APPENDIX 7-5

BIRD SURVEY RESULTS – WINTER 2020-2021

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Bird Survey Report Winter 2020-21

BIRD SURVEY REPORT

WINTER 2020/21

Seven Hills Wind Farm I and II

Prepared for: Seven Hills Wind Farm Ltd

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TABLE OF CONTENTS

DOCUMENT REFERENCES

TABLES

FIGURES

APPENDICES

1.0 Introduction

SLR Consulting Ireland (SLR) was commissioned by Seven Hills Wind Farm Ltd in October 2020 to carry out a winter bird survey programme for the proposed Seven Hills Wind Farm, Co. Roscommon during the winter period 2020-21. There are two phases within the current iteration of the wind farm design, hereafter referred to as Wind Farm I and Wind Farm II.

1.1 Background to the Commission

Planning permission was originally granted by An Bord Pleanála (ABP) for both developments (Phase 1 ABP Planning Ref: PL 20.244346 / 20.239759 and Phase 2 ABP Planning Ref: PL 20.244347 / 20.241069) but was subsequently refused following the appeal process. The main reasons for refusal of planning cited by An Bord Pleanála were issues relating to the lack of certainty in relation to the impact of the proposed development on European Sites in the vicinity of the proposed developments and the qualifying interests for which those European Sites are designated.

1.2 Site Description

The dominant habitat within the boundaries of the proposed Seven Hills Wind Farm I development site is improved agricultural grassland and the proposed site is not designated for nature conservation.

The proposed Seven Hills Wind Farm II development site is a slightly more diverse area in terms of habitat composition with dominant habitats present being improved agricultural grassland, dry calcareous grassland and scrub. The proposed site also does not hold any designations for nature conservation.

There are several Natura 2000 designated sites relating to birds of conservation concern located within 15km of both wind farms. Please see Table 3-1 for further details of these.

1.3 Purpose of the Report

The aim of this report is to provide robust baseline ornithological survey data for the winter period 2020/21 at both phases of the wind farm. These data will be used to inform a separate ecological impact assessment and appropriate assessment for the proposed wind farm. The assessment of potential impacts is beyond the scope of this report.

This report follows on from the bird survey reports for winter 2018/2019 and 2019/20 (SLR Consulting, 2021a; SLR Consulting, 2021b). As such, in order to glean a comprehensive representation of winter bird activity at both proposed wind farm sites across the three winter seasons, the two previous reports should be read alongside this report.

2.0 Methodology

2.1 Desk-based Review

The desk-based review collated available information collected to date on the wintering bird movements in and around the proposed wind farm development sites. This included a review of the following documents submitted as part of the previous planning applications in 2010 and 2012:

- FERS (2010) Proposed Seven Hills Wind Farm Site (Phase I): Ornithological Assessment Report June 2010. Appendix 8.1 of IWCM (2010) Proposed Seven Hills Wind Farm Phase I EIS Chapter 8 – Ornithology;
- FERS (2011) Proposed Seven Hills Wind Farm (Phase II): Ornithological Assessment Report July 2011. Appendix 8.1 of IWCM (2011) Proposed Seven Hills Wind Farm Phase II EIS Chapter 8 – Ornithology;
- Moore Group, FERS and IWCM (2010) Natura Impact Statement and Appropriate Assessment as required under Article 6(3) of the Habitats Directive (Council Directive 92/43/EEC) of Seven Hills Wind Farm Co. Roscommon (Phase I);
- FERS (2010) Response to issues arising from item (5) of a Request for Further Information (RFI) from Roscommon Co. Council (Planning Reference no. 10/541);
- Moore Group, FERS and IWCM (2011) Natura Impact Statement and Appropriate Assessment as required under Article 6(3) of the Habitats Directive (Council Directive 92/43/EEC) of Seven Hills Wind Farm Co. Roscommon (Phase II);
- EcoFact Environmental Consultants Ltd (2012) Seven Hills Wind Farm (Phase I) Co. Roscommon Report to inform the Appropriate Assessment Process; and
- EcoFact Environmental Consultants Ltd (2012) Seven Hills Wind Farm (Phase II) Co. Roscommon Report to inform the Appropriate Assessment Process.

In addition, a review of the following more recent documents which were produced subsequent to the submission of the planning applications was also undertaken:

- EcoFact Environmental Consultants Ltd (2015) Seven Hills Wind Farm, Co. Roscommon Wintering Bird Survey 2014/2015;
- EcoFact Environmental Consultants Ltd (2018) Seven Hills Wind Farms Winter Bird Surveys 2016/17; and
- Inis Environmental Consultants Ltd (2018) Summary Report on Winter 2017/18 Findings at the Proposed Seven Hills I and II Windfarms, Co. Roscommon.

The websites of the National Parks and Wildlife Service (NPWS) www.npws.ie and the National Biodiversity Data Centre (NBDC) http://maps.biodiversityireland.ie/#/Map were also accessed for information on sites designated for nature conservation in the vicinity of the site.

2.2 Field Surveys

The scope of winter bird surveys for the proposed wind farm is based on recommendations given in Scottish Natural Heritage (SNH) (now NatureScot) 2017 guidance. This survey methods guidance is recognised as standard best practice guidance throughout the UK and Ireland for surveying birds to inform impact assessment for onshore wind farms.

The scope of survey work was the same as that conducted in 2019/20 with the exception of nocturnal foraging surveys for golden plover, which were not considered necessary given the very low levels of nocturnal golden plover activity recorded on site during the 2019/20 survey season. Further details are provided in Sections 2.2.2 to 2.2.5.

2.2.1 Field Survey Team: Evidence of Technical Competence and Experience

Sarah Ingham (SI) BSc (Hons) MSc ACIEEM– Project Manager and Lead Ornithologist

Sarah is a Senior Ecologist with SLR and holds a BSc in Zoology from Anglia Ruskin University, Cambridge, UK and an MSc in Biodiversity and Conservation from Trinity College Dublin. She is an Associate member of the Chartered Institute of Ecology and Environmental Management (CIEEM). Sarah is a highly skilled and experienced bird surveyor with 11 years' post graduate experience as a professional consultant ecologist/ornithologist. Sarah managed this project through liaison with the client, coordination of the survey team, supervision of the health and safety of the team, carrying out various bird surveys onsite throughout the survey season, collating, quality controlling and assessing the survey data and writing this report.

Jason Cahill (JC) BSc (Hons) – Assistant Bird Surveyor

Jason joined SLR in February 2020, and this is his first long-term role in ecological consultancy. Jason holds a BSc (Hon) in Field Biology with Wildlife Tourism from Institute of Technology Tralee. Jason has experience with bird surveys, involving vantage point and transect surveys, data collection and input. Supervised by Sarah Ingham, Jason assisted with the Greenland white-fronted goose roost surveys at Seven Hills Wind Farm during the winter 2020/2021 survey season.

