Seabird Survey Programme Findings, Humber Gateway Windfarm

Report to E.ON Renewables

Institute of Estuarine
and Coastal Studies,
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For and on behalf of the Institute of Estuarine and Coastal Studies	
Approved by:	_____
Signed:	_____
Position:	_____
Date:	_____

EXECUTIVE SUMMARY

This report details the results of seabird surveys conducted by the Institute of Estuarine & Coastal Studies (IECS) on behalf of Humber Wind Ltd (HWL) in the vicinity of a proposed offshore windfarm site off the Yorkshire coast. The proposed windfarm site lies in inshore waters *c.* 8km off the Holderness coast and covers an area of 35.5km^2. In addition to a desk study collating published and unpublished ornithological data for this section of the Holderness coast, two survey techniques were employed in and around the proposed windfarm site in order to collect and collate information on seabird usage. The monitoring programme included a total of 29 ship-based seabird surveys conducted between September 2003 and December 2005, and a further 16 aeroplane surveys during the October 2003 to September 2005 period; both monitoring techniques were conducted using the standard seabird methodology recording techniques using a transect based approach. Subsequent to the survey programme, the data have been analysed for abundance, seasonality and density and the data input to a series of maps in order to graphically demonstrate the distribution of key species on a seasonal basis).

Where appropriate, consultation and agreement on key issues and monitoring and analysis approach has been sought and agreed with a range of statutory and non-statutory environmental bodies, including Natural England (NE), the Royal Society for the Protection of Birds (RSPB) and the Yorkshire Wildlife Trust (YWT).

The proposed windfarm site lies in the vicinity of several Special Protection Areas (SPAs) along the Yorkshire coast. The main ornithological interest in the vicinity of the windfarm site is the Humber Flats, Marshes and Coast SPA. The nearest point of this SPA to the proposed development site is c. 8km. The Flamborough Head and Bempton Cliffs SPA and Flamborough Head SAC is located at about 55km to the north of the proposed offshore windfarm site. In addition, the Hornsea Mere SPA is situated less than 1km from the sea on the East Yorkshire coast. Other sites of interest in the vicinity of the proposed development include Spurn Head, with coastal passage seabird data from recent years collected by the Spurn Bird Observatory also included within this report.

The boat and aircraft survey programmes undertaken off the Holderness coast identified the area of sea in the vicinity of the proposed Humber Gateway windfarm site as being used by a number of seabird species, together with, on occasion, migratory waterfowl and passerines. Detailed accounts of the programme findings on a species basis are provided within the main text, with a summary of these given below.

The majority of registrations were for seabirds, largely Gulls and Auks, but with Divers and Terns also present. The area around the proposed windfarm development was used throughout the year, with the function and abundance of individuals varying seasonally. For instance, Auk usage peaked during the late summer and early autumn, with dispersion away from the breeding colony on Flamborough Head, whilst usage by most Gull species tended to peak during the winter months.

Red-throated Diver were recorded within the survey area, although densities within the proposed windfarm site were relatively low, with a more near-shore distribution, running along the coast. Recent seabird surveys around Thames mouth have identified substantial

offshore Diver flocks with distribution ascribed to a combination of physical, biological and anthropogenic parameters, including shallow waters, a sandy substratum supporting a *Nephtys* and amphipod community and an absence of shipping movement. Off the Holderness coast, these parameters are largely confined to the nearshore, coastal margins with waters deepening to over 10m CD within c. 5km of the coast, and with the majority of mobile sands similarly confined to the coastal margins, except around the Binks and in Bridlington Bay. As such, it is not unexpected that the wintering distribution of Red-throated Diver along the Holderness coast had a largely coastal distribution.

The Northern Fulmar was recorded throughout the survey area, particularly during the summer, with dispersed foraging undertaken within the area. However, no concentrations were identified within, or adjacent to, the windfarm site, and flight heights were almost always below the rotor height. The species breeds on Flamborough Head, and as with other breeding species associated with the area, may be considered of greater sensitivity, given the relative proximity of the development to the colony. However, the absence of any concentrations within or adjacent to the development area suggests that the area is not particularly important for foraging, and the relatively low flight height means that the species has a low collision risk with the rotors.

The Northern Gannet also breeds at the Flamborough Head and Bempton Cliffs SPA site, and, given its relatively long lifespan and associated relatively low population dynamics) and small breeding population at the colony, it might be considered of greater sensitivity to the development, particularly as long distance flights to habitual feeding areas are undertaken. However, relatively few birds were recorded within the survey area, and fewer still in the vicinity of the windfarm site, with most birds located to the northern section of the survey area, and further offshore. Although flights through the area were observed, no key flight-lines were observed within the windfarm area.

Tern species were also recorded within the survey area, and indeed, within the development site. Predominantly, records were for the main passage periods, with Common Tern most frequently recorded. No concentrations of usage, in particular fishing, were observed within the proposed development site, but flights within the rotor height did occur. Numbers of Little Tern, which have a breeding colony at Spurn Head were not recorded within the development site.

Gull registrations were the most numerous from the survey programme, with Mew Gull and Black-legged Kittiwake particularly common. In general, Gull usage was primarily recorded during the autumn and early winter, with most registrations for individual birds foraging within the survey area. On occasion, a roost flock of Great Black-backed Gull was recorded on one of the remotely operated gas platforms, with a greater density of registrations around this area with birds transiting to and from the roost. However, most Gull species exhibited no particular concentration of usage within, or adjacent to, the proposed Humber Gateway site, although the area of sea off the mouth of the Humber was potentially one of the preferred areas for some species. The Black-legged Kittiwake is included within the Flamborough Head and Bempton Cliffs SPA citation, and as such, the impact of the proposed development to the species and in particular the status of the breeding colony will need to be addressed in detail during the main Environmental Statement phase. Whilst the species was regularly recorded within the proposed windfarm area, no concentrations were identified in the vicinity. A large, often dispersed, flock of Little Gull was recorded during the

late summer and autumn periods of survey programme, this flock being initially recorded off Hornsea Mere in the late summer, where the species is known to roost during post-breeding moult, but with flocks also recorded further south down the coast during the early autumn, predominantly over 15km offshore, but with a small number of birds recorded within the proposed windfarm site.

As might be expected given the abundance and proximity of the Flamborough Head breeding colony, Auks were frequently recorded during the survey programme. Common Guillemot were most commonly recorded, with the peak abundance within the vicinity of the proposed development site recorded during the late summer and early autumn. However, no particular concentrations of feeding or loafing birds were recorded within the proposed development site, and similarly, no clear flight-lines to and from feeding areas were observed through the site, with flight movements undertaken below the height of the rotors.

The report concludes that no seabird species were recorded in particular concentrations within the proposed windfarm site, and no clear flight-lines within the potential rotor height identified. However, the report recommends that for several seabird species, either due to their breeding status on the Flamborough Head and Bempton Cliffs SPA site, an aspect of their ecology, or conservation concern status, additional impact analysis during the main Environmental Statement phase will be necessary.

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1. INTRODUCTION

This report details the result of seabird surveys conducted by the Institute of Estuarine & Coastal Studies (IECS) on behalf of Humber Wind Ltd (HWL) in the vicinity of a proposed offshore windfarm site off the Yorkshire coast. The proposed windfarm lies in inshore waters *c.* 8km off the Holderness coast and covers an area of 35.5km^2 (see Figure 1). For the context of this report, the UK offshore area refers to the area from the 12 nautical mile territorial seas limit out to the designated UK Continental Shelf limit.

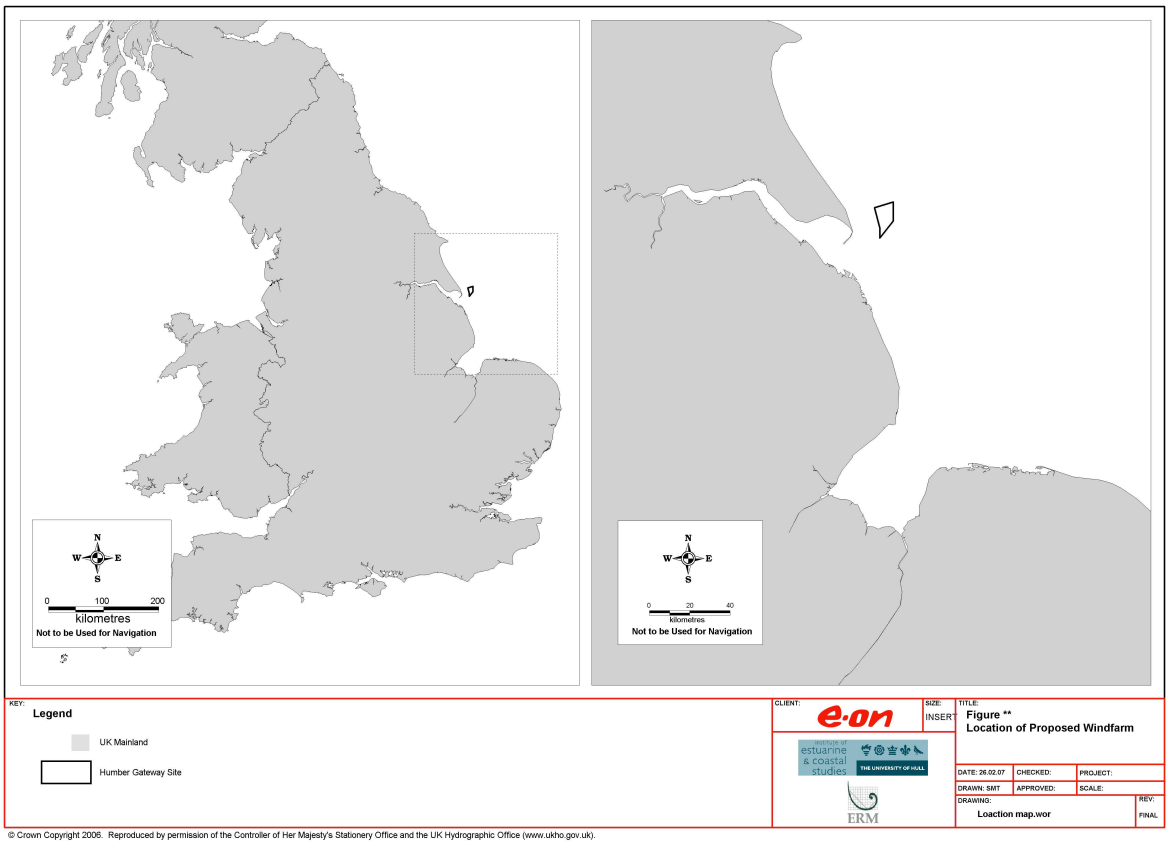

Figure 1: Location of the proposed development site.

In addition to a desk study collating published and unpublished ornithological data for this section of the Holderness coast, two survey techniques were employed in and around the proposed windfarm site in order to collect and collate information on seabird usage. These techniques employed boat and aircraft based survey platforms using established and agreed methodologies for the monitoring of seabird populations in relation to offshore windfarm developments.

The monitoring programme has included a total of 29 ship-based seabird surveys conducted between September 2003 and December 2005, and a further 16 aeroplane surveys during the October 2003 to September 2005 period; both monitoring techniques were conducted using the standard seabird methodology recording techniques (Camphuysen *et al.,* 2003), with amendments where necessary in order to ensure compliance with the evolving national methodologies.

This report details the results of the ship-based and aerial surveys, with the main objective to detail the generalised seasonal movements of seabird species across the windfarm site, and also to provide information on the relative densities and distribution of bird species across the proposed windfarm site. In addition, the surveys were tasked with identifying any avifaunal movements in relation to important ornithological sites in the region, and in particular, sites designated as being of international importance.

2. CONTEXT

2.1 Project Consultation

Consultation has been undertaken with a range of statutory and non-statutory environmental bodies, including Natural England (NE), the Royal Society for the Protection of Birds (RSPB) and the Yorkshire Wildlife Trust (YWT). The requirements for the survey methods (extent, timing and scope) were discussed with the relevant consultees during autumn 2003, with a meeting between Humber Wind Ltd and relevant parties at York in December of 2003 when the final methodology was agreed. A further meeting between the same parties was undertaken in June 2004, in order to respond to evolving survey methodologies and to incorporate issues relating to several proposed windfarms in the area, including the Total windfarm development (Westermost Rough), located to the north of the Humber Wind Ltd site, the size and extent of this latter site having only been established after the initial programme on behalf of HWL had been agreed and had commenced. Regular meetings of a liaison group (comprising representatives from Natural England, Yorkshire Wildlife Trust, IECS and Humber Wind Ltd) continued during and subsequent to the programme in order to inform all parties of interim findings and potential issues.

2.2 Review of SPA and Other Relevant Designations along the Holderness Coast

The proposed windfarm site lies in the vicinity of several Special Protection Areas (SPAs) along the Yorkshire coast. The SPAs are strictly protected sites classified in accordance with Article 4 of the EC Directive on the conservation of wild birds (79/409/EEC), also known as the Birds Directive, which came into force in April 1979. They are classified for rare and vulnerable birds, listed in Annex I of the Birds Directive, and for regularly occurring migratory species. A full review of the UK SPA network both in terms of the number of sites selected and the species that qualify within these sites has been produced by Stroud *et al.* (2001) in *The UK SPA network: its scope and content*. The information presented in the following section is extracted from Stroud *et al.* (2001).

2.2.1 HUMBER ESTUARY EUROPEAN SITE

The main ornithological interest in the vicinity of the windfarm site is the Humber Flats, Marshes and Coast SPA. The nearest point of this SPA to the proposed development site is c. 8km. The estuary supports important numbers of waterbirds (especially geese, ducks and waders) during the migration periods and in the winter. It also supports breeding populations of Terns and Raptors in summer.

This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive (Table 1).

Table 1: Humber Flats, Marshes and Coast SPA/Ramsar - qualifying species and populations listed in Annex 1 of the directive.

Status	Species	Population
Breeding	Little Tern *(Sterna albifrons)*	63 pairs representing at least 2.6% of the breeding population in Great Britain[1]
	Eurasian Marsh Harrier *(Circus aeruginosus)*	11 pairs representing at least 6.9% of the breeding population in Great Britain (count as at 1995)[1]
Wintering	Great Bittern *(Botaurus stellaris)*	2 individuals representing at least 2.0% of the wintering population in Great Britain (5 year mean 1991/92-1995/96)[1]
	European Golden Plover *(Pluvialis apricaria)*	29,235 individuals representing at least 11.7% of the wintering population in Great Britain (5 year peak mean 1991/92 - 1995/96)[1]
	Hen Harrier *(Circus cyaneus)*	20 individuals representing at least 2.7% of the wintering population in Great Britain (5 year peak mean 1984/85-1988/89)[1]

[1] JNCC SPA Review data.

This site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting migratory species populations of European importance (Table 2).

Table 2: Humber Flats, Marshes and Coast SPA /Ramsar - qualifying internationally important bird populations (wintering and migratory species).

Status	Species	Population
Passage	Common Redshank *(Tringa totanus)*	5,212 individuals representing at least 2.9% of the Eastern Atlantic - wintering population (5 year peak mean 1991/92 - 1995/96)[1]
	Sanderling (*Calidris alba*)	1,767 individuals representing at least 1.8% of the Eastern Atlantic/Western & Southern Africa wintering population (2 year mean May 1993-5)[1]
Wintering	Dunlin (*Calidris alpina alpine*)	23,605 individuals representing at least 1.7% of the wintering Northern Siberia/Europe/Western Africa population (5 year peak mean 1991/92 - 1995/96)[1]
	Red Knot (*Calidris canutus)*	33,848 individuals representing at least 9.7% of the wintering north-eastern Canada/Greenland/Iceland/north-western Europe population (5 year peak mean 1991/92 - 1995/96)[1]
	Common Redshank (*Tringa tetanus*)	4,452 individuals representing at least 3.0% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/92 - 1995/96)[1]
	Common Shelduck (*Tadorna tadorna*)	4,083 individuals representing at least 1.4% of the wintering north-western Europe population (5 year peak mean 1991/92 - 1995/96)[1]

[1] JNCC SPA Review data

The area additionally qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl. Over winter, the area regularly supports 187,617 individual waterfowl (5 year peak mean 1991/92 - 1995/96) including: Mallard (*Anas platyrhynchos)*, European Golden Plover (*Pluvialis apricaria)*, Bar-tailed Godwit (*Limosa lapponica)*, Common Shelduck (*Tadorna tadorna)*, Red Knot (*Calidris canutus)*, Dunlin (*Calidris alpina)*, Common Redshank (*Tringa totanus)*, Great Cormorant (*Phalacrocorax carbo)*, Dark-bellied Brent Goose (*Branta bernicla bernicla)*, Great Bittern (*Botaurus stellaris)*, Eurasian Teal (*Anas crecca)*, Eurasian Curlew (*Numenius arquata)*, Common Pochard (*Aythya ferina)*, Common Goldeneye (*Bucephala clangula)*, Eurasian Oystercatcher (*Haematopus ostralegus)*, Ringed Plover (*Charadrius hiaticula)*, Grey Plover (*Pluvialis squatarola)*, Northern Lapwing (*Vanellus vanellus)*, Sanderling (*Calidris alba)*, Black-tailed Godwit (*Limosa limosa)*, Eurasian Wigeon (*Anas penelope)* and Whimbrel (*Numenius phaeopus)*.

2.2.2 FLAMBOROUGH HEAD AND BEMPTON CLIFFS EUROPEAN SITE

This is a European Marine Site (Flamborough Head and Bempton Cliffs SPA and Flamborough Head SAC) located at about 55km to the north of the proposed offshore windfarm site, and covers over 6300ha, including the steep chalk cliffs of the headland which rise to 135m, adjacent cliff-top vegetation, the intertidal chalk platforms at the base of the cliffs and adjacent subtidal chalk reefs and caves.

The site supports large numbers of breeding seabirds (over 300,000 birds) including Black-legged Kittiwake and Auks, as well as the only mainland-breeding colony of Northern Gannet in the UK (over 1,500 pairs depending on year). The seabirds feed and raft in the waters around the cliffs, outside the SPA, as well as feeding more distantly in the North Sea. The intertidal chalk platforms are also used as roosting sites, particularly at low water and notably by juvenile Black-legged Kittiwakes (Stroud *et al.,* 2001).

This site qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting migratory species populations of European importance (Table 3).

Table 3: Flamborough Head and Bempton Cliffs SPA - qualifying internationally important bird populations.

Status	Species	Population
Breeding	Black-legged Kittiwake *(Rissa Tridactyla)*	83,370 pairs representing at least 2.6% of the breeding Eastern Atlantic - Breeding population (count, as at 1987) [1]

[1] JNCC SPA Review data

The area additionally qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 seabirds. During the breeding season, the area regularly supports 305,784 individual seabirds including: Atlantic Puffin (*Fratercula arctica)*, Razorbill (*Alca torda)*, Common Guillemot (*Uria aalge)*, Herring Gull (*Larus argentatus)*, Northern Gannet (*Morus bassanus*) and Black-legged Kittiwake (*Rissa tridactyla)*.

2.2.3 HORNSEA MERE EUROPEAN SITE

Hornsea Mere is the largest freshwater lake in Yorkshire, situated less than 1km from the sea on the East Yorkshire coast. It is of glacial origin, shallow (1-2m deep), eutrophic and fringed with reedbeds, fen and carr. Hornsea Mere supports breeding and wintering waterbirds, which feed on the open water and use the marginal vegetation for feeding and roosting (Stroud *et al.,* 2001).

This site qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting migratory species populations of European importance (Table 4).

Table 4: Hornsea Mere SPA /Ramsar - qualifying internationally important bird populations.

Status	Species	Population
Wintering	Gadwall *(Anas strepera)*	83,370 pairs representing at least 2.6% of the breeding Eastern Atlantic - Breeding population (Count, as at 1987) [1]

[1] JNCC SPA Review data

2.2.4 OTHER SITES & DESIGNATIONS

A series of other sites of regional or national importance can be found in south Holderness and north Lincolnshire, including wetland areas such as Haverfield Pits, Fisherman's Channel and Beacon Lagoons. Spurn Head, as well as being part of the Humber European Site, is of importance as a coastal landform and associated habitat for the landfall of many migrant passerines. As such, a bird observatory has compiled a comprehensive database of records of bird movements along and onto the coast at this point. Recent information from this database is summarised and discussed in the following sections.

2.3 Review of Existing Avifaunal Data from the Spurn Area

2.3.1 SPURN BIRD OBSERVATORY (7 YEAR DATA SET 1999 TO 2005)

Information on the area is available from the Spurn Bird Observatory, which brings valuable details on the usage of bird of Spurn Peninsula although for marine birds the observations are predominantly restricted to the coastal margin (*c.* 1-2km). Information from the Spurn Bird Observatory shows the area to be important for seabird passage. Table 5 summarizes observations from the Spurn Bird Observatory from 1999 to 2005. It presents the peak maxima and months of occurrence for key species recorded at the Spurn Bird Observatory.

Table 5: Summary of key species maxima and months of occurrence recorded at Spurn, 1999 to 2005 (source: Spurn Bird Observatory)

Direction/activity with the highest count is listed first for each species. *Gaps indicate where data is not applicable*

KEY							
N	North	F	Falls	FO	Feeding offshore	R	Roosting
S	South	FD	Feeding	FI	Feeding inshore	FE	In from the east
E	East	I	Inshore	OS	Coming off the sea	EH	East of the Humber
W	West	O	Offshore	FS	Coming in from the sea	UH	Up the Humber

Species	Year													
	1999		2000		2001		2002		2003		2004		2005	
	Peak count: direction/ activity: date	Main period of movement	Peak count: direction/ activity: date	Main period of movement	Peak count: direction/ activity: date	Main period of movement	Peak count: direction/ activity: date	Main period of movement	Peak count: direction/ activity: date	Main period of movement	Peak count: direction/ activity: date	Main period of movement	Peak count: direction/ activity: date	Main period of movement
Red-throated diver	145: N: 06/03	05/03 - 04/12	291: N: 26/02	15/01 - 26/02	167: S: 23/09	No record	134: FO: 10/03	19/02 - 10/03, 23/09	181: FO: 15/02	11/02 - 13/03	203: O: 16/02	No record	239: S: 16/09	04/02 - 15/03, 16/09 - 17/09
	100: S: 05/03	05/03 - 04/12	150: S: 12/02, 03/03	15/01 - 03/03, 26/11	80: O: 01 - 03	15/01 - 14/03					104: N: 16/02	16/02, 25/09 - 23/11	186: N: 04/03	04/02 - 15/03, 16/09 - 17/09
					9: N: 23/09	No record					49: S: 16/02	16/02, 25/09 - 23/11	25: O: 04/02	No record

Table 5 cont.

Fulmar	770: S: 19/08 390: N: 20/08	09/03 - 20/08 09/03 - 20/08	622: S: 02/09 58: N: 16/09	27/05 - 28/05, 19/08 - 16/09 27/05 - 28/05, 16/09	219: S: 02/06 151: N: 02/06	04/02 - 10/06, 09/09 - 18/09 28/02, 02/06 - 10/06, 07/09 - 18/09	157: S: 15/03 44: N: 26/08	No record No record			123: N: 08/07 39: S: 07/09	08/07 - 07/09 08/07 - 07/09	274: N: 16/09 138: S: 20/04 5: UH: 16/04	16/04 - 16/09 16/04 - 16/09 No record
Manx Shearwater	217: N: 22/07 15: S: 30/05	30/05 - 22/07 30/05 - 22/07	97: N: 26/06 63: S: 19/08	No record 25/06 - 19/08	136: S: 02/06 63: N: 03/06	02/06 - 17/06 02/06 - 17/06	58: N: 28/06 31: S: 14/03	14/03, 28/06 14/03, 28/06	62: N: 26/08	26/08 - 27/08	185: N: 15/09 43: S: 07/07 10: UH: 16/09	07/07 - 09/10 07/07 - 09/10 No record	58: N: 08/08	No record
Sooty Shearwater											44: N: 16/09	15/09 - 16/09	1520: N: 16/09	16/09 - 02/10
Gannet	905: S: 19/09 75: N: 04/10	19/09 - 04/10 19/09 - 04/10	263: N: 16/09 170: S: 11/06	29/03, 25/06 - 15/10 25/06 - 15/10	398: S: 17/06 303: N: 17/09	02/06 - 17/06, 16/09 - 23/09 28/02, 02/06 - 17/06, 16/09 - 23/09	409: N: 23/09 315: S: 05/10	22/09 - 05/10 22/09 - 05/10	533: S: 11/10 500: N: 24/09	No record No record	1093: N: 25/09 706: S: 24/09 14: I: 23/09	23/09 - 09/10 23/09 - 09/10 No record	592: N: 03/10 372: S: 29/07 30: I: 08/08	09/05 - 03/10 09/05 - 03/10 08/07 - 08/08
Cormorant	71: S: 25/09	25/09 - 20/11	69: S: 19/10	21/09 - 24/10										

Table 5 cont.

Pink-footed Goose	1780: S: 26/10 64: W: 26/10	Oct - Nov No record	2900: S: 31/10 508: N: 12/03	12/10 - 10/12 04/01 - 12/03	1090: S: 27/10 595: N: 10/03	13/10 - 12/11 No record	2000: S: 19/10 615: NW: 03/03	03/03, 19/10 - 05/11 02/03 - 03/03	1470: S: 21/09 1000+: NW: 08/02 57: NE: 21/02	20/09 - 16/11 08/02 - 09/02 No record	4610: S: 31/10 500: NW: 13/02	12/09 - 05/11 No record	6510: S: 05/11 1672: N: 13/03 10: W: 01/10	04/02, 17/09 - 09/11 04/02 - 14/03, 17/09 - 09/11 No record
Brent Goose											163: S: 28/10	No record		
Barnacle Geese	35: E: 04/10	No record												
Shelduck	166: E: 14/07	12/07 - 14/07	53: E: 16/07	No record	82: E	09/07 - 22/07	105: E: 08/07	08/07 - 22/07	52: NE: 02/05 32: S: 01/01	No record No record	115: E: 10/07	10/07 - 23/07	1371: UH: 30/08	22/01, 30/08 - 24/11
Wigeon	168: S: 12/09	12/09 - 21/09	1090: S: 22/09	15/09 - 22/11	620: S: 30/09	14/02 - 24/10	1400: S: 03/11	27/01, 01/11 - 16/11	380: S: 06/11	22/09 - 10/11	1109: S: 28/10	01/01 - 28/03, 30/09 - 03/11	1515: S: 17/10 70: UH: 11/09 143: FS: 08/10 60: N: 11/09	11/09 - 09/11 No record 08/10 - 09/11 11/09, 09/11

Table 5 cont.

Teal	732: S: 26/08	26/08 - 21/09	614: S: 27/08	26/08 - 25/09	651:S: 30/09 369: N: 30/08	19/08 - 23/10 No record	530: S: 03/11	09/09 - 06/11	333: S: 09/11	23/06 - 09/11	828: S: 02/10	01/01, 04/09 - 29/10	429: S: 12/10 74: I: 18/10 27: FS: 11/09	11/09 - 18/10 No record No record
Eider	730: N: 11/11 125: EH: 17/10 110: S: 21/09 40: UH: 20/11	21/09 - 20/11 17/10 - 12/11 21/09 - 20/11 No record	197: N: 08/11 59: S: 22/12	24/01, 21/10 - 02/12 No record	75: N: 10/11	09/11 - 14/11	144: N: 07/12	No record	96: NE: 03/12 68: S: 09/11 47: N : 08/11 41: O: 14/01	7/11 - 03/12 07/11 - 09/11 07/11 - 03/12 14/01 - 07/12	246: NE: 02/11 179: N: 02/12 11: S: 02/11	02/11 - 03/11 No record 02/11 - 03/11	60: N: 10/12 29: S: 17/10 17: FS: 17/10 6: out: 17/10	No record No record No record No record
Common Scoter	665: S: 14/11 380: N: 12/06	21/09 - 18/11 12/06 - 11/11	404: N: 13/08 125: S: 17/09	25/01, 01/07 - 07/11 28/05, 22/07 - 08/11	994: N: 09/11 498: S: 01/11	14/07 - 18/07, 01/11 - 29/12 14/07, 01/11 - 29/12	188: O: 03/11	06/07 - 03/11	301: S: 09/11 151: N: 28/09	25/08 - 09/11 25/08 - 28/09	693: N: 01/11 422: FI: 01/11 361: S: 27/10	25/09 - 08/11 No record 25/09 - 08/11	919: S: 03/10 913: N: 17/11 30: I: 09/07	09/07 - 17/11 09/07 - 17/11 No record
Kestrel					173: S	No record								

Table 5 cont.

Oystercatcher	715: S: 06/08 47: E: 13/03	01/08 - 08/08 No record	291: S: 30/07	30/07 - 19/08	326: S: 19/08 96: E: 24/03	26/07 - 19/08 12/03 - 24/03	547: S: 01/08	No record	533: S: 08/08	28/07 - 08/08	561: S: 13/08 55: E: 28/03	26/07 - 13/08 28/03 - 06/06	724: S: 29/07 51: E: 23/03 9: FS: 30/07	23/03 - 10/09 No record 30/07 - 21/08
Grey Plover			103: S: 17/08	No record									103: S: 04/09	No record
Golden Plover	90: S: 29/09	25/09 - 29/09			124: S: 06/10	No record	200: OS: 09/09	No record	70: S: 25/11	No record				
Lapwing	227: S: 25/10	No record	1053: S: 22/11	31/01 - 08/03, 22/11 - 02/12	230: S: 09/03	09/03 - 14/12	820: S: 14/01	No record	400: S: 02/03	02/03 - 20/11	230: S: 06/03	05/02 - 06/03	423: S: 04/12	No record
Knot	328: S: 21/07	21/07 - 05/11	142: S: 02/08	No record	162: S: 30/09	No record	220: S: 01/08	No record	228: S: 18/07	17/07 - 03/08	220: S: 19/08	25/07 - 28/10	400: S: 21/08 275: FS: 30/06 250: NE: 31/05	No record No record No record
Sanderling	344: S: 21/07	No record	90: S: 31/07	30/07 - 01/08	98: S: 26/07	26/07 - 27/07	45: S: 01/08	01/08 - 09/08	398: S: 18/07	18/07 - 21/07	275: S: 20/07 275: E: 27/05	20/07 - 13/08 No record	114: FS: 09/11 104: S: 12/08	No record 02/08 - 09/11

Table 5 cont.

