Partners in UK offshore wind

MONA OFFSHORE WIND PROJECT

Preliminary Environmental Information Report

Volume 7, annex 24.2: Intertidal Ornithology Technical Report

Image of an offshore wind farm

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Glossary

Term	Meaning
British Trust for Ornithology	A non-statutory ornithological research organisation.
Joint Nature Conservation Committee	A statutory body that advises the UK Government and devolved administrations on UK-wide and international nature conservation.
Non-Estuarine Waterbird Survey	A BTO led waterbird survey of non-estuarine stretches of coastline.
Peak	The maximum number of birds noted at one time. All figures quoted for birds relate to individuals unless noted otherwise
Special Protection Area	Special Protection Areas (SPAs) are protected areas for birds in the UK
Wetland Bird Survey	A monitoring programme of waterbirds in the UK organised by the BTO and run since 1965. The Wetland Bird Survey, or WeBS, is widely recognised as the most accurate national assessment of waterbird numbers.
Wildlife and Countryside Act 1981, (as amended)	UK legislation which sets out protections for species and habitats.
Spring passage	The period when migratory species are returning to their breeding grounds. It is defined as the April to June inclusive period by Stroud *et al*. (2016).
Autumn passage	The period when migratory species are returning to their wintering grounds. It is defined as the August to October inclusive period by Stroud *et al*. (2016).
Wintering season	The period when birds are present on their wintering grounds. The period is defined as November to March inclusive by Stroud *et al*. (2016).
Non-breeding season	Taken as the wintering season plus the spring and autumn passage period as recognised by Stroud *et al*. (2016).
Breeding season	The duration and timing of the breeding season varies according to species (Douse, 2014), but the breeding season is generally taken as March – July inclusive.
Roosting	The time when birds are resting
Foraging	The time when birds are actively looking for food

Acronyms

Acronym	Description
BTO	British Trust for Ornithology
ES	Environmental Statement
GIS	Geographic Information System
HAT	Highest Astronomical Tide
JNCC	Joint Nature Conservation Committee
LNR	Local Nature Reserves
LWS	Local Wildlife Sites
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
NEWS	Non-Estuarine Waterbird Survey
NNR	National Nature Reserves
NRW	Natural Resources Wales
PEIR	Preliminary Environmental Information Report
pSPA	potential SPA
RSPB	The Royal Society for the Protection of Birds
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
WeBS	Wetland Bird Survey
WWT	Wildfowl and Wetlands Trust

Units

Unit	Description
%	Percentage
m	Metres
km	Kilometres
ha	Hectare

1 MONA INTERTIDAL ORNITHOLOGY BASELINE CHARACTERISATION

1.1 Introduction

1.1.1 Background

1.1.1.1 Mona Offshore Wind Limited (the Applicant), a joint venture of bp Alternative Energy investments Ltd (hereafter referred to as bp) and Energie Baden-Württemberg AG (hereafter referred to as EnBW) is developing the Mona Offshore Wind Project. The Mona Offshore Wind Project is a proposed offshore wind farm located in the east Irish Sea.

1.1.1.2 This report characterises the baseline waterbird utilisation of the intertidal zone and nearshore waters during the non-breeding season at the intertidal ornithology study area. This baseline information has been used to inform the assessment reported in volume 3, chapter 24: Onshore and intertidal ornithology of the Preliminary Environmental Information Report (PEIR).

1.1.1.3 This technical report details the findings of the review of existing data sources and site-specific surveys carried out to date at the Mona Proposed Landfall. The report describes the methods used to characterise the baseline conditions (i.e. abundance and distribution of seabirds and waterbirds) and presents the results of the desk-based studies.

1.1.1.4 For the purpose of this study the intertidal zone is defined as the zone within which the shoreline location varies with the rising and falling astronomical tide as defined by Mean High Water Spring (MHWS) and Mean Low Water Spring (MLWS) tidal planes.

1.1.1.5 The Mona Proposed Landfall is located on the north coast of Conwy, North Wales. Colwyn Bay and the Orme lie to the west, and the town of Rhyl and the Dee Estuary to the east. It is adjacent to the boundary of the Liverpool Bay Special Protection Area (SPA) and is approximately 16.5km west from the Dee Estuary SPA. These sites are of international importance for many species of waterbird.

1.1.1.6 As defined by the Ramsar Convention on Wetlands (1971): waterbirds include geese, swans, ducks, rails, cranes, grebes, waders, divers, cormorants, spoonbills, herons, gulls, terns, and kingfishers (Ramsar, 1971). In addition to waterbirds, the value of the Mona Proposed Landfall has been characterized for other true seabirds that may use the nearshore waters. Together, these formed the target species for the site-specific surveys and baseline characterisation, including the qualifying species of the Liverpool Bay and Dee Estuary SPAs.

1.1.1.7 As abundance of waterbirds fluctuates according to the time of the year, waterbird abundance and trends are analysed on a seasonal basis. At the time of analysis, data was only available for December 2021 to April 2022. Therefore, data was analysed for the wintering period, as defined by Stroud *et al*. (2016). As surveys did not start until December 2021, these data were analysed from December 2021 to March 2022 inclusive. Preliminary spring passage findings were also noted (including April 2022 only). As site-specific surveys are ongoing for a two-year period, the findings of the two-year survey programme will be included in the Environmental Statement (ES). Surveys started in December 2021 and have been ongoing with a proposed finish date of June 2023.

1.1.1.8 This technical report also reviews existing data sources and literature to provide context to inform the assessment.

1.1.2 Intertidal ornithology search area

1.1.2.1 The intertidal ornithology search area focuses on:

- Internationally designated ornithological sites, including Special Protection Areas (SPAs), potential SPAs (pSPAs), and Ramsar sites located within 20km of the Mona Proposed Landfall
- Nationally designated sites, including Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNR), located within 5km of the Mona Proposed Landfall
- Locally designated sites, including Local Nature Reserves (LNR) and Local Wildlife Sites (LWS), located within 2km of the Mona Proposed Landfall.

1.1.2.2 There are two SPAs with waterbird qualifying features within 20km of the Mona Proposed Landfall, Liverpool Bay SPA and the Dee Estuary SPA (see Table 1.1 and Figure 1.1). However, there are no SSSIs or NNRs with waterbird interests within 5km, and no LNRs or LWSs with waterbird interests within 2km of the Mona Proposed Landfall.

Table 1.1: Qualifying features of the SPAs located within 20km of the Mona Proposed Landfall.

* Figures taken from Lawson, *et. al.*, (2016) and are means from 2004/05 – 2010/11. ** Figures taken from SPA citations. Core wintering and passage counts are means from 1994/95 – 1998/99 counts. Breeding counts are means from 1995 – 1999. *** Taken from Ramsar Information Sheet (2009-2012).

Designated Site	Feature of interest	Season	SPA Population
Liverpool Bay SPA	Common scoter *Melanitta nigra*	Non-breeding	56,679*
	Red-throated diver *Gavia stellata*	Non-breeding	1,171*
	Red-breasted merganser *Mergus* serrator	Non-breeding	160*
	Cormorant *Phalacrocarox carbo*	Non-breeding	826*
	Little gull *Hydrocoloeus minutus*	Non-breeding	333*
	Little tern *Sternula albifrons*	Breeding	260*
	Common tern *Sterna hirundo*	Breeding	360*
	Waterbird assemblage	+ 20,000 individuals in any season	69,687*

Designated Site	Feature of interest	Season	SPA Population
Dee Estuary SPA	Bar-tailed godwit *Limosa laponica*	winter	1,150**
	Redshank *Tringa tetanus*	winter + passage	5,293 and 8,795**
	Oystercatcher *Haematopus ostralegus*	winter	22,677**
	Grey plover *Pluvalis squatorola*	Winter	1,643**
	Knot *Calidris canuta*	Winter	12,394**
	Dunlin *Calidris alpina*	Winter	26,769**
	Black-tailed godwit *Limosa limosa*	Winter	1,747**
	Curlew *Numenius arquata*	Winter	3,899**
	Shelduck *Tadorna tadorna*	Winter	7,725**
	Teal *Anas crecca*	Winter	5,251**
	Pintail *Anas acuta*	Winter	5,407**
	Common tern	Breeding	784**
	Little tern	Breeding	138**
	Sandwich tern *Sterna sandvicensis*	Autumn passage	957**
	Waterbird assemblage	+ 20,000 individuals in any season	120,726**
Dee Estuary Ramsar - In addition to the species named in the SPA citation, the following were present in nationally important numbers:	Redshank	Breeding	Approximately 200 pairs breeding. Regionally important population not reaching 1% national threshold but included on Joint Nature Conservation Committee (JNCC) advice***
	Ringed plover *Charadrius hiaticula*	Spring and autumn passage	272**
	Wigeon *Anas penelope*	Winter	4,526**
	Sanderling *Calidris alba*	Winter	502**
	Cormorant	Winter	405**
	Great crested grebe *Podiceps cristatus*	Winter	114**

1.1.3 Intertidal ornithology study area

1.1.3.1 The intertidal ornithology study area (Figure 1.2), comprises of the Mona Proposed Landfall plus a 500m buffer extending west along the coast. The intertidal ornithology study area extends offshore from the MHWS and consists of the intertidal zone (which features sandflats and shingles) and the nearshore marine waters. The buffer zone extends beyond 500m to the east of the Mona Proposed Landfall as at the time RPS were surveying an extended version of the landfall, which was subsequently dropped by the Applicant. This area is now due to be used for access. Therefore, the intertidal ornithology study area includes these data as this area must also be characterised for the assessment.

1.1.4 Seasonality of the species present

1.1.4.1 Many of the species that occur within the intertidal zone and nearshore waters are migratory (Table 1.2). The seasons as defined by Stroud *et al*. (2016) are as follows:

- Wintering period - November to March inclusive
- Spring passage period - April to June inclusive
- Autumn passage period - August to October inclusive
- Non-breeding period - The winter period plus the spring and autumn passage periods.

Table 1.2: Showing bio-seasons of species groups recorded within the intertidal ornithology study area.

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Wild fowl *Anatidae*											
Divers *Gaviidae*											
Grebes *Podicipedidae*											
Plovers *Charadriae*											
Waders *Scolopacidae*											
Gulls *Laridae*											
Terns *Sternidae*											
Cormorants *Phalacrocoracidae*											

Autumn passage
Winter period
Spring passage
Breeding
Birds are generally absent, either on breeding, or winter.

1.1.5 Consultation

1.1.5.1 Consultation with Natural Resources Wales (NRW) was undertaken in August 2021 to confirm the methodology and extent of the intertidal and nearshore waterbird survey area. A summary of the key issues raised and responses from NRW are presented in Table 1.3 below.

Table 1.3: Summary of key consultation topics raised during consultation activities undertaken for the Mona Offshore Wind Project relevant to intertidal and nearshore waterbirds.

Date	Consultee and type of response	Topic covered/consultee response
12 August 2021	NRW (email)	A technical note was prepared for NRW (Appendix A) describing the proposed survey methodology for intertidal and nearshore coastal birds, including a map of the survey area, for review and comment. The proposed methodology included: • Desk based assessment of online resources, including a review of available designated site citations and British Trust for Ornithology (BTO)/Wetland Bird Survey (WeBS) data • Scoping walkover of each landfall option during August/early September 2021 to identify habitats requiring survey • Monthly intertidal and nearshore coastal bird surveys of the landfall areas and a buffer of at least 500m in either direction along the coast and up to 1.5km from the MHWS mark. It must be noted that at this stage of the Mona Offshore Wind Project multiple landfall options were being considered.
02 September 2021	NRW (email)	NRW provided the following comments on the methodology: • NRW advised that at least two contemporary years of core wintering bird surveys were required to account for interannual variation in use by bird features of designated sites • NRW welcomed the timing of the migratory passage and core wintering surveys being September 2021 to April 2022 inclusive, with the possibility of an extension into May, June, July • NRW welcomed the proposed 'Through-the-tidal-cycle' survey methodology which provides good coverage across the tidal cycle • NRW recommended contacting BTO for the latest WeBS and Non-Estuarine Waterbird Survey (NEWS) data as well as the most up-to-date high tide roost locations.
06 September 2021	NRW (Teams meeting)	NRW's comments were discussed in a meeting and the following actions were identified: • Add nocturnal surveys and the strategy for coverage to the survey methodology. This followed from a similar meeting with Natural England in relation to the Morgan Offshore Windfarm project who requested nocturnal survey data. While NRW highlighted that the daytime surveys should provide the level of data required, the survey methodology was aligned with both NRW and Natural England's approaches • NRW to review lessons learnt from previous landfall areas and advise in terms of ornithological constraints • NRW to share the relevant NRW conservation packages for the protected sites in the vicinity of the landfall options • The Applicant to share initial results and progress with NRW.
31 October 2021	NRW (email)	The updated survey methodology was issued to NRW, including requirements for nocturnal surveys.
11 November 2021	NRW	NRW confirmed that their ornithologist was "*happy with the added content… and has no further comments to make*."
16 June 2022	Expert Working Group (01) - Cyfoeth Naturiol Cymru (Natural Resources Wales), Denbighshire County Council, RSPB	• Agreement on the Remit and Inputs to the EWG (as set out in the Evidence Plan Template) • Agreement on Ways of Working Documents, including timescales

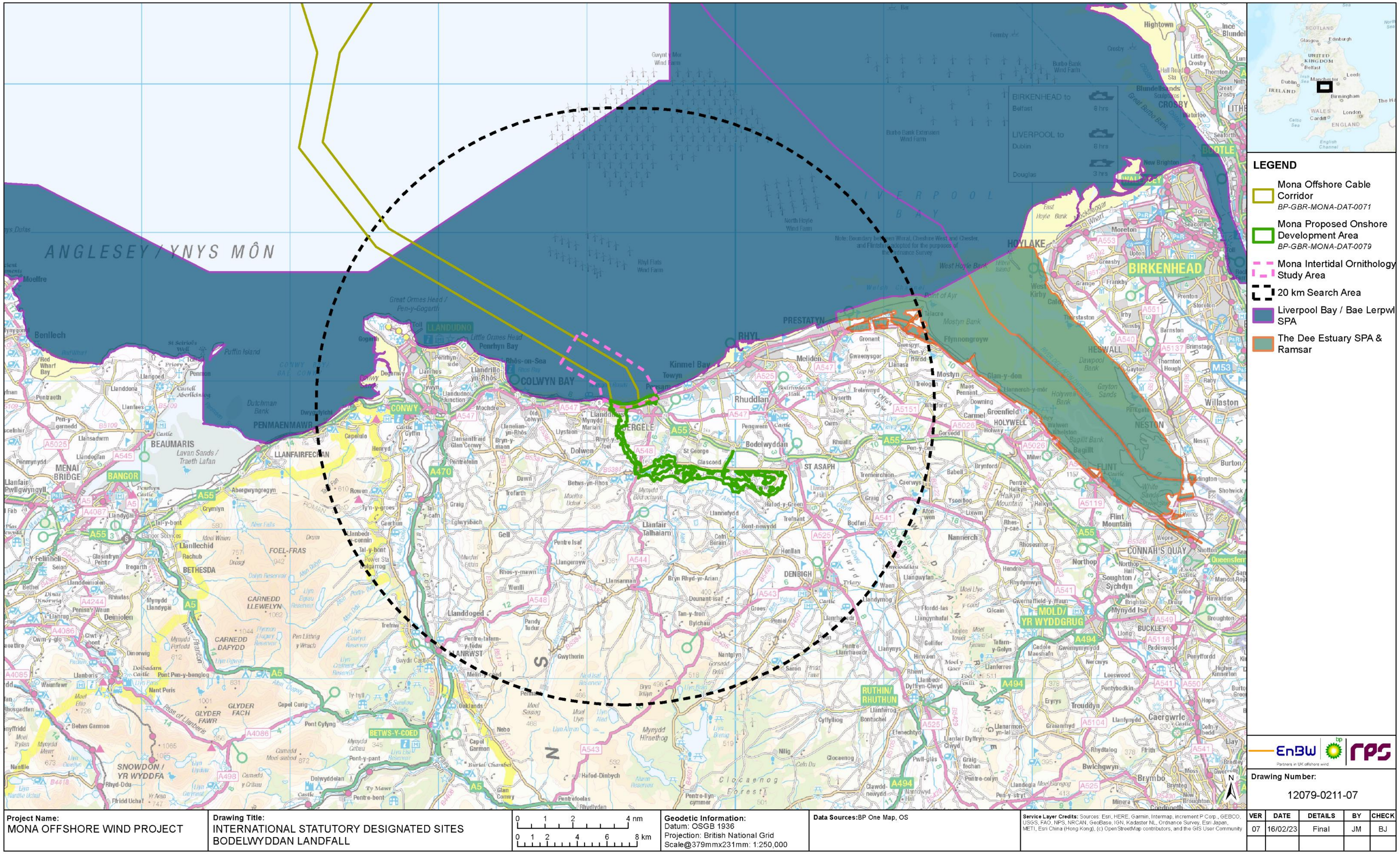


Figure 1.1: Intertidal ornithology search area and designated sites.

Figure 1.2: Intertidal ornithology study area.

1.2 Methodology

1.2.1 Desktop study methodology

1.2.1.1 Information on intertidal and nearshore bird utilisation within the intertidal ornithology study area was collected through a desktop review of existing studies and datasets. These are summarised at Table 1.4.

1.2.1.2 Where numerical data were extracted, the methods used to analyse the data is explained in section 1.2.4 below. For all non-numerical sources full references are provided in section 1.4 of this report.

Table 1.4: Summary of key desktop sources.

Title	Source	Year	Author
An assessment of the numbers and distributions of core wintering waterbirds and seabirds in Liverpool Bay area of search.	JNCC	2016	Lawson, J., Kober, K., Win, I., Allcock, Z., Black, J., Reid, J.B., Way, L. and O'Brien, S.H.
An assessment of the numbers and distributions of inshore aggregations of waterbirds using Liverpool Bay during the non-breeding season in support of possible SPA identification.	JNCC	2006	Webb, A., McSorley, C.A., Dean, B.J., Reid, J.B., Cranswick, P.A., Smith, L. and Hall, C.
Predicting the displacement of common scoter from benthic feeding areas due to offshore windfarms.	Centre for Applied Marine Sciences, School of Ocean Studies, University of Wales, Bangor	2002	Kaiser, M., Elliot, A., Galanidi, M., Rees, E.I.S., Caldow, R., Stillman, R., Sutherland, W. and Showler, D.
Results of the third Non-Estuarine Waterbird Survey, including Population Estimates for Key Waterbird Species.	BTO Research Report	2017	Austin, G., Frost, T., Mellan, H. and Balmer, D.
Waterbirds in the UK 2019/20: The Wetland Bird Survey.	BTO, The Royal Society for the Protection of Birds (RSPB) and JNCC	2021	Frost, T.M., Calbrade, N.A., Birtles, G.A., Hall, C., Robinson, A.E., Wotton, S.R., Balmer, D.E. and Austin, G.E.

1.2.2 Site specific survey methodology

Diurnal field methodology

1.2.2.1 The survey method set out in Appendix A and agreed with NRW (see Table 1.3 above) is based on WeBS Core Count (high tide) and the Low Tide Count methodologies of the BTO, JNCC, RSPB, Wildfowl and Wetlands Trust (WWT), WeBS scheme as outlined by Gilbert *et al.* (1998).

1.2.2.1 Surveyors made six, hourly counts per survey, and a minimum of two survey visits (reflecting different tidal influences) per month. Table 1.5 summarises the December 2021 to April 2022 diurnal surveys and the detailed methodology is provided in Appendix A of this technical report. All surveys were carried out by competent and experienced field ornithologists.

Table 1.5: Summary of diurnal intertidal surveys.