Aisling Kinsella (AK) BSc MSc – Assistant Bird Surveyor

Aisling is a graduate ecologist who joined SLR in September 2020. Aisling holds a BSc in Biological, Earth and Environmental Sciences (Zoology) from University College Cork and an MSc in Wildlife Management and Conservation from University College Dublin. Aisling's main interest is in ornithology. Since joining SLR, Aisling's field experience includes acting as ECoW on a large national road scheme, habitat survey mapping and classification, mammal survey, bird surveys, data collection and data input. Aisling has also helped prepare EIAR Biodiversity chapters and AA screening reports and Natura Impact Statements for a range of different projects and plans. Supervised by Sarah Ingham, Aisling assisted with the Greenland white-fronted goose roost surveys at Seven Hills Wind Farm during the winter 2020/2021 survey season.

2.2.2 Flight Activity Surveys

Vantage point (VP) locations were the same as those used in winters 2018/19 and 2019/20, which were initially chosen based on locations used during previous surveys (see Section 3.1). The adequacy of these VPs was checked by carrying out a desk-based viewshed analysis using a bespoke GIS tool for calculating the visible area from each vantage point (VP). The Zones of Theoretical Visibility (ZTV) from each VP were calculated using ArcMAP 10.5.1 Spatial Analyst using a terrain model derived from EU-DEM data with a vertical accuracy of ± 7m. In previous years, when proposed turbine dimensions were unknown, the ZTVs were calculated with a surface offset of 30m. However, now that the proposed turbine dimensions are known the ZTVs have been re-calculated using a surface offset of 18m, to match the lowest point swept by the rotors of the proposed turbines. As in previous years the ZTVs are based in a viewing height of 1.8m above ground level. VP locations and viewing arcs are shown in **Figure 1** and the updated VP viewsheds are shown in **Figure 2**.

A total of 36 hours of watches were undertaken at each of six vantage point (VP) locations during the winter season (monthly visits October – March inclusive). This equates to a total of six hours per VP per month. The VP survey effort undertaken during the winter of 2020/21 is summarised in Table 2-1 with full details of survey dates, times and observers provided in Appendix I and details of weather conditions during the surveys provided in Appendix II.

Table 2-1: VP survey effort undertaken at the Seven Hills Wind Farms I and II sites October 2020 to March 2021

Month	WFI VP1 (hours)	WFI VP2 (hours)	WFII VP1 (hours)	WFII VP2 (hours)	WFII VP3 (hours)	WFII VP4 (hours)
October	6:00	6:00	6:00	6:00	6:00	6:00
November	6:00	6:00	6:00	6:00	6:00	6:00
December	6:00	6:00	6:00	6:00	6:00	6:00
January	6:00	6:00	6:00	6:00	6:00	6:00
February	6:00	6:00	6:00	6:00	6:00	6:00
March	6:00	6:00	6:00	6:00	6:00	6:00
Total hrs	**6:00**	**6:00**	**6:00**	**6:00**	**6:00**	**6:00**
VP locations (**Figure 1**)	587337 E 748665 N	585834 E 746017 N	588967 E 745061 N	587372 E 743512 N	590643 E 743279 N	592160 E 743701 N

It is good practice to ensure that where possible each monthly six-hour survey period is split over more than a single day. As such, the six-hour survey periods were divided into three-hour blocks which were alternated across consecutive days e.g., on day 1, VP1 would be completed in the morning and VP2 would be completed in the afternoon and on day 2, VP2 would be completed in the morning and VP1 in the afternoon. Breaks of at least 30 minutes were taken between watches to minimise observer fatigue.

VP watches aimed to quantify the flight activity of primary and secondary target species (as defined in Section 2.2.2.1) within the study area.

The main purpose of VP watches is to collect data on primary target species that will enable estimates to be made of:

- The time spent flying over the site;
- The relative use by birds of different parts of the site;
- The proportion of flying time spent within the provisional upper and lower risk height limits as determined by the potential rotor diameter and rotor hub height; and
- Ultimately, the analysis of the potential risk of collision of birds with rotating turbines.

For each primary target species observation, the following details were recorded:

- Time of observation;
- Duration of flying bout;
- Species, age and sex (where determinable);
- Time spent within each height band and;
- Notes on observation.

Recording height bands were determined based on the likely turbine specifications under consideration at the time of survey. It is noted that these were slightly different to the height bands used in previous surveys when information regarding likely turbines specifications was not available. Surveys in October 2020 used the following flight height bands which were the same as those used in winter 2019/20:

- 1 = <25m (below the likely rotor swept area);

- 2 = 25m to 50m (within the likely rotor swept area);
- 3 = 50m to 150m (within the likely rotor swept area); and
- 4 = >150m (above the likely rotor swept area).

Following discussions with the client in November 2020, the flight height bands were altered to reflect potential changes to turbine specifications under consideration at that time. As such, from November onwards flight heights were attributed to five distinct height bands as follows:

- 1 = < 15m (below the likely rotor swept area);
- 2 = 15m to 30m (potentially within the likely rotor swept area, at least in part);
- 3 = 30m to 150m (within the likely rotor swept area);
- 4 = 150m to 200m (potentially within the likely rotor swept area, at least in part); and
- 5 = >200m (above the likely rotor swept area).

In addition, a summary of observations of secondary target species was recorded at the end of each five-minute period during each VP watch to provide an index of flight activity for secondary target species within the site, in accordance with current SNH guidance. Data collected on secondary species included:

- The five-minute period start and end time;
- Species;
- Number of birds observed;
- If flying, the height band in which birds were observed flying;
- Whether birds were observed onsite, in the 500m buffer or beyond;
- Flight behaviour and;
- Notes on observation.

2.2.2.1 Target Species

Target species for the surveys were defined by legal and/or conservation status and vulnerability to impacts caused by wind turbines, as defined in SNH (2017) Guidance.

Primary Target Species

The list of primary target species was limited to species upon which effects are most likely to be potentially significant in EIA terms, thereby enabling recording to focus on the species of greatest importance without the distraction of having to record detailed flight data for a larger number of more common species.

SNH (2017) guidelines state that "*in most circumstances the target species will be limited to those species which are afforded a higher level of legislative protection*." Kestrel, buzzard and sparrowhawk are not subject to a higher level of legislative protection than any other bird species and were therefore not recorded as primary target species during the winter 2020/21 surveys.

