



ARCUS

BREEDING BIRD REPORT 2019

**HAVERIGG III WIND FARM LIFE EXTENSION
NORTH LANE, HAVERIGG, CUMBRIA**

WINDCLUSTER LTD.

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ABBREVIATIONS

| | |
|-------|---|
| BAP: | Biodiversity Action Plan |
| BBS: | Breeding Bird Survey |
| BNGR: | British National Grid Reference |
| BoCC: | Birds of Conservation Concern |
| BOU: | British Ornithologists' Union |
| BTO: | British Trust for Ornithology |
| CBC: | Common Birds Census |
| DAS: | Discretionary Advice Service |
| GPS: | Global Positioning System |
| HMP: | Her Majesty's Prison |
| Km: | Kilometres |
| LNR: | Local Nature Reserve |
| NE: | Natural England |
| NERC: | Natural Environment and Rural Communities |
| NNR: | National Nature Reserve |
| RSH: | Rotor Swept Height |
| S41: | Section 41 |
| SNH: | Scottish Natural Heritage |
| SPI: | Species of Principal Importance |
| SSSI: | Site of Special Scientific Interest |
| SPA: | Special Protection Area |
| VP: | Vantage Point |

EXECUTIVE SUMMARY

Arcus Consultancy Services Ltd (Arcus) was commissioned by Windcluster Ltd to carry out ornithology surveys at Haverigg III Wind Farm (the Development) in Cumbria, between September 2018 and August 2019. The scope of surveys was agreed with Natural England.

This report details the results of the breeding bird surveys completed between March 2019 and August 2019 (inclusive). The breeding bird surveys included:

- Carcass searches;
- Searcher efficiency trials;
- Carcass persistence trials;
- Breeding bird survey (BBS); and
- Flight activity survey.

Based on the results of the carcass persistence and searcher efficiency trials undertaken in parallel with the carcass searches to date, it is considered likely that the vast majority (at least 85%) of bird carcasses in situ (i.e. not removed by scavengers) at the time monitoring was carried out were detected. Although the results of the breeding season carcass persistence trials indicated that levels of scavenger removal at the Development are relatively high (1-4 days), some evidence of a carcass (feathers) typically remained visible for several weeks, suggesting that the majority of bird collisions were likely to have been detected by surveyors.

The BBS results indicate that a number of species of conservation concern bred within the Site Boundary at low densities. A greater number of species and higher densities of breeding territories are present within the 500 m buffer where there is increased habitat diversity. The most notable registrations of breeding birds were the herring gull and lesser black-backed gull colonies within HMP Haverigg.

The results of the flight activity surveys show that there are large numbers of certain target species flights over the Site Boundary during the breeding season. Species recorded most frequently were herring and lesser black-backed gulls, followed by oystercatcher, all three of which are qualifying features of the Morecambe Bay & Duddon Estuary SPA. Although the majority of target species flights (including both aforementioned gull species) occurred at rotor swept height, turbines seem to have little impact on bird flight behaviour, with the vast majority following a "Bullet" flight path. This may indicate that many birds breeding in the vicinity of the Development may have become habituated to the presence of the turbines and routinely avoid them, without exhibiting any sudden avoidance behaviour detectable by surveyors.

Based on the very high number of flights at rotor swept height, and low number of carcasses found during searches, collision rates appear to be relatively low. Most of the carcasses recorded were gull species, which is unsurprising given the proportion of flights at rotor swept height by herring and lesser black-backed gulls, both of which appear to follow regular flight paths across the Site between breeding and foraging, including one flight path close to turbine 1.

Taking into account the results of the searcher efficiency and carcass persistence trials, as well as the persistence of carcasses recorded during both the carcass searches and incidentally, it is considered likely that the number of carcasses recorded is likely to be broadly representative of actual collision rates, although it is acknowledged that there will be some level of underestimation due to carcass removal by scavenger species.

The results of these surveys, with other available data have been utilised in the Report to Inform a Habitats Regulations Assessment, which will accompany the planning application for the Development and assesses the impact of the life extension of the Development on the Morecambe Bay & Duddon Estuary Special Protection Area (SPA).

1 INTRODUCTION

1.1 Background

Arcus Consultancy Services Ltd (Arcus) was commissioned by Windcluster Ltd to carry out ornithology surveys at Haverigg III Wind Farm (the Development) in Cumbria, during 2018-19. The results of the ornithology surveys will be used to inform an application for the life extension of the Development. Surveys commenced in September 2018 and were completed in September 2019. Details of the non-breeding season surveys completed between September 2018 and February 2019 (inclusive) are presented in a separate report¹ (hereafter referred to as 'the Winter Ornithology Report') and are not repeated here, except where relevant to put the breeding season results into context. This report should be read in conjunction with the Winter Ornithology Report.

Note that the bird collision monitoring at the Development took place concurrently with monitoring at the adjacent Haverigg II Wind Farm. Although this report will focus on monitoring at the Development, due to its close proximity to Haverigg II, relevant results of bird collision monitoring at the latter development are also included for reference.

Bird species names used in this report follow the British List², which is maintained by the British Ornithologists' Union (BOU), with all species referred to by their British (English) vernacular name. A list of scientific names, as well as details of relevant legislation and conservation status, of all bird species referred to in this report is provided in Table A1.1, Appendix 1.

1.2 Site Description

The Development is located approximately 2 km west of Haverigg, Cumbria and comprises four operational onshore wind turbines. It is sited east of Her Majesty's Prison (HMP) Haverigg, immediately to the west of the four-turbine Haverigg II Wind farm. Both wind farm developments are located within a single landownership area (the Site). The Site Boundary is shown in Figure 1, Appendix 2.

The southern part of the Site is largely comprised of intensively grazed grassland, while the northern part of the Site is a motocross track.

1.3 Nearby Statutory Sites Designated for Ornithological Features

The Site is located adjacent to the Morecambe Bay & Duddon Estuary Special Protection Area (SPA), which is designated for a range of waterfowl and seabird species, and the Duddon Estuary Ramsar site, which is partly designated for wintering waterfowl, as well as for natterjack toad (*Epidalea calamita*). In addition, Morecambe Bay Ramsar site, which is designated for a range of waterfowl and seabird species, is located approximately 11.4 km to the southwest of the Site.

A number of other statutory sites of national and local importance that support ornithological features were identified within 10 km of the Site.

Details of these statutory sites are presented in the Winter Ornithology Report¹ and are not repeated here.

¹ Arcus. (2019a). *Haverigg III Wind Farm Life Extension Winter Ornithology Report 2018-19*.

² British Ornithologists' Union. (2017). *The British List: A Checklist of Birds of Britain* (9th edition). *Ibis* 160: 190-240.

1.4 Summary of Ornithological Consultation

1.4.1 Initial Consultation

A Discretionary Advice Service (DAS) request was made to Natural England (NE) in July 2018 relating to the scope of supporting information to be used in the assessment of ornithological and ecological impacts of a proposed life extension to the Development. A DAS consultation meeting with NE took place on 09/08/2018. Discussions during the meeting focussed on obtaining sufficient information to enable the competent authority to undertake an Appropriate Assessment of the proposals in the context of the Habitat Regulations. Following the meeting, Arcus issued a letter to NE (dated 10/09/2018) listing the available information and confirming the proposed survey scope. The response from NE (via email dated 18/09/2018) included the requirement for a breeding bird survey (BBS) to be undertaken in 2019 to update existing data, as well as flight activity surveys (between 01/05/2019 and 15/07/2019) to assess potential impacts on breeding gulls from the nearby SPA.

Further details of this initial consultation are presented in the Winter Ornithology Report.

1.4.2 Further Consultation

Further consultation with NE took place in March 2019 to confirm the scope of breeding season ornithology surveys (as well as bat surveys, as detailed in the Ecological Appraisal³). The proposed methods for the breeding season ornithology surveys were detailed in a letter dated 26/03/2019 and issued to NE on the same date.

Within this letter, Arcus suggested that, since the level of gull flight activity was likely to be high, it would, therefore, potentially be difficult to record gulls as target species during the flight activity surveys, with each flight mapped and detailed information recorded for each flight in accordance with standard survey guidance^{4,5}. Arcus therefore queried whether it was essential for gulls to be recorded as target species, or whether flight activity could be summarised (e.g., mapping of regular flight paths/areas of activity rather than mapping of individual flight lines, and a summary of overall numbers and flight height range).

In their response (via email dated 29/03/2019), NE stated that, overall, the proposed breeding season survey scope was suitable, but advised that gulls would need to be recorded as target species during the flight activity surveys since they are likely to be the main species impacted by the turbines.

Arcus replied to NE (via email dated 05/04/2019) to confirm that the breeding season ornithology surveys would proceed as per the letter issued to NE (dated and issued on 26/03/2019), with gull species included as target species during the surveys as requested.

The Arcus letter and email response from NE are provided in Appendix 3.

2 METHODS

The breeding season ornithology survey programme comprised the following:

- Collision monitoring:
 - Carcass searches;
 - Searcher efficiency trials;

³ Arcus. (2019b). *Ecological Appraisal: Haverigg III Wind Farm Life Extension, Cumbria*.

⁴ Drewitt, A. (2010) *Assessing the effects of onshore wind farms on birds*. Natural England Guidance TIN 069.

⁵ Scottish Natural Heritage (2017) *Recommended bird survey methods to inform impact assessment of onshore wind farms*.

- Carcass persistence trials;
- BBS; and
- Flight activity surveys.

The methods followed for each of these surveys are detailed below and ornithology survey areas are shown in Figure 1, Appendix 2.

2.1 Collision Monitoring

The breeding season collision monitoring was completed each month between March and August 2019 (inclusive) and followed on directly from the non-breeding season surveys (i.e. with no gaps between seasons) detailed in the Winter Ornithology Report¹.

The aim of the collision monitoring was to determine the level of bird collision mortality due to the Development, particularly for species that are designated features of the nearby statutory sites.

The collision monitoring involved monthly searches for bird carcasses, together with trials to validate the search results; the methods were the same as those followed during the non-breeding season (detailed in the Winter Ornithology Report¹).

Deployment of items for the searcher efficiency trials was undertaken by Jim Harding; all other collision monitoring was completed by Matt Harding, who is a highly experienced ecologist and a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM).

2.1.1 Carcass Searches

Searches of all four turbines were undertaken once per month to record bird mortality due to turbine collisions. Breeding season carcass search dates were as follows⁶:

- March: 21/03/2019;
- April: 23 & 24/04/2019;
- May: 16 & 17/05/2019;
- June: 21/06/2019;
- July: 16 & 17/07/2019; and,
- August: 22 & 23/08/2019.

Further details of each survey visit (including survey times, weather conditions and notable bird sightings) are provided in Table A4.1, Appendix 4.

During each carcass search, the ground within a 110 m grid centred on the base of each turbine was intensively visually searched to identify any evidence of bird collisions (i.e. bird carcasses or injured birds). Each of the turbine search areas, which are shown in Figure 2, Appendix 2, was divided into eleven transects, running north-south and parallel to each other, 10 m apart. Each was slowly walked by the surveyor, scanning the ground ahead and to 5 m either side of the transect line for bird carcasses and other remains (e.g. feathers).

For all carcasses identified within the search area the following information was recorded:

- Species (and age/sex where this could be determined);
- Turbine number;
- Grid reference (to ten figures);
- Date and time of detection;
- Distance from the turbine base in metres, measured by Global Positioning System (GPS) or tape measure;

⁶ The March and June survey visits were completed within a single day, but all other visits were split over two consecutive days. However, the survey effort was the same for all visits, with each turbine searched once per survey visit.

- Notes on condition, including evidence of scavenging post-mortem, any apparent injuries, apparent/likely cause of death, apparent freshness and persistence.

2.1.2 Searcher Efficiency Trials

Monthly searcher efficiency trials were undertaken, during the course of each carcass search visit, to determine the efficiency of surveyors at detecting bird carcasses. The breeding season searcher efficiency trials commenced in March 2019, with the final trial completed in August 2019.

For practical reasons, and due to landowner permission issues related to the deployment of carcasses (see Section 2.4), food items (biscuits and bread rolls) were deployed in place of bird carcasses.

This involved deployment of a variable number of items (between four and seven) at random locations within the turbine search area of two turbines per carcass search visit, and a second surveyor searching for them. The two turbines searched changed from visit to visit so that each turbine was searched a total of three times across the breeding season.

2.1.3 Carcass Persistence Trials

Monthly carcass persistence trials were carried out to determine how long bird carcasses remained in situ until removed by scavengers. The aim of these trials was to determine how long bird carcasses are likely to be detectable following collision with turbines.

Each carcass persistence trial involved the deployment of a single, feathered and intact woodpigeon or red-legged partridge carcass within the carcass search area of turbine 4 (at British National Grid Reference (BNGR) SD 13759 79756) which was left undisturbed by surveyors. The carcass was monitored using a Bushnell Trophy camera trap affixed to fence posts. The trap was triggered by movement, with photographs taken every five seconds during periods of continuous triggering. The camera trap location is shown in Figure 1, Appendix 2.

The breeding season carcass persistence trials commenced in March 2019 and were subsequently completed once per month, during the course of the monthly carcass searches. The camera trap was checked during each carcass search visit and memory cards/batteries replaced as required. All camera traps were retrieved in September 2019.

2.2 Breeding Bird Survey

A BBS was completed between April and July 2019 (inclusive) to identify breeding bird territories within 500 m of the Development (access permitting). The BBS followed a reduced version of the Common Birds Census (CBC)⁷ developed by the British Trust for Ornithology (BTO). This was considered to be the most appropriate method for the farmland habitats present on Site. The BBS Area is shown in Figure 1, Appendix 2.

During each BBS visit, with the exception of common and widespread species of low conservation concern (e.g. woodpigeon, corvids and wren), all birds seen and heard were recorded on large-scale maps using standard BTO species codes and symbology to denote behaviour⁸, particularly where this related to breeding (e.g. singing, alarm calling, gathering nest material or food, feeding newly fledged young, etc.).

Four visits were carried out; survey dates were as follows:

- Visit 1: 23/04/2019;
- Visit 2: 14/05/2019;
- Visit 3: 13/06/2019; and

⁷ Marchant, J. (1983) *Common Birds Census Instructions*. British Trust for Ornithology, Thetford.

⁸ Summarised in Gilbert, G., Gibbons, D.W. & Evans, J. (1998) *Bird Monitoring Methods*. RSPB.

- Visit 4: 11/07/2019.

All survey visits commenced within the first hour after sunrise and lasted for up to seven hours. Weather conditions were logged at hourly intervals. All BBS were completed by Matt Harding and Chris Gomersall, both of whom have extensive experience of completing ornithology surveys, including breeding bird surveys.

Full details of timings and hourly weather conditions during each BBS visit are provided in Table A4.2, Appendix 4.

2.2.1.1 Territory Mapping Analysis

Upon completion of all four BBS visits, all registrations of species of conservation concern from the field maps were transcribed to produce 'species summary maps'. Species of conservation concern were defined as birds included on one or more of the following:

- Annex I of the Birds Directive⁹;
- Schedule 1 of the Wildlife and Countryside Act 1981 (as amended)¹⁰;
- Species of Principal Importance (SPI) under Section 41 (S41) of the Natural Environment and Rural Communities (NERC) Act 2006¹¹;
- UK Birds of Conservation Concern (BoCC) Red or Amber list¹²; and
- Cumbria Biodiversity Action Plan (BAP) species for priority action¹³.

From these species summary maps, the number and distribution of likely breeding territories for each species was determined through a combination of interpretation of behavioural observations and identification of clusters of registrations likely to relate to breeding territories. The method was based on Bibby (2000)¹⁴, with an element of professional judgement.

A precautionary approach was taken and a bird was deemed to be holding a breeding territory if it was recorded singing or exhibiting other behaviour indicative of breeding during just one of the four BBS visits, or if a pair of birds was observed in or near suitable nesting habitat on more than one occasion.

2.3 Flight Activity Surveys

Flight activity surveys were undertaken between May 2019 and mid-July 2019 (inclusive) using a series of vantage point (VP) watches to record flight activity of target bird species during the non-breeding season. Flight activity surveys followed standard methods published by NE⁴ and Scottish Natural Heritage (SNH)⁵. All flight activity surveys were completed by Chris Gomersall.

The primary aim of the flight activity surveys was to record flight activity over the Site by those gull species which are qualifying features of the Morecambe Bay & Duddon Estuary SPA¹⁵, namely herring gull and lesser black-backed gull, to determine how birds interact with, and are impacted by, the turbines.

⁹ <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:020:0007:0025:EN:PDF>

¹⁰ <http://www.legislation.gov.uk/ukpga/1981/69>

¹¹ <http://www.legislation.gov.uk/ukpga/2006/16/contents>

¹² Eaton, M.A., Aebischer, N.J., Brown, A., Hearn, R.D., Lock, L., Musgrove, A.J., Noble, D.G., Stroud, D.A., and Gregory, R.D. (2015). Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man. *British Birds* 108, 708-746.

¹³ Available from <https://www.cumbria.gov.uk/eLibrary/Content/Internet/538/755/1929/42151103717.pdf> [Accessed 02/10/19]

¹⁴ Bibby, C.J., Burgess, N.D., Hill, D.A. and Mustoe, S.H. (2000). *Bird Census Techniques*, 2nd edition. Academic Press, London.

¹⁵ Morecambe Bay & Duddon Estuary SPA: *Site Citation*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/641980/morecambe-duddon-citation.pdf

However, other 'target' bird species were also recorded during the flight activity surveys, including the following:

- All wildfowl species (geese, swans and ducks);
- All grebes, herons and egrets;
- All raptor species (including owls) listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended)¹⁰ or Annex I of the Birds Directive⁹;
- All wader species;
- All other gull species; and
- Any other qualifying features of the nearby SPA and Ramsar sites.

All watches were completed from a single VP located at BNGR SD 14262 79540, which is shown in Figure 1, Appendix 2.

A total of 36 hours of observation were completed during the core gull breeding season, i.e. May to mid-July. Survey dates are shown in Table 1.

Table 1: Flight activity survey dates

| Month | Survey visit | Date |
|-------|--------------|------------|
| May | 1 | 13/05/2019 |
| | 2 | 15/05/2019 |
| June | 3 | 12/06/2019 |
| | 4 | 14/06/2019 |
| July | 5 | 10/07/2019 |
| | 6 | 12/07/2019 |

A total of six hours of watches were completed during each survey visit. Survey times were stratified to cover a range of times during the survey period, including dawn, dusk and the middle of the day, to record observations of birds moving between feeding and breeding areas at different times. To avoid observer fatigue, individual survey sessions did not exceed a 2-hour period and surveys on the same date were separated by a 20-minute interval.

During all flight activity surveys, the flight line of each target species flight observed was drawn onto a large-scale map in the field. Each recorded flight line was numbered and cross-referenced to the following flight data:

- Time (when first seen);
- Species, age and sex (where identification of age/sex was possible);
- Number of birds;
- Duration of flight within the flight activity survey area; and
- Flight height in one of three height bands corresponding approximately to below, at, or above, Rotor Swept Height (RSH), on detection and at 15 second intervals thereafter.

In addition, the behaviour of each flight in relation to the turbines was classified into one of the categories shown in Table 2, which are based on Meredith *et al.* (2002)¹⁶, to describe bird behaviour relative to the turbines.

¹⁶ Meredith, C., Venosta, M. and Ransom, R. (2002) *Cordington Wind Farm Avian Avoidance Behaviour Report, 2002*. Biosis Research Report.

Table 2: Flight behaviour categories

| Flight behaviour category | Definition |
|---------------------------|---|
| Weave | Weaving flight line up to maximum height of turbine. |
| Direct | A direct flight line, within the turbine envelope but clearly in a line up to a maximum turbine blade height, avoiding turbines. |
| Horiz | A bird flying towards a wind farm site, which takes avoiding action by a horizontal movement (i.e. no change in height) so as to take it around the perimeter of the wind farm. |
| Vert | As for 'Horiz' but this time, the bird gains altitude to take it over the top of the wind farm site. |
| Bullet | Flight behaviour within or outside a wind farm site, which appears to take no avoiding action with regard to turbines (or other infrastructure). |
| Hit | A recorded collision event. |
| Avoid | Avoidance behaviour near a turbine, generally taken at short notice, and is likely to appear as a sudden change in direction or height (or both). |
| Other | Any behaviour not easily classifiable into any of the above categories. |

In addition to recording target species flights, the number and activity of 'secondary' species observed during all flight activity surveys was summarised during each 5-minute period. Secondary species included the following: sparrowhawk, kestrel, buzzard, raven and cormorant, and flocks of 20+birds included on the UK BoCC Red list¹². Recording of target species took priority over that of secondary species.

The timing and type of any observed disturbance was recorded throughout the watch, and weather conditions were recorded on an hourly basis.

Full details of flight activity survey timings and hourly weather conditions are provided in Table A4.3, Appendix 4.

2.4 Survey Limitations

2.4.1 Collision Monitoring

2.4.1.1 Carcass Searches

As landowner permission was limited to the area within the Site Boundary, some parts of the search area around all turbines were inaccessible. During the July visit, access around the turbine 2 base was also restricted due to the presence of work at height vehicles. As far as possible, these areas were checked from within the adjacent Site Boundary using binoculars.

During the March survey visit, the turbine 4 search area was largely flooded. Although the full search area was still accessible, the detectability of smaller carcasses (e.g. passerines¹⁷) may have been reduced.

In addition, during the June survey, vegetation height in the search areas of all four turbines was very high, which impeded the surveyors to some extent and may also have reduced detectability of any carcasses present, particularly for smaller species such as passerines. This constraint also applied during the July survey at turbine 4.

¹⁷ Passerine' is a common term used by ornithologists, which applies to any bird in the order Passeriformes. Passerines are distinguished from other avian orders by the arrangement of their toes, which facilitates perching and are sometimes known as perching birds or, less accurately, songbirds.

All other breeding season carcass searches were completed in full with no constraints.

2.4.1.2 Searcher Efficiency Trials

The access restrictions noted above limited the areas within which search items could be deployed during the searcher efficiency trials. In addition, as noted above, food items (biscuits and bread rolls) were deployed in place of bird carcasses. However, the type of item was varied between survey visits to minimise the potential for bias in levels of detectability.

2.4.1.3 Carcass Persistence Trials

Due to landowner concerns relating to livestock welfare, permission to deploy bird carcasses for the carcass persistence trials was restricted to an area in the west of the Site, which is fenced off from livestock. Consequently, the carcass persistence trials were limited to the search area around turbine 1.

Due to the limited area suitable for carcass deployment, the location of the camera trap could not be varied between survey visits to reduce the potential for resident scavengers becoming habituated to carcass provisioning.

Following the March survey visit, the camera trap deployed for the bird collision monitoring at the Development was stolen and therefore no March data could be recovered. In addition (since this situation had not been anticipated), a replacement camera trap was not available for deployment during the subsequent visit in April. A replacement camera trap was deployed during the May survey visit, but this was also subsequently stolen. Consequently, no carcass persistence trial data was obtained during the first three survey visits.

Note, however, that the persistence of incidental observations of bird carcasses across the Site was monitored each month to give an indication of scavenger removal rates. In addition, results from carcass persistence trials at the adjacent Haverigg II development were available to inform the rates of carcass persistence on Site.

2.4.2 Breeding Bird Survey

Access to parts of the BBS Area falling outside of the Site Boundary was restricted to public roads, footpaths and rights of way. As there are several such public roads and tracks etc., it was possible to adequately survey much of the inaccessible areas by scanning for birds from adjacent points (where access was permitted) using binoculars.

Due to access restrictions, the BBS did not cover HMP Haverigg, and it was not possible to scan for bird species in much of this area due to the presence of boundary fences, which obstructed views of the prison grounds from outside. However, notable breeding bird populations within the prison grounds (gull species and oystercatcher) were detected during the BBS; although numbers and status of the oystercatchers could not be determined accurately, it was possible to count gulls nesting on building roofs. As such, access restrictions are not considered to represent a material limitation to the robustness of the BBS dataset.

Although BBS were carried out in suitable weather conditions as far as possible, it was not always possible to completely avoid periods of poor weather, especially when conditions varied from those forecast. Consequently, sub-optimal conditions were experienced during BBS visit 3, with persistent (and at times heavy) rain. In addition, there was some light rain during visit 4 and occasional periods of reduced visibility at the start of visits 2-4. It is considered unlikely that the reduced visibility affected detectability of birds, since this was never less than 1 km and all parts of the Site were approached to within 100 m. Moreover, many breeding birds are detected and identified by songs and calls rather than visual sightings. In addition, it is considered unlikely that the light rain during BBS visit 4 will have resulted in significantly reduced bird activity or detectability, although it is acknowledged

that conditions during visit 3 may have resulted in reduced levels of breeding bird activity and/or detectability during this visit. However, as four visits were carried out, this is not considered to represent a material limitation to the robustness of the BBS dataset.

2.4.3 Flight Activity Surveys

During the flight activity surveys, noise from sirens from HMP Haverigg was noted. However, no birds within the Survey Area appeared to exhibit any behavioural response to this potential disturbance. It is possible that some local bird populations may be habituated to siren noise from the prison. However, it was noted during BBS visit 2 that gulls sometimes appeared to be flushed by the noise. Nonetheless, sampling bird activity during periods when the sirens were both silent and activated is likely to mean that levels of flight activity during the flight activity surveys were representative of local conditions. As such, this is not considered to represent a material limitation to the robustness of the dataset.

Weather conditions during some flight activity surveys were sub-optimal, with heavy rain during both June surveys and the second July visit, and occasional periods of reduced visibility, particularly around the hours of dawn and dusk. However, large numbers of flights were recorded during all flight activity surveys, and sampling bird activity during a range of weather conditions is likely to mean that recorded levels of flight activity were representative of local conditions. As a result, weather is not considered to represent a material limitation to the robustness of the flight activity survey dataset.