Diurnal surveys					
Month	**Date**	**Number of counts**	**Time**	**Tidal range**	**Weather**
December	11 December 2021	5	10:10 - 16:00	Low-High	Fresh breeze and intermittent rain
	17 December 2021	6	09:40 - 16:03	High-Low	Light breeze and dry
January	08 January 2022	5	08:40 - 14:30	Low-High	Fresh breeze with intermittent rain
	15 January 2022	6	09:30 - 14:20	High-Low	Light breeze and dry
February	08 February 2022	4	09:40 - 15:50	Low-High	Light breeze and dry
	15 February 2022	4	10:20 - 16:15	High-Low	Gentle breeze with intermittent rain
	22 February 2022	5	08:35 - 14:30	Low-High	Fresh breeze with intermittent rain
March	15 March 2022	6	09:16 - 15:03	High-Low	Gentle breeze and dry
	19 March 2022	6	11:38 - 17:25	High-Low	Fresh breeze and dry
	23 March 2022	6	08:05 - 13:40	Low-High	Gentle breeze and dry
April	14 April 2022	6	10:19 - 16:05	High-Low	Light air, cloudy, and dry
	21 April 2022	6	08:52 - 14:33	Low-High	Moderate breeze and dry

Nocturnal field methodology

1.2.2.1 The nocturnal element of the intertidal and nearshore bird survey method is set out in the methodology agreed with NRW (see Table 1.3 above) and follows the same approach as the diurnal surveys, except that the surveys ran on a reduced intensity (i.e., single survey visit of a half tidal cycle (six-hour period) per month between January 2022 and March 2022 inclusive). The methodology followed best practice guidance as per Bird Survey & Assessment Steering Group (Bird Survey & Assessment Steering Group, 2022).

1.2.2.2 Table 1.6 summarises the January 2022 to March 2022 nocturnal surveys conducted and the detailed methodology is provided in Appendix A of this report. All surveys were carried out by competent and experienced field ornithologists.

Table 1.6: Summary of nocturnal intertidal surveys.

* The period between high tide and low tide when the sea level falls

Nocturnal surveys					
Month	**Date**	**Number of counts**	**Time**	**Tidal range**	**Weather**
January	24 January 2022	1	18:05 - 20:25	Ebb* + Low	No wind and dry
February	08 February 2022	1	19:00 - 21:15	Ebb + Low	Moderate breeze and dry

Nocturnal surveys					
	15 February 2022	1	20:05 - 22:30	Flood + High	Moderate breeze and dry
	17 February 2022	2	19:30 - 22:30	Flood + High	Moderate breeze and dry
	22 February 2022	2	17:50 - 20:50	Ebb + Low	Moderate breeze and dry
March	15 March 2022	2	18:30 - 21:30	Flood + High	Light air and dry
	23 March 2022	2	18:40 - 21:40	Ebb + Low	Gentle breeze and dry

1.2.2.3 All surveys were carried out by competent field ornithologists suitably trained and experienced in undertaking the survey methodologies identified in this report.

1.2.3 Survey limitations

1.2.3.1 Due to the Mona Proposed Landfall not being identified by the Applicant until December 2021, surveys within the intertidal ornithology study area did not start until 11 December 2021. This means that data for the 2021 autumn passage period and the start of the winter period (November 2021) have not been collected. The nocturnal surveys did not start until 24 January 2022.

1.2.3.2 Due to the more limited range of nocturnal equipment, only the first 500m of the intertidal zone (from the MHWS/Highest Astronomical Tide (HAT) mark) was surveyed. Furthermore, moisture in the air and blowing sand also affected the effectiveness of the nocturnal equipment, which led to further reduced detection and identification of birds on occasion. Despite several precautions birds were also more easily disturbed at night and responded negatively to the presence of the surveyors, which led to a possible under-estimation of number of birds at night. Finally, not all birds seen at night were identifiable to the species level. For the reasons identified above, the nocturnal survey data is not directly comparable to the diurnal survey data.

1.2.4 Data analysis

WeBS and NEWS

1.2.4.1 WeBS counts are split into the following two categories:

- WeBS sites – these are entire recording areas, such as the Dee Estuary. WeBS whole site data is freely available on the BTO website up to 2019 and 2020
- WeBS sectors – the WeBS sites are split into multiple smaller sectors for ease of surveying. WeBS sector data is available to purchase from the BTO and contains more localised information. The WeBS site and sector data assessed for this report is shown in Figure 1.3 below.

1.2.4.2 The Mona Proposed Landfall is covered by the WeBS Colwyn Bay and the North Clwyd Coast site (Figure 1.3). The WeBS aims to collate data on birds using the intertidal zone at high tide (core counts), and low tide (low tide counts). Only core counts data was available for the Colwyn Bay and the North Clwyd Coast WeBS site and associated sectors.

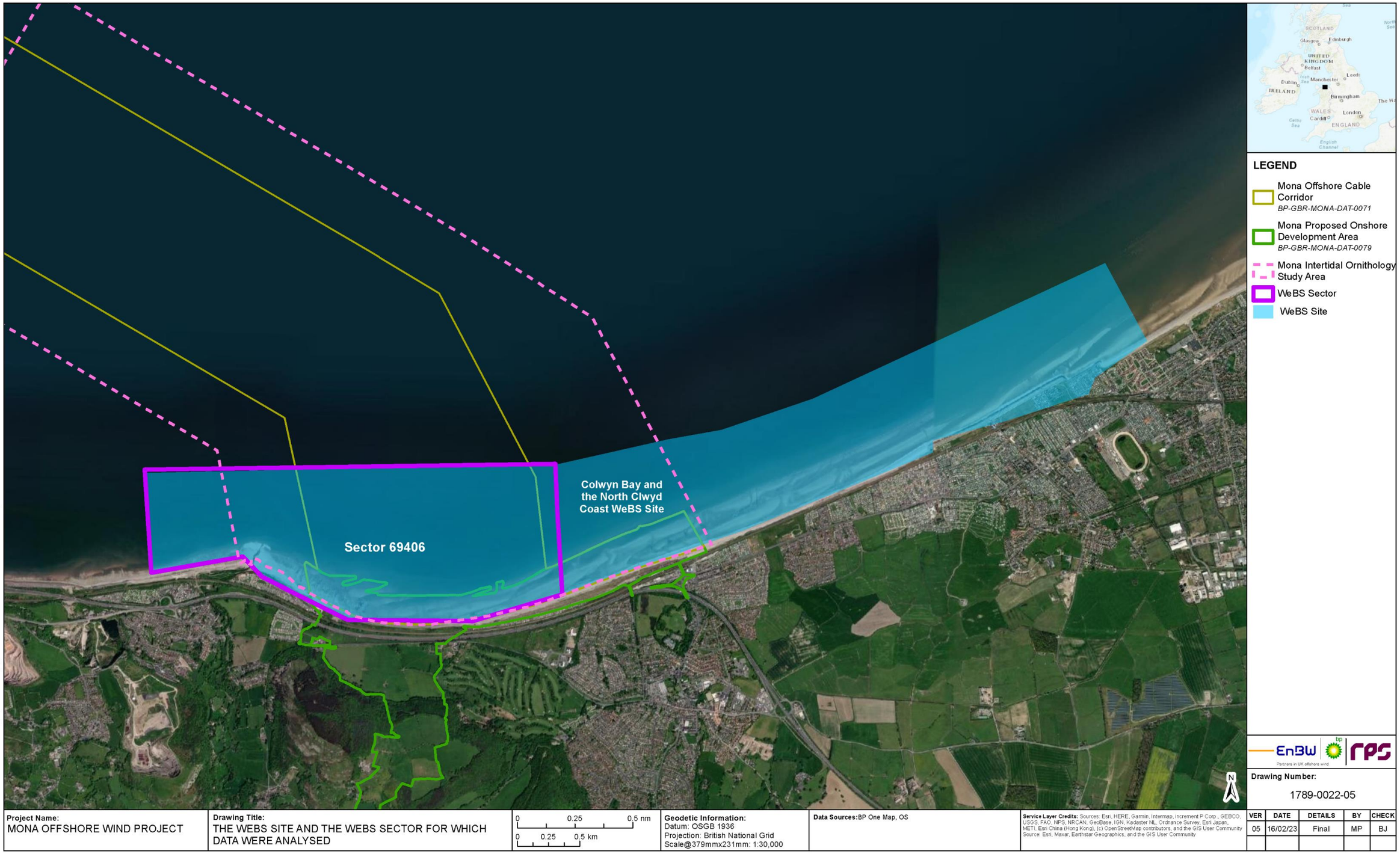


Figure 1.3: WeBS site and the WeBS sector for which data were analysed.

1.2.4.3 Target species for WeBS counts are waterbird species, with an emphasis on waterfowl and waders. The recording of gulls and terns is not compulsory in the WeBS methodology. The WeBS Colwyn Bay and North Clwyd Coast site is split into sectors. The intertidal ornithology study area is best covered by the WeBS sector 69406 – Abergele to Llandulas (Figure 1.3). These data were purchased from the BTO. The most recent data available was from 2015/16 until 2019/20. The data during this period covers the months from September to April.

1.2.4.4 For the WeBS sector data, the maximum peak count from the 2015/16 to 2019/20 period was presented for each species recorded during the surveys. Annual peak maxima were extracted and averaged over the 2015/16 – 2019/20 period to produce a five-year mean of peak counts.

1.2.4.5 The intertidal ornithology study area is also covered by two Non-Estuarine Waterbird Survey (NEWS) sectors Z360104, and Z360103B (Figure 1.4). The NEWS is carried out on a less frequent basis than the WeBS and is designed to target less estuarine stretches of coastline and collate data for three zones:

- intertidal
- nearshore waters
- area landward of intertidal zone.

1.2.4.6 This includes data on birds on the sea, and birds that forage or roost in fields close to the intertidal area. NEWS sectors Z360104, and Z360103B were obtained from the BTO for the 2015/16 – 2019/20 wintering periods. This was the most recent data available at the time of this report.

1.2.4.7 Some historical NEWS data were available for the intertidal ornithology study area. Due to the age of the data obtained from the BTO (dated 1995 and 2007), these historical data is not presented or discussed in this report. However, two NEWS counts from 2015/16 were available for the two adjacent sectors covering the survey area (Figure 1.4). The NEWS maximum annual peak were extracted from these NEWS counts. Sector Z360104 was counted on the 24 December 2015, and sector Z360103B was counted on the 28 January 2016.

Figure 1.4: NEWS sectors for which data were analysed.

1.2.5 Survey count data

1.2.5.1 As the intertidal surveys remain ongoing, and species are to be analysed on a seasonal basis, the data presented in this report are derived from the December 2021 to March 2022 wintering period only. As the migratory passage surveys, which commenced in April 2022 (spring and autumn) and are ongoing, the spring seasonal data is not included in the baseline characterisation of volume 3, chapter 24: Onshore and intertidal ornithology of the PEIR, but will, however, be considered in the Environmental Statement.

1.2.5.2 For the analyses presented, the monthly peak maxima were calculated as the maximum number of birds of a single species seen on a single count (where different groups of the same species were observed during the same count, then they were summated). The seasonal peak is the greatest of the monthly peaks during the core wintering period (i.e. data from December 2021 to March 2022).

1.2.5.3 To calculate the total number of waterbirds that used the intertidal ornithology study area during this period, all species peaks were summated. For the purposes of this report, only core wintering peaks (December 2021 to March 2022) were included in this total number of waterbirds.

1.2.5.4 To calculate utilisation of the intertidal and nearshore waters throughout the tidal cycle, all counts were averaged by the total number of counts taken (a total of 53 diurnal counts were made over 10 surveys (Table 1.5), and according to tidal state (i.e. low, low + 1hr, low + 2hrs).

1.2.5.5 Due to limitations encountered during the nocturnal surveys, these data have been considered separately to diurnal results. Implications regarding disturbance must also be treated differently at night (see paragraph 1.2.3.2).

1.2.6 Mapping count data

1.2.6.1 To characterise the value of the intertidal ornithology study area for different species of waterbirds, species maps have been produced showing the average density of birds (Figure 1.10 to Figure 1.31). Maps were only produced from the diurnal data and for the wintering period only, so as not to introduce biases. Maps for other seasons (e.g. spring seasonal data) will be included as part of the ES.

1.2.6.2 Firstly, all point data were entered into an Arc Geographic Information System (GIS) database complete with species, counts of birds, and behaviour. A 1 hectare (ha) grid was then overlaid on the intertidal ornithology study area and all counts of birds recorded within each 1ha square over the period were averaged. This gave the mean number of birds present in 1ha squares. These data is divided into categories with the highest category being the mean peak for that species, and the lowest category being less than 0.1 bird per/ha (Table 1.7). Grid squares where no birds were recorded were left blank.

Table 1.7: Example of how density (number of birds per/ha) is displayed.

Colour coding	Average number of birds based on 53 counts (per/ha)
	<0.10
	0.10-0.25
	0.25-0.50
	0.50-1.00
	1.00-2.00
	2.00-5.00
	5.00-10.00
	10.00-15.00
	20.00-30.00
	30.00-40.00
	40.00-50.00
	50.00-60.00
	70.00+

1.2.6.3 Species maps for the December 2021 to March 2022 period are shown in Figure 1.10 to Figure 1.31.

1.2.7 Baseline Characterisation of the intertidal ornithology study area

Review of desktop study and data sources

Assemblage and designated Sites

1.2.7.1 The following species were recorded during the 2021/2022 survey period and were used to inform the desktop study: common scoter, tufted duck *Aythya fuligula,* red-throated diver *Gavia arctica*, great crested grebe, goosander *Mergus merganser*, red-breasted merganser, oystercatcher, curlew, redshank *Tringa tetanus*, turnstone *Arenaria interpres*, ringed plover, whimbrel *Numenius phaeopus*, black-headed gull *Chroicocephalus ridibundus*, common gull *Larus canus*, herring gull *Larus argentus*, great black-backed gull *Larus marinus*, lesser black-backed gull *Larus fuscus*, sandwich tern *Thalasseus sandvicensis*, cormorant, shag *Phalacrocarox aristotelis*, guillemot *Uria aalge*, grey heron *Ardea cinerea* and little egret *Egretta garzetta*.

1.2.7.2 Of these, common scoter, red-throated diver, red-breasted merganser, and cormorant are named as features of the Liverpool Bay SPA (Table 1.1). Oystercatcher, curlew and redshank are named as features of the Dee Estuary SPA (Table 1.1). These species were therefore considered in more depth for the desktop study.

1.2.7.3 There are two SPAs within 20km of Mona Proposed Landfall, the Dee Estuary SPA and Ramsar and the Liverpool Bay SPA (Figure 1.1), for qualifying species (Table 1.1).

1.2.7.4 There are no nationally designated SSSIs or NNRs with waterbird interests located within 5km of the Mona Proposed Landfall.

1.2.7.5 There are no locally designated LNRs or LWSs with waterbird interests within 2km of the Mona Proposed Landfall.

Potential SPA connectivity to the intertidal ornithology study area

1.2.7.6 The Liverpool Bay SPA is a marine SPA that extends to MLWS and therefore overlaps with the nearshore of the intertidal ornithology study area (Figure 1.1); it is designated for seabird features, not waders and wildfowl. Liverpool Bay SPA features of interest found during survey were: common scoter, red-throated diver, red-breasted merganser, and cormorant (Figure 1.8). In addition, other seabirds found during the surveys qualified as part of the assemblage.

1.2.7.7 Recent studies by Webb *et al.* (2006) and Lawson *et al.* (2016), to inform the creation and extension (respectively) of the Liverpool Bay SPA, found concentrations of both red-throated diver and common scoter along the North Wales coast. Webb *et al*. (2006) found three concentrations of red-throated diver: one in Conwy Bay, one of off the Dee Estuary, and one between Colwyn and Rhyl. Lawson *et al.* (2016) corroborated these findings. The highest concentrations of common scoter in these studies were recorded on the nearshore waters between the Dee Estuary and Colwyn Bay where the intertidal ornithology study area is located. Lawson *et al*. (2016) is the most recent and comprehensive of the two studies and their figures are quoted in the SPA citation.

1.2.7.8 In addition to these, Kaiser *et al*. (2006) collected data on the distribution and behaviour of common scoter to help model the predicted effects that offshore wind farms might have on the species. They collected data on common scoter distribution through the use of aerial surveys and found concentrations of common scoter in the nearshore waters off the coast of Abergele. For the collection of behavioural data, they chose a location at Llandulas (SH 906786) as at this point "*it was possible to observe consistently between 200 and 2000 Common Scoter*". This is at the east extent of the intertidal ornithology study area. Kaiser *et al*. (2006) found that all common scoter had left the Liverpool Bay area for their breeding grounds by May.

1.2.7.9 Kaiser *et al.* (2006) also used bathymetry to model the seafloor and collected data on prey distribution. They found that the North Wales seafloor falls away relatively steeply and that the highest prey densities along this coastline were located at a depth of 7.88m. Common scoter were most frequently found in water between 7 to 15m deep and it is widely accepted that they forage in water less that 20m deep.

1.2.7.10 The three studies highlighted above all indicated that both common scoter and red-throated diver congregate in high (relative) densities in the nearshore waters adjacent to the intertidal ornithology study area.

1.2.7.11 The Dee Estuary is approximately 16.5km to the east of the intertidal ornithology study area and is designated for waders and wildfowl features. Although there is potential for waders and wildfowl to travel between the SPA and the intertidal ornithology study area, no evidence was found in the literature review for wader species travelling that far for foraging or roosting purposes. It is widely accepted that many wader species are site faithful to their wintering grounds (Van de Kam *et al*., 2004) and roost close to their foraging grounds (Burton and Armitage, 2005; Rehfisch *et al*., 1996).

WeBS data review of Colwyn Bay and the North Clwyd Coast WeBS site

1.2.7.12 The literature and SPA citation figures give a good indication of regional populations and distributions. However, the WeBS site data were used to put these figures into context at a more local scale. The Colwyn Bay and the North Clwyd Coast site was reviewed as it covers the intertidal ornithology study area (Figure 1.2). Data was only reviewed for those species found to be present within the intertidal ornithology study area. Other species such as dunlin and knot were present, but not regularly or in significant numbers.

1.2.7.13 Common scoter were identified to be the most abundant waterbird species with a peak of 6,334 between 2015/16 to 2019/20 (Table 1.8) followed by cormorant with a peak of 694, both of these populations are of national significance. Of the wader species oystercatcher were the most abundant, followed by curlew, turnstone and redshank. Herring gull and black-headed gull were the most frequently recorded gull species with relatively low numbers of the other species (although the recording of gulls is optional in the WeBS methodology so they may be under-represented). All other species were present in relatively low numbers.

Table 1.8: WeBS summary of the Colwyn Bay and the North Clwyd Coast WeBS site.

* Species which have experienced local declines between the two 5-year periods.

Species	WeBS 10/11 – 14/15 5 year average	WeBS 15/16 – 19/20 5 year average	% Change
Common scoter*	8,685	6,334	-27.07
Tufted duck	0	11	1,100
Red-throated diver	18	24	33.33
Great crested grebe*	87	18	-79.31
Goosander	0	1	100
Red-breasted merganser	10	12	20
Oystercatcher*	556	380	-31.65
Curlew	64	190	196.88
Redshank	69	124	79.71
Turnstone	115	132	14.78
Ringed plover	9	45	400
Black-headed gull	71	161	126.76
Common gull	11	55	400
Herring gull	45	227	404.44
Great black-backed gull	2	6	200
Lesser black-backed gull	2	5	150
Sandwich tern	2	55	2650
Cormorant	141	694	392.2
Shag	2	17	750

Species	WeBS 10/11 – 14/15 5 year average	WeBS 15/16 – 19/20 5 year average	% Change
Grey heron	0	1	100
Little egret	0	2	200

1.2.7.14 Common scoter, great crested grebe and oystercatcher have shown local declines between 2014/15 and 2019/20 (according to the WeBS site data). All other species showed increases over the period. Common scoter and cormorant are features of interest of the Liverpool Bay SPA, so these changes were put into context with the WeBS national trends for Wales together with other species (see Figure 1.5 and Figure 1.6).

Review of the Welsh population trends for the Liverpool Bay SPA and Dee Estuary SPA designated features

1.2.7.15 The trends shown in Figure 1.5 and Figure 1.6 are reported as an index. A value of 100 on the index represents the population at the first count. As the first count pre-dates the year 2000, these species trends do not necessarily start at 100.