Primary target species were therefore specifically limited to species forming qualifying features for nearby SPAs and those other species upon which effects could be potentially significant in EIA terms, e.g. Annex I raptor and owl species.

As such, the primary target species for these VP surveys included the following bird species:

- Greenland white-fronted goose *Anser albifrons flavirostris;*
- Whooper swan *Cygnus cygnus*;
- Golden plover *Pluvialis apricaria;*
- Lapwing *Vanellus vanellus;*
- Wigeon *Mareca penelope;*
- Peregrine falcon *Falco peregrinus*;
- Hen harrier *Circus cyaneus;*
- Merlin *Falco columbarius;* and

- Short-eared owl *Asio flammeus*.

Secondary Species

Local circumstances may indicate that survey information should also be acquired on other species, especially those of regional conservation concern. Such species are termed secondary species (SNH, 2017). Recording of secondary species is subsidiary to recording of primary target species.

Secondary target species included:

- Any other wildfowl and wader species;
- Buzzard *Buteo buteo;*
- Sparrowhawk *Accipiter nisus*;
- Kestrel *Falco tinnunculus;*
- Raven *Corvus corax*;
- Grey heron *Ardea cinerea;*
- Cormorant *Phalacrocorax carbo;* and
- Gulls *Larus sp*.

2.2.3 Swan and Goose Feeding Distribution Surveys

SNH (2017) recommends that for whooper swan, Greenland white-fronted goose and other goose species, feeding distribution surveys should be undertaken in areas of suitable habitat where the survey area lies within the core foraging distance of SPAs for these species or other major roosts, unless it can be established from existing data that the area is not utilised for feeding. Feeding distribution surveys were therefore carried out on a fortnightly basis to establish if swans and geese were using the fields within a minimum of 1 km of the wind farm boundary.

Whooper swan and Greenland white–fronted goose are features of interest of several SPAs within 15 km of the site boundary (see Table 3-1). A minimum buffer of 1 km around both wind farm sites was used for these surveys which were undertaken by driven transect, stopping on a regular basis to check all fields for goose and swan feeding activity. The transect route and survey results are shown in **Figure 9**.

Details of survey dates, times and observers are provided in Appendix I and a record of weather conditions during surveys is provided in Appendix II

2.2.4 Greenland White-fronted Goose Roost Surveys

Data indicating recent usage of Lough Croan as a roost site by Greenland white-fronted geese came to light during discussions between SLR and personal contacts at Birdwatch Ireland in the latter part of 2019, following which an unpublished study on the species (Burke *et al*., 2014) was obtained. This revealed evidence of recent use of Lough Croan, and other turloughs such as Four Roads, by roosting Greenland white-fronted geese. Surveys for roosting Greenland white-fronted geese were therefore added to the scope from December 2019 to March 2020. These surveys were repeated on a monthly basis from October 2020 to March 2021.

There are a number of lakes and turloughs within a 2km radius of the wind farm sites, namely Lough Croan to the north of Wind Farm I, Coolagarry Lough to the east of Wind Farm I, Feacle Lough to the southeast of Wind Farm II and Corkip Lough to the east of Wind Farm II.

Coolagarry Lough has been consistently watched during the swan and goose feeding distribution surveys, which yielded no records of Greenland white-fronted geese using this lough. Furthermore, the data provided by Birdwatch Ireland revealed that there are no previous records of geese roosting at this lough. Thus, Coolagarry Lough was ruled out as a site for targeted goose roost surveys. Feacle Lough is overlooked entirely by VP3. As such, it has been closely monitored during VP surveys and did not require further targeted goose roost surveys.

Corkip Lough is approximately 400m east of VP4. It was visited early in the winter season of 2019/20 and observed to have evolved into a reed bed. As such, the habitat has become unsuitable for roosting Greenland white-fronted geese and was also ruled out of targeted roost surveys.

The data provided by Birdwatch Ireland revealed that there are two turloughs within 6.5km of the proposed Wind Farm I which hold previous records roosting Greenland white-fronted geese (Burke *et al*, 2014). These are Lough Funshinagh and Lough Croan.

Lough Funshinagh is the larger and most distant of the two, located 6.5km to the north east of Wind Farm I. Records show that geese previously foraged on the islands and wet-grassland fringes at the north-east end of the turlough. Lough Funshinagh contains an extensive area of water throughout the year, which rises with increased rainfall in winter. Water levels fluctuate significantly between years however, and the turlough dries out entirely 2-3 times per decade on average, meaning its value to waterfowl varies from year to year. Islands and peripheral patches of fields formerly used for feeding have become overgrown with scrub since the early 1990s and White-fronts have not been recorded on Lough Funshinagh since the mid-1990s. As such, given the distance from the proposed wind farm site and the fact that Greenland white-fronts have not been recorded there for almost three decades, this turlough was excluded from targeted goose roost surveys.

Lough Croan is approximately 1.5km north of the proposed Wind Farm I. Lough Croan contains a variety of habitats such as turlough on the eastern side, with a reed-bed in the centre and a partly floating fen in the west, which also floods most winters. Burke *et al* (2014) reviewed all available data on the Greenland white-fronted goose population that overwinters in Ireland, which was collected over the three-decade period, 1982/83 – 2011/12, providing a description on each of the extant flocks present during that time. This review suggests that Lough Croan is suspected as having been used as a roosting site for Greenland White-fronted Goose to some extent in the past when water levels were suitably high. As such, given its proximity to Wind Farm I, it was deemed necessary to investigate the current status of and potential for the presence of roosting geese at Lough Croan by carrying out monthly dawn and dusk vantage point surveys at the lough.

As mentioned above, watches of Lough Croan were carried out simultaneously from two vantage points on the local road north of Lough Croan monthly between October 2020 and March 2021. The watches were carried out at dusk and the following dawn each month for a duration of up to 2 hours depending on the levels of light. The dawn watches began at civil twilight i.e., 30 minutes before the time of sunrise and continued for up to 1.5 hours after sunrise. The dusk watches ended at civil twilight i.e., starting up to 1.5hrs before the time of sunset and continuing for 30 minutes after sunset. All flight-lines of Greenland white-fronted geese to and from the turlough in addition to the direction of flight and the number of birds were recorded during watches. The vantage point locations and survey results are shown in **Figure 10**.

Details of survey dates, times and observers are provided in Appendix I and a record of weather conditions during surveys is provided in Appendix II.