3 RESULTS

3.1 Collision Monitoring

3.1.1 Carcass Searches

3.1.1.1 Bird Carcasses/Remains Found During Carcass Searches

Carcasses or other remains from five birds were found during the breeding season carcass searches. These comprised three passerines (one blackbird and two unidentified species), a single lesser black-backed gull and a woodpigeon.

Two of the carcasses/remains were found within the turbine 4 search area, two within the turbine 1 search area, and one within the turbine 2 search area. None of the carcasses found remained until the following survey visit, however from assessing the carcass freshness, it can be estimated that carcasses persisted from several days to several weeks.

Full details of all carcasses found during the breeding season carcass searches are presented in Table 3.

Note that only one carcass (lesser black-backed gull) was considered to be to the result of a turbine collision; it was considered likely that the remainder were attributable to raptor (e.g. peregrine) kills¹⁸.

¹⁸ When assessing whether the cause of death was likely predation by a raptor (rather than a turbine collision, with the carcass subsequently scavenged by a raptor), this was partly determined by signs of plucking and partly by proximity of the carcass to a likely plucking post; although professional judgement was used, it is acknowledged that this is subjective. As such, apparent/likely cause of death in Table 3 is speculative based on the evidence observed.

Table 3: Summary of bird remains identified during the 2018-19 breeding carcass searches

| Carcass reference number | Date first recorded | Turbine no. | Distance (m) from turbine | Species (and age/sex if determined) | Carcass condition (including any evidence of scavenging) | Apparent/ likely cause of death ¹⁸ | Apparent freshness | Persistence | Other notes |
|--------------------------|---------------------|-------------|---------------------------|-------------------------------------|--|---|--------------------|--------------------------|-----------------|
| 20190517T418 | 17/05/2019 | 4 | 39 | Passerine species | Left wing and occasional feathers | Raptor kill (plucked on knoll) | Several weeks old | No further registrations | |
| 20190620T419 | 20/06/2019 | 4 | 47 | Passerine species | Breast and wing feathers only | Raptor kill (plucked) | Several days old | No further registrations | |
| 20190716T120 | 16/07/2019 | 1 | 24 | Woodpigeon | Feathers only | Raptor kill | Days or weeks old | No further registrations | |
| 20190716T121 | 16/07/2019 | 1 | 9 | Lesser black-backed gull | Half bird (right wing, lower torso, legs and tail); entrails eaten | Collision | Several weeks old | No further registrations | Severed in half |
| 20190717T222 | 17/07/2019 | 2 | 45 | Blackbird | Feathers only | Raptor kill | Several days old | No further registrations | |

3.1.1.2 Other Records of Bird Carcasses/Remains

In addition to the carcasses/remains found during the formal breeding season carcass searches, there were two incidental records of bird remains observed outside the turbine area. Up to seven¹⁹ additional carcasses/remains were found during concurrent surveys at the adjacent Haverigg II Wind Farm. A summary of these records is presented in Table 4.

¹⁹ As noted in Table 4, it is possible that one of the herring gulls was recorded on two different occasions (as the unidentified gull species on the second occasion)

Table 4: Summary of incidental records of bird remains identified during the breeding season surveys

| Carcass reference number | Date first recorded | Grid reference. | Species (and age/sex if determined) | Carcass condition (including any evidence of scavenging) | Apparent/likely cause of death | Apparent freshness | Persistence | Other notes |
|--------------------------|---------------------|------------------------------------|--|--|-------------------------------------|--------------------|--------------------------|---|
| 20190322T413 | 22/03/2019 | SD 13825 79733 | Herring gull – first or second year bird | Dismembered; two wings, two legs, feathers and backbone present | Potential collision or bird of prey | Several weeks old | 3 visits – 8 weeks | Recorded during carcass searches at adjacent Haverigg II; Feathers appeared to have been plucked and were found at fence line |
| 20190322T314 | 22/03/2019 | SD 13654 79464 / SD 13649 79472 | Herring gull adult | Feathers at one location, left wing primaries at second. Primaries bitten off by scavenger | Unknown | Several weeks old | 4 visits – 13 weeks | Recorded during carcass searches at adjacent Haverigg II; Scattered feathers were present elsewhere in the survey area; note that the remains were not detected during the April carcass search but were seen during the May and June carcass searches |
| 20190424T415 | 24/04/2019 | SD 13775 79728 | Herring gull – third year bird | Only right wing present, sheared off | Collision | Days old | 4 visits – 12 weeks | Recorded during carcass searches at adjacent Haverigg II; No rigor mortis, very recent. Found next to following record |
| 20190424T416 | 24/04/2019 | SD 13781 79726 | Herring gull – adult | Left wing missing, with some damage to the left of the neck | Collision | Days old. | 3 visits – 9 weeks | Recorded during carcass searches at adjacent Haverigg II; No rigor mortis, very recent. Found next to previous record in a ditch |
| 20190516NA17 | 16/05/2019 | SD 14216 79486 | Lesser black-backed gull | Intact – no injuries visible | Unknown | A few days old | No further registrations | Incidental record from outside turbine area to east |

| Carcass reference number | Date first recorded | Grid reference. | Species (and age/sex if determined) | Carcass condition (including any evidence of scavenging) | Apparent/likely cause of death | Apparent freshness | Persistence | Other notes |
|--------------------------|---------------------|--|-------------------------------------|---|-------------------------------------|---------------------|--|--|
| 20190717T123 | 17/07/2019 | SD 13731 79240 / SD 13782 79270 | Great black-backed gull - adult | Left wing severed at first location, breast feathers at second. Rest of bird presumably scavenged | Collision (likely) | Several weeks old | 1 visit – 5 weeks | Recorded during carcass searches at adjacent Haverigg II |
| 20190822NA24 | 22/08/2019 | SD 14235 79475 | Possible lesser black-backed gull | Intact – no injuries visible | Unknown, possibly vehicle collision | Less than a day old | Undetermined (no further carcass searches completed) | Incidental record from outside turbine area to east |
| 20190823T425 | 23/08/2019 | SD 13783 79690 / SD 13778 79682 | Chicken | Right wing – chewed breast bone and wing feathers at first location. Legs and backbone at second location | Mammalian predator likely | Several weeks old | Undetermined (no further carcass searches completed) | Recorded during carcass searches at adjacent Haverigg II; Likely taken by a mammalian predator from livestock pen at east end of Site |
| 20190823T126 | 23/08/2019 | SD 13765 79205 | Gull sp. | Just breast feathers bitten off | Unknown | Several weeks old | Undetermined (no further carcass searches completed) | Recorded during carcass searches at adjacent Haverigg II; Possibly same bird as 20190717T123 |

3.1.2 Searcher Efficiency Trials

The total detection rate during the breeding season searcher efficiency trials at the Development ranged from 81.8-100% per visit, with an overall detection rate of 96.9% across the survey period. All items deployed at turbines 2-4 were found during all three searches of these turbines, while the total detection rate for turbine 1 was 85.7%. A summary of the results during each search is provided in Table 5, while the detection rates per turbine and per item type are presented in Tables 6 and 7 respectively.

Detection rates during concurrent breeding season searcher efficiency trials at the adjacent Haverigg II Wind Farm were very similar, with an overall detection rate of 93.0% across the survey period (and were also in line with the overall detection rate during the non-breeding season searcher efficiency trials at the Site, which was 91.8%)¹.

There was a 100% detection rate for bread rolls and biscuits across the survey period, while bread rolls wrapped in cling film had a slightly lower detection rate of 90.9%. This contrasts with detection rates for these items during the non-breeding season, where biscuits had the lowest detection rate, with the highest detection rates for bread rolls.

Table 5: Summary of detection rates during the breeding season searcher efficiency trials

| Month & year | Type of item deployed | Turbine no. | Detection rate per turbine | Detection rate per visit | Percentage of detections per visit |
|--|---|-------------|----------------------------|--------------------------|------------------------------------|
| March 2019 | Bread rolls | 3 | 10/10 | 16/16 | 100% |
| | | 4 | 6/6 | | |
| April 2019 | Bread rolls | 1 | 6/6 | 11/11 | 100% |
| | | 2 | 5/5 | | |
| May 2019 | Bread rolls wrapped in cling film ²⁰ | 3 | 6/6 | 11/11 | 100% |
| | | 4 | 5/5 | | |
| June 2019 | Bread rolls wrapped in cling film ²⁰ | 1 | 3/5 | 9/11 | 81.8% |
| | | 2 | 6/6 | | |
| July 2019 | Bread rolls | 3 | 4/4 | 8/8 | 100% |
| | | 4 | 4/4 | | |
| August 2019 | Biscuits | 1 | 3/3 | 7/7 | 100% |
| | | 2 | 4/4 | | |
| Total detections across survey period | | | | 62/64 | 96.9% |

²⁰ This was to give the item a paler appearance

Table 6: Summary of total detection rate per turbine during the 2019 breeding season searcher efficiency trials

| Turbine no. | Total detection rate | Total percentage of detections |
|-------------|----------------------|--------------------------------|
| 1 | 12/14 | 85.7% |
| 2 | 15/15 | 100% |
| 3 | 20/20 | 100% |
| 4 | 15/15 | 100% |

Table 7: Summary of total detection rate per item type during the 2019 breeding season searcher efficiency trials

| Item type | Total detection rate | Total percentage of detections |
|--|----------------------|--------------------------------|
| Biscuit | 7/7 | 100% |
| Bread roll | 35/35 | 100% |
| Bread roll wrapped in cling film ²⁰ | 20/22 | 90.9% |

3.1.3 Carcass Persistence Trials

The carcasses deployed during each trial except July were eaten/removed by scavengers between surveys (i.e. the carcasses did not persist until the subsequent survey visit). However, some remains (feathers) of carcasses from most trials did persist until the subsequent survey visit. Further details are presented in Table 8.

Rates of carcass persistence during the breeding season were much higher than those during the two winter trials at the Development (when carcasses persisted for just 6-7 days)¹, and were broadly similar to those during concurrent breeding season trials at the adjacent Haverigg II Wind Farm.

Table 8: Summary of the 2019 breeding season carcass persistence trial results

| Trial number | Carcass species | Deployment date | Minimum persistence period of carcass ²¹ | Minimum persistence period of remains ²¹ | Notes |
|--------------|----------------------|-----------------|---|---|--|
| 1 | Woodpigeon | 21/03/2019 | N/A | 34 days | <ul style="list-style-type: none"> • Camera trap stolen during deployment period. • Feathers remaining during subsequent survey visit. |
| 2 | Red-legged partridge | 20/06/2019 | 1 day | 25 days | <ul style="list-style-type: none"> • Carcass initially foraged by magpie. • Carcass then moved out of camera field of view by carrion crow on day 2. |

²¹ The exact number of days that remains persisted could not be detected because some remains (feathers) were not visible on the camera trap photographs, and the surveyor only visited the Site on a monthly (rather than daily) basis, so remains may have persisted for several additional days in between survey visits.

| Trial number | Carcass species | Deployment date | Minimum persistence period of carcass ²¹ | Minimum persistence period of remains ²¹ | Notes |
|--------------|----------------------|-----------------|---|---|---|
| | | | | | <ul style="list-style-type: none"> • Carcass area also visited by brown hare (<i>Lepus europaeus</i>), starling and pheasant. • Plucked feathers remained when camera trap was collected after 25 days. |
| 3 | Red-legged partridge | 16/07/2019 | 2 days | 37 days | <ul style="list-style-type: none"> • Initially foraged by magpie. • Carcass was plucked and removed from field of view by a buzzard after 2 days. • Also foraged by carrion crow. • Area also investigated by stoat (<i>Mustela erminea</i>), woodpigeon, pheasant, brown hare and cow. • Some feathers remained when camera trap was collected after 37 days. |
| 4 | Woodpigeon | 22/08/2019 | 4 days | 13 days | <ul style="list-style-type: none"> • Initially foraged by magpie. • Then foraged by two buzzards, and removed from field of view after 4 days. • Feathers remained on view for 13 days. • Area also investigated by, fox (<i>Vulpes vulpes</i>), stoat, brown hare, an unidentified gull species and pheasant. |

3.2 Breeding Bird Survey

A total of 61 species were recorded within the BBS Area during the 2019 BBS.

3.2.1 Species of Conservation Concern

Of the 61 species recorded, 34 were of conservation concern, as defined in Section 2.1.

Seventeen of the species of conservation concern recorded within the BBS Area were assessed as breeding²². Numbers of territories of each of these species are provided in Table 9 and territory locations are shown in Figures 2 (non-passerines) and 3 (passerines¹), Appendix 2.

No evidence of breeding was observed for the remaining seventeen species of conservation concern, which were as follows: greylag goose, shelduck, eider, manx shearwater, little egret, gannet, whimbrel, curlew, black-headed gull, sandwich tern, common tern, black guillemot, black-tailed godwit, barn owl, swift, house martin and reed bunting.

²² Defined as all birds that were potentially breeding (identified as described in Section 2.1), including birds that were defending or holding a territory (even if this was not subsequently occupied by any nesting birds) and regardless of the outcome (i.e. including birds that may have been unsuccessful in their breeding attempts).

Registrations of these species are likely to include non-breeding birds, and birds from the local area which were breeding outside the BBS Area, although it is possible that small numbers of some of these species (e.g. reed bunting) were breeding undetected within the BBS Area.

Two species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) were recorded, namely whimbrel and barn owl. A barn owl roost was recorded in a disused building in the west of the BBS Area, but there was no evidence of breeding, while whimbrel was recorded on passage migration (the species does not breed in England).

Little egret and sandwich tern, both of which are listed on Annex I of the Birds Directive⁹, were recorded within the BBS Area, but were not considered to be breeding.

During BBS visit 2, when visible migration of whimbrel over the Site was recorded, it was further noted that these birds may use the Site as a feeding/staging area. Similarly, during BBS visit 4, approximately 280 curlew and four black-tailed godwits were observed in the BBS Area, providing further evidence that waders may use the Site for feeding/staging.

Table 9: Summary of species of conservation concern assessed as breeding²² within the BBS Area

| Species* | Number of territories in BBS Area | | | Relevant legislation/conservation listings** | Corresponding Figure no. |
|--------------------------|-----------------------------------|----------------|-----------------|--|--------------------------|
| | Within Site Boundary | In 500m buffer | Total | | |
| Mute swan | 0 | 1 | 1 | Amber | 2 |
| Mallard | 1 | 2 | 3 | Amber | 2 |
| Oystercatcher | 2 | 7 | 9**** | Amber | 2 |
| Lapwing | 1 | 2 | 3 | Red; SPI; | 2 |
| Herring gull | 0 | 100 | 100***** | Red; SPI | 2 |
| Lesser black-backed gull | 0 | 60 | 60***** | Amber | 2 |
| Stock dove | 1 | 1 | 2 | Amber | 2 |
| Skylark | 4 | 22 | 26 | Red; SPI | 3 |
| Willow warbler | 0 | 6 | 6 | Amber; SPI | 3 |
| Grasshopper warbler | 0 | 4 | 4 | Red; SPI | 3 |
| Starling | 6 | 36 | 42 | Red; SPI | 3 |
| Song thrush | 0 | 2 | 2 | Red; SPI; BAP | 3 |
| House sparrow | 0 | 13 | 13 | Red; SPI | 3 |
| Duncock | 1 | 17 | 18 | Amber; SPI | 3 |
| Pied wagtail*** | 3 | 2 | 5 | NT; Amber | 3 |
| Meadow pipit | 2 | 17 | 19 | Amber | 3 |
| Linnet | 8 | 29 | 37 | Red; SPI | 3 |

| Species* | Number of territories in BBS Area | | | Relevant legislation/ conservation listings** | Corresponding Figure no. |
|---|-----------------------------------|----------------|-------|---|--------------------------|
| | Within Site Boundary | In 500m buffer | Total | | |
| <p>*Species names and order follow the British List maintained by the BOU².</p> <p>** Red = UK Red-listed BoCC¹²; Amber = UK Amber-listed BoCC¹²; SPI = listed as SPI under S41 of the NERC Act 2006¹¹; BAP = listed in the Cumbria BAP as a species for priority action¹³</p> <p>***Although the 'parent' species is Green-listed, both pied wagtail subspecies occurring in the UK (<i>yarelli</i> and <i>alba</i>), are Amber-listed</p> <p>****During visit 4, the surveyor noted that ~20 Oystercatchers appeared to be nesting in the prison grounds, this has not been included due to access restrictions which meant prison grounds were not accurately surveyed.</p> <p>*****Although there was no access to prison grounds, gull territories were determined by scanning building rooftops allowing for an accurate population estimate to be made.</p> | | | | | |

3.2.2 Species of Low Conservation Concern

The remaining 27 species, which are generally common and widespread, were as follows: pheasant, grey heron, sparrowhawk, buzzard, feral pigeon, woodpigeon, collared dove, magpie, jackdaw, rook, carrion crow, hooded crow, raven, blue tit, great tit, sand martin, swallow, chiffchaff, sedge warbler, whitethroat, wren, blackbird, robin, stonechat, wheatear, chaffinch and goldfinch. The majority of these species were confirmed or likely to be breeding within the BBS Area.

3.3 Flight Activity Surveys

3.3.1 Target Species

A total of 786 flights by 15 target species were recorded during the flight activity surveys. Herring gull was the species recorded most frequently (354 flights), followed by lesser black-backed gull (261 flights), oystercatcher (72 flights) and black-headed gull (50 flights). There were also 16 curlew flights, 10 whimbrel flights, five great black-backed gull flights, four flights of each of greylag goose flights, mallard and lapwing, two little egret flights, and single flights of grey heron, gannet, black-tailed godwit and common gull.

A total of 744 flights (94.7 %) occurred at least partially at RSH. The majority of flights (726 flights) followed a 'Bullet' flight line, with birds apparently taking no avoiding action towards the turbines. Nine flights followed a 'Weave' flight line, two flights followed a 'Horiz' flight line and seven flights followed an 'Other' flight line or were not recorded.

A summary of all target species flights recorded during the flight activity surveys, broken down by species, is provided in Table 10. The Table includes details of relevant legislation and conservation listings.

Target species flight lines are shown in Figures 4-10, Appendix 2 and full details of each target species flight are presented in Appendix 5.

Table 10: Summary of target species flights recorded during the Year 3 FAS

| Species* | Total no. of flights | No. of flights occurring at RSH** | Mean count no. of (birds) | Maximum flock size (no. of birds) | No. of flights in each recorded flight category | | Schedule 1/ Annex I listings | Conservation listing(s)*** | Corresponding figure no. |
|--------------------------|----------------------|-----------------------------------|---------------------------|-----------------------------------|---|-----|------------------------------|----------------------------|--------------------------|
| | | | | | | | | | |
| Greylag goose | 4 | 4 | 5.3 | 7 | Bullet | 3 | | Amber | 10 |
| | | | | | Horiz | 1 | | | |
| Mallard | 4 | 3 | 2.5 | 3 | Bullet | 4 | | Amber | 10 |
| Grey heron | 1 | 1 | 1.0 | 1 | Bullet | 1 | | | 10 |
| Little egret | 2 | 2 | 2.0 | 3 | Bullet | 2 | Annex I | | 10 |
| Gannet | 1 | 1 | 1.0 | 1 | Horiz | 1 | | Amber | 10 |
| Oystercatcher | 72 | 46 | 1.9 | 6 | Bullet | 70 | | Amber | 8 |
| | | | | | Other | 2 | | | |
| Lapwing | 4 | 4 | 13.8 | 26 | Bullet | 3 | | Red; SPI | 9 |
| | | | | | Other | 1 | | | |
| Whimbrel | 10 | 10 | 4.0 | 12 | Bullet | 12 | Schedule 1 | Red; SPI | 9 |
| Curlew | 16 | 16 | 14.4 | 90 | Bullet | 15 | | Red; SPI | 9 |
| | | | | | Weave | 1 | | | |
| Black-tailed godwit | 1 | 1 | 3.0 | 3 | Bullet | 1 | Schedule 1 | Red; SPI | 9 |
| Black-headed gull | 50 | 39 | 2.7 | 8 | Bullet | 50 | | Amber | 6 |
| Common gull | 1 | 0 | 2.0 | 3 | Bullet | 1 | | Amber | 7 |
| Great black-backed gull | 5 | 2 | 2.0 | 4 | Bullet | 5 | | Amber | 7 |
| Herring gull | 354 | 354 | 4.9 | 50 | Bullet | 341 | | Red; SPI | 4 |
| | | | | | Weave | 4 | | | |
| | | | | | Other | 2 | | | |
| | | | | | Not recorded | 1 | | | |
| Lesser black-backed gull | 261 | 261 | 3.9 | 30 | Bullet | 255 | | Amber | 5 |
| | | | | | Weave | 4 | | | |
| | | | | | Not recorded | 1 | | | |

**Red = UK Red-listed BoCC¹²; Amber = UK Amber-listed BoCC¹²; SPI = listed as SPI under S41 of the NERC Act 2006¹¹; BAP = listed in the Cumbria BAP as a species for priority action¹³

3.3.2 Secondary Species Registrations

Four secondary species were recorded during the flight activity surveys. The majority of these were raptor species, with kestrel recorded most frequently (10 registrations), followed by buzzard (seven registrations), with raven and sparrowhawk recorded in lower numbers (five and four registrations respectively).

3.3.3 Disturbance Events

The only noted disturbance event noted during flight activity surveys was sirens from the prison sounding during the first visit.

4 SUMMARY OF KEY FINDINGS

4.1 Carcass Searches

- Carcasses or other remains from five birds were found during the formal carcass searches: three passerines, one lesser black-backed gull and a woodpigeon.
- However, it was considered likely that only one of these (the lesser black-backed gull) resulted from a turbine collision (with the rest likely attributable to raptor kills¹⁸).
- Two of the carcasses/remains were found within the turbine 4 search area, two were within the turbine 1 search area (including the lesser black-backed gull), and a single carcass was found within the search area of turbine 2.
- Remains from up to seven¹⁹ additional birds were found outside the formal breeding season carcass searches (five during concurrent surveys at the adjacent Haverigg II Wind Farm, and two in other parts of the Site, outside the search areas). However, it is not certain that all of these additional carcasses/remains were attributable to collision events; there was evidence that some were the remains of mammal and/or raptor kills, and others for which likely cause of death could not be assessed (due to the condition of the remains).
- None of the five carcasses recorded during the formal breeding season carcass searches persisted until the following survey visit, but based their apparent freshness, it was estimated that they persisted for at least several days, and in some cases, several weeks.

4.2 Searcher Efficiency Trials

- Searcher efficiency trials indicated that the detection rate was high, with an overall detection rate of 96.9% across the survey period (which is consistent with the results of the winter searcher efficiency trials¹).
- Across all searcher efficiency trials, detection rates were 85.7% at turbine 1 and 100% at the remaining turbines. It is notable that the lowest detection rate was for turbine 1, which is located on the moto-cross track in area that was comparatively difficult to search due to the presence of large patches of tall, dense vegetation, rough/uneven ground and several ditches and would thus be expected to have the lowest levels of detectability (particularly in June and July when vegetation growth impeded the surveys).
- There was also some variation in detectability of deployed items, ranging from 90.9% for bread rolls wrapped in cling film to 100% for bread rolls and biscuits, although this was only minor.
- These results suggest that bird carcasses may be more easily detected at certain turbines, and detection rates could vary according to the type of remains (e.g. size, colour and shape).
- However, the results further indicate that detectability is consistently high ($\geq 85\%$), regardless of the location or size/type of remains. Therefore, the majority of birds

colliding with turbines and still in situ (i.e. not removed by scavengers) were likely to be detected by surveyors during the carcass searches.

4.3 Carcass Persistence Trials

- Due to stolen camera traps, only three surveys could be completed fully, which decreased the sample size and reduces the robustness of the results to some extent, although results are available from the adjacent Haverigg II to supplement the results from the Development.
- Although the carcasses deployed during breeding season carcass persistence trials were eaten/removed by scavengers between monthly survey visits, in the majority of trials, some remains (feathers) from carcasses persisted until at least one subsequent survey visit.
- Although persistence rates of whole carcasses were low, (a maximum of four days), remains (feathers) from the carcasses persisted for a minimum period²¹ of 13 days and a maximum of 37 days during the trials (and a mean of 27 days).
- A range of different avian and mammalian scavengers inspected and/or consumed the carcasses, with carrion crow the scavenger species observed most frequently.
- These results indicate that, although whole carcasses of birds colliding with turbines are likely to remain in situ for less than one week on average, some remains (feathers) are likely to persist for approximately one month.
- These findings are broadly similar to the results of carcass persistence trials at the adjacent Haverigg II development where, although the carcasses were eaten/removed by scavengers between visits, feathers often persisted until subsequent searches. Additionally, although much greater variation in carcass persistence rates was recorded at Haverigg II, the mean persistence across the breeding season was 20 days.
- When compared to the non-breeding season persistence trials at the Development, carcasses remained in situ for similarly short periods (six to seven days), but feathers did not persist in sufficient numbers to indicate the prior presence of a carcass¹.
- Results of the carcass persistence trials suggest that the number of birds present during the carcass searches is broadly representative of the actual number of carcasses; although the results indicate that a proportion of carcasses will be removed by scavengers between visits, they also suggest that.
- It is likely that some remains (feathers) will persist. It is therefore considered unlikely that significant numbers of carcasses are eaten/removed by scavengers before they are detected during monthly visits.
- Given the broad similarities in carcass persistence rates between the Development and the adjacent Haverigg II Wind Farm across the same period, it is considered that the carcass persistence trials at the Development represent typical levels of scavenger removal.
- It is acknowledged that levels of removal by scavengers may vary at different times of year (e.g. rates may be higher when scavengers are breeding and have young to feed, and/or when other food resources are scarce), and may also vary across the Site (e.g. there may be more scavengers in areas with dense vegetation to provide cover), or possibly according to bird species (e.g. some bird species may be more palatable to scavengers than others).
- There is also likely to be some natural variation in local scavenger populations, which may also result in fluctuating levels of scavenging/predation; furthermore there is anecdotal evidence that the landowner controls certain scavenger species (e.g. foxes), which may increase the variation in predation levels.