1.2.7.16 The trend for common scoter in Wales shows a step decline since the 2014/15 peak. However, the long-term trend shows overall a slight increase, and the population is higher than in 2000/01 (Figure 1.5). Red-throated diver have seen major declines in Wales over the 2000/01 to 2019/20 period with red-breasted merganser showing a small decline. Conversely cormorant have seen a slight increase (Figure 1.5).

1.2.7.17 All wader species have shown long term declines in Wales during the core wintering period. (Figure 1.6). Despite fluctuations, the overall trend for oystercatcher has been of a decline. The greatest decline was experienced by curlew while redshank showed fluctuations with overall stability throughout the period (Figure 1.6).

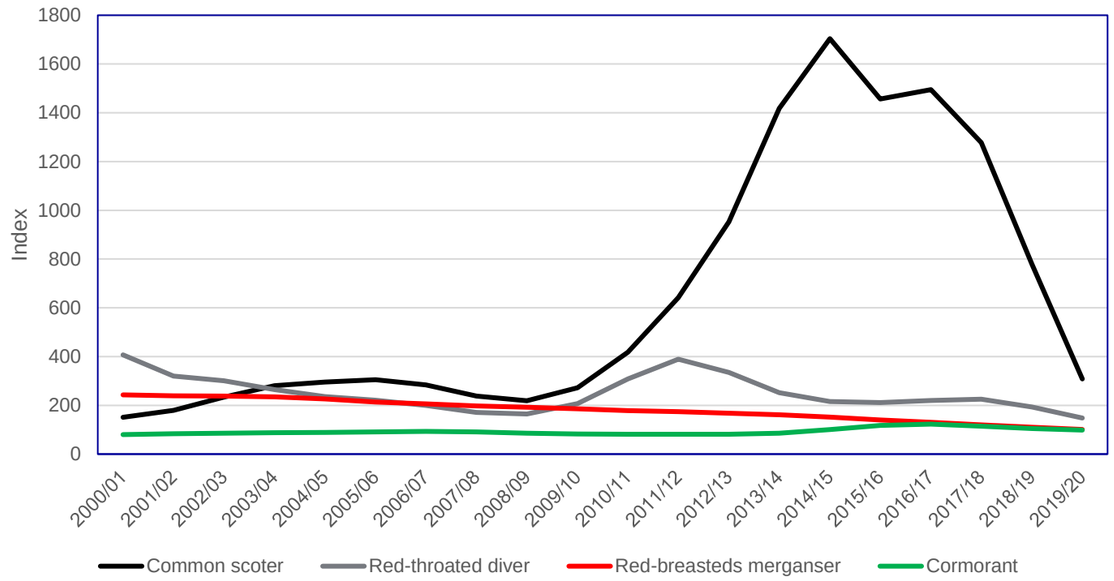


Figure 1.5: Showing the smoothed core wintering trends of the Welsh population of the Liverpool Bay SPA designated features. Data taken from WeBS online.

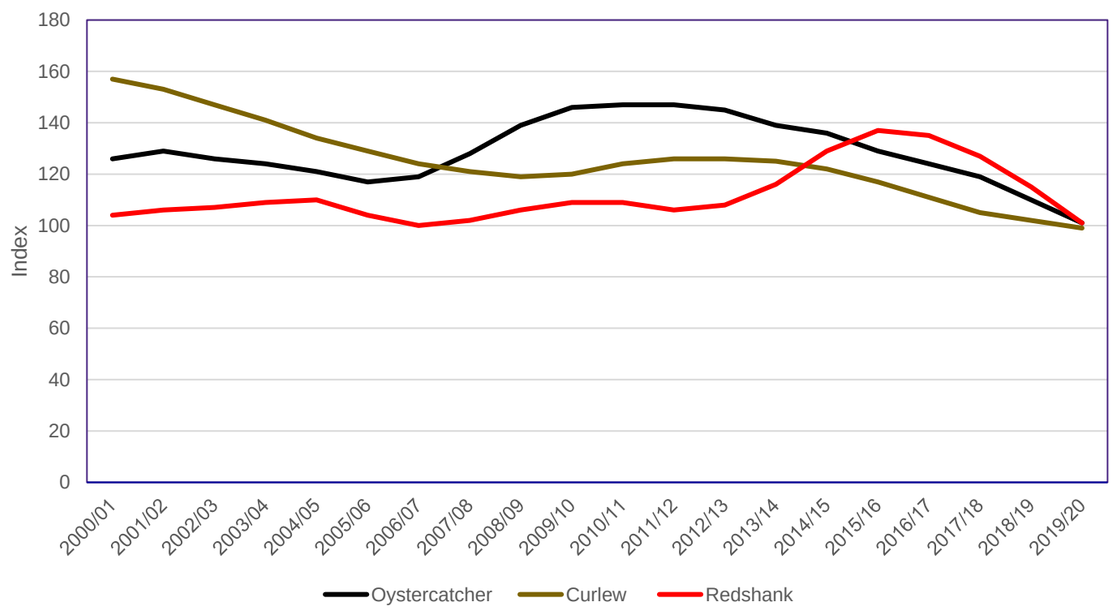


Figure 1.6: Showing the smoothed core wintering trends of the Welsh population of the Dee Estuary SPA designated features. Data taken from WeBS online.

WeBS Sector Summary

The overall peak number of waterbirds recorded using WeBS sector 69,406 (

1.2.7.18 Figure 1.3) over the five-year period from 2015/16 to 2019/20 was 1,195. This figure was obtained by summing the peak counts of each species over the period. The overall peak, and the five-year mean of peak data is displayed below (Figure 1.7).

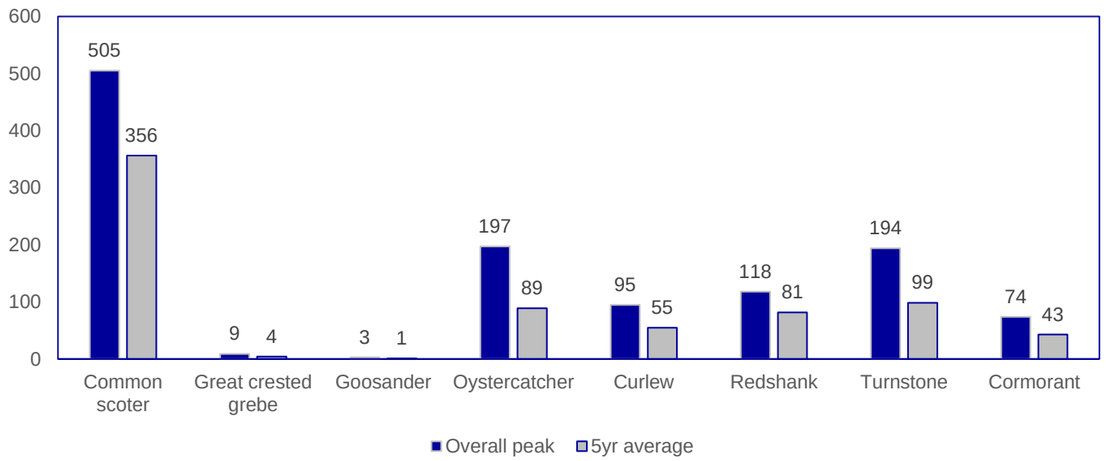


Figure 1.7: Summarising the peak and 5 year average data from 2015/16 – 2019/20, as recorded by the WeBS for sector 69406 - Abergele to Llandulas.

1.2.7.19 In addition, the species in Table 1.9 were recorded as occasionally using the area. The frequency is represented as a fraction out of 31 counts (the total number of WeBS counts carried out over the five-year period) that the species was recorded in.

Table 1.9: WeBS sector (69406 - Abergele to Llandulas) data for occasional species, 2015/16 – 2019/20.

* Peak count occurred during Autumn passage period.

Species	Peak count	Month of peak	Frequency
Sandwich tern*	6*	Sep-18	0.03
Red-breasted merganser*	1*	Sep-15	0.06
Grey heron*	1*	Sep-16	0.06
Little egret*	2*	Oct-18	0.09
Dunlin	6	Nov-18	0.06
Knot	101	Feb-20	0.09
Mallard*	4*	Sep-19	0.06

NEWS sector summary

1.2.7.20 The overall peak of waterbirds counted in the combined NEWS sectors from the wintering period of 2015/16 was 1,653 (Table 1.10). Figure 1.8 shows the species peaks from only one sector (whichever sector peak was highest) as the surveys were carried out on different days.

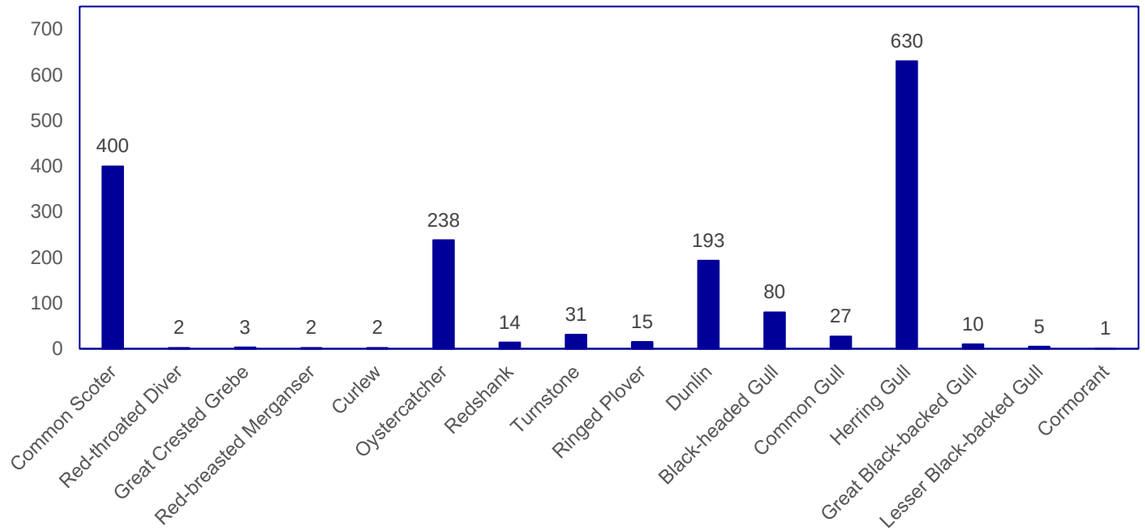


Figure 1.8: Summarising the peak data for the core wintering period of 2015/16, as recorded by NEWS for sectors Z360103B and Z360104.

1.2.8 Survey results

Diurnal surveys

1.2.8.1 A total of 65 diurnal counts were carried out spread over 12 surveys (Table 1.5). The first survey was conducted on 11 December 2021 with the remaining 11 surveys spread between then and the 21 April 2022. The earliest start time was 08:05 (23 March 2022) and the latest finish time was 17:25 (19 March 2022). Surveys are ongoing to capture the spring and autumn 2022 passage periods as well as picking up any SPA breeding features. The peak data is summarised below (Figure 1.9).

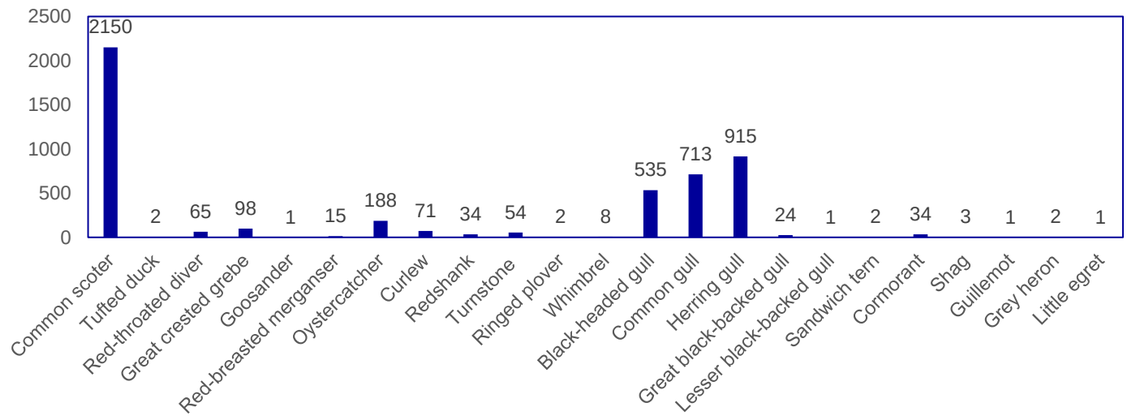


Figure 1.9: Summarising the peak data counts for the diurnal surveys.

1.2.8.2 Common scoter were the most abundant species recorded (Figure 1.11) with a peak count of 2,150 in January 2022 (Table 1.10). During all four wintering months of survey they were recorded at peak abundances of 1,600+ with a wintering monthly mean of 1,872 birds. Other Liverpool Bay SPA features present were:

- Red-throated diver (peak of 65 birds in January 2022), although they were usually found at lower densities but present during all the wintering months in which surveys took place (December 2021 to March 2022)
- Red-breasted merganser were found in lower numbers (peak of 15 in January 2022), they were also often found at lower densities and present throughout the wintering period
- Cormorant were generally found in low numbers (monthly mean of 12), the exception to this was January 2022, when 34 birds were present.

1.2.8.3 The above species all forage and/or roost on the sea and they all had peak counts in January 2022. This could have coincided with bad weather out at sea driving birds towards more sheltered inshore waters, or with a particular food source becoming available in the intertidal ornithology study area during that period thus swelling numbers (although it should be noted that common scoter have different dietary requirements to the other three species).

1.2.8.4 Of the waders - oystercatcher, curlew, redshank and turnstone were present throughout the core wintering period (Table 1.10). Oystercatcher were the most abundant wader species (peak of 188), followed by curlew (peak of 71), turnstone (peak of 54), and redshank (peak of 34).

1.2.8.5 The other two wader species were only recorded in one month respectively. Whimbrel were recorded during the April 2022 passage period, and it is likely that these birds used the intertidal ornithology study area as a stop off on their migration. Ringed plover were only recorded during one survey, although it is likely that they utilise the intertidal ornithology study area at night, as they were picked up more frequently during nocturnal surveys (Table 1.6).

1.2.8.6 Gulls were the most abundant species group (Table 1.10) with high peak counts for common gull (713), black-headed gull (546), and herring gull (915). Great black-backed gull were also frequent, albeit at lower densities (peak of 24). Lesser black-backed gull were only recorded once (peak of 1) and are probably not locally present in large numbers during the core wintering period. Sandwich tern were recorded once (peak of 2), although this was during the spring passage period (April 2022). This species is a designated autumn passage feature of the Dee Estuary SPA and surveys are ongoing to characterise the intertidal ornithology study area with regards to SPA breeding and passage features.

1.2.8.7 Other species that were recorded at low densities and infrequently were: shag, guillemot, grey heron, little egret (Table 1.10). The intertidal ornithology study area contains unsuitable habitat to support populations of shag or guillemot. Both grey heron and little egret appear to be utilising the intertidal ornithology study area, although at different times during the core wintering period.

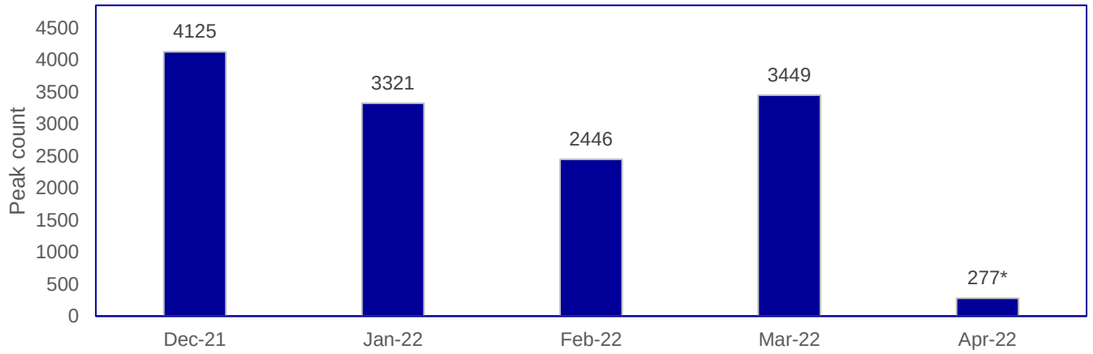
Table 1.10: Monthly peak counts for the diurnal surveys 2021 to 2022.

* Spring passage period. ** Derived from summing the species peaks.

Species	December 2021	January 2022	February 2022	March 2022	April* 2022
Common Scoter	2,000	2,150	1,736	1,600	72*
Tufted duck	0	0	0	2	0
Red-throated diver	2	65	2	29	0
Great crested grebe	2	98	85	32	4*
Goosander	1	1	0	0	0
Red-breasted merganser	2	15	2	4	0
Oystercatcher	188	154	88	42	14*
Curlew	65	71	23	4	3*
Redshank	23	34	18	13	3*
Turnstone	51	50	4	54	6*
Ringed plover	0	0	2	0	0
Whimbrel	0	0	0	0	8*
Black-headed gull	535	14	15	108	0
Common gull	310	470	420	713	6*
Herring gull	915	158	20	835	153*
Great black-backed gull	24	5	23	5	2*
Lesser black-backed gull	0	0	1	0	0
Sandwich tern	0	0	0	0	2*
Cormorant	3	34	5	7	3*

Species	December 2021	January 2022	February 2022	March 2022	April* 2022
Shag	3	0	0	0	0
Guillemot	0	0	1	0	0
Grey heron	1	2	0	0	0
Little egret	0	0	1	1	1*
Monthly Totals	4,125	3,321	2,446	3,449	277
Overall Total**			**4,909**		

1.2.8.8 The month with the highest number of birds was December 2022, with 4,125 birds recorded in total (Figure 1.10). These figures were derived by summing the monthly peaks of all species. Although the Spring 2022 passage data is not complete, the interim results suggest that the majority of waterbirds had left the area by April 2022 (peak of 277). The overall number of waterbirds that were recorded utilising the intertidal ornithology study area during the core wintering period was 4,909. This figure was derived by summing all individual species peak counts over the core wintering period (December 2021 to March 2022).



* April 2022 is Spring passage period.

Figure 1.10: Initial findings on bird seasonality within the intertidal ornithology study area.

Spatial utilisation of the intertidal ornithology study area

1.2.8.9 As many species are less abundant outside of the wintering period, the inclusion of April 2022 data would bias the calculation of the seasonal means. Hence, only diurnal December 2021 to March 2022 is considered in the spatial and temporal utilisation.

Waterfowl, divers and grebes' spatial utilisation of the intertidal ornithology study area

1.2.8.10 Common scoter appear to be fairly concentrated in their distribution (Figure 1.11) considering their numbers (Table 1.10). Red-throated diver, great crested grebe, and red-breasted merganser were all regularly recorded species although they occurred in lower numbers than common scoter. However, the distribution of these three species appears more spread out (Figure 1.12, Figure 1.13 and Figure 1.15). Tufted duck and goosander (Figure 1.12 and Figure 1.15) were only recorded occasionally (Table 1.10) in the intertidal ornithology study area.

1.2.8.11 All these marine (during the non-breeding period) species appear to occur quite close in to shore except for red-throated diver. Red-throated diver are known to be the least tolerant of disturbance of all the waterbirds recorded with Goodship & Furness (2022) reporting that non-breeding birds may be flushed at distances of over 1km. No data is available for non-breeding birds being flushed from the shore; however disturbance is likely to be higher closer to shore.