2.3 Survey Limitations

The majority of vantage point surveys were undertaken in optimal weather conditions. However, during such an extensive series of surveys carried out over the winter period it was inevitable that some surveys were completed in suboptimal conditions. There were 46 hours out of the total of 216 during which the visibility was recorded as “moderate”, i.e. 1-3km. This comprises 21% of the total survey effort but in most cases all of the relevant 2km viewing arc was visible and this is not considered to significantly affect the validity of the data collected. There were also 13 non-consecutive hours (up to 6% of the total survey effort) in which the visibility was recorded as “poor”, i.e. less than 1km, at some point. However, in no cases did visibility fall below 500m (when survey would have been suspended) and in many cases visibility was better than this for part of the relevant hour. As such, given the low proportion of surveys affected this is not considered to significantly affect the validity of the data collected. Further details regarding weather conditions during surveys are provided in Appendix II.

As shown in **Figure 2**, due to local topographical conditions a small area at the western end of Wind Farm I and a very small area within the 500m buffer zone for Wind Farm II were not within the 2km viewsheds from any of the VPs. All turbine locations and the vast majority of the 500m buffer were visible from at least one VP however and the gaps in coverage are therefore not considered to represent a significant limitation.

In accordance with the standard methodology, the swan and goose feeding distribution surveys were carried out from the roads without any access to third party land and as such, a small number of fields within the 1km survey area were not visible from roads. This was a limitation in that there is a possibility that some feeding flocks may have been out of sight. However, any additional swans or geese which were potentially not recorded during the feeding distribution surveys would have most likely been observed moving between foraging grounds during the remainder of the survey or during vantage point surveys and it is therefore considered unlikely that significant feeding flocks were overlooked.

Due to inclement weather on the morning of the scheduled dawn goose roost survey at Lough Croan in February 2021, which made driving to site before dawn a health and safety risk, it was necessary to postpose that survey. The postponed dawn survey was rescheduled to be undertaken in March. However, due to a staffing issue, only one surveyor was available to undertake the survey. This surveyor was located at the eastern VP and had a clear view of the lough. The main role of the second surveyor at the western VP was to confirm the direction of flight of any geese leaving the turlough in a westerly direction. However, given that the initial direction of flight of geese leaving the turlough was also visible to the surveyor at the eastern VP, this limitation during one survey period is not deemed significant to the overall results of the survey season.

3.0 Results

3.1 Desk-based Review

3.1.1 Natura 2000 Sites

There are no Special Protection Areas (SPA) within the proposed wind farm sites. However, there are a total of five SPAs within a 15 km[1] radius of the survey area.

The five SPAs within 15km are shown in Table 3-1, which also shows the qualifying interests for each site. For the purposes of this report, which deals specifically with wintering birds, qualifying interests which are only present during the breeding season have been excluded from Table 3-1.

Table 3-1: SPAs within 15km of Seven Hills Wind Farms I and II and their qualifying interests (species present during the winter period only)

Site Name	Site Code	Distance/ Direction from Site Boundary	Wintering Species of Special Conservation Interest
Lough Croan Turlough SPA	004139	1.5km north	• Shoveler *Anas clypeata* • Golden Plover *Pluvialis apricaria* • Greenland White-fronted Goose *Anser albifrons flavirostris* • Wetland and Waterbirds
River Suck Callows SPA	004097	1.7km west	• Whooper Swan *Cygnus cygnus* • Wigeon *Anas penelope* • Golden Plover *Pluvialis apricaria* • Lapwing *Vanellus vanellus* • Greenland White-fronted Goose *Anser albifrons flavirostris* • Wetland and Waterbirds
Four Roads Turlough SPA	004140	1.9km north	• Golden Plover *Pluvialis apricaria* • Greenland White-fronted Goose *Anser albifrons flavirostris* • Wetland and Waterbirds
Lough Ree SPA	004064	8km east	• Little Grebe *Tachybaptus ruficollis* • Whooper Swan *Cygnus cygnus* • Wigeon *Anas penelope* • Teal *Anas crecca* • Mallard *Anas platyrhynchos* • Shoveler *Anas clypeata* • Goldeneye *Bucephala clangula* • Coot *Fulica atra* • Golden Plover *Pluvialis apricaria* • Lapwing *Vanellus vanellus* • Wetland and Waterbirds

[1] 15 km is the distance typically applied when considering wildfowl ranging from roost sites to foraging sites.

Site Name	Site Code	Distance/ Direction from Site Boundary	Wintering Species of Special Conservation Interest
Middle Shannon Callows SPA	004096	11.4km southeast	• Whooper Swan *Cygnus cygnus* • Wigeon *Anas penelope* • Golden Plover *Pluvialis apricaria* • Lapwing *Vanellus vanellus* • Black-tailed Godwit *Limosa limosa* • Black-headed Gull *Chroicocephalus ridibundus* • Wetland and Waterbirds

3.1.2 Previous Survey Data

Winter bird surveys were undertaken at Wind Farms I and II during the winter seasons of 2008/09, 2009/10, 2011/12, 2014/15, 2016/17 and 2017/18. A review of the previous winter bird survey reports listed in Section 2.1 revealed that a variety of bird survey methods were used across the six survey seasons. Surveys carried out each year at each wind farm site are described below together with a short summary of the survey results. The relevant reports should be referred to for further details.

During the survey period November 2008 – February 2009, the site was visited four times per month (FERS 2010; FERS 2011). On each of these occasions, five vantage points were visited for a period of 20 minutes throughout the day (three at Wind Farm I and two at Wind Farm II). During the surveys at Wind Farm I, a total of four species of red-listed status (Lynas *at al.*, 2009) were observed using the proposed development site, namely black-headed gull, curlew *Numenius arquata*, golden plover and lapwing. Six species of amber status were observed using the proposed development site, namely whooper swan, starling *Sturnus vulgaris*, house sparrow *Passer domesticus*, swallow *Hirundo rustica*, snipe *Gallinago gallinago* and linnet *Carduelis cannabina*. During surveys at Wind Farm II, a total of six red-listed species were recorded within the proposed development site namely pintail *Anas acuta*, shoveler, black-headed gull, curlew, golden plover and lapwing. A total of 17 amber-listed species were observed at Wind Farm II. In addition to the same six amber-listed species as observed at Wind Farm I, Bewick's swan *Cygnus columbianius,* mute swan *Cygnus olor,* wigeon, pochard *Aythya ferina,* tufted duck *Aythya fuligula,* teal, shelduck *Tadorna tadorna*, dunlin *Caladris alpina,* coot, lesser black-backed gull *Larus fuscus* and kestrel were also recorded within the site. Of these species, only two were evaluated as "potentially threatened" by the proposed wind farms, namely curlew and whooper swan.