4.4 Breeding Bird Survey

- A total of 61 species were recorded during the BBS. This included 33 species of conservation concern, of which 17 were assessed as breeding within the BBS Area (with no evidence of breeding observed for the remaining 17 species of species of conservation concern). Ten of the breeding species of conservation concern were breeding within the Site Boundary (and all 17 species were breeding within the 500 m buffer).
- A total of 350 breeding territories of birds of conservation concern (all species combined) were recorded during the BBS. This comprised
 - 29 territories within the Site Boundary and 321 territories within the 500 m buffer.
 - The contrast in numbers of breeding territories between the Site and surrounding 500 m buffer unsurprising given the greater habitat diversity and larger area within the 500 m buffer, which will support greater species diversity and abundance.
 - The most notable results were the herring gull and lesser black-backed gull breeding colonies (comprising ~100 and ~60 territories respectively) recorded on building roofs within the grounds of HMP Haverigg. Relatively large numbers of oystercatcher also appeared to be breeding within the prison grounds.
 - It was also noted that relatively large numbers of (non-breeding) waders such as whimbrel and curlew may use the BBS Area as a stopover site during their spring migration.
 - No Schedule 1¹⁰ or Annex I species were recorded breeding within the BBS Area, although there was evidence that a barn owl was roosting in one of the buildings.

4.5 Flight Activity Survey

- A total of 786 flights by 15 target species were recorded during the flight activity surveys.
- Herring gull was the species recorded most frequently (354 flights), followed by lesser black-backed gull (261 flights). Flight activity by both species was strongly associated with the breeding colonies within HMP Haverigg, with gulls apparently moving along three distinct (but broad) flight paths, presumably between nest sites and particular feeding areas. One of the three flight paths passes very close to the northernmost turbine (turbine 1).
- In contrast, flight activity of black-headed gull (which was not breeding within the BBS Area) was concentrated to the north-east of the Site and largely followed an east-west orientation, with no flights close to the turbines.
- Relatively high levels of oystercatcher flight activity were also recorded during the 2019 breeding season, concentrated over the eastern half of the Site, with few flights in close proximity to the turbines.
- Flight activity of other target species recorded during the breeding season flight activity surveys was generally low.
- A total of 744 flights occurred at least partially at RSH; this included all of the herring gull and lesser black-backed gull flights.
- The majority of flights (726 flights) followed a 'Bullet' flight line, with birds apparently taking no avoiding action towards the turbines.
- Results show that there was a high density of flights within the Site Boundary, with the vast majority occurring at least partially at RSH. However, two of the three broad flight paths flights were to the east of the Haverigg III turbines and no collisions were observed during any of the flight activity surveys.

5 CONCLUSION

Based on the results of the carcass persistence and searcher efficiency trials undertaken in parallel with the carcass searches to date, it is considered likely that the vast majority (at least 85%) of bird carcasses in situ (i.e. not removed by scavengers) at the time monitoring was carried out were detected. Although the results of the breeding season carcass persistence trials indicated that levels of scavenger removal at the Development are relatively high (1-4 days), some evidence of a carcass (feathers) typically remained visible for several weeks, suggesting that the majority of bird collisions were likely to have been detected by surveyors.

Five carcasses were found during the six breeding season carcass searches (mainly passerine species), with up to a further seven¹⁹ carcasses (mainly gulls) found in other parts of the Site during the same period. However, cause of death was not always apparent and it is considered likely that several of these carcasses were killed by predators rather than turbines. No collisions were observed during the 36 hours of breeding season flight activity surveys. These results indicate that, although bird collisions regularly occur, a large proportion of which are gulls, the numbers of collisions are relatively low, particularly given the high levels of flight activity across the Site for certain species, including some gulls.

The BBS results indicate that a number of species of conservation concern bred within the Site Boundary at low densities. A greater number of species and higher densities of breeding territories are present within the 500 m buffer where there is increased habitat diversity. The most notable registrations of breeding birds were the herring gull and lesser black-backed gull colonies within HMP Haverigg.

The results of the flight activity surveys show that there are large numbers of certain target species flights over the Site Boundary during the breeding season. Species recorded most frequently were herring and lesser black-backed gulls, followed by oystercatcher, all three of which are qualifying features of the Morecambe Bay & Duddon Estuary SPA. Although the majority of target species flights (including both aforementioned gull species) occurred at RSH, turbines seem to have little impact on bird flight behaviour, with the vast majority following a "Bullet" flight path. This may indicate that many birds breeding in the vicinity of the Development may have become habituated to the presence of the turbines and routinely avoid them, without exhibiting any sudden avoidance behaviour detectable by surveyors.

Based on the very high number of flights at RSH, and low number of carcasses found during searches, collision rates appear to be relatively low. Most of the carcasses recorded were gull species, which is unsurprising given the proportion of flights at RSH by herring and lesser black-backed gulls, both of which appear to follow regular flight paths across the Site between breeding and foraging, including one flight path close to turbine 1.

Taking into account the results of the searcher efficiency and carcass persistence trials, as well as the persistence of carcasses recorded during both the carcass searches and incidentally, it is considered likely that the number of carcasses recorded is likely to be broadly representative of actual collision rates, although it is acknowledged that there will be some level of underestimation due to carcass removal by scavenger species.

APPENDIX 1: BIRD SPECIES NAMES AND CONSERVATION DESIGNATIONS

Table A1.1 list provides English vernacular and scientific names for all bird species recorded during the survey. Taxonomic order and nomenclature is based on the BOU 'British List'².

Table A1.1: List of English vernacular and scientific names of bird species mentioned in this report

| Species* | | Schedule 1/Annex I listings | Conservation listings** |
|-----------------------------------|-----------------------------------|-----------------------------|-------------------------|
| English (British) vernacular name | Scientific name | | |
| Greylag Goose | <i>Anser anser</i> | | Amber |
| Mute Swan | <i>Cygnus olor</i> | | Amber |
| Shelduck | <i>Tadorna tadorna</i> | | Amber |
| Mallard | <i>Anas platyrhynchos</i> | | Amber |
| Eider | <i>Somateria mollissima</i> | | Amber |
| Red-legged Partridge | <i>Alectoris rufa</i> | | |
| Pheasant | <i>Phasianus colchicus</i> | | |
| Manx Shearwater | <i>Puffinus puffinus</i> | | Amber |
| Grey Heron | <i>Ardea cinerea</i> | | |
| Little Egret | <i>Egretta garzetta</i> | | |
| Gannet | <i>Morus bassanus</i> | | Amber |
| Cormorant | <i>Phalacrocorax carbo</i> | | |
| Sparrowhawk | <i>Accipiter nisus</i> | | |
| Buzzard | <i>Buteo buteo</i> | | |
| Oystercatcher | <i>Haematopus ostralegus</i> | | Amber |
| Lapwing | <i>Vanellus vanellus</i> | | Red; Sec41 |
| Golden Plover | <i>Pluvialis apricaria</i> | Ann1 | |
| Whimbrel | <i>Numenius phaeopus</i> | Sch1.1 | Red; |
| Curlew | <i>Numenius arquata</i> | | Red; Sec41 |
| Black-tailed Godwit | <i>Limosa limosa</i> | Sch1.1 | Red; Sec41 |
| Black-headed Gull | <i>Chroicocephalus ridibundus</i> | | Amber |
| Common Gull | <i>Larus canus</i> | | Amber |
| Great black-backed Gull | <i>Larus marinus</i> | | Amber |
| Herring Gull | <i>Larus argentatus</i> | | Red; Sec41 |
| Lesser Black-backed Gull | <i>Larus fuscus</i> | | Amber |
| Sandwich Tern | <i>Thalasseus sandvicensis</i> | Ann1 | Amber |
| Common Tern | <i>Sterna hirundo</i> | Ann1 | Amber |
| Black Guillemot | <i>Cephus grylle</i> | | Amber |
| Feral Pigeon | <i>Columba livia</i> | | |
| Stock Dove | <i>Columba oenas</i> | | Amber |
| Woodpigeon | <i>Columba palumbus</i> | | |
| Collared Dove | <i>Streptopelia decaocto</i> | | |
| Barn Owl | <i>Tyto alba</i> | Sch1.1 | BAP |
| Swift | <i>Apus apus</i> | | Amber |
| Kestrel | <i>Falco tinnunculus</i> | | Amber |
| Peregrine | <i>Falco peregrinus</i> | Sch1.1; Ann1 | |
| Magpie | <i>Pica pica</i> | | |
| Jackdaw | <i>Coloeus monedula</i> | | |

| Species* | | Schedule 1/Annex I listings | Conservation listings** |
|-----------------------------------|-------------------------------------|-----------------------------|-------------------------|
| English (British) vernacular name | Scientific name | | |
| Rook | <i>Corvus frugilegus</i> | | |
| Carrion Crow | <i>Corvus corone</i> | | |
| Hooded Crow | <i>Corvus cornix</i> | | |
| Raven | <i>Corvus corax</i> | | |
| Blue Tit | <i>Cyanistes caeruleus</i> | | |
| Great Tit | <i>Parus major</i> | | |
| Skylark | <i>Alauda arvensis</i> | | Red; Sec41 |
| Sand Martin | <i>Riparia riparia</i> | | |
| Swallow | <i>Hirundo rustica</i> | | |
| House Martin | <i>Delichon urbica</i> | | Amber |
| Willow Warbler | <i>Phylloscopus trochilus</i> | | Amber |
| Chiffchaff | <i>Phylloscopus collybita</i> | | |
| Sedge Warbler | <i>Acrocephalus schoenobaenus</i> | | |
| Grasshopper Warbler | <i>Locustella naevia</i> | | Red; Sec41 |
| Whitethroat | <i>Sylvia communis</i> | | |
| Wren | <i>Troglodytes troglodytes</i> | | |
| Starling | <i>Sturnus vulgaris</i> | | Red; Sec41 |
| Blackbird | <i>Turdus merula</i> | | |
| Song Thrush | <i>Turdus philomelos</i> | | Red; Sec41; BAP |
| Robin | <i>Erithacus rubecula</i> | | |
| Stonechat | <i>Saxicola rubicola</i> | | |
| Wheatear | <i>Oenanthe oenanthe</i> | | |
| House Sparrow | <i>Passer domesticus</i> | | Red; Sec41 |
| Dunnock | <i>Prunella modularis</i> | | Amber; Sec41 |
| Pied Wagtail*** | <i>Motacilla alba ssp. yarellii</i> | | Amber |
| Meadow Pipit | <i>Anthus pratensis</i> | | Amber |
| Chaffinch | <i>Fringilla coelebs</i> | | |
| Linnet | <i>Linaria cannabina</i> | | Red; Sec41 |
| Goldfinch | <i>Carduelis carduelis</i> | | |
| Reed Bunting | <i>Emberiza schoeniclus</i> | | Amber; Sec41 |

*Species names and order follow the British List maintained by the BOU²

** Red = UK Red-listed BoCC¹²; Amber = UK Amber-listed BoCC¹²; SPI = listed as SPI under S41 of the NERC Act 2006¹¹; BAP = listed in the Cumbria BAP as a species for priority action¹³

***Although the 'parent' species is Green-listed, both pied wagtail subspecies occurring in the UK (*yarellii* and *alba*), are Amber-listed

APPENDIX 2: FIGURES

Figure 1: Ornithology Study Areas

Figure 2: Breeding Bird Territories: Non-passerines

Figure 3: Breeding Bird Territories: Passerines

Figure 4: Herring Gull Flights

Figure 5: Lesser Black-backed Gull Flights

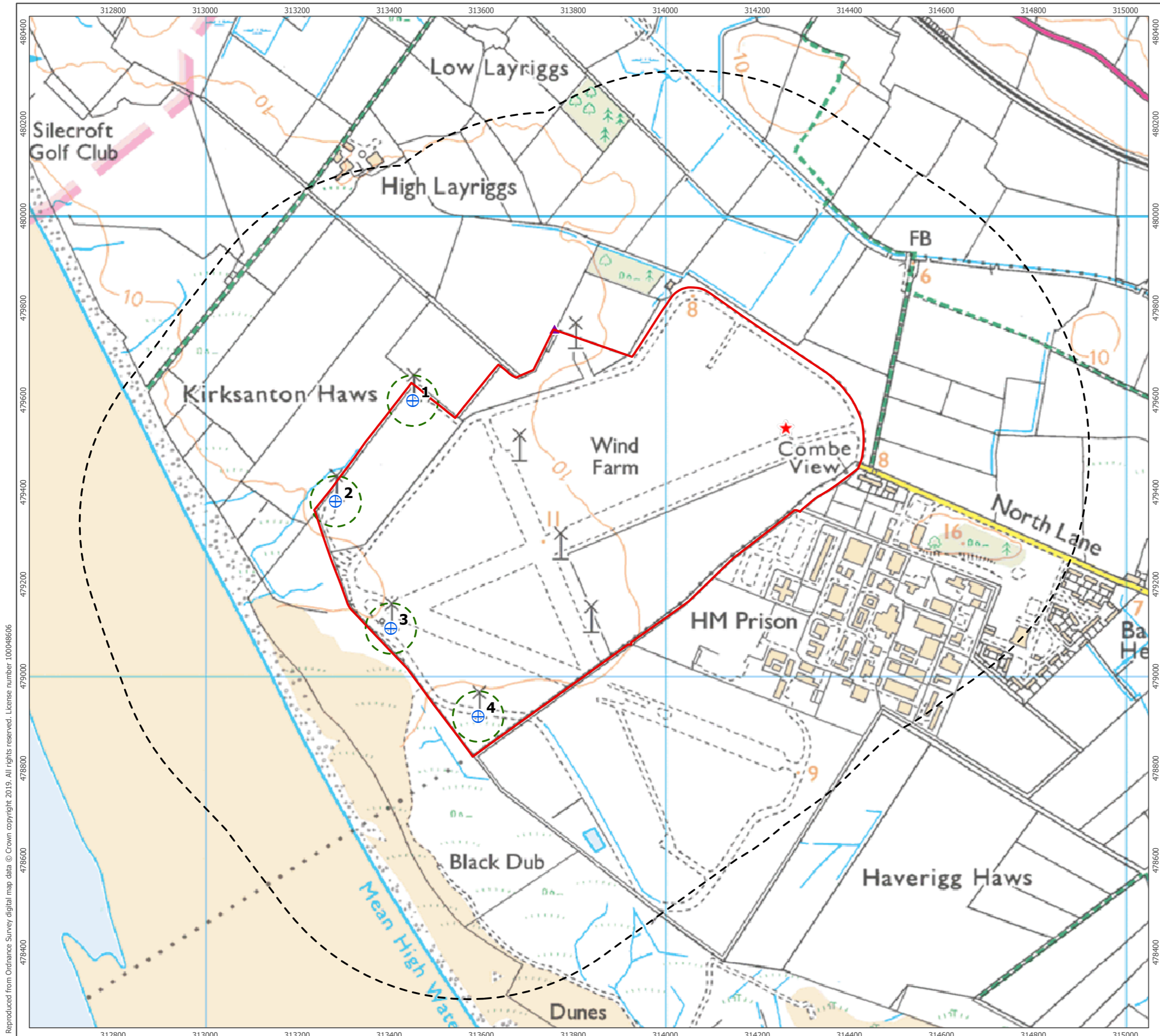
Figure 6: Black-headed Gull Flights

Figure 7: Other Gull Flights

Figure 8: Oystercatcher Flights

Figure 9: Other Wader Flights

Figure 10: Other Target Species Flights



Windcluster



- Site Boundary
- ⊕ Haverigg III Turbines
- Breeding Bird Survey Area
- Carcass Search Area
- ★ Vantage Points
- ▲ Camera Trap Location

1:8,000 Scale @ A3
 0 0.1 0.2 km

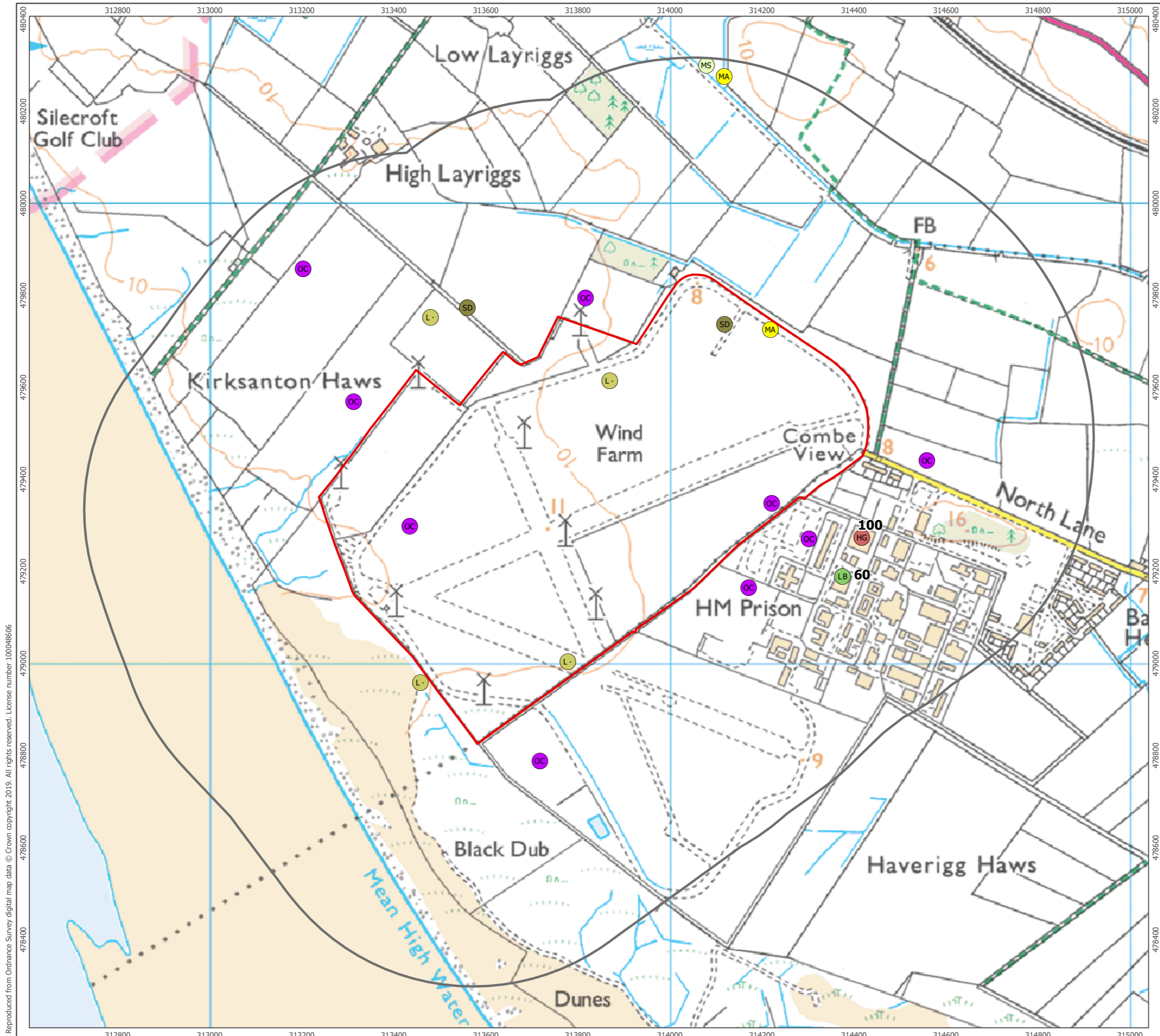


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| Checked By: SC | Date: 14/10/2019 |

Ornithology Study Areas
Figure 1

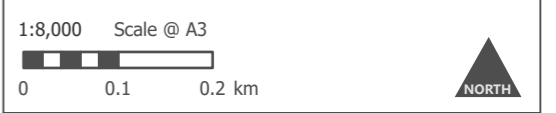
**Haverigg III Wind Farm
Life Extension Breeding
Bird Report 2019**

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- Site Boundary
- Breeding Bird Survey Area (500 m Buffer of Site Boundary)
- Breeding Birds**
- MS Mute Swan
- MA Mallard
- OC Oystercatcher
- L Lapwing
- HG Herring Gull
- LB Lesser Black-backed Gull
- SD Stock Dove

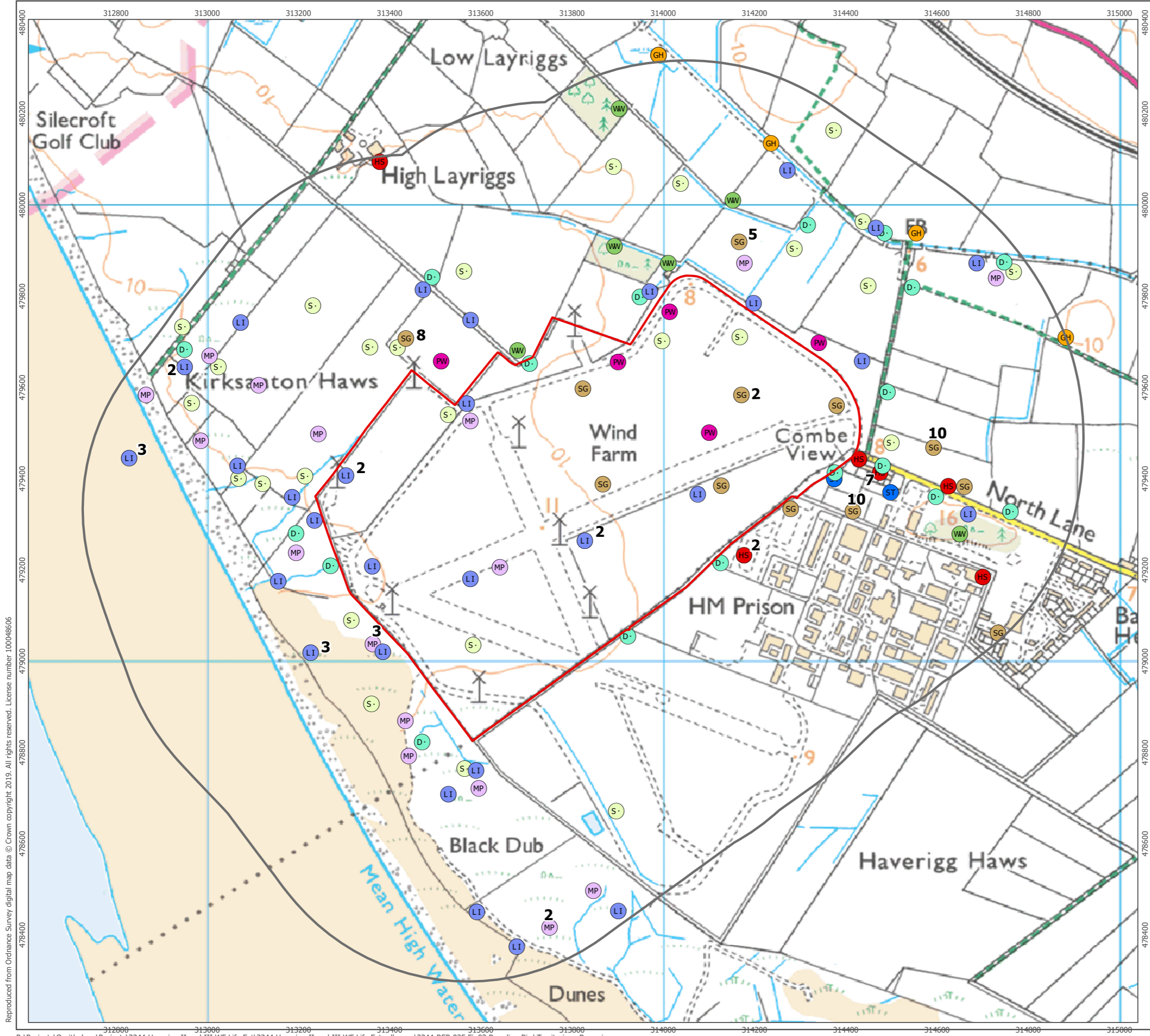
Numbers on map denote number of territories where more than one territory was recorded in close proximity.



