

## APPENDIX 8.1: ORNITHOLOGICAL SURVEY METHODS AND RESULTS

### SCOPE

- 8.5.1 A baseline survey of the proposed Heckington Fen Wind Park was undertaken by Kevin Shepherd - Consultant Ornithologist Limited with the following objectives:
- To determine the distribution and abundance of birds breeding within at least 500m of the proposed wind park
  - To determine the distribution and abundance of birds wintering within at least 500m of the proposed wind park
  - To quantify levels of flight activity, particularly by birds of high nature conservation importance<sup>1</sup>, within at least 200m of the proposed wind park.
- 8.5.2 The location of the proposed wind park and the survey areas referred to above are shown in **Figure. 1**.

### FIELD SURVEY METHODS

- 8.5.3 Field surveys were undertaken by Chris Bradshaw, Neil Bostock, Rob Hopkinson, Craig Robson, Graham Riley and Kevin Shepherd. The surveyors were all first class, highly experienced field ornithologists. Nevertheless, extensive training was provided both prior to and during survey, irrespective of previous experience. Aspects covered included navigation, application of the various survey methods, techniques to minimise fieldworker effects on bird detection, and recognition of birds, bird signs and bird behaviour. Emphasis was placed on the importance of carrying out the surveys in a systematic, standardised way to enable collection of rigorous survey data and direct comparison of data from different areas and survey periods.

### Breeding birds

- 8.5.4 The breeding bird survey method was based upon the British Trust for Ornithology's Common Birds Census method<sup>2</sup>.
- 8.5.5 Six visits were made to the survey area between 7 April – 18 July 2008 (on 7-10 and 21-22 April, 7-9 and 22-23 May, 13-15 June and 12-18 July 2008). Work was undertaken between dawn and noon BST in optimum weather conditions for survey i.e. light winds, good visibility and lack of precipitation. All habitats frequented by crepuscular/nocturnal species were also surveyed from dusk into dark. During each visit, emphasis was placed on thoroughly surveying all parts of the survey area<sup>3</sup>; achieved by slowly walking around, frequently pausing at appropriate vantage and listening points. All woodland, copse and scrub boundaries, hedgerows, ditches, rivers and streams were walked. Water bodies, isolated trees and buildings were carefully approached and examined. All parts of the survey area were approached to within 50m.

<sup>1</sup> i.e. species listed on Annex I of EC Directive 79/409/EEC on the Conservation of Wild Birds 1979 (Annex I species) and/or breeding species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (Schedule 1 species).

<sup>2</sup> Marchant, J.H. (1983). BTO Common Birds Census Instructions. British Trust for Ornithology, Thetford.

<sup>3</sup> Access permission could not be obtained to walk some parts of the survey area. These were surveyed from adjacent points of access, overlooking higher ground and public rights of way (Fig. 1).

- 8.5.6 The objective of the fieldwork was to carry out a full *breeding* bird survey of the site; to map the locations of breeding territories and hence to derive population estimates for all species. Emphasis was therefore placed on accurately mapping the locations of all birds exhibiting breeding behaviour. Birds were considered to be present within breeding territories if any of the following were observed:
- song/courtship/display
  - bird engaged in territorial behaviour/territorial dispute
  - nest-building (including excavating nest-hole)
  - adult visiting probable nest-site
  - location of nest or newly fledged young
  - agitated behaviour of adult bird (e.g. repetitive alarm-calling, distraction display) indicating nearby presence of nest or young
  - bird carrying food to nearby nest or young
  - bird removing faecal sac from nearby nest.
- 8.5.7 During each visit, special care was taken:
- to record each individual bird exhibiting breeding behaviour once only
  - to link observations likely to relate to single breeding pairs (e.g. singing male / nearby nest-site, two birds repetitively alarm-calling)
  - to emphasise observations clearly relating to separate breeding pairs (e.g. males singing simultaneously, males involved in territorial disputes).
- 8.5.8 At the end of each visit, a 'visit-map' was compiled showing all registrations made.
- 8.5.9 At the end of the survey, for each species, registrations on the visit-maps were transferred on to 'species maps' from which the locations of breeding territories (registrations in suitable breeding habitat, usually in 'clusters', relating to the activity of breeding pairs), hence minimum population estimates were derived.

### Breeding barn owl

- 8.5.10 Field methods were based upon those currently recommended<sup>4</sup>, based upon those used during the 1994-97 British Trust for Ornithology / Hawk and Owl Trust national barn owl survey.<sup>5</sup>
- 8.5.11 The survey area was thoroughly searched for all *potential* barn owl nest/roost sites during December 2007:

<sup>4</sup> Gilbert, G., Gibbons, D.W. and Evans, J. (1998). Bird Monitoring Methods; a manual of techniques for key UK species. RSPB, Sandy.

<sup>5</sup> Toms, M. (1995). *Project Barn Owl 1995: fieldwork instructions; information sheets and recording sheets*. A BTO / Hawk and Owl Trust Collaboration. BTO, Thetford.