Targeted whooper swan surveys were carried out twice monthly during the winter periods October 2009 – April 2010 (at both Wind Farms I and II) and November 2010 – February 2011 (Wind Farm II only) (FERS 2010; FERS 2011). These surveys were undertaken to determine if whooper swans flew through the area in which the turbines were proposed to be sited. Methods were based on Larsen and Clausen (2002). Observations were carried out from one vantage point within the Wind Farm I site in 2009/10 and three vantage points within Wind Farm II during the 2009/10 and 2010/11 seasons. Surveys at Wind Farm I in 2009/10 yielded observations of three flocks of whooper swan (n=5, n=3 and n=4) flying through the Wind Farm I site within a single survey period in February 2010. The three flocks were observed flying at heights of 15-20m. These were the only sightings of whooper swan at Wind Farm I throughout the winter season 2009/10. Surveys at Wind Farm II during the same season, yielded two observations of whooper swan flocks flying through the wind farm site, with one flock of seven recorded in December 2009 and a second flock of 17 recorded in February 2010. Both flocks were observed flying at heights of 10-20m above ground level.

During the 2010/11 whooper swan surveys undertaken at Wind Farm II, there were two records of whooper swan flying through the wind farm site. The first was of a flock of four observed in December 2010 flying towards Feacle Lough at a height of 30-40m, while the second, observed in February 2011, was of a flock of six whooper swan flying through the site at 5-10m height. There were also two observations of peregrine falcon recorded flying through the site during these surveys in December and February.

The methodology used in 2009/10 and 2010/11 was repeated twice monthly at both wind farm sites between December 2011 and February 2012 by FERS (data presented in Appendix 7 of the NIS (Ecofact, 2012)). During the 2011/12 survey season, a single whooper swan was recorded flying through the proposed location of the turbines at Wind Farm I at a height of 5m. This was the only sighting of whooper swan during those three months of surveying. An unspecified number of golden plovers were also recorded feeding in fields north of the proposed turbine locations in rough grassland during February 2012. At Wind Farm II, there were five flocks of whooper swan recorded flying through the site during December (n=4) and February (n=2; n=3; n=2 and n=4). All five flocks were recorded flying at heights of 5-15m.

Further winter surveys were undertaken at Wind Farms I and II from October 2014 to March 2015 (Ecofact, 2015). These surveys involved assessing an extensive area surrounding the proposed wind farm sites, which covered a large proportion of South Roscommon and encompassed waterbodies including Lough Croan Turlough SPA, Lough Feacle Turlough, Coolagarry Lough, Thomas Street Turlough and Four Roads Turlough SPA as well as the Ballyglass River Callows and other minor season waterbodies. The aim of the survey was to record the distribution of waterbirds in the region, primarily Greenland white-fronted geese, whooper swans and golden plover. Vantage point surveys targeting the proposed development sites were also undertaken from two vantage points, one at each proposed wind farm site. Although there were peak numbers of 42-48 whooper swans observed grazing on the grasslands surrounding Thomas Street Turlough, approximately 1.5km south of Wind Farm I, on two occasions (February and March 2015), there was only one observation of whooper swan recorded flying through Wind Farm I throughout the winter season. This observation was in November when a flock of nine whooper swan was recorded leaving Thomas Street turlough and flying in the direction of Lough Croan Turlough at dusk. There were two records of whooper swans flying through the Wind Farm II site between Feacle Lough and Ballyglass River Callows in February (n=52) and March (n=63). Throughout the season, flocks of whooper swan ranging in size from 4-78 were observed at various waterbodies within a 15km radius of both wind farm sites. Flocks of 21-79 Greenland white-fronted geese were observed in November (n=21), December (n=29) and March (n=79) at the Muckanagh Callows along the River Suck, which is approximately 5km to the northwest of the Wind Farm I site. There were no Greenland white-fronted geese observed flying through the wind farm sites throughout the winter season of 2014/15.

The winter 2016/17 surveys were undertaken at both wind farm sites from November 2016 to March 2017 (EcoFact, 2018). The approach followed that of the 2014/15 surveys i.e., to establish whether birds used or crossed the sites, and attempted to explain their movements when they were not interacting with the sites. As with previous surveys, the study focused primarily on species such as whooper swan and Greenland white-fronted geese, while also providing full counts and assessments for all other water birds. The wintering bird survey used two main vantage points, one at each proposed wind farm site and followed SNH guidance in place at that time (SNH, 2014) with a minimum of 6 hours per vantage point per month. Up to 10 other sites within the surrounding area were also visited at least twice per month and full counts undertaken on each visit. The survey was adaptive, as before, and was extended up to 10km+ away from the proposed wind farm site as necessary. Results showed that there was no significant bird activity recorded within either proposed development site during the November survey. This was attributed to the low water levels across the study area with all the turloughs very low or dry. In December 2016, the only notable observations were a sighting of a small flock of Greenland white-fronted geese on the River Suck, along with the large numbers of starlings which were resident on Lough Croan. No whooper swans were recorded during the December visit. During January 2017, a flock of c.60 golden plover were recorded passing near the Wind Farm I site and a flock of 32 curlew was recorded flying near Wind Farm II and landing on Lough Feacle (flight heights not reported). It was reported that water levels at Lough Croan remained low and there were no whooper swans present. However, there were increased numbers of ducks present with significant numbers of wigeon, teal, and shoveler recorded at Lough Croan. During the January vantage point watch on Wind Farm I, a merlin was recorded crossing the site. A total of 40 golden plover and 100 lapwing were recorded passing near the Wind Farm I site (location and direction not reported), with one snipe recorded within the site in January 2017. There were no records of whooper swans or Greenland white-fronted geese using or passing through the Wind Farm I site during February 2017 surveys.

Again, there were no movements of whooper swan or Greenland white-fronted geese recorded passing through or near the proposed either wind farm site during the March 2017 surveys. Whooper swan flocks were recorded at several waterbodies surrounding both wind farm sites in March 2017, namely Lough Croan, River Suck at Muckinagh North, Coolagarry turlough, Brideswell and Ballyglass River Callows. A total of 80 Greenland white-fronted geese were also recorded at the River Suck at Muckinagh north.

The 2017/18 surveys again followed SNH (2014) guidance with flight activity surveys undertaken from October 2017 to March 2018. Seven vantage points across the two wind farm sites (two at Wind Farm I and five at Wind Farm II) were used at which monthly flight activity surveys were undertaken at dawn and dusk only. Monthly wildfowl distribution surveys were also undertaken, although the area over which these were undertaken was unspecified within the report. Results showed that kestrel and sparrowhawk were the only two target species recorded using the Wind Farm II site during vantage point surveys on one occasion each. There were no other records of target species recorded at either wind farm throughout the entire survey season. A range of wildfowl was recorded during the monthly distribution surveys at locations surrounding both wind farm sites, namely whooper swan, mute swan, lapwing, curlew, golden plover, wigeon and teal. There were no flights of swan species observed flying through the proposed rotor swept areas.