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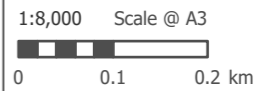
**Breeding Bird Territories:
Non-Passerines**
Figure 2

**Haverigg III Wind Farm
Life Extension Breeding
Bird Report 2019**



- Site Boundary
- Breeding Bird Survey Area (500 m Buffer of Site Boundary)
- Breeding Birds**
- S Skylark
- WW Willow Warbler
- GH Grasshopper Warbler
- SG Starling
- ST Song Thrush
- HS House Sparrow
- D Dunnock
- PW Pied Wagtail
- MP Meadow Pipit
- LI Linnet

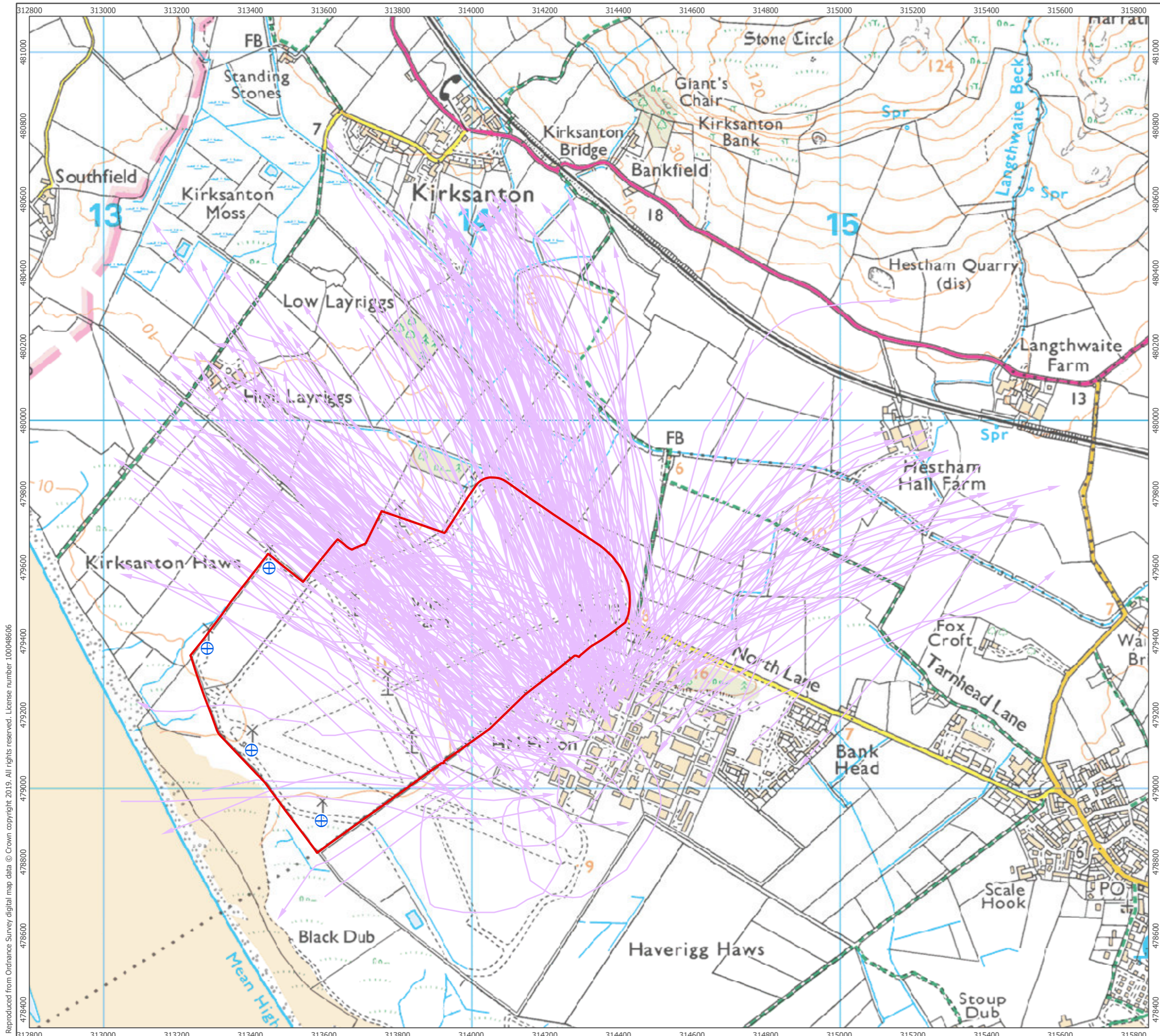
Numbers on map denote number of territories where more than one territory was recorded in close proximity.



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| Checked By: SC | Date: 14/10/2019 |

**Breeding Bird Territories:
Passerines
Figure 3**

**Haverigg III Wind Farm
Life Extension Breeding
Bird Report 2019**



- Site Boundary
- ⊕ Haverigg III Turbines
- Flightlines
- Herring Gull

1:10,000 Scale @ A3
 0 0.15 0.3 km

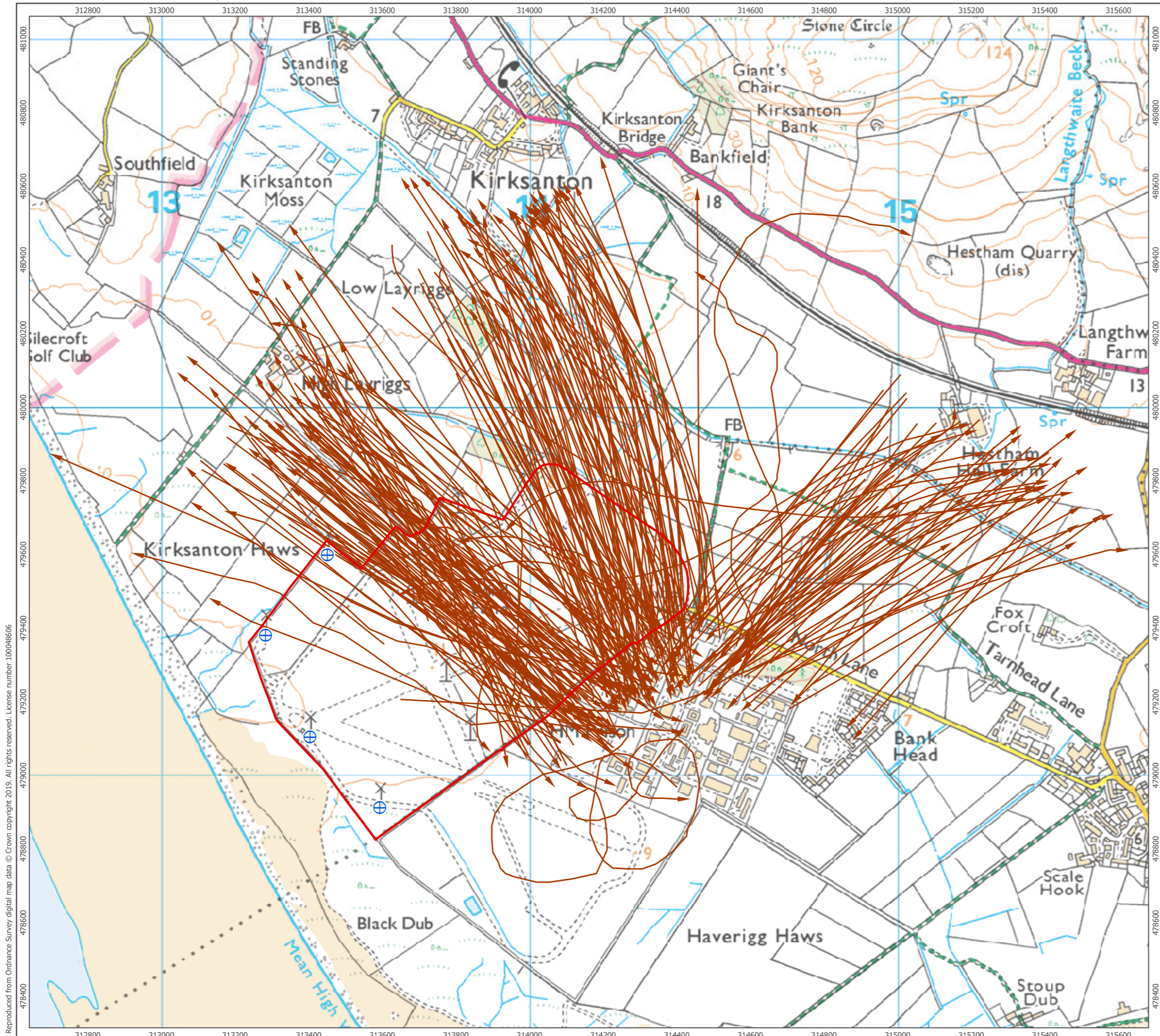


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| Checked By: SC | Date: 10/10/2019 |

Herring Gull Flights
Figure 4

**Haverigg III Wind Farm
Life Extension Breeding
Bird Report 2019**

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- Site Boundary
- ⊕ Haverigg III Turbines
- Flightlines
- Lesser Black-backed Gull

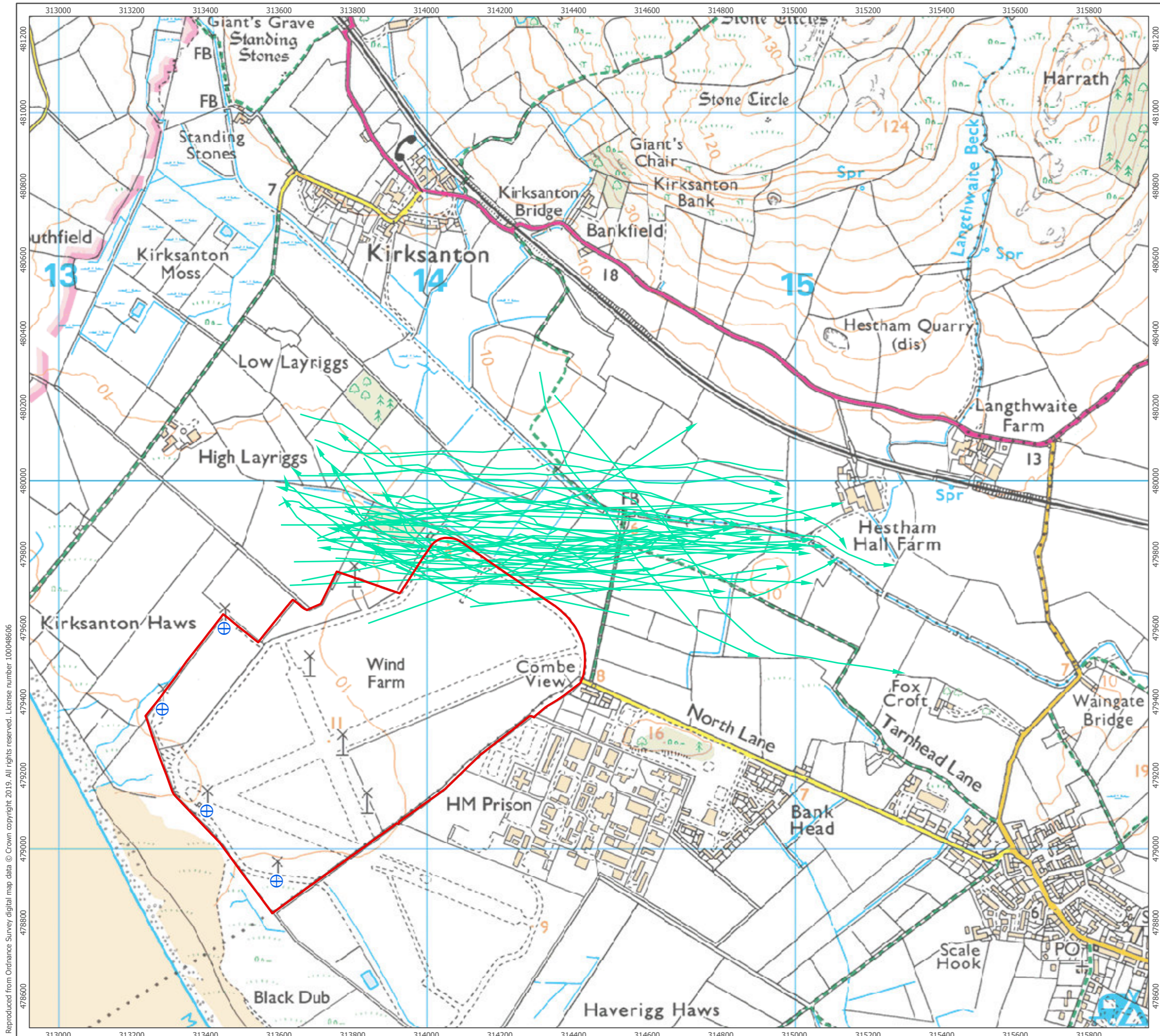
1:10,000 Scale @ A3
 0 0.1 0.2 km

| | |
|-----------------|-------------------|
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| Checked By: SC | Date: 10/10/2019 |

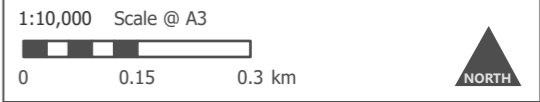
Lesser Black-backed Gull Flights
Figure 5

**Haverigg III Wind Farm
Life Extension Breeding
Bird Report 2019**

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- Site Boundary
- ⊕ Haverigg III Turbines
- Flightlines
- Black-headed Gull

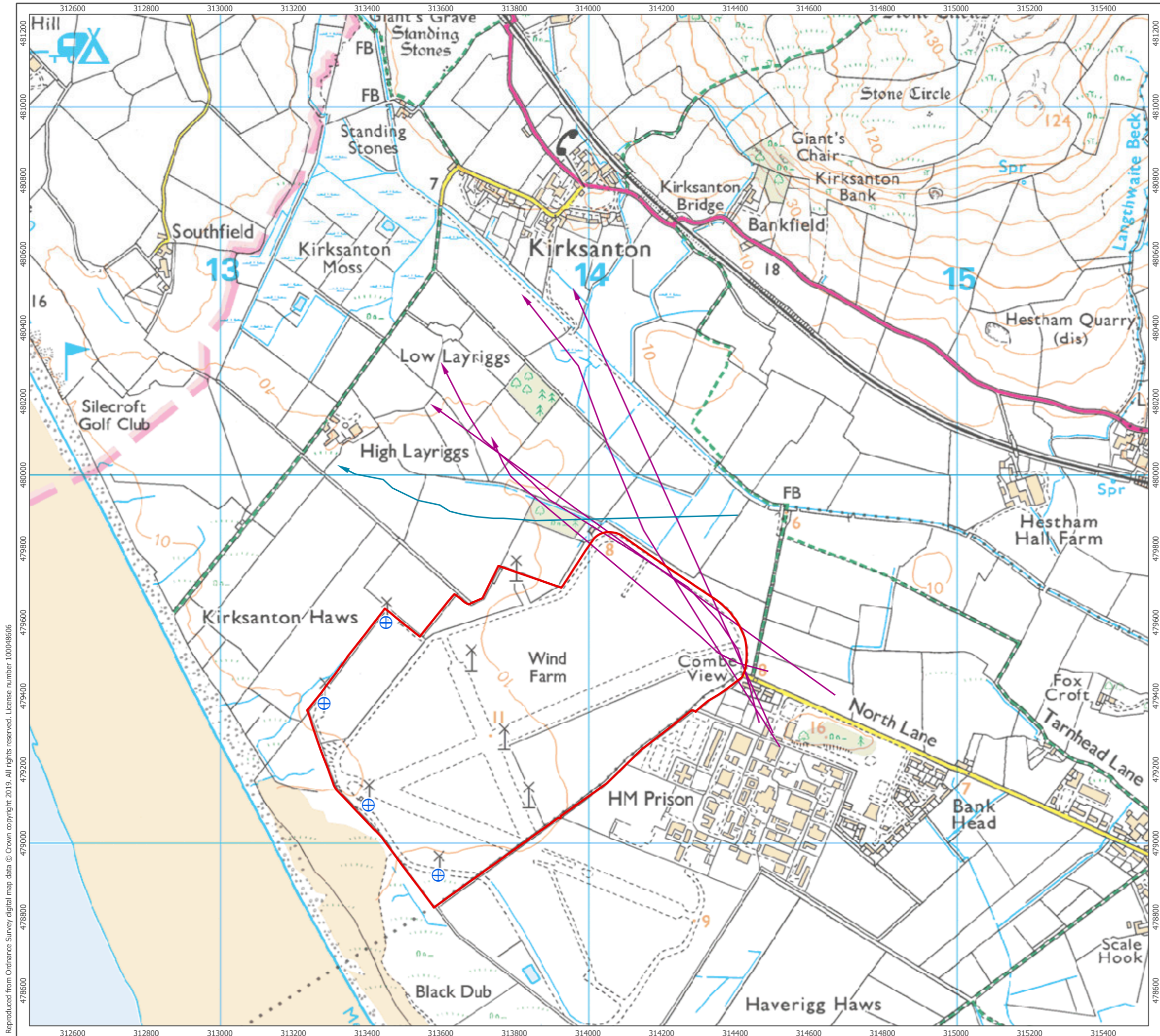


| | |
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| Produced By: LC | Ref: 3344-REP-028 |
| Checked By: SC | Date: 10/10/2019 |

Black-headed Gull Flights
Figure 6

**Haverigg III Wind Farm
Life Extension Breeding
Bird Report 2019**

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- Site Boundary
- ⊕ Haverigg III Turbines
- Flightlines
- Common Gull
- Great Black-backed Gull

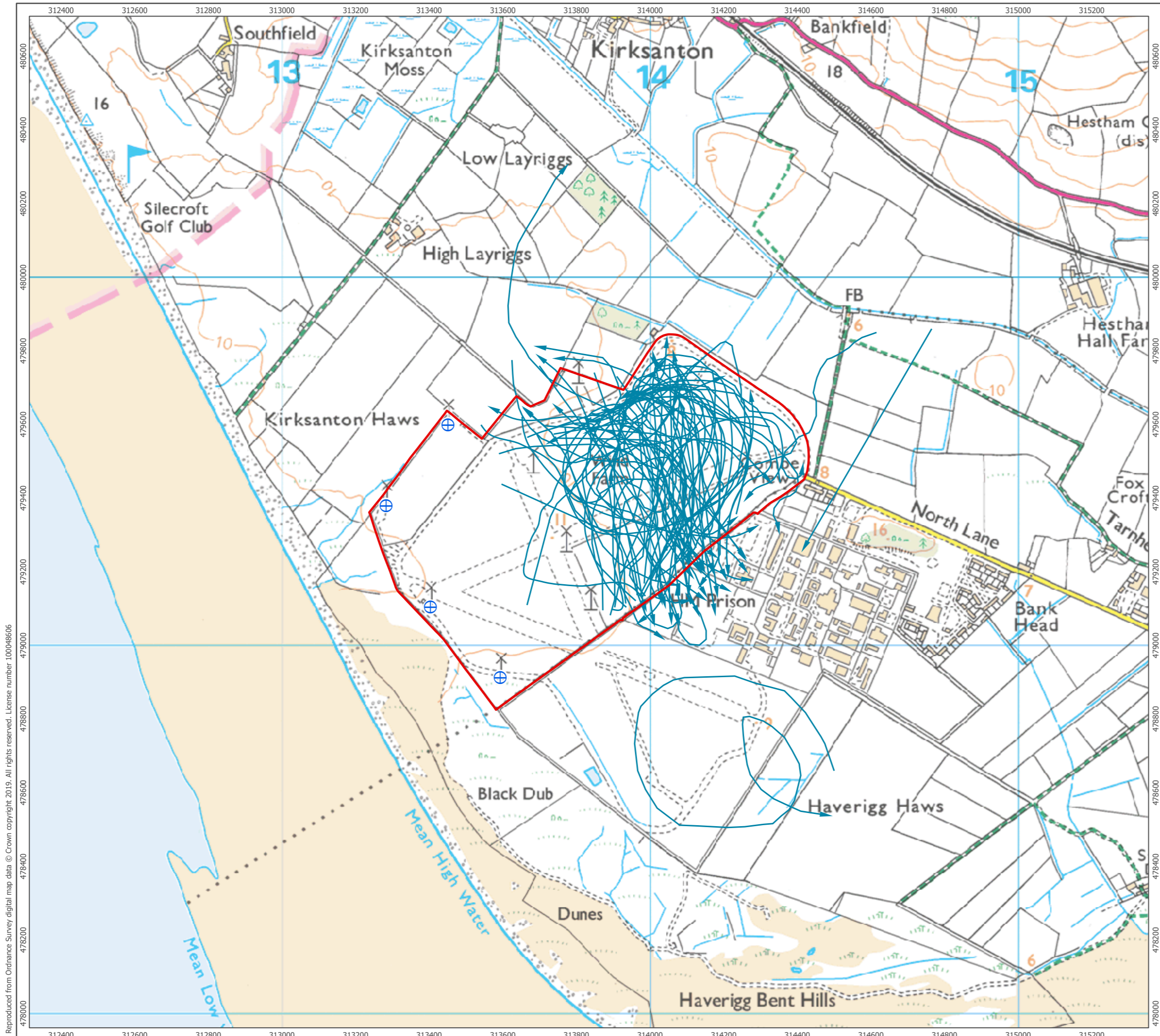
1:10,000 Scale @ A3
 0 0.15 0.3 km

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| Produced By: LC | Ref: 3344-REP-029 |
| Checked By: SC | Date: 14/10/2019 |

Other Gull Flights
Figure 7

**Haverigg III Wind Farm
Life Extension Breeding
Bird Report 2019**

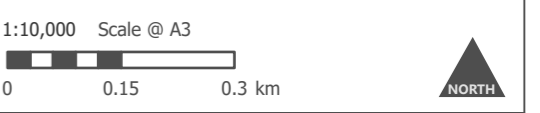
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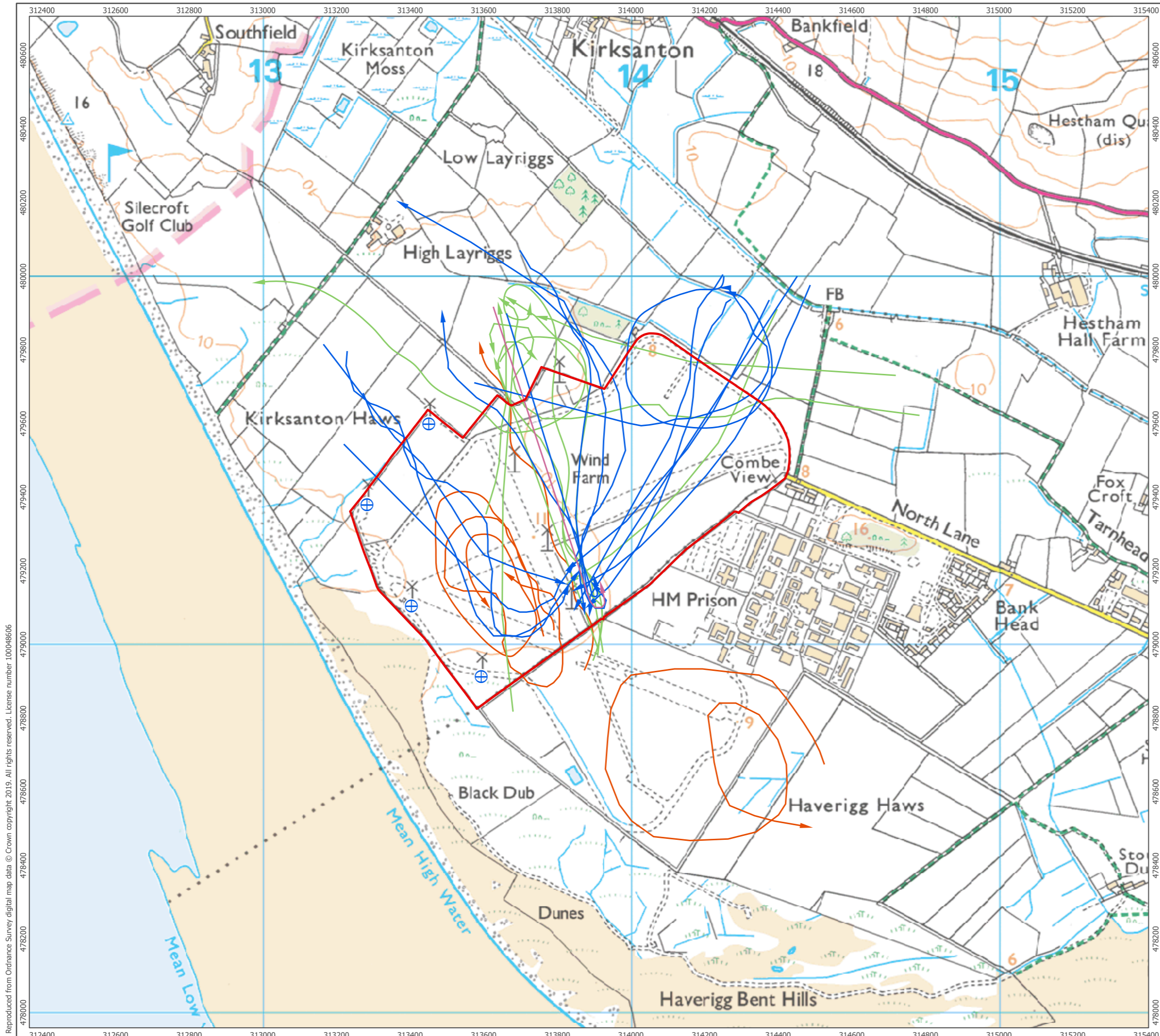
- Site Boundary
- ⊕ Haverigg III Turbines
- Flightlines
- Oystercatcher



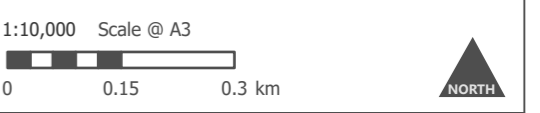
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| Checked By: SC | Date: 10/10/2019 |

Oystercatcher Flights
Figure 8

**Haverigg III Wind Farm
Life Extension Breeding
Bird Report 2019**



- Site Boundary
- ⊕ Haverigg III Turbines
- Flightlines**
- Lapwing
- Whimbrel
- Curlew
- Black-tailed Godwit