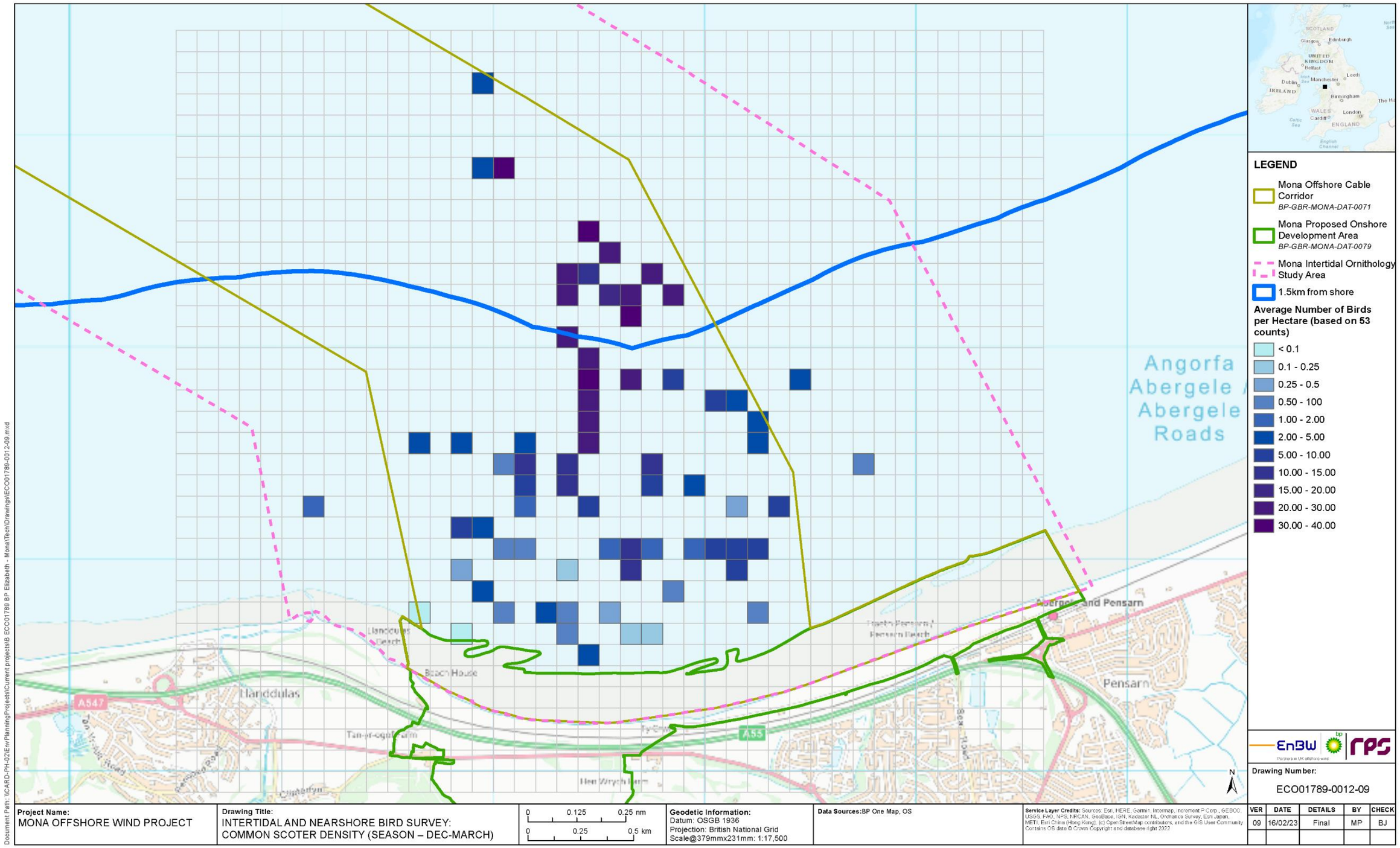


Figure 1.11: Common scoter spatial utilisation of the intertidal ornithology study area.

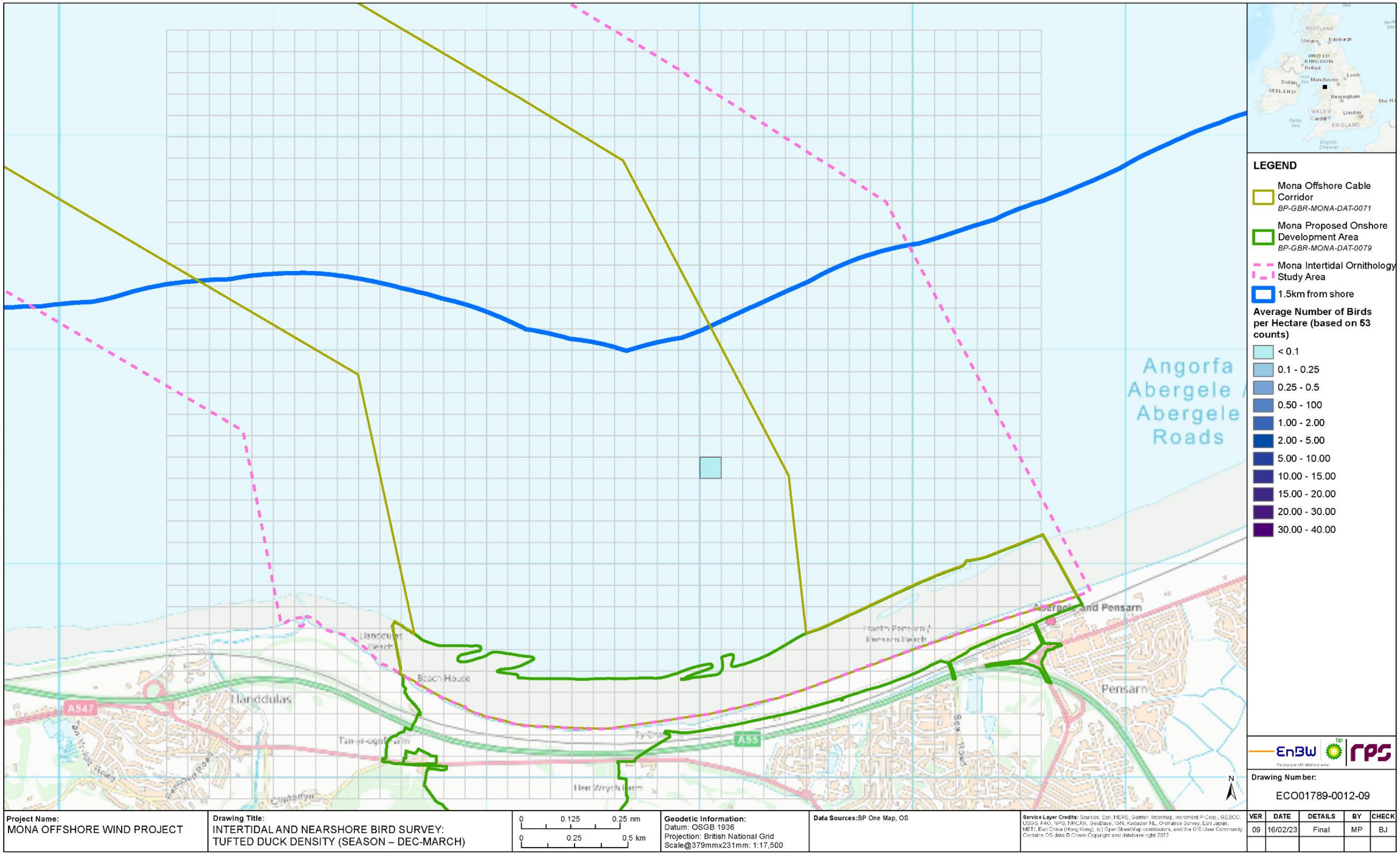


Figure 1.12: Tufted duck spatial utilisation of the intertidal ornithology study area.

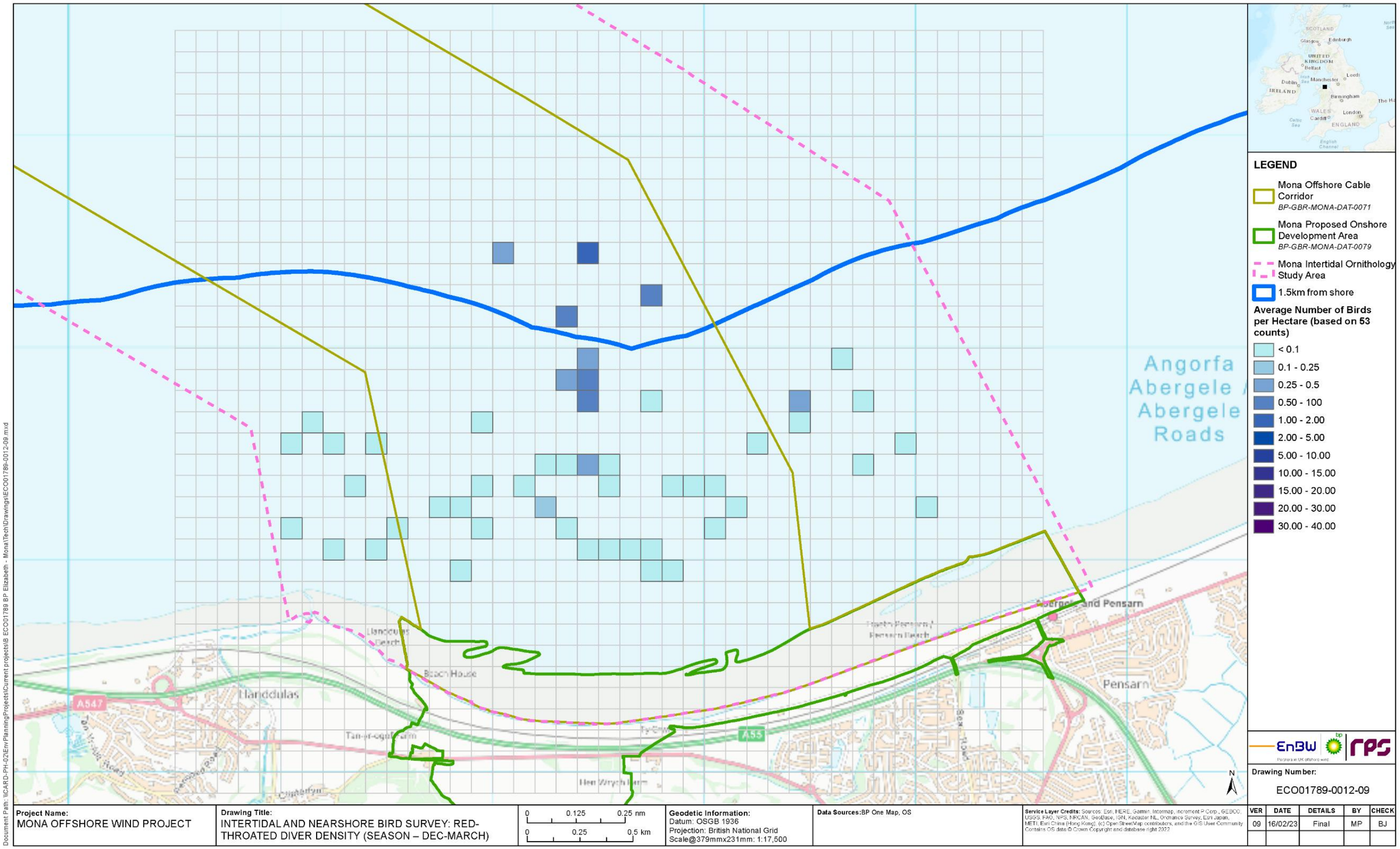


Figure 1.13: Red-throated diver spatial utilisation of the intertidal ornithology study area.

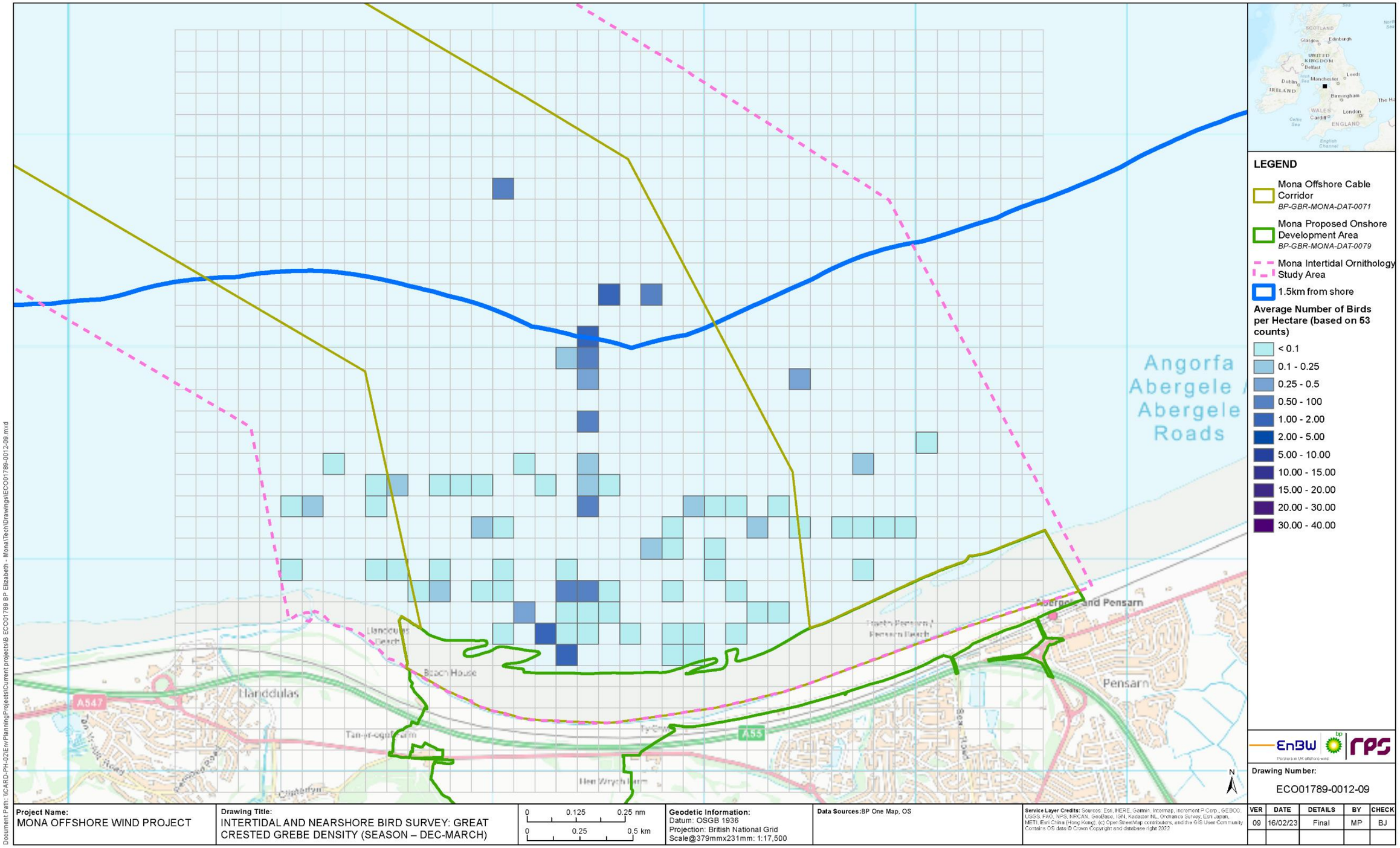


Figure 1.14: Great-crested grebe spatial utilisation of the intertidal ornithology study area.

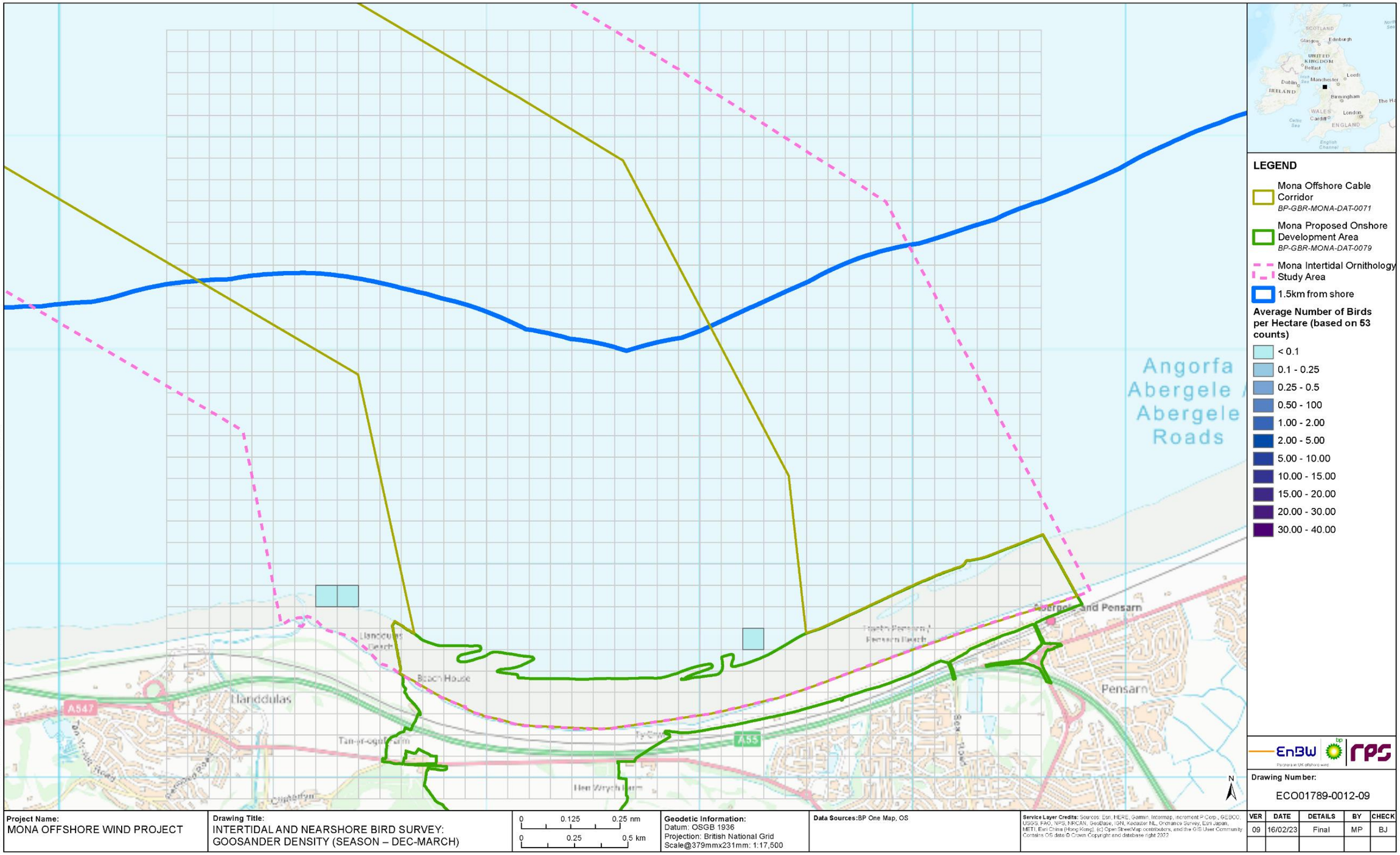


Figure 1.15: Goosander spatial utilisation of the intertidal ornithology study area.