3.2 Flight Activity Surveys

Flight lines of primary target species recorded at both wind farm sites throughout the winter season are presented in **Figures 3-8** and a summary of the survey findings are provided in Sections 3.2.1 and 3.2.2 for primary and secondary target species, respectively. Flight data for both primary and secondary target species are provided in Appendix III.

3.2.1 Primary Target Species

3.2.1.1 Wind Farm I

In total, five primary target species were recorded flying within the study area on and around Wind Farm I during the winter survey period. Flight activity recorded from Wind Farm I VP1 and VP2 by primary target species is summarised in Table 3-2. Primary target species flights from both VPs are shown on **Figures 3 to 8**. Detailed survey data are provided in Appendix III.

Table 3-2: Number of Primary Target Species Flights from Wind Farm I VP1 and VP2 Combined – October 2020 – March 2021

Species	Number of flights and birds by month*						Total number of flights	Total number of flights potentially at-risk height**	Total number of birds recorded in flight	Total number of birds potentially at-risk height**
	Oct	Nov	Dec	Jan	Feb	Mar				
Whooper swan	2 (10)	0	6 (24)	0	1 (2)	5 (22)	14	10	58	39
Golden plover	2 (32)	0	1 (60)	0	1 (15)	0	4	3	107	92
Lapwing	0	0	0	0	3 (60)	0	3	2	60	10
Wigeon	0	0	0	0	0	1 (35)	1	0	35	0
Peregrine falcon	0	0	0	0	1 (1)	0	1	1	1	1

Species	Number of flights and birds by month*						Total number of flights	Total number of flights potentially at-risk height**	Total number of birds recorded in flight	Total number of birds potentially at-risk height**
	Oct	Nov	Dec	Jan	Feb	Mar				
Total	4 (42)	0	7 (84)	0	6 (78)	6 (57)	23	16	261	142

* numbers in parentheses represent the total number of birds observed that month

** precautionary risk height assumed to be between 15m – 200m

3.2.1.1.1 Primary Target Species Accounts

A total of 23 flights by five primary target species were recorded during flight activity surveys at Wind Farm I between October 2020 and March 2021. A summary of flight activity by species is presented below.

Whooper Swan

There were 14 flights of whooper swan observed at Wind Farm I, with a total of 58 birds recorded. All observations of whooper swan were recorded from VP2 flying over the Thomas Street Turlough to the south of the wind farm site and buffer. There were no flights recorded from VP1. There were 10 flights (n=39) observed at potential collision risk height, however, only one of these, a flock of four, was observed flying through the wind farm site, in December.

Golden Plover

There were four flights of golden plover recorded at Wind Farm I (n=107), all of which were observed outside the wind farm site. Three of the four flights were recorded outside the 500m buffer flying over Thomas Street Turlough and the fourth was observed within the 500m buffer to the north of the site. Although none of the flocks were observed flying within the wind farm site, 92 of the 107 birds were recorded at potential collision risk height.

Lapwing

Three flights of lapwing were observed in February flying over Thomas Street Turlough. Two of these flights were of 10 birds which were observed in the same location within seven minutes of each other. It is therefore assumed that these were two observations of the same flock. Although this flock was observed off site, they were flying at potential collision risk height. The third observation was of a flock of 40 lapwing flying below the potential collision risk height.

Wigeon

There was one observation of a flock of wigeon (n=35) throughout the season. This observation occurred in March, off site at Thomas Street Turlough. The flight was below the potential collision risk height.

Peregrine Falcon

A single female peregrine falcon was observed from VP2 flying offsite over Thomas Street Turlough in February. Although the flight was off site, the bird was flying within the potential collision risk height.

Wind Farm II

In total, six primary target species were recorded flying within the study area on and around Wind Farm II during the winter survey period. Flight activity recorded from Wind Farm II VP1 to VP4 by primary target species is summarised in Table 3-3. Primary target species flights from all VPs are shown on **Figures 3 to 8**. Detailed survey data are provided in Appendix III.

Table 3-3: Number of Primary Target Species Flights from Wind Farm II VP1-VP4 Combined – October 2020 – March 2021

Species	Number of flights by month*						Total number of flights	Total number of flights potentially at-risk height**	Total number of birds recorded in flight	Total number of birds potentially at-risk height**
	Oct	Nov	Dec	Jan	Feb	Mar				
Whooper swan	0	2 (11)	2 (10)	2 (5)	1 (7)	1 (2)	8	8	35	35
Greenland white-fronted goose	1 (50)	0	0	0	0	0	1	1	50	50
Golden plover	0	0	4 (120)	1 (2)	0	0	5	5	122	122
Lapwing	0	0	8 (313)	0	0	0	8	8	313	313
Wigeon	0	0	2 (137)	1 (21)	2 (33)	2 (100)	7	3	291	158
Peregrine falcon	1 (1)	0	0	0	0	1 (1)	2	2	2	2
Total	**2 (51)**	**2 (11)**	**16 (580)**	**4 (28)**	**3 (40)**	**4 (103)**	**31**	**27**	**813**	**680**

* numbers in parentheses represent the total number of birds observed that month

** precautionary risk height assumed to be between 15m – 200m

Primary Target Species Accounts

A total of 31 flights by six primary target species were recorded during flight activity surveys at Wind Farm II between October 2020 and March 2021. A summary of flight activity by species is presented below.

Whooper Swan

A total of eight flights recorded of whooper swan (n=35) were recorded at Wind Farm II, none of which were observed flying on site. Seven of the eight flights were observed from VP3, flying to and from Feacle Lough within the buffer to the southeast of the site and one was recorded from VP2 within the buffer to the west of the site. Although none of the flights were recorded flying through the site, all 35 whooper swans were observed flying at the potential collision risk height.

Greenland White-fronted Goose

A single flock of 50 white-fronted geese was recorded from VP4 in October. The flock was observed flying in a north-westerly direction to the east of the boundary of the 500m buffer at the potential collision risk height

Golden Plover

There were five golden plover flights recorded at Wind Farm II. Four of the five flights were observed from VP3 at Feacle Lough within two surveys periods on consecutive days in December. Thus, it is likely that these four flights were of the same single flock or two flocks. All five flights were observed at the potential collision risk height, however none were recorded flying through the site.

Lapwing

Lapwing were observed on eight occasions throughout the survey season. All eight flights were observed over two consecutive days in December, with all bar one recorded from VP3 at Feacle Lough. Although all flights were observed at the potential collision risk height, there were no observations of lapwing flying through the site.