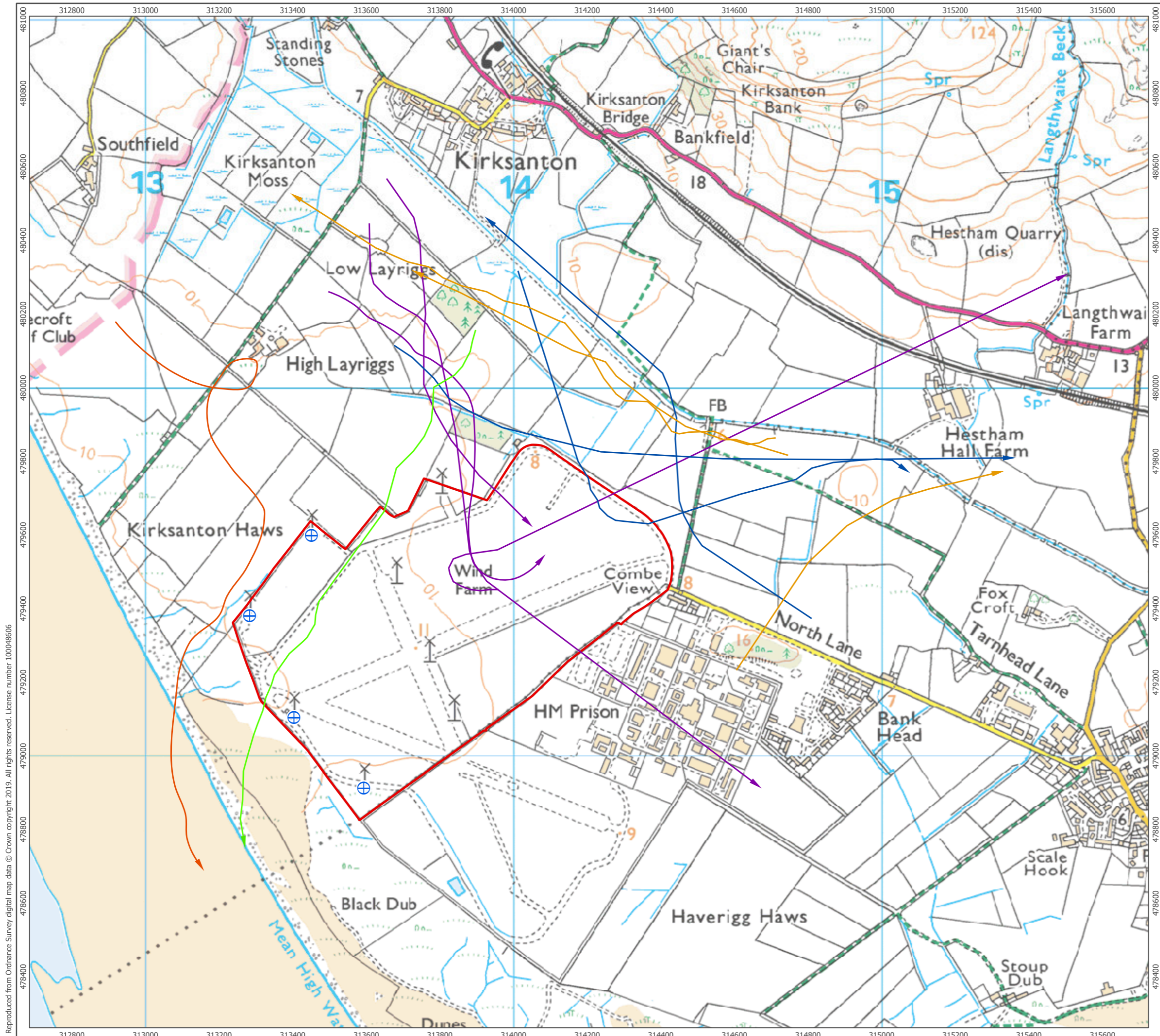


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| Produced By: LC | Ref: 3344-REP-031 |
| Checked By: SC | Date: 10/10/2019 |

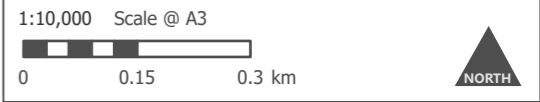
Other Wader Flights
Figure 9

**Haverigg III Wind Farm
Life Extension Breeding
Bird Report 2019**

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- Site Boundary
- ⊕ Haverigg III Turbines
- Flightlines**
- Grey Lag Goose
- Mallard
- Grey Heron
- Little Egret
- Gannet



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Other Target Species Flights
Figure 10

**Haverigg III Wind Farm
Life Extension Breeding
Bird Report 2019**

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**APPENDIX 3: DETAILS OF CONSULTATION WITH NATURAL ENGLAND
RELATING TO WINTER BIRD COLLISION MONITORING**

- Letter from Arcus summarising existing information and confirming proposed survey scope
- Email response from Natural England



1c Swinegate Court East
3 Swinegate
York
YO1 8AJ

Kate Berry
Advisor – Cumbria Team
Natural England
Lake District National Park Building
Murley Moss Business Park
Oxenholme Road
Kendal
Cumbria
LA9 7RL

26 March 2019

Our Reference: 2022_3191/NE_DAS
Natural England Reference: 252221
Copeland BC Reference: 4/02/0505/0 [Haverigg III]

Dear Kate,

Haverigg II and III Wind Farms – Life Extension Applications –Breeding Season Ornithology Surveys and Non-Avian Ecology Surveys - Scope Confirmation

Further to DAS consultation with Natural England last year, Arcus has been commissioned to also undertake the necessary ornithology and non-avian ecology surveys in relation to a life extension of the adjacent Haverigg II wind farm (previous consultation was particularly in relation to Haverigg III wind farm). Surveys agreed on Haverigg III to date have therefore been undertaken for both sites.

The non-breeding season ornithological surveys at Haverigg III and Haverigg II wind farms were undertaken between September 2018 and March 2019. Arcus would now like to confirm the scope of the breeding season ornithology surveys and the non-avian ecology surveys with Natural England.

We will continue the monthly collision risk monitoring (carcass searches, along with observer efficiency and carcass persistence trials) until August 2019.

In addition, in line with the recommendations in an email from Natural England dated 18/09/2018, we will complete breeding bird survey and vantage point (VP) surveys during the breeding season.

During the bat activity season (April to August) the carcass searches for birds will be extended to include searches for bat casualties.

Arcus would be grateful if you could confirm that the methods for the surveys are suitable for assessing impacts of a proposed life extension on breeding birds and bats, particularly in relation to the proposed VP surveys (VP location, recording method and level of survey effort) and the bat survey methodology.

Scope of Breeding Season Ornithology Surveys

Collision Monitoring (April to August 2019)

Collision risk monitoring will continue with the same methods as during the non-breeding season (September 2018 to March 2019), with monthly searches for bird carcasses within a 50 m radius of each turbine base. Monthly carcass persistence and observer efficiency trials will also be completed to validate the results of the carcass searches.

Breeding Bird Survey (April to July 2019)

As requested by Natural England (NE) during initial consultation (via email dated 18/09/2019), a breeding bird survey will be completed, to map the territories of breeding birds within 500 m of the Site (access permitting). The survey will follow a reduced version of the British Trust for Ornithology's (BTO) Common Birds Census (CBC)¹ as this is considered to be the most appropriate method for the predominantly farmland habitats present on the Site. Four survey visits will be completed, at least seven days apart, between April and July 2019.

Vantage Point Surveys (May to mid-July 2019)

As requested by NE during initial consultation (via email dated 18/09/2019), Flight Activity Surveys will be undertaken between 1st May and 15th July 2019 to record flight activity of target species such as wildfowl, waders and protected raptors and owls, and to monitor the impacts of the Haverigg turbines on breeding gulls from the adjacent Morecambe Bay and Duddon Estuary Special Protection Area (SPA).

The level of gull flight activity has the potential to be high, and it may therefore be difficult to record gulls as target species with each flight mapped and detailed information recorded for each flight. We would therefore be grateful if you could confirm whether it is essential for gulls to be recorded as target species, or whether flight activity can be summarised (e.g., mapping of regular flight paths/areas of activity rather than mapping of individual flight lines, and a summary of overall numbers and flight height range).

A single VP location will be sufficient to cover the turbines within both Developments, and a surrounding 500 m buffer around them². A viewshed analysis will be carried out to identify the most suitable VP location.

This is based on a 2 km viewshed from the VP location, which is in line with current Scottish Natural Heritage (SNH) guidance³, but exceeds the 1 km viewshed recommended in the earlier NE guidance⁴. We consider that this approach is preferable to using a 1 km viewshed because:

- (a) all turbines would be within 1 km of the VP with only the 500 m buffer area extending beyond this; and
- (b) restricting viewsheds to 1 km would require an additional VP location, which (due to potential access restrictions) would likely be located within 500 m of the turbines and/or close to the SPA, which could affect flight behaviour of birds from the SPA and/or within 500 m of the turbines.

A total of 36 hours of watches per VP location will be carried out between 1st May and 15th July 2019. This meets the survey effort requirement in NE guidance⁵.

¹ Marchant, J. (1983) *Common Birds Census Instructions*. British Trust for Ornithology, Thetford.

² This is the recommended maximum buffer in the current Scottish Natural Heritage (2017) document, and the maximum buffer in the older NE guidance⁴.

³ Scottish Natural Heritage. (2017). *Recommended bird survey methods to inform impact assessment of onshore wind farms*.

⁴ Natural England. (2010). *Natural England Technical Information Note TIN069 Assessing the effects of onshore wind farms on birds*.

⁵ *ibid*

Scope of Bat Surveys

Desk Study (April 2019)

A data search request will be submitted to Cumbria Biodiversity Data Centre (CBDC) for bat records within 10 km of the wind farms, and a desk study search of online geographical data sources will be undertaken to identify known bat roosts and determine local distribution of bat species. The desk study will provide further information regarding bat species likely to use the site and therefore inform analysis of the collision monitoring element.

Ecological Appraisal and Preliminary Assessment for Bats (April 2019)

An onsite assessment of habitats for their potential to support commuting, foraging and roosting bats, will be undertaken on site, extending up to 200 m from the site boundaries. The survey will be undertaken by a licenced bat ecologist in order to identify any roosts, should they be present. The onsite assessment will determine features of value for bats.

Bat Collision Monitoring

New bat survey guidance⁶ puts emphasis on the importance of undertaking casualty searches around the existing turbines. In combination with a review of existing baseline information, site based assessment, knowledge gained during ornithology surveys (in terms of habitat distribution, flight paths by other animals and site conditions such as wind speed and exposure) it is considered the collision monitoring will provide a robust evidence base for assessment of the existing wind farm's impact on bats. Therefore, whilst carcass searches are undertaken as part of the ornithology surveys, during the 2019 bat survey season (April to August), additional survey effort for bats will be included, and alternative carcasses will be deployed to ensure the scavenging rates are applicable to bats as well as birds. This will be undertaken monthly between April and August with searches for bat carcasses within a 50 m radius of each turbine base. Monthly carcass persistence and observer efficiency trials will also be completed to validate the results of the carcass searches.

It would be much appreciated if you could confirm that the survey approach set out is considered to form an appropriate baseline for the Development and is acceptable to NE.

The surveys described in this letter will commence in April 2019, therefore we would be grateful if you are able to respond at your earliest opportunity, and by 12 April 2019 if possible.

Yours sincerely,



Mike Bird

Associate Director

⁶ Scottish Natural Heritage (January 2019). Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation. Available at: <https://www.nature.scot/sites/default/files/2019-01/Bats%20and%20onshore%20wind%20turbines%20-%20survey%2C%20assessment%20and%20mitigation.pdf> [accessed March 2019].

From: Berry, Kate <Kate.Berry@naturalengland.org.uk>
Sent: 29 March 2019 13:58
To: Mike Bird <mikeb@arcusconsulting.co.uk>
Subject: RE: NE response: Scope of Ecology and Ornithology Surveys

Hi Mike

I've discussed the scope of the surveys with Bart. Overall the scope is suitable, however as gulls are likely to be the main species impacted by the turbines they will need to be a target species as part of the vantage point surveys.

Kind regards

Kate

Kate Berry
Sustainable Development Adviser
Solway, Coast & Sustainable Development Team
Cumbria Area Team
Natural England
Murley Moss
Kendal, LA9 7RL
T: 0208 026 2178

Please note I do not work Wednesdays

<http://www.gov.uk/natural-england>

We are here to secure a healthy natural environment for people to enjoy, where wildlife is protected and England's traditional landscapes are safeguarded for future generations.

Do you need help negotiating your way through environmental legislation? Using Natural England's Discretionary Advice Service (DAS) at an early stage in the development of your proposals can help minimise delay, uncertainty and overall costs. There are three strands to this service: help with [Planning Applications](#), help with [Protected Species Mitigation Plans](#) and help with [Consent to carry out works on Sites of Special Scientific Interest \(SSSIs\)](#)

From: Mike Bird
Sent: 05 April 2019 13:11
To: Berry, Kate
Cc: Adrian Warman; Colin Palmer; Lisette Coiffait; Clare Walters
Subject: RE: NE response: Scope of Ecology and Ornithology Surveys

Hi Kate,

Thank you for confirming the survey scope is suitable.

The ecology and breeding season ornithology surveys will proceed as per the letter from Arcus to Natural England dated 26 March 2019 with gull species being included as target species in the surveys as requested.

Many thanks for the quick response on this – it's much appreciated.

Kind regards,

Mike

Michael Bird

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APPENDIX 4: SURVEY DETAILS

Full details of the 2019 breeding season surveys are presented in Tables A4.1 (carcass searches), A4.2 (BBS) and A4.3 (flight activity surveys) below.

Table A4.1: Details of the 2019 breeding season carcass searches

| Survey date | Turbine number | Search start time | Search end time | Weather conditions at start and end of search | | | | | Notable observations of birds and mammals |
|-------------|----------------|-------------------|-----------------|---|----------------|------|-------------|---|--|
| | | | | Wind speed | Wind direction | Rain | Cloud cover | Notes | |
| 21/03/19 | 1 | 13:53 | 14:25 | 3 | WSW | 0 | 8 | Much of the survey area around turbine 4 was flooded | <ul style="list-style-type: none"> • 150+ gulls in east of Site (mixed flock including lesser black-backed gull, herring gull, black-headed gull and great black-backed gull); • A barn owl was hunting around Haverigg II turbine 4; • 37 whooper swans flew north to the west of the Site at RSH; • Single mallard and raven flew through the turbine envelope |
| | 2 | 14:52 | 15:18 | | | | | | |
| | 3 | 16:12 | 16:40 | | | | | | |
| | 4 | 16:50 | 17:25 | | | | | | |
| 23/04/19 | 4 | 13:10 | 14:00 | 4 | E | 0 | 3 | | |
| | 3 | 14:05 | 14:45 | | | | | | |
| 24/04/19 | 2 | 10:13 | 11:05 | 5 | NE | 0 | 8-3 | High cloud | |
| | 1 | 11:28 | 12:20 | | | | | | |
| 16/05/19 | 1 | 16:34 | 17:18 | 4 | E | 0 | 1-2 | | |
| 17/05/19 | 2 | 09:46 | 10:28 | 2 | NNW | 0 | 5-3 | Significant remodelling of motocross tracks; rain overnight; strong sun from 14:00 | <ul style="list-style-type: none"> • Female sparrowhawk flew past turbine 2; • Kestrel hunting to south of turbine 4 |
| | 3 | 10:54 | 11:50 | | | | | | |
| | 4 | 12:14 | 13:40 | | | | | | |
| 20/06/19 | 4 | 16:09 | 16:57 | 3-2 | WNW | 0 | 2-1 | Vegetation height much increased since May, with sharp-flowered rush (<i>Juncus acutiflorus</i>) growing to knee height around turbine 4; significant hindrance to searching on some turbines | <ul style="list-style-type: none"> • Single oystercatcher and eight lapwing near turbine 4; • 153+ lesser black-backed and herring gulls east of turbines |
| | 3 | 17:04 | 17:42 | | | | | | |

| Survey date | Turbine number | Search start time | Search end time | Weather conditions at start and end of search | | | | | Notable observations of birds and mammals |
|--|----------------|-------------------|-----------------|---|----------------|------|-------------|--|---|
| | | | | Wind speed | Wind direction | Rain | Cloud cover | Notes | |
| 21/06/19 | 1 | 15:44 | 16:30 | 2/3-2 | WSW | 0 | 6-5 | Height of vegetation in motocross area now prohibitive; very bright light | |
| | 2 | 17:03 | 17:49 | | | | | | |
| 16/07/19 | 1 | 15:33 | 16:16 | 2-3 | WSW | 0 | 5-8 | Vegetation height prohibitive | <ul style="list-style-type: none"> • Fox tracks present near turbine 1; • A pair of oystercatcher observed on motocross track near turbine 1 |
| 17/07/19 | 2 | 10:13 | 10:45 | 3-5 | SSE/SW | 0-4 | 8 | Access around turbine 2 base restricted due to work at height vehicles; heavy rain from 12:30 (very heavy during search of turbine 4); visibility <1 km from 16:00 | <ul style="list-style-type: none"> • Fox tracks present near turbine 2; • Two oystercatcher flights (numbering 4 and 3 individuals) through turbine envelope; |
| | 3 | 11:17 | 12:03 | | | | | | |
| | 4 | 12:33 | 13:39 | | | | | | |
| 22/08/19 | 3 | 15:32 | 16:13 | 6-4 | SW | 0 | 8 | Some areas of turbine 4 flooded | <ul style="list-style-type: none"> • Overall - 60+ curlew including juveniles foraging in turbine envelope; • 200+ starling including juveniles foraging in turbine envelope; • 60+ herring gull including juveniles east of site, and several lesser black-backed including juveniles east of Site; • Sparrowhawk hunting through turbine 4 envelope |
| | 4 | 16:15 | 17:03 | | | | | | |
| 23/08/19 | 1 | 12:20 | 13:00 | 4-2 | SW | 0 | 8-3 | | |
| | 2 | 13:25 | 14:06 | | | | | | |
| Key: <ul style="list-style-type: none"> • Wind speed: according to Beaufort Scale • Wind direction: according to 16-point compass • Rain: 0 = None; 1 = Drizzle/Mist; 2 = Light showers; 3 = Heavy showers; 4 = Light rain; 5 = Heavy rain • Cloud cover: in eighths of sky (oktas) | | | | | | | | | |

Table A4.2: 2019 BBS times and hourly weather conditions

| Visit | Date | Observer | Start time | End time | Hour | Wind speed | Wind direction | Rain | Cloud cover | Cloud height | Visibility | Frost | Snow |
|-------|------------|----------|------------|----------|------|------------|----------------|------|-------------|--------------|------------|-------|------|
| 1 | 23/04/2019 | MH | 06:20 | 12:39 | 1 | 3 | NE | 0 | 7 | 2 | 2 | 0 | 0 |
| | | | | | 2 | 3 | NE | 0 | 7 | 2 | 2 | 0 | 0 |
| | | | | | 3 | 3 | NE | 0 | 7 | 2 | 2 | 0 | 0 |
| | | | | | 4 | 3 | NE | 0 | 8 | 2 | 2 | 0 | 0 |
| | | | | | 5 | 4 | E | 0 | 6 | 2 | 2 | 0 | 0 |
| | | | | | 6 | 4 | E | 0 | 4 | 2 | 2 | 0 | 0 |
| | | | | | 7 | 4 | E | 0 | 4 | 2 | 2 | 0 | 0 |
| 2 | 14/05/2019 | CG | 05:15 | 11:15 | 1 | 1 | SE | 0 | 3 | 2 | 1-2 | 0 | 0 |
| | | | | | 2 | 1 | SE | 0 | 2 | 2 | 2 | 0 | 0 |
| | | | | | 3 | 2 | SE | 0 | 2 | 2 | 2 | 0 | 0 |
| | | | | | 4 | 2 | SE | 0 | 4 | 2 | 2 | 0 | 0 |
| | | | | | 5 | 3 | SE | 0 | 4 | 2 | 2 | 0 | 0 |
| | | | | | 6 | 3 | SE | 0 | 5 | 2 | 2 | 0 | 0 |
| 3 | 13/06/2019 | CG | 05:15 | 11:15 | 1 | 1 | N | 3 | 8 | 1 | 1-2 | 0 | 0 |
| | | | | | 2 | 2 | N | 3 | 8 | 2 | 2 | 0 | 0 |
| | | | | | 3 | 2 | N | 5 | 8 | 1 | 1 | 0 | 0 |
| | | | | | 4 | 2 | N | 4 | 8 | 2 | 2 | 0 | 0 |
| | | | | | 5 | 2 | N | 2 | 8 | 2 | 2 | 0 | 0 |
| | | | | | 6 | 2 | N | 0 | 8 | 2 | 2 | 0 | 0 |
| 4 | 11/07/2019 | CG | 05:10 | 11:10 | 1 | 3 | SW | 1 | 8 | 1 | 1 | 0 | 0 |
| | | | | | 2 | 3 | SW | 0 | 8 | 1 | 1 | 0 | 0 |
| | | | | | 3 | 2 | W | 0 | 8 | 1 | 1 | 0 | 0 |
| | | | | | 4 | 2 | W | 2 | 8 | 1 | 2 | 0 | 0 |
| | | | | | 5 | 3 | SW | 2 | 8 | 2 | 2 | 0 | 0 |
| | | | | | 6 | 3 | SW | 0 | 7 | 2 | 2 | 0 | 0 |

Key:

- Observer: CG = Chris Gomersall; MH = Matt Harding
- Wind speed: according to Beaufort Scale
- Wind direction: according to 16-point compass
- Rain: 0 = None; 1 = Drizzle/Mist; 2 = Light showers; 3 = Heavy showers; 4 = Light rain; 5 = Heavy rain
- Cloud cover: in eighths of sky (oktas)
- Cloud height: 0 = <150 m; 1 = 150-500 m; 2 = >500 m
- Visibility: 0 = Poor (<1 km); 1 = Moderate (1-2 km); 2 = Good (>2 km)
- Frost: 0 = None; 1 = Ground frost; 2 = All day frost
- Snow: 0 = None; 1 = On site; 2 = On high ground

Table A4.3: 2019 breeding season flight activity survey times and hourly weather conditions

| Date | Start time | End time | Hour | Wind speed | Wind direction | Rain | Cloud | Cloud | Cloud | Visibility | Frost | Snow | Notes |
|------------|------------|----------|------|------------|----------------|------|-------|-------|-------|------------|-------|-------|-------|
| 13/05/2019 | 12:30 | 14:30 | 1 | 2-3 | SSW | 0 | 3 | 2 | 2 | 0 | 0 | | |
| | | | 2 | 3 | SSW | 0 | 4 | 2 | 2 | 0 | 0 | | |
| | 14:50 | 16:50 | 1 | 2 | SSW | 0 | 4 | 2 | 2 | 0 | 0 | | |
| | | | 2 | 2 | SW | 0 | 2 | 2 | 2 | 0 | 0 | | |
| | 17:10 | 19:10 | 1 | 1 | SW | 0 | 2 | 2 | 2 | 0 | 0 | | |
| | | | 2 | 1 | SW | 0 | 1 | 2 | 2 | 0 | 0 | | |
| 15/05/2019 | 05:15 | 07:15 | 1 | 2 | SE | 0 | 3 | 2 | 1-2 | 0 | 0 | | |
| | | | 2 | 0 | SE | 0 | 2 | 2 | 2 | 0 | 0 | | |
| | 07:35 | 09:35 | 1 | 2 | SE | 0 | 2 | 2 | 2 | 0 | 0 | | |
| | | | 2 | 3 | SE | 0 | 1 | 2 | 2 | 0 | 0 | | |
| | 09:55 | 11:55 | 1 | 3 | SE | 0 | 1 | 2 | 2 | 0 | 0 | | |
| | | | 2 | 3 | SE | 0 | 3 | 2 | 2 | 0 | 0 | | |
| 12/06/2019 | 15:05 | 17:05 | 1 | 2 | NNE | 1 | 8 | 2 | 2 | 0 | 0 | 14 °C | |
| | | | 2 | 3 | NNE | 4 | 8 | 2 | 2 | 0 | 0 | 14 °C | |
| | 17:25 | 19:25 | 1 | 3 | NNE | 5 | 8 | 1 | 2 | 0 | 0 | 13 °C | |
| | | | 2 | 2 | NNE | 4 | 8 | 1 | 1 | 0 | 0 | 12 °C | |
| | 19:45 | 21:45 | 1 | 2 | NE | 4 | 8 | 1 | 2 | 0 | 0 | 11 °C | |
| | | | 2 | 2 | N | 4 | 8 | 1 | 1 | 0 | 0 | 11 °C | |
| 14/06/2019 | 05:15 | 07:15 | 1 | 2 | S | 0 | 5 | 2 | 2 | 0 | 0 | 9 °C | |
| | | | 2 | 2 | S | 2 | 7 | 2 | 2 | 0 | 0 | 9 °C | |
| | 07:35 | 09:35 | 1 | 2 | S | 5 | 8 | 1 | 2 | 0 | 0 | 9 °C | |
| | | | 2 | 2 | S | 3 | 8 | 1 | 2 | 0 | 0 | 9 °C | |
| | 09:55 | 11:55 | 1 | 2 | S | 4 | 8 | 1 | 2 | 0 | 0 | 9 °C | |
| | | | 2 | 1 | S | 5 | 8 | 1 | 1 | 0 | 0 | 9 °C | |
| 10/07/2019 | 15:05 | 17:05 | 1 | 3 | WSW | 0 | 7 | 2 | 2 | 0 | 0 | | |
| | | | 2 | 3 | WSW | 0 | 8 | 2 | 2 | 0 | 0 | | |
| | 17:25 | 19:25 | 1 | 2 | SW | 0 | 8 | 2 | 2 | 0 | 0 | | |
| | | | 2 | 2 | SW | 0 | 5 | 2 | 2 | 0 | 0 | | |
| | 19:45 | 21:45 | 1 | 2 | SW | 0 | 7 | 2 | 2 | 0 | 0 | | |
| | | | 2 | 2 | SW | 0 | 5 | 2 | 1-2 | 0 | 0 | | |
| 12/07/2019 | 05:10 | 07:10 | 1 | 2 | NW | 1-4 | 8 | 1 | 1-2 | 0 | 0 | | |
| | | | 2 | 2 | NW | 5 | 8 | 1 | 1 | 0 | 0 | | |
| | 07:30 | 09:30 | 1 | 2 | NW | 4 | 8 | 1 | 1 | 0 | 0 | | |
| | | | 2 | 3 | NW | 2 | 8 | 1 | 1 | 0 | 0 | | |
| | 09:50 | 11:50 | 1 | 3 | NW | 4 | 8 | 1 | 1 | 0 | 0 | | |
| | | | 2 | 3 | NW | 2 | 8 | 1 | 2 | 0 | 0 | | |

Key:

- Wind speed: according to Beaufort Scale
- Wind direction: according to 16-point compass
- Rain: 0 = None; 1 = Drizzle/Mist; 2 = Light showers; 3 = Heavy showers; 4 = Light rain; 5 = Heavy rain
- Cloud cover: in eighths of sky (oktas)
- Cloud height: 0 = <150 m; 1 = 150-500 m; 2 = >500 m
- Visibility: 0 = Poor (<1 km); 1 = Moderate (1-2 km); 2 = Good (>2 km)
- Frost: 0 = None; 1 = Ground frost; 2 = All day frost
- Snow: 0 = None; 1 = On site; 2 = On high ground

APPENDIX 5: DETAILS OF TARGET SPECIES FLIGHTS

Details of each target species flight recorded during the 2019 breeding season flight activity surveys are presented below in Table A5.1. All flights were recorded by Chris Gomersall. Shaded flights are at least partially at RSH.