- A building with a suitable entrance hole and possibility of a suitable nest-site beyond was recorded as a potential site (a group of such buildings, e.g. a farm, was classified as a single site).
  - A hay-bale stack was recorded as a potential site.
  - A heavily ridged or creviced cliff or quarry face was recorded as a potential site.
  - All trees<sup>6</sup> were checked for suitable cavities, each tree recorded as a single site.
  - All bridges and underpasses were checked for suitable cavities, each bridge/underpass recorded as a single site.
  - Barn owl nest-boxes were searched for; particularly on beams inside buildings, on exterior walls, on telegraph poles or in trees.
- 8.5.12 Each potential nest/roost site was mapped, numbered and described.
- 8.5.13 All potential nest/roost sites located were then thoroughly checked for signs of barn owl presence in June 2008 e.g. barn owl(s), pellets, feathers, white splashings. In buildings; all floors, hay lofts and ledges, the tops of walls, the ends of roof beams, gaps in walls, ventilation and ducting tubes, loft spaces, cavities alongside chimney breasts, spaces under floorboards, corners of upper rooms, storage bins and old water tanks were checked for signs.
- 8.5.14 Surveyors checked buildings in pairs; one entering and one standing outside to record any birds emerging. Goggles / face-protection was worn when checking confined spaces. Ladders were used in preference to climbing.
- 8.5.15 At any sites with signs of presence, attempts were then made to confirm breeding e.g. nest, eggs, young, recent prey remains, adult carrying food to nest.
- 8.5.16 All potential nest/roost sites located during the winter survey were categorised as either:
- No signs of barn owls
  - Signs of barn owl presence but no evidence of breeding (with details)
  - Breeding barn owls (with details)
  - Site lost or destroyed.

Wintering birds

8.5.17 The survey area was surveyed once per calendar month during September 2007 - March 2008. Work was undertaken mainly between sunrise and noon GMT in optimum weather conditions for survey i.e. light winds, good visibility and lack of precipitation. During each survey visit, emphasis was placed on thoroughly surveying all parts of the survey area; achieved by slowly walking around, frequently pausing at appropriate vantage and listening points. All woodland, copse and scrub boundaries, hedgerows, ditches, rivers and streams were walked. Water bodies were carefully approached and examined. All parts of the survey area<sup>7</sup> were approached to within 100m.

<sup>6</sup> Trees of trunk diameter <45cm were ignored. Up to 3 trees only from woodland edges were checked.

<sup>7</sup> Access permission could not be obtained to walk some parts of the survey area. These were surveyed from adjacent points of access, overlooking higher ground and public rights of way (Fig. 1).

8.5.18 All birds utilising the survey area were counted. Localised movements of birds were carefully noted to avoid double recording. Locations of all individuals of the following species and species groups were mapped: grebes, egrets, swans, geese (except greylag and canada), duck (except mallard), raptors (except sparrowhawk, buzzard and kestrel), grey partridge, waders, owls (except tawny), kingfisher, lesser spotted woodpecker, woodlark, willow tit, tree sparrow, linnet, bullfinch, yellowhammer, reed bunting, corn bunting and unexpected species.

Flight activity

8.5.19 Information on bird flight activity was collected during September 2007 – August 2008 during timed watches from strategic vantage points (VPs)<sup>8</sup>. VPs were selected to maximise visibility of the proposed wind park using the minimum number of points. Seven VPs (1-7) were selected (Table 1, Fig. 2).

Table 1. Location of vantage points used for flight activity watches

| VP | Grid reference |
|----|----------------|
| 1  | TF 19539 46184 |
| 2  | TF 20826 46038 |
| 3  | TF 19582 45216 |
| 4  | TF 20751 45283 |
| 5  | TF 20660 44464 |
| 6  | TF 21335 46040 |
| 7  | TF 22418 45318 |

8.5.20 Observers positioned themselves at VPs to minimise their effects on bird behaviour. Watches were undertaken during daylight hours by a single observer in weather conditions rendering clear visibility of all ground being observed. Six two-hour watches per calendar month were undertaken from each VP. During September-March, two commenced within one hour of sunrise, two commenced within one hour of noon GMT and two terminated within one hour of sunset. During April-August, the watches were spread evenly throughout daylight hours. A total of 1008 hours observations were therefore undertaken during September 2007 - March 2008; 144 hours from each of the seven VPs. The work included numerous dawn and dusk observations to investigate flightlines of birds moving to/from roost and crepuscular species.

8.5.21 During each watch, two hierarchical recording methods were used, as follows:

- a) Focal bird sampling. The observer scanned the VP recording zone constantly until a *target species*<sup>9</sup> was detected in flight. Once detected, the bird was followed until it ceased flying, had clearly vacated the VP recording zone or was lost to view. The time the bird was initially detected and the times (to the nearest second) spent flying within the VP recording zone at three categories of flying height (<28m, 28-140m and >140m above ground) were recorded. The route followed by the bird was plotted on to a 1:15,000 scale map with direction of flight indicated and flying heights depicted in black (<28m above ground), red (28-140m above ground) and blue (>140m above ground). These observations had priority over activity summaries (below).