Dunlin	332: S: 05/11	No record	540: S: 22/09	02/08 - 22/09	249: S: 15/10 78: E: 20/05	12/07 - 15/10 No record	150: NE: 27/05 60: S: 02/08	12/05 - 27/05 02/08 - 06/11	739: S: 28/07 37: NE: 29/05	28/07 - 28/08 No record	1758: S: 25/07 116: E: 27/05	19/07 - 02/10 23/05 - 27/05		
Black-tailed Godwit													60: S: 11/08	No record
Bar-tailed Godwit	232: S: 30/08	No record	150: NE: 01/05	No record	70: NE: 23/04	21/04 - 23/04			70: NE: 06/03	No record	80: E: 10/08	10/08 - 12/08	43: E: 01/05	No record
Whimbrel	173: S: 30/07	No record	200: S: 31/07	No record	46: S: 28/07	No record	55: S: 20/07	20/07 - 02/08	87: S: 28/07 23: NE: 09/07	13/07 - 01/08 No record	234: S: 21/07 21: NE: 09/05	21/07 - 29/07 No record	52: S: 24/07 16: FS: 16/07	16/07 - 26/07 No record
Curlew	83: S: 03/07	No record	40: S: 25/06 31: NE: 08/04	No record No record	142: NE: 14/04 45: S: 27/06	14/04 - 21/04 No record	35: NE: 21/04	No record	44: S: 19/07	No record	57: E: 17/04 28: S: 27/06	No record No record	63: S: 04/04 34: E: 04/04	No record No record
Redshank	187: S: 14/07	14/07 - 15/07	121: S: 16/08	No record	83: S: 12/07	11/07 - 30/09	87: S: 30/08	No record	169: S: 22/08	28/07 - 22/08	256: S: 25/07	25/07 - 22/08		
Arctic Skua	360: S: 19/08	19/08 - 06/11	239: S: 02/09	14/08 - 06/09	148: S: 09/09	08/08 - 09/09	68: S: 22/09	10/08 - 14/10	65: S: 07/09	17/08 - 07/09	64: S: 24/09 23: N: 24/09 6: I: 23/09	23/09 - 24/09 23/09 - 24/09 No record	24: S: 31/07 12: N: 08/08	31/07 - 08/08 31/07 - 08/08

Table 5 cont.

Great Skua	90: S: 06/11	19/09 - 06/11	74: S: 07/11	No record	67: S: 08/11	08/09 - 08/11	37: S: 27/10	05/10 - 27/10	50: S: 19/10	05/10 - 19/10	44: S: 24/09 6: N: 24/09	23/09 - 24/09 23/09 - 24/09	41: S: 01/10	No record
Little Gull	261: S: 06/11 105: W: 08/10 89: N: 11/10	No record No record No record	1400: FO: 08/10 60: N: 29/07 43: S: 07/11	28-Oct No record No record	900: S: 12/10 219: N: 23/09 30: E: 12/05	No record 23/09 - 14/11 No record	428: NE: 23/09 394: N: 07/10 254: E: 01/08	20/07 - 23/09 No record No record	10000: FI: 12/09 4000: R: 04/08 769: S: 19/10	12/09 - 29/09 02/08 - 17/08 18/10 - 19/10	935: O: 01/10 860: N: 27/09 257: S: 29/10	No record 27/09 - 02/10 No record	693: N: 05/10 236: S: 30/09 93: FS: 30/09	No record No record No record
Black-headed Gull	600: S: 14/03	No record	2000: S: 31/10	05/03 - 21/04, 02/10 - 04/11	780: 10/03	13/01 - 14/04, 03/10 - 28/10	1004: S: 06/03 500: N: 28/08 336: NE: 11/05	06/03 - 05/09 No record No record	1800: E: 02/03 800: FD: 31/07 184: S: 08/11	No record 19/03: 31/07 09/03: 08/11	2000: UH: 25/09 779: S: 20/09 600: FS: 27/09 350: NE: 22/04	No record 19/03 - 23/03, 20/09 No record No record	632: S: 01/11 500: I: 18/09 163: FS: 09/11 141: E: 23/03	11/02 - 04/04, 22/07 - 09/11 22/07 - 01/11 No record No record
Common Gull	500: S: 22/05	No record	1500: S: 31/10	No record	110: S: 12/10	No record	114: S: 20/04	20/04 - 01/11	120: S: 28/01	28/01 - 31/01	500: S: 22/04	22/04, 27/11	500: I: 06/03 200: S: 05/05	21/02 - 06/03 No record

Table 5 cont.

Herring Gull	3000: S: 06/11	No record	5000: O: 31/10	27/02 - 03/03, 31/10 - 26/11	650: S: 31/10	05/02 - 10/03, 31/10 - 04/12	1030: S: 10/02	10/02 - 08/12	300: S: 28/03	28/03 - 10/11	504: S: 07/02	07/02 - 19/03, 21/09	914: S: 05/11 500: I: 09/01 260: N: 18/03	18/03, 05/11 - 12/11 No record No record
Great Black-backed Gull	2000: S: 06/11	No record	2000: S: 31/10	28/02, 31/10	55: S: 11/08 - 30/10	11/08 - 30/10	300: S: 09/09	09/09 - 09/12	180: S: 28/03	28/03, 20/12	220: I: 10/09 150: S: 20/03	02/08 - 05/10 02/02 - 20/03	876: S: 10/09 100: I: 10/09	04/04, 10/09 - 11/09 10/09 - 11/09
Kittiwake	4000: S: 18/11 2600: N: 21/08	22/07 - 18/11 No record	3600: S: 07/11 500: N: 25/06	22/01, 03/06, 07/11 - 24/12 18/03 - 15/07	14000: S: 08/11 1150: N: 09/11	25/02 - 28/02, 10/07, 05/11 - 13/11 09/05 - 18/07, 17/09 - 09/11	2000: S: 27/10 843: N: 23/09	15/03 - 07/07, 14/10 - 27/10 23/09 - 06/10	4000: O: 23/09 650: S: 29/01	13/05, 24/08 - 23/09 No record	6320: S: 23-30/05 4000: N: 09/10	23/05 - 30/05 21/05, 24/09 - 10/10	1108: S: 12/05 1023: N: 09/05 109: I: 12/03	08/04 - 12/05, 13/11 09/05 - 12/05, 05/10 - 13/11 No record
Sandwich Tern	6000: S: 22/07 1500: N: 08/08 - 20/08	22/07 - 07/09 No record	2200: R: 16/08	No record	1755: R: 13/08	08/08 - 03/09	1000: R: 30/08 58: S: 22/06	No record No record	921: R: 22/08 130: O: 25/06	23/07 - 11/09 No record	582: R: 24/07	24/07 - 13/07	350: R: 08/07	16/06 - 11/08
Common Tern	1800: fishing O: 29/08	26/08 - 07/09	3120: R: 06/09	14/08 - 08/09	95: E: 12/05 4366: R: 11/08	12/05 - 14/05 11/08 - 13/08	1280: R: 30/08	28/08 - 07/09	6000: R: 07/09	26/07 - 13/09	5800: R: 14/09	14/08 - 14/09	6050: R: 11/08	29/07 - 13/09

Table 5 cont.

Arctic Tern							300: R: 26/07 160: NE: 05/05	No record No record	1430: R: 11/09 33: E: 23/04	31/07 - 11/09 No record	360: R: 25/07 200: NE: 02/05	24/07 - 25/07 No record		
'Commic' Tern	6675: S: 30/08	15/08 - 07/09	5500: R: 14/08	06/08 - 16/08	3245: R: 13/08	13/08 - 04/09	2500: R: 13 - 25/08	08/08 - 25/08	6400: R: 06/08	02/08 - 14/09	6600: R: 19/08	19/08 - 21/09	6000: 27/08	06/08 - 01/09
Guillemot	231: N: 14/11	14/11 - 12/12	200: FO: 19/11 160: N: 25/06	No record 28/05 - 25/06	373: S: 17/07 231: N: 02/06	No record 05/05 - 23/09	177: N: 18/02 319: S: 18/02	18/02 - 23/02 18/02 - 23/02	722: N: 08/03 500+: O: 20/09	No record 30/05, 19/09 - 19/10	273: N: 21/05 170: S: 12/01	12/01 - 21/05, 10/10 12/01, 08/05	520: N: 10/05	10/05 - 07/07
Razorbill	229: N: 30/05	17/05 - 12/06	114: S: 03/06 100: N: 28/05	No record 23/05 - 17/06	56: N: 03/06	03/06 - 10/06							226: N: 10/05	No record
Auk Sp	831: N: 12/06 457: S: 30/05	05/03 - 12/06, 04/10 - 26/11 05/03 - 12/06, 04/10 - 26/11	1100: N: 18/09 337: S: 02/06	20/05, 18/09 - 07/10 12/02, 28/05 - 03/06	984: S: 02/06 479: N: 04/06	26/03: 02/06 - 10/06 03/06 - 04/06, 06/11	506: N: 23/09 166: S: 14/10	26/02 - 14/10 No record	550: O: 05/10	08/03 - 19/10	2396: N: 09/10 561: S: 23/09	13/01, 21/05, 23/09 - 10/10 13/01, 21/05, 23/09 - 10/10	1102: S: 02/10 1091: N: 10/05	02/10 - 06/12 10/05, 02/10 - 06/12
Stock Dove													193: S: 04/11	No record

Table 5 cont.

Wood Pigeon	155: S: 03/11	No record	400: S: 26/10	20/03 - 26/10	970: S: 25/10	15/02, 19/05, 03/10 - 01/11	84: N: 13/10 70: S: 26/10	No record 13/10 - 03/11	260: S: 18/10	16/01: 02/03: 18/10 - 15/11	331: S: 15/03 & 11/06	15/03 - 11/06, 18/10 - 24/10	2260: S: 04/11	26/10 - 14/11
Swift	7000: S: 19/06, 20/07	16/06 - 21/07	4500: S: 19/06, 09/07	19/06 - 09/07	12000: S: 27/06	27/05 - 29/07	4000: S: 22/06	15/06 - 11/07	7500: S: 18/06	18/06 - 29/07	8000: S: 30/06	26/06 - 19/08	4200: S: 01/07	28/05 - 19/07
Skylark	1130: S: 25/10	03/10 - 25/10	300: S: 12/10, 26/10	12/10 - 04/11	810: S: 09/10	11/03, 09/10 - 27/10	376: S: 28/10	31/01, 17/10 - 28/10	180: S: 04/11	No record	682: S: 07/10	01/10 - 26/10	745: S: 20/10	18/03 - 19/03, 04/10 - 29/12
Sand Martin	2000: S: 17/07	03/05 - 18/08	700: S: 13/07	21/04 - 30/04, 09/07 - 09/09	350: S: 22/07	12/05 - 12/09	1020: S: 04/08	23/04, 12/07 - 02/09	2500: S: 03/09	20/07 - 04/09	500: S: 10/07	29/06 - 16/09		
Swallow	12500: S: 26/09	08/05, 16/09 - 29/09	6000: S: 12/09	12/05 - 18/05, 06/08 - 03/10	2700: S: 16/05	12/05 - 12/09	12000: S: 05/07	19/05 - 20/09	45000: S: 03/09	05/05: 28/07 - 14/09	4000: S: 15/08	03/05 - 26/09	4016: S: 07/09	02/05 - 23/05, 06/08 - 07/09
House Martin	4000: S: 25/09	28/05, 30/08 - 25/09	8000: S: 12/09	17/05 - 18/05, 10/09 - 03/10	1850: S: 13/09	27/05 - 29/05, 13/09	1000: S: 20/09	19/05 - 20/09	15000: S: 03/09	19/05 - 14/09	3500: S: 16/09	27/05 - 29/05, 16/09 - 19/09	1250: S: 26/05	20/05 - 26/05
Meadow Pipit	13300: S: 18/09 151: NW: 05/04	13/09 - 26/09 No record	6000: NE?: 17/09 88: S: 25/03	8/04, 09/09 - 23/09 No record	3150: S: 30/09 92: NW: 29/03	05/04, 12/09 - 04/10 29/03 - 31/03	2000: S: 20/09 51: NW: 02/04	01/04 - 02/04, 14/09 - 29/09 No record	2800: S: 20/09	03/09 - 21/09	10000: S: 22/09 335: FS: 17/04	04/04 - 17/04, 11/09 - 24/10 No record	3378: S: 26/09	12/09 - 26/10
Dunnock													145: F: 28/03	No record

Table 5 cont.

Robin	200: F: 15/10	15/10 - 22/10	400: F: 07/11	07/11 - 09/11	550: F: 25/09	24/09 - 27/09	250: F: 11/10	11/10 - 20/10	88: F: 16-19/10	No record	83: F: 20/10	20/10 - 28/10	105: F: 16/10	No record
Blackbird	2500: F: 15/10	15/10 - 12/11	3500: F: 03/11	03/11 - 08/11	1300: F: 07/11	18/10 - 07/11	820: F: 03/11	20/03 - 22/03, 12/10 - 20/11	285: F: 08/11	21/03 - 24/11	10000: F: 07/11	18/03, 29/10 - 24/11	1045: F: 24/10	19/10 - 24/10
Fieldfare	1000: F: 22/10	14/10 - 25/10	3600: F: 22/12	03/11 - 24/12	750: F: 18/10	18/10 - 23/10	240: F: 01/11	01/01, 01/11 - 03/11	700: F: 08/11	04/01 - 05/01, 16/10 - 09/11	2000: F: 07/11	27/10 - 24/11	2000: F: 24/10	24/10 - 14/11
Song Thrush	230: F: 15/10	15/10 - 22/10	775: F: 06/11	26/09 - 08/11	620: F: 18/10	25/09 - 18/10	400: F: 10/10	08/10 - 16/10	96: F: 16/10	No record	245: F: 30/09	30/09 - 07/11	560: F: 15/10	No record
Redwing	1500: F: 16/10	14/10 - 22/10	800: F: 27/10, 03/11, 07/11	02/04 - 11/04, 07/10 - 11/11	1680: F: 18/10	01/04, 25/09 - 23/10	1485: F: 08/10	06/10 - 01/11	640: F: 14/10	13/10 - 08/11	2000: F: 07/11	30/09 - 24/11	13500: F: 15/10	15/10 - 24/10
Goldcrest	180: F: 16/10	No record	300: F: 07/11	01/10 - 11/11	90: F: 21/10	17/10 - 22/10	80: F: 16/10	No record	237: F: 14/10	13/10 - 18/10	560: F: 10-11/10	10/10 - 20/10	1500: F: 16/10 - 17/10	15/10 - 17/10
Starling	8000: S: 11/03	11/03 - 18/03	1455: S: 06/11	21/03 - 25/03, 25/09 - 11/11	3100: S: 18/10	15/03, 19/06, 30/09 - 26/10	650: S: 04/11	22/03 - 05/11	2200: S: 15/03	15/03: 18/10	3024: F: 20/03	06/03 - 20/03, 28/10 - 02/11	4400: F: 23/10	26/03, 23/09 - 22/11
	5015: S: 22/10	22/10 - 15/10	1285: OS: 08/11	23/10 - 08/11	500: FS: 03/11	02/11 - 09/11	426: OS: 06/11	19/10 - 06/11	1760: OS: 18/10	20/10 - 27/10	1024: S: 28/03	16/03 - 28/03, 24/10 - 07/11	1380: S: 30/10	23/09 - 01/11
	830: FS: 29/10	07-Nov									217: FS: 01/11	No record		
House Sparrow											85: S: 07/10	No record		

Table 5 cont.

Tree Sparrow											352: S: 18/10	18/10 - 07/11		
Chaffinch											402: S: 20/03	16/03 - 20/03		
Greenfinch	362: S: 23/10	09/10 - 23/10	588: S: 26/10	12/10 - 05/11	590: S: 09/10	11/03, 28/09 - 25/10	609: S: 29/09	01/04, 29/09 - 05/10	320: S: 16/10	16/10 - 03/11	1047: S: 24/10	03/04, 07/10 - 24/10	2333: S: 09/10	29/04 - 02/05, 22/09 - 12/11
Goldfinch	1520: S: 09/10	03/10 - 25/10	780: S: 12/10	24/04 - 27/04, 02/10 - 19/10	1500: S: 12/10	28/04 - 17/05, 06/10 - 12/10	358: S: 28/10	22/04 - 01/05, 28/10	800: S: 29/04	26/04 - 30/09	4640: S: 07/10	22/04 - 06/05, 03/10 - 24/10	2333: S: 09/10	29/04 - 02/05, 22/09 - 12/11
Siskin													560: S: 12/11	13/09 - 04/12
Linnet	1800: S: 22/04 700: S: 25/09	05/04 - 25/04 22/09 - 09/10	1250: S: 23/09	19/04 - 27/04, 21/09 - 05/10	1300: S: 06/10	05/04 - 06/10	508: S: 20/09	31/03 - 22/04, 20/09 - 01/10	750: S: 29/04	22/04 - 30/09	908: S: 06/10	03/04 - 03/05, 28/09 - 07/10	713: S: 17/04	25/03 - 02/05, 20/09 - 11/10
Reed Bunting											88: S: 07/10	No record		
Redpoll													173: S: 09/10	No record

2.3.2 OTHER INFORMATION

A range of other data sources have also been used in reviewing the bird interest of the proposed windfarm site. These included atlases derived from the European Seabirds at Sea (ESAS) database, results of breeding seabird census, and various unpublished reports.

Atlases of Seabirds Distribution in the North Sea: Valuable data were taken from several atlases which detail the distribution of seabirds in the North Sea (Stone *et al.*, 1995; Skov *et al.*, 1995; Tasker *et al.*, 1987; Blake *et al.*, 1984). This information is derived from the European Seabirds at Sea (ESAS) database, which has been contributed to by a variety of environmental organisations from across northwest Europe. The UK Seabirds at Sea Team (SAST) carried out research of seabird distribution in the North Sea Between 1979 and 1994, using both aerial and boat based survey techniques. The data is summarised in Skov *et al.* (1995), which also provides estimates of seabird population in the wider area, for example the North Atlantic. A more fine scale resolution for species densities than others atlas can be found in the *Atlas of Seabird Distribution in North-West European Waters* produced by Stone *et al*. (1995). This provides an enormous amount of valuable data describing the seasonal distribution of Gulls, Terns, Seaducks, Skuas, Divers etc. in the seas around north-west Europe, including Britain. Early work from Tasker *et al*. (1987) and (Blake *et al*., 1984) have also been incorporated into the review. Tasker *et al.* (1987) details the results of seven years of research and surveys between 1979 and 1986 into the distribution and behaviour of seabirds in the North Sea whilst work by Blake *et al*. (1984) details the result of surveys between 1979 and 1982. The majority of the results are derived from observations made from a variety of ships on passage in the North Sea.

Breeding Seabird Population Estimates: The most up to date and comprehensive estimates of numbers and locations of breeding seabirds in the UK comes from the "Seabird 2000" survey, which is reproduced in Mitchell *et al.* (2004).

Unpublished Report: Information has also been taken from a key report by the Institute of Estuarine and Coastal Studies (IECS, 1993). IECS undertook ship-based seabird surveys and aeroplane surveys along the coastal areas of Flamborough Head and Bridlington Areas during the winter 1992/3 using the SAST methodologies as part of a proposed oil and gas development.

3. SURVEY METHODS

3.1 Aerial Survey Methodology

The aerial surveys were undertaken primarily to provide information on the wider distribution of seabirds in the region, to verify the distribution and abundance of divers and seaduck in the study area and to identify usage within the proposed windfarm site by species associated with the European Marine Sites in the vicinity (the Humber Estuary and Flamborough Head and Bempton Cliffs sites). Aerial surveys used a methodology recently developed in Denmark by the National Environment Research Institute (NERI) (Kahlert *et al.*, 2000) and summarised in the COWRIE Guidelines (Camphuysen *et al.*, 2003).

These guidelines have been developed over the last few years in order to standardise the survey approach for identifying seabird populations around offshore windfarms (and other offshore developments), and as such, are suitable for use both for individual Environmental Impact Assessments, and also in the context of wider Cumulative and Strategic Environmental Impact Assessments.

3.1.1 SURVEY AREA

The series of transects were designed to cover both the Humber Wind Ltd site (Humber Gateway) as well as much of the surrounding waters to the north or the south. The original survey area is shown in Figure 2 and for the purposes of this report, is referred to as Survey Area 1.

The aerial survey area was modified in June 2004 following the relocation of the control site, both in order to incorporate the proposed Westermost Rough (Total) development (Figure2), this being for a further offshore windfarm located some distance to the north of the Humber Wind Ltd site, as well as to avoid access issues through the Practice and Exercise Area (the Donna Nook PEXA) in the southern part of the original survey area, with military flight activity in this site having affected transect access in the past.

This change in survey area did not affect the data in the vicinity of the Humber Wind Ltd site as the areas of coverage of the two aerial survey methodologies both incorporated the Humber Wind Ltd site. These changes to survey coverage were agreed with Natural England (then English Nature), the RSPB and Yorkshire Wildlife Trust, prior to being initiated.

It should be noted that it is understood that the Westermost Rough development site will not be taken forward to a planning application by Total, but that a process of re-letting the licence area is currently underway.

Figure 2 shows the aerial survey study area established in conjunction with the consultees during 2004 following the establishment of the Total windfarm site, and for the purposes of this report, it is referred to as Survey Area 2.

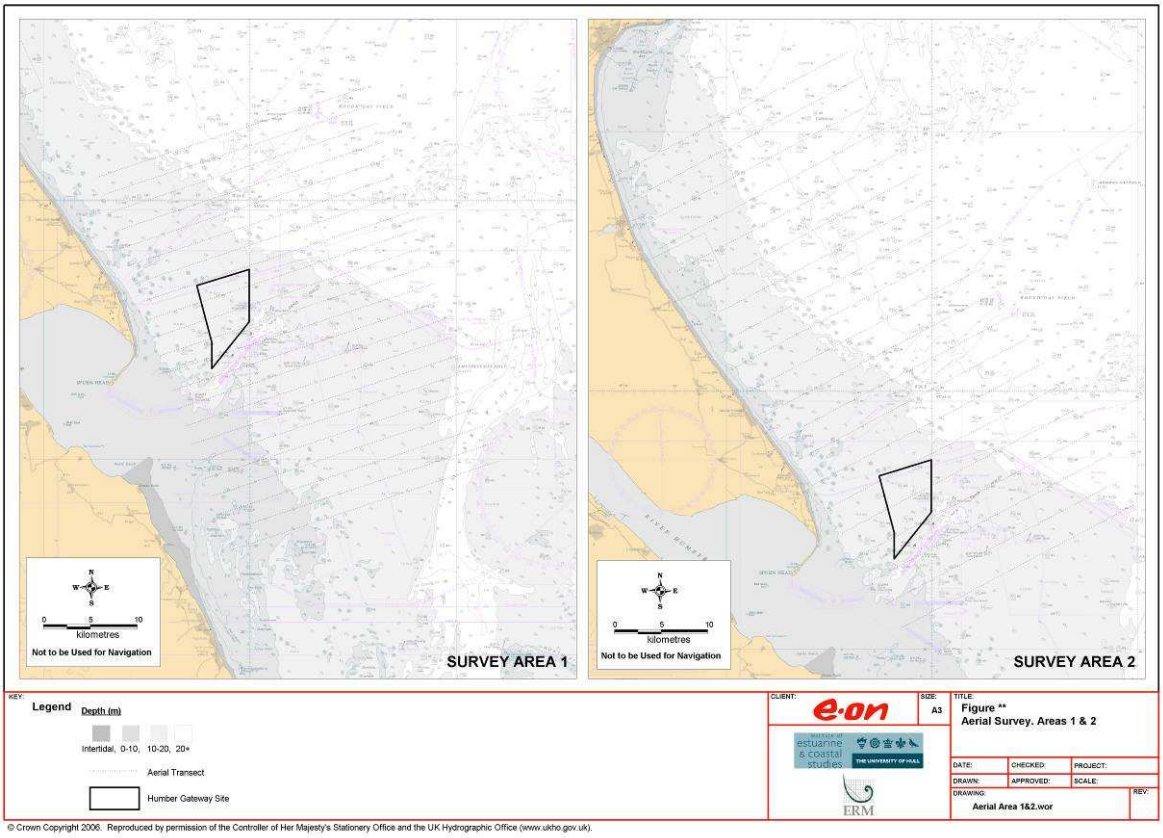

Figure 2: Aerial survey transects showing original (Survey Area 1) and revised (Survey Area 2) coverage.

3.1.2 SURVEY PROGRAMME

Surveys were undertaken on an approximately once per month basis over the first winter period 2003/4 (October through to March inclusive), although a combination of weather conditions and aircraft availability meant that no survey was possible during December, with an extra survey undertaken during the first week of January (this being agreed with Natural England), and it was necessary to carry out surveys in conditions slightly above a force 4 in order to achieve coverage. After consultation with relevant parties in the summer 2004, it was decided to slightly reduce the winter survey frequency during the September 2004 to March 2005 period, as the monthly interval surveys in the first year programme showed a low level of seabird usage at this time. This reduction in survey frequency also allowed for a greater flexibility in survey timing, and thus avoided the need to potentially carry out surveys in sea state conditions that might affect data collection quality. As such, five winter surveys were conducted between September 2004 and March 2005, but with September 2004 and March 2005 being obligatory, in order to capture potential migratory movements through the area. This agreed approach allowed for a greater flexibility in survey timing over the winter months, and thus prolonged spells of bad weather were better accommodated within the survey programme.

It was agreed with the key consultees that no aerial surveys were necessary over the spring period, as the technique is not well suited to the assessment of flying birds (particularly small

waders and passerines), with no accurate determination of flight height possible for most records (an important component when assessing potential collision impacts of migratory movements). The Joint Nature Conservation Agency guidelines for aerial surveys identified the possibility of a generic requirement for a May survey, this presumably to cover colonial Tern activity in the vicinity of a number of offshore foraging sites. However, for the HWL site, it was considered that this was not a particular issue (and would be picked up in any case by the more appropriate boat based survey programme). It was therefore agreed with the consultees to concentrate the monitoring effort on key periods of usage by SPA species, in particular those species associated with the Flamborough Head and Bempton Cliffs SPA site, with usage of the open coast (both sea and air) by Humber Estuary SPA waterfowl in the vicinity of the proposed development most appropriately surveyed by the boat-based programme (see below).

However, the potential for an offshore post breeding build-up relating to the Flamborough Head and Bempton Cliffs SPA, including Auk rafts, was considered to be an issue and to this end, in agreement with Natural England and the RSPB, aerial surveys were carried out during the summer period (June, July and August), in order to identify any concentrations of rafting Auks and other seabirds using the area, these potentially associated with the breeding colony on the Flamborough Head and Bempton Cliffs EMS.

Initially, surveys during the winter (January and February 2004 only) were conducted in conditions up to a sea state 4-5, in order to ensure that data was collected during all the winter months (when COWRIE guidelines preferred conditions of a maximum of sea state 3 can be absent for several weeks at a time). However, in discussion with Natural England, it was agreed that surveys during the remaining programme (the second half of 2004 and 2005) should not carried be out in conditions above a sea state 3, but with a reduced frequency requirement of surveys during the winter months (as discussed above) allowing for a greater flexibility in survey timing to meet these weather requirements, and a greater potential for programme completion. Survey dates, sea state and survey timings are given in Table 6 below.

Table 6: Survey Dates (October 2003 to September 2005).

Date	Wind conditions	State of the Sea	Survey	Survey Start Time (GMT)	Survey Finish Time (GMT)
27/10/03	west F1-2	1-2	1	11:37 a.m.	15:35 p.m.
28/11/03	south-west F2-3	1-2	2	12:01 p.m.	15:52 p.m.
09/01/04	west F3-4	3-4	3	11:21 a.m.	14:40 p.m.
29/01/04	north-west F4-5	3-5	4	11:53 a.m.	15:41 p.m.
25/02/04	north-east F3-4	3-4	5	11:10 a.m.	14:10 p.m.
18/03/04	west F3-4	2	6	11:43 a.m.	15:25 p.m.
23/06/04	west F2-3	1-2	7	10:25 a.m.	13:38 p.m.
27/07/04	north-east F1-2	1-2	8	11:06 a.m.	14:31 p.m.
26/08/04	north-west F2-3	2-3	9	10:51 a.m.	14:28 p.m.
23/09/04	north-west F5-6	3-4	10	11:08 a.m.	15:09 p.m.
18/10/04	south-west F3-4	3	11	11:20 a.m.	14:44 p.m.
16/11/04	west F3	1-2	12	10:47 a.m.	14:10 p.m.
09/02/05	south-west F4-5	2-3	13	11:14 a.m.	15:05 p.m.
21/03/05	south-east F4	3	14	11:39 a.m.	15:16 p.m.
27/06/05	variable then south F1-2	0-2	15	10:43 a.m.	14:07 p.m.
27/07/05	east F2-3	1-2	16	10:48 a.m.	14:24 p.m.
23/08/05	west F2-3	1-2	17	10:25 a.m.	14:05 p.m.
13/09/05	south-west F4-5	2-3	18	10:15 a.m.	14:04 p.m.