Table A5.1: Details of each target species flight recorded during the 2019 breeding season flight activity surveys*

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|---------------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| Greylag Goose | 12/06/2019 | 16:52 | 193 | 4 | Transit | 418 | Horiz |
| | 12/06/2019 | 19:04 | 102 | 7 | Transit | 458 | Bullet |
| | 12/06/2019 | 21:36 | 91 | 4 | Transit | 513 | Bullet |
| | 14/06/2019 | 08:59 | 226 | 6 | Transit | 627 | Bullet |
| Mallard | 12/06/2019 | 16:32 | 106 | 2 | Transit | 406 | Bullet |
| | 12/06/2019 | 18:07 | 136 | 3 | Transit | 437 | Bullet |
| | 14/06/2019 | 06:07 | 104 | 2 | Transit | 550 | Bullet |
| | 14/06/2019 | 11:48 | 179 | 3 | Transit | 665 | Bullet |
| Grey Heron | 15/05/2019 | 09:19 | 174 | 1 | Transit | 215 | Bullet |
| Little Egret | 12/07/2019 | 07:52 | 171 | 3 | Transit | 849 | Bullet |
| | 12/07/2019 | 10:58 | 98 | 1 | Transit | 885 | Bullet |
| Gannet | 12/06/2019 | 20:09 | 191 | 1 | Transit | 478 | Horiz |
| Oystercatcher | 13/05/2019 | 12:41 | 71 | 2 | Transit | 268 | Bullet |
| | 13/05/2019 | 13:37 | 109 | 2 | Courtship | 281 | Bullet |
| | 13/05/2019 | 13:59 | 86 | 1 | Courtship | 287 | Bullet |
| | 13/05/2019 | 14:14 | 72 | 3 | Courtship | 290 | Bullet |
| | 13/05/2019 | 14:27 | 71 | 2 | Courtship | 299 | Bullet |
| | 13/05/2019 | 16:02 | 76 | 2 | Courtship | 321 | Bullet |
| | 13/05/2019 | 16:19 | 61 | 2 | Transit | 329 | Bullet |
| | 13/05/2019 | 16:30 | 109 | 2 | Transit | 333 | Bullet |
| | 13/05/2019 | 16:42 | 124 | 1 | Courtship | 340 | Bullet |
| | 13/05/2019 | 16:47 | 61 | 2 | Transit | 343 | Bullet |
| | 13/05/2019 | 17:17 | 93 | 1 | Courtship | 348 | Bullet |
| | 13/05/2019 | 18:41 | 88 | 1 | Courtship | 367 | Bullet |
| | 15/05/2019 | 05:36 | 68 | 1 | Transit | 110 | Bullet |
| | 15/05/2019 | 06:11 | 108 | 3 | Courtship | 121 | Bullet |
| | 15/05/2019 | 06:39 | 61 | 2 | Transit | 134 | Bullet |
| | 15/05/2019 | 07:04 | 68 | 1 | Courtship | 151 | Bullet |
| 15/05/2019 | 07:09 | 70 | 2 | Transit | 157 | Bullet | |
| 15/05/2019 | 07:43 | 93 | 2 | Courtship | 168 | Bullet | |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|----------------------------|
| | 15/05/2019 | 07:52 | 80 | 1 | Transit | 171 | Bullet |
| | 15/05/2019 | 08:22 | 66 | 1 | Transit | 182 | Bullet |
| | 15/05/2019 | 08:58 | 68 | 1 | Transit | 196 | Bullet |
| | 15/05/2019 | 09:09 | 87 | 2 | Courtship | 203 | Bullet |
| | 15/05/2019 | 09:13 | 66 | 2 | Transit | 207 | Other (flushed by buzzard) |
| | 15/05/2019 | 09:16 | 105 | 5 | Transit | 208 | Other (flushed by buzzard) |
| | 15/05/2019 | 09:27 | 89 | 1 | Transit | 222 | Bullet |
| | 15/05/2019 | 09:32 | 111 | 3 | Courtship | 226 | Bullet |
| | 15/05/2019 | 10:22 | 79 | 1 | Transit | 238 | Bullet |
| | 15/05/2019 | 11:19 | 81 | 1 | Transit | 253 | Bullet |
| | 15/05/2019 | 11:32 | 97 | 2 | Transit | 257 | Bullet |
| | 15/05/2019 | 11:45 | 78 | 2 | Transit | 261 | Bullet |
| | 12/06/2019 | 15:15 | 59 | 1 | Transit | 379 | Bullet |
| | 12/06/2019 | 15:18 | 66 | 1 | Transit | 381 | Bullet |
| | 12/06/2019 | 15:30 | 64 | 2 | Transit | 387 | Bullet |
| | 12/06/2019 | 15:46 | 70 | 1 | Courtship | 393 | Bullet |
| | 12/06/2019 | 16:28 | 66 | 1 | Courtship | 404 | Bullet |
| | 12/06/2019 | 16:42 | 79 | 2 | Courtship | 413 | Bullet |
| | 12/06/2019 | 17:40 | 87 | 1 | Courtship | 430 | Bullet |
| | 12/06/2019 | 17:59 | 59 | 2 | Courtship | 436 | Bullet |
| | 12/06/2019 | 18:29 | 64 | 1 | Courtship | 442 | Bullet |
| | 12/06/2019 | 18:59 | 76 | 1 | Courtship | 455 | Bullet |
| | 12/06/2019 | 19:48 | 91 | 1 | Courtship | 471 | Bullet |
| | 12/06/2019 | 21:19 | 91 | 1 | Courtship | 503 | Bullet |
| | 14/06/2019 | 05:51 | 81 | 1 | Courtship | 539 | Bullet |
| | 14/06/2019 | 06:25 | 65 | 1 | Courtship | 564 | Bullet |
| | 14/06/2019 | 06:58 | 72 | 1 | Courtship | 584 | Bullet |
| | 14/06/2019 | 07:02 | 57 | 1 | Courtship | 588 | Bullet |
| | 14/06/2019 | 07:10 | 98 | 2 | Courtship | 593 | Bullet |
| | 14/06/2019 | 07:58 | 104 | 1 | Courtship | 606 | Bullet |
| | 14/06/2019 | 09:03 | 92 | 2 | Courtship | 629 | Bullet |
| | 14/06/2019 | 09:07 | 64 | 1 | Transit | 632 | Bullet |
| | 14/06/2019 | 10:46 | 119 | 1 | Courtship | 650 | Bullet |
| | 14/06/2019 | 11:21 | 104 | 2 | Courtship | 660 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|----------------------------|
| | 10/07/2019 | 15:31 | 63 | 1 | Transit | 675 | Bullet |
| | 10/07/2019 | 15:36 | 109 | 4 | Transit | 678 | Bullet |
| | 10/07/2019 | 16:14 | 57 | 3 | Courtship | 689 | Bullet |
| | 10/07/2019 | 17:39 | 72 | 2 | Courtship | 721 | Bullet |
| | 10/07/2019 | 18:23 | 93 | 2 | Courtship | 734 | Bullet |
| | 10/07/2019 | 19:13 | 84 | 1 | Courtship | 754 | Bullet |
| | 10/07/2019 | 19:49 | 119 | 2 | Courtship | 760 | Bullet |
| | 12/07/2019 | 06:02 | 81 | 1 | Courtship | 813 | Bullet |
| | 12/07/2019 | 06:21 | 69 | 2 | Transit | 821 | Bullet |
| | 12/07/2019 | 06:32 | 98 | 2 | Courtship | 829 | Bullet |
| | 12/07/2019 | 07:05 | 71 | 1 | Transit | 840 | Bullet |
| | 12/07/2019 | 07:39 | 156 | 5 | Courtship | 846 | Bullet |
| | 12/07/2019 | 07:59 | 82 | 2 | Courtship | 850 | Bullet |
| | 12/07/2019 | 08:21 | 76 | 1 | Transit | 854 | Bullet |
| | 12/07/2019 | 08:46 | 93 | 2 | Transit | 859 | Bullet |
| | 12/07/2019 | 09:14 | 77 | 3 | Courtship | 868 | Bullet |
| | 12/07/2019 | 10:03 | 95 | 3 | Courtship | 873 | Bullet |
| | 12/07/2019 | 10:24 | 62 | 4 | Courtship | 876 | Bullet |
| | 12/07/2019 | 10:56 | 132 | 6 | Courtship | 884 | Bullet |
| | 12/07/2019 | 11:06 | 74 | 4 | Courtship | 889 | Bullet |
| Lapwing | 13/05/2019 | 16:45 | 92 | 1 | Transit | 342 | Bullet |
| | 15/05/2019 | 09:16 | 105 | 6 | Transit | 209 | Other (flushed by buzzard) |
| | 12/07/2019 | 06:42 | 159 | 22 | Transit | 833 | Bullet |
| | 12/07/2019 | 10:40 | 178 | 26 | Transit | 880 | Bullet |
| Whimbrel | 13/05/2019 | 15:26 | 172 | 5 | Transit | 312 | Bullet |
| | 13/05/2019 | 15:54 | 91 | 2 | Transit | 319 | Bullet |
| | 13/05/2019 | 16:32 | 128 | 5 | Transit | 334 | Bullet |
| | 13/05/2019 | 18:33 | 141 | 12 | Transit | 364 | Bullet |
| | 15/05/2019 | 06:48 | 92 | 2 | Transit | 137 | Bullet |
| | 15/05/2019 | 06:53 | 78 | 4 | Transit | 140 | Bullet |
| | 15/05/2019 | 07:14 | 59 | 3 | Transit | 163 | Bullet |
| | 15/05/2019 | 09:26 | 83 | 4 | Transit | 221 | Bullet |
| | 15/05/2019 | 10:28 | 93 | 2 | Transit | 241 | Bullet |
| | 12/07/2019 | 18:46 | 118 | 1 | Transit | 743 | Bullet |
| Curlew | 10/07/2019 | 16:40 | 73 | 11 | Transit | 701 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|---------------------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| | 10/07/2019 | 17:04 | 52 | 4 | Transit | 714 | Bullet |
| | 10/07/2019 | 17:32 | 91 | 12 | Transit | 719 | Bullet |
| | 10/07/2019 | 18:13 | 92 | 23 | Transit | 731 | Weave |
| | 10/07/2019 | 18:36 | 116 | 14 | Transit | 738 | Bullet |
| | 10/07/2019 | 18:46 | 118 | 17 | Transit | 742 | Bullet |
| | 10/07/2019 | 19:05 | 92 | 7 | Transit | 750 | Bullet |
| | 10/07/2019 | 19:16 | 129 | 4 | Transit | 756 | Bullet |
| | 10/07/2019 | 20:11 | 116 | 16 | Transit | 766 | Bullet |
| | 10/07/2019 | 21:18 | 96 | 4 | Transit | 786 | Bullet |
| | 12/07/2019 | 06:26 | 112 | 5 | Transit | 824 | Bullet |
| | 12/07/2019 | 06:35 | 172 | 90 | Transit | 831 | Bullet |
| | 12/07/2019 | 06:58 | 87 | 4 | Transit | 838 | Bullet |
| | 12/07/2019 | 08:04 | 106 | 11 | Transit | 851 | Bullet |
| | 12/07/2019 | 08:38 | 101 | 4 | Transit | 857 | Bullet |
| | 12/07/2019 | 11:39 | 132 | 5 | Transit | 895 | Bullet |
| Black-tailed Godwit | 12/07/2019 | 06:58 | 87 | 3 | Transit | 837 | Bullet |
| Black-headed Gull | 13/05/2019 | 12:56 | 73 | 2 | Transit | 272 | Bullet |
| | 13/05/2019 | 15:42 | 93 | 2 | Transit | 316 | Bullet |
| | 13/05/2019 | 16:44 | 78 | 2 | Transit | 341 | Bullet |
| | 13/05/2019 | 18:05 | 87 | 1 | Transit | 358 | Bullet |
| | 13/05/2019 | 19:06 | 81 | 3 | Transit | 372 | Bullet |
| | 15/05/2019 | 05:38 | 124 | 6 | Transit | 111 | Bullet |
| | 15/05/2019 | 05:51 | 96 | 8 | Transit | 116 | Bullet |
| | 15/05/2019 | 06:24 | 119 | 4 | Transit | 126 | Bullet |
| | 15/05/2019 | 06:38 | 125 | 3 | Transit | 133 | Bullet |
| | 15/05/2019 | 07:01 | 78 | 2 | Transit | 147 | Bullet |
| | 15/05/2019 | 07:04 | 86 | 2 | Transit | 150 | Bullet |
| | 15/05/2019 | 07:57 | 79 | 6 | Transit | 175 | Bullet |
| | 15/05/2019 | 08:06 | 106 | 3 | Transit | 178 | Bullet |
| | 15/05/2019 | 08:47 | 132 | 2 | Transit | 190 | Bullet |
| | 15/05/2019 | 10:09 | 127 | 2 | Transit | 233 | Bullet |
| | 15/05/2019 | 10:13 | 139 | 3 | Transit | 234 | Bullet |
| | 15/05/2019 | 10:25 | 116 | 4 | Transit | 240 | Bullet |
| | 15/05/2019 | 11:52 | 109 | 2 | Transit | 264 | Bullet |
| 12/06/2019 | 15:39 | 109 | 2 | Transit | 391 | Bullet | |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-------------------------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| | 12/06/2019 | 16:05 | 118 | 1 | Transit | 399 | Bullet |
| | 12/06/2019 | 16:19 | 71 | 1 | Transit | 402 | Bullet |
| | 12/06/2019 | 16:45 | 108 | 1 | Transit | 415 | Bullet |
| | 12/06/2019 | 16:59 | 94 | 1 | Transit | 420 | Bullet |
| | 12/06/2019 | 18:45 | 108 | 3 | Transit | 447 | Bullet |
| | 12/06/2019 | 18:54 | 94 | 2 | Transit | 452 | Bullet |
| | 12/06/2019 | 19:07 | 81 | 2 | Transit | 460 | Bullet |
| | 12/06/2019 | 19:12 | 108 | 2 | Transit | 463 | Bullet |
| | 12/06/2019 | 19:16 | 93 | 4 | Transit | 466 | Bullet |
| | 12/06/2019 | 20:05 | 116 | 1 | Transit | 477 | Bullet |
| | 12/06/2019 | 20:43 | 95 | 3 | Transit | 490 | Bullet |
| | 12/06/2019 | 21:21 | 109 | 6 | Transit | 504 | Bullet |
| | 14/06/2019 | 05:45 | 91 | 2 | Transit | 535 | Bullet |
| | 14/06/2019 | 06:34 | 119 | 1 | Transit | 569 | Bullet |
| | 14/06/2019 | 06:38 | 87 | 1 | Transit | 573 | Bullet |
| | 14/06/2019 | 07:04 | 91 | 2 | Transit | 590 | Bullet |
| | 14/06/2019 | 07:43 | 90 | 4 | Transit | 601 | Bullet |
| | 14/06/2019 | 08:14 | 107 | 5 | Transit | 610 | Bullet |
| | 14/06/2019 | 08:48 | 114 | 2 | Transit | 619 | Bullet |
| | 14/06/2019 | 08:55 | 121 | 3 | Transit | 624 | Bullet |
| | 14/06/2019 | 09:06 | 106 | 2 | Transit | 631 | Bullet |
| | 14/06/2019 | 09:22 | 172 | 3 | Transit | 636 | Bullet |
| | 14/06/2019 | 10:06 | 115 | 4 | Transit | 642 | Bullet |
| | 14/06/2019 | 10:54 | 94 | 3 | Transit | 652 | Bullet |
| | 10/07/2019 | 16:01 | 103 | 2 | Transit | 685 | Bullet |
| | 10/07/2019 | 16:30 | 116 | 3 | Transit | 695 | Bullet |
| | 10/07/2019 | 17:52 | 117 | 2 | Transit | 725 | Bullet |
| | 12/07/2019 | 08:11 | 88 | 2 | Transit | 852 | Bullet |
| | 12/07/2019 | 08:53 | 127 | 4 | Transit | 861 | Bullet |
| | 12/07/2019 | 10:51 | 113 | 3 | Transit | 882 | Bullet |
| | 12/07/2019 | 11:09 | 86 | 1 | Transit | 890 | Bullet |
| Common Gull | 15/05/2019 | 07:08 | 82 | 2 | | 156 | Bullet |
| Great Black-backed Gull | 10/07/2019 | 16:03 | 112 | 1 | Transit | 686 | Bullet |
| | 10/07/2019 | 17:45 | 119 | 4 | Transit | 723 | Bullet |
| | 10/07/2019 | 18:24 | 108 | 2 | Transit | 735 | Bullet |
| | 12/07/2019 | 06:29 | 97 | 2 | Transit | 826 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|--------------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| | 12/07/2019 | 11:02 | 168 | 1 | Transit | 888 | Bullet |
| Herring Gull | 13/05/2019 | 12:32 | 129 | 8 | Transit | 265 | Bullet |
| | 13/05/2019 | 12:44 | 136 | 7 | Transit | 270 | Bullet |
| | 13/05/2019 | 13:07 | 140 | 50 | Transit | 273 | Bullet |
| | 13/05/2019 | 13:16 | 124 | 17 | Transit | 276 | Bullet |
| | 13/05/2019 | 13:22 | 95 | 8 | Transit | 277 | Bullet |
| | 13/05/2019 | 13:28 | 112 | 3 | Transit | 279 | Bullet |
| | 13/05/2019 | 13:49 | 138 | 11 | Transit | 284 | Bullet |
| | 13/05/2019 | 13:54 | 93 | 5 | Transit | 285 | Bullet |
| | 13/05/2019 | 14:08 | 81 | 4 | Transit | 289 | Bullet |
| | 13/05/2019 | 14:17 | 78 | 7 | Transit | 291 | Bullet |
| | 13/05/2019 | 14:20 | 84 | 8 | Transit | 293 | Bullet |
| | 13/05/2019 | 14:21 | 122 | 7 | Transit | 294 | Bullet |
| | 13/05/2019 | 14:22 | 127 | 4 | Transit | 295 | Bullet |
| | 13/05/2019 | 14:24 | 91 | 6 | Transit | 297 | Bullet |
| | 13/05/2019 | 14:28 | 137 | 8 | Transit | 301 | Bullet |
| | 13/05/2019 | 14:54 | 118 | 5 | Transit | 305 | Bullet |
| | 13/05/2019 | 15:08 | 114 | 4 | Transit | 308 | Bullet |
| | 13/05/2019 | 15:34 | 103 | 6 | Transit | 313 | Bullet |
| | 13/05/2019 | 15:51 | 116 | 9 | Transit | 318 | Bullet |
| | 13/05/2019 | 15:58 | 87 | 7 | Transit | 320 | Bullet |
| | 13/05/2019 | 16:03 | 134 | 9 | Transit | 323 | Bullet |
| | 13/05/2019 | 16:07 | 118 | 7 | Transit | 325 | Bullet |
| | 13/05/2019 | 16:16 | 107 | 6 | Transit | 327 | Bullet |
| | 13/05/2019 | 16:23 | 119 | 6 | Transit | 330 | Bullet |
| | 13/05/2019 | 16:28 | 138 | 5 | Transit | 332 | Bullet |
| | 13/05/2019 | 16:35 | 112 | 2 | Transit | 336 | Bullet |
| | 13/05/2019 | 16:37 | 96 | 4 | Transit | 337 | Bullet |
| | 13/05/2019 | 16:40 | 117 | 6 | Transit | 338 | Bullet |
| | 13/05/2019 | 16:48 | 138 | 2 | Transit | 344 | Bullet |
| | 13/05/2019 | 16:48 | 116 | 4 | Transit | 345 | Bullet |
| | 13/05/2019 | 17:14 | 142 | 3 | Transit | 347 | Bullet |
| | 13/05/2019 | 17:25 | 94 | 4 | Transit | 350 | Bullet |
| 13/05/2019 | 17:31 | 107 | 4 | Transit | 352 | Bullet | |
| 13/05/2019 | 17:46 | 114 | 3 | Transit | 354 | Bullet | |
| 13/05/2019 | 17:56 | 115 | 3 | Transit | 357 | Bullet | |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| | 13/05/2019 | 18:19 | 136 | 4 | Transit | 360 | Bullet |
| | 13/05/2019 | 18:31 | 81 | 2 | Transit | 363 | Bullet |
| | 13/05/2019 | 18:37 | 108 | 6 | Transit | 365 | Bullet |
| | 13/05/2019 | 18:46 | 127 | 4 | Transit | 368 | Bullet |
| | 13/05/2019 | 18:55 | 122 | 14 | Transit | 369 | Bullet |
| | 15/05/2019 | 05:16 | 64 | 16 | Transit | 103 | Bullet |
| | 15/05/2019 | 05:21 | 107 | 30 | Transit | 105 | Bullet |
| | 15/05/2019 | 05:25 | 132 | 17 | Transit | 107 | Bullet |
| | 15/05/2019 | 05:25 | 132 | 5 | Transit | 108 | Bullet |
| | 15/05/2019 | 05:43 | 96 | 24 | Transit | 112 | Bullet |
| | 15/05/2019 | 05:44 | 73 | 7 | Transit | 113 | Bullet |
| | 15/05/2019 | 05:48 | 128 | 4 | Transit | 115 | Bullet |
| | 15/05/2019 | 06:02 | 103 | 9 | Transit | 119 | Bullet |
| | 15/05/2019 | 06:06 | 139 | 6 | Transit | 120 | Bullet |
| | 15/05/2019 | 06:18 | 106 | 4 | Transit | 123 | Bullet |
| | 15/05/2019 | 06:22 | 132 | 4 | Transit | 125 | Bullet |
| | 15/05/2019 | 06:29 | 109 | 8 | Transit | 128 | Bullet |
| | 15/05/2019 | 06:33 | 139 | 6 | Transit | 129 | Bullet |
| | 15/05/2019 | 06:37 | 106 | 3 | Transit | 132 | Bullet |
| | 15/05/2019 | 06:42 | 112 | 6 | Transit | 135 | Bullet |
| | 15/05/2019 | 06:44 | 127 | 3 | Transit | 136 | Bullet |
| | 15/05/2019 | 06:49 | 116 | 5 | Transit | 138 | Bullet |
| | 15/05/2019 | 06:56 | 94 | 3 | Transit | 141 | Bullet |
| | 15/05/2019 | 06:58 | 108 | 4 | Transit | 143 | Bullet |
| | 15/05/2019 | 07:00 | 123 | 3 | Transit | 145 | Bullet |
| | 15/05/2019 | 07:02 | 108 | 4 | Transit | 148 | Bullet |
| | 15/05/2019 | 07:08 | 121 | 3 | Transit | 155 | Bullet |
| | 15/05/2019 | 07:11 | 129 | 5 | Transit | 158 | Bullet |
| | 15/05/2019 | 07:12 | 109 | 8 | Transit | 160 | Bullet |
| | 15/05/2019 | 07:13 | 73 | 2 | Transit | 162 | Bullet |
| | 15/05/2019 | 07:36 | 88 | 5 | Transit | 164 | Bullet |
| | 15/05/2019 | 07:38 | 136 | 2 | Transit | 166 | Bullet |
| | 15/05/2019 | 07:41 | 119 | 3 | Transit | 167 | Bullet |
| | 15/05/2019 | 07:46 | 111 | 3 | Transit | 170 | Bullet |
| | 15/05/2019 | 07:54 | 94 | 4 | Transit | 172 | Bullet |
| | 15/05/2019 | 08:12 | 122 | 4 | Transit | 179 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|----------------------------|
| | 15/05/2019 | 08:16 | 113 | 3 | Transit | 181 | Bullet |
| | 15/05/2019 | 08:28 | 119 | 7 | Transit | 183 | Bullet |
| | 15/05/2019 | 08:33 | 121 | 2 | Transit | 185 | Bullet |
| | 15/05/2019 | 08:43 | 118 | 5 | Transit | 187 | Bullet |
| | 15/05/2019 | 08:44 | 99 | 2 | Transit | 189 | Bullet |
| | 15/05/2019 | 08:51 | 128 | 3 | Transit | 191 | Bullet |
| | 15/05/2019 | 08:57 | 124 | 2 | Transit | 194 | Bullet |
| | 15/05/2019 | 09:01 | 91 | 4 | Transit | 198 | Bullet |
| | 15/05/2019 | 09:04 | 112 | 3 | Transit | 199 | Bullet |
| | 15/05/2019 | 09:06 | 110 | 4 | Transit | 201 | Bullet |
| | 15/05/2019 | 09:08 | 118 | 3 | Transit | 202 | Bullet |
| | 15/05/2019 | 09:10 | 121 | 3 | Transit | 204 | Bullet |
| | 15/05/2019 | 09:12 | 113 | 4 | Transit | 206 | Bullet |
| | 15/05/2019 | 09:16 | 120 | 30 | Transit | 210 | Other (flushed by buzzard) |
| | 15/05/2019 | 09:18 | 112 | 6 | Transit | 212 | Bullet |