Wigeon

There were seven flocks of wigeon observed throughout the survey season. All flights were observed flying over Feacle Lough, with four flights below the potential collision risk height and three within. There were no flights observed within the wind farm site.

Peregrine Falcon

A total of two peregrine falcon flights were recorded throughout the winter season. The first was observed from VP4 to the southeast of the site in October. This individual was observed flying towards the site at the potential collision risk height. The second was observed from VP1 in March circling over the Roadstone Cam Quarry at collision risk height. The quarry is on the boundary of the 500m buffer.

3.2.2 Secondary Species

Wind Farm I

Secondary species activity at Wind Farm I is summarised in Table 3-4. There were four secondary species recorded throughout the season at Wind Farm I. Black-headed gull was the most frequently recorded secondary species (in 43 five-minute periods out of a possible 864), and the most numerous (maximum flock size 60).

Table 3-4: Secondary Species Activity Summary for Wind Farm I VP1 and VP2 Combined – October 2020 – March 2021

Species	Number of 5 min periods recorded *	Maximum number of birds recorded	Combined maximum total of birds recorded	Comments
Common buzzard	13	2	16	Activity in October, January and March only, within the survey buffer and off site. Not recorded within the wind farm site.
Raven	17	4	33	Activity throughout all months, within the survey buffer and off site. Not recorded within the wind farm site.
Black-headed gull	43	60	334	Activity throughout all months. Recorded primarily off site outside the survey buffer using Thomas Street Turlough.
Snipe	1	1	1	Observed off site in October only.
* total of 864 five-minute periods during surveys				

Wind Farm II

Secondary species activity at Wind Farm II is summarised in Table 3-5. There were 12 secondary species recorded throughout the season at Wind Farm II. Black-headed gull and raven were the most frequently recorded secondary species (in 54 five-minute periods out of a possible 864), and curlew was the most numerous (maximum flock size 100).

Table 3-5: Secondary Species Activity Summary for Wind Farm II VP1 - VP4 Combined – October 2020 – March 2021

Species	Number of 5 min periods recorded *	Maximum number of birds recorded	Combined maximum total of birds recorded	Comments
Common buzzard	26	2	37	Activity throughout all months, within the wind farm site and the survey buffer.
Kestrel	15	1	15	Activity throughout all months, within the survey buffer and off site. Not recorded within the wind farm site.
Raven	54	14	96	Activity throughout all months, within the survey buffer and off site. Not recorded within the wind farm site.
Curlew	11	100	267	Activity throughout all months except October. All records within the survey buffer associated with Feacle Lough and off site. Not recorded within the wind farm site.
Grey heron	7	2	8	Activity throughout all months, within the survey buffer and off site. Not recorded within the wind farm site.
Black-headed gull	54	60	312	Activity throughout all months, within the survey buffer and off site. Not recorded within the wind farm site. Majority of activity associated with Feale Lough.
Herring gull *Larus argentatus*	2	1	2	Low activity in January and February only, within the survey buffer and off site.
Lesser black-backed gull	8	2	10	Activity in November, December and March only, within the survey buffer and off site.
Cormorant	4	6	10	Activity in November and January only, predominantly within the survey buffer and off site. There was one observation flying through the site.
Coot	1	2	2	Two birds observed flying from a small pond adjacent VP1 within the buffer.
Mallard	9	4	22	Activity in December, February and March only, within the survey buffer and off site.
Mute swan	1	2	2	Low activity in December only, within the survey buffer at Feacle Lough.

Species	Number of 5 min periods recorded *	Maximum number of birds recorded	Combined maximum total of birds recorded	Comments
* total of 864 five-minute periods during surveys				

3.3 Swan and Goose Feeding and Distribution Surveys

Whooper swan was by far the most abundant species recorded, with Greenland white-fronted goose observed in February only and greylag goose *Anser anser* observed in February and March. A summary of results of the twice-monthly swan and goose feeding and distribution surveys undertaken within a minimum 1km radius of each wind farm site throughout the winter season is presented Table 3-6. Table 3-6 presents the peak count obtained for each species on any single date in each month and the combined total for each species across the two surveys each month. Please see **Figure 9** for locations of all sightings, several of which were outside the 1km buffer.

Table 3-6: Peak counts and combined results of the twice-monthly swan and goose feeding and distribution surveys undertaken within a minimum 1km radius of both wind farm sites between October 2020 and March 2021

Month	Peak Count and Combined Total of Each Species Recorded Per Month					
	Whooper Swan		Greenland White-fronted Goose		Greylag Goose	
	Peak Count	Combined Total	Peak Count	Combined Total	Peak Count	Combined Total
October	64	64	0	0	0	0
November	71	104	0	0	0	0
December	114	162	0	0	0	0
January	78	139	0	0	0	0
February	75	102	129	179	3	3
March	119	189	0	0	3	3
Total	-	**760**	-	**179**	-	**6**

3.3.1 Swan and Goose Species Accounts

3.3.1.1 Whooper Swan

Whooper swans were recorded within the survey area during all 12 feeding and distribution surveys undertaken throughout the winter season.

There were two predominant grazing locations within the survey area at Wind Farm I, namely Lough Croan to the north and Thomas Street Turlough to the south, whilst Coolagarry Lough to the east of Wind Farm I was used less frequently. There were no observations of whooper swan flocks feeding within the Wind Farm site, however, there was one flock of 30 whooper swan recorded grazing within 500m of the wind farm in October.

Within the survey area for Wind Farm II, Ballyglass River Callows to the northwest was the principal grazing site, with a single flock of 40 whooper swans recorded at Feacle Lough in March only. October was the quietest

month in terms of total numbers of swans, with a peak count of 64 recorded, whilst December and March were the most active with peak counts of 114 and 119 birds recorded respectively.

3.3.1.2 Greenland White-fronted Goose

Greenland white-fronted geese were recorded in February only, with three separate flocks observed grazing during the same survey period in the fields surrounding Lough Croan, just outside the 1km buffer. On the first February survey five geese were observed in a field to the west of Lough Croan grazing within a flock of 29 whooper swans while further east of that location on the same day, a further 124 white-fronted geese were recorded grazing. On the second February visit, 38 white-fronted geese were observed grazing with 22 whooper swans in a field to the south of Lough Croan, while slightly further west a flock of 12 geese was recorded. These were the only observations of Greenland white-fronted geese during the feeding and distribution surveys throughout the season.

3.3.1.3 Greylag Goose

A flock of three greylag geese was recorded both in February and March grazing in pastures around Lough Croan. Given that these two observations were recorded in close proximity to each other, albeit in consecutive months, it is likely that these were two observation of the same small flock of three. There were no other observations of greylag geese during these surveys throughout the season.