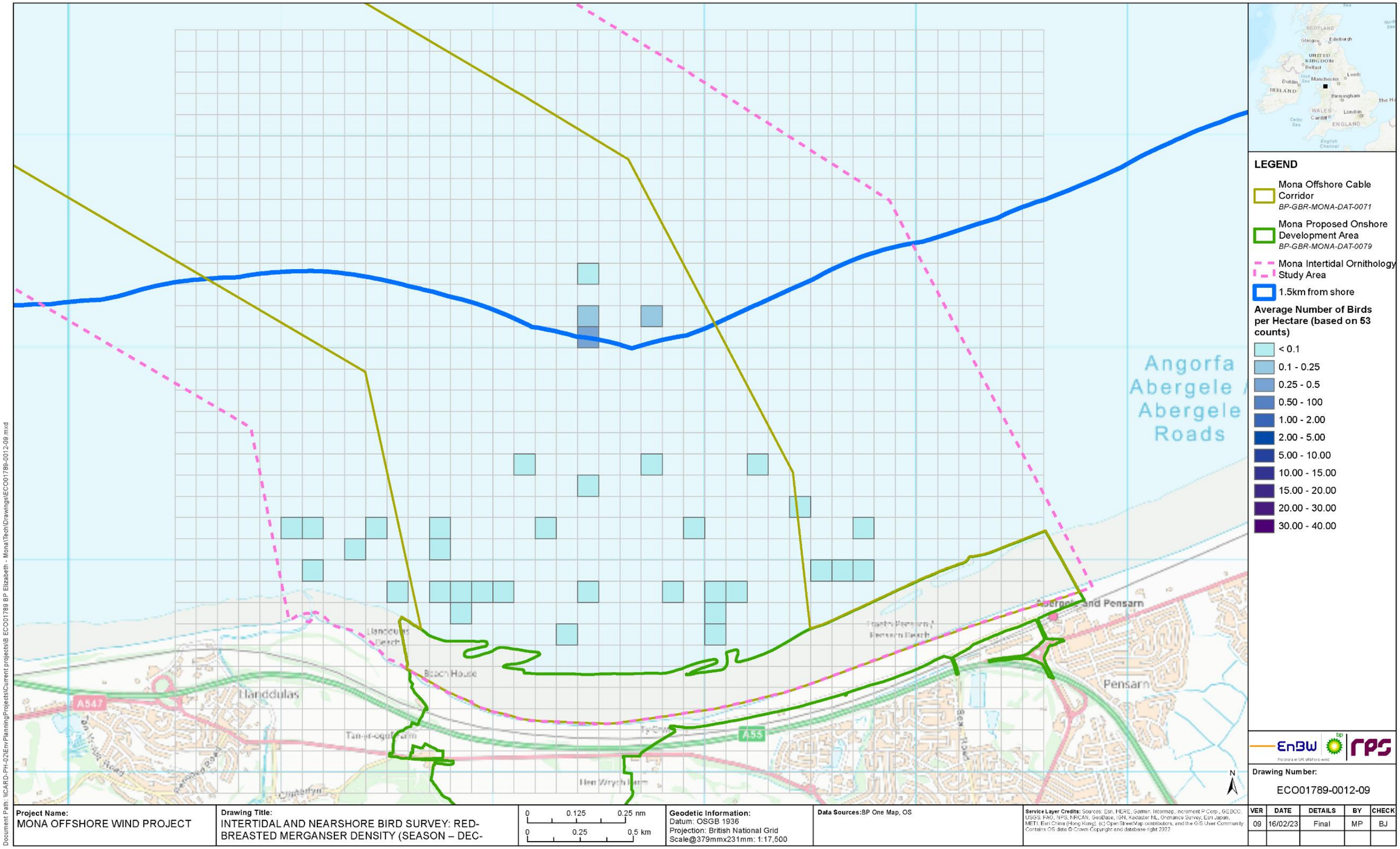


Figure 1.16: Red-breasted merganser spatial utilisation of the intertidal ornithology study area.

Waders' spatial utilisation of the intertidal ornithology study area

1.2.8.12 Oystercatcher and curlew occur only within the intertidal zone, whereas turnstone and redshank occur higher up the beach (Figure 1.17 to Figure 1.20). This ties in with the analysis of temporal usage of the intertidal area (Figure 1.32) which shows increased usage of the intertidal area during low tides by both oystercatcher and curlew. This indicates foraging behaviour. Turnstone and redshank are found outside of the intertidal zone, this coupled with their presence during high tide (Figure 1.32) indicates that these species are using the upper beach for roosting. Ringed plover were only recorded diurnally in February 2022 (Table 1.10) so no conclusions have been drawn regarding their distribution.

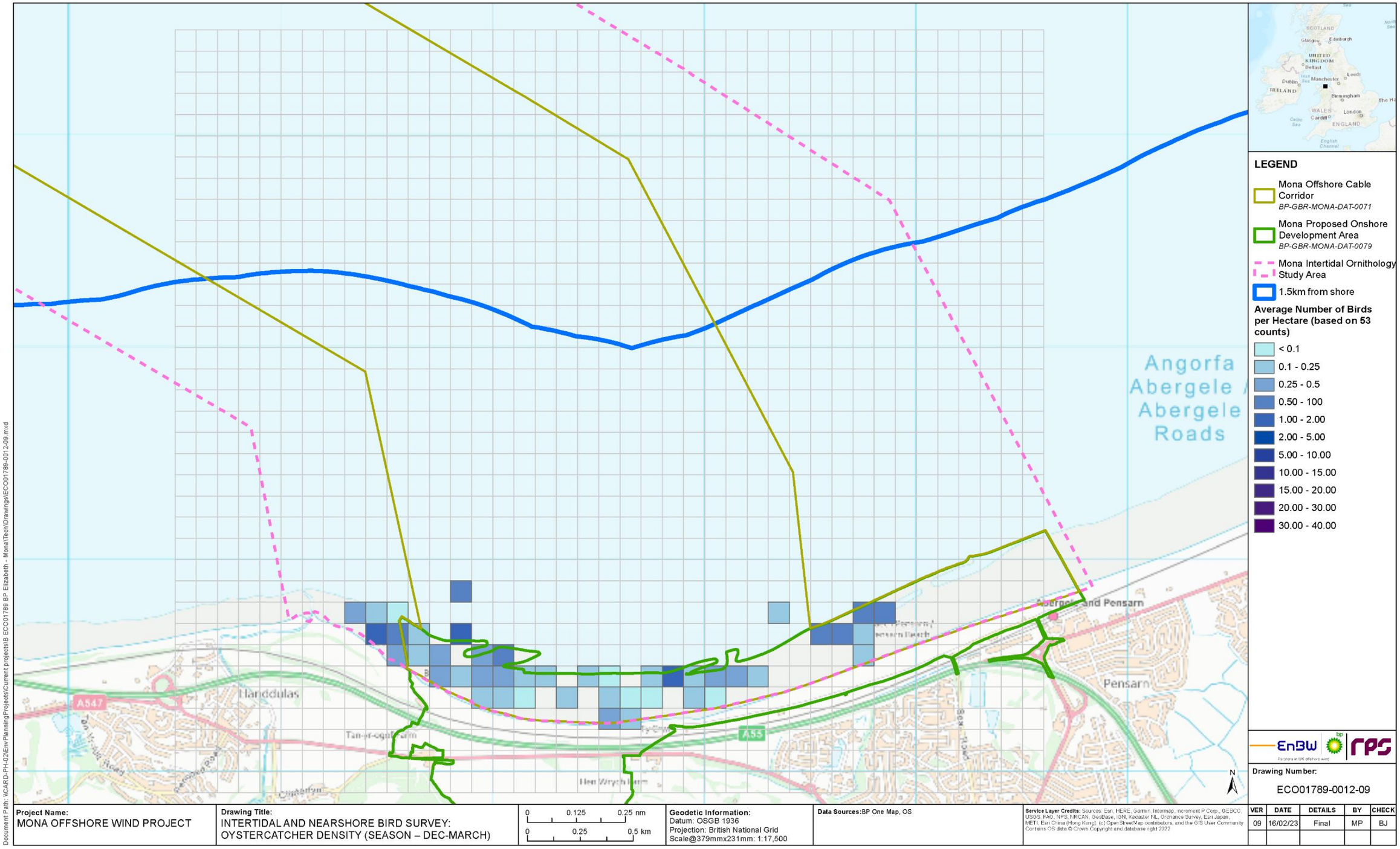


Figure 1.17: Oystercatcher spatial utilisation of the intertidal ornithology study area.

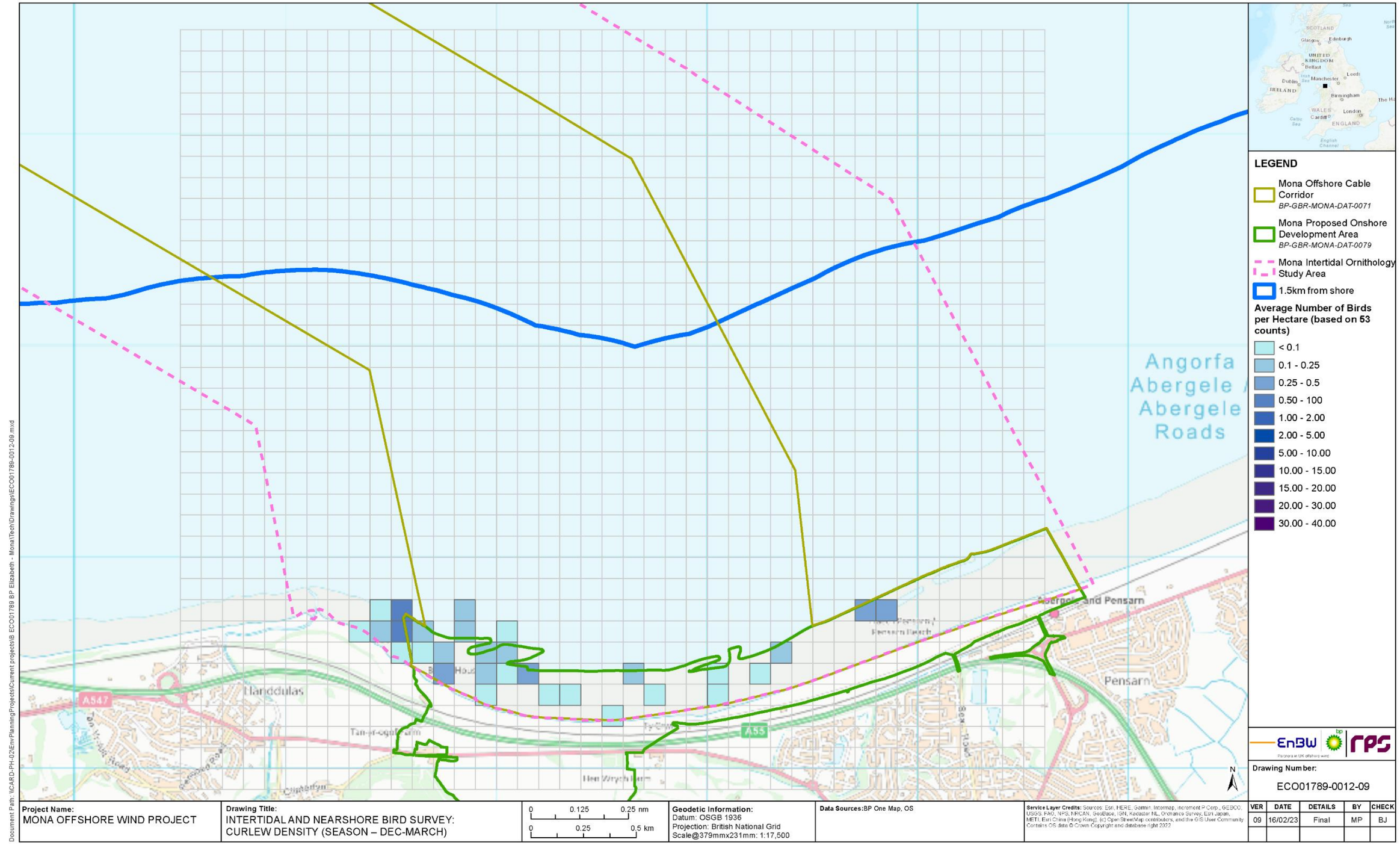


Figure 1.18: Curlew spatial utilisation of the intertidal ornithology study area.

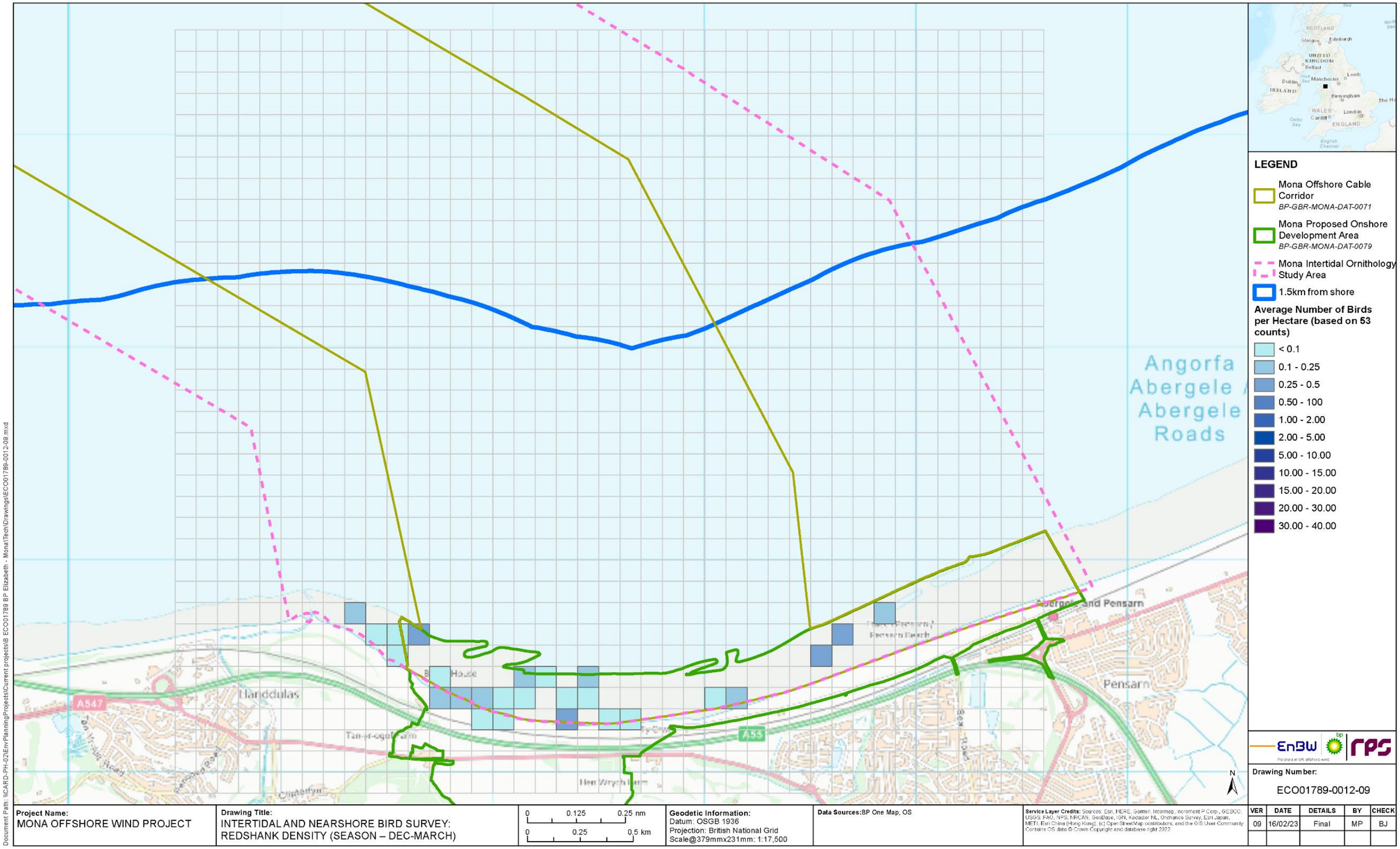


Figure 1.19: Redshank spatial utilisation of the intertidal ornithology study area.

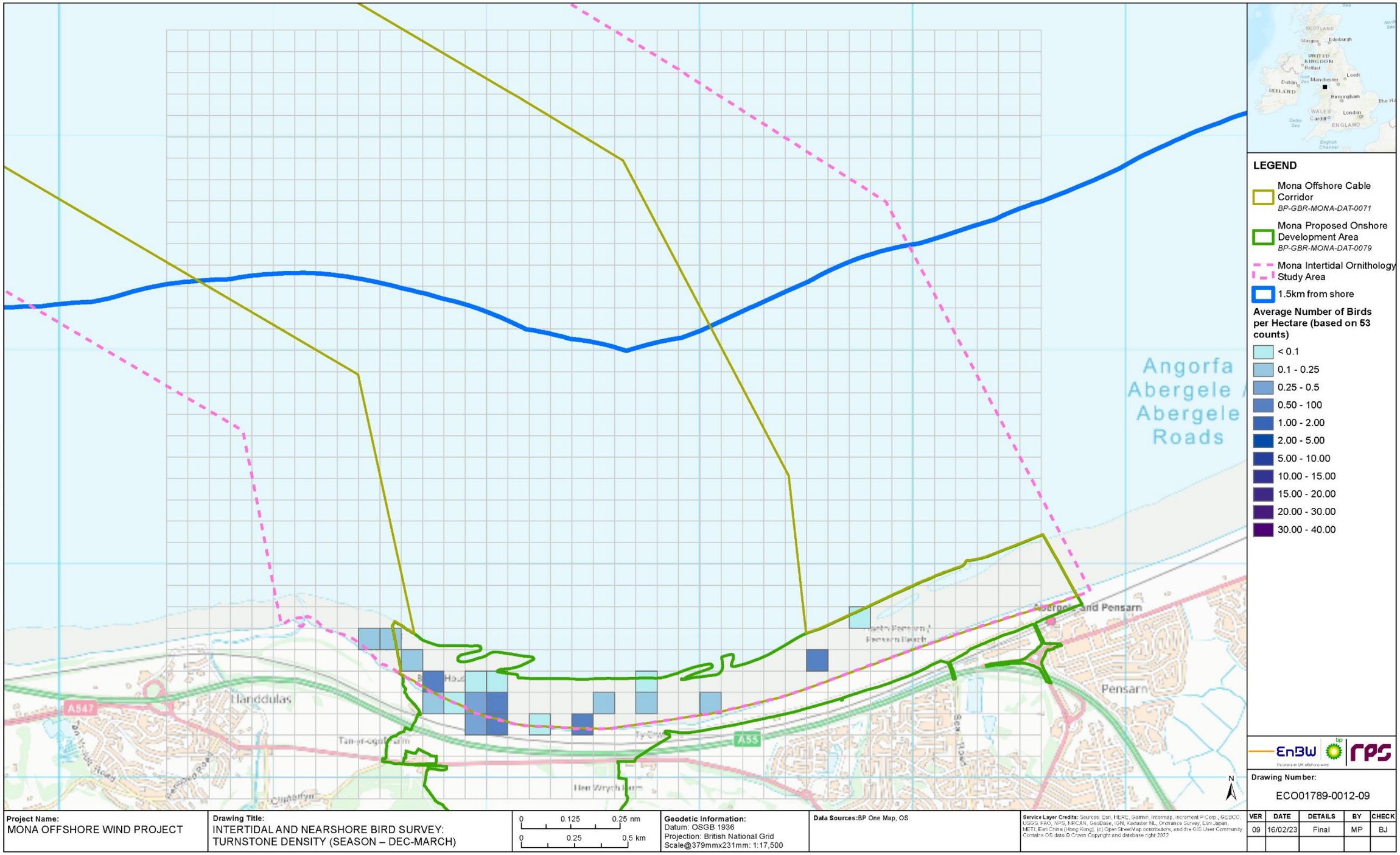


Figure 1.20: Turnstone spatial utilisation of the intertidal ornithology study area.