<sup>8</sup> Band, W., Madders, M. & Whitfield, D.P. (2006). Developing field and analytical methods to assess avian collision risk at wind farms. In: de Lucas, M., Janss, G. & Ferrer, M. (eds). Birds and Wind Power. Lynx Edicions, Barcelona.

<sup>9</sup> i.e. species listed on Annex I of EC Directive 79/409/EEC on the Conservation of Wild Birds 1979 and/or breeding species listed on Schedule 1 of the Wildlife and Countryside Act 1981.

- 8.5.22 Activity summaries. At the end of each one-hour period, flight activity within the VP recording zone by *secondary species*<sup>10</sup> was summarised. For each species, the number of bird-flights observed between 28-140m above ground was recorded.
- 8.5.23 Data entered in the field on to recording sheets were later transferred to Excel spreadsheets. Maps of flight activity by target species were compiled for each watch. Each flying bout was numbered consecutively and cross-referenced to the relevant flight-path on the map. Summary maps were compiled for each species at the end of the season.

FIELD SURVEY RESULTS

Breeding birds

- 8.5.24 A total of 54 species were recorded during the breeding bird survey of which 44 species bred (Table 2).

Table 2. Numbers of territories recorded during the breeding bird survey. F = Species foraging, but no evidence of breeding.

| Species              | No. territories |
|----------------------|-----------------|
| Grey heron           | F               |
| Mute swan            | 4               |
| Greylag goose        | 2               |
| Gadwall              | F               |
| Mallard              | 28              |
| Tufted duck          | F               |
| Marsh harrier        | F               |
| Sparrowhawk          | F               |
| Buzzard              | F               |
| Kestrel              | 2               |
| Hobby                | F               |
| Red-legged partridge | 31              |
| Grey partridge       | 5               |
| Quail                | 6               |
| Pheasant             | 23              |
| Moorhen              | 25              |
| Coot                 | 13              |
| Lapwing              | 16              |
| Stock dove           | 10              |
| Woodpigeon           | 16              |
| Barn owl             | 2               |
| Little owl           | 3               |
| Swift                | F               |
| Skylark              | 151             |
| Swallow              | 5               |
| House martin         | F               |

<sup>10</sup> i.e. cormorant, grey heron, mute swan, geese, ducks, sparrowhawk, buzzard, kestrel, waders, gulls and raven.

|                 |     |
|-----------------|-----|
| Meadow pipit    | 51  |
| Yellow wagtail  | 30  |
| Pied wagtail    | 6   |
| Wren            | 66  |
| Dunnock         | 20  |
| Robin           | 11  |
| Blackbird       | 24  |
| Song thrush     | 2   |
| Mistle thrush   | 1   |
| Sedge Warbler   | 99  |
| Whitethroat     | 62  |
| Chiffchaff      | 1   |
| Long-tailed tit | 1   |
| Blue tit        | 3   |
| Great tit       | 3   |
| Magpie          | 5   |
| Jackdaw         | 9   |
| Rook            | F   |
| Carriion crow   | 11  |
| Starling        | 1   |
| Tree sparrow    | 9   |
| Chaffinch       | 17  |
| Greenfinch      | 3   |
| Goldfinch       | 1   |
| Linnet          | 16  |
| Yellowhammer    | 22  |
| Reed bunting    | 131 |
| Corn bunting    | 11  |

- 8.5.25 Quail (a Schedule 1 species) were heard singing in six locations, two breeding pairs of barn owl (a Schedule 1 species) and a total of 414 breeding territories of twelve UK Biodiversity Action Plan (BAP) priority species were found (Fig. 3).

Wintering birds

- 8.5.26 A total of 92 species were recorded using the survey area during September-March (Table 3).

Table 3. Numbers of birds recorded during the wintering bird survey.

| Species           | Sep | Oct | Nov | Dec | Jan | Feb | Mar |
|-------------------|-----|-----|-----|-----|-----|-----|-----|
| Little grebe      | 0   | 1   | 2   | 4   | 2   | 3   | 0   |
| Cormorant         | 5   | 10  | 11  | 4   | 9   | 3   | 5   |
| Little egret      | 0   | 0   | 0   | 5   | 0   | 0   | 0   |
| Great white egret | 0   | 0   | 1   | 0   | 0   | 1   | 0   |
| Grey heron        | 5   | 3   | 9   | 7   | 7   | 7   | 7   |
| Mute swan         | 16  | 14  | 19  | 22  | 46  | 59  | 93  |
| Bewick's swan     | 0   | 0   | 5   | 0   | 0   | 0   | 1   |
| Whooper swan      | 0   | 0   | 0   | 0   | 0   | 0   | 1   |
| Pink-footed goose | 0   | 12  | 0   | 0   | 32  | 0   | 0   |