3.1.3 SAMPLING METHODS

The aircraft survey programme employed the standard seabird census techniques for use from an aircraft as described by Camphuysen *et al.* (2003). This involved a "distance sampling" whereby the distance to each bird/flock of birds was recorded by two observers, one on either side of the aircraft. The aircraft used for the surveys was a Partenavia PN68, a twin-engined high wing aircraft ideally suited to such survey requirements (Plate 1) and as used by other survey teams on behalf of the JNCC in the UK (see COWRIE Guidelines).

Each survey flight was crewed by a flight co-ordinator and two experienced seabird observers, these latter two people being seated behind the pilot and co-ordinator, and with flight speed, height, track and timings logged to an Ormtec 412 DGPS, with interface into a laptop running MapInfo & ARCS and giving a visual display of current location. Positional back-up was achieved by a Thales Mobile Mapper GPS or handheld Garmin 76 GPS, with the flight co-ordinator advising the pilot on route etc. based on real-time cartographic output from the laptop or Mobile Mapper. Prior to the survey commencing, all watches were synchronised to the DGPS to allow accurate cross-referencing during the data analysis stages and during the survey both observers used digital dictaphones to record sightings, with each record identified by a time reference to the nearest second.

Plate 1: Partenavia PN68, a twin-engined high wing aircraft used during the monitoring programme.

The 20 individual 28km long transects (760km in total) were flown at an altitude of 80m (250 feet), and at a speed of 185km/h (100kt), with the observers looking down and ahead out of each side of the aircraft, with, through the regular use of an appropriately inscribed inclinometer, the assignment of the transect into a series of distance bands from the aircraft, band A covering a zone 44m to 163m from the track line, band B from 164m to 432m and band C from 433m to 1000m. Sighting records therefore included a verbal time stamp, together with the species (if identified) or family, the number of individuals in the observation, whether the bird(s) were on the water, in the air or flushed to flight by the aircraft, and the zone they were located in, as well as, where possible the direction of flight also being recorded.

In addition to these records, any observations on pot markers, trawling activity, cetacean sightings etc. were made, whilst sea state and glare were also regularly recorded along the transects. On completion of the survey, the data were transcribed from digital tape to standard SAST recording forms and then input into a GIS database for subsequent analysis.

3.1.4 DATA TREATMENT AND ANALYSIS

The data from the aerial surveys have been used in the following ways;

- to produce distribution maps showing the locations of bird observations during the aerial surveys;

- to produce density values and, where appropriate, maps, of key bird species recorded within survey area (density maps).

3.1.5 MAPPING PROTOCOLS

In order to provide an indication of the overall distribution of key species, distribution maps have been generated from the raw data records. Distribution maps were produced separately for survey area 1 (October 2003 to May 2004) and survey area 2 (June 2004 to December 2005). For common species, a seasonal separation was established for each survey area, in order to best illustrate their seasonality of occurrence and the variability in the counts. By contrast, for less common or rare species, aggregated raw data were plotted for each survey area.

The density values and figures were obtained using GIS Kriging methods, with the values aimed at illustrating the bird populations present in the windfarm study area in the context of a wider area, i.e. the Holderness Coast.

3.2 Ship-based Survey Methodology

The boat based survey programme effectively employed the standard seabird census techniques for use on a boat platform as described by Camphuysen *et al.* (2003) and DEFRA (2005). The method involves a band-transect operated on one side and ahead of the ship and short time-intervals in a continuous series to sample short stretches of water with a known surface area and location. Two skilled observers carried out the observations from survey vessels with a viewing platform exceeding 5m.

3.2.1 SURVEY AREA

The boat survey area included the proposed windfarm, a buffer area around the windfarm and a control area to the south of the windfarm site (approximately half size of the survey block). At the time of survey design, further windfarm development sites were known to be proposed to the north of the development block (as part of the Round 2 application process), and it was decided that, in order to ensure the utilisation of the control area for several years after development, to locate the control block in an area facing no other potential development (at least to the knowledge of Humber Wind Ltd and IECS), i.e. immediately to the south of the estuary. The control site was of similar bathymetry, sediment profile and structure but at a greater distance from the shore than the survey block. However, as the area to the south of development is subject to extensive use as a navigation route into and out of the Humber, with vessel traffic flows routed through a series of main corridors, this, together with the proximity of a military PEXA off Donna Nook restricted the positioning of the control site further inshore. Similarly, the southern extent of the main survey block was located adjacent to one of the vessel traffic corridors, entailing the curtailment of the southernmost transect line for reasons of safe operation. For the purposes of this report, this transect layout has been referred to as the Survey 1 layout.

Figure 3 shows the area of the original survey and control blocks where monitoring was carried out from September 2003 to May 2004) (i.e. those established in conjunction with consultees during 2003).

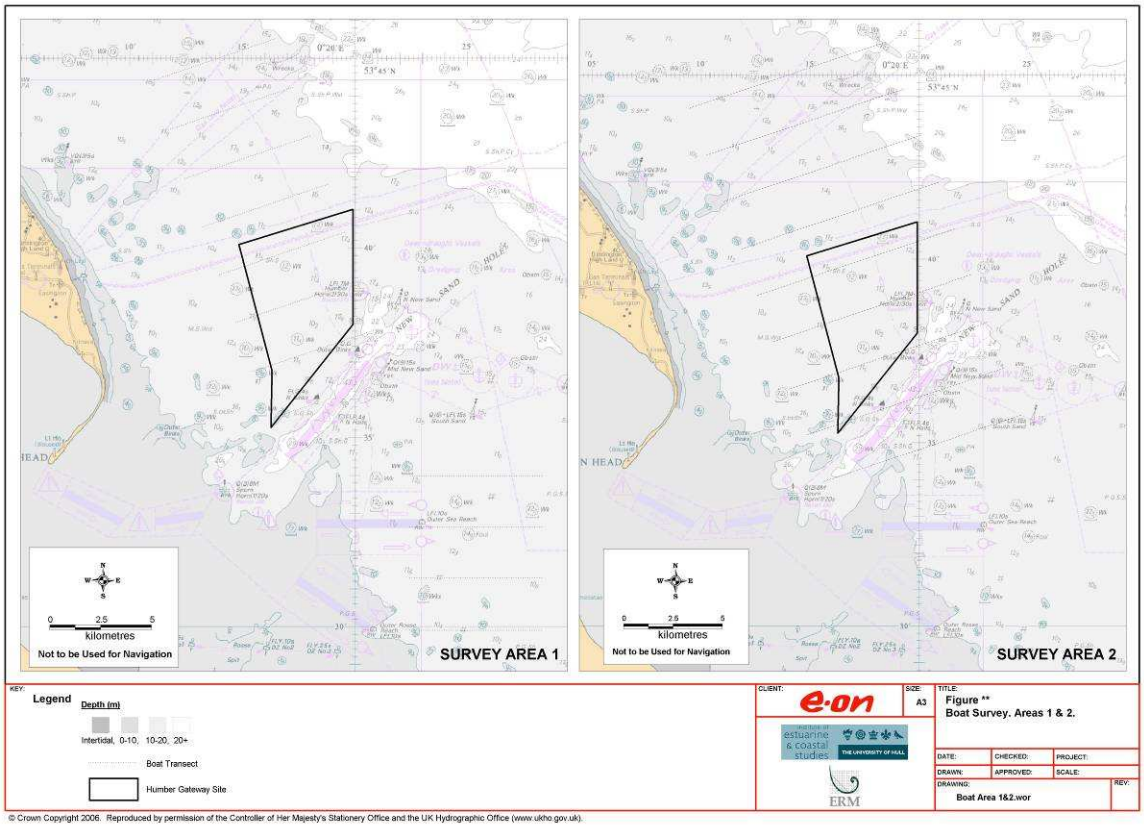

Figure 3: Boat survey transects showing original (Survey Area 1) and revised (Survey Area 2) coverage.

However, when it was identified that the proposed development site immediately to the north of the HWL was not going to be taken forward as part of the Round 2 tranche, this meant that the HWL control block could be moved to the north of the development area, to an area of coast more representative of the physical parameters of the area, and as such more appropriate for any before, after, control, impact (BACI) study. This was agreed with the statutory consultees.

Additionally, in response to the guidelines on bird survey techniques Camphuysen *et al.,* 2003 (under Collaborative Offshore Wind Research into the Environment (COWRIE)), modifications to the survey area were made to provide at least a 1.5km buffer around the development site (the original buffer zone being of variable distance (*c.* 100m to 1,000m) due to potential operational constraints). As a result, all transects were increased in length from 6.5km to 10.5km to provide the necessary buffer zone around the development site, and one transect was added to the south of survey area. The 3 transects originally surveyed at the north of the windfarm survey area were extended by 4km and formed the new control site. This area was more appropriate as a control site exhibiting similar physical attributes to that of the survey block (bathymetry, seabed type, distance from shore etc.). For the purposes of this report, this transect layout has been referred to as the Survey 2 layout.

Original transect intervals were kept at 2.5km, although guidance documents (Camphuysen *et al.,* 2003) recommended a 2km separation for the boat survey. Whilst a 2km separation may provide greater detail of coverage, it was considered that there could potentially definite

issues with double counting at this frequency of transect, particularly in a coastal area with high current velocities. As such, for the original specification, it was suggested a 2.5km transect spacing would be most appropriate in order to avoid double counting, this having a particular potential off the south Holderness coast, where relatively strong ebb or flood currents could lead to rafting birds drifting through two transects. For instance, a 'static' rafting flock could potentially travel over 4km down the coast in one hour, and with the mid point from one transect to the next taking around an hour to steam, there would be a possibility of the flock being encountered twice under some tidal conditions. Even at the 2.5km spacing, definite instances of potential double counting were noted from the surveys already undertaken in the vicinity of the HWL site, and it was therefore suggested and agreed with relevant consultees that the 2.5km spacing be maintained as the minimum suitable spacing distance during the remaining programme, this distance being a suitable compromise between a very wide spaced transect methodology (say 3 or 4km) and one that had a definite risk of double counting (2km or less).

All the modifications to the methodology were discussed and agreed with the relevant consultees including English Nature (now Natural England), the Royal Society for the Protection of Birds and the Yorkshire Wildlife Trust during the spring of 2003, with a meeting between Humber Wind Ltd and relevant parties at York in June of 2003 to agree the revised survey area.

Figure 3 shows the revised area of the survey and control blocks (i.e. those established in conjunction with consultees during 2004, after the evolution of methods at a national scale, and after the establishment of the Total windfarm site).

3.2.2 SURVEY PROGRAMME

Between September 2003 and December 2005, 29 surveys were carried out at approximately monthly intervals including an additional survey in September 2005. This September survey was undertaken to coincide with peak passage of Little Gull and with the aim to investigate the extent of Little Gull migration at sea. For the purpose of the survey, the transects were therefore extended further on both ends to gain a greater coverage along the water depth gradient. All transects were extended by 2.75km inshore and 6.5km offshore which made each transect surveyed 20km long.

On two occasions (February 2004 and October 2005) the prevalence of strong winds during the month combined with restricted boat availability, prevented the scheduled surveys being undertaken as planned, and as such the surveys were postponed to the early part of the following months (see Table 7).

It also should be mentioned that the first survey in September acted as a familiarisation survey and that on this instance the control area was not covered due to light constraints. Boat survey dates, sea state and survey timings are given in Table 7.

Table 7: Survey Dates (September 2003 to December 2005).

Date	Wind conditions	State of the Sea	Survey	Survey Start Time (GMT)	Survey Finish Time (GMT)
30/09/03 [1] (See notes)	south-east F2-3	2-3	1	11:24 a.m.	17:23 p.m.
28/10/03	south-west F3-4	2-3	2	08:22 a.m.	14:06 p.m.
25/11/03	south-east F4-5	3-4	3	08:44 a.m.	16:22 p.m.
09/12/03	south F2	1-2	4	08:27 a.m.	14:12 p.m.
22/01/04	south F3-4	2-3	5	08:22 a.m.	15:22 p.m.
03/03/04	south F4	2-3	6	07:29 a.m.	13:52 p.m.
24/03/04	north F4-5	4-5	7	09:15 a.m.	16:02 p.m.
23/04/04	south F1-2	0-1	8	07:09 a.m.	13:51 p.m.
19/05/04	north-west F4-5 backing west F3-4	2-4	9	08:52 a.m.	16:28 p.m.
Modification of the survey areas					
16/06/04	west F2	1-2	10	06:38 a.m.	16:21 p.m.
13/07/04	north-west backing south-east F2	2-4	11	07:04 a.m.	13:06 p.m.
27/08/04	south-west to west F4-5	2-3	12	07:12 a.m.	13:22 p.m.
16/09/04	south F4-5 decreasing F2-3	2-4	13	08:02 a.m.	14:42 p.m.
26/10/04	west to north-west F4	2-3	14	07:10 a.m.	14:02 p.m.
24/11/04	south F2-3	2-3	15	08:19 a.m.	14:43 p.m.
09/12/04	south-west F1-2 backing south F3-4	1-3	16	07:55 a.m.	14:23 p.m.
26/01/05	north-west F2-3	2-3	17	08:27 a.m.	14:53 p.m.
17/02/05	variable F1 then north-north-east F2-3	1-3	18	11:48 a.m.	17:56 p.m.
19/03/05	variable then south-east F1	0-1	19	10:58 a.m.	17:18 p.m.
12/04/05	south-west F1-3	1-2	20	07:42 a.m.	13:46 p.m.
12/05/05	south-east F1 backing east F2-3	1-2	21	06:54 a.m.	12:54 p.m.
06/06/05	north-east F3-4	4	22	09:33 a.m.	16:01 p.m.
12/07/05	Variable F1 then south-east F2-3	0-1	23	11:27 a.m.	17:57 p.m.
04/08/05	west F2-4	0-1	24	06:06 a.m.	12:24 p.m.
02/09/05	north F2-3	0-3	25	07:00 a.m.	13:38 p.m.
07/10/05 [2] (See notes)	variable then south F1-2	0-2	26	08:28 a.m.	15:38 p.m.
07/11/05	south-west F4-5 decreasing F2-3	2-4	27	08:24 a.m.	14:26 p.m.
23/11/05	west to south-west F1-2	0-1	28	09:56 a.m.	16:06 p.m.
21/12/05	south-west F3-5	2-4	29	08:34 a.m.	15:20 p.m.

Notes

[1] Familiarisation Survey

[2] Dedicated Little Gull Survey

3.2.3 SAMPLING METHODS

The boat based survey programme effectively employs the standard seabird census techniques for use on a boat platform as described by Camphuysen *et al.* (2003), using *the scan with band transect using the snapshot* technique as originally detailed in Komdeur *et al*. (1992).

After the initial familiarisation survey in September 2003, when a local fishing boat was used, the survey platform employed has been either the *MV Riverman* or *MV Tradesman*, both vessels being large tug boats operating out of Grimsby, with a high viewing area (Plate 2). These vessels provide a good, safe viewing platform, with height above sea level well in excess of the minimum of 5m, furthermore, neither vessels are active or deactivated trawlers, thus minimising the possibility of seabird association with the survey platform.

Plate 2: *MV Riverman* used during the monitoring programme. Surveys were conducted from the roof of the wheelhouse.

Prior to the survey programme commencing, all transect start and finish points were plotted onto ARCS charts within a GIS platform, and co-ordinates determined. Prior to the commencement of the surveys, these co-ordinates were input into the ship's GPS system, and subsequent transects then steamed using these co-ordinates. Survey logging of transects was determined using an Ormtec 412 DGPS & logger, with further back-up from a handheld Garmin GPS76. A constant 10kt speed was steamed during the transects (COWRIE guidelines preferred speed (Camphuysen *et al.* (2003)), with additional environmental data in the form of a log being maintained during the survey, with data collated including weather conditions and sea state, as well as additional observations such as cetacean records, positions of fishing boats and pot markers etc, with observational data on species etc logged on standard SAST recording sheets. Surveys were generally conducted in conditions in a sea state of 4 or less (see Table 7), with consideration given to residual swell levels prior to surveys being commenced.

The survey work was undertaken by two experienced observers (both having completed and passed the JNCC/DTI seabird survey training and assessment course in 2005 & 2006), surveying carried out on either side of the vessel, with a band transect (300m wide) conducted on one side. The bands were divided into a series of subdivisions running perpendicular to the ship (using the Camphuysen *et al.* (2003) divisions). Birds observed within the band were noted as being *in transect* and flying birds recorded using the *snapshot technique* in order to overcome biases caused by the flux of flying birds. The only variation from the standard technique related to the timing of observation runs which were divided into a series of two minute periods rather than the 5 minute period recommended by Camphuysen *et al.* (2003) (acceptable range 1-10 minutes), this greater snapshot frequency being considered to be more applicable for such relatively small scale (area) and coastal location, allowing a more detailed subsequent analysis of species distribution with the co-ordinates taken at each transect.

For each observation the details shown in Table 8 were recorded in order of priority.

Table 8: Data collected and order of priority.

1	Species:	Where possible identification is to species level. However, this is not always possible and in this case the most precise identification possible should be given. e.g. *Alcidae sp.*, *Larus sp.* and *Gavia sp*.
2	Numbers:	Number of individuals present within the sighting.
3	Transect:	A tick placed in a column of the recording sheet if the bird is *in transect*. A blank is left if the bird is not *in transect*.
4	Behaviour:	On the water or flying, flushed to flight or diving in response to vessel.
5	Distance from the ship:	Distance of the bird from the ship are estimated using a range finder, and coded as follows. For birds on the water the SAST sub-divide the 300m band transect into four zones. A: 0-50m, B: 50-100m, C: 100-200m, D: 200-300m and E> 300m. For flying birds; 1: 0-100m, 2: 100-1000 and 3: > 1000.
6	Flight height:	The distribution of flying height is estimated and assessed from the ship, by categorising any birds seen in flight to its altitude. Categories are expressed as 0-2m, 2-10m, 10-15m, 15-25m, 25-50m, 50-100m, 100-200m, >200m to avoid confusion.
7	Direction:	Flight direction of each bird recorded.
8	Plumage, moult, age and sex of the bird:	Where age is unknown, a blank is left otherwise coded as follows: A: Adult and IMM: Immature. For plumage S: summer and W: winter are used.
9	Cetaceans:	Cetacean and sea mammal sightings recorded where appropriate.

3.2.4 DATA TREATMENT AND ANALYSIS

This stage of the analysis used only birds recorded as being “in transect”. The total number of birds seen on one side of the boat during the scan and the snapshot was analysed to produce bird species and group totals. The correction factors calculated in Table 9 were applied to the birds recorded on the water in order to compensate for the reduced visibility of birds recorded at distances of more than 100m. The total number of birds “in transect” was then divided by the area surveyed during a unit time; the area surveyed being calculated by multiplying the distance travelled by the width of the transect. This method enabled the ‘true’

density of birds flying and on the water to be calculated, with abundance values then comparable between and within species, even where there are radical changes in behaviour.

To allow direct comparison of densities between the windfarm and the control site, densities were calculated for each survey from October 2003 to December 2005. Data from the familiarisation survey undertaken in September 2003 were excluded from the analysis.

Birds of small size such as Puffin and Little Auk are often missed or under estimated during ship-based seabird surveys, as their visibility depends upon the distance of the bird from the observer, the sea state and the visibility conditions. Those birds seen in the distance bands furthest from the boat can be corrected for this bias using factors applicable to the distance bands C and D following Stone *et al.* (1995). Stone *et al.* (1995) published correction factors based upon large date sets of bird distance data from observation platform between 6 and 25m; these ranged from 1.9 for small species such as Little Auk to 1.0 for the larger species, more easily detectable at distance. The correction factors shown in Table 9 have been used in calculating the density estimates.

Table 9: Correction factors after (Stone *et al*., 1995).

Species	Correction Factor
Diver sp.	1.3
Fulmar	1.1
Sooty Shearwater	1.3
Manx Shearwater	1.3
Storm Petrel	1.5
Gannet	1.0
Cormorant	1.1
Shag	1.1
Eider	1.0
Common Scoter	1.0
Arctic Skua	1.3
Great Skua	1.3
Gull sp.	1.4
Little Gull	1.4
Black-headed Gull	1.4
Common Gull	1.4
Lesser Black-backed Gull	1.4
Herring Gull	1.4
Great Black-backed Gull	1.4
Kittiwake	1.4
Tern sp.	1.7
Sandwich Tern	1.7
Commic Tern	1.7
Auk sp.	1.5
Common Guillemot	1.4
Razorbill	1.5
Little Auk	1.9
Atlantic Puffin	1.5

3.2.5 MAPPING PROTOCOLS

In order to give an indication of the overall distribution of key species, distribution maps have been generated from the raw data records. The distribution of birds from the ship-based seabird survey were mapped in two ways

- **Common Species e.g. Auks and Gulls:** The data was plotted as dots for the number of birds recorded “in transect” both on the water and flying in each rectangle

surveyed (0.617km long x 0.300km wide). For these species, only birds seen on the water or flying within the 300m band transect at the time of the snapshot were mapped. The seasonal separation was established for each survey area, in order to best illustrate their seasonality of occurrence and the variability in the counts. The survey areas were defined as Survey Area 1 (October 2003 to May 2004) and survey area 2 (June 2004 to December 2005).

- **Less Common or Rare Species e.g. Divers and Skuas**: For species that were seen occasionally, the number of birds recorded has been plotted using all records of sightings. This includes the cumulative numbers of birds seen in or outside the 300m band transect. In order to best illustrate records and any underlying spatial patterns, the aggregated raw data were plotted for each survey area, as initially defined (Survey Areas 1 and 2).

4. SURVEY PROGRAMME FINDINGS

The following section details the findings of the survey programme on a species account basis. For each key species or group, a brief summary of their ecology and status within the North Sea is summarised, density estimates are provided and monthly abundance maxima plotted for both the proposed windfarm site and the control. In addition, the distribution of individuals and flocks on an individual survey basis are shown graphically on a series of maps and this information is also described textually.

4.1 Species Accounts

4.1.1 DIVERS SPP.

A number of diver species were identified during the survey programme, with the Red-throated Diver the most commonly recorded. In some instances it was not possible to speciate the record, although it is expected that the majority of such registrations would be Red-throated Diver, given their dominance within the Diver assemblage. As such, the maps plotting the distribution of findings are given for total Diver spp. recorded, including those records where it was possible to speciate the registration. As such, although Figures 4-6 are for Diver spp. these records largely consist of Red-throated Diver registrations.

4.1.1.1 Red-throated Diver

The Red-throated Diver is included in Annex 1 of the Birds Directive, Appendix II of the Bern Convention, Appendix II of the Bonn Convention, Schedule 1 under the Wildlife and Countryside Act, 1981 and is on the Amber List of Species of Conservation Concern and is a SPEC2/3 species. The species is entirely coastal in its wintering distribution, often being associated with shallow coastal inshore sandy bays during the winter months, and can occur in loose parties of over 20. The major prey items are crustaceans, sand eels, sprat, herring, flatfish and codling and, as its name suggests, these items are obtained by diving. The availability of many of the prey items is often determined by external factors such as weather conditions and levels of pollution and consequently, the distribution and abundance of this species fluctuates with prey availability. The majority of wintering individuals are located down the east coast of Britain. Passage on the east coast occurs both in late summer, with the arrival of the Shetland population, and in early autumn with the migration of birds from Scandinavia. Return passage occurs in late February to early March with the return to Scotland of the British breeding populations, followed by a second movement in April and May involving the Scandinavian population. All divers have two moults during the year, one before and one after breeding. For Red-throated Diver, the major moult occurs in October and November, and during this period the birds are flightless and therefore vulnerable to disturbance and/or pollution. The JNCC have estimated the total wintering population for the UK is in the region of 5,000 individuals (UK SPA Suite analysis). However, this is probably a low estimate in the light of more recent findings from seabird survey programmes off eastern England, and a figure well in excess of 10,000 wintering birds is considered a more realistic population estimate.

Studies in Liverpool Bay have indicated that Red-throated Diver distribution is constrained by water depth, birds possibly favouring the relatively sheltered inshore of areas or predominantly feeding on bottom-dwelling fish species (NWP Offshore Ltd, 2002). However,

Webb and Tasker (1988) recorded Red-throated Divers out to 9km from the shore in several areas off eastern Britain, but with the species recorded in greatest density out to 4km from the coast. Open sea areas where Divers were recorded some distance out from the shore, tended to be over sandy sediments and at depths of less than 25m (Webb and Tasker, 1988). A similar series of environmental determinands were seen to influence Diver distribution in the vicinity of the London Array offshore windfarm site, with preferred conditions identified as including a water depth of less than 10m and a sandy substratum comprising mobile sands with *Nephtys cirrosa* and amphipods, although with a greater density of occurrence outwith 5km of the coastline (Kahlert & Petersen, 2005; London Array Ltd, 2005). The Humber Wind Ltd windfarm site features a water depth of around 15m with variable substratum of sand, cobble, pebble and shell (Allen *et al*., 2006). However, conditions more closely aligned to those described as being preferred by Diver spp. occur further inshore along the Holderness coast.

The survey programme for the Humber Gateway site recorded Red-throated Diver in small numbers, predominantly during the winter period. Figure 7 illustrates the largely winter distribution of Red-throated Diver occurrences off the Holderness coast, but with small passage numbers also recorded during the spring, as well as the low maxima for the species on an individual survey basis. There would appear to be little pattern in relative usage between control and main survey areas, although maxima from October and November 2004 and December 2005 were notably greater in the main survey area, albeit for a relatively small number of birds (<10 individuals).

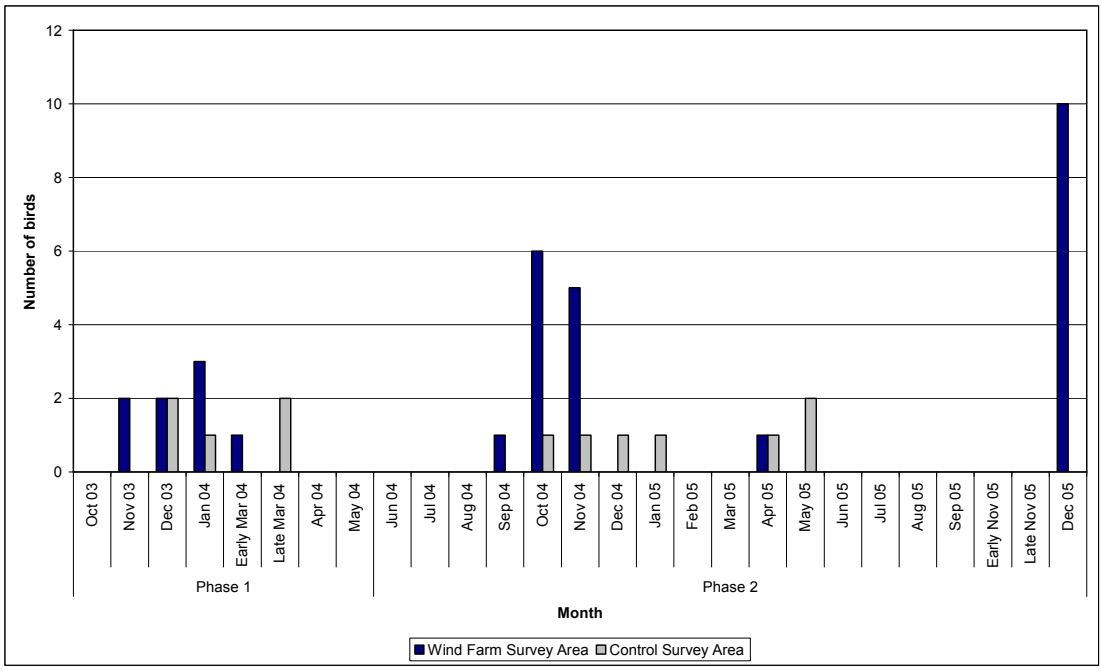

Figure 7: Monthly abundance of Red-throated Diver (all sightings from ship-based survey).

Figures 4 and 5 show the distribution of Red-throated Diver from the boat-based surveys. Both Figures show an absence of any particular concentration in distribution within the development site, as well as an overall low level of usage across the survey area, although the period covering the winter 2003/4 recorded lower usage maxima than 2004/5 and early winter 2005. Peak usage occurred in December 2005, with 6 separate records for birds on the water and 10 individuals recorded, the majority of these being in the vicinity of the Binks,

an area of shallow sand and gravel east of Spurn Head. Registrations from the aerial survey programme were less frequent, but with most registrations from the southern section of the Holderness coast, off the Spurn to Dimlington reach, and with the majority of records from between 5km and 10km off shore.

Table 10: Density estimates (DE), standard deviations (SD) and standard errors (SE) for Red-throated Diver (density corrected from ship-based survey).