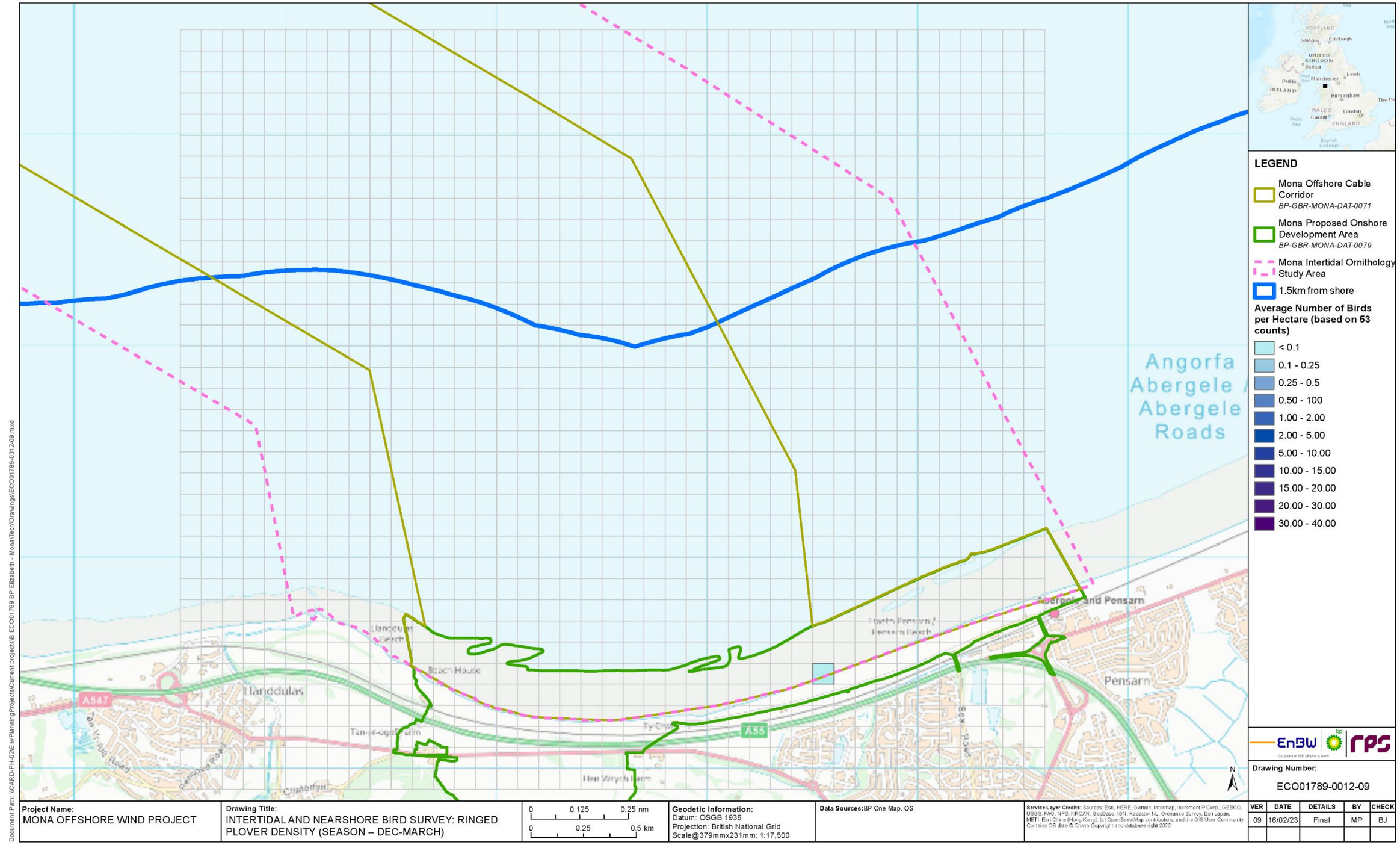


Figure 1.21: Ringed plover spatial utilisation of the intertidal ornithology study area.

Gulls' spatial utilisation of the intertidal ornithology study area

1.2.8.13 All four frequently recorded gulls, black-headed, common gull, herring, and great black-backed gull (Figure 1.22 to Figure 1.25) were found to use the upper beach, the intertidal, and the nearshore waters. This suggests that they use the area for multiple purposes and are likely to be present at all times of day regardless of the tidal state. Lesser black-backed gull were an infrequent visitor (Figure 1.26).

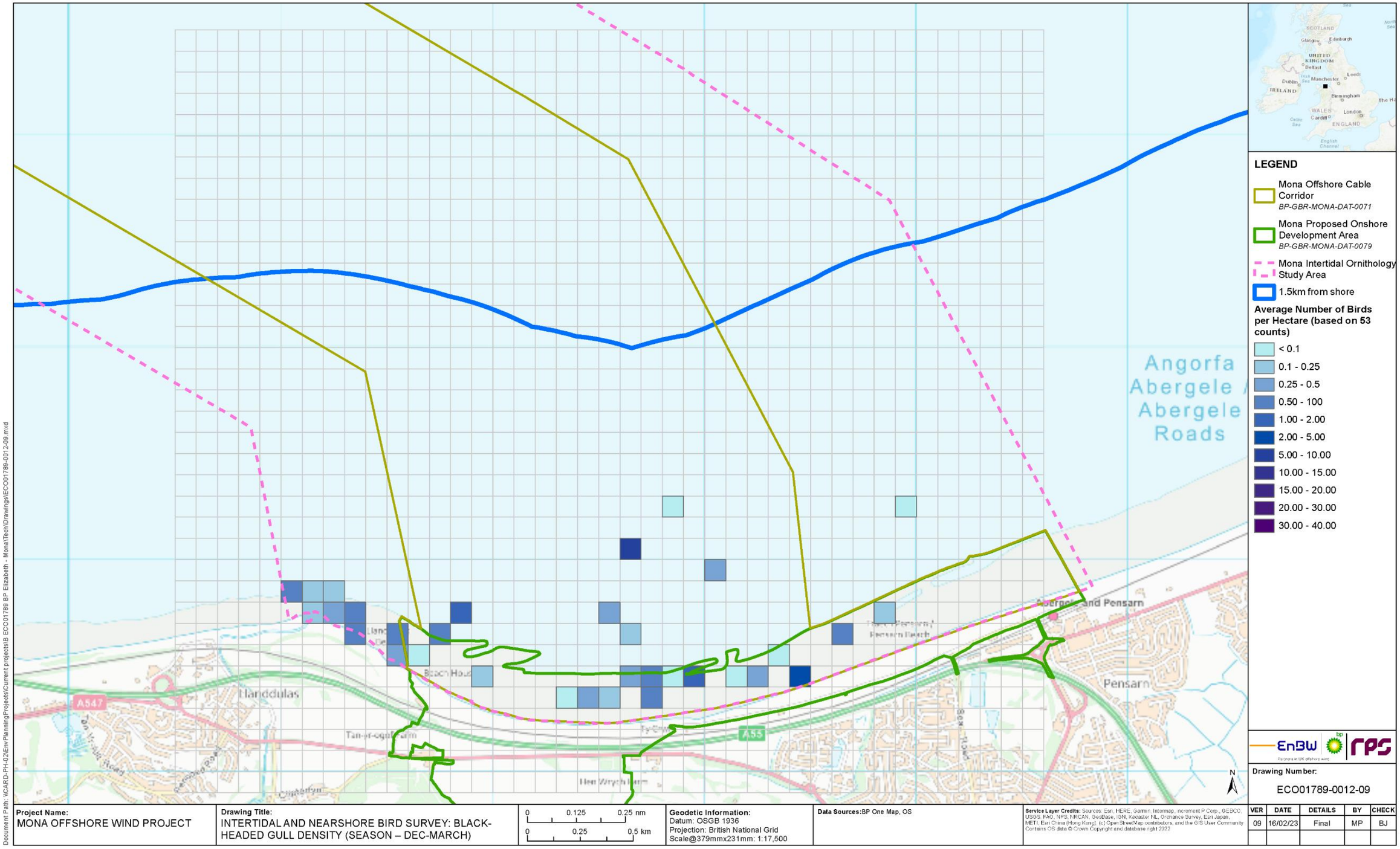


Figure 1.22: Black-headed gull spatial utilisation of the intertidal ornithology study area.

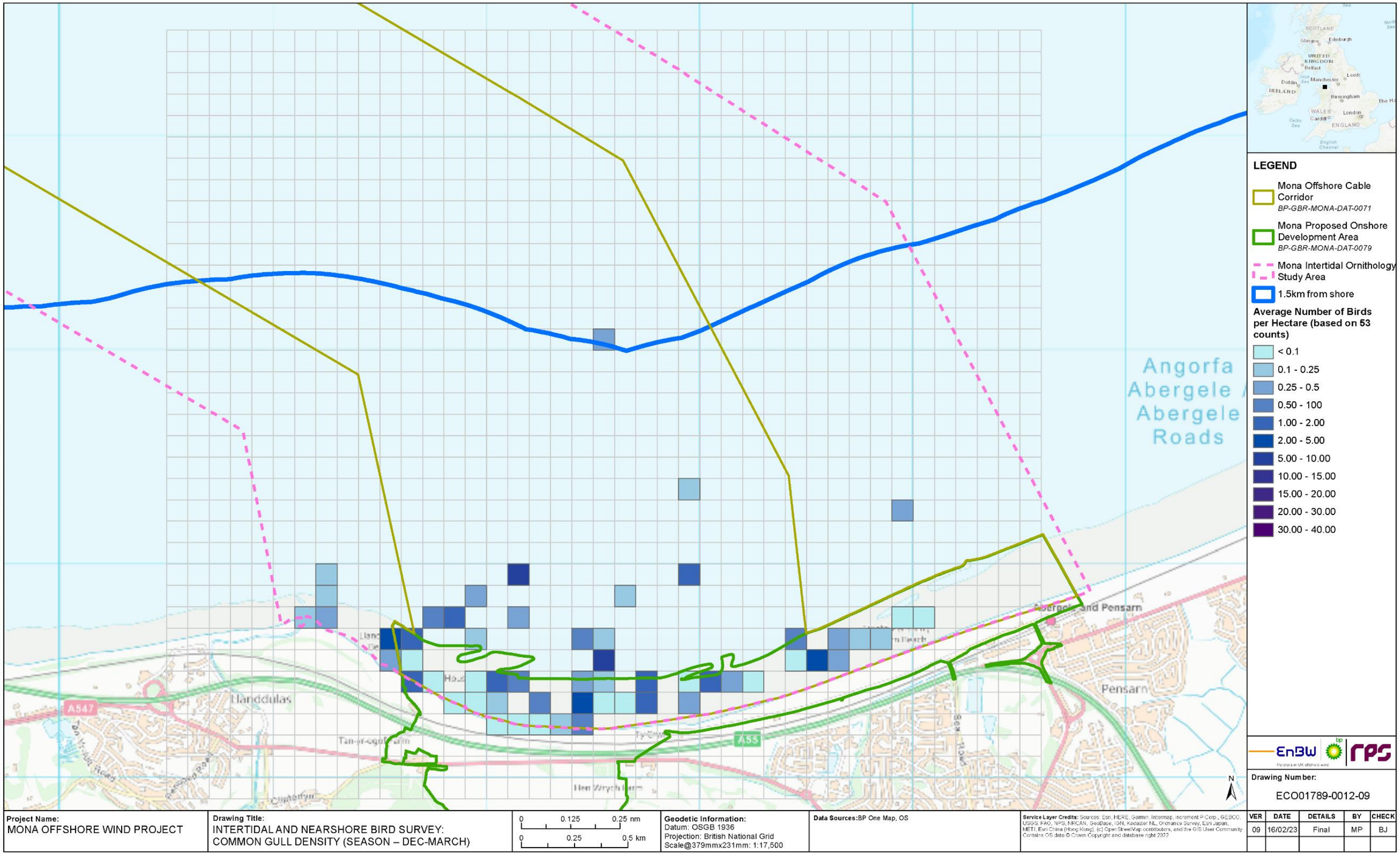


Figure 1.23: Common gull spatial utilisation of the intertidal ornithology study area.

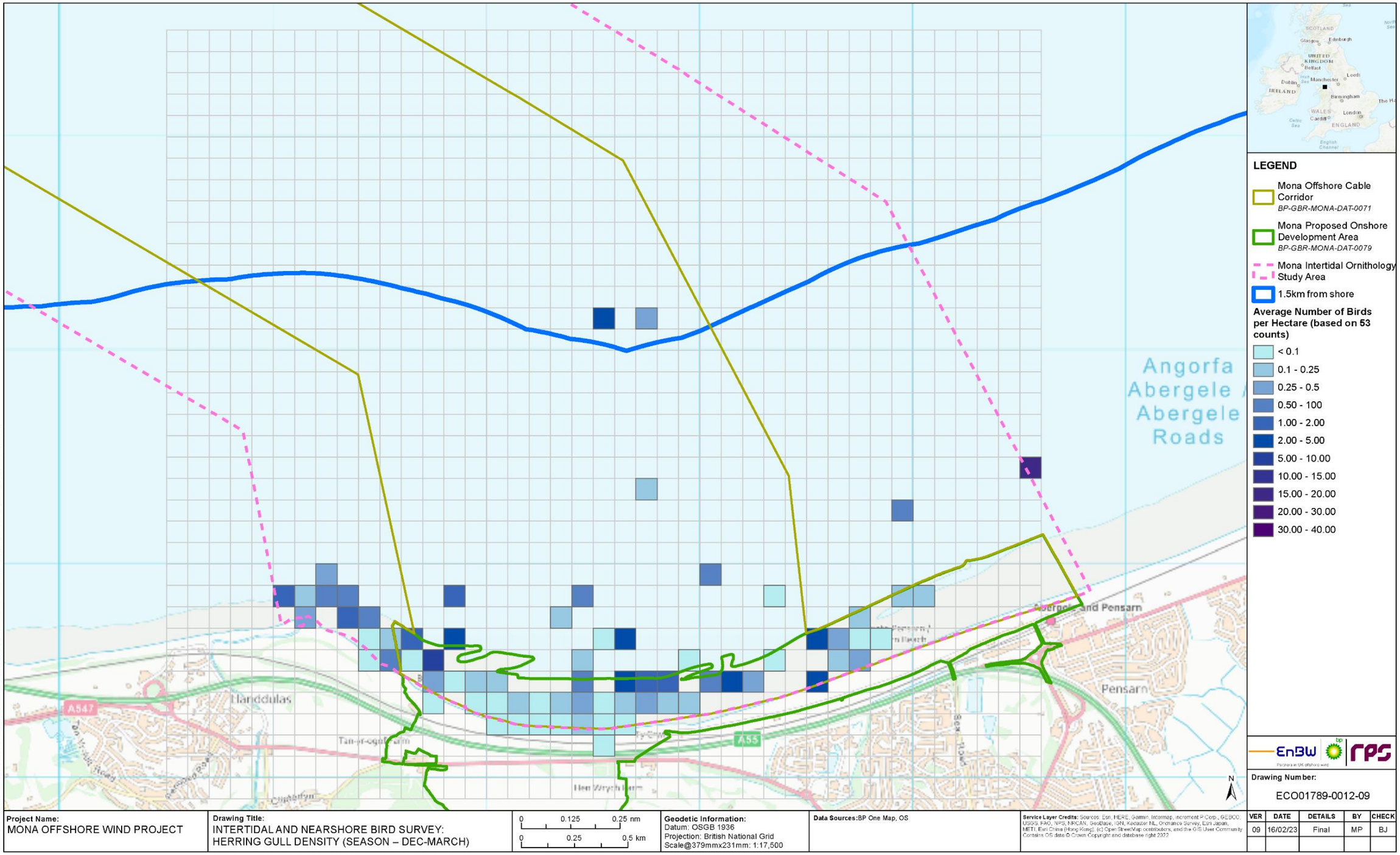


Figure 1.24: Herring gull spatial utilisation of the intertidal ornithology study area.

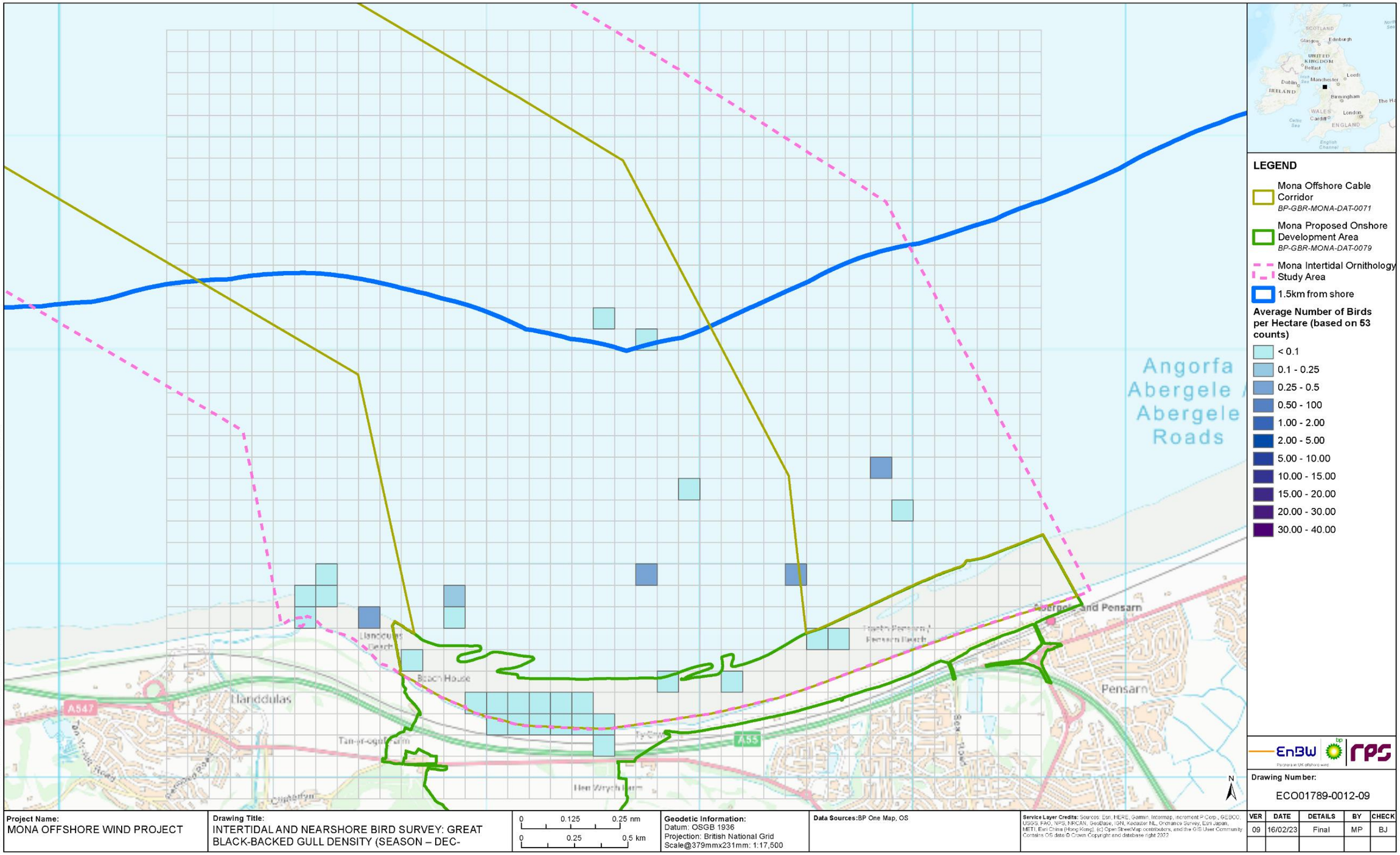


Figure 1.25: Great black-backed gull spatial utilisation of the intertidal ornithology study area.