|                          |      |      |     |      |      |      |      |
|--------------------------|------|------|-----|------|------|------|------|
| Greylag goose            | 0    | 0    | 0   | 0    | 0    | 0    | 3    |
| Wigeon                   | 0    | 1    | 1   | 0    | 0    | 0    | 0    |
| Gadwall                  | 3    | 10   | 0   | 3    | 22   | 22   | 28   |
| Teal                     | 1    | 14   | 11  | 50   | 77   | 106  | 131  |
| Mallard                  | 339  | 407  | 185 | 114  | 292  | 208  | 181  |
| Pintail                  | 1    | 0    | 1   | 0    | 1    | 0    | 0    |
| Shoveler                 | 0    | 3    | 0   | 0    | 0    | 0    | 0    |
| Tufted duck              | 0    | 0    | 0   | 0    | 0    | 3    | 0    |
| Marsh harrier            | 3    | 0    | 0   | 0    | 0    | 0    | 0    |
| Hen harrier              | 1    | 1    | 0   | 2    | 1    | 1    | 1    |
| Sparrowhawk              | 3    | 3    | 2   | 3    | 2    | 2    | 2    |
| Buzzard                  | 6    | 4    | 2   | 3    | 2    | 3    | 3    |
| Kestrel                  | 16   | 13   | 12  | 12   | 12   | 7    | 8    |
| Merlin                   | 0    | 1    | 1   | 1    | 1    | 1    | 1    |
| Hobby                    | 1    | 0    | 0   | 0    | 0    | 0    | 0    |
| Peregrine                | 3    | 3    | 2   | 3    | 3    | 3    | 2    |
| Red-legged partridge     | 6    | 40   | 66  | 23   | 46   | 17   | 24   |
| Grey partridge           | 5    | 3    | 26  | 6    | 16   | 2    | 4    |
| Pheasant                 | 104  | 117  | 146 | 92   | 88   | 97   | 63   |
| Water rail               | 0    | 0    | 0   | 0    | 0    | 1    | 0    |
| Moorhen                  | 20   | 40   | 25  | 22   | 20   | 16   | 24   |
| Coot                     | 15   | 14   | 9   | 0    | 1    | 10   | 5    |
| Golden plover            | 133  | 2250 | 143 | 176  | 125  | 256  | 25   |
| Lapwing                  | 22   | 1019 | 419 | 444  | 9    | 1033 | 47   |
| Snipe                    | 8    | 4    | 8   | 9    | 19   | 5    | 17   |
| Woodcock                 | 0    | 0    | 0   | 1    | 0    | 0    | 0    |
| Curlew                   | 2    | 1    | 0   | 1    | 0    | 0    | 0    |
| Redshank                 | 0    | 0    | 0   | 0    | 0    | 0    | 2    |
| Green sandpiper          | 0    | 0    | 0   | 0    | 0    | 1    | 0    |
| Black-headed gull        | 1100 | 206  | 384 | 77   | 22   | 27   | 24   |
| Common gull              | 50   | 31   | 94  | 81   | 36   | 80   | 66   |
| Lesser black-backed gull | 2    | 0    | 0   | 0    | 0    | 0    | 3    |
| Herring gull             | 0    | 0    | 1   | 4    | 0    | 0    | 0    |
| Great black-backed gull  | 0    | 0    | 1   | 1    | 1    | 0    | 0    |
| Stock dove               | 31   | 47   | 38  | 81   | 89   | 49   | 22   |
| Woodpigeon               | 443  | 1213 | 806 | 1219 | 1369 | 989  | 1084 |
| Collared dove            | 1    | 4    | 26  | 0    | 0    | 1    | 0    |
| Barn owl                 | 8    | 8    | 7   | 5    | 6    | 7    | 8    |
| Little owl               | 2    | 3    | 2   | 1    | 0    | 2    | 1    |
| Short-eared owl          | 1    | 1    | 0   | 0    | 0    | 1    | 0    |
| Kingfisher               | 3    | 4    | 3   | 1    | 0    | 0    | 0    |
| Great spotted woodpecker | 0    | 0    | 2   | 2    | 1    | 0    | 0    |
| Skylark                  | 42   | 494  | 308 | 145  | 158  | 188  | 205  |
| Sand martin              | 2    | 0    | 0   | 0    | 0    | 0    | 0    |
| Swallow                  | 60   | 0    | 0   | 0    | 0    | 0    | 0    |
| House martin             | 18   | 0    | 0   | 0    | 0    | 0    | 0    |
| Meadow pipit             | 92   | 39   | 58  | 30   | 46   | 64   | 93   |