Survey Month & Year	Wind Farm Survey Area			Control Survey Area		
	DE	SD	SE	DE	SD	SE
October 2003	0.00	0.00	0.00	0.00	0.00	0.00
November 2003	0.09	0.25	0.09	0.00	0.00	0.00
December 2003	0.00	0.00	0.00	0.00	0.00	0.00
January 2004	0.06	0.18	0.06	0.13	0.26	0.13
Early March 2004	0.00	0.00	0.00	0.00	0.00	0.00
Late March 2004	0.00	0.00	0.00	0.18	0.36	0.18
April 2004	0.00	0.00	0.00	0.00	0.00	0.00
May 2004	0.00	0.00	0.00	0.00	0.00	0.00
June 2004	0.00	0.00	0.00	0.00	0.00	0.00
July 2004	0.00	0.00	0.00	0.00	0.00	0.00
August 2004	0.00	0.00	0.00	0.00	0.00	0.00
September 2004	0.00	0.00	0.00	0.00	0.00	0.00
October 2004	0.08	0.19	0.08	0.00	0.00	0.00
November 2004	0.06	0.14	0.06	0.11	0.19	0.11
December 2004	0.00	0.00	0.00	0.00	0.00	0.00
January 2005	0.00	0.00	0.00	0.11	0.19	0.11
February 2005	0.00	0.00	0.00	0.00	0.00	0.00
March 2005	0.00	0.00	0.00	0.00	0.00	0.00
April 2005	0.00	0.00	0.00	0.00	0.00	0.00
May 2005	0.00	0.00	0.00	0.31	0.27	0.16
June 2005	0.00	0.00	0.00	0.00	0.00	0.00
July 2005	0.00	0.00	0.00	0.00	0.00	0.00
August 2005	0.00	0.00	0.00	0.00	0.00	0.00
September 2005	0.00	0.00	0.00	0.00	0.00	0.00
October 2005 [1] (See note)	0.00	0.00	0.00	N/A	N/A	N/A
Early November 2005	0.00	0.00	0.00	0.00	0.00	0.00
Late November 2005	0.00	0.00	0.00	0.00	0.00	0.00
December 2005	0.48	0.73	0.30	0.00	0.00	0.00

Note

[1] Dedicated Little Gull Survey

It should be noted that the inshore waters of Holderness (usually within the 10m contour and perhaps out to *c*. 5km from the coast) appear, from previous survey programmes and land-based observations, to support a greater number of Red-throated Diver at a greater density. As such, the current survey data (although predominantly covering more offshore waters around the proposed development site) appears to largely support these findings, but with the majority of records out to c. 10km of the coast. In fact, this distribution is slightly skewed for the boat-based data, as survey transects only approached to *c*. 5km of the shore, and as such, inshore registrations were not possible from the boat-based survey. Aerial survey

records (Figure 6) were less numerous than for the boat survey, but showed a more coastal distribution, with the majority of records within 5km or 6km of the coast (these transects approaching to c. 2km of the coastline).

Interestingly, there would appear to be a small degree of correlation between Diver spp. distribution and the relatively shallow sandy gravel bank areas of the Binks, although given the relatively small dataset, it is unclear whether this reflects a spatial preference for the species. However, such environmental parameters would be consistent with known preferred habitat and prey requirements (see above).

The above values (Table 10) show usage by Red-throated Diver during the survey period to be relatively low, and certainly below the densities recorded from similar survey programmes in the Greater Thames, when densities well in excess of 1 bird per km^2 were regularly recorded on the Greater Gabbard survey programme (Banks *et al,* 2005).

As expected, peak densities were generally recorded from the Humber Gateway survey programme during the winter period, with a dispersed wintering population known to occur along the Holderness coast at this time (e.g. Mather, 1986 & IECS, 1994). However, previous studies have identified this wintering population to be concentrated within the coastal margin, within 5km of the shore (IECS, 1995), and this distribution would accord with the current survey findings. A peak density figure of almost. 0.5 birds per km^2 was recorded (December 2005), this relating to 10 individuals but with only 1 bird recorded in the control site from the December 2004 survey and 2 birds in both the control and main survey areas in 2003. This relatively low recording level can be compared to estimates of 6,437 for Greater Thames and 5,634 for Greater Wash/Thames Strategic Area (Banks, 2006).

Assuming a national importance threshold of 49 birds (Banks *et al,* 2006), the level of birds recorded within the survey and control areas during the programme is considered of low concern, the level of records broadly concurring with that from previous surveys in the area, and below those from more inshore waters where densities of between 2 and 3 birds per km^2 were recorded in the coastal margins (e.g. IECS, 1995).

4.1.1.2 Black-throated Diver

The Black-throated Diver also winters along the east coast, but in smaller numbers than the Red-throated Diver along the Yorkshire coast, and is also recorded during passage. The species is included on the Amber List of Species of Conservation Concern and is included in Annex 1 of the Birds Directive, Appendix II of the Bern Convention, Appendix II of the Bonn Convention, Schedule 1 under the Wildlife and Countryside Act, 1981.

A single Black-throated Diver was observed on one ship-based seabird survey in December 2004.

4.1.1.3 Great Northern Diver

The Great Northern Diver is also included in Annex 1 of the Birds Directive, Appendix II of the Bern Convention, Appendix II of the Bonn Convention, Schedule 1 under the Wildlife and Countryside Act, 1981 and is on the Amber List of Species of Conservation Concern. The

species may winter in the UK in numbers up to 1,000, but the majority of these are off the west coast of Ireland and north-west coast of Scotland.

The species is regularly, but uncommonly, observed on passage along the Yorkshire coast, and is recorded in substantially fewer numbers than the Red-throated Diver. There are also wintering records for the species along the coast, but these are irregular and patchy, with one or two birds usually recorded along the Holderness coast for short periods over the winter. However, during the survey programme, there were only two sightings of the species, one flying north in May 2005 (ship-based survey) and one flying in February 2004 (aerial survey).

4.1.1.4 Unidentified Divers

Survey conditions, distance and/or plumage often dictated that a diver sighting could not be speciated. When this occurred, the record was assigned to unidentified diver. Where appropriate, such registrations have been included in the distribution data given in Figures 4-6.

4.1.2 FULMARS, SHEARWATERS AND PETRELS

The Northern Fulmar was regularly recorded during the survey programme, with shearwaters and petrels less commonly encountered.

4.1.2.1 Northern Fulmar

The Fulmar (Northern Fulmar) has shown a phenomenal growth in population size and distribution in the last 100 years, possibly initially attributable to the provision of offal and discards from whalers and subsequently, trawlers as well as the gradual warming of the eastern Atlantic (Lloyd *et al*, 1991). Breeding birds are present around the colonies for most of the year, eggs are laid in May and the young leave the cliffs in September. The closest colony of any size to the proposed development site is on the cliffs of Flamborough c. 55km from windfarm site where over 1,000 pairs breed. Somewhere between 1.6 million & 1.8 million birds winter around the UK coasts (Lack., 1986) but numbers have declined in recent years and it is now on the Amber List of Species of Conservation Concern. This decline continued into 2004 with UK breeding numbers being the lowest since the mid 1980s.

Largely pelagic during the winter, it would be expected, given the relative proximity of the breeding colony, that the main period of occurrence in the waters around the proposed windfarm would be during the breeding and immediate post breeding period, given that the species has a breeding colony at Flamborough Head, to the north of the survey area. This temporal concentration is illustrated in Table 11 with a near absence of the species from the area apart from during the summer months and the early autumn. Densities of up to c. 0.5 birds per km^2 were recorded from the boat surveys during the summer months, but with much lower levels during the winter and so this concurs with expectations.

Figure 4 also illustrates this increased occurrence during the breeding period, with up to 20 birds recorded from the boat-based surveys in June and a near absence of the species during the winter period. This accords with levels recorded away from the breeding colony from the IECS seabird survey programme in the early 1990s, when a far greater number of

sightings (producing a density of c. 4 birds per km^2 was recorded immediately off Flamborough (IECS, 1993).

Relative usage between the survey and control sites in terms of monthly maxima are largely comparable, although the three highest maxima were recorded from the main survey block (Figure 4). However, it should be noted that the control area featured a smaller total transect length than the main survey area, and a slightly higher density was recorded within the control area during the breeding season (Table 11).

Table 11: Density estimates (DE), standard deviations (SD) and standard errors (SE) for Northern Fulmar (density corrected from ship-based survey).

Survey Month & Year	Wind Farm Survey Area			Control Survey Area		
	DE	SD	SE	DE	SD	SE
October 2003	0.00	0.00	0.00	0.00	0.00	0.00
November 2003	0.00	0.00	0.00	0.00	0.00	0.00
December 2003	0.00	0.00	0.00	0.00	0.00	0.00
January 2004	0.00	0.00	0.00	0.00	0.00	0.00
Early March 2004	0.00	0.00	0.00	0.00	0.00	0.00
Late March 2004	0.00	0.00	0.00	0.00	0.00	0.00
April 2004	0.00	0.00	0.00	0.00	0.00	0.00
May 2004	0.06	0.18	0.06	0.00	0.00	0.00
June 2004	0.23	0.29	0.12	0.11	0.19	0.11
July 2004	0.11	0.17	0.07	0.56	0.96	0.56
August 2004	0.00	0.00	0.00	0.00	0.00	0.00
September 2004	0.00	0.00	0.00	0.11	0.19	0.11
October 2004	0.00	0.00	0.00	0.00	0.00	0.00
November 2004	0.00	0.00	0.00	0.11	0.19	0.11
December 2004	0.00	0.00	0.00	0.00	0.00	0.00
January 2005	0.06	0.14	0.06	0.00	0.00	0.00
February 2005	0.00	0.00	0.00	0.00	0.00	0.00
March 2005	0.00	0.00	0.00	0.00	0.00	0.00
April 2005	0.00	0.00	0.00	0.00	0.00	0.00
May 2005	0.17	0.28	0.11	0.00	0.00	0.00
June 2005	0.13	0.33	0.13	0.11	0.19	0.11
July 2005	0.11	0.17	0.07	0.00	0.00	0.00
August 2005	0.00	0.00	0.00	0.00	0.00	0.00
September 2005	0.18	0.29	0.12	0.00	0.00	0.00
October 2005 [1] (See note)	0.00	0.00	0.00	0.00	0.00	0.00
Early November 2005	0.00	0.00	0.00	0.00	0.00	0.00
Late November 2005	0.00	0.00	0.00	0.00	0.00	0.00
December 2005	0.11	0.27	0.11	0.00	0.00	0.00

Note

[1] Dedicated Little Gull Survey

Figures 8 to 15 plot Northern Fulmar registrations from both the boat and aircraft surveys. The boat-based survey programme (Figures 8 to11) shows a near absence of the species from the area during the winter and spring, but with a relatively high usage during the summer months. In particular, June usage was relatively high, with the majority of records for birds in flight rather than on the water, these birds presumably undertaking foraging activity across the area and feeding young on the Flamborough colony. Usage then decreases during the late summer and early autumn with post-breeding dispersion, again with the majority of registrations for birds in flight, rather than on the water.

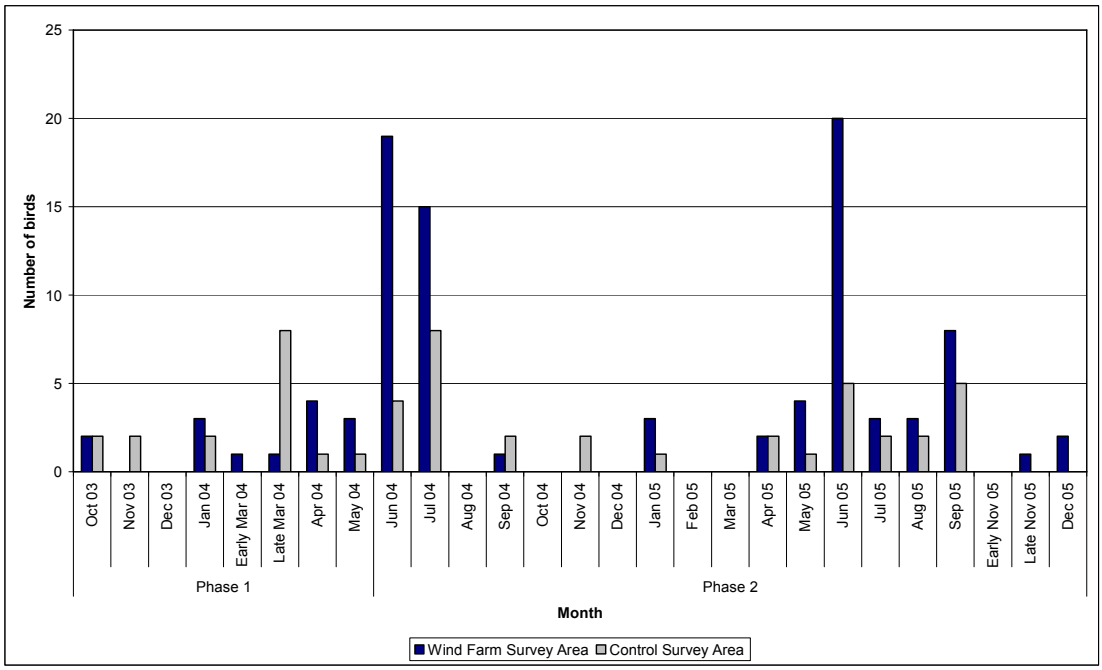

Figure 16 Monthly abundance of Northern Fulmar (all sightings from ship-based survey).

A similar pattern of usage was seen during the aerial survey programme, with a relatively high number of registrations made for the May to August period, compared to September and October. In particular, this is apparent from the second survey phase (Figure 16), where registrations were relatively evenly distributed across the main survey area and across the months. In addition, it should be noted that the vast majority of records were for 1 to 10 birds (both for the boat and aerial surveys), with most registrations being for single foraging birds.

This pattern of temporal usage, distribution and frequency of occurrence is entirely as expected for the area, with colonial breeding activity associated with Flamborough Head being the most important driver of usage by Northern Fulmar in the region. Usage by the species within the proposed development area would appear to be similar to surrounding areas, with the aerial survey data suggesting that distribution tends to be further offshore than the development area, with the majority of registrations being beyond 12km offshore. In the context of the colonial population at Flamborough, of which it is assumed the majority of summer registrations are associated, the number of birds using the development area and immediate environs represents a very small percentage of the breeding population. Indeed, it would appear that with no more than 20 individual sightings from any individual boat survey day (c. 1% of the breeding population), the proposed windfarm site is potentially used by substantially <1% of the breeding population on a daily basis), with no particular pattern of usage in terms of flight direction and foraging movements etc.

4.1.2.1 Manx Shearwater

The species is primarily recorded during passage periods off the Yorkshire coast (e.g. Mather, 1986, various Spurn Bird Observatory reports), and is on the Amber List of Species of Conservation Concern, as well as being a SPEC 2 species. Data from Spurn (Table 5) indicates that the majority of movements off the Holderness coast occurring during the early to late summer, with peak daily movements of between 50 and 100 birds in recent years.

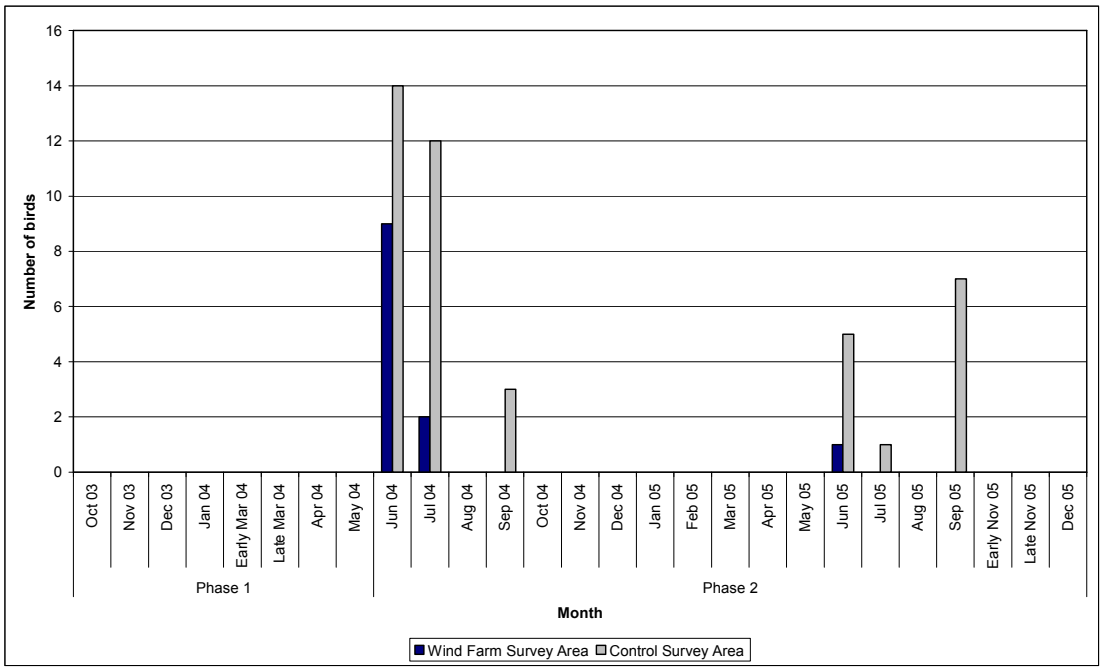

Figure 17 Monthly abundance of Manx Shearwater (all sightings from ship-based survey).

During the seabird survey programme a similar pattern of movement was recorded, with the species present in September, as well as June and July. Whilst the September movement (up to 7 birds) was presumably a post breeding dispersion, probably of juveniles, the July and June activity may have been late or early passage movements of adults, or potentially foraging activity by individuals from the Atlantic and Irish Sea breeding colonies.

The peak number of registrations (14 from the June 2004 boat survey) would accord with the levels of movement seen from Spurn (See Table 5), with very low densities present (Table 12). Figures 18 and 19 plot the registrations of Manx Shearwater observed during the boat and aircraft survey programmes. Figure 18 (boat surveys) shows the majority of registrations to be for birds in flight, with no particular pattern of distribution within the survey area apart from a possible slight clustering to the north of the proposed windfarm area by about 5km, the majority of registrations being from the June and July surveys.

Figure 19 (aerial surveys) shows a relatively even distribution of sightings but with the majority of registrations from July and September, and with a smaller number during August. The majority of these sightings were for birds over 10km from the coast and away from the windfarm site.

Table 12: Density estimates (DE), standard deviations (SD) and standard errors (SE) for Manx Shearwater (density corrected from ship-based survey).

Survey Month & Year	Wind Farm Survey Area			Control Survey Area		
	DE	SD	SE	DE	SD	SE
October 2003	0.00	0.00	0.00	0.00	0.00	0.00
November 2003	0.00	0.00	0.00	0.00	0.00	0.00
December 2003	0.00	0.00	0.00	0.00	0.00	0.00
January 2004	0.00	0.00	0.00	0.00	0.00	0.00
Early March 2004	0.00	0.00	0.00	0.00	0.00	0.00
Late March 2004	0.00	0.00	0.00	0.00	0.00	0.00
April 2004	0.00	0.00	0.00	0.00	0.00	0.00
May 2004	0.00	0.00	0.00	0.00	0.00	0.00
June 2004	0.00	0.00	0.00	0.22	0.38	0.22
July 2004	0.00	0.00	0.00	0.00	0.00	0.00
August 2004	0.00	0.00	0.00	0.00	0.00	0.00
September 2004	0.00	0.00	0.00	0.00	0.00	0.00
October 2004	0.00	0.00	0.00	0.00	0.00	0.00
November 2004	0.00	0.00	0.00	0.00	0.00	0.00
December 2004	0.00	0.00	0.00	0.00	0.00	0.00
January 2005	0.00	0.00	0.00	0.00	0.00	0.00
February 2005	0.00	0.00	0.00	0.00	0.00	0.00
March 2005	0.00	0.00	0.00	0.00	0.00	0.00
April 2005	0.00	0.00	0.00	0.00	0.00	0.00
May 2005	0.00	0.00	0.00	0.00	0.00	0.00
June 2005	0.00	0.00	0.00	0.11	0.19	0.11
July 2005	0.00	0.00	0.00	0.11	0.19	0.11
August 2005	0.00	0.00	0.00	0.00	0.00	0.00
September 2005	0.00	0.00	0.00	0.00	0.00	0.00
October 2005 [1] (See note)	0.00	0.00	0.00	0.00	0.00	0.00
Early November 2005	0.00	0.00	0.00	0.00	0.00	0.00
Late November 2005	0.00	0.00	0.00	0.00	0.00	0.00
December 2005	0.00	0.00	0.00	0.00	0.00	0.00

Note

[1] Dedicated Little Gull Survey

4.1.2.2 Sooty Shearwater

The species is occasionally recorded off the Yorkshire coast. During the survey programme there have been several records of Sooty Shearwater in September. A total of 3 birds were recorded from the boat-based programme in September 2003 and 2004 whilst a single bird was observed from the aeroplane survey in September 2004.

4.1.2.3 Unidentified Shearwater

Where weather conditions, distance and/or plumage meant that a sighting could not accurately be speciated from the aeroplane, it was assigned as an unidentified shearwater. A total of 14 Shearwater spp. were recorded during the aerial survey programme, with two in

June 2004, two in September 2004 and 10 in October 2004. It is believed that the majority of these birds were likely to have been Manx Shearwater.

4.1.2.4 Leach's Petrel

The species breeds on the northern and western isles of Scotland, but has a pelagic distribution at other times and is occasionally recorded off the Yorkshire coast. It is included on the Amber List of Species of Conservation Concern as well as Annex 1 of the Birds Directive, Appendix II of the Bern Convention, Appendix II of the Bonn Convention, Schedule 1 under the Wildlife and Countryside Act, 1981.

A total of 3 individuals were recorded during the November 2005 ship-based survey. It is possible that these individuals were on late migratory passage, but there is no evidence to suggest that large numbers pass through the windfarm survey area during autumn.

It is noted that no Storm Petrels (*Hydrobates pelagicus*) were recorded during the survey programme.

4.1.3 NORTHERN GANNET

The Gannet (Northern Gannet) is on the Amber List of Species of Conservation Concern and is a SPEC2/3. The recent SPA network review (Stroud *et al*, 2001), identified the Northern Gannet as an important component of the wider breeding seabird assemblage at Flamborough Head and Bempton Cliffs SPA, which is 55km away from the windfarm . This SPA is the only mainland Northern Gannet breeding colony on the east coast of England with 2.500 pairs estimated to be breeding in 2001 (Stroud *et al.*, 2001). Gannets generally return to their breeding colonies around February and eggs are laid in April (Cramp, 1998). Although breeding Gannets are generally thought to feed up at up to 150km from their colony, some studies have suggested that the majority may feed at a distance of 30-40km (Tasker *et al.*, 1985). Concentrations of feeding Gannets may form where there is a large shoal of fish, such as herring (*Clupea harengus*), sprat (*Sprattus sprattus*), sand eel (*Ammodytes* spp.) or mackerel (*Scomber scombrus*), near the sea surface. Most young birds leave their nests in August and September and enter the water beneath the colony, being initially flightless and the last birds leave the colony in October. Gannets tolerate human presence if they are not exploited, but entanglement in discarded fishing nets and toxic chemical pollution may affect population sizes through direct mortality or lowered breeding success (Lloyd *et al,* 1991).

Figures 20 to 28 show the seasonal distribution of Northern Gannet sightings from the boat and aircraft survey programmes. In general, Figures 20 to 23 show a very low level of usage by Gannet in the survey area during the period September through to April, with the species at this time, having a more pelagic distribution.

However, Figure 24 shows registrations made from the boat-based survey programme during the main breeding period (May to August), with flying bird registrations relatively well distributed across the survey area, and birds on the water predominantly recorded to the north of the proposed windfarm site. The majority of registrations for birds were made during the June surveys, with a smaller number of registrations in July.

Figures 25 to 28 plot the seasonal distribution of records made from the aerial survey programme, and these reveal a similar pattern of usage with the species almost absent from the area during the winter and with the majority of sightings during the breeding season. Figure 25 shows a relatively evenly dispersed distribution of sightings during the breeding season, but with, as might be expected, a slightly increased density of records in the northern section of Bridlington Bay, at a closer proximity to the breeding colony. Whilst birds were recorded to within c. 2km of the coast, the majority of registrations were beyond 10km from the coastline. Few registrations were made from within, or immediately adjacent to, the area of the proposed windfarm during this period.

Figure 26 plots the registrations for the post breeding period (September to October) from the aerial surveys, and reveals a continued presence of the species in September, a factor not picked up from the boat-based surveys. In general, the distribution of sightings during September was similar to that seen in the summer, with a slight increase in sighting density in the northern part of the survey area, closer to the Flamborough colony. A few records were also made in October, but far fewer than for September, and this summer and early autumn pattern of usage is evident from Figure 29 (below), with June and July featuring the majority of sightings in both the main survey and control blocks in 2004 and 2005, associated with the movement of adult birds between foraging areas and the breeding colony, but with usage also continuing during the late summer and early autumn with the dispersal of adults and juvenile birds from the site.

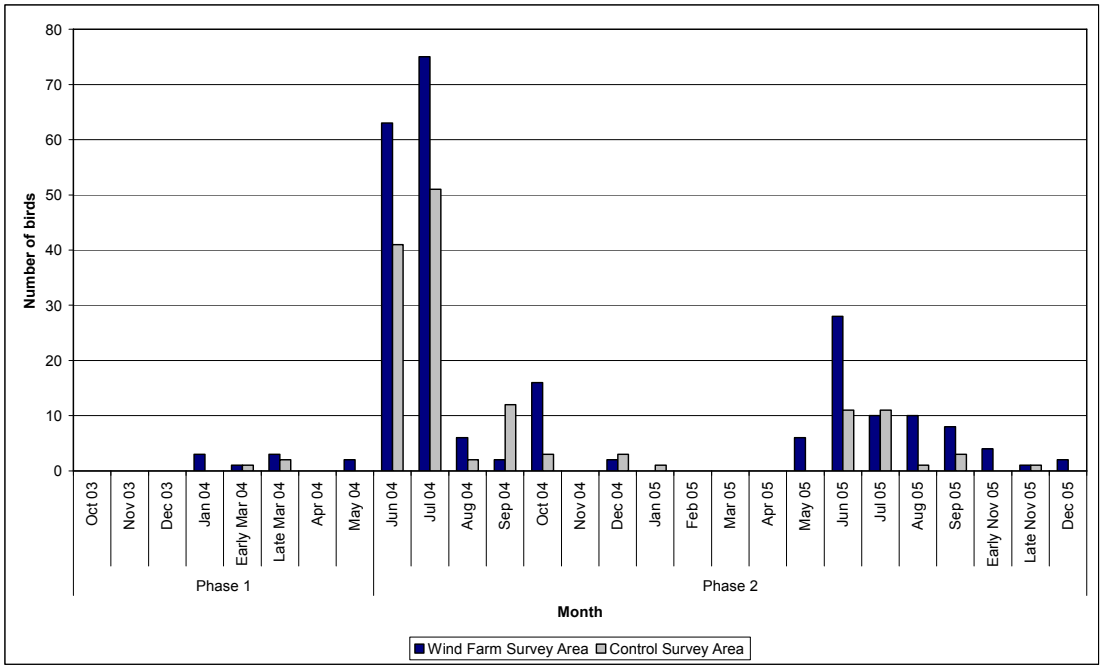

Figure 29: Monthly abundance of Northern Gannet (all sightings from ship-based survey).

Figure 27 covers the winter period, with very few registrations made, the majority of these from November, and with Figure 28 covering the pre-breeding spring period (February to April), with February and increasing into March as individuals arrive in the vicinity of the breeding colony. No birds were recorded during the April surveys, with breeding individuals established at Flamborough by this time. Again a slight skew in distribution was recorded

during this period, with the majority of registrations in the northern half of the survey area, again presumably due to the closer proximity of the actvie Flamborough Head breeding site.

Table 13 also illustrates the relativley high level of usage during the breeding season, with densities of around 1 bird per km^2 recorded from the main survey area and 2 birds per km^2 from the control area to the north of the windfarm site. However, outwith this period, usage was considerably lower (and associated densities). Stone *et al.* (1995) suggest the density of Gannet to be less that 1 bird per km^2 along the Holderness coast during the breeding season (May to August).

Table 13: Density estimates (DE), standard deviations (SD) and standard errors (SE) for Northern Gannet (density corrected from ship-based survey).

Survey Month & Year	Wind Farm Survey Area			Control Survey Area		
	DE	SD	SE	DE	SD	SE
October 2003	0.00	0.00	0.00	0.00	0.00	0.00
November 2003	0.00	0.00	0.00	0.00	0.00	0.00
December 2003	0.00	0.00	0.00	0.00	0.00	0.00
January 2004	0.00	0.00	0.00	0.00	0.00	0.00
Early March 2004	0.00	0.00	0.00	0.13	0.26	0.13
Late March 2004	0.06	0.18	0.06	0.00	0.00	0.00
April 2004	0.00	0.00	0.00	0.00	0.00	0.00
May 2004	0.00	0.00	0.00	0.00	0.00	0.00
June 2004	0.22	0.27	0.11	2.69	2.33	1.35
July 2004	0.49	0.52	0.21	0.11	0.19	0.11
August 2004	0.00	0.00	0.00	0.00	0.00	0.00
September 2004	0.00	0.00	0.00	0.11	0.19	0.11
October 2004	0.00	0.00	0.00	0.00	0.00	0.00
November 2004	0.00	0.00	0.00	0.00	0.00	0.00
December 2004	0.00	0.00	0.00	0.00	0.00	0.00
January 2005	0.00	0.00	0.00	0.00	0.00	0.00
February 2005	0.00	0.00	0.00	0.00	0.00	0.00
March 2005	0.00	0.00	0.00	0.00	0.00	0.00
April 2005	0.00	0.00	0.00	0.00	0.00	0.00
May 2005	0.06	0.14	0.06	0.00	0.00	0.00
June 2005	1.00	1.76	0.72	0.33	0.33	0.19
July 2005	0.00	0.00	0.00	0.27	0.24	0.14
August 2005	0.00	0.00	0.00	0.00	0.00	0.00
September 2005	0.00	0.00	0.00	0.16	0.27	0.16
October 2005 [1] (See note)	0.12	0.16	0.06	0.00	0.00	0.00
Early November 2005	0.06	0.14	0.06	0.00	0.00	0.00
Late November 2005	0.00	0.00	0.00	0.00	0.00	0.00
December 2005	0.00	0.00	0.00	0.00	0.00	0.00

Note

[1] Dedicated Little Gull Survey

Very little active fishing by the species was observed during the survey programme, with birds either loafing on the water or flying through the site. Regular flight movements were observed within the survey area, although few within the proposed windfarm site, with the

birds moving predominantly along the coastline in the inshore areas west of the proposed windfarm site. The ship-based surveys recorded 67% of the flying Gannet heading in a northerly or southerly directions. This might suggest that those birds were travelling betweeen the Flamborough colony and foraging areas to the south of the Humber (e.g. the area around the Silver Pit).