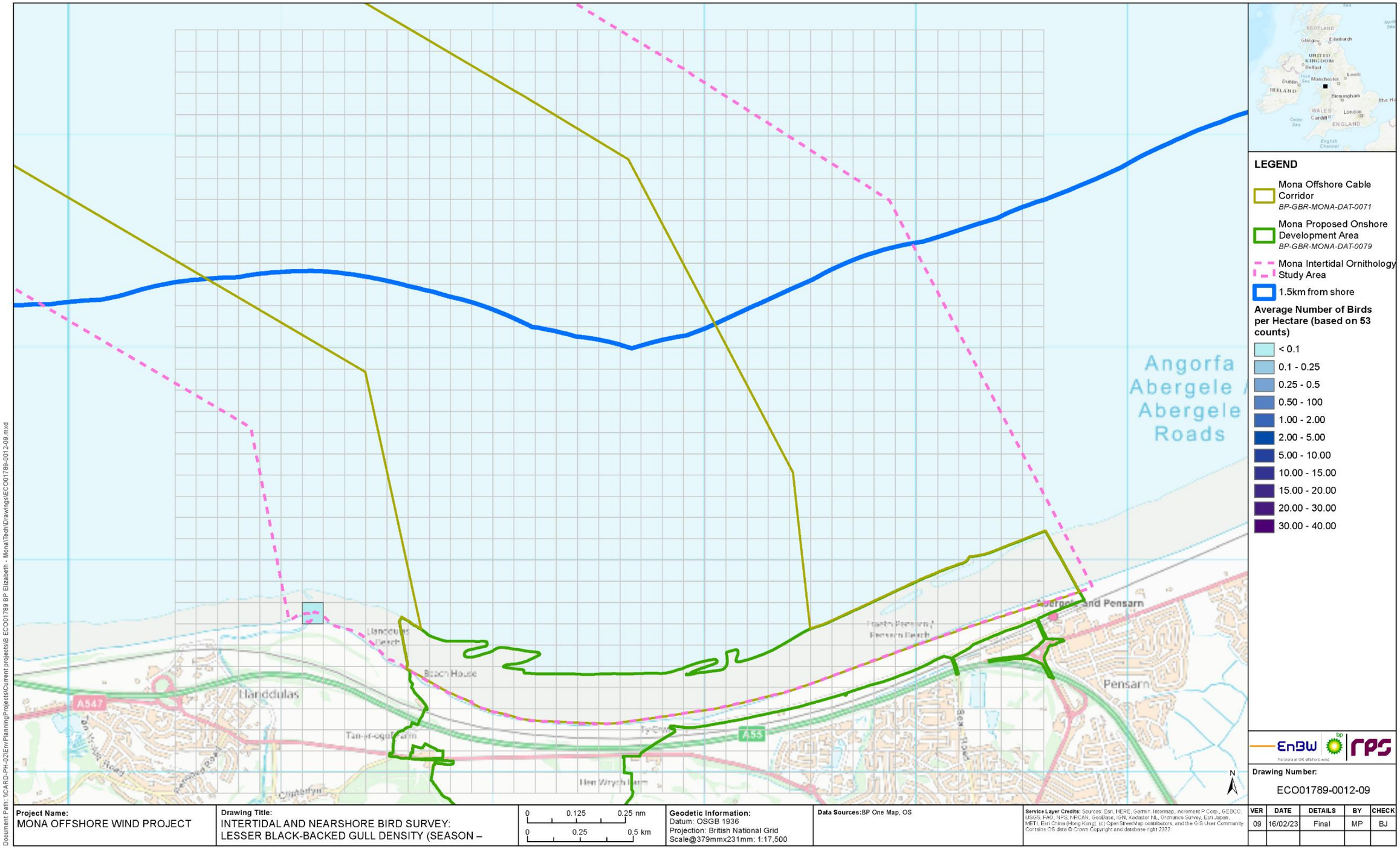


Figure 1.26: Lesser black-backed gull spatial utilisation of the intertidal ornithology study area.

Cormorants' spatial utilisation of the intertidal ornithology study area

1.2.8.14 Cormorant were present on the upper beach, intertidal, and nearshore waters (Figure 1.27), suggesting that they utilise the area for multiple purposes, whilst shag were only present on the intertidal area (Figure 1.28), suggesting that they may use the area for roosting (albeit infrequently and at low densities).

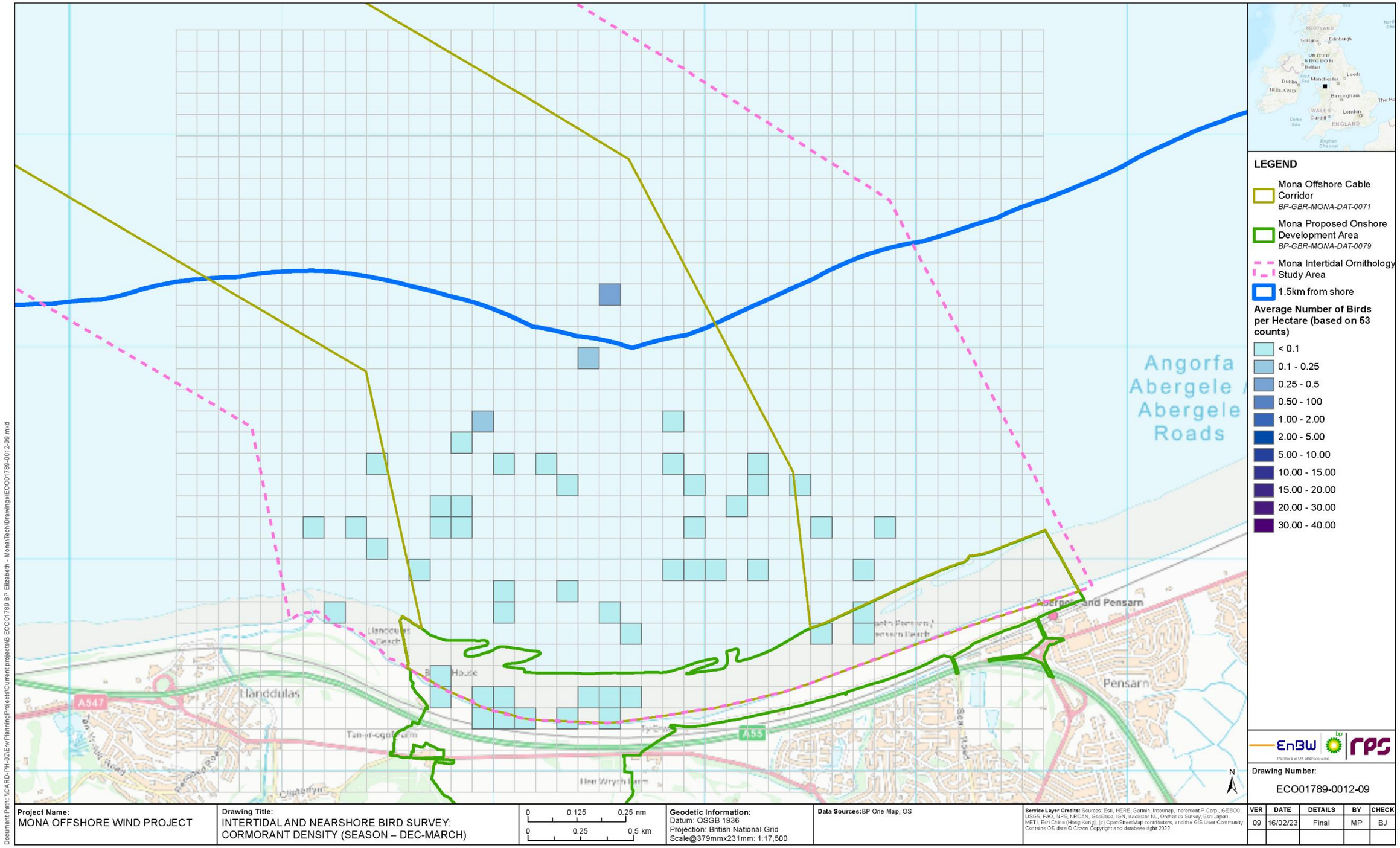


Figure 1.27: Cormorant spatial utilisation of the intertidal ornithology study area.

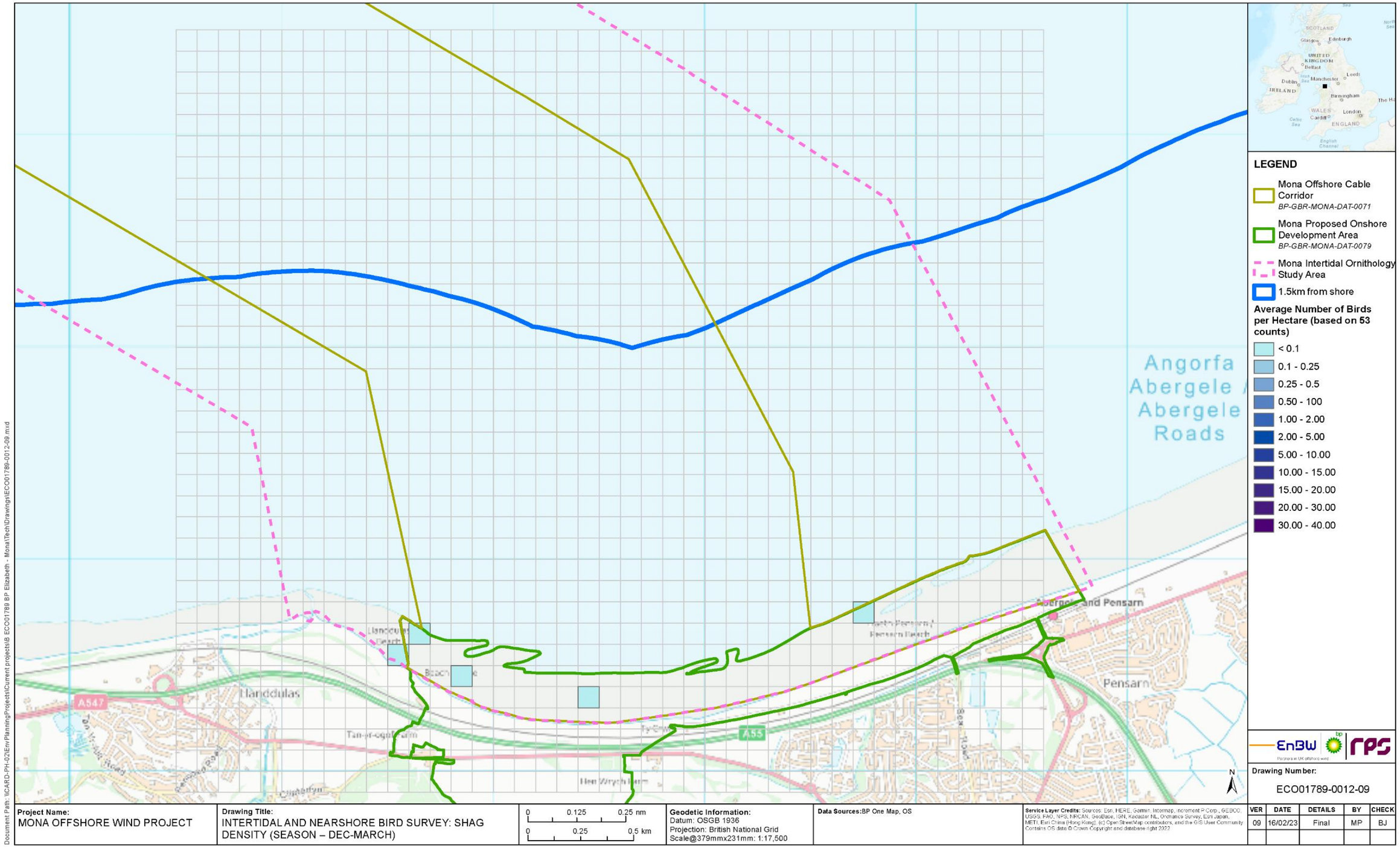


Figure 1.28: Shag spatial utilisation of the intertidal ornithology study area.

Other species' spatial utilisation of the intertidal ornithology study area

1.2.8.15 Guillemot, grey heron, and little egret (Figure 1.29 to Figure 1.31) were recorded too infrequently and at too low densities to suggest that the area is important for either foraging or roosting purposes.

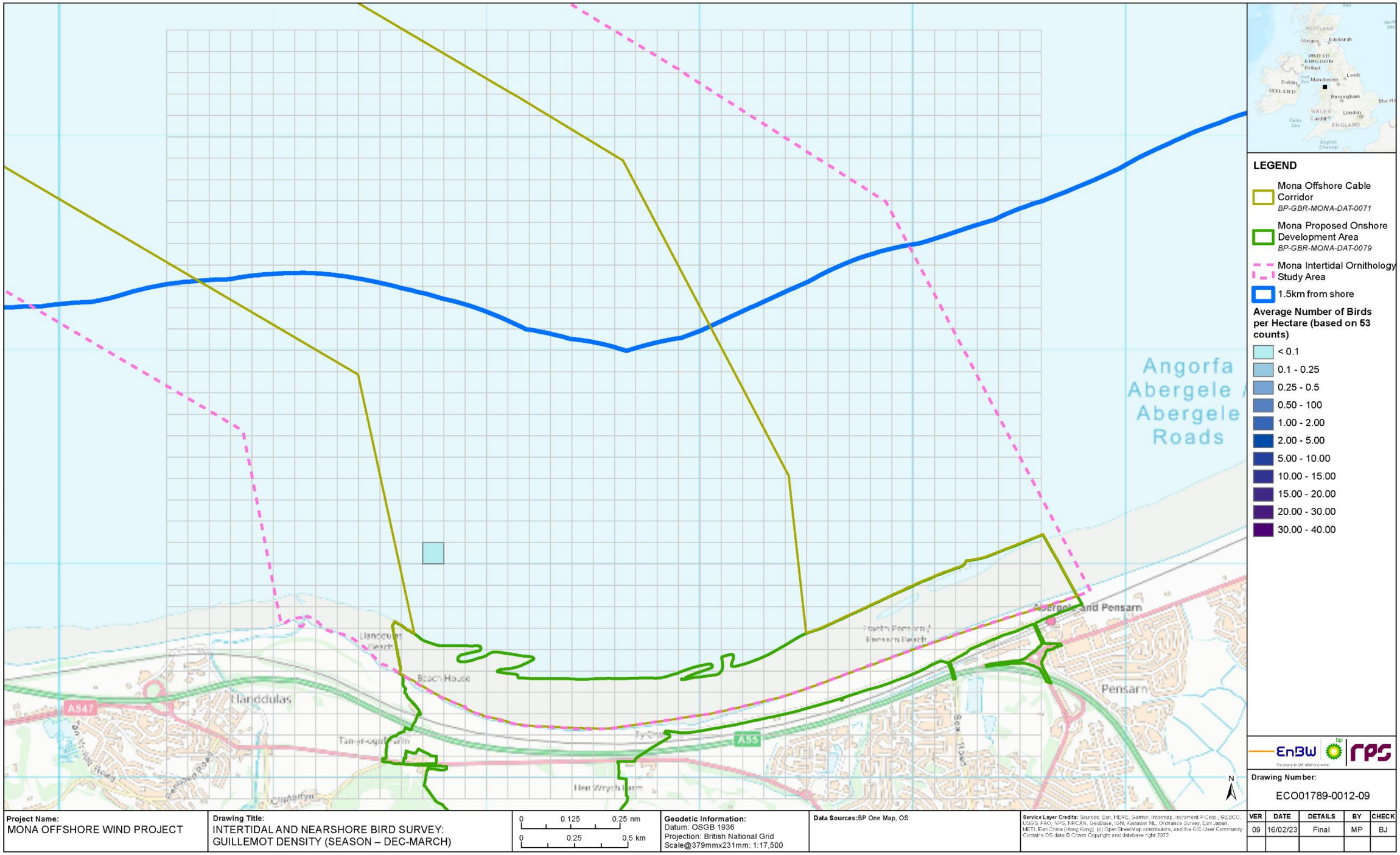


Figure 1.29: Guillemot spatial utilisation of the intertidal ornithology study area.

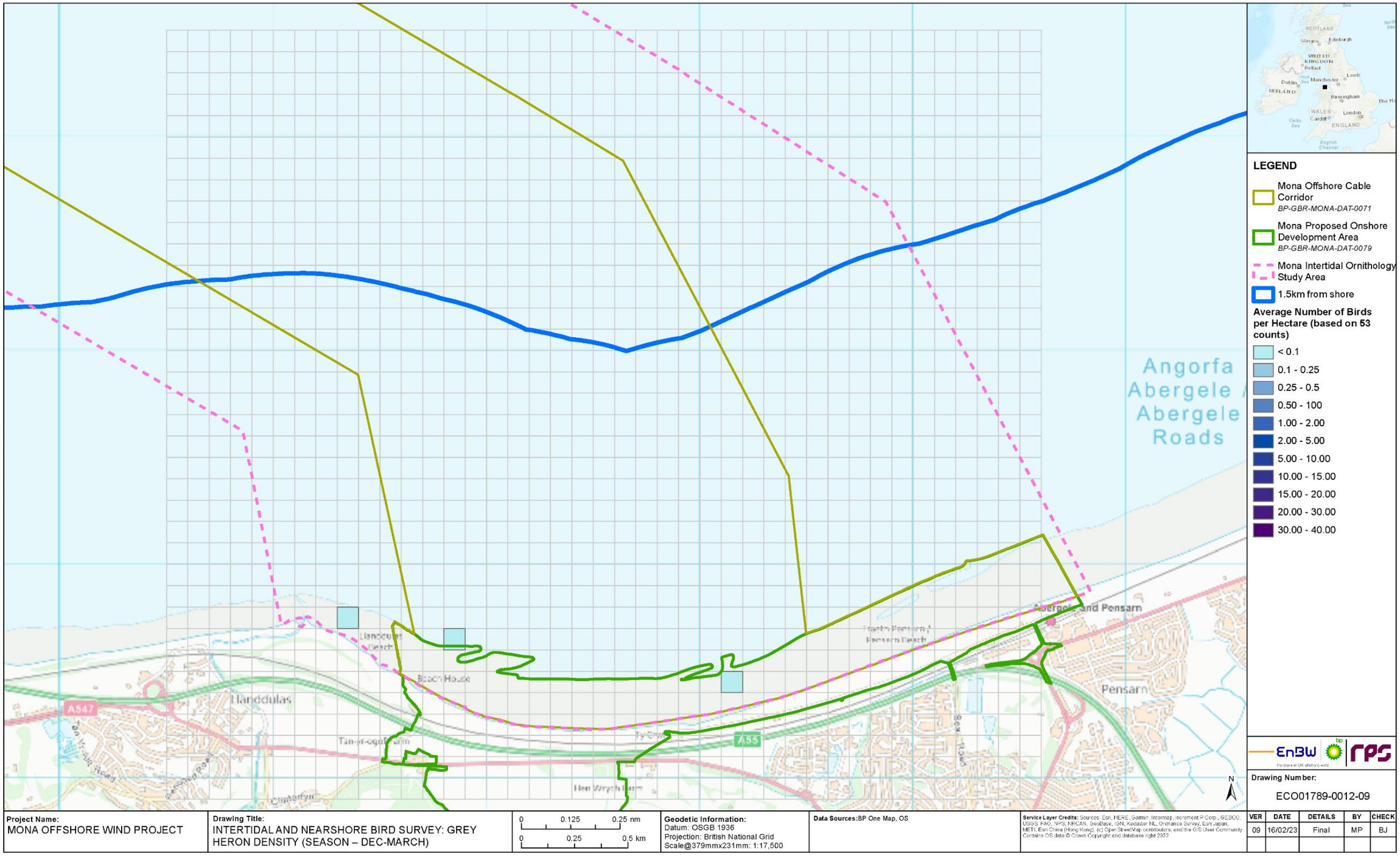


Figure 1.30: Grey heron spatial utilisation of the intertidal ornithology study area.