|                 |     |      |     |     |     |     |     |
|-----------------|-----|------|-----|-----|-----|-----|-----|
| Grey wagtail    | 0   | 1    | 1   | 0   | 0   | 0   | 0   |
| Pied wagtail    | 0   | 8    | 3   | 3   | 3   | 8   | 18  |
| Wren            | 28  | 55   | 52  | 45  | 27  | 38  | 33  |
| Duncock         | 6   | 27   | 28  | 19  | 16  | 15  | 11  |
| Robin           | 4   | 32   | 23  | 8   | 8   | 5   | 7   |
| Stonechat       | 0   | 0    | 1   | 2   | 0   | 0   | 2   |
| Wheatear        | 5   | 4    | 0   | 0   | 0   | 0   | 0   |
| Blackbird       | 12  | 49   | 67  | 65  | 62  | 42  | 44  |
| Fieldfare       | 0   | 298  | 372 | 294 | 265 | 416 | 241 |
| Song thrush     | 3   | 24   | 14  | 13  | 7   | 7   | 6   |
| Redwing         | 0   | 37   | 72  | 24  | 29  | 28  | 11  |
| Mistle thrush   | 1   | 1    | 1   | 2   | 1   | 0   | 0   |
| Chiffchaff      | 0   | 1    | 0   | 0   | 0   | 0   | 0   |
| Reed Warbler    | 2   | 0    | 0   | 0   | 0   | 0   | 0   |
| Sedge Warbler   | 1   | 0    | 0   | 0   | 0   | 0   | 0   |
| Goldcrest       | 0   | 6    | 3   | 3   | 4   | 1   | 1   |
| Long-tailed tit | 0   | 8    | 5   | 5   | 7   | 5   | 2   |
| Blue tit        | 8   | 18   | 16  | 8   | 15  | 9   | 5   |
| Great tit       | 4   | 5    | 2   | 0   | 3   | 6   | 5   |
| Jay             | 1   | 0    | 0   | 0   | 0   | 0   | 0   |
| Magpie          | 27  | 9    | 29  | 13  | 22  | 21  | 20  |
| Jackdaw         | 66  | 815  | 732 | 700 | 260 | 360 | 450 |
| Rook            | 166 | 752  | 830 | 800 | 40  | 400 | 250 |
| Carriion crow   | 76  | 45   | 61  | 33  | 41  | 26  | 42  |
| Starling        | 328 | 2158 | 449 | 25  | 111 | 389 | 495 |
| House sparrow   | 0   | 12   | 10  | 7   | 0   | 0   | 0   |
| Tree sparrow    | 21  | 54   | 45  | 48  | 45  | 25  | 24  |
| Chaffinch       | 12  | 43   | 26  | 49  | 19  | 51  | 34  |
| Greenfinch      | 7   | 97   | 67  | 5   | 16  | 5   | 9   |
| Goldfinch       | 14  | 86   | 49  | 32  | 8   | 22  | 17  |
| Linnet          | 348 | 20   | 15  | 6   | 0   | 33  | 2   |
| Bullfinch       | 0   | 0    | 2   | 0   | 0   | 0   | 0   |
| Lapland bunting | 0   | 0    | 0   | 0   | 0   | 1   | 0   |
| Yellowhammer    | 14  | 35   | 18  | 27  | 31  | 12  | 12  |
| Reed bunting    | 114 | 103  | 72  | 91  | 90  | 79  | 91  |
| Corn bunting    | 7   | 2    | 6   | 0   | 7   | 4   | 2   |

8.5.27 The mapped monthly distributions of selected species are available upon request.

### Flight activity

8.5.28 Flight activity by 35 species of bird was recorded, including ten target species; marsh harrier, hen harrier, merlin, hobby, peregrine, golden plover, Mediterranean gull, common tern, barn owl and short-eared owl (Table 4).

**Table 4. Summary of flight activity by target species. Table shows the total number of flights, mean interval between flights, flock size, mean flock size, total flying time and percentage time spent flying within the three categories of flying height.**