Given the importance of the Flamborough colony in the southern North Sea, as well as the relatively long-lived nature of the species and habitual foraging flight routes, the potential for deleterious effects to the status of the species resulting from the operation of offshore windfarms requires considerable consideration. However, whilst the species was present both on the water and flying through the location of Humber Gateway site, usage was relatively low in the context of the overall study area from the survey programme, with the majority of registrations orginating from further offshore.

As such, although there is the potential for deleterious impact to the species from the operation of offshore windfarms at a theoretical level, it is anticipated that in the case of the Humber Gatway development, the relatively low level of usage within and immediately around the site produces a substantially lower actual threat of deleterious impact. Howevre, this will need to be considered in greater detail during the collision risk modelling and main ES stages of the EIA process.

4.1.4 CORMORANT SPP.

4.1.4.1 Great Cormorant

Present along the coast throughout the year and breeds in small numbers from Flamborough northwards. It is included as an Amber List Species of Conservation Concern.

Figures 30 to 32 plot usage recorded during the boat and aircraft survey programmes, with Figures 30 & 31 (boat survey) showing a very low level of usage, with only three registrations made during the boat survey programme. Whilst the sample size was too low to provide any seasonal pattern of usage, the records totalling four birds were from transects off Spurn Head (southern transects of the windfarm site) and off the Humber mouth (northern transects of the control site), suggesting that birds may be associated with the Humber corridor.

Figure 32 (aerial survey) recorded a cluster of sightings immediately off the coast, in the vicinity of Hornsea, and it is considered likely that these birds were associated with Hornsea Mere, presumably fishing and roosting on the site. A further small number of records were made off the mouth of the Humber, and as with the boat survey records, it is assumed that these birds were associated with the estuarine corridor.

4.1.4.2 European Shag

The Shag is typically a bird of rocky coastlines and is almost exclusively restricted to the coastal waters around the Flamborough Head and Bempton Cliffs colony where it breeds. As expected given its relatively low abundance in the region (compared to other breeding seabird species), the records from the survey programme were scarce with only two birds recorded in the windfarm survey area during the ship-based survey programme. The

numbers were also scarce from the aerial survey, with the sightings during the breeding season restricted to the most northerly transects (c. 20km from the Flamborough Colony).

4.1.4.3 Unidentified Cormorant

Where weather conditions, distance and/or plumage meant that a sighting could not accurately be speciated, it was assigned as an unidentified cormorant. One unidentified individual Cormorant sp. was recorded during the aerial survey in October 2003.

4.1.5 DUCKS, GEESE AND SWANS

Seaduck flocks have been historically present both along the Holderness coast and in the outer Humber on occasion (various Spurn Observatory records). In addition, the Humber Estuary SPA supports populations of many species of ducks and geese in nationally or internationally important numbers.

4.1.5.1 Pink-footed Goose

Associated with the Humber estuary rather than the coast, and included within the Humber Estuary SPA assemblage, the species may also undertake migratory movements off the coast (various Spurn Observatory records). Two flocks were recorded during the ship based seabird surveys; one flock of six birds in November 2004 and an additional flock of 39 birds in October 2005, with both flocks observed to fly below 25m. On both occasions, the birds were sighted in inshore waters with the birds seen moving along the coast in a southerly direction.

4.1.5.2 Common Shelduck

Associated with the Humber estuary rather than the coast, and included within the Humber Estuary SPA assemblage, the species also undertakes migratory movements off the coast, moving between wetland sites in the UK and with continental movements to moult areas in the Waddensee, with movements to this area occurring during the mid to late summer, and return flights arriving from the autumn and through the winter (Lack, 1986; Meltofte *et al*., 1994).

Only one sighting of four birds in flight was made during the survey programme. These were recorded in January 2004 during a ship-based survey, heading towards the Humber mouth.

4.1.5.3 Eurasian Wigeon

Associated with the Humber estuary rather than the coast, and included within the Humber SPA assemblage, the species also undertakes migratory movements to and from breeding grounds in northern Europe (Iceland, Fennoscandia and northern Russia), with flocks arriving in the Humber during the autumn and departing in the spring, the Humber supporting over 4,000 birds.

A flock of 9 birds was flushed from the sea surface during the ship-based survey in November 2005. The birds were present in the control area, and it is possible that these birds were in active migration through the area.

4.1.5.4 Mallard

Associated with the Humber estuary rather than the coast, and included within the Humber SPA assemblage, a largely resident population occurs within the Humber catchment. However, there may be an influx of continental birds during the winter, depending on weather conditions, with return movements undertaken during the late winter or early spring. Recent years have seen a substantial decline in numbers of the species recorded in the Humber, with a 5 year mean of 2,599 birds using the site from 2000/1 to 2004/5 compared to a value of 5,429 from the period 1981/2 to 1985/6 (BoEE/WeBS data)

The relative lack of sightings reflected the low importance of the area for wintering and migratory Mallard populations and there were only two sightings of Mallard during the survey programme in November 2005 with two separate sightings of two birds in the windfarm survey area and six birds in the control survey area.

4.1.5.5 Common Teal

Associated with the Humber estuary rather than the coast, and included within the Humber SPA assemblage. The majority of flocks move into the estuary during autumn, over-winter and then return to northern breeding grounds (Fennoscandia and western Russia) in the spring, although a smaller population breeds in the Humber catchment (e.g. Gibbons *et al.*, 1993).

Teal was recorded on only one occasion, in November 2005, in association with Mallard. Both species were present on the sea surface in the control area.

4.1.5.6 Common Eider

The Eider is numerically the most common British seaduck, with a wintering population of approximately 75,000 individuals. Flocks can now be found anywhere along the rocky coasts of eastern England and are now a fairly common sighting along the Yorkshire coast, although until the 1950's they were rarely recorded (Mather, 1986). The species feeds on mussel beds, molluscs, crustaceans and echinoderms, obtaining its prey by surface diving, head dipping and upending. Breeding performance is based to a large extent on the ability of the female to accumulate sufficient body reserves during the winter, which in turn depends upon winter social behaviour (the presence of a mate) and the availability of the food supply. As such disturbance to wintering flocks and/or loss of feeding resources are of particular importance for the ecology of the species. The species is included within the Amber List of Species of Conservation Concern.

During the 1992/3 seabird survey programme in Bridlington Bay, small numbers of the species were found to be wintering in the vicinity of Flamborough Head, but with no records in the southern part of Bridlington Bay, their distribution is presumed to be associated with the presence of hard substratum in the area; this more stable habitat being able to support the development of mussel beds (IECS, 1993).

The only sighting of Common Eider from the current programme was in December 2004 during a ship-based survey when a flock of five birds was recorded in the most northern transect of the control survey area, with the birds observed to fly in a north-easterly direction.

4.1.5.7 Common Scoter

The species is included on the Red List of Species of Conservation Concern and is included in Annex II of the Wild Birds Directive, Appendix III of the Bern Convention, Appendix II of the Bonn Convention, Schedule 1 under the Wildlife and Countryside Act, 1981. It also has a UK Biodiversity Action Plan.

Common Scoter feed mainly on molluscs during the winter, principally on blue mussel (Cramp, 1998). Winter concentrations have traditionally been recorded from Bridlington Bay, and the 1992/3 survey programme in Bridlington Bay recorded small numbers around Flamborough Head a flock immediately south of Bridlington Harbour (IECS, 1993), although small flocks can be present along the Holderness coast down to Spurn on occasion.

However, during the Humber Gateway seabird survey programme, the majority of records were made during the summer and autumn. In August 2004, 5 birds were observed in the windfarm survey area whilst 4 individuals were present in the control survey area, both flocks were seen in flight. The peak occurred in October 2004 when a flock of 15 birds was seen on the water (October 2004). This is illustrated in Figure 33, and shows a near absence of the species from the survey area in 2005 when compared to 2004.

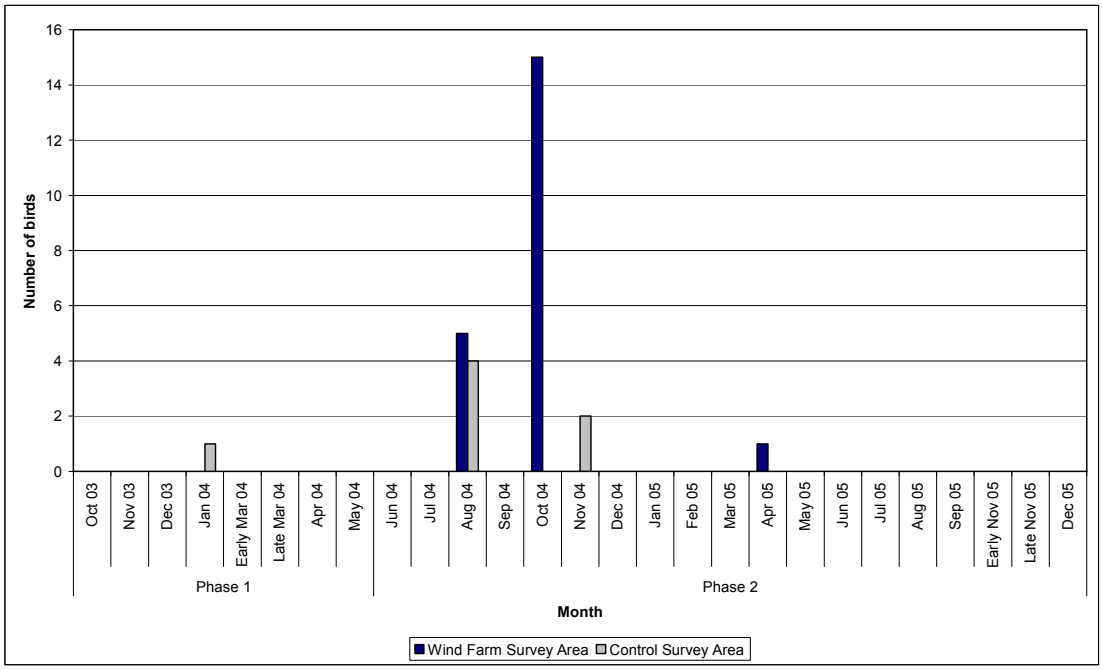

Figure 33: Monthly abundance of Common Scoter (all sightings from ship-based survey)

Figures 34 and 35 show the distribution of these sightings, with no particular pattern of usage descernable, although in general, the majority of records were from an area of sea off the Humber mouth, in the region of the Binks, a sand, gravel and cobble area which may have the potential to support mussel bed communities.

4.1.6 WADERS SPP.

The Humber Estuary European Marine Site supports populations of many species of waders in nationally or internationally important numbers. In addition, flocks move along the coast during passage periods (various Spurn Observatory reports).

Very few waders were recorded during the Humber Gateway seabird survey programme, although occasional registrations were made, these largely off Spurn Head. A total of 5 birds were recorded from the boat in December 2005, with a single bird recorded flying west in the control site and four birds flying south in the windfarm survey area. Both sightings were registered to fly just above sea level. These were suspected to be of the small *Calidris* genus, possibly Dunlin or Ringed Plover. Additionally, three sightings of unidentified waders were made during the aerial survey programme, totalling five birds (Figure 36).

4.1.6.1 European Golden Plover

The Humber estuary is of international importance for Golden Plover with the birds mainly foraging in inland pastures and using the intertidal areas of the estuary to loaf (Mander & Cutts., 2005). The only sighting made during the survey programme was a single bird in December 2004 (ship-based survey) observed to fly south west in the windfarm survey area.

4.1.6.2 Common Redshank

During the autumn and winter the Redshank is one of the most widespread species in the Humber Estuary (Mander & Cutts, 2005), encountered on just about any foreshore where a small area of mud is present. At sea, the species was only sighted once in the control survey area where two birds were recorded flying in a south-westerly direction in July 2004.

4.1.6.3 Eurasian Woodcock

The Eurasian Woodcock is a bird of well-wooded districts. In the winter months, hard weather can provoke at coastal sites an arrival of individuals from the continent. Whist the species was not recorded during the aerial survey programme, the ship-based survey in November 2004 recorded the passage of three individuals across the control and survey areas, with the birds flying in a south westerly direction just above sea level.

4.1.6.4 Grey Phalarope

Grey Phalarope is a scarce visitor to British inshore waters mostly from late September to November (Lack., 1986). One bird was recorded in January 2005 during a ship-based survey.

4.1.7 SKUA SPP.

Skuas move through the area during the autumn, with the Spurn Observatory data for Spurn Head indicating the main movement to occur between September and November, with over 200 birds moving through the coast within a day on occasion. Both Great Skua and Arctic Skua are also recorded during spring passage, and other Skua species may be recorded in small numbers on occasion.

Although the boat-based survey programme allowed for the speciation of Great and Arctic Skuas, the aerial survey programme tended to not record individual species, but rather a generic Skua spp. Figure 37 shows these registrations, with records occurring from most sections of the survey area from south of Flamborough Head to off Spurn Head. In general, records were for birds over 10km from the coast and with the majority from the July to October period, this corresponding well with records from Spurn Bird Observatory (Table 5).

4.1.7.1 Great Skua

Observations from the boat and aeroplane showed the species to be restricted to the spring and autumn periods. Great Skuas remain close to their breeding colonies in Northern Scotland, Iceland, Norway and Northern Russia during the breeding season and the sightings during the autumn period reflect the dispersion of these birds from their breeding colonies. The numbers of sightings were far greater from the aerial surveys with a total of 14 birds, and by contrast, only three birds were recorded flying from the survey boat platform. From the aeroplane surveys, it appeared that the birds were dispersed across the entire survey, with no apparent area of concentration. 90% of the aeroplane sightings related to single or paired birds sat on the sea surface.

4.1.7.2 Arctic Skua

A total of 14 individuals were recorded from the boat-based survey programme (Figures 38 and 39) with registrations again covering the period July through to October, and with the majority of birds in flight but no particular concentration of usage within the survey area apparent. Around a third of flights were observed to be at rotor height. Sightings from the aeroplane were lower with only 6 individuals noted.

4.1.8 GULLS SPP.

A number of species of Gull were recorded during the boat and aerial survey campaigns, with individuals speciated where possible. However, in some instances, this was not possible, and records were either grouped into large and small Gull categories, or as Gull spp. The distribution and density of these unidentified gulls are discussed in Section 4.1.8.9. Where speciation was possible, records have been analysed and addressed in the following individual species accounts sections.

4.1.8.1 Little Gull

The Little Gull is included in Appendix II of the Bern Convention, Annex 1 of the Wild Birds Directive, and is on the Amber List of Species of Conservation Concern. Its breeding range is generally across Finland, the Baltic countries and northern Russia with most UK records as a passage migrant. On the Yorkshire coast, the species can be recorded in daily numbers well in excess of 100 during passage periods, with the main movement occurring during September and October.

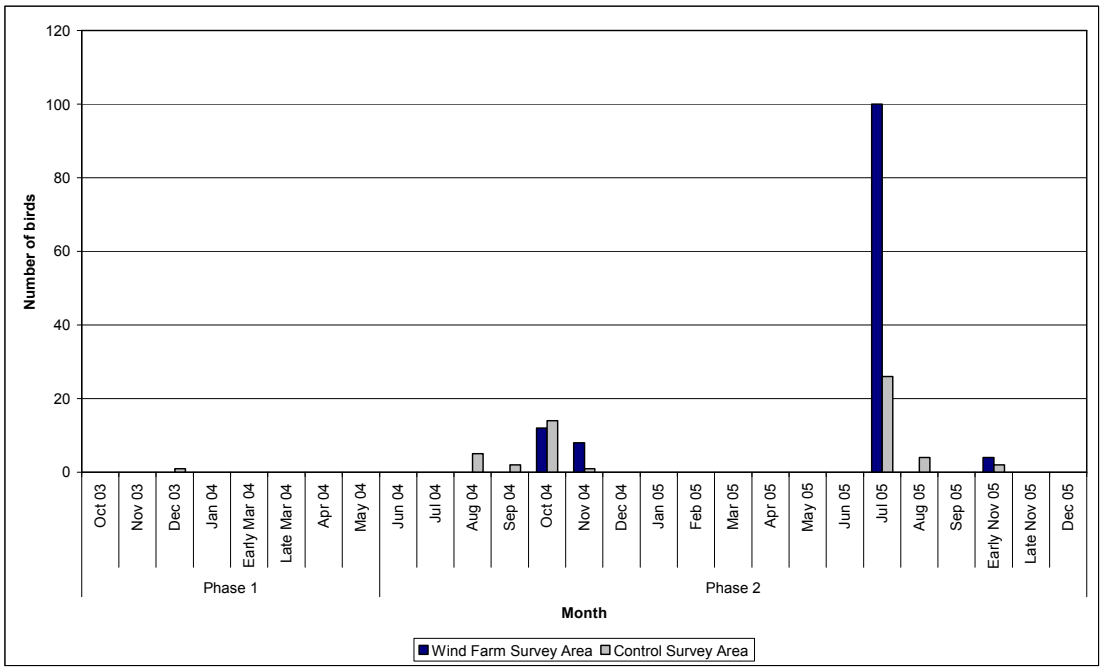

Figure 40 Monthly abundance of Little Gull (all sightings from ship-based survey).

In fact, on occasion, far larger flocks can be observed, with over 10,000 birds recorded on a single occasion off Spurn in September 2003 and over 8,000 off Flamborough during the same month (Hartley, 2004).

These birds are part of a substantial movement of Little Gull onto the UK North Sea coast, birds having bred in the Baltic and undergoing post-breeding moult before moving out to wintering grounds. Figure 40 illustrates this passage occurrence distribution, with up to 100 birds recorded in July 2005, and the species present in lower numbers both in the survey area and the control block thereafter in the late summer and early autumn.

Outwith this period the species was generally absent from the survey area. In general, the species was present in densities of around >1 bird per km^2 during the passage months (Table 14), but with the dedicated Little Gull survey of October 2005 survey, which was designed to cover the main period and area of Little Gull activity, density was at over 10 birds per km^2. The area surveyed during the dedicated Little Gull survey ecompassed offshore waters (up to 20km offshore) where large concentrations of Little Gull were observed in October 2005, hence the inflated density estimates for the modified windfarm survey area.

Table 14: Density estimates (DE), standard deviations (SD) and standard errors (SE) for Little Gull (density corrected from ship-based survey).

Survey Month & Year	Wind Farm Survey Area			Control Survey Area		
	DE	SD	SE	DE	SD	SE
October 2003	0.00	0.00	0.00	0.00	0.00	0.00
November 2003	0.00	0.00	0.00	0.00	0.00	0.00
December 2003	0.00	0.00	0.00	0.00	0.00	0.00
January 2004	0.00	0.00	0.00	0.00	0.00	0.00
Early March 2004	0.00	0.00	0.00	0.00	0.00	0.00
Late March 2004	0.00	0.00	0.00	0.00	0.00	0.00
April 2004	0.00	0.00	0.00	0.00	0.00	0.00
May 2004	0.00	0.00	0.00	0.00	0.00	0.00
June 2004	0.00	0.00	0.00	0.00	0.00	0.00
July 2004	0.00	0.00	0.00	0.00	0.00	0.00
August 2004	0.00	0.00	0.00	0.00	0.00	0.00
September 2004	0.00	0.00	0.00	0.00	0.00	0.00
October 2004	0.17	0.18	0.07	0.56	0.96	0.56
November 2004	0.17	0.41	0.17	0.00	0.00	0.00
December 2004	0.00	0.00	0.00	0.00	0.00	0.00
January 2005	0.00	0.00	0.00	0.00	0.00	0.00
February 2005	0.00	0.00	0.00	0.00	0.00	0.00
March 2005	0.00	0.00	0.00	0.00	0.00	0.00
April 2005	0.00	0.00	0.00	0.00	0.00	0.00
May 2005	0.00	0.00	0.00	0.00	0.00	0.00
June 2005	0.00	0.00	0.00	0.00	0.00	0.00
July 2005	1.28	1.96	0.80	1.09	1.89	1.09
August 2005	0.00	0.00	0.00	0.00	0.00	0.00
September 2005	0.00	0.00	0.00	0.00	0.00	0.00
October 2005 [1] (See note)	10.40	12.09	4.57	0.00	0.00	0.00
Early November 2005	0.11	0.27	0.11	0.00	0.00	0.00
Late November 2005	0.00	0.00	0.00	0.00	0.00	0.00
December 2005	0.00	0.00	0.00	0.00	0.00	0.00

Notes

[1] Dedicated Little Gull Survey

Figures 41 to 44 plot the registrations from the standard boat and aerial survey programmes, with few birds recorded from the boat-based programme (Figures 41 and 42), and the majority of records from the August to October 2005 period. Birds were present both in flight and on the water, with a dispersed distribution across most of the survey area. However, the aerial programme recorded a substantially greater level of usage, with concentrations of birds recorded in July and August offshore from Hornsea, with most birds recorded from between 7km to 17km off the coast or 25km to 30km (Transect end). However, by the September surveys, the distribution of flocks had moved southwards to cover the area offshore from north of Withernsea to Easington, and further birds off the Humber mouth. By this time usage was generally concentrated across a wider area, ranging from 7km offshore to 25km offshore. A small number of occurrences were also recorded in October, around 9km off Spurn Head. Clearly, during the late summer, a large flock was present off

Hornsea, with sizeable concentrations known to use the Mere at this time (Hartley, 2004). The September distribution suggests a possible movement southwards, with a further dispersion generally out of the area during October but this may be an artefact of survey timing. Usage during the winter months (Figure 44) was extremely low, with a near absence of the species from the survey area.

A dedicated Little Gull boat-based survey was undertaken in October 2005, timed, in conjunction with sightings from Spurn Observatory, to cover the main period of movement of the species along the coast. This survey employed a similar standard observation and recording methodology, but covered a different survey area, with transects concentrated off the Spurn and Easington coastal reach, but extending further out, in order to capture any significant abundance/distance contours. The findings of this survey are given in Figure 45 and indicate a greater level of usage, both by birds on the water and flying, with distance from shore. The majority of registrations were made from 10km out to the end of transect (c. 22km offshore), with the largest flocks (on the water) around 15km to 20km offshore.

This largely offshore distribution (and data recorded from the standard boat and aircraft survey programmes) broadly accords with the findings of the Little Gull study undertaken in September 2003 (Hartley, 2004) which identified a substantial feeding 'flock' offshore from the Holderness coast between 15km and 25km out. Whilst the findings of Hartley and the current programme indicate that feeding is predominantly undertaken offshore, and outside the proposed windfarm development area, the species will on occasion be present within the inshore waters, including the windfarm site. The reason for this movement in flock location may be a result of several potential causal factors, including tidal influence and food supply, poor offshore weather conditions and dispersion movements.

4.1.8.2 Black-headed Gull

Ubiquitous within the region, and commonly recorded along the Yorkshire coast, breeding at inland colonies (Mather, 1986). It is included on the Amber List of Species of Conservation Concern.

The boat-based survey programme (Figures 46 and 47) recorded relatively few birds in the area, with the majority of records being of individuals flying in a westerly or south westerly direction through the windfarm and control survey areas. Similarly, the aerial survey (Figure 48) recorded sporadic numbers along the coast and with the majority of sightings made in the autumn period, potentially during post-breeding moult and dispersion to wintering grounds.

4.1.8.3 Mew Gull

The Common or Mew Gull breeds in north-west Europe (including Scotland and western Ireland with a few in England) and across Russia, with large breeding populations in Norway and Sweden. The majority of Yorkshire coast records are therefore for passage and wintering birds (various Spurn Observatory reports). The species is a SPEC2/3 and is on the Amber List of Conservation Concern.

The species was more commonly recorded than the Black-headed Gull during the survey programme, with the majority of records from the boat-based survey made outside the summer months (Figure 49).

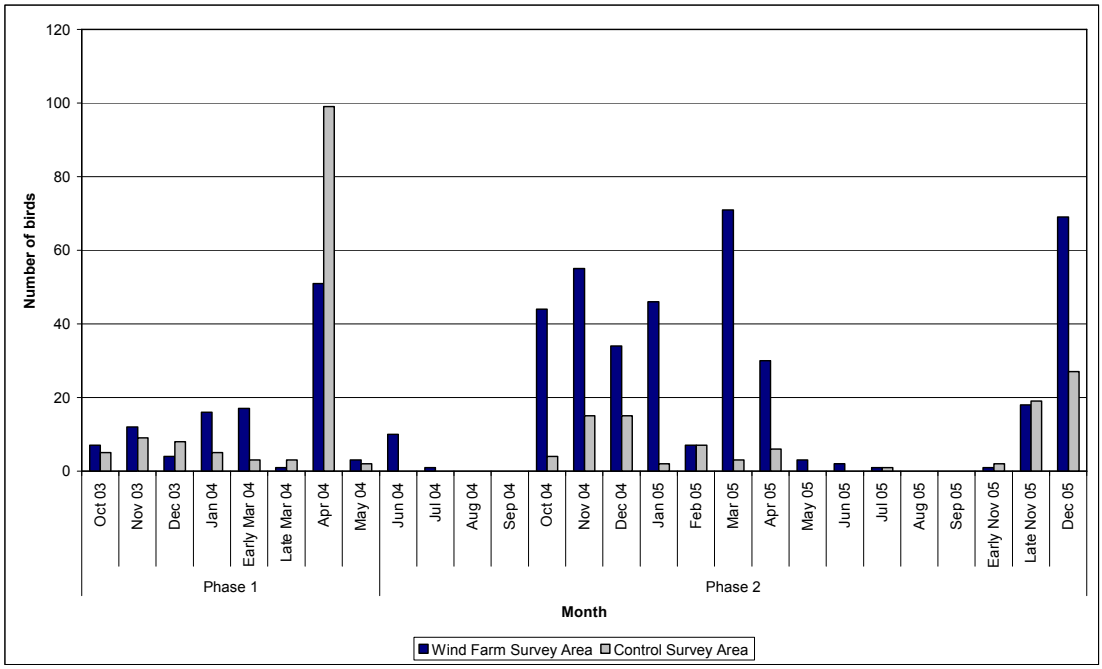

Figure 49: Monthly abundance of Mew Gull (all sightings from ship-based survey).

Wintering numbers were generally found to range between 15 and 70 birds in the main survey area, and below 20 in the smaller control area, but with around 100 birds recorded in the control block in April 2004. From the above Figure, the species was present during the autumn to spring of the survey years, with a near absence from July to September and few individuals present in the late spring, birds being on breeding sites at this time.

This temporal pattern is evident from Figures 50 to 53 covering the boat-based survey seasons, with the majority of records made during the autumn/winter/spring of 2004/5 and the autumn/winter of 2005. However, there is little evident spatial trend in these Figures, apart from a slight increase in usage, particularly for birds on the water, at the southern portion of the survey area, off the mouth of the Humber and it is suggested that these birds may also be moving into and out of the Humber on occasion, perhaps in relation to roost areas.

Table 15 provides density values for the species, with highest densities recorded during the autumn/winter/spring, with up to c. 2 birds per km^2 recorded, but with general densities at around the 1 bird per km^2 density for that period. The densities encountered during the boat survey programme were comparable to those found by Stone *et al*., (1995) off the Humber Mouth.

Table 15: Density estimates (DE), standard deviations (SD) and standard errors (SE) for Mew Gull (density corrected from ship-based survey).

Survey Month & Year	Wind Farm Survey Area			Control Survey Area		
	DE	SD	SE	DE	SD	SE

October 2003	0.57	1.61	0.57	0.00	0.00	0.00
November 2003	0.06	0.18	0.06	0.51	0.59	0.30
December 2003	0.06	0.18	0.06	0.00	0.00	0.00
January 2004	0.13	0.36	0.13	0.00	0.00	0.00
Early March 2004	0.25	0.54	0.19	0.26	0.30	0.15
Late March 2004	0.00	0.00	0.00	0.00	0.00	0.00
April 2004	1.18	1.48	0.52	1.38	2.14	1.07
May 2004	0.06	0.18	0.06	0.00	0.00	0.00
June 2004	0.29	0.27	0.11	0.00	0.00	0.00
July 2004	0.00	0.00	0.00	0.00	0.00	0.00
August 2004	0.00	0.00	0.00	0.00	0.00	0.00
September 2004	0.00	0.00	0.00	0.00	0.00	0.00
October 2004	0.70	1.04	0.42	0.00	0.00	0.00
November 2004	0.33	0.21	0.09	0.11	0.19	0.11
December 2004	0.50	0.28	0.11	0.22	0.38	0.22
January 2005	0.83	1.07	0.44	0.11	0.19	0.11
February 2005	0.06	0.14	0.06	0.00	0.00	0.00
March 2005	2.08	4.61	1.88	0.11	0.19	0.11
April 2005	0.33	0.52	0.21	0.00	0.00	0.00
May 2005	0.00	0.00	0.00	0.00	0.00	0.00
June 2005	0.00	0.00	0.00	0.00	0.00	0.00
July 2005	0.00	0.00	0.00	0.00	0.00	0.00
August 2005	0.00	0.00	0.00	0.00	0.00	0.00
September 2005	0.00	0.00	0.00	0.00	0.00	0.00
October 2005 [2] (See note1)	0.29	0.69	0.26	0.00	0.00	0.00
Early November 2005	0.00	0.00	0.00	0.00	0.00	0.00
Late November 2005	0.22	0.27	0.11	0.00	0.00	0.00
December 2005	1.83	3.05	1.24	0.93	0.55	0.32

Note

[1] Dedicated Little Gull Survey

Figure 54 plots the registrations from the aerial programme, with no particular spatial usage pattern discernable, but with usage largely restricted to the autumn/winter/spring and at its highest during March and November. The proposed windfarm development area was not found to be of particular value either for foraging birds or birds in transit.

4.1.8.4 Lesser Black-backed Gull

Recorded in relatively low numbers along the Yorkshire coast, the species has declined in numbers in the UK (Gregory *et al*, 2002) and is on the Amber List of Species of Conservation Concern.