| | 15/05/2019 | 09:19 | 116 | 2 | Transit | 214 | Bullet |
| | 15/05/2019 | 09:21 | 122 | 4 | Transit | 216 | Bullet |
| | 15/05/2019 | 09:24 | 117 | 2 | Transit | 219 | Bullet |
| | 15/05/2019 | 09:26 | 124 | 5 | Transit | 220 | Bullet |
| | 15/05/2019 | 09:29 | 138 | 3 | Transit | 223 | Bullet |
| | 15/05/2019 | 09:30 | 106 | 6 | Transit | 224 | Bullet |
| | 15/05/2019 | 09:32 | 116 | 4 | Transit | 227 | Bullet |
| | 15/05/2019 | 09:58 | 125 | 4 | Transit | 229 | Bullet |
| | 15/05/2019 | 10:06 | 106 | 2 | Transit | 232 | Bullet |
| | 15/05/2019 | 10:14 | 129 | 4 | Transit | 235 | Bullet |
| | 15/05/2019 | 10:17 | 117 | 5 | Transit | 237 | Bullet |
| | 15/05/2019 | 10:28 | 122 | 2 | Transit | 242 | Bullet |
| | 15/05/2019 | 10:38 | 138 | 3 | Transit | 244 | Bullet |
| | 15/05/2019 | 10:44 | 107 | 5 | Transit | 245 | Bullet |
| | 15/05/2019 | 11:04 | 128 | 2 | Transit | 249 | Bullet |
| | 15/05/2019 | 11:08 | 144 | 3 | Transit | 251 | Bullet |
| | 15/05/2019 | 11:31 | 141 | 6 | Transit | 255 | Bullet |
| | 15/05/2019 | 11:34 | 159 | 11 | Transit | 258 | Bullet |
| | 15/05/2019 | 11:41 | 121 | 3 | Transit | 260 | Bullet |
| | 15/05/2019 | 11:49 | 86 | 3 | Transit | 262 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| | 12/06/2019 | 15:06 | 52 | 4 | Transit | 373 | Bullet |
| | 12/06/2019 | 15:09 | 118 | 2 | Transit | 375 | Bullet |
| | 12/06/2019 | 15:11 | 123 | 5 | Transit | 376 | Bullet |
| | 12/06/2019 | 15:12 | 72 | 2 | Transit | 377 | Bullet |
| | 12/06/2019 | 15:17 | 127 | 2 | Transit | 380 | Bullet |
| | 12/06/2019 | 15:20 | 85 | 6 | Transit | 382 | Bullet |
| | 12/06/2019 | 15:21 | 103 | 3 | Transit | 383 | Weave |
| | 12/06/2019 | 15:26 | 107 | 1 | Transit | 385 | Bullet |
| | 12/06/2019 | 15:27 | 68 | 4 | Transit | 386 | Bullet |
| | 12/06/2019 | 15:35 | 114 | 3 | Transit | 389 | Bullet |
| | 12/06/2019 | 15:41 | 116 | 3 | Transit | 392 | Bullet |
| | 12/06/2019 | 15:49 | 103 | 2 | Transit | 394 | Bullet |
| | 12/06/2019 | 15:57 | 128 | 6 | Transit | 396 | Bullet |
| | 12/06/2019 | 15:58 | 161 | 4 | Transit | 397 | Bullet |
| | 12/06/2019 | 16:12 | 148 | 5 | Transit | 400 | Bullet |
| | 12/06/2019 | 16:16 | 82 | 3 | Transit | 401 | Bullet |
| | 12/06/2019 | 16:31 | 117 | 5 | Transit | 405 | Bullet |
| | 12/06/2019 | 16:33 | 101 | 4 | Transit | 407 | Bullet |
| | 12/06/2019 | 16:35 | 116 | 2 | Transit | 408 | Bullet |
| | 12/06/2019 | 16:37 | 133 | 3 | Transit | 409 | Bullet |
| | 12/06/2019 | 16:39 | 119 | 6 | Transit | 411 | Bullet |
| | 12/06/2019 | 16:41 | 174 | 7 | Transit | 412 | Bullet |
| | 12/06/2019 | 16:44 | 91 | 3 | Transit | 414 | Bullet |
| | 12/06/2019 | 16:48 | 125 | 2 | Transit | 416 | Bullet |
| | 12/06/2019 | 16:54 | 117 | 11 | Transit | 419 | Bullet |
| | 12/06/2019 | 17:01 | 123 | 5 | Transit | 421 | Bullet |
| | 12/06/2019 | 17:03 | 126 | 3 | Transit | 423 | Bullet |
| | 12/06/2019 | 17:25 | 109 | 4 | Transit | 424 | Bullet |
| | 12/06/2019 | 17:28 | 118 | 3 | Transit | 426 | Bullet |
| | 12/06/2019 | 17:34 | 114 | 2 | Transit | 428 | Bullet |
| | 12/06/2019 | 17:37 | 132 | 4 | Transit | 429 | Bullet |
| | 12/06/2019 | 17:47 | 111 | 5 | Transit | 432 | Bullet |
| | 12/06/2019 | 17:50 | 94 | 3 | Transit | 433 | Bullet |
| | 12/06/2019 | 17:56 | 91 | 4 | Transit | 435 | Bullet |
| | 12/06/2019 | 18:14 | 107 | 3 | Transit | 438 | Bullet |
| | 12/06/2019 | 18:22 | 116 | 3 | Transit | 440 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| | 12/06/2019 | 18:34 | 119 | 6 | Transit | 443 | Bullet |
| | 12/06/2019 | 18:40 | 127 | 4 | Transit | 445 | Bullet |
| | 12/06/2019 | 18:48 | 142 | 12 | Transit | 449 | Bullet |
| | 12/06/2019 | 18:51 | 107 | 2 | Transit | 450 | Bullet |
| | 12/06/2019 | 18:53 | 86 | 5 | Transit | 451 | Bullet |
| | 12/06/2019 | 18:57 | 88 | 3 | Transit | 453 | Bullet |
| | 12/06/2019 | 18:58 | 139 | 4 | Transit | 454 | Bullet |
| | 12/06/2019 | 19:01 | 163 | 9 | Transit | 457 | Bullet |
| | 12/06/2019 | 19:05 | 122 | 6 | Transit | 459 | Bullet |
| | 12/06/2019 | 19:09 | 128 | 7 | Transit | 461 | Bullet |
| | 12/06/2019 | 19:14 | 136 | 14 | Transit | 464 | Bullet |
| | 12/06/2019 | 19:18 | 128 | 5 | Transit | 467 | Bullet |
| | 12/06/2019 | 19:19 | 91 | 3 | Transit | 468 | Bullet |
| | 12/06/2019 | 19:22 | 132 | 3 | Transit | 470 | Bullet |
| | 12/06/2019 | 19:54 | 131 | 5 | Transit | 473 | Bullet |
| | 12/06/2019 | 19:56 | 139 | 6 | Transit | 474 | Bullet |
| | 12/06/2019 | 20:04 | 134 | 3 | Transit | 476 | Bullet |
| | 12/06/2019 | 20:14 | 96 | 2 | Transit | 480 | Bullet |
| | 12/06/2019 | 20:19 | 146 | 14 | Transit | 481 | Bullet |
| | 12/06/2019 | 20:22 | 114 | 6 | Transit | 483 | Weave |
| | 12/06/2019 | 20:27 | 78 | 3 | Transit | 485 | Bullet |
| | 12/06/2019 | 20:31 | 111 | 4 | Transit | 486 | Bullet |
| | 12/06/2019 | 20:32 | 63 | 6 | Transit | 487 | Bullet |
| | 12/06/2019 | 20:38 | 114 | 2 | Transit | 488 | Bullet |
| | 12/06/2019 | 20:49 | 129 | 4 | Transit | 491 | Bullet |
| | 12/06/2019 | 20:54 | 154 | 5 | Transit | 493 | Bullet |
| | 12/06/2019 | 21:01 | 123 | 1 | Transit | 496 | Bullet |
| | 12/06/2019 | 21:06 | 131 | 12 | Transit | 498 | Bullet |
| | 12/06/2019 | 21:10 | 74 | 5 | Transit | 499 | Bullet |
| | 12/06/2019 | 21:14 | 96 | 7 | Transit | 501 | Bullet |
| | 12/06/2019 | 21:16 | 143 | 1 | Transit | 502 | Bullet |
| | 12/06/2019 | 21:24 | 146 | 14 | Transit | 505 | Bullet |
| | 12/06/2019 | 21:25 | 98 | 5 | Transit | 506 | Bullet |
| | 12/06/2019 | 21:30 | 67 | 3 | Transit | 509 | Bullet |
| | 12/06/2019 | 21:32 | 104 | 19 | Transit | 510 | Bullet |
| | 12/06/2019 | 21:34 | 122 | 7 | Transit | 512 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| | 12/06/2019 | 21:39 | 80 | 2 | Transit | 515 | Bullet |
| | 12/06/2019 | 21:42 | 79 | 3 | Transit | 517 | LOW |
| | 12/06/2019 | 21:43 | 93 | 2 | Transit | 518 | Bullet |
| | 12/06/2019 | 21:44 | 129 | 2 | Transit | 519 | Bullet |
| | 14/06/2019 | 05:15 | 108 | 2 | Transit | 520 | Bullet |
| | 14/06/2019 | 05:20 | 133 | 2 | Transit | 523 | Bullet |
| | 14/06/2019 | 05:23 | 116 | 4 | Transit | 524 | Bullet |
| | 14/06/2019 | 05:27 | 123 | 5 | Transit | 527 | Bullet |
| | 14/06/2019 | 05:29 | 111 | 6 | Transit | 528 | Bullet |
| | 14/06/2019 | 05:31 | 107 | 2 | Transit | 529 | Bullet |
| | 14/06/2019 | 05:36 | 122 | 2 | Transit | 531 | Bullet |
| | 14/06/2019 | 05:38 | 102 | 3 | Transit | 532 | Bullet |
| | 14/06/2019 | 05:46 | 129 | 6 | Transit | 536 | Bullet |
| | 14/06/2019 | 05:48 | 97 | 5 | Transit | 537 | Bullet |
| | 14/06/2019 | 05:54 | 108 | 6 | Transit | 541 | Bullet |
| | 14/06/2019 | 05:56 | 129 | 9 | Transit | 542 | Bullet |
| | 14/06/2019 | 05:59 | 138 | 7 | Transit | 544 | Weave |
| | 14/06/2019 | 06:01 | 116 | 3 | Transit | 545 | Bullet |
| | 14/06/2019 | 06:04 | 134 | 5 | Transit | 547 | Bullet |
| | 14/06/2019 | 06:06 | 152 | 11 | Transit | 549 | Bullet |
| | 14/06/2019 | 06:09 | 109 | 6 | Transit | 551 | Bullet |
| | 14/06/2019 | 06:13 | 160 | 7 | Transit | 553 | Bullet |
| | 14/06/2019 | 06:16 | 132 | 7 | Transit | 555 | Bullet |
| | 14/06/2019 | 06:18 | 156 | 10 | Transit | 557 | Bullet |
| | 14/06/2019 | 06:20 | 108 | 5 | Transit | 558 | Bullet |
| | 14/06/2019 | 06:21 | 126 | 4 | Transit | 559 | Bullet |
| | 14/06/2019 | 06:22 | 108 | 4 | Transit | 561 | Bullet |
| | 14/06/2019 | 06:25 | 148 | 3 | Transit | 563 | Bullet |
| | 14/06/2019 | 06:27 | 137 | 2 | Transit | 565 | Bullet |
| | 14/06/2019 | 06:28 | 112 | 3 | Transit | 566 | Bullet |
| | 14/06/2019 | 06:32 | 104 | 3 | Transit | 568 | Bullet |
| | 14/06/2019 | 06:38 | 138 | 6 | Transit | 572 | Bullet |
| | 14/06/2019 | 06:40 | 106 | 3 | Transit | 574 | Bullet |
| | 14/06/2019 | 06:42 | 149 | 7 | Transit | 575 | Bullet |
| | 14/06/2019 | 06:45 | 144 | 2 | Transit | 577 | Bullet |
| | 14/06/2019 | 06:51 | 93 | 4 | Transit | 580 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| | 14/06/2019 | 06:53 | 114 | 5 | Transit | 581 | Bullet |
| | 14/06/2019 | 06:55 | 148 | 5 | Transit | 582 | Bullet |
| | 14/06/2019 | 06:56 | 119 | 3 | Transit | 583 | Bullet |
| | 14/06/2019 | 06:59 | 128 | 4 | Transit | 585 | Bullet |
| | 14/06/2019 | 07:00 | 143 | 3 | Transit | 586 | Bullet |
| | 14/06/2019 | 07:02 | 112 | 7 | Transit | 589 | Bullet |
| | 14/06/2019 | 07:05 | 127 | 2 | Transit | 591 | Bullet |
| | 14/06/2019 | 07:12 | 84 | 4 | Transit | 594 | Bullet |
| | 14/06/2019 | 07:13 | 116 | 3 | Transit | 596 | Bullet |
| | 14/06/2019 | 07:36 | 123 | 3 | Transit | 597 | Bullet |
| | 14/06/2019 | 07:41 | 117 | 2 | Transit | 599 | Bullet |
| | 14/06/2019 | 07:50 | 102 | 3 | Transit | 603 | Bullet |
| | 14/06/2019 | 07:53 | 136 | 2 | Transit | 604 | Bullet |
| | 14/06/2019 | 07:56 | 119 | 4 | Transit | 605 | Bullet |
| | 14/06/2019 | 08:21 | 142 | 4 | Transit | 611 | Bullet |
| | 14/06/2019 | 08:29 | 146 | 5 | Transit | 613 | Bullet |
| | 14/06/2019 | 08:43 | 114 | 5 | Transit | 616 | Bullet |
| | 14/06/2019 | 08:45 | 93 | 7 | Transit | 617 | Bullet |
| | 14/06/2019 | 08:51 | 111 | 2 | Transit | 620 | Bullet |
| | 14/06/2019 | 08:53 | 135 | 4 | Transit | 622 | Bullet |
| | 14/06/2019 | 08:57 | 138 | 3 | Transit | 625 | Bullet |
| | 14/06/2019 | 08:58 | 106 | 2 | Transit | 626 | Bullet |
| | 14/06/2019 | 09:01 | 129 | 2 | Transit | 628 | Bullet |
| | 14/06/2019 | 09:10 | 138 | 9 | Transit | 633 | Bullet |
| | 14/06/2019 | 09:18 | 129 | 4 | Transit | 635 | Bullet |
| | 14/06/2019 | 09:30 | 114 | 2 | Transit | 638 | Bullet |
| | 14/06/2019 | 09:33 | 163 | 4 | Transit | 639 | Bullet |
| | 14/06/2019 | 09:57 | 121 | 3 | Transit | 640 | Bullet |
| | 14/06/2019 | 10:02 | 139 | 5 | Transit | 641 | Bullet |
| | 14/06/2019 | 10:21 | 132 | 2 | Transit | 644 | Bullet |
| | 14/06/2019 | 10:29 | 141 | 3 | Transit | 646 | Bullet |
| | 14/06/2019 | 10:36 | 137 | 2 | Transit | 647 | Bullet |
| | 14/06/2019 | 10:43 | 156 | 5 | Transit | 649 | Bullet |
| | 14/06/2019 | 10:51 | 149 | 4 | Transit | 651 | Bullet |
| | 14/06/2019 | 10:58 | 131 | 5 | Transit | 653 | Bullet |
| | 14/06/2019 | 11:04 | 118 | 2 | Transit | 655 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|-----------------------|-------------|------------------------------|
| | 14/06/2019 | 11:11 | 132 | 4 | Transit | 658 | Bullet |
| | 14/06/2019 | 11:14 | 79 | 3 | Transit | 659 | Bullet |
| | 14/06/2019 | 11:27 | 122 | 3 | Transit | 661 | Bullet |
| | 14/06/2019 | 11:36 | 129 | 2 | Transit | 663 | Weave |
| | 14/06/2019 | 11:52 | 124 | 4 | Transit | 666 | Bullet |
| | 10/07/2019 | 15:09 | 86 | 3 | Transit | 668 | Bullet |
| | 10/07/2019 | 15:14 | 131 | 4 | Transit | 669 | Bullet |
| | 10/07/2019 | 15:19 | 103 | 3 | Transit | 671 | Bullet |
| | 10/07/2019 | 15:26 | 122 | 5 | Transit | 673 | Bullet |
| | 10/07/2019 | 15:34 | 12 | 6 | Transit | 676 | Bullet |
| | 10/07/2019 | 15:45 | 106 | 5 | Transit and courtship | 680 | Bullet (chasing sparrowhawk) |
| | 10/07/2019 | 15:54 | 125 | 6 | Transit | 683 | Bullet |
| | 10/07/2019 | 16:08 | 99 | 5 | Transit | 687 | Bullet |
| | 10/07/2019 | 16:12 | 134 | 7 | Transit | 688 | Bullet |
| | 10/07/2019 | 16:17 | 113 | 3 | Transit | 690 | Bullet |
| | 10/07/2019 | 16:22 | 138 | 7 | Transit | 692 | Bullet |
| | 10/07/2019 | 15:51 | 98 | 4 | Transit | 682 | Bullet |
| | 10/07/2019 | 16:26 | 132 | 9 | Transit | 693 | Bullet |
| | 10/07/2019 | 16:29 | 127 | 4 | Transit | 694 | Bullet |
| | 10/07/2019 | 16:37 | 142 | 7 | Transit | 698 | Bullet |
| | 10/07/2019 | 16:38 | 93 | 2 | Transit | 699 | Bullet |
| | 10/07/2019 | 16:40 | 136 | 5 | Transit | 700 | Bullet |
| | 10/07/2019 | 16:42 | 129 | 2 | Transit | 702 | Bullet |
| | 10/07/2019 | 16:44 | 107 | 4 | Transit | 704 | Bullet |
| | 10/07/2019 | 16:46 | 88 | 6 | Transit | 706 | Bullet |
| | 10/07/2019 | 16:49 | 102 | 5 | Transit | 708 | Bullet |
| | 10/07/2019 | 16:52 | 137 | 5 | Transit | 710 | Bullet |
| | 10/07/2019 | 16:59 | 163 | 13 | Transit | 713 | Bullet |
| | 10/07/2019 | 17:27 | 133 | 5 | Transit | 718 | Bullet |
| | 10/07/2019 | 17:36 | 139 | 6 | Transit | 720 | Bullet |
| | 10/07/2019 | 17:48 | 142 | 7 | Transit | 724 | Bullet |
| | 10/07/2019 | 17:55 | 108 | 3 | Transit | 726 | Bullet |
| | 10/07/2019 | 17:59 | 124 | 2 | Transit | 727 | Bullet |
| | 10/07/2019 | 18:04 | 119 | 5 | Transit | 728 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| | 10/07/2019 | 18:10 | 117 | 2 | Transit | 730 | Bullet |
| | 10/07/2019 | 18:19 | 143 | 6 | Transit | 733 | Bullet |
| | 10/07/2019 | 18:29 | 129 | 5 | Transit | 736 | Bullet |
| | 10/07/2019 | 18:37 | 125 | 4 | Transit | 739 | Bullet |
| | 10/07/2019 | 18:40 | 136 | 7 | Transit | 740 | Bullet |
| | 10/07/2019 | 18:42 | 91 | 4 | Transit | 741 | Bullet |
| | 10/07/2019 | 18:52 | 134 | 4 | Transit | 746 | Bullet |
| | 10/07/2019 | 18:57 | 139 | 6 | Transit | 748 | Bullet |
| | 10/07/2019 | 19:09 | 139 | 5 | Transit | 752 | Bullet |
| | 10/07/2019 | 19:15 | 112 | 3 | Transit | 755 | Bullet |
| | 10/07/2019 | 19:23 | 127 | 5 | Transit | 758 | Bullet |
| | 10/07/2019 | 19:47 | 122 | 5 | Transit | 759 | Bullet |
| | 10/07/2019 | 19:56 | 136 | 2 | Transit | 762 | Bullet |
| | 10/07/2019 | 19:59 | 126 | 3 | Transit | 763 | Bullet |
| | 10/07/2019 | 20:15 | 136 | 4 | Transit | 767 | Bullet |
| | 10/07/2019 | 20:18 | 103 | 2 | Transit | 768 | Bullet |
| | 10/07/2019 | 20:24 | 127 | 3 | Transit | 769 | Bullet |
| | 10/07/2019 | 20:31 | 117 | 2 | Transit | 772 | Bullet |
| | 10/07/2019 | 20:33 | 128 | 4 | Transit | 773 | Bullet |
| | 10/07/2019 | 20:42 | 123 | 3 | Transit | 775 | Bullet |
| | 10/07/2019 | 20:44 | 148 | 13 | Transit | 776 | Bullet |
| | 10/07/2019 | 20:46 | 131 | 3 | Transit | 777 | Bullet |
| | 10/07/2019 | 20:56 | 124 | 6 | Transit | 779 | Bullet |
| | 10/07/2019 | 21:04 | 143 | 6 | Transit | 781 | Bullet |
| | 10/07/2019 | 21:09 | 125 | 7 | Transit | 783 | Bullet |
| | 10/07/2019 | 21:15 | 129 | 8 | Transit | 785 | Bullet |
| | 10/07/2019 | 21:20 | 139 | 2 | Transit | 787 | Bullet |
| | 10/07/2019 | 21:24 | 98 | 3 | Transit | 789 | Bullet |
| | 10/07/2019 | 21:27 | 149 | 3 | Transit | 791 | Bullet |
| | 10/07/2019 | 21:29 | 118 | 3 | Transit | 792 | Bullet |
| | 10/07/2019 | 21:33 | 106 | 3 | Transit | 794 | Bullet |
| | 10/07/2019 | 21:36 | 152 | 2 | Transit | 795 | Bullet |
| | 10/07/2019 | 21:42 | 117 | 1 | Transit | 797 | Bullet |
| | 12/07/2019 | 05:12 | 134 | 4 | Transit | 800 | Bullet |
| | 12/07/2019 | 05:16 | 117 | 2 | Transit | 801 | Bullet |
| | 12/07/2019 | 05:21 | 126 | 5 | Transit | 802 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|--------------------------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------------|
| | 12/07/2019 | 05:29 | 137 | 4 | Transit | 804 | Bullet |
| | 12/07/2019 | 05:37 | 116 | 5 | Transit | 806 | Bullet |
| | 12/07/2019 | 05:47 | 142 | 2 | Transit | 809 | Bullet |
| | 12/07/2019 | 05:53 | 147 | 6 | Transit | 810 | Bullet |
| | 12/07/2019 | 05:59 | 164 | 5 | Transit | 812 | Bullet |
| | 12/07/2019 | 06:03 | 117 | 3 | Transit | 814 | Bullet |
| | 12/07/2019 | 06:09 | 122 | 4 | Transit | 816 | Bullet |
| | 12/07/2019 | 06:14 | 108 | 4 | Transit | 818 | Bullet |
| | 12/07/2019 | 06:17 | 133 | 5 | Transit | 819 | Bullet |
| | 12/07/2019 | 06:25 | 107 | 2 | Transit | 823 | Bullet |
| | 12/07/2019 | 06:28 | 142 | 4 | Transit | 825 | Bullet |
| | 12/07/2019 | 06:29 | 129 | 3 | Transit | 827 | Bullet |
| | 12/07/2019 | 06:33 | 130 | 5 | Transit | 830 | Bullet |
| | 12/07/2019 | 06:48 | 108 | 7 | Transit | 834 | Bullet |
| | 12/07/2019 | 06:51 | 136 | 3 | Transit | 835 | Bullet |
| | 12/07/2019 | 07:01 | 121 | 5 | Transit | 839 | Bullet |
| | 12/07/2019 | 07:08 | 142 | 7 | Transit | 841 | Bullet |
| | 12/07/2019 | 07:31 | 95 | 4 | Transit | 844 | Bullet |
| | 12/07/2019 | 07:46 | 136 | 6 | Transit | 847 | Bullet |
| | 12/07/2019 | 07:49 | 149 | 2 | Transit | 848 | Bullet |
| | 12/07/2019 | 08:13 | 146 | 3 | Transit | 853 | Bullet |
| | 12/07/2019 | 08:27 | 138 | 5 | Transit | 855 | Bullet |
| | 12/07/2019 | 08:33 | 129 | 3 | Transit | 856 | Bullet |
| | 12/07/2019 | 08:56 | 108 | 3 | Transit | 862 | Not recorded |
| | 12/07/2019 | 09:02 | 124 | 3 | Transit | 865 | Bullet |
| | 12/07/2019 | 09:19 | 133 | 4 | Transit | 869 | Bullet |
| | 12/07/2019 | 09:08 | 128 | 3 | Transit | 867 | Bullet |
| | 12/07/2019 | 09:54 | 136 | 3 | Transit | 872 | Bullet |
| | 12/07/2019 | 10:34 | 137 | 4 | Transit | 877 | Bullet |
| | 12/07/2019 | 10:38 | 122 | 2 | Transit | 879 | Bullet |
| | 12/07/2019 | 10:54 | 144 | 3 | Transit | 883 | Bullet |
| | 12/07/2019 | 10:59 | 153 | 5 | Transit | 886 | Bullet |
| | 12/07/2019 | 11:32 | 117 | 2 | Transit | 894 | Bullet |