| Species       | VP      | No. flights | Int. (hours) | Flock size | Mean flock size | Flying time (secs) | <28m | 28-140m | >140m |
|---------------|---------|-------------|--------------|------------|-----------------|--------------------|------|---------|-------|
| Marsh harrier | 1       | 28          | 5.1          | 1          | 1               | 2681               | 72   | 27      | 1     |
|               | 2       | 32          | 4.5          | 1          | 1               | 3718               | 96   | 4       | 0     |
|               | 3       | 10          | 14.4         | 1          | 1               | 1560               | 99   | 1       | 0     |
|               | 4       | 41          | 3.5          | 1          | 1               | 6011               | 91   | 9       | 0     |
|               | 5       | 7           | 20.6         | 1          | 1               | 736                | 100  | 0       | 0     |
|               | 6       | 28          | 5.1          | 1          | 1               | 3963               | 98   | 2       | 0     |
|               | 7       | 8           | 18.0         | 1          | 1               | 862                | 93   | 7       | 0     |
|               | Overall | 154         | 6.5          | 1          | 1               | 19531              | 91   | 8       | 1     |
| Hen harrier   | 1       | 2           | 72.0         | 1          | 1               | 125                | 100  | 0       | 0     |
|               | 2       | 8           | 18.0         | 1          | 1               | 1080               | 100  | 0       | 0     |
|               | 3       | 2           | 72.0         | 1          | 1               | 216                | 100  | 0       | 0     |
|               | 4       | 11          | 13.1         | 1          | 1               | 731                | 100  | 0       | 0     |
|               | 5       | 3           | 48.0         | 1          | 1               | 561                | 100  | 0       | 0     |
|               | 6       | 2           | 72.0         | 1          | 1               | 103                | 100  | 0       | 0     |
|               | 7       | 0           | -            | -          | -               | -                  | -    | -       | -     |
|               | Overall | 28          | 36.0         | 1          | 1               | 2816               | 100  | 0       | 0     |
| Merlin        | 1       | 1           | 144.0        | 1          | 1               | 14                 | 100  | 0       | 0     |
|               | 2       | 7           | 20.6         | 1          | 1               | 259                | 89   | 11      | 0     |
|               | 3       | 4           | 36.0         | 1          | 1               | 133                | 100  | 0       | 0     |
|               | 4       | 4           | 36.0         | 1          | 1               | 113                | 100  | 0       | 0     |
|               | 5       | 5           | 28.8         | 1          | 1               | 166                | 100  | 0       | 0     |
|               | 6       | 0           | -            | -          | -               | -                  | -    | -       | -     |
|               | 7       | 1           | 144.0        | 1          | 1               | 34                 | 100  | 0       | 0     |
|               | Overall | 22          | 45.8         | 1          | 1               | 719                | 96   | 4       | 0     |
| Hobby         | 1       | 3           | 48.0         | 1          | 1               | 89                 | 100  | 0       | 0     |
|               | 2       | 0           | -            | -          | -               | -                  | -    | -       | -     |
|               | 3       | 8           | 18.0         | 1          | 1               | 660                | 85   | 15      | 0     |
|               | 4       | 1           | 144.0        | 1          | 1               | 48                 | 17   | 83      | 0     |
|               | 5       | 4           | 36.0         | 1          | 1               | 244                | 95   | 5       | 0     |
|               | 6       | 1           | 144.0        | 1          | 1               | 183                | 72   | 18      | 0     |
|               | 7       | 0           | -            | -          | -               | -                  | -    | -       | -     |
|               | Overall | 17          | 59.3         | 1          | 1               | 1224               | 84   | 16      | 0     |
| Peregrine     | 1       | 27          | 5.3          | 1-3        | 1.1             | 794                | 88   | 12      | 0     |
|               | 2       | 14          | 10.3         | 1          | 1               | 714                | 97   | 3       | 0     |
|               | 3       | 16          | 9.0          | 1          | 1               | 708                | 86   | 14      | 0     |
|               | 4       | 11          | 13.1         | 1          | 1               | 594                | 85   | 15      | 0     |
|               | 5       | 8           | 18.0         | 1          | 1               | 368                | 65   | 35      | 0     |
|               | 6       | 7           | 20.6         | 1          | 1               | 532                | 90   | 10      | 0     |
|               | 7       | 3           | 48.0         | 1          | 1               | 518                | 6    | 37      | 57    |
|               | Overall | 86          | 11.7         | 1          | 1               | 4228               | 77   | 16      | 7     |
| Golden plover | 1       | 60          | 2.4          | 1-2100     | 173             | 3636               | 41   | 58      | 1     |

|                    |         |     |       |        |    |       |     |    |   |
|--------------------|---------|-----|-------|--------|----|-------|-----|----|---|
|                    | 2       | 25  | 5.8   | 1-103  | 19 | 767   | 45  | 55 | 0 |
|                    | 3       | 60  | 2.4   | 1-320  | 48 | 1712  | 41  | 59 | 0 |
|                    | 4       | 47  | 3.1   | 1-58   | 9  | 1784  | 58  | 42 | 0 |
|                    | 5       | 29  | 5.0   | 1-86   | 15 | 1202  | 30  | 69 | 1 |
|                    | 6       | 33  | 4.4   | 1-85   | 16 | 1054  | 24  | 71 | 5 |
|                    | 7       | 25  | 5.8   | 1-75   | 22 | 590   | 18  | 82 | 0 |
|                    | Overall | 279 | 3.6   | 1-2100 | 56 | 10745 | 40  | 59 | 1 |
| Mediterranean gull | 1       | 1   | 144.0 | 1      | 1  | 11    | 100 | 0  | 0 |
|                    | 2       | 0   | -     | -      | -  | -     | -   | -  | - |
|                    | 3       | 4   | 36.0  | 1      | 1  | 20    | 100 | 0  | 0 |
|                    | 4       | 0   | -     | -      | -  | -     | -   | -  | - |
|                    | 5       | 0   | -     | -      | -  | -     | -   | -  | - |
|                    | 6       | 1   | 144.0 | 1      | 1  | 68    | 100 | 0  | 0 |
|                    | 7       | 0   | -     | -      | -  | -     | -   | -  | - |
|                    | Overall | 6   | 168.0 | 1      | 1  | 99    | 100 | 0  | 0 |
| Common tern        | 1       | 4   | 36.0  | 1      | 1  | 504   | 100 | 0  | 0 |
|                    | 2       | 3   | 48.0  | 1      | 1  | 265   | 100 | 0  | 0 |
|                    | 3       | 0   | -     | -      | -  | -     | -   | -  | - |
|                    | 4       | 0   | -     | -      | -  | -     | -   | -  | - |
|                    | 5       | 0   | -     | -      | -  | -     | -   | -  | - |
|                    | 6       | 1   | 144.0 | 1      | 1  | 61    | 100 | 0  | 0 |
|                    | 7       | 2   | 72.0  | 1      | 1  | 191   | 100 | 0  | 0 |
|                    | Overall | 10  | 100.8 | 1      | 1  | 1021  | 100 | 0  | 0 |
| Barn owl           | 1       | 19  | 7.6   | 1      | 1  | 1443  | 100 | 0  | 0 |
|                    | 2       | 68  | 2.1   | 1      | 1  | 4491  | 100 | 0  | 0 |
|                    | 3       | 55  | 2.6   | 1      | 1  | 4416  | 100 | 0  | 0 |
|                    | 4       | 82  | 1.8   | 1      | 1  | 9555  | 100 | 0  | 0 |
|                    | 5       | 49  | 2.9   | 1      | 1  | 3649  | 100 | 0  | 0 |
|                    | 6       | 96  | 1.5   | 1      | 1  | 5187  | 100 | 0  | 0 |
|                    | 7       | 84  | 1.7   | 1      | 1  | 2987  | 100 | 0  | 0 |
|                    | Overall | 453 | 2.2   | 1      | 1  | 31728 | 100 | 0  | 0 |
| Short-eared owl    | 1       | 1   | 144.0 | 1      | 1  | 415   | 100 | 0  | 0 |
|                    | 2       | 2   | 72.0  | 1      | 1  | 111   | 100 | 0  | 0 |
|                    | 3       | 0   | -     | -      | -  | -     | -   | -  | - |
|                    | 4       | 0   | -     | -      | -  | -     | -   | -  | - |
|                    | 5       | 0   | -     | -      | -  | -     | -   | -  | - |
|                    | 6       | 3   | 48.0  | 1      | 1  | 172   | 100 | 0  | 0 |
|                    | 7       | 0   | -     | -      | -  | -     | -   | -  | - |
|                    | Overall | 6   | 168.0 | 1      | 1  | 698   | 100 | 0  | 0 |