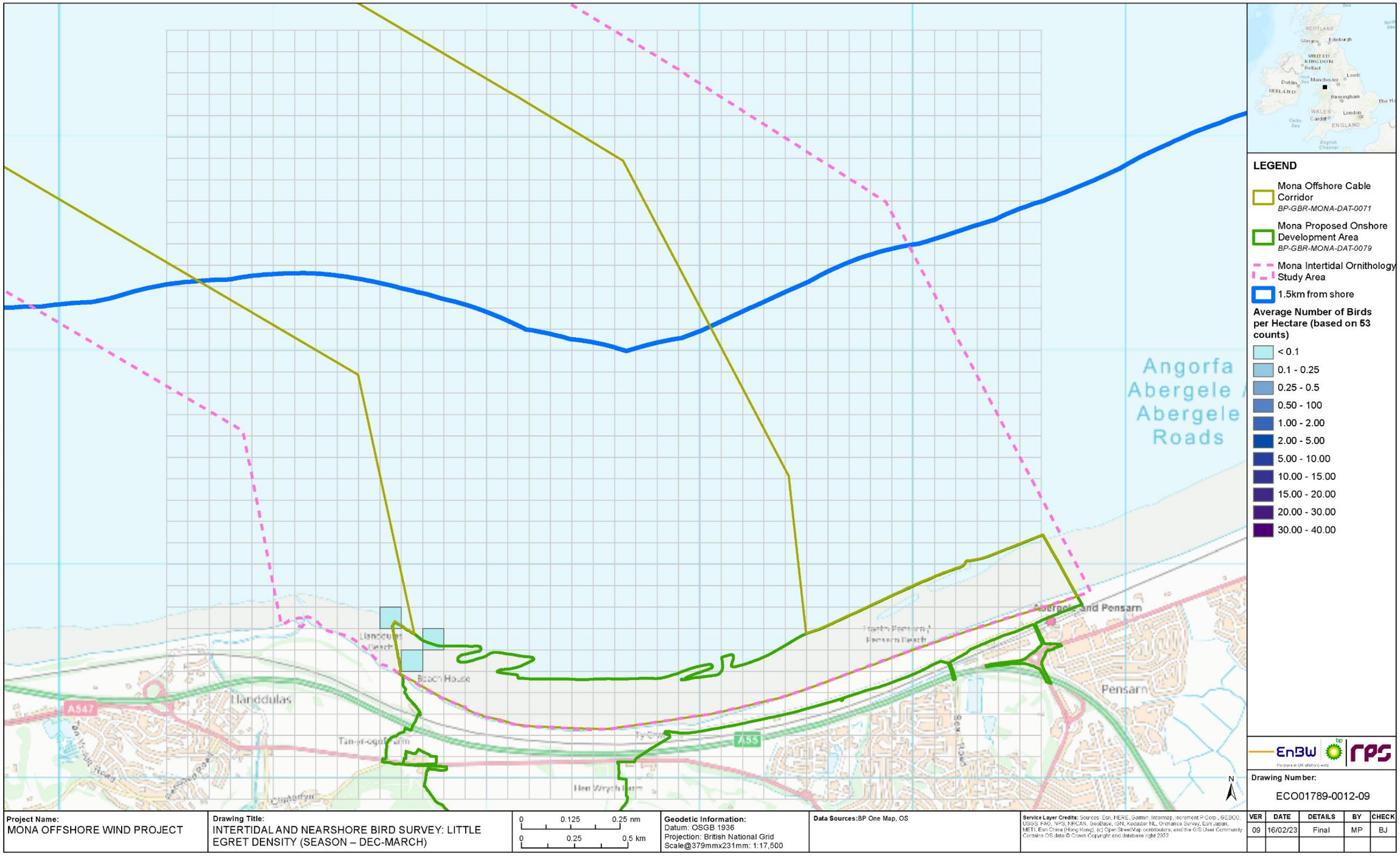


Figure 1.31: Little egret spatial utilisation of the intertidal ornithology study area.

1.2.9 Temporal utilisation of the intertidal ornithology study area

Liverpool Bay SPA qualifying species' temporal utilisation of the nearshore waters

1.2.9.1 All four Liverpool Bay SPA qualifying species were more abundant in the intertidal ornithology study area during the ebb period (from high to low) than at other stages of the tide (Figure 1.32). Red-throated diver, red-breasted merganser, and cormorant feed on fish, whereas common scoter feed on molluscs found within the benthic layer.

1.2.9.2 The survey data indicates that they switch between high and low tide positions in the nearshore waters, coming closer to shore for half a tidal cycle before switching back to a further offshore position as the water gets shallower. Cormorant are different in that they come ashore to roost and preen, so the peak seen after high tide may represent birds roosting on the shoreline.

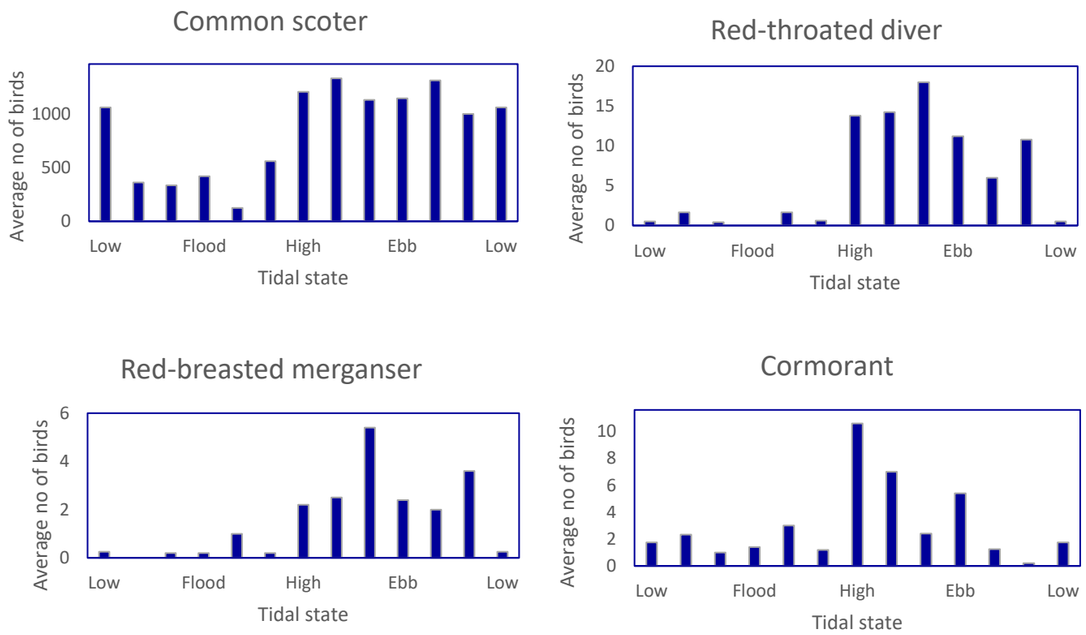


Figure 1.32: Showing how Liverpool Bay qualifying species are utilising the intertidal ornithology study area throughout the tidal cycle. The number of birds is the averaged from all counts. All data included are from the core wintering period (December 2021 to March 2022) only.

Wader species' temporal utilisation of the intertidal

1.2.9.3 Curlew and oystercatcher are abundant in the intertidal ornithology study area in all periods below mid-tide but are most abundant when the tide is ebbing (Figure 1.33). This may reflect use of the intertidal for foraging while the tide is going out and fresh foraging grounds are being uncovered. Turnstone are more abundant around the period when the tide is highest, suggesting a high tide roost in the intertidal ornithology study area (reported during survey). Redshank abundance appears to be less dependent on tidal state, indicating they use the intertidal ornithology study area for both roosting (again reported during survey) and foraging.

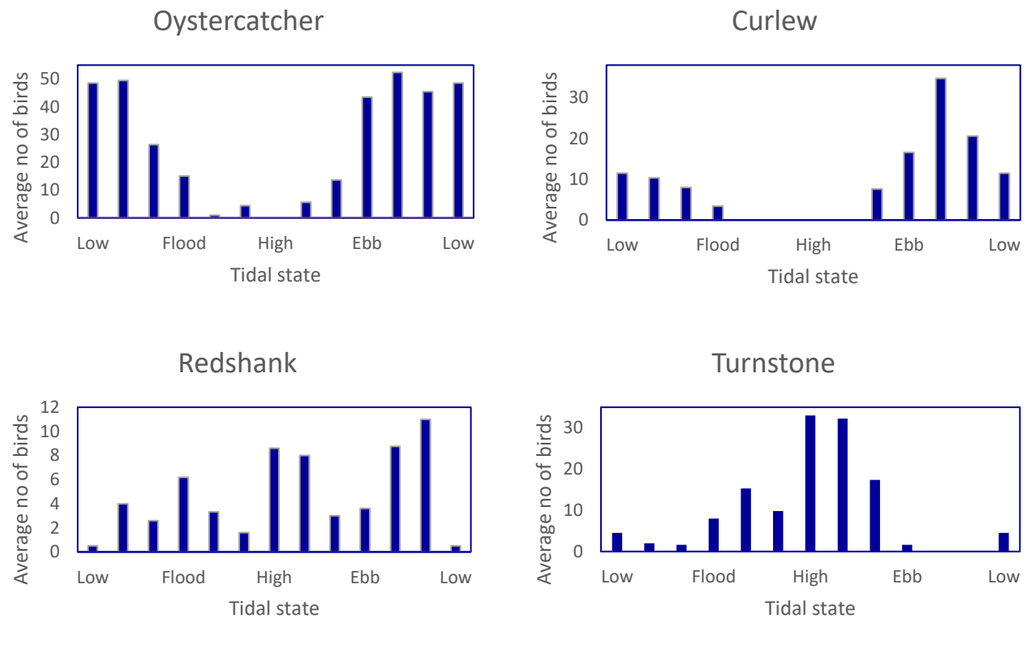


Figure 1.33: Showing how different wader species are utilising the intertidal ornithology study area throughout the tidal cycle. The number of birds is the averaged from all counts. All data included are from the core wintering period (December 2021 to March 2022) only.

1.2.10 Nocturnal surveys

1.2.10.1 As noted, there are limits on detecting birds at distance at night, but birds were still recorded, albeit at lower densities. Except for barn owl *Tyto alba* (Table 1.11), no new species were recorded at night compared to during diurnal surveys. Species richness for the intertidal ornithology study area at night was lower than during the day, with eight confirmed species recorded between January 2022 and March 2022. No birds were recorded during the January survey.

1.2.10.2 Although ringed plover were recorded during the diurnal surveys, they were recorded more frequently and at higher densities at night. Plovers have good eyesight and are known to forage extensively at night.

Table 1.11: Monthly peaks for the nocturnal survey data.

* Barn owl is a non-waterbird but is included due to its' protected status as a Schedule 1 species in the Wildlife and Countryside Act 1981, as amended.

Species	January 2022	February 2022	March 2022	Peak count
Common scoter	-	250	-	**250**
Oystercatcher	-	4	-	**4**
Redshank	-	10	-	**10**
Ringed plover	-	15	5	**15**
Common gull	-	600	-	**600**
Herring gull	-	-	590	**590**
Grey heron	-	-	1	**1**
Unidentified birds	-	70	150	**150**
Barn owl*	-	-	1	**1**

1.2.10.3 Common scoter were recorded at lower densities than during the day although this may be due to limitations with recording birds on water and at distance using the nocturnal equipment. Gulls were still frequent at night with large numbers recorded despite the survey limitations.

1.2.10.4 Some birds were not identifiable to a species level at night, with a peak of 150 unidentified birds being recorded in March 2022.

Figure 1.34: Summarising the peak data for the nocturnal surveys.

1.2.10.5 Overall, much lower numbers of birds were recorded at night than during the day (Table 1.12). This is likely to be due to visibility limitations.

Table 1.12: Monthly and overall peaks for the nocturnal survey data.

*The overall peak was calculated by summing the peak count of each species over the period (January 2022 – March 2022). This figure gives an overall number for the assemblage of waterbird species that were recorded using The intertidal ornithology study area at night during the core wintering period.

	February 2022	March 2022	Overall Number*
Peak	**949**	**747**	**1,621**

Disturbance

1.2.10.6 There is a degree of human activity, both in the locality, and within the intertidal ornithology study area. There is large tarmacked coastal path above beach level which can get quite busy and the beach to the east is well used by visitors at times. The A55 duel-carriageway also lies behind the coastal path. There is therefore a substantial level of background disturbance. For most of the survey period, direct disturbance within the intertidal ornithology study area was low. (Table 1.13). There were, however, brief periods of moderate and strong disturbance, particularly at localised points higher up the beach.

Table 1.13: Recorded disturbance, averaged per count for the diurnal surveys.

* Recorded on the upper shore so little disturbance to birds

Month	Number of each type of disturbance per count averaged per month							Overall effect of disturbance on birds
	Walkers	Dogs	Bait digger	Anglers	Kite surfers	Vehicles	Other	
December 2021	0	0	0	0	0	0	0	Weak
January 2022	1	1	0	0	0	0	1	Weak
February2022	13*	7*	0	0	0	0	2	Weak
March 2022	2	1	0	0	0	0	0	Weak
April 2022	8	2	0	0	0	0	0	Moderate

1.2.10.7 Disturbance at night was lower than that recorded during the day (Table1.14). However, surveyors reported that birds were flushed more easily at night. Background disturbance is likely to be lower at night due to lower volumes of traffic on the A55 and less pedestrians using the coastal path. This lower level of background disturbance, combined with the low levels of direct disturbance may provide one reason as to why the birds seemed more prone to disturbance at night.

Table1.14: Recorded disturbance, averaged per count for the nocturnal surveys.

Month	Number of each type of disturbance per count averaged per month							Overall effect of disturbance on birds
	Walkers	Dogs	Bait digger	Anglers	Kite surfers	Vehicles	Other	
January 2022	0	0	0	0	0	0	0	Weak
February 2022	0	0	0	0	0	0	0	Weak
March 2022	0	0	0	0	0	0	0	Weak

1.3 Summary

1.3.1.1 The wintering survey period as reported ran from December 2021 to March 2022 (inclusive). A total of 10 diurnal surveys comprising 53 counts, and seven nocturnal surveys comprising 11 counts were conducted over this period in the intertidal ornithology study area. In addition, initial results from the spring passage period (April 2022) are presented with both whimbrel and sandwich tern occurring solely during this period.

1.3.1.2 Common scoter were the most abundant species recorded in the intertidal ornithology study area throughout the wintering period, with a January 2022 peak of 2,150. Common scoter are named as a feature of the Liverpool Bay SPA, which overlaps the intertidal ornithology study area. Other Liverpool Bay features of interest which were present in the intertidal ornithology study area were: red-throated diver, red-breasted merganser, and cormorant. Common scoter, red-throated diver, and red-breasted merganser were more numerous in the nearshore waters on high and falling tides.

1.3.1.3 Waders were present in the intertidal ornithology study area, although in relatively low densities. Of the frequently recorded wader species, oystercatcher were the most abundant (peak of 188), followed by curlew (peak of 71), turnstone (peak of 54), and redshank (peak of 34). Oystercatcher and curlew were most abundant at low tides indicating that they use the intertidal ornithology study area for foraging whereas turnstone were most abundant at high tide indicating a high tide roost for this species. Redshank showed no strong relationship with tidal state indicating that they may use the intertidal ornithology study area for multiple purposes.

1.3.1.4 Gulls were abundant within the intertidal ornithology study area with relatively high peaks for black-headed gull (peak of 546), common gull (peak of 713), and herring gull (peak of 915).

1.3.1.5 Species that were present during both the nocturnal and diurnal surveys were common scoter, oystercatcher, redshank, and ringed plover. Ringed plover were the only species which were both more abundant and more frequently recorded at night.

1.3.1.6 Many birds were unidentifiable to species level at night, and a peak of 150 unidentified birds were recorded. It was also evident that birds were more prone to disturbance at night.

1.3.1.7 Nocturnal survey results are not directly comparable to diurnal data. However, the nocturnal surveys have confirmed that the intertidal ornithology study area is frequented by waterbirds at night.

1.3.1.8 Although direct disturbance on the intertidal ornithology study area is weak, the background disturbance in the area is strong, and birds are likely to be habituated to a degree to the noise from the A55, and pedestrian traffic from the busy tarmacked coastal path above the upper shore.

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Appendix A: Intertidal and nearshore coastal waterbird surveys methodology

A.1.1 Intertidal and nearshore coastal 'through-the-tidal-cycle' waterbird surveys methodology

1.4.1.1 The main objectives of the inertial and nearshore coastal 'throughout-the-tidal-cycle' waterbird surveys are to identify any areas:

- Which support significant numbers of qualifying species of the various coastal/marine designated sites
- Which are of importance for large assemblages of wetland birds
- Which have seasonal periods of sensitivity for wetland birds (e.g. staging posts for migratory birds or traditional feeding and roosting grounds).

A.1.2 Daytime surveys

1.4.1.2 The daytime survey programme comprises of a series of monthly intertidal and nearshore coastal waterbird surveys that commenced in December 2021 and are proposed to continue until June 2023, to account for the inter-annual variation and capture seasonal fluctuations (i.e. spring, autumn passage and winter).

1.4.1.3 The intertidal ornithology study area comprises the Mona Proposed Landfall and extend for a minimum of 500m in each direction along the coast from the Mona Proposed Landfall. The survey area will remain the same throughout the survey period subject to any changes of the Mona Proposed Landfall, or subject to feedback from Natural England and NRW. Any refinements will be documented and reported to Natural England and NRW as appropriate.

1.4.1.4 The survey area is segmented into discrete count sectors, which are clearly defined on a field map. The count sectors, set up during a preliminary scoping visit, are based on local features such that the sectors can be repeatedly identified by different surveyors if necessary.

1.4.1.5 Each survey sector extends out to sea by 1.5km from the shoreline (MHWS mark) or the HAT mark. To identify the distribution of birds, the count sectors are further segregated into three distance bands from the shoreline:

- 0 to 500m
- 500m
- 1km
- 1km to 1.5km.

1.4.1.6 Counts in each sector are conducted by a surveyor at approximately monthly intervals during the survey period. During each survey the waterbird species present in each sector along the foreshore and nearshore coastal waters are counted and ascribed to one of the three distance bands. Observations of waterbird species (including the numbers of each species in a given location and behaviour) are plotted onto a field map using standard BTO species codes.

1.4.1.7 Surveys are scheduled to cover a range of times of day and different tidal conditions (high, low and mid-tides; on spring and neap tides) throughout the survey programme. If feasible, counts are made once per hour of the tidal cycle period of 12 hours (-6 to +5 relative to low tide), but as a minimum provide counts of birds in the four periods of high tide, ebb tide, low tide and flood tide. Surveys alternate between spring (or near-spring) and neap (or near-neap) tidal states.

1.4.1.8 Survey methods are based on the Core Count (high tide) and Low Tide Count methodology of the BTO, JNCC, RSPB and WWT WeBS scheme (Musgrove et al., 2003). This involves the surveyor counting or plotting birds from vantage points along the coast using binoculars and a telescope. In addition to the location and number of birds, notes are also made on their behaviour: foraging and non-foraging (e.g. roosting, loafing etc).

1.4.1.9 Field records are transferred to a GIS. This produces accurate information on the distribution of birds within the intertidal ornithology study area and enables maps to be produced so that areas of ornithological importance can be identified.

1.4.1.10 Weather conditions including wind speed (using the Beaufort Scale), cloud cover (estimated as eighths or octas of the sky), visibility and temperature are also recorded as well as sources of disturbance to birds encountered during surveys.

A.1.3 Nocturnal surveys

1.4.1.11 A programme of nocturnal surveys has also commenced in January 2022 and is proposed to continue until February 2023. These are the same as the diurnal surveys except that they run on a reduced intensity and cover a reduced survey area.

1.4.1.12 Due to the more limited range of nocturnal equipment, only the first 500m of the intertidal zone (from the MHWS/HAT mark) is surveyed. For health and safety reasons, observers carry out night work in pairs. Monthly through-the-tidal-cycle counts cover half a tidal cycle each month. This means that for each monthly survey, birds are counted during an approximate 6 hour period (instead of full tidal cycle of approximately 12 hours), with the aim of a complete count of a tidal cycle every two months.

1.4.1.13 The frequency of counts is adapted to the amount of bird activity in the section. During periods of high level of activity, the frequency of counts is reduced to three over a half tidal cycle (i.e. high, mid and low) whilst it is possible to conduct hourly counts during period of low level of activity.

1.4.1.14 Working in pairs, one observer locates birds using a thermal monocular (e.g. Pulsar Axion XM30S or the Pulsar Quantum HD50S), whilst the second observer video and ID species or groups using an image-intensifying camera (or camcorder) coupled with an infra-red spotlight. This approach allows the detection and identification of most waterbird species within 300m to 400m from the observer's position.

1.4.1.15 Similar to diurnal surveys, the position of the birds is directly mapped using BTO codes or alternatively marked with a labelled symbol and subsequently cross referenced to a data field form. Behaviour is recorded as foraging (actively looking for food) and non-foraging. In some instances, it is not possible to identify species in situ and the observers will need to view pictures or videos on a desktop/laptop to confirm identification. In addition to the avoidance of periods of strong wind, the survey is

planned to avoid any types of precipitation (even slight rain) given that precipitation interferes with nocturnal recording equipment.

1.4.1.16 Any source of disturbance to the birds in each section at the time of the count is recorded under the following categories: walkers, dogs, anglers, bait diggers, shellfishers, vehicles, unpowered boats, powered boats, aircraft and 'other'. The perceived effect of disturbance on abundance and behaviour of birds in the count section is scaled according to the following categories shown in Table A. 1 below.

Table A. 1: Perceived effect of disturbance on abundance and behaviour of birds.

	Notation	Definition
Effect	W	Weak (e.g. change in behaviour, but birds not excluded)
	M	Moderate (e.g. birds excluded from parts of the recording sector)
	S	Strong (e.g. avoidance of the recording sector)