| | 12/07/2019 | 11:17 | 148 | 3 | Transit | 892 | Bullet |
| Lesser Black-backed Gull | 13/05/2019 | 12:38 | 95 | 6 | Transit | 267 | Bullet |
| | 13/05/2019 | 12:44 | 136 | 2 | Transit | 269 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| | 13/05/2019 | 12:47 | 82 | 1 | Transit | 271 | Bullet |
| | 13/05/2019 | 13:07 | 140 | 30 | Transit | 274 | Bullet |
| | 13/05/2019 | 13:16 | 124 | 12 | Transit | 275 | Bullet |
| | 13/05/2019 | 13:22 | 95 | 6 | Transit | 278 | Bullet |
| | 13/05/2019 | 13:28 | 112 | 5 | Transit | 280 | Bullet |
| | 13/05/2019 | 13:41 | 82 | 3 | Transit | 282 | Bullet |
| | 13/05/2019 | 13:45 | 97 | 2 | Transit | 283 | Bullet |
| | 13/05/2019 | 13:56 | 114 | 3 | Transit | 286 | Bullet |
| | 13/05/2019 | 14:06 | 144 | 2 | Transit | 288 | Bullet |
| | 13/05/2019 | 14:18 | 109 | 4 | Transit | 292 | Bullet |
| | 13/05/2019 | 14:22 | 86 | 4 | Transit | 296 | Bullet |
| | 13/05/2019 | 14:25 | 148 | 5 | Transit | 298 | Bullet |
| | 13/05/2019 | 14:27 | 67 | 3 | Transit | 300 | Bullet |
| | 13/05/2019 | 14:28 | 72 | 2 | Transit | 302 | Bullet |
| | 13/05/2019 | 14:59 | 88 | 3 | Transit | 306 | Bullet |
| | 13/05/2019 | 15:02 | 107 | 2 | Transit | 307 | Bullet |
| | 13/05/2019 | 15:11 | 82 | 5 | Transit | 309 | Bullet |
| | 13/05/2019 | 15:17 | 126 | 4 | Transit | 310 | Bullet |
| | 13/05/2019 | 15:20 | 133 | 3 | Transit | 311 | Bullet |
| | 13/05/2019 | 15:34 | 103 | 5 | Transit | 314 | Bullet |
| | 13/05/2019 | 15:37 | 75 | 3 | Transit | 315 | Bullet |
| | 13/05/2019 | 15:49 | 149 | 6 | Transit | 317 | Bullet |
| | 13/05/2019 | 16:03 | 134 | 4 | Transit | 322 | Bullet |
| | 13/05/2019 | 16:07 | 118 | 11 | Transit | 324 | Bullet |
| | 13/05/2019 | 16:09 | 124 | 5 | Transit | 326 | Bullet |
| | 13/05/2019 | 16:16 | 107 | 2 | Transit | 328 | Bullet |
| | 13/05/2019 | 16:27 | 89 | 3 | Transit | 331 | Bullet |
| | 13/05/2019 | 16:35 | 112 | 3 | Transit | 335 | Bullet |
| | 13/05/2019 | 16:40 | 117 | 4 | Transit | 339 | Bullet |
| | 13/05/2019 | 17:14 | 142 | 6 | Transit | 346 | Bullet |
| | 13/05/2019 | 17:21 | 109 | 2 | Transit | 349 | Bullet |
| | 13/05/2019 | 17:31 | 107 | 3 | Transit | 351 | Bullet |
| | 13/05/2019 | 17:39 | 129 | 2 | Transit | 353 | Bullet |
| | 13/05/2019 | 17:46 | 114 | 2 | Transit | 355 | Bullet |
| | 13/05/2019 | 17:52 | 123 | 4 | Transit | 356 | Bullet |
| | 13/05/2019 | 18:19 | 136 | 8 | Transit | 359 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| | 13/05/2019 | 18:23 | 98 | 4 | Transit | 361 | Bullet |
| | 13/05/2019 | 18:31 | 81 | 5 | Transit | 362 | Bullet |
| | 13/05/2019 | 18:37 | 108 | 3 | Transit | 366 | Bullet |
| | 13/05/2019 | 18:55 | 122 | 8 | Transit | 370 | Bullet |
| | 13/05/2019 | 19:02 | 76 | 6 | Transit | 371 | Bullet |
| | 15/05/2019 | 05:16 | 64 | 9 | Transit | 104 | Bullet |
| | 15/05/2019 | 05:21 | 107 | 20 | Transit | 106 | Bullet |
| | 15/05/2019 | 05:32 | 111 | 12 | Transit | 109 | Bullet |
| | 15/05/2019 | 05:44 | 73 | 5 | Transit | 114 | Bullet |
| | 15/05/2019 | 05:57 | 122 | 5 | Transit | 117 | Bullet |
| | 15/05/2019 | 06:02 | 103 | 4 | Transit | 118 | Bullet |
| | 15/05/2019 | 06:15 | 124 | 2 | Transit | 122 | Bullet |
| | 15/05/2019 | 06:22 | 132 | 5 | Transit | 124 | Bullet |
| | 15/05/2019 | 06:27 | 112 | 3 | Transit | 127 | Bullet |
| | 15/05/2019 | 06:33 | 139 | 3 | Transit | 130 | Bullet |
| | 15/05/2019 | 06:35 | 103 | 4 | Transit | 131 | Bullet |
| | 15/05/2019 | 06:51 | 123 | 4 | Transit | 139 | Bullet |
| | 15/05/2019 | 06:56 | 94 | 2 | Transit | 142 | Bullet |
| | 15/05/2019 | 06:58 | 108 | 3 | Transit | 144 | Bullet |
| | 15/05/2019 | 07:01 | 102 | 4 | Transit | 146 | Bullet |
| | 15/05/2019 | 07:04 | 124 | 3 | Transit | 149 | Bullet |
| | 15/05/2019 | 07:05 | 137 | 3 | Transit | 152 | Bullet |
| | 15/05/2019 | 07:06 | 106 | 2 | Transit | 153 | Bullet |
| | 15/05/2019 | 07:08 | 121 | 5 | Transit | 154 | Bullet |
| | 15/05/2019 | 07:11 | 114 | 6 | Transit | 159 | Bullet |
| | 15/05/2019 | 07:13 | 73 | 4 | Transit | 161 | Bullet |
| | 15/05/2019 | 07:38 | 136 | 3 | Transit | 165 | Bullet |
| | 15/05/2019 | 07:46 | 111 | 2 | Transit | 169 | Bullet |
| | 15/05/2019 | 07:54 | 94 | 2 | Transit | 174 | Bullet |
| | 15/05/2019 | 07:59 | 108 | 2 | Transit | 176 | Bullet |
| | 15/05/2019 | 08:04 | 115 | 5 | Transit | 177 | Bullet |
| | 15/05/2019 | 08:12 | 122 | 4 | Transit | 180 | Bullet |
| | 15/05/2019 | 08:28 | 119 | 4 | Transit | 184 | Bullet |
| | 15/05/2019 | 08:41 | 107 | 4 | Transit | 186 | Bullet |
| | 15/05/2019 | 08:43 | 118 | 3 | Transit | 188 | Bullet |
| | 15/05/2019 | 08:53 | 107 | 2 | Transit | 192 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| | 15/05/2019 | 08:55 | 139 | 5 | Transit | 193 | Bullet |
| | 15/05/2019 | 08:57 | 124 | 3 | Transit | 195 | Bullet |
| | 15/05/2019 | 09:00 | 119 | 5 | Transit | 197 | Bullet |
| | 15/05/2019 | 09:05 | 126 | 5 | Transit | 200 | Bullet |
| | 15/05/2019 | 09:10 | 98 | 6 | Transit | 205 | Bullet |
| | 15/05/2019 | 09:16 | 120 | 30 | Transit | 211 | Bullet |
| | 15/05/2019 | 09:19 | 131 | 3 | Transit | 213 | Bullet |
| | 15/05/2019 | 09:22 | 104 | 2 | Transit | 217 | Bullet |
| | 15/05/2019 | 09:24 | 129 | 3 | Transit | 218 | Bullet |
| | 15/05/2019 | 09:30 | 106 | 2 | Transit | 225 | Bullet |
| | 15/05/2019 | 09:33 | 132 | 3 | Transit | 228 | Bullet |
| | 15/05/2019 | 09:58 | 125 | 5 | Transit | 230 | Bullet |
| | 15/05/2019 | 10:02 | 112 | 7 | Transit | 231 | Bullet |
| | 15/05/2019 | 10:17 | 117 | 6 | Transit | 236 | Bullet |
| | 15/05/2019 | 10:22 | 113 | 2 | Transit | 239 | Bullet |
| | 15/05/2019 | 10:36 | 101 | 5 | Transit | 243 | Bullet |
| | 15/05/2019 | 10:44 | 107 | 2 | Transit | 246 | Bullet |
| | 15/05/2019 | 10:53 | 126 | 4 | Transit | 247 | Bullet |
| | 15/05/2019 | 10:59 | 131 | 3 | Transit | 248 | Bullet |
| | 15/05/2019 | 11:04 | 128 | 4 | Transit | 250 | Bullet |
| | 15/05/2019 | 11:16 | 98 | 2 | Transit | 252 | Bullet |
| | 15/05/2019 | 11:23 | 135 | 2 | Transit | 254 | Bullet |
| | 15/05/2019 | 11:31 | 141 | 5 | Transit | 256 | Bullet |
| | 15/05/2019 | 11:36 | 127 | 5 | Transit | 259 | Bullet |
| | 15/05/2019 | 11:49 | 86 | 3 | Transit | 263 | Bullet |
| | 15/05/2019 | 12:33 | 114 | 4 | Transit | 266 | Bullet |
| | 12/06/2019 | 15:08 | 88 | 3 | Transit | 374 | Bullet |
| | 12/06/2019 | 15:14 | 136 | 2 | Transit | 378 | Bullet |
| | 12/06/2019 | 15:24 | 91 | 4 | Transit | 384 | Bullet |
| | 12/06/2019 | 15:32 | 149 | 4 | Transit | 388 | Bullet |
| | 12/06/2019 | 15:37 | 82 | 4 | Transit | 390 | Bullet |
| | 12/06/2019 | 15:54 | 117 | 5 | Transit | 395 | Bullet |
| | 12/06/2019 | 16:03 | 109 | 3 | Transit | 398 | Bullet |
| | 12/06/2019 | 16:22 | 98 | 2 | Transit | 403 | Bullet |
| | 12/06/2019 | 16:37 | 133 | 1 | Transit | 410 | Bullet |
| | 12/06/2019 | 16:48 | 125 | 4 | Transit | 417 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| | 12/06/2019 | 17:02 | 83 | 2 | Transit | 422 | Bullet |
| | 12/06/2019 | 17:27 | 93 | 2 | Transit | 425 | Bullet |
| | 12/06/2019 | 17:32 | 127 | 3 | Transit | 427 | Bullet |
| | 12/06/2019 | 17:46 | 141 | 6 | Transit | 431 | Weave |
| | 12/06/2019 | 17:54 | 116 | 2 | Transit | 434 | Bullet |
| | 12/06/2019 | 18:17 | 139 | 2 | Transit | 439 | Bullet |
| | 12/06/2019 | 18:27 | 125 | 5 | Transit | 441 | Bullet |
| | 12/06/2019 | 18:37 | 138 | 3 | Transit | 444 | Bullet |
| | 12/06/2019 | 18:42 | 117 | 2 | Transit | 446 | Bullet |
| | 12/06/2019 | 18:48 | 142 | 4 | Transit | 448 | Bullet |
| | 12/06/2019 | 19:01 | 163 | 6 | Transit | 456 | Bullet |
| | 12/06/2019 | 19:10 | 113 | 4 | Transit | 462 | Bullet |
| | 12/06/2019 | 19:15 | 99 | 3 | Transit | 465 | Weave |
| | 12/06/2019 | 19:20 | 113 | 2 | Transit | 469 | Bullet |
| | 12/06/2019 | 19:51 | 119 | 2 | Transit | 472 | Bullet |
| | 12/06/2019 | 19:59 | 123 | 2 | Transit | 475 | Bullet |
| | 12/06/2019 | 20:11 | 135 | 3 | Transit | 479 | Bullet |
| | 12/06/2019 | 20:19 | 146 | 9 | Transit | 482 | Bullet |
| | 12/06/2019 | 20:27 | 78 | 3 | Transit | 484 | Bullet |
| | 12/06/2019 | 20:40 | 128 | 2 | Transit | 489 | Bullet |
| | 12/06/2019 | 20:52 | 119 | 2 | Transit | 492 | Bullet |
| | 12/06/2019 | 20:54 | 154 | 6 | Transit | 494 | Bullet |
| | 12/06/2019 | 20:57 | 115 | 3 | Transit | 495 | Bullet |
| | 12/06/2019 | 21:03 | 114 | 2 | Transit | 497 | Bullet |
| | 12/06/2019 | 21:10 | 74 | 4 | Transit | 500 | Bullet |
| | 12/06/2019 | 21:28 | 72 | 3 | Transit | 507 | Bullet |
| | 12/06/2019 | 21:29 | 93 | 2 | Transit | 508 | Bullet |
| | 12/06/2019 | 21:33 | 148 | 14 | Transit | 511 | Bullet |
| | 12/06/2019 | 21:38 | 109 | 3 | Transit | 514 | Bullet |
| | 12/06/2019 | 21:41 | 61 | 2 | Transit | 516 | Bullet |
| | 14/06/2019 | 05:17 | 131 | 2 | Transit | 521 | Bullet |
| | 14/06/2019 | 05:18 | 109 | 3 | Transit | 522 | Bullet |
| | 14/06/2019 | 05:23 | 116 | 2 | Transit | 525 | Bullet |
| | 14/06/2019 | 05:26 | 115 | 3 | Transit | 526 | Bullet |
| | 14/06/2019 | 05:34 | 103 | 4 | Transit | 530 | Bullet |
| | 14/06/2019 | 05:40 | 139 | 2 | Transit | 533 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| | 14/06/2019 | 05:43 | 125 | 4 | Transit | 534 | Bullet |
| | 14/06/2019 | 05:48 | 97 | 6 | Transit | 538 | Bullet |
| | 14/06/2019 | 05:53 | 130 | 4 | Transit | 540 | Bullet |
| | 14/06/2019 | 05:59 | 138 | 5 | Transit | 543 | Weave |
| | 14/06/2019 | 06:03 | 121 | 8 | Transit | 546 | Bullet |
| | 14/06/2019 | 06:04 | 134 | 3 | Transit | 548 | Bullet |
| | 14/06/2019 | 06:11 | 117 | 4 | Transit | 552 | Bullet |
| | 14/06/2019 | 06:14 | 96 | 2 | Transit | 554 | Bullet |
| | 14/06/2019 | 06:17 | 143 | 4 | Transit | 556 | Bullet |
| | 14/06/2019 | 06:22 | 119 | 3 | Transit | 560 | Bullet |
| | 14/06/2019 | 06:23 | 112 | 2 | Transit | 562 | Bullet |
| | 14/06/2019 | 06:30 | 132 | 2 | Transit | 567 | Bullet |
| | 14/06/2019 | 06:35 | 148 | 2 | Transit | 570 | Bullet |
| | 14/06/2019 | 06:36 | 152 | 3 | Transit | 571 | Bullet |
| | 14/06/2019 | 06:44 | 162 | 4 | Transit | 576 | Bullet |
| | 14/06/2019 | 06:48 | 109 | 2 | Transit | 578 | Bullet |
| | 14/06/2019 | 06:50 | 126 | 3 | Transit | 579 | Bullet |
| | 14/06/2019 | 07:00 | 143 | 4 | Transit | 587 | Bullet |
| | 14/06/2019 | 07:08 | 121 | 3 | Transit | 592 | Bullet |
| | 14/06/2019 | 07:13 | 116 | 2 | Transit | 595 | Bullet |
| | 14/06/2019 | 07:38 | 134 | 2 | Transit | 598 | Bullet |
| | 14/06/2019 | 07:41 | 117 | 3 | Transit | 600 | Bullet |
| | 14/06/2019 | 07:46 | 149 | 2 | Transit | 602 | Bullet |
| | 14/06/2019 | 08:01 | 139 | 1 | Transit | 607 | Bullet |
| | 14/06/2019 | 08:07 | 116 | 2 | Transit | 608 | Bullet |
| | 14/06/2019 | 08:11 | 129 | 4 | Transit | 609 | Bullet |
| | 14/06/2019 | 08:24 | 128 | 2 | Transit | 612 | Bullet |
| | 14/06/2019 | 08:35 | 121 | 6 | Transit | 614 | Bullet |
| | 14/06/2019 | 08:39 | 110 | 3 | Transit | 615 | Bullet |
| | 14/06/2019 | 08:47 | 123 | 3 | Transit | 618 | Bullet |
| | 14/06/2019 | 08:52 | 92 | 1 | Transit | 621 | Bullet |
| | 14/06/2019 | 08:55 | 126 | 2 | Transit | 623 | Bullet |
| | 14/06/2019 | 09:04 | 152 | 5 | Transit | 630 | Bullet |
| | 14/06/2019 | 09:12 | 124 | 2 | Transit | 634 | Bullet |
| | 14/06/2019 | 09:27 | 116 | 3 | Transit | 637 | Bullet |
| | 14/06/2019 | 10:14 | 146 | 3 | Transit | 643 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| | 14/06/2019 | 10:25 | 128 | 4 | Transit | 645 | Bullet |
| | 14/06/2019 | 10:39 | 95 | 1 | Transit | 648 | Bullet |
| | 14/06/2019 | 11:01 | 88 | 4 | Transit | 654 | Bullet |
| | 14/06/2019 | 11:05 | 109 | 2 | Transit | 656 | Bullet |
| | 14/06/2019 | 11:08 | 112 | 2 | Transit | 657 | Bullet |
| | 14/06/2019 | 11:34 | 108 | 4 | Transit | 662 | Bullet |
| | 14/06/2019 | 11:43 | 113 | 3 | Transit | 664 | Bullet |
| | 10/07/2019 | 15:06 | 139 | 2 | Transit | 667 | Bullet |
| | 10/07/2019 | 15:15 | 146 | 3 | Transit | 670 | Bullet |
| | 10/07/2019 | 15:26 | 122 | 11 | Transit | 672 | Bullet |
| | 10/07/2019 | 15:29 | 117 | 4 | Transit | 674 | Bullet |
| | 10/07/2019 | 15:34 | 12 | 3 | Transit | 677 | Bullet |
| | 10/07/2019 | 15:42 | 157 | 8 | Transit | 679 | Bullet |
| | 10/07/2019 | 15:58 | 107 | 7 | Transit | 684 | Bullet |
| | 10/07/2019 | 16:20 | 129 | 4 | Transit | 691 | Bullet |
| | 10/07/2019 | 15:47 | 63 | 4 | Transit | 681 | Bullet |
| | 10/07/2019 | 16:32 | 123 | 4 | Transit | 696 | Bullet |
| | 10/07/2019 | 16:34 | 62 | 8 | Transit | 697 | Bullet |
| | 10/07/2019 | 16:43 | 143 | 2 | Transit | 703 | Bullet |
| | 10/07/2019 | 16:46 | 138 | 4 | Transit | 705 | Bullet |
| | 10/07/2019 | 16:48 | 126 | 3 | Transit | 707 | Bullet |
| | 10/07/2019 | 16:52 | 137 | 3 | Transit | 711 | Bullet |
| | 10/07/2019 | 16:54 | 54 | 9 | Transit | 712 | Bullet |
| | 10/07/2019 | 16:49 | 132 | 4 | Transit | 709 | Bullet |
| | 10/07/2019 | 17:26 | 87 | 3 | Transit | 717 | Bullet |
| | 10/07/2019 | 17:44 | 126 | 4 | Transit | 722 | Bullet |
| | 10/07/2019 | 18:09 | 106 | 2 | Transit | 729 | Bullet |
| | 10/07/2019 | 18:17 | 131 | 3 | Transit | 732 | Bullet |
| | 10/07/2019 | 18:32 | 83 | 4 | Transit | 737 | Weave |
| | 10/07/2019 | 18:50 | 124 | 3 | Transit | 745 | Bullet |
| | 10/07/2019 | 18:54 | 118 | 2 | Transit | 747 | Bullet |
| | 10/07/2019 | 19:01 | 108 | 2 | Transit | 749 | Bullet |
| | 10/07/2019 | 19:07 | 153 | 4 | Transit | 751 | Bullet |
| | 10/07/2019 | 18:49 | 143 | 2 | Transit | 744 | Bullet |
| | 10/07/2019 | 19:09 | 139 | 4 | Transit | 753 | Bullet |
| | 10/07/2019 | 19:20 | 151 | 2 | Transit | 757 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------------|
| | 10/07/2019 | 19:52 | 94 | 3 | Transit | 761 | Bullet |
| | 10/07/2019 | 20:03 | 131 | 4 | Transit | 764 | Bullet |
| | 10/07/2019 | 20:07 | 148 | 5 | Transit | 765 | Bullet |
| | 10/07/2019 | 20:27 | 134 | 4 | Transit | 770 | Bullet |
| | 10/07/2019 | 20:28 | 129 | 2 | Transit | 771 | Bullet |
| | 10/07/2019 | 20:36 | 139 | 3 | Transit | 774 | Bullet |
| | 10/07/2019 | 20:52 | 129 | 5 | Transit | 778 | Bullet |
| | 10/07/2019 | 20:58 | 132 | 8 | Transit | 780 | Bullet |
| | 10/07/2019 | 21:07 | 134 | 3 | Transit | 782 | Bullet |
| | 10/07/2019 | 21:12 | 108 | 2 | Transit | 784 | Bullet |
| | 10/07/2019 | 21:21 | 122 | 6 | Transit | 788 | Bullet |
| | 10/07/2019 | 21:27 | 149 | 9 | Transit | 790 | Bullet |
| | 10/07/2019 | 21:32 | 127 | 2 | Transit | 793 | Bullet |
| | 10/07/2019 | 21:39 | 141 | 2 | Transit | 796 | Bullet |
| | 10/07/2019 | 21:44 | 96 | 3 | Transit | 798 | Bullet |
| | 12/07/2019 | 05:24 | 112 | 3 | Transit | 803 | Bullet |
| | 12/07/2019 | 05:32 | 131 | 3 | Transit | 805 | Bullet |
| | 12/07/2019 | 05:39 | 90 | 3 | Transit | 807 | Bullet |
| | 12/07/2019 | 05:44 | 128 | 4 | Transit | 808 | Bullet |
| | 12/07/2019 | 05:55 | 127 | 3 | Transit | 811 | Bullet |
| | 12/07/2019 | 06:06 | 128 | 5 | Transit | 815 | Bullet |
| | 12/07/2019 | 06:11 | 129 | 2 | Transit | 817 | Bullet |
| | 12/07/2019 | 06:19 | 133 | 3 | Transit | 820 | Bullet |
| | 12/07/2019 | 06:23 | 114 | 3 | Transit | 822 | Bullet |
| | 12/07/2019 | 06:31 | 87 | 4 | Transit | 828 | Bullet |
| | 12/07/2019 | 06:39 | 113 | 3 | Transit | 832 | Bullet |
| | 12/07/2019 | 06:53 | 158 | 5 | Transit | 836 | Bullet |
| | 12/07/2019 | 07:08 | 142 | 5 | Transit | 842 | Bullet |
| | 12/07/2019 | 07:35 | 139 | 5 | Transit | 845 | Bullet |
| | 12/07/2019 | 08:44 | 112 | 3 | Transit | 858 | Bullet |
| | 12/07/2019 | 08:49 | 82 | 2 | Transit | 860 | Bullet |
| | 12/07/2019 | 08:58 | 106 | 4 | Transit | 863 | Not recorded |
| | 12/07/2019 | 09:00 | 127 | 2 | Transit | 864 | Not recorded |
| | 12/07/2019 | 09:06 | 115 | 2 | Transit | 866 | Bullet |
| | 12/07/2019 | 09:24 | 121 | 2 | Transit | 870 | Bullet |
| | 12/07/2019 | 10:09 | 142 | 2 | Transit | 874 | Bullet |

| Species** | Date | Flight start time | Duration (s) | Minimum no. of birds | Flight behaviour*** | Key no.**** | Notes |
|-----------|------------|-------------------|--------------|----------------------|---------------------|-------------|--------|
| | 12/07/2019 | 10:17 | 109 | 1 | Transit | 875 | Bullet |
| | 12/07/2019 | 10:34 | 137 | 2 | Transit | 878 | Bullet |
| | 12/07/2019 | 10:46 | 139 | 2 | Transit | 881 | Bullet |
| | 12/07/2019 | 11:00 | 137 | 2 | Transit | 887 | Bullet |
| | 12/07/2019 | 11:13 | 122 | 3 | Transit | 891 | Bullet |
| | 12/07/2019 | 11:46 | 119 | 2 | Transit | 896 | Bullet |
| | 12/07/2019 | 11:26 | 114 | 4 | Transit | 893 | Bullet |

* Flights that were partially or entirely at RSH are shaded;
**Species names and order follow the British List maintained by the BOU²;
***As defined in Table 2;
**** Key numbers allow identification of individual flights