8.5.29 A total of 154 marsh harrier flights were recorded (Table 4); twelve in April, 35 in May, twelve in June, 24 in July, 60 in August and eleven in September.

8.5.30 A total of 28 hen harrier flights were recorded (Table 4); two in January, two in February, two in March, thirteen in April, one in August, one in September, three in October and four in December.

8.5.31 A total of 22 merlin flights were recorded (Table 4); six in January, two in February, five in March, three in October, one in November and five in December.

- 8.5.32 Seventeen hobby flights were recorded (Table 4); six in May, four in June, six in August and one in September.
- 8.5.33 A total of 86 peregrine flights were recorded (Table 4); 24 in January, ten in February, nine in March, one in August, fourteen in September, fifteen in October, five in November and eight in December.
- 8.5.34 A total of 279 golden plover flights were recorded (Table 4); twelve in January, 27 in February, fifteen in March, three in April, two in July, eighteen in August, 37 in September, 64 in October, 66 in November and 35 in December.
- 8.5.35 Six Mediterranean gull flights were recorded (Table 4); all in August.
- 8.5.36 Ten common tern flights were recorded (Table 4); all in May.
- 8.5.37 A total of 453 barn owl flights were recorded (Table 4); 34 in January, 91 in February, 93 in March, 45 in April, eight in May, 40 in June, 55 in July, five in August, twelve in September, seventeen in October, seventeen in November and 36 in December.
- 8.5.38 Six short-eared owl flights were recorded (Table 4); one in May and five in August.
- 8.5.39 The mapped flight lines of target species are available upon request.
- 8.5.40 A total of 25 non-target species were observed: cormorant, grey heron, mute swan, pink-footed goose, greylag goose, wigeon, gadwall, teal, mallard, tufted duck, sparrowhawk, buzzard, kestrel, lapwing, dunlin, snipe, whimbrel, curlew, redshank, green sandpiper, black-headed gull, common gull, lesser black-backed gull, herring gull and great black-backed gull (Table 5).

**Table 5. Summary of flight activity by non-target species. Table shows the percentage number of hours each species was recorded and the mean number of bird-flights per hour.**

| Species           |              | VP1  | VP2  | VP3  | VP4  | VP2  | VP6  | VP7  | Overall |
|-------------------|--------------|------|------|------|------|------|------|------|---------|
| Cormorant         | % hours      | 8    | 7    | 3    | 3    | 3    | 10   | 12   | 6       |
|                   | Mean flights | 0.2  | <0.1 | <0.1 | <0.1 | <0.1 | 0.1  | 0.2  | <0.1    |
| Grey heron        | % hours      | 3    | 2    | 1    | 4    | 2    | 7    | 8    | 4       |
|                   | Mean flights | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1    |
| Mute swan         | % hours      | <1   | 0    | <1   | 0    | 0    | 0    | 0    | <1      |
|                   | Mean flights | <0.1 | 0    | <0.1 | 0    | 0    | 0    | 0    | <0.1    |
| Pink-footed goose | % hours      | 1    | 1    | 5    | 0    | <1   | 0    | 0    | 1       |
|                   | Mean flights | 0.5  | 7.2  | 7.4  | 0    | <0.1 | 0    | 0    | 2.2     |
| Greylag goose     | % hours      | <1   | <1   | <1   | 0    | 0    | <1   | 0    | <1      |
|                   | Mean flights | <0.1 | 0.1  | <0.1 | 0    | 0    | <0.1 | 0    | <0.1    |
| Wigeon            | % hours      | <1   | 0    | 0    | 0    | 0    | 0    | 0    | <1      |
|                   | Mean flights | <0.1 | 0    | 0    | 0    | 0    | 0    | 0    | <0.1    |
| Gadwall           | % hours      | 1    | 3    | 3    | 1    | 0    | 3    | 7    | 3       |
|                   | Mean flights | <0.1 | <0.1 | <0.1 | <0.1 | 0    | <0.1 | 0.2  | <0.1    |
| Teal              | % hours      | 0    | 1    | 0    | 0    | 0    | 1    | 7    | 1       |
|                   | Mean flights | 0    | <0.1 | 0    | 0    | 0    | 0.1  | 0.3  | <0.1    |
| Mallard           | % hours      | 34   | 30   | 17   | 20   | 14   | 47   | 46   | 30      |
|                   | Mean flights | 1.5  | 2.5  | 1.1  | 1.0  | 0.6  | 4.7  | 3.0  | 2.1     |