A small number of Lesser Black-backed Gull were recorded during the survey programme. Whilst no clear spatial distribution pattern is evident (Figures 55 and 56) the majority of records were made in August, suggesting a degree of migratory movement through the area at this time from inland and coastal breeding sites further to the north.

4.1.8.5 Herring Gull

Commonly recorded along the coast, the Herring Gull breeds at Flamborough and adjacent areas (Gibbons *et al*, 1993). Although commonly seen, the species has declined in numbers in the UK (Gregory et al, 2002) and is on the Amber List of Species of Conservation Concern.

Generally present in greatest numbers during the winter and spring, the species was recorded in substantially lower numbers during the 2005 boat-based survey than from 2004 (Figure 57). Usage on the control and main survey areas were broadly similar, with around 10 to 15 birds recorded on most surveys during the winter and spring. The majority of individuals were recorded in flight but occasionally the birds were seen on the sea surface around the fishing vessels, mainly potting boats.

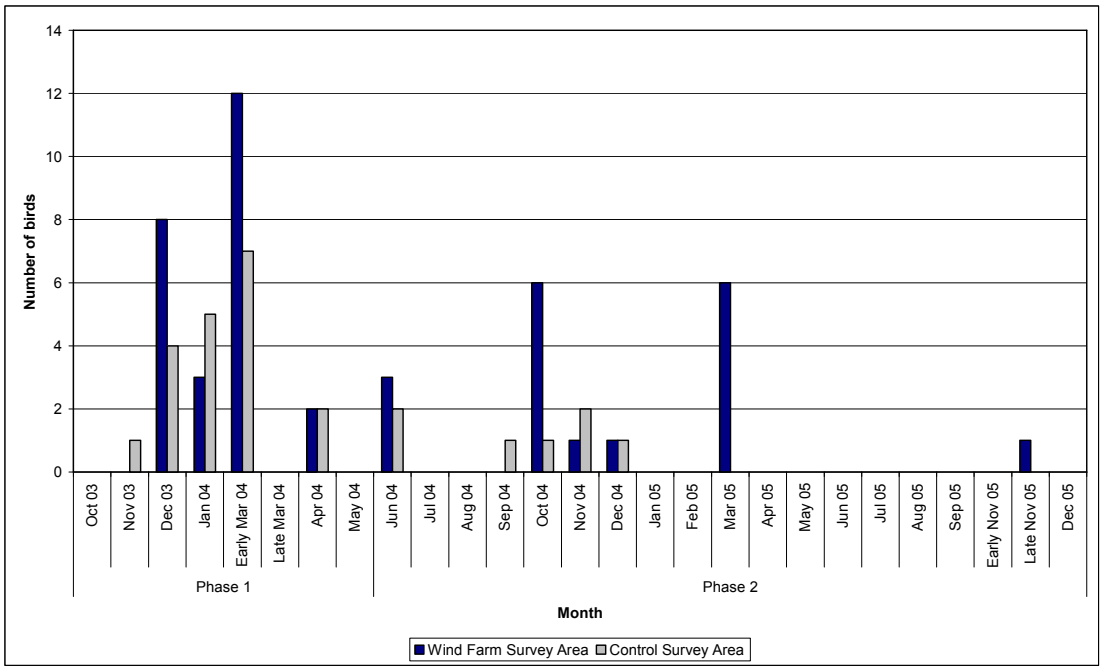

Figure 57: Monthly abundance of Herring Gull (all sightings from ship-based survey).

Figures 58 to 63 show the Herring Gull registrations from the boat-based and aerial survey programmes. Figures 58 and 59, covering the boat-based survey show no particular spatial pattern of registration distribution, although a slight clustering around the mouth of the Humber may occur (very small sample size).

Figures 60 to 63 show the aerial programme registrations, with again no significant spatial clustering evident, and with the majority of registrations for the late summer and autumn period. Very few registrations were however, made within, or adjacent to, the windfarm area, and the potential cluster off the mouth of the Humber described from the boat-based survey does not appear to be evident from the aerial programme.

Table 16: Density estimates (DE), standard deviations (SD) and standard errors (SE) for Herring Gull (density corrected from ship-based survey).

Survey Month & Year	Wind Farm Survey Area			Control Survey Area		
	DE	SD	SE	DE	SD	SE
October 2003	0.00	0.00	0.00	0.00	0.00	0.00
November 2003	0.00	0.00	0.00	0.00	0.00	0.00
December 2003	0.44	1.06	0.38	0.00	0.00	0.00
January 2004	0.00	0.00	0.00	0.00	0.00	0.00
Early March 2004	0.00	0.00	0.00	0.00	0.00	0.00
Late March 2004	0.00	0.00	0.00	0.00	0.00	0.00
April 2004	0.00	0.00	0.00	0.00	0.00	0.00
May 2004	0.00	0.00	0.00	0.00	0.00	0.00
June 2004	0.00	0.00	0.00	0.00	0.00	0.00
July 2004	0.00	0.00	0.00	0.00	0.00	0.00
August 2004	0.00	0.00	0.00	0.00	0.00	0.00
September 2004	0.00	0.00	0.00	0.00	0.00	0.00
October 2004	0.00	0.00	0.00	0.00	0.00	0.00
November 2004	0.00	0.00	0.00	0.00	0.00	0.00
December 2004	0.00	0.00	0.00	0.00	0.00	0.00
January 2005	0.00	0.00	0.00	0.00	0.00	0.00
February 2005	0.00	0.00	0.00	0.00	0.00	0.00
March 2005	0.17	0.41	0.17	0.00	0.00	0.00
April 2005	0.00	0.00	0.00	0.00	0.00	0.00
May 2005	0.00	0.00	0.00	0.00	0.00	0.00
June 2005	0.00	0.00	0.00	0.00	0.00	0.00
July 2005	0.00	0.00	0.00	0.00	0.00	0.00
August 2005	0.00	0.00	0.00	0.00	0.00	0.00
September 2005	0.00	0.00	0.00	0.00	0.00	0.00
October 2005 [1] (See note)	0.00	0.00	0.00	0.00	0.00	0.00
Early November 2005	0.00	0.00	0.00	0.00	0.00	0.00
Late November 2005	0.00	0.00	0.00	0.00	0.00	0.00
December 2005	0.00	0.00	0.00	0.00	0.00	0.00

Note

[1] Dedicated Little Gull Survey

Density values presented in Table 16 show usage on the water to have been extremely low throughout the survey programme, and below the density found by Stone *et al.,* (1995) during the winter period along the Holderness coast.

4.1.8.6 Glaucous Gull

Uncommonly recorded along the Yorkshire coast, but not a species of particular conservation concern at a European level (Papazoglou *et al*, 2004). There was an immature bird in the windfarm survey area during the March ship-based seabird survey.

4.1.8.7 Great Black-backed Gull

The Great Blacked Gull breeds around the Atlantic coast of Britain (and northern North Sea coasts) and Ireland as well Norway, the Baltic coast and Iceland.

On the Yorkshire coast it is recorded both on passage and as an over-wintering species, and although comparatively solitary during the breeding season, it can form sizeable flocks, particularly at roosts during the winter. It feeds from a variety of sources, including rubbish tips and scavenging waste material from fishing vessels, but is often piratical with other Gull species (and other species) forcing disgorges and sometimes predating directly on seabirds (e.g. Cramp, 1998).

Figures 64 to 72 plot Great Black-backed Gull distribution recorded during the survey programme on a seasonal basis. Figures 64 to 68 cover the boat-based survey programme registrations and indicate a generally low level of usage with most birds recorded during the autumn and early winter (October to December) dispersed across the outer part of the survey zone, largely over 10km from the coast.

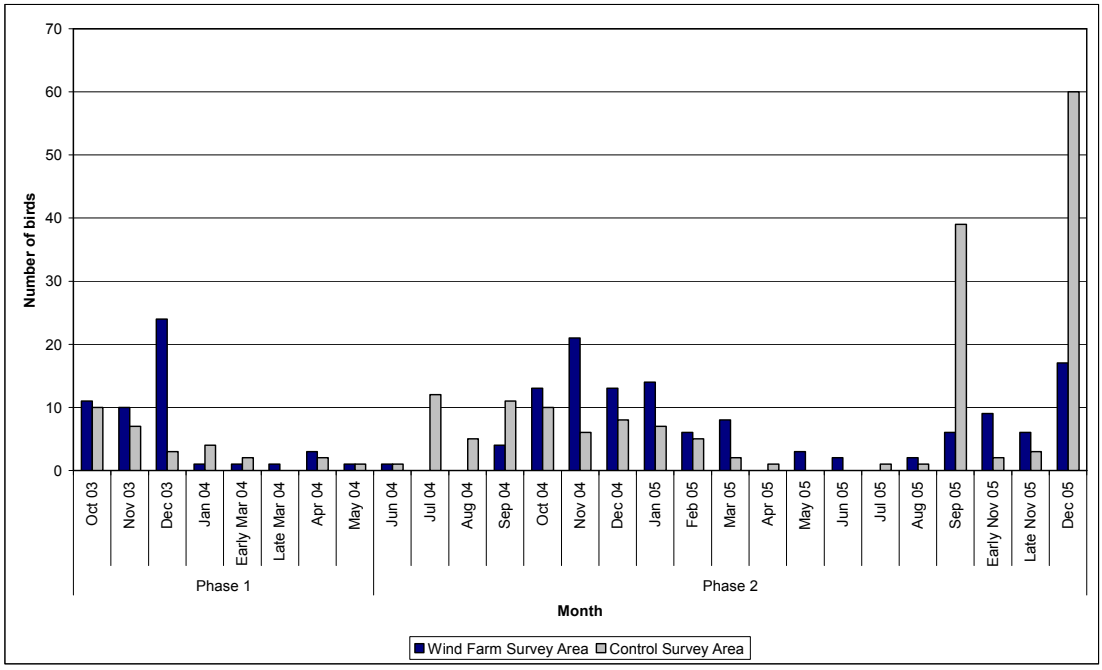

Figure 73: Monthly abundance of Great Black-backed Gull (all sightings from ship-based survey).

The aerial survey programme identified usage during the autumn and winter, in particular during the survey of November 2003, but also with birds present in the summer months, and the spring. However, there appears to no significant concentration in the distribution of sightings, other than the occasional utilisation of one of the offshore gas platforms as a roost site, with a greater abundance of birds recorded around this area sometimes noted.

Table 17: Density estimates (DE), standard deviations (SD) and standard errors (SE) for Great Black-backed Gull (density corrected from ship-based survey).

Survey Month & Year	Wind Farm Survey Area			Control Survey Area		
	DE	SD	SE	DE	SD	SE
October 2003	0.86	1.84	0.65	0.38	0.49	0.25
November 2003	0.25	0.54	0.19	0.00	0.00	0.00
December 2003	0.39	0.90	0.32	0.22	0.44	0.22
January 2004	0.00	0.00	0.00	0.26	0.51	0.26
Early March 2004	0.00	0.00	0.00	0.00	0.00	0.00
Late March 2004	0.00	0.00	0.00	0.00	0.00	0.00
April 2004	0.00	0.00	0.00	0.00	0.00	0.00
May 2004	0.00	0.00	0.00	0.00	0.00	0.00
June 2004	0.06	0.14	0.06	0.00	0.00	0.00
July 2004	0.00	0.00	0.00	1.22	2.12	1.22
August 2004	0.00	0.00	0.00	0.00	0.00	0.00
September 2004	0.00	0.00	0.00	0.56	0.96	0.56
October 2004	0.09	0.23	0.09	0.67	1.15	0.67
November 2004	0.56	0.50	0.20	0.11	0.19	0.11
December 2004	0.17	0.18	0.07	0.00	0.00	0.00
January 2005	0.15	0.24	0.10	0.63	0.52	0.30
February 2005	0.11	0.17	0.07	0.33	0.33	0.19
March 2005	0.00	0.00	0.00	0.00	0.00	0.00
April 2005	0.00	0.00	0.00	0.00	0.00	0.00
May 2005	0.00	0.00	0.00	0.00	0.00	0.00
June 2005	0.00	0.00	0.00	0.00	0.00	0.00
July 2005	0.00	0.00	0.00	0.00	0.00	0.00
August 2005	0.11	0.27	0.11	0.00	0.00	0.00
September 2005	0.00	0.00	0.00	0.11	0.19	0.11
October 2005 [1] (See note)	0.06	0.17	0.06	0.00	0.00	0.00
Early November 2005	0.17	0.18	0.07	0.00	0.00	0.00
Late November 2005	0.11	0.17	0.07	0.30	0.28	0.16
December 2005	0.30	0.44	0.18	4.94	8.28	4.78

Note

[1] Dedicated Little Gull Survey

Density values are presented in Table 15 and indicate a relatively low density of <0.5 birds per km^2 during the main months of occurrence. The densities encountered were in line with those found by Stone *et al*., (1995) in t*he Atlas of Seabird Distribution in North-West European Waters*.

4.1.8.8 Black-legged Kittiwake

The Kittiwake (Black-legged Kittiwake) breeds in large numbers on Flamborough Head, this site supporting the largest UK breeding colony. In addition, there is a substantial spring and autumn passage through the area, with over 10,000 birds observed passing Flamborough & Spurn on some days during peak movements. However, numbers have been in decline in

recent years and the breeding season in 2004 was particularly poor, and the species is now included on the Amber List of Species of conservation Concern (Gregory *et al*, 2002).

Figure 74 shows the monthly abundance levels for Black-legged Kittiwake recorded during the boat-based survey programme. Apart from the very high level recorded in the control area in June 2004 (over 200 birds), the species is present in the survey area on most months, with total registrations numbering between around 20 and 50 birds. However, usage peaks during the summer months, and is at its lowest during the mid winter, with this pattern of usage associated with breeding activity on the Flamborough Head site and a more pelagic distribution during the winter.

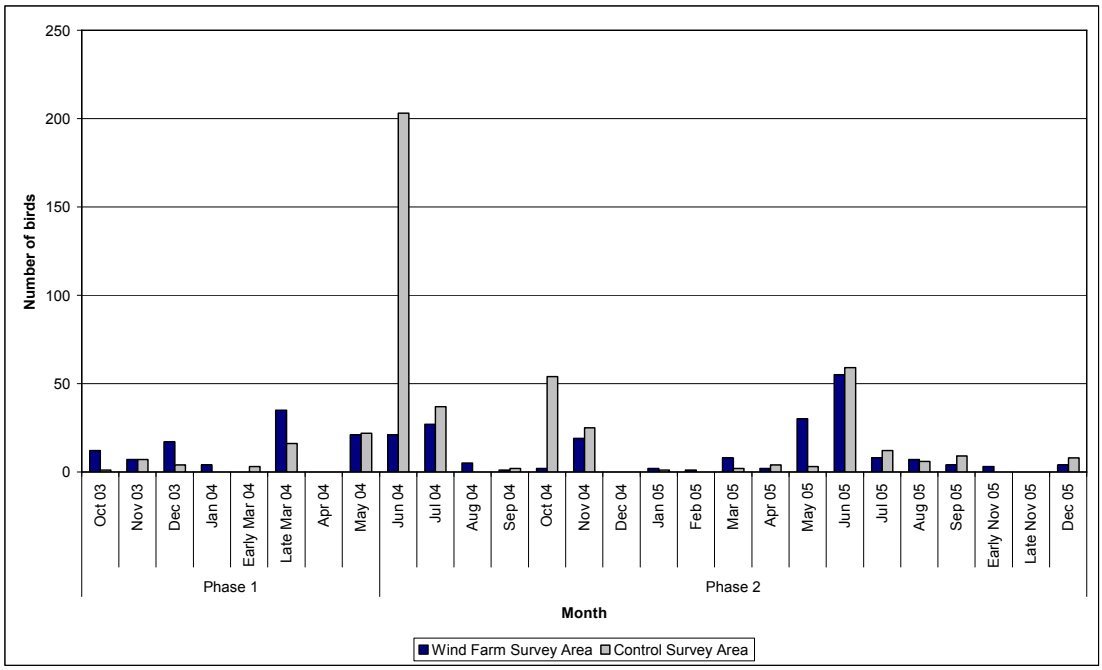

Figure 74: Monthly abundance of Black-legged Kittiwake (all sightings from ship-based survey).

Figures 75 to 80 plot the registrations recorded from the boat-based survey on a seasonal basis and show usage within and around the proposed windfarm site to peak during the April to July period (breeding season), with birds moving through the area as well as foraging within the survey blocks at this time. In particular, registrations for June were high in both 2004 and 2005, but with the majority of registrations for both birds in flight and on the water, originating from an area to the north of the proposed development site. This distribution would not be unexpected, with the location of the breeding colony further to the north. Usage outside this period was seen to be very low.

However, Figures 81 to 83 covering the aerial survey programme, indicate a slightly differing spatial distribution to that seen from the boat surveys. Although the June 2004 distribution was predominantly to the north of the development site, the 2005 June data include a concentration of usage in the southern area of the survey block, largely outwith the development site, but further offshore. The July 2004 pattern of usage was more evenly distributed across the survey area, with August and September registrations perhaps slightly clustered to the northern part of the survey area. October and over winter usage then appears to be relatively evenly distributed across the aerial survey area, and largely

restricted to offshore areas over 10km offshore. The reasons for the clustering of Kittiwake in the southern part of the survey area during the June survey is unclear. It may reflect some hydrodynamic effect, concentrating food availability in that area, particularly in combination with flows out of the Humber mouth, but may also be linked to fishing activity in the area at that time. The results of the fisheries studies undertaken as part of the baseline survey programme for the Humber Gateway site will be integrated with those from the ornithological survey programme within the main body of the Environmental Statement, and potential linkages examined appropriately within that document.

Table 18 shows peak densities to have occurred during June in both the main survey and control blocks, with over 2 birds per km^2 for the main windfarm survey area and over 3.5 birds per km^2 in the control block.

Table 18: Density estimates (DE), standard deviations (SD) and standard errors (SE) for Black-legged Kittiwake (density corrected from ship-based survey).

Survey Month & Year	Wind Farm Survey Area			Control Survey Area		
	DE	SD	SE	DE	SD	SE
October 2003	0.19	0.27	0.09	0.00	0.00	0.00
November 2003	0.06	0.18	0.06	0.13	0.26	0.13
December 2003	0.24	0.45	0.16	0.13	0.26	0.13
January 2004	0.00	0.00	0.00	0.00	0.00	0.00
Early March 2004	0.00	0.00	0.00	0.13	0.26	0.13
Late March 2004	0.26	0.39	0.14	0.97	0.63	0.31
April 2004	0.00	0.00	0.00	0.00	0.00	0.00
May 2004	0.67	1.04	0.37	0.38	0.49	0.25
June 2004	0.33	0.42	0.17	4.00	3.61	2.08
July 2004	0.11	0.17	0.07	0.89	0.38	0.22
August 2004	0.06	0.14	0.06	0.00	0.00	0.00
September 2004	0.00	0.00	0.00	0.00	0.00	0.00
October 2004	0.00	0.00	0.00	0.00	0.00	0.00
November 2004	0.33	0.37	0.15	0.44	0.51	0.29
December 2004	0.00	0.00	0.00	0.00	0.00	0.00
January 2005	0.00	0.00	0.00	0.00	0.00	0.00
February 2005	0.00	0.00	0.00	0.00	0.00	0.00
March 2005	0.40	0.98	0.40	0.00	0.00	0.00
April 2005	0.11	0.17	0.07	0.08	0.17	0.08
May 2005	0.11	0.17	0.07	0.00	0.00	0.00
June 2005	2.24	4.62	1.89	3.67	5.49	3.17
July 2005	0.20	0.49	0.20	0.82	0.85	0.49
August 2005	0.27	0.43	0.18	0.31	0.30	0.17
September 2005	0.00	0.00	0.00	0.00	0.00	0.00
October 2005 [1] (See note)	0.54	1.24	0.47	0.00	0.00	0.00
Early November 2005	0.00	0.00	0.00	0.00	0.00	0.00
Late November 2005	0.00	0.00	0.00	0.00	0.00	0.00
December 2005	0.06	0.14	0.06	0.51	0.62	0.36

Note

[1] Dedicated Little Gull Survey

4.1.8.9 Unidentified Gull

Where weather conditions, distance and/or plumage meant that a sighting could not accurately be speciated, it was assigned as an unidentified gull.

Figures 84 to 88 plot these registrations, with, as might be expected for such generic groupings, few spatial or temporal patterns available. However, Figure 88 covering the aerial survey programme in its entirety, does appear to show two potential clusters of usage, the first, as expected, in Bridlington Bay, presumably associated with the breeding colony, and the second at the southern part of the survey area, offshore from the mouth of the Humber, particularly for Survey Area 2. This would appear to correlate with the distribution findings for Black-legged Kittiwake and Great Black-backed Gull.

4.1.9 TERN SPP.

Terns spp. are frequently recorded along the Holderness coast, both on passage, and during the breeding season (various Spurn Observatory reports). This seasonal usage is evident from Figures 89 to 91, with very few birds recorded during the late autumn, winter and early spring, but with a greater number of registrations during the late spring, summer and early autumn. In particular, usage recorded from the boat surveys appeared to peak in August, with the return of adult and juvenile birds through the area, with peak usage in July from the aerial survey, again indicating a return passage movement. No particular spatial pattern of usage was observed during the survey programme, but as expected, with the majority of birds recorded in the air rather than on the water.

4.1.9.1 Sandwich Tern

The Sandwich Tern is included in Annex 1 of the Birds Directive, Appendix II of the Bern Convention, Appendix II of the Bonn Convention and Schedule 1 of the Wildlife Countryside Act. It is a colonial nester with very localised populations. Eggs are laid in late April to May, with East Anglian and Northumberland sites key along the east coast (inc. the Farne Islands, Blakeney, Scolt Head and Foulney). Prey items are largely fish, with sand eels and herring taken in particular and the species is susceptible to fluctuations in food supply (Cramp, 1998).

By late July, both adults and accompanying juveniles disperse from their breeding colonies to feed offshore. Ringing has shown that on leaving the breeding colonies, birds move both south and north within Britain and Ireland and that there is also an interchange between British and Dutch colonies (Cramp *et al*, 1990), a more complicated migration pattern than the often perceived simple lateral coastal movement (Wenham *et al*, 2002).

During the late summer, large numbers of Sandwich Tern are recorded on passage off Flamborough Head and Spurn Point (various Spurn Observatory reports).

Table 19: Density estimates (DE), standard deviations (SD) and standard errors (SE) for Sandwich Tern (density corrected from ship-based survey).

Survey Month & Year	Wind Farm Survey Area			Control Survey Area		
	DE	SD	SE	DE	SD	SE
October 2003	0.00	0.00	0.00	0.00	0.00	0.00
November 2003	0.00	0.00	0.00	0.00	0.00	0.00
December 2003	0.00	0.00	0.00	0.00	0.00	0.00
January 2004	0.00	0.00	0.00	0.00	0.00	0.00
Early March 2004	0.00	0.00	0.00	0.00	0.00	0.00
Late March 2004	0.00	0.00	0.00	0.00	0.00	0.00
April 2004	0.00	0.00	0.00	0.00	0.00	0.00
May 2004	0.00	0.00	0.00	0.00	0.00	0.00
June 2004	0.00	0.00	0.00	0.00	0.00	0.00
July 2004	0.06	0.14	0.06	0.00	0.00	0.00
August 2004	0.00	0.00	0.00	0.00	0.00	0.00
September 2004	0.00	0.00	0.00	0.00	0.00	0.00
October 2004	0.00	0.00	0.00	0.00	0.00	0.00
November 2004	0.00	0.00	0.00	0.00	0.00	0.00
December 2004	0.00	0.00	0.00	0.00	0.00	0.00
January 2005	0.00	0.00	0.00	0.00	0.00	0.00
February 2005	0.00	0.00	0.00	0.00	0.00	0.00
March 2005	0.00	0.00	0.00	0.00	0.00	0.00
April 2005	0.11	0.27	0.11	0.00	0.00	0.00
May 2005	0.56	1.36	0.56	0.00	0.00	0.00
June 2005	0.06	0.14	0.06	0.00	0.00	0.00
July 2005	0.06	0.14	0.06	0.00	0.00	0.00
August 2005	0.00	0.00	0.00	0.00	0.00	0.00
September 2005	0.00	0.00	0.00	0.00	0.00	0.00
October 2005 [1] (See note)	0.00	0.00	0.00	0.00	0.00	0.00
Early November 2005	0.00	0.00	0.00	0.00	0.00	0.00
Late November 2005	0.00	0.00	0.00	0.00	0.00	0.00
December 2005	0.00	0.00	0.00	0.00	0.00	0.00

Note

[1] Dedicated Little Gull Survey

Densities throughout the survey programme were low, both for the main survey and control areas, with highest levels recorded in May with c. 0.5 birds per km^2.

Figure 92 illustrates the seasonal variability in occurrence of the species off the Holderness coast, with the species generally present between April and September/October, with both passage movements occurring during the spring and autumn, and feeding movements during the summer months. This accords with the findings from the long-term records of Spurn Observatory.

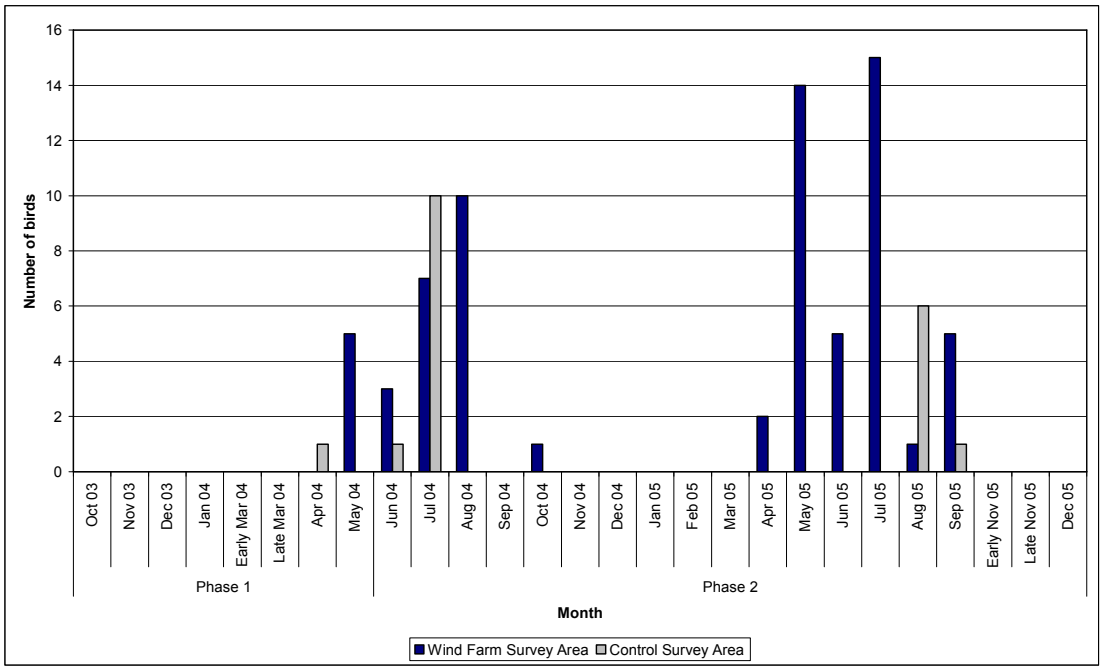

Figure 92: Monthly abundance of Sandwich Tern (all sightings from ship-based survey).

4.1.9.2 Common Tern

The Common Tern is largely recorded during passage periods off the Holderness coast, with colonies located on the Lincolnshire coast and Teesside, as well as a few inland sites in west and north Yorkshire (Gibbons, 1993).

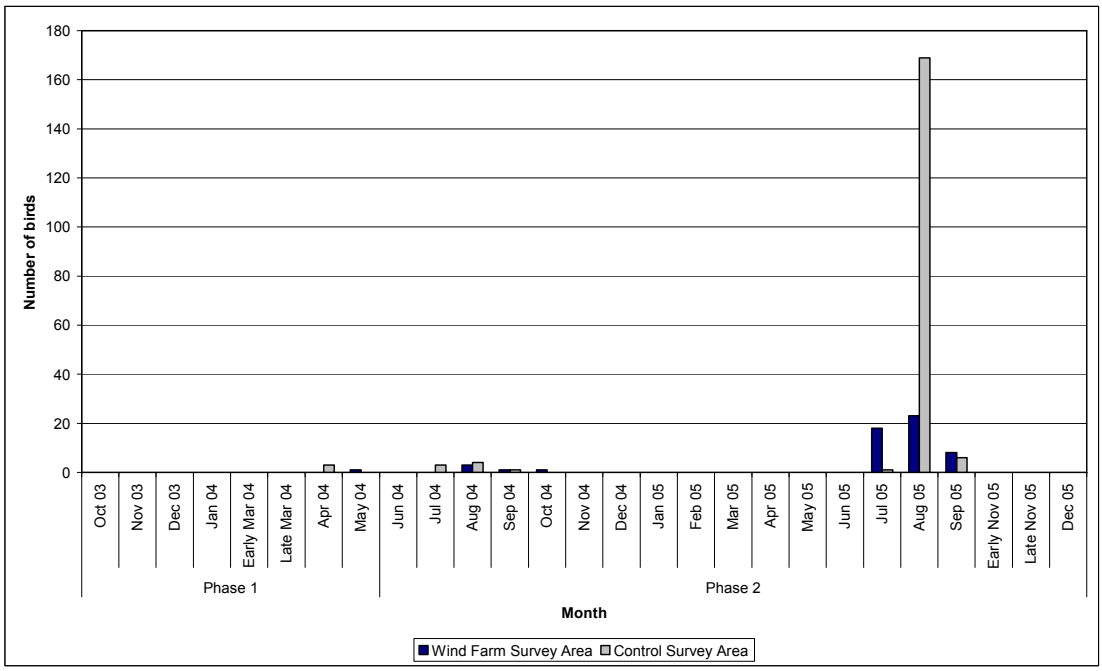

Figure 93: Monthly abundance of Common Tern (all sightings from ship-based survey).

