAT GANILLY	353.88	2015	2
DEENISH ISLAND	425.85	2000	702
RUM SPA	454.38	2001	240,000

Colony name	Distance from array site (km)	Count date	Count (ind)
Total breeding adults			**1,283,319**

Table 6.11: Gannet colonies within mean-maximum forging range + 1 SD (509.4 km – Woodward *et al*., 2019) of array site

Colony name	Distance from array site (km)	Count date	Count (ind)
IRELAND'S EYE	33.97	2015	700
LAMBAY	43.14	2015	1,852
MIDDLE MOUSE	100.25	2022	42
GREAT SALTEE ISLAND	126.05	2014	9,444
GRASSHOLM	143.31	2015	72,022
SCAR ROCKS	207.38	2014	4,752
GARVAN ISLES	213.56	2016	60
AILSA CRAIG	251.54	2014	66,452
BULL ROCK	417.78	2014	12,776
LITTLE SKELLIG	439.48	2014	70,588
BERNERAY	474.96	2021	30
Total breeding adults			**238,718**

Table 6.12: Cormorant colonies within mean-maximum forging range + 1 SD (33.9 km – Woodward *et al*., 2019) of array site

Colony name	Distance from array site (km)	Count date	Count (ind)
BRAY HEAD	17.49	2010	124
Total breeding adults			**124**

Table 6.13: Shag colonies within mean-maximum forging range + 1 SD (23.7 km – Woodward *et al*., 2019) of array site

Colony name	Distance from array site (km)	Count date	Count (ind)
WICKLOW HEAD	11.24	2023	98
BRAY HEAD	17.49	2015	30
Total breeding adults			**128**

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