|                          |              |      |      |      |      |      |      |      |      |
|--------------------------|--------------|------|------|------|------|------|------|------|------|
| Tufted duck              | % hours      | 0    | 0    | 0    | 0    | 0    | 0    | <1   | <1   |
|                          | Mean flights | 0    | 0    | 0    | 0    | 0    | 0    | <0.1 | <0.1 |
| Sparrowhawk              | % hours      | 1    | 5    | 4    | 2    | 4    | 3    | <1   | 3    |
|                          | Mean flights | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Buzzard                  | % hours      | 7    | 7    | 6    | 4    | 8    | 6    | 4    | 6    |
|                          | Mean flights | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Kestrel                  | % hours      | 14   | 25   | 13   | 9    | 20   | 13   | 6    | 14   |
|                          | Mean flights | 0.2  | 0.4  | 0.3  | 0.1  | 0.2  | 0.2  | <0.1 | 0.2  |
| Lapwing                  | % hours      | 29   | 26   | 25   | 22   | 15   | 19   | 11   | 21   |
|                          | Mean flights | 30.2 | 7.4  | 16.2 | 2.9  | 5.5  | 7.7  | 1.3  | 10.2 |
| Dunlin                   | % hours      | <1   | 0    | 0    | 0    | 0    | 0    | 0    | <1   |
|                          | Mean flights | <0.1 | 0    | 0    | 0    | 0    | 0    | 0    | <0.1 |
| Snipe                    | % hours      | 3    | 1    | 0    | 0    | <1   | <1   | <1   | <1   |
|                          | Mean flights | <0.1 | <0.1 | 0    | 0    | <0.1 | <0.1 | <0.1 | <0.1 |
| Whimbrel                 | % hours      | 0    | 0    | 0    | 0    | 0    | <1   | 0    | <1   |
|                          | Mean flights | 0    | 0    | 0    | 0    | 0    | <0.1 | 0    | <0.1 |
| Curlew                   | % hours      | 0    | 0    | <1   | 0    | 1    | <1   | 1    | <1   |
|                          | Mean flights | 0    | 0    | <0.1 | 0    | <0.1 | <0.1 | <0.1 | <0.1 |
| Redshank                 | % hours      | 0    | 0    | <1   | 0    | 0    | 0    | 0    | <1   |
|                          | Mean flights | 0    | 0    | <0.1 | 0    | 0    | 0    | 0    | <0.1 |
| Green sandpiper          | % hours      | <1   | 0    | 0    | 0    | 0    | 0    | <1   | <1   |
|                          | Mean flights | <0.1 | 0    | 0    | 0    | 0    | 0    | <0.1 | <0.1 |
| Black-headed gull        | % hours      | 40   | 31   | 43   | 31   | 45   | 34   | 33   | 37   |
|                          | Mean flights | 14.3 | 17.4 | 22.7 | 5.5  | 46.2 | 12.0 | 9.6  | 18.2 |
| Common gull              | % hours      | 28   | 22   | 35   | 25   | 38   | 26   | 20   | 28   |
|                          | Mean flights | 1.4  | 1.3  | 2.8  | 1.3  | 4.0  | 2.1  | 2.2  | 2.1  |
| Lesser black-backed gull | % hours      | 13   | 7    | 15   | 8    | 18   | 15   | 10   | 12   |
|                          | Mean flights | 0.3  | 0.1  | 0.3  | 0.3  | 0.3  | 0.3  | 0.2  | 0.3  |
| Herring gull             | % hours      | <1   | 3    | 8    | 1    | 7    | 3    | 7    | 4    |
|                          | Mean flights | <0.1 | 0.1  | 0.3  | <0.1 | 0.4  | <0.1 | 0.3  | 0.2  |
| Great black-backed gull  | % hours      | 6    | 4    | 12   | 8    | 4    | 7    | 7    | 7    |
|                          | Mean flights | <0.1 | <0.1 | 0.2  | 0.2  | 0.1  | <0.1 | 0.1  | 0.1  |

- 8.5.41 Low levels of flight activity were recorded for mallard, kestrel, lapwing, black-headed gull, common gull and lesser black-backed gull. All other species were recorded occasionally.