Small numbers of Common Tern were recorded during the spring passage period.

However, the majority of records were made during the autumn, with usage peaking in August (169 birds), but with passage also recorded during July and September (Figure 93).

Table 20: Density estimates (DE), standard deviations (SD) and standard errors (SE) for Common Tern (density corrected from ship-based survey).

Survey Month & Year	Wind Farm Survey Area			Control Survey Area		
	DE	SD	SE	DE	SD	SE
October 2003	0.00	0.00	0.00	0.00	0.00	0.00
November 2003	0.00	0.00	0.00	0.00	0.00	0.00
December 2003	0.00	0.00	0.00	0.00	0.00	0.00
January 2004	0.00	0.00	0.00	0.00	0.00	0.00
Early March 2004	0.00	0.00	0.00	0.00	0.00	0.00
Late March 2004	0.00	0.00	0.00	0.00	0.00	0.00
April 2004	0.00	0.00	0.00	0.00	0.00	0.00
May 2004	0.00	0.00	0.00	0.00	0.00	0.00
June 2004	0.00	0.00	0.00	0.00	0.00	0.00
July 2004	0.00	0.00	0.00	0.00	0.00	0.00
August 2004	0.00	0.00	0.00	0.00	0.00	0.00
September 2004	0.00	0.00	0.00	0.00	0.00	0.00
October 2004	0.00	0.00	0.00	0.00	0.00	0.00
November 2004	0.00	0.00	0.00	0.00	0.00	0.00
December 2004	0.00	0.00	0.00	0.00	0.00	0.00
January 2005	0.00	0.00	0.00	0.00	0.00	0.00
February 2005	0.00	0.00	0.00	0.00	0.00	0.00
March 2005	0.00	0.00	0.00	0.00	0.00	0.00
April 2005	0.00	0.00	0.00	0.00	0.00	0.00
May 2005	0.00	0.00	0.00	0.00	0.00	0.00
June 2005	0.00	0.00	0.00	0.00	0.00	0.00
July 2005	0.00	0.00	0.00	0.00	0.00	0.00
August 2005	0.00	0.00	0.00	4.00	2.33	1.35
September 2005	0.00	0.00	0.00	0.22	0.38	0.22
October 2005 [1] (See note)	0.00	0.00	0.00	0.00	0.00	0.00
Early November 2005	0.00	0.00	0.00	0.00	0.00	0.00
Late November 2005	0.00	0.00	0.00	0.00	0.00	0.00
December 2005	0.00	0.00	0.00	0.00	0.00	0.00

Notes

[1] *Dedicated Little Gull Survey*

In general, very low densities were recorded, although the August 2005 value of 4 birds per km^2 in the control area is of interest.

4.1.9.3 Arctic Tern

Arctic Terns were seen very infrequently on the boat surveys. Extremely few birds of this species were recorded during both breeding or non-breeding seasons, implying that the area is not important as a foraging site. The maximum recorded during the survey was 21 birds in August 2005, and the individuals were all recorded in the most northern transect of the

control survey area. This peak might have included the birds dispersing southerly from their breeding sites.

4.1.9.4 'Commic' Tern

In many instances, it was not possible to speciate the sighting, particularly between Common and Arctic Terns, and where this was the case, the term 'Commic' Tern was applied.

Generally, usage by 'Commic' Terns matched that of the Common Tern, with registrations occurring during the autumn, and to a lesser extent, spring passage periods (Figure 94). The record of 180 birds in August 2005 is of interest, with this sighting in the control area producing density values of 20 birds per km^2 (Table 21).

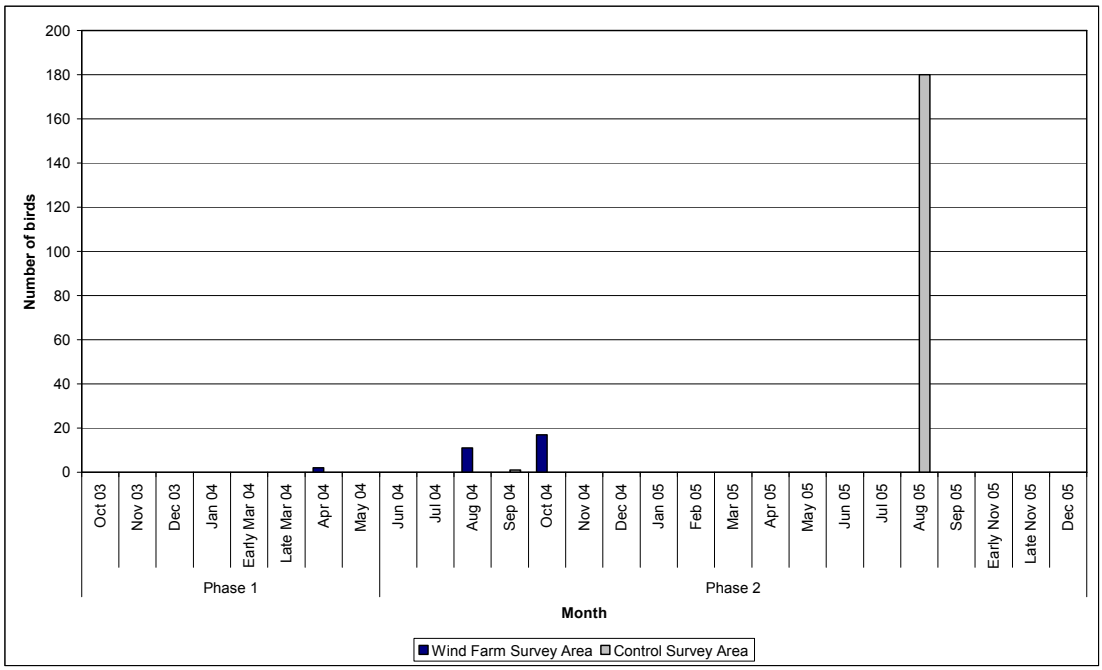

Figure 94: Monthly abundance of Commic Tern (all sightings from ship-based survey).

It is assumed these were probably Common Tern, the more numerous species recorded during the survey and given the relative low abundance of Arctic Tern in the area. The peak of 160 birds included two distinctive flocks of 100 and 80 birds resting on the sea surface in the control area. The concentration may have reflected the beginning of the Common Tern migration to southern Europe and Africa. During the July to September period, Stone *et al*., (1995) indicates a very low abundance of Commic Terns in the inshore waters of the Holderness coast. However, in recent years the Spurn Bird Observatory has recorded a large coastal movement during the autumn migration (various Spurn Observatory reports).

Table 21: Density estimates (DE), standard deviations (SD) and standard errors (SE) for Commic Tern (density corrected from ship-based survey).

Survey Month & Year	Wind Farm Survey Area			Control Survey Area		
	DE	SD	SE	DE	SD	SE
October 2003	0.00	0.00	0.00	0.00	0.00	0.00
November 2003	0.00	0.00	0.00	0.00	0.00	0.00
December 2003	0.00	0.00	0.00	0.00	0.00	0.00
January 2004	0.00	0.00	0.00	0.00	0.00	0.00
Early March 2004	0.00	0.00	0.00	0.00	0.00	0.00
Late March 2004	0.00	0.00	0.00	0.00	0.00	0.00
April 2004	0.00	0.00	0.00	0.00	0.00	0.00
May 2004	0.00	0.00	0.00	0.00	0.00	0.00
June 2004	0.00	0.00	0.00	0.00	0.00	0.00
July 2004	0.00	0.00	0.00	0.00	0.00	0.00
August 2004	0.00	0.00	0.00	0.00	0.00	0.00
September 2004	0.00	0.00	0.00	0.00	0.00	0.00
October 2004	0.11	0.17	0.07	0.00	0.00	0.00
November 2004	0.00	0.00	0.00	0.00	0.00	0.00
December 2004	0.00	0.00	0.00	0.00	0.00	0.00
January 2005	0.00	0.00	0.00	0.00	0.00	0.00
February 2005	0.00	0.00	0.00	0.00	0.00	0.00
March 2005	0.00	0.00	0.00	0.00	0.00	0.00
April 2005	0.00	0.00	0.00	0.00	0.00	0.00
May 2005	0.00	0.00	0.00	0.00	0.00	0.00
June 2005	0.00	0.00	0.00	0.00	0.00	0.00
July 2005	0.00	0.00	0.00	0.00	0.00	0.00
August 2005	0.00	0.00	0.00	20.00	34.64	20.00
September 2005	0.00	0.00	0.00	0.00	0.00	0.00
October 2005 [1] (See note)	0.00	0.00	0.00	0.00	0.00	0.00
Early November 2005	0.00	0.00	0.00	0.00	0.00	0.00
Late November 2005	0.00	0.00	0.00	0.00	0.00	0.00
December 2005	0.00	0.00	0.00	0.00	0.00	0.00

Notes

[1] Dedicated Little Gull Survey

4.1.9.5 Black Tern

The Black Tern is regularly recorded in small numbers (usually up to flocks of 10 birds off the Holderness coast as well as at inland sites, predominantly during the autumn passage, with most records from August and September, although late birds can occur in November (various YNU reports).

Three registrations were made in August 2005 during the ship-based survey, presumably the same bird counted on separate occasions.

4.1.10 AUK SPP.

Three species of Auk breed on Flamborough Head (Common Guillemot, Razorbill and Atlantic Puffin), with Common Guillemot present all year round in Bridlington Bay and off the Holderness coast, although with the summer months featuring the greatest level of usage, associated with the breeding colony. In addition, the Little Auk winters off the Holderness coast, with 'wrecks' sometimes reported, but its status less well understood than the more commonly encountered species in the region (Mather, 1986, various YNU and Spurn Observatory reports).

4.1.10.1 Common Guillemot

The (Common) Guillemot is included on the Amber List Species of Conservation Concern. This species has a patchy winter distribution around most British coasts, with concentrations occurring just offshore. Birds leave the summer colony in mid to late summer, and undergo their main moult which leaves them flightless for up to two months until they attain their winter plumage. Prospective breeding birds then gradually return to the vicinity of the colony in early winter, swiftly moulting back to their breeding plumage. Visits to the breeding colony continue through to the spring. In the periods when the birds are not in attendance at colonies, the Guillemot disperses widely, with the first year birds dispersing the furthest. Feeding birds will, however, gather in small flocks with feeding achieved by diving, the main prey items being a variety of fish, squid, pelagic worms and crustacea (Cramp, 1998).

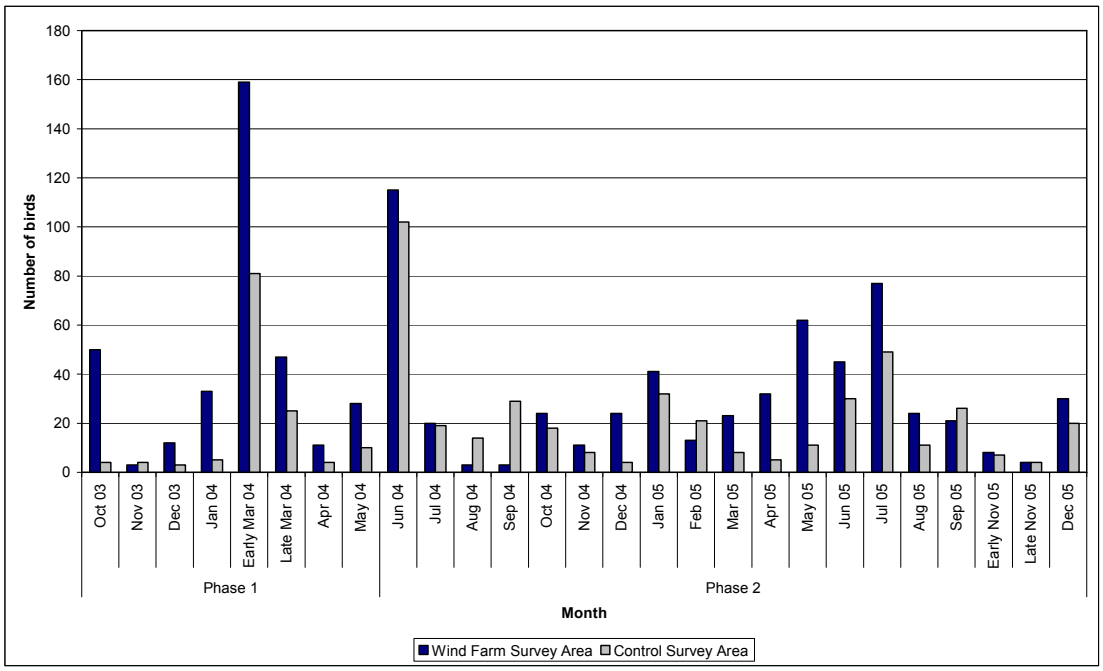

Figure 95: Monthly abundance of Common Guillemot (all sightings from ship-based survey).

This species, like other Auks, is vulnerable to bad weather conditions, changes in food availability, disturbance and pollution, particularly during the adult's post-breeding moult period when they are flightless for 45 to 50 days. If one or a combination of these conditions arise, deaths of this species can occur on a large scale, such occasions being known as wrecks. In February 1983, a major wreck occurred down the east coast of England with

nearly 10,000 Guillemot washed up (as well as 18,000 Razorbill), this resulting from a combination of bad weather and changing patterns in the abundance of sprats were the cause.

The boat-based survey recorded the species in the vicinity of the proposed windfarm site during the winter months, and although Common Guillemot have a largely pelagic distribution at this time of year, visits to the breeding colony are occasionally made, and a residual population remains off the Holderness coast and in Bridlington Bay.

However, by March, registrations increased, with most birds recorded on the water, and with numbers then increasing into the summer months, coinciding with breeding activity on the Flamborough Head colony (Figure 95 above). Again, the majority of registrations were for birds on the water, rather than flying, with a relatively even distribution within the main study area and control, including usage within the proposed development site. Although abundance levels then declined into the late summer and autumn, broadly the same even distribution of usage continued within the survey area, and a substantial presence remained during the winter.

Figures 96 to 103 plot the seasonal registrations for Common Guillemot from the boat-based survey, aerial survey results being shown as a generic Auk spp. category given the difficulties in speciation of them on the water at distance and altitude (Figures 127 to 130).

Density values of almost 3 birds per km^2 were recorded during the boat-based programme, with the peak usage occurring in September, this presumably being a post-breeding moult flock having moved down from the breeding colony area. However, in general, densities of around 2 birds per km^2 were more commonly recorded, but with values of around 4 birds per km^2 recorded in March and June (Table 22).

Maxima in excess of 50 individuals were regularly recorded during the boat-based survey programme, and the species was present during all months, albeit at lower abundances during the winter period. No particular spatial pattern of usage was observed during the survey programme. In general, despite some relatively high densities recorded for the species in the survey area in the context of other species, levels were low compared to those around Flamborough Head. The IECS seabird survey off Flamborough in the early 1990s (IECS, 1993) recorded densities of between 25 and 100 birds per km^2 immediately off the Head and around 5 to 7 birds per km^2 recorded in Bridlington Bay.

Table 22: Density estimates (DE), standard deviations (SD) and standard errors (SE) for Common Guillemot (density corrected from ship-based survey).

Survey Month & Year	Wind Farm Survey Area			Control Survey Area		
	DE	SD	SE	DE	SD	SE
October 2003	1.19	2.11	0.75	0.38	0.77	0.38
November 2003	0.10	0.29	0.10	0.13	0.26	0.13
December 2003	0.26	0.39	0.14	0.26	0.30	0.15
January 2004	0.96	1.37	0.49	0.46	0.63	0.31
Early March 2004	2.63	4.77	1.69	3.95	1.12	0.56
Late March 2004	1.15	1.57	0.56	1.36	1.28	0.64
April 2004	0.65	0.88	0.31	0.26	0.30	0.15
May 2004	1.10	1.35	0.48	0.87	1.01	0.51
June 2004	1.94	1.71	0.70	4.62	3.66	2.11
July 2004	0.46	0.30	0.12	0.44	0.77	0.44
August 2004	0.00	0.00	0.00	1.33	1.53	0.88
September 2004	0.17	0.18	0.07	3.11	3.10	1.79
October 2004	0.90	1.06	0.43	0.96	1.38	0.79
November 2004	0.17	0.41	0.17	0.44	0.51	0.29
December 2004	0.48	0.43	0.18	0.00	0.00	0.00
January 2005	1.43	0.56	0.23	2.22	0.69	0.40
February 2005	0.39	0.53	0.22	1.07	1.57	0.91
March 2005	0.51	0.59	0.24	1.04	0.96	0.55
April 2005	0.86	0.57	0.23	0.17	0.33	0.17
May 2005	0.79	0.54	0.22	0.22	0.38	0.22
June 2005	1.53	1.48	0.60	1.29	1.19	0.68
July 2005	1.29	2.68	1.09	2.07	1.85	1.07
August 2005	0.76	0.64	0.26	1.04	0.70	0.40
September 2005	1.10	0.70	0.29	1.96	1.85	1.07
October 2005 [1] (See note)	0.00	0.00	0.00	N/A	N/A	N/A
Early November 2005	0.22	0.40	0.16	0.56	0.51	0.29
Late November 2005	0.06	0.14	0.06	0.44	0.38	0.22
December 2005	0.97	0.95	0.39	0.96	0.93	0.54

Notes

[1] Dedicated Little Gull Survey

4.1.10.2 Razorbill

The species is included an Amber List Species of Conservation Concern. The Razorbill is a colonial nesting bird, with approximately the same summer and winter distribution as the Guillemot, although generally less numerous. Birds leave the colony in mid-August and disperse, the adults then moulting into winter plumage, during which they undergo a flightless phase similar to that of the Guillemot. In most instances, there is little contact with the land until the next spring, although there are increasing instances of mid-winter visits to the nest sites similar to those made by Guillemot. As with the Guillemot, this species is vulnerable to "wrecks" with large numbers of dead birds being washed ashore. The major winter prey items are fish such as sand eel, sprat, herring, whiting and other *Gadidae*, with pelagic worms and crustacea also being taken (Cramp, 1998).

Figures 104 to 111 plot the registrations for Razorbill made during the boat-based survey programme, aerial survey results being shown as a generic Auk spp. category given the difficulties in speciation of them on the water at distance and altitude (Figures 127 to 130). The boat-based survey programme recorded Razorbill at lower abundance levels to that of Common Guillemot (Figure 112), this being expected given their smaller breeding population on the Flamborough Head colony (perhaps c. 20% of the Common Guillemot population). Although present in most months, survey area maxima were generally below 20 birds per survey, apart from August 2005 when over 200 birds were recorded, these presumably part of the post breeding dispersion and moult. Figures 104 to 111 indicate a near absence during the spring and into the breeding season, with birds presumably closely associated with the Flamborough area at this time. Numbers then increase during the late summer and autumn with the post breeding dispersion, with sightings dispersed across the survey area during this period (August to October). A residual wintering usage was also recorded, with a small number of sightings from November to January, but with fewer records for the late winter.

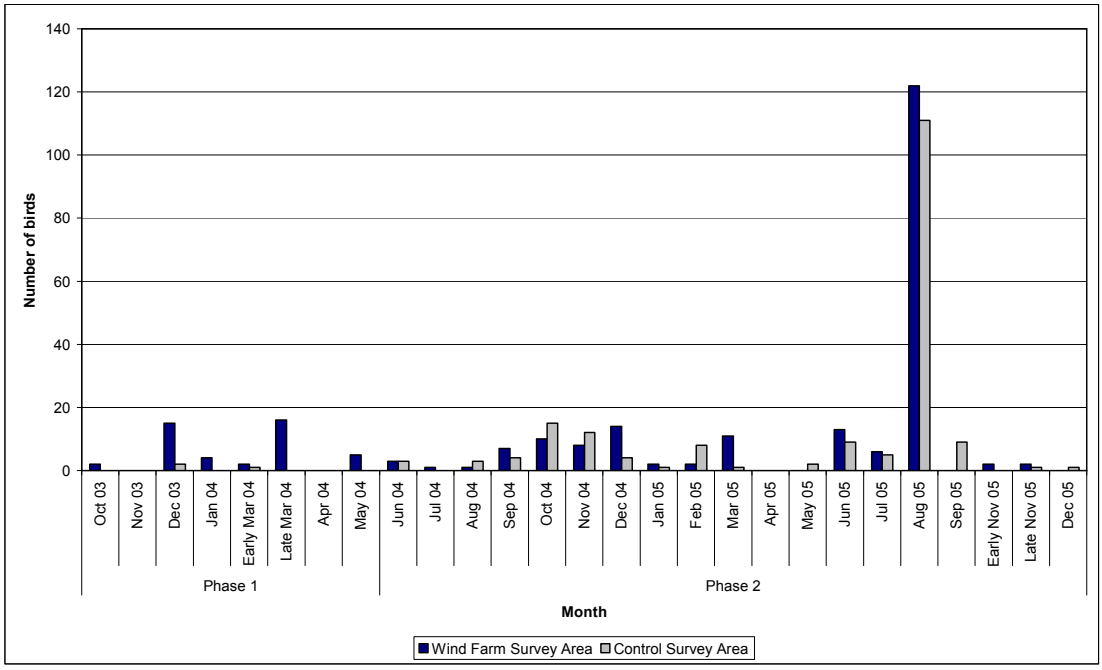

Figure 112: Monthly abundance of Razorbill (all sightings from ship-based survey).

As with the Common Guillemot, Table 23 indicates that September 2003 recorded a very high usage density (over 6 birds per km^2, but with lower values recorded thereafter and none in excess of 1 bird per km^2. However, in the context off numbers and densities recorded around Flamborough Head, usage around the survey area was comparatively low, with densities of over 10 birds per km^2 recorded by IECS (1993) immediately around the headland colony, and around 4 birds per km^2 recorded in Bridlington Bay.

Table 23: Density estimates (DE), standard deviations (SD) and standard errors (SE) for Razorbill (density corrected from ship-based survey).

Survey Month & Year	Wind Farm Survey Area			Control Survey Area		
	DE	SD	SE	DE	SD	SE
October 2003	0.00	0.00	0.00	0.00	0.00	0.00
November 2003	0.00	0.00	0.00	0.00	0.00	0.00
December 2003	0.78	1.24	0.44	0.00	0.00	0.00
January 2004	0.00	0.00	0.00	0.00	0.00	0.00
Early March 2004	0.00	0.00	0.00	0.13	0.26	0.13
Late March 2004	0.06	0.18	0.06	0.00	0.00	0.00
April 2004	0.00	0.00	0.00	0.00	0.00	0.00
May 2004	0.06	0.18	0.06	0.00	0.00	0.00
June 2004	0.00	0.00	0.00	0.00	0.00	0.00
July 2004	0.00	0.00	0.00	0.00	0.00	0.00
August 2004	0.00	0.00	0.00	0.11	0.19	0.11
September 2004	0.33	0.42	0.17	0.44	0.19	0.11
October 2004	0.14	0.23	0.09	0.89	1.54	0.89
November 2004	0.33	0.30	0.12	0.67	0.67	0.38
December 2004	0.44	0.78	0.32	0.11	0.19	0.11
January 2005	0.00	0.00	0.00	0.00	0.00	0.00
February 2005	0.11	0.17	0.07	0.33	0.33	0.19
March 2005	0.46	0.60	0.24	0.11	0.19	0.11
April 2005	0.00	0.00	0.00	0.00	0.00	0.00
May 2005	0.00	0.00	0.00	0.00	0.00	0.00
June 2005	0.39	0.80	0.33	0.22	0.38	0.22
July 2005	0.17	0.41	0.17	0.44	0.77	0.44
August 2005	2.60	2.65	1.08	5.64	4.18	2.41
September 2005	0.00	0.00	0.00	0.56	0.69	0.40
October 2005 [1] (See note)	6.59	7.29	2.76	N/A	N/A	N/A
Early November 2005	0.00	0.00	0.00	0.00	0.00	0.00
Late November 2005	0.00	0.00	0.00	0.00	0.00	0.00
December 2005	0.00	0.00	0.00	0.00	0.00	0.00

Notes

[1] Dedicated Little Gull Survey

4.1.10.3 Atlantic Puffin

The (Atlantic) Puffin is included on the Amber List of Species of Conservation Concern as well as being a SPEC2/3. The Puffin breeds on the Flamborough Head and Bempton Cliffs SPA, when small rafts of the species can occur on the adjacent waters, but numbers are substantially less than those of the Guillemot and Razorbill. It is largely pelagic during the winter period, although some birds are usually present off Bridlington Bay and the wider Holderness coast, these potentially sick or oiled birds. The species appears to be susceptible to variability in food supplies as well as weather conditions (heavy rain) during the breeding season, and numbers on the Bempton colony have declined by 63% between 1985-1988 and 1998-2002 (Mitchell *et al*, 2004).

A pattern of usage broadly similar to that of Common Guillemot and Razorbill was recorded from the boat-based survey programme, with a near absence of usage during the spring and early summer when individuals would be more closely associated with the breeding colony, but an increase during the late summer with a post-breeding dispersion. Maxima peaked during August, with perhaps 70 birds recorded during the survey, although numbers in July within the control area were also relatively high (over 25 birds). Numbers during the autumn then decreased, with a near absence during the winter, the species moving out into more pelagic areas at this time (Figures 113 to 120 and Figure 121 below).

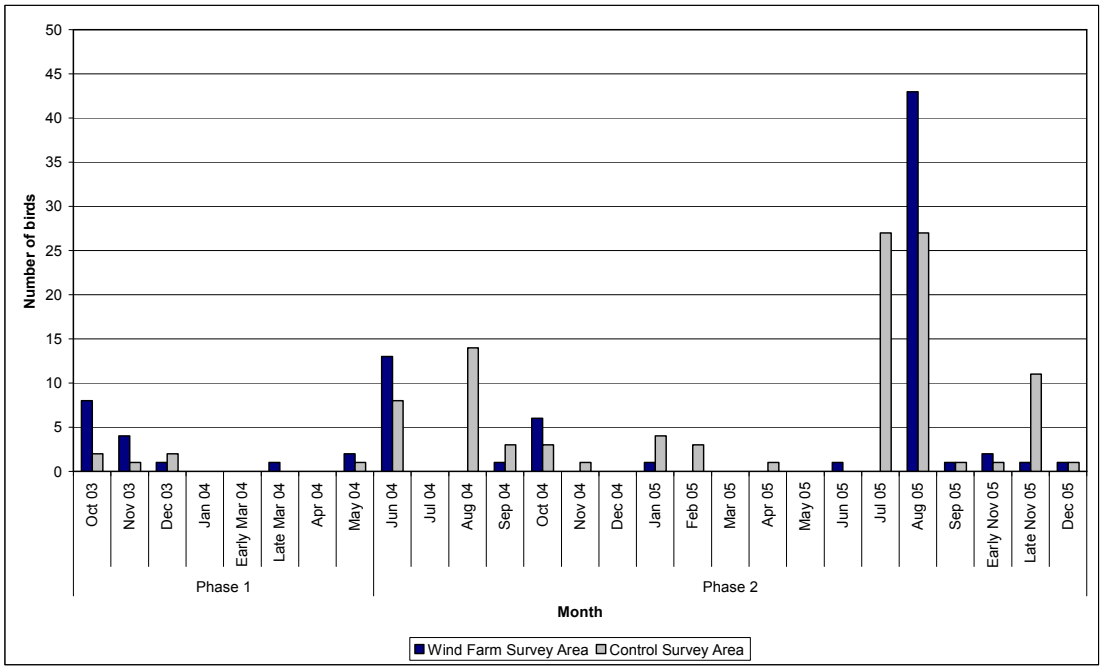

Figure 121: Monthly abundance of Atlantic Puffin (all sightings from ship-based survey).

Density values (Table 24) were lower than for the other two main Auk species, peaking at around 0.5 birds per km^2. However, greater densities might be expected closer to the Flamborough colony, and the IECS survey of 1992/3 recorded densities of 7 to 8 birds per km^2 within 2km of the Head.

Table 24: Density estimates (DE), standard deviations (SD) and standard errors (SE) for Atlantic Puffin (density corrected from ship-based survey).

Survey Month & Year	Wind Farm Survey Area			Control Survey Area		
	DE	SD	SE	DE	SD	SE
October 2003	0.45	0.43	0.15	0.00	0.00	0.00
November 2003	0.45	1.08	0.38	0.13	0.26	0.13
December 2003	0.06	0.18	0.06	0.26	0.30	0.15
January 2004	0.00	0.00	0.00	0.00	0.00	0.00
Early March 2004	0.00	0.00	0.00	0.00	0.00	0.00
Late March 2004	0.06	0.18	0.06	0.00	0.00	0.00
April 2004	0.00	0.00	0.00	0.00	0.00	0.00
May 2004	0.13	0.36	0.13	0.00	0.00	0.00
June 2004	0.17	0.41	0.17	1.22	1.17	0.68
July 2004	0.00	0.00	0.00	0.00	0.00	0.00
August 2004	0.00	0.00	0.00	0.89	1.54	0.89
September 2004	0.00	0.00	0.00	0.33	0.33	0.19
October 2004	0.17	0.28	0.11	0.33	0.33	0.19
November 2004	0.00	0.00	0.00	0.11	0.19	0.11
December 2004	0.00	0.00	0.00	0.00	0.00	0.00
January 2005	0.00	0.00	0.00	0.44	0.77	0.44
February 2005	0.00	0.00	0.00	0.00	0.00	0.00
March 2005	0.00	0.00	0.00	0.00	0.00	0.00
April 2005	0.00	0.00	0.00	0.17	0.33	0.17
May 2005	0.00	0.00	0.00	0.00	0.00	0.00
June 2005	0.00	0.00	0.00	0.00	0.00	0.00
July 2005	0.00	0.00	0.00	2.67	1.20	0.69
August 2005	1.89	1.57	0.64	1.22	0.19	0.11
September 2005	0.06	0.14	0.06	0.11	0.19	0.11
October 2005 [1] (See note)	1.79	1.71	0.65	N/A	N/A	N/A
Early November 2005	0.17	0.41	0.17	0.11	0.19	0.11
Late November 2005	0.06	0.14	0.06	1.44	0.19	0.11
December 2005	0.00	0.00	0.00	0.22	0.38	0.22

Notes

[1] Dedicated Little Gull Survey

4.1.10.4 Little Auk

The Little Auk over winters in the pelagic waters of the low arctic. However, it is also distributed widely throughout the northern North Sea during the winter and flocks of up to around 1,000 birds can be observed off the Holderness coast in the autumn and early winter, although the size of these movements can be variable (various YNU and Spurn Observatory reports). The species can be susceptible to mass mortalities (wrecks) usually after strong northerly gales. The presence of single Little Auk was noted in both October 2004 and 2005 during the ship-based surveys.

4.1.10.5 Unidentified Auk

As already noted, speciation between Auk species can be difficult at distance and under moult/winter plumage conditions, and it was necessary to group some sightings as generic Auk spp., both during the boat surveys, and for the aerial programme.

Figure 122 suggests that around 10 individuals could not be speciated on most surveys, but with more during July and August, as a result of greater abundance levels for the 3 main species, and during the autumn and winter, with birds in less distinctive plumage.

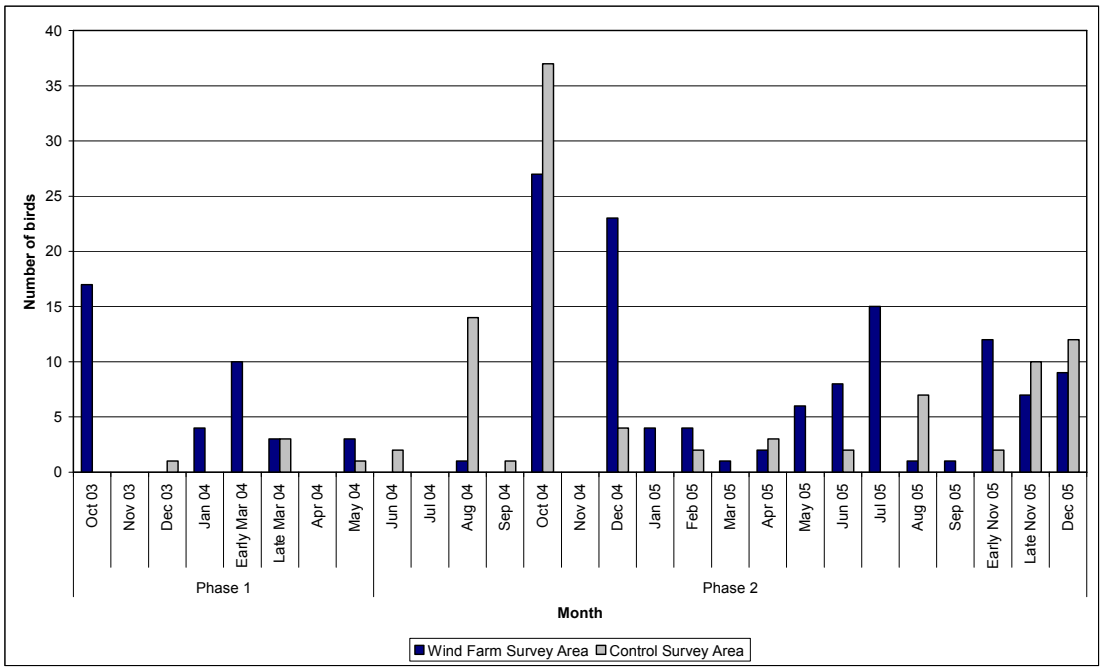

Figure 122: Monthly abundance of unidentified Auk (all sightings from ship-based survey).

The distribution of these sightings is plotted in Figures 123 to 126, with a similar temporal pattern to those of the individual species apparent and no spatial pattern discernible.

Figures 127 to 130 plot the registrations for Auks, made during the aerial survey programme. A fairly even distribution of sightings was made during the June surveys, but with most birds located in water depths greater than 20mCD and/or over 10km from the shore. Usage increased substantially in the late summer and early autumn, with a greater density of registrations in the northern half of the survey area, and again, with distribution skewed towards the offshore areas.

Interestingly, a possible spatial/temporal trend is evident, with the majority of July registrations at the upper northern half of the study area, August registrations in the lower northern half of the survey block, and September registrations stretching from the lower northern half to the lower southern half, indicating a potential dispersion away from the colony during the post breeding moult period. Furthermore, whilst the July to September registrations were predominantly offshore, those for October show an onshore distribution, generally within 8km of the coast.

By November, most birds had vacated the survey area, but with an increased in numbers in March, with the pre-breeding build-up.

Table 25: Density estimates (DE), standard deviations (SD) and standard errors (SE) for unidentified Auk (density corrected from ship-based survey).

Survey Month & Year	Wind Farm Survey Area			Control Survey Area		
	DE	SD	SE	DE	SD	SE
October 2003	0.00	0.00	0.00	0.00	0.00	0.00
November 2003	0.00	0.00	0.00	0.00	0.00	0.00
December 2003	0.00	0.00	0.00	0.00	0.00	0.00
January 2004	0.00	0.00	0.00	0.00	0.00	0.00
Early March 2004	0.00	0.00	0.00	0.00	0.00	0.00
Late March 2004	0.00	0.00	0.00	0.00	0.00	0.00
April 2004	0.00	0.00	0.00	0.00	0.00	0.00
May 2004	0.00	0.00	0.00	0.13	0.26	0.13
June 2004	0.00	0.00	0.00	0.00	0.00	0.00
July 2004	0.00	0.00	0.00	0.00	0.00	0.00
August 2004	0.00	0.00	0.00	1.56	2.69	1.56
September 2004	0.00	0.00	0.00	0.00	0.00	0.00
October 2004	0.56	1.20	0.49	3.56	6.16	3.56
November 2004	0.00	0.00	0.00	0.00	0.00	0.00
December 2004	0.00	0.00	0.00	0.00	0.00	0.00
January 2005	0.11	0.17	0.07	0.00	0.00	0.00
February 2005	0.11	0.27	0.11	0.22	0.38	0.22
March 2005	0.00	0.00	0.00	0.00	0.00	0.00
April 2005	0.00	0.00	0.00	0.00	0.00	0.00
May 2005	0.06	0.14	0.06	0.00	0.00	0.00
June 2005	0.18	0.44	0.18	0.00	0.00	0.00
July 2005	0.00	0.00	0.00	0.00	0.00	0.00
August 2005	0.00	0.00	0.00	0.00	0.00	0.00
September 2005	0.09	0.22	0.09	0.00	0.00	0.00
October 2005 [1] (See note)	1.10	1.81	0.69	0.00	0.00	0.00
Early November 2005	0.06	0.14	0.06	0.00	0.00	0.00
Late November 2005	0.00	0.00	0.00	0.18	0.31	0.18
December 2005	0.00	0.00	0.00	0.78	0.77	0.44

Notes

[1] *Dedicated Little Gull Survey*

Density values given in Table 25 reflect the increases in abundance during the late summer and difficulties in plumage determination during the winter months, with higher values generally recorded at these times. However, recorded levels remain well below those observed closer to the breeding colony (IECS, 1993). Figure 125 shows the interpolated density of Auk spp. registrations from the boat-based survey which recorded the peak maxima. The figure illustrates the relatively offshore distribution of the group, with the majority of usage outside 15km from the coast, and with most concentrations around 20km offshore.

4.1.11 PASSERINES

Although not a specific target of the seabird survey programme, where individual birds or flocks were encountered, their details were recorded using the standard logging procedure. The following table summarises these records.

Table 26: Passerine records, combined surveys.

Species	Maxima	Comments
Eurasian Collard Dove	1 (May 2005)	One bird heading east in May 2005.
Common Swift	2 (May 2004)	Two birds were recorded in May 2004, these presumably being migratory birds.
Sky Lark	4 (March 2005)	The species was recorded in October, February, March and April.
Barn Swallow	3 (May 2004)	These birds were presumably local breeders blown out at sea by strong westerly winds.
Meadow Pipit	16 (March 2005)	Of a total of 21 birds recorded during the survey programme, 16 were recorded in March 2005
White / Pied Wagtail	2 (March 2005)	Only two sightings were made in March 2005.
European Robin	1 (March 2005 and October 2005)	Singles were sighted in March 2005 and October 2005.
Common Blackbird	9 (November 2004)	The ship-based survey in November 2004 indicated a very small westerly passage of Common Blackbird. The species was absent from the remaining surveys.
Fieldfare	4 (November 2005)	The majority of sighting occurred during the autumn migration (11 in total), with westerly movement observed through the survey area.
Song Thrush	6 (October 2005)	Only 6 birds were recorded in active migration during the October survey in 2005.
Blackcap	1 (October 2005)	One bird in active migration.
Goldcrest	1 (October 2005)	One individual landed on the boat in October. The bird later died of exhaustion.
Common Starling	85 (March 2005)	The ship-based survey in March showed a movement of Starling through the area. Other registrations were made in October, November and February, totalling 91 birds.
Finch *sp.*	5 (October 2005)	Five Finch *sp.* were recorded in active migration in October 2005. The birds were heading in a south westerly direction.
Chaffinch	42 (March 2005)	The count of 42 birds included individuals recorded several times the same day. A dense offshore fog was affecting migration movement in March 2005, and the birds appeared to be lost.
Brambling,	2 (October 2005)	The same Brambling landed twice on the boat during the ship-based survey in October 2005.
Snow Bunting	1 (May 2004)	One bird was flying west in May 2004.

5. FLIGHT RISK ASSESSMENT

The survey programme recorded a number of species using the proposed windfarm site and the adjacent areas, with usage both on the water, including loafing and foraging activity, and with birds flying through the area. Whilst the broad ecological function of the area has been discussed on a seasonal basis for individual key species in the previous Section, issues regarding flight height through the area are also of importance.

The following tables (Tables 26 to 29) provide a characterisation of general flight heights from the windfarm and control areas for key species, and a brief assessment of the likelihood of interaction with the turbines (based on worse case rotor sweep heights). It is emphasised that this analysis does not constitute a full collision risk assessment, but provides an early stage indication of those species mostly likely to be affected by the windfarm operation.

Table 26 covers the flights observed during the period October 2003 to June 2004 in the main survey area (including the windfarm development area). Of the 264 flights observed in the area, 58 were considered to be within the rotor height (22%). Of these flights, Common Tern, Sandwich Tern and Little Gull had 100% of flights through the rotor height range, although this accounted for 3 flights for Common Tern, 1 flight for Sandwich Tern and 1 flight for Little Gull. 83% of Gull spp. flights were also through the rotor height range (5 flights) and 59% of Herring Gull flights (10 flights). Numerically, the most number of flights during this period were by Mew Gull (18 flights), although this constituted 32% of all flights by the species. In addition, Great Black-backed Gull had 10 flights through the rotor height (45% of flights) and Black-legged Kittiwake 10 flights (20% of all flights).

Table 27 covers the flights observed during the period July 2004 to December 2005, again for the main survey area, including the windfarm). During this period 1,402 flights were logged in the survey area, with 352 within the rotor height range (25%). Great Black-backed Gull featured the greatest percentage of flights through the rotor height (77%) with 67 flights, with Lesser Black-backed Gull having 64% of flights through the range (14 flights) and 56% of Mew Gull flights also were made within rotor height, this species also having the greatest number of flights through the area at rotor height range (160). A total of 39 Black-legged Kittiwake were recorded within the rotor height range, equating to 35% of all flights by the species. Other species of note were the Great Skua with one of two flights recorded within the rotor height and Red-throated Diver with 4 flights (40% of all flights by the species).

Tables 28 and 29 give similar data, but for the control area, with percentage values in excess of 50% for flights through the rotor height against total flights made including Pink-footed Goose, Common Eider, Great Black-backed Gull, Mew Gull, Herring Gull, Gull spp., Arctic Skua, Sandwich Tern and Common Tern. However, for most of these species, these values were generated by a very small number of flights, with only Pink-footed Goose, Great Black-backed Gull, Herring Gull, Mew Gull and Gull spp. featuring 10 or more flights within the rotor area. Black-legged Kittiwake actually featured the second largest number of individuals flying at rotor height (47 flights), equating to 26% of all flights by the species. In total, 314 flights were observed within the control area to be within rotor height, equating to 21% of total flights in the control block, a value broadly similar to that of the main survey area.

Table 26: Numbers and Flight Height of Bird Species Recorded During Boat Surveys-Wind Farm Survey Area October 2003 to June 2004.

	Bird Flight Height Categories (metres)											
Species	0-2	2-10	10-15	15-25	25-50	50-100	100-200	200+	No data	Total	Total flying at rotor height	% flying at rotor height
Arctic Skua			1							1	0	0%
Atlantic Puffin		1								1	0	0%
Auk sp.	1	1	3							5	0	0%
Barn Swallow		1								1	0	0%
Black-headed Gull			1							1	0	0%
Black-legged Kittiwake	3	25	8	7	3				3	49	10	20%
Common Guillemot	30	26	12						4	72	0	0%
Common Shelduck		4								4	0	0%
Common Tern				3						3	3	100%
Great Black-backed Gull		4	8	1	9					22	10	45%
Great Cormorant		1								1	0	0%
Gull sp.			1	1	3	1				6	5	83%
Herring Gull		1	5	5	5				1	17	10	59%
Little Gull				1						1	1	100%
Mew Gull	1	6	31	15	3				1	57	18	32%
Northern Fulmar	10	6								16	0	0%
Northern Gannet	2	1								3	0	0%
Razorbill	1									1	0	0%
Red-throated Diver		2								2	0	0%
Sandwich Tern				1						1	1	100%
Totals	**48**	**79**	**70**	**34**	**23**	**1**			**9**	**264**	**58**	**22%**

Table 27: Numbers and Flight Height of Bird Species Recorded During Boat Surveys-Wind Farm Survey Area July 2004 to December 2005.

	Bird Flight Height Categories (metres)											
Species	0-2	2-10	10-15	15-25	25-50	50-100	100-200	200+	No data	Total	Total flying at rotor height	% flying at rotor height
Arctic Skua	1	3		1						5	1	20%
Arctic Tern			2	1						3	1	33%
Atlantic Puffin	3	14								17	0	0%
Auk sp.	57	26								83	0	0%
Black Tern		2	1							3	0	0%
Black-headed Gull		7	1	4						12	4	33%
Black-legged Kittiwake	8	22	33	33	6				10	112	39	35%
Chaffinch		36								36	0	0%
Commic Tern	1	16		10						27	10	37%
Common Blackbird		5								5	0	0%
Common Guillemot	120	17	1						3	141	0	0%
Common Scoter	5	1								6	0	0%
Common Starling	1	44	4							49	0	0%
Common Tern	3	34	4	1						42	1	2%
Diver sp.		1								1	0	0%
Eurasian Collard Dove									1	1	0	0%
Eurasian Woodcock	1	1								2	0	0%
European Golden Plover	1									1	0	0%
European Robin	1									1	0	0%
Fieldfare	4	3		1						8	1	13%
Glaucous gull		1								1	0	0%
Great Black-backed Gull	4	10	5	36	28	3			1	87	67	77%

Table 27 cont.

	Bird Flight Height Categories (metres)											
Species	0-2	2-10	10-15	15-25	25-50	50-100	100-200	200+	No data	Total	Total flying at rotor height	% flying at rotor height
Great Northern Diver			2							2	0	0%
Great Skua					1				1	2	1	50%
Gull sp.		1			1				1	3	1	33%
Herring Gull		5	2	4	1					12	5	42%
Lesser Black-backed Gull	7			14					1	22	14	64%
Little Gull	4	14	4	4						26	4	15%
Mallard			2							2	0	0%
Manx Shearwater	4	8								12	0	0%
Meadow Pipit		4	10							14	0	0%
Mew Gull	1	60	61	129	31				4	286	160	56%
Northern Fulmar	47	16								63	0	0%
Northern Gannet	69	80	29	18	12				7	215	30	14%
Pink-footed Goose		6								6	0	0%
Razorbill	18	5							1	24	0	0%
Red-throated Diver	1	5		4						10	4	40%
Sandwich Tern		11	22	7	2					42	9	21%
Sky Lark		6								6	0	0%
Small wader sp.	4									4	0	0%
Sooty Shearwater	1									1	0	0%
Unidentified Passerine sp.	1	4								5	0	0%
White / Pied Wagtail		1							1	2	0	0%
Totals	**367**	**469**	**183**	**267**	**82**	**3**			**31**	**1402**	**352**	**25%**

Table 28: Numbers and Flight Height of Bird Species Recorded During Boat Surveys-Control Survey Area October 2003 to June 2004.

	Bird Flight Height Categories (metres)											
Species	0-2	2-10	10-15	15-25	25-50	50-100	100-200	200+	No data	Total	Total flying at rotor height	% flying at rotor height
Arctic Skua										0	0	
Atlantic Puffin										0	0	
Auk sp.	17	19	1							37	0	0%
Barn Swallow	1	1								2	0	0%
Black-legged Kittiwake	7	36	10	17	7				5	82	24	29%
Common Guillemot	72	109	4						5	190	0	0%
Common Swift		1	1							2	0	0%
Common Tern					1					1	1	100%
Great Black-backed Gull		3	6	5	10	3			2	29	18	62%
Great Cormorant		2								2	0	0%
Gull sp.			2		4	1				7	5	71%
Herring Gull			1	10	4				5	20	14	70%
Meadow Pipit		1								1	0	0%
Mew Gull	1	7	18	18	15				8	67	33	49%
Northern Fulmar	9	5								14	0	0%
Northern Gannet	1	7	1							9	0	0%
Razorbill		5								5	0	0%
Red-throated Diver	1	2								3	0	0%
Sandwich Tern			2	3						5	3	60%
Snow Bunting		1								1	0	0%
Totals	**109**	**199**	**46**	**53**	**41**	**4**			**25**	**477**	**98**	**21%**

Table 29: Numbers and Flight Height of Bird Species Recorded During Boat Surveys-Control Survey Area July 2004 to December 2005.

	Bird Flight Height Categories (metres)											
Species	0-2	2-10	10-15	15-25	25-50	50-100	100-200	200+	No data	Total	Total flying at rotor height	% flying at rotor height
Arctic Skua	1			2						3	2	67%
Arctic Tern	3	14								17	0	0%
Atlantic Puffin	1									1	0	0%
Auk sp.	18	14								32	0	0%
Black-legged Kittiwake	46	64	24	33	14				3	184	47	26%
Chaffinch		4	2							6	0	0%
Commic Tern		1								1	0	0%
Common Blackbird	3									3	0	0%
Common Eider				5						5	5	100%
Common Guillemot	99	15							2	116	0	0%
Common Redshank	2									2	0	0%
Common Scoter		4		2						6	2	33%
Common Starling	3	24	12		2					41	2	5%
Common Tern	5	109	5	4					4	127	4	3%
Diver sp.	1									1	0	0%
Eurasian Woodcock		1								1	0	0%
Fieldfare		3								3	0	0%
Finch sp.	5									5	0	0%
Great Black-backed Gull	2	44	5	16	16	1	1		8	93	34	37%
Gull sp.	1	6		2	8			2		19	10	53%
Herring Gull		1		4						5	4	80%
Lesser Black-backed Gull		1								1	0	0%
Little Auk	1									1	0	0%

Table 29 cont.

	Bird Flight Height Categories (metres)											
Species	0-2	2-10	10-15	15-25	25-50	50-100	100-200	200+	No data	Total	Total flying at rotor height	% flying at rotor height
Little Gull	8	8	3							19	0	0%
Manx Shearwater	24	8								32	0	0%
Meadow Pipit	4	2								6	0	0%
Mew Gull		13	26	49	6				1	95	55	58%
Northern Fulmar	22	7							2	31	0	0%
Northern Gannet	66	26	2	8	1				6	109	9	8%
Pink-footed Goose				39						39	39	100%
Razorbill	17	6							1	24	0	0%
Red-throated Diver	1	1								2	0	0%
Sandwich Tern		11	2	1						14	1	7%
Sky Lark	1	2	1							4	0	0%
Small wader sp.	1									1	0	0%
Sooty Shearwater	1									1	0	0%
Tern sp.				2						2	2	100%
Unidentified Passerine sp.			6							6	0	0%
Totals	**336**	**389**	**88**	**167**	**47**	**1**	**1**	**2**	**27**	**1058**	**216**	**20%**

The data presented in the above tables suggest therefore, that for most species recorded during the survey programme, the potential risk of flight collision with turbines is relatively low, with all or most flights carried out well below the rotor sweep range. For instance around 750 Auk spp. flights were recorded, with none within the potential worst case rotor height range. However, some species would appear to present a greater risk of collision, either because they have well defined flight height within the worst case rotor height, but with few birds present (e.g. 100% of Pink-footed Geese flights, but only one two flocks totalling 39 birds recorded and 100% of Eider flight, but with one flock of 5 Eider), or with a larger number of overall flights but with a smaller percentage of birds flying at rotor height (e.g. Mew Gull with 266 of 505 flights within rotor height range and Black-legged Kittiwake with 120 flights of 427 within rotor height range).

However, it is emphasised that the information presented within Tables 26 to 29 has been generated from data for the total survey area (main survey area and control area), whilst the proposed windfarm covers only a part of this total survey area from which the flight data has been collected (*c.* 17%). As such, the number of flights made through the proposed windfarm site at rotor height should be reduced by a similar value, to more accurately reflect the relative size of the development. However, the percentage of flights at rotor height compared to total flights for each species might be expected to remain at around the same level, and the figures produced in the tables relate purely to the days on which surveys were carried out.

It is therefore considered that a collision risk assessment will need to be undertaken using collision risk modelling, in order to better characterise usage and collision risk, taking into account annual levels of movement through the area, as well as avoidance actions and other biological and operational parameters. The above tables should assist in prioritising the species to be included within the collision risk assessment, in conjunction with conservation criteria for adjacent areas and input from statutory consultees.

6. CONCLUSIONS ON AVIFAUNAL STATUS AND SENSITIVITY

The boat and aircraft survey programmes undertaken off the Holderness coast identified the area of sea in the vicinity of the proposed Humber Gateway windfarm site as being used by a number of seabird species, together with, on occasion, migratory waterfowl and passerines.

The majority of registrations were for seabirds, largely Gulls and Auks, but with Divers and Terns also present. The area around the proposed windfarm development was used throughout the year, with the function and abundance of individuals varying seasonally. For instance, Auk usage peaked during the late summer and early autumn, with dispersion away from the breeding colony on Flamborough Head, whilst usage by most Gull species tended to peak during the winter months.

The species accounts detailed in Section 4 address in detail usage by key species on a spatial, seasonal and functional basis. The following text briefly summarises some of these findings in the context of the proposed windfarm area and attempts to identify, in conjunction with the flight risk assessment in Section 5, status and sensitivity of key species.

6.1 Gulls

Gull registrations were the most numerous from the survey programme, with Mew Gull and Black-legged Kittiwake particularly common. In general, Gull usage was primarily recorded during the autumn and early winter, with most registrations for individual birds foraging within the survey area.

On occasion, a roost flock of Great Black-backed Gull was recorded on one of the remotely operated gas platforms (on the helicopter landing pad), with a greater density of registrations around this area with birds transiting to and from the roost.

However, most Gull species exhibited no particular concentration of usage within or adjacent to the proposed Humber Gateway site, although the area of sea off the mouth of the Humber was potentially one of the preferred areas for some species. However, given the current status of the species, no particular sensitivity has been identified.

The Black-legged Kittiwake is included within the Flamborough Head and Bempton Cliffs SPA citation, and as such, the impact of the proposed development to the species and in particular the status of the breeding colony will need to be addressed in detail during the main Environmental Statement phase. Whilst the species was regularly recorded within the proposed windfarm area, no concentrations were identified in the vicinity. As such, although the Environmental Statement for the proposed development will specifically need to address the impacts of the construction and operation of the windfarm on the status of the breeding colony (SPA population), it is not anticipated that the species would be particularly sensitive to the operation or construction phases.

Of particular interest, was the presence of a large, often dispersed, flock of Little Gull recorded during the late summer and autumn periods of survey programme. This flock was initially recorded off Hornsea Mere in the late summer, where the species is known to roost during post-breeding moult, but with flocks also recorded further south down the coast

during the early autumn, predominantly over 15km offshore, but with a small number of birds recorded within the proposed windfarm site. The dedicated Little Gull survey recorded sizeable flocks off the south Holderness coast, with these birds predominantly 15km offshore, but with some birds within the windfarm area.

This section of coast is undoubtedly currently of importance for the species, with a substantial post-breeding moult flock present off the Yorkshire coast. Its SPEC 3 status means that impacts to it from the proposed development should be considered in detail, however, the distribution of the species off the Holderness coast identified from the current survey programme, together with other sources (e.g. Hartley, 2004), would indicate that inmost conditions, the species predominantly utilises waters further offshore than the windfarm. However, whilst the operation of the windfarm is unlikely to detrimentally impact upon the wider status of the species, the Little Gull will require detailed consideration during the main Impact Assessment phase, as well as potentially during the collision risk assessment.

6.2 Auks

As might be expected given the abundance and proximity of the Flamborough Head Auk colony, Auk spp. were frequently recorded during the survey programme. Common Guillemot were most commonly recorded, with all species most abundant within the vicinity of the proposed development during the late summer and early autumn.

However, no particular concentrations of feeding or loafing birds were recorded within the proposed development site, and similar, no clear flight-lines to and from feeding areas were observed through the site. Flight movements across the survey area were undertaken below the height of the rotors.

As such, in general, it would not be anticipated that the operation of the windfarm would have a measurable impact upon the status of the Auk species associated with the Flamborough Head and Bempton Cliffs colony. However, during the late summer and early autumn, the species undergo a post-breeding moult, which can leave birds flightless for a short period. During this time, substantial Auk rafts can develop, with birds gradually moving southwards away from the Flamborough colony with the residual current.

The flightless, or semi-flightless nature of these flocks, together with the relatively high densities and numbers of individuals involved leads to an increased vulnerability to a series of potential impacts at this time. In particular, the rafts are unable to quickly move out of an area in response to disturbance, deleterious water quality or changes in prey availability, and therefore construction activities may potentially have a detrimental localised influence. Methods to reduce impacts to the group at this period should therefore be considered, although it is not anticipated that any significant impact to the status of the breeding colony population would occur.

6.3 Other Species

Red-throated Diver were recorded within the survey area, although densities within the proposed windfarm site were relatively low, with a more near-shore distribution, running along the coast. As such, although wintering flocks can potentially be an issue off the east

coast of England, the level of wintering usage over 10km off the Holderness coast is not considered particularly important regionally. This is of interest, given the extensive wintering population identified offshore in the Thames mouth, with this latter concentration ascribed to a combination of physical, biological and anthropogenic parameters, including shallow waters, a sandy substratum supporting a Nephtys and amphipod community and an absence of hipping movement. Off the Holderness coast, these parameters are largely confined to the nearshore, coastal margins, and around the Binks, with waters deepening to over 10m CD within 5km of the coast, and with the majority of mobile sands similarly confined to the coastal margins, except around the Binks and in Bridlington Bay (e.g. Smithic Sands) (Allen, in prep). As such, it is not unexpected that the wintering distribution of Red-throated Diver along the Holderness coast features a more coastal distribution than that seen in the Thames estuary, and the status of the species within the proposed Humber Gateway windfarm site is accordingly relatively low.

Northern Fulmar was recorded throughout the survey area, particularly during the summer, with dispersed foraging undertaken within the area. However, no concentrations were identified within, or adjacent to, the windfarm site, and flight heights were almost always below the rotor height. The species breeds on Flamborough Head, and as with other breeding species associated with the area, may be considered of greater sensitivity, given the relative proximity of the development to the colony. However, the absence of any concentrations within or adjacent to the development area suggests that the area is not particularly important for foraging, and the relatively low flight height means that the species has a low collision risk with the rotors. As such, sensitivity levels to the development would be low.

The Northern Gannet also breeds at the Flamborough Head and Bempton Cliffs site, and, given its relatively long-life (and associated relatively low population dynamics) and small breeding population at the colony, it might be considered of greater sensitivity to the development, particularly as long distance flights to habitual feeding areas are undertaken. However, relatively few birds were recorded within the survey area, and fewer still in the vicinity of the windfarm site, with most birds located to the northern section of the survey area, and further offshore. Although flights through the area were observed, no key flight-lines were observed within the windfarm area. As such, whilst it will be necessary to assess impacts of the development on the status of the species, and in particular, on the Flamborough colony, it is not anticipated that any significant impacts to the population at this level will be identified.

Tern species were also recorded within the survey area, and indeed, within the development site. Predominantly, records were for the main passage periods, with Common Tern most frequently recorded. No concentrations of usage, in particular fishing, were observed within the proposed development site, but flights within the rotor height did occur. Numbers of Little Tern, which have a breeding colony at Spurn Head were not recorded within the development site. In general, few Terns were recorded using the sea in the vicinity of the proposed windfarm during the breeding season, and as such, the sensitivity of breeding colony productivity to the development is considered to be low. Passage usage may be more affected, in that a greater number of birds use the Holderness coast at this time. As such, it will probably be necessary to more closely investigate the potential impacts to passage flocks during the main ES stage, and through the collision risk assessment.

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8. APPENDICES

Many of the Figures referred to in this document have been produced in A3 format in order to allow interpretation of the data more easily.

As such, they have been compiled, together with duplicate copies of the A4 Figures included in this text, in a separate Appendix Document.