3.4 Greenland White-fronted Goose Roost Surveys

Dawn and dusk Greenland white-fronted goose roost surveys were carried out at Lough Croan on a monthly basis between October 2020 and March 2021. Please see **Figure 10** for flight-line results and flock sizes observed during these surveys.

Greenland white-fronted geese were recorded at Lough Croan in January, February and March 2021 only, with no sightings of geese during the October - December surveys.

During the January dusk survey, a flock of 55 geese flew from the west just after sunset and landed in the east of the lough. The dawn survey on the following morning in January yielded the greatest level of activity throughout the season of goose roost surveys at Lough Croan with nine movements of white-fronted geese recorded. A total of three of the nine flocks (n=36, n=40 and n=80) were observed flying in from the west just after sunrise and landing on a field to the south of the lough. A further three flocks (n=11, n=50 and n=50) moved a short distance from the eastern section of the turlough to the fields to the south of the central section of the turlough, joining the three flocks which had arrived from the west. This formed a large flock of approximately 267 Greenland white-fronted geese. A short time later, there were three departures from this flock with two flocks of four flying to the northeast and west respectively. A third, larger flock of 95 geese left the turlough towards the end of the survey period, flying to the northwest.

As previously mentioned in the limitations section of this report (Section 2.3), owing to inclement weather in February, the dawn survey could not be undertaken. As such, a dusk survey only could be carried out. During that survey, a flock of 70 geese was observed leaving the lough to the west just after sunset. The additional dawn survey undertaken in March, in place of the dawn survey which was unable to be undertaken in February, did not record any geese.

The planned March surveys yielded no sightings of geese during the dusk survey, however, a flock of 50 geese was observed leaving the lough at dawn the following morning, heading in a north-westerly direction.

4.0 Summary and Conclusions

The aim of this report is to provide baseline ornithological survey data for the 2020/2021 winter season at the two proposed wind farm sites at Seven Hills, Dysart, Co. Roscommon. These data will be used to inform the ecological impact assessment and appropriate assessment for the proposed wind farms. The assessment of potential effects of the proposed wind farms is beyond the scope of this report.

The winter bird survey methods employed during the 2020/2021 survey season are based on recommendations given in SNH (2017) guidance. This survey methods guidance is recognised as standard best practice guidance through the UK and Ireland for surveying birds to inform impact assessment of onshore wind farms. Winter season surveys were undertaken from October 2020 to March 2021. The following ornithological survey types were undertaken at the proposed Seven Hills Wind Farm development sites:

- Flight activity (VP) surveys;
- Swan and goose feeding and distribution surveys; and
- Goose roost surveys at Lough Croan.

Flight activity surveys were undertaken from two vantage points overlooking Wind Farm I and four vantage points overlooking Wind Farm II. These vantage points were visited for six hours per month. This resulted in a total survey effort of 36 hours per vantage point throughout the season.

Swan and goose feeding and distribution surveys were repeated twice monthly across the season. A buffer of minimum 1 km around each wind farm site was used for these surveys, which were undertaken by driven transect, stopping on a regular basis to check fields for goose and swan feeding activity.

Goose watches of Lough Croan were carried out simultaneously from two vantage points on the local road north of Lough Croan monthly between October 2020 and March 2021. The watches were carried out at dusk and the following dawn each month for a duration of up to 2 hours depending on the levels of light. The dawn watches began at civil twilight i.e., 30 minutes before the time of sunrise and continued for up to 1.5 hours after sunrise. The dusk watches ended at civil twilight i.e., starting 1.5hrs before the time of sunset and continuing for up to 30 minutes after sunset. All flight-lines of Greenland white-fronted geese to and from the turlough, in addition to the direction of flight and the number of birds, were recorded during watches.

The following primary target species were recorded during flight activity surveys at both proposed wind farm sites combined:

- Whooper swan;
- Greenland white-fronted goose;
- Golden plover;
- Lapwing;
- Wigeon; and
- Peregrine falcon.

The most frequent flight activity was by whooper swan (14 flights recorded at WFI and 8 at WFII), with other target species activity less frequent. The next most frequently recorded species was lapwing (8 flights recorded at WFII). All other target species were recorded seven times or less.

In relation to whooper swan, vantage point surveys at Wind Farm I showed that all flights of this species were associated with the fields around Thomas Street Turlough to the south, with only one movement of this species across the wind farm site itself. All eight sightings of swans at Wind Farm II were associated with the pastures surrounding Feacle Lough, which is off site and within the 500m survey buffer. During the feeding and distribution surveys around Wind Farm I whooper swans were most frequently recorded at Lough Croan to the north and Thomas Street Turlough, whilst Coolagarry Lough to the east of Wind Farm I was used less frequently. There were no observations of whooper swan flocks feeding within the proposed Wind Farm site, and just one

flock of 30 whooper swan recorded within 500m of the site. During the surveys at Wind Farm II Ballyglass River Callows to the northwest was the principal grazing site, with a single flock of 40 whooper swans recorded at Feacle Lough in March only.

Greenland white-fronted geese were not recorded during VP watches at WFI. They were, however, recorded on one occasion during VP watches at Wind Farm II, although off site. They were also observed using Lough Croan during the dawn/dusk goose roost surveys. This species was recorded using the lough during three of the six months of surveys, which suggests that although Lough Croan is potentially an established roost site, it is not used on a consistent basis throughout the winter season. Burke *et al.* (2014) suggested that Lough Croan is suspected as having been used as a roosting site to some extent in the past when water levels were suitably high but has been used less so in more recent years. This may align with the sporadic use of the lough recorded during this survey. This result is also comparable with results of the 2019/20 surveys, during which geese were observed using Lough Croan twice throughout the season.

In addition, also similar to 2019/2020, all movements and flight-paths of the flocks of Greenland white-fronted geese which were observed at Lough Croan during roost watches were on a lateral east/west or west/east plane. These flight patterns suggest that these birds may be associated with the River Suck Callows SPA located approximately 5km to the west of Lough Croan. This theory can be supported by the fact that there were no sightings of Greenland white-fronted geese recorded flying through either of the proposed wind farm sites during the entire season of vantage point surveys or using either of the sites during the feeding distribution driven transects (with the only records of feeding birds recorded close to Lough Croan).

Both proposed wind farm sites are used as sporadic foraging grounds for a number of wintering wader species, in particular golden plover and lapwing. Golden plover was recorded on four occasions at Wind Farm I and on five occasions at Wind Farm II during vantage point surveys throughout the entire survey season. All nine sightings were recorded within the 500m buffer and were associated with the two largest waterbodies, Thomas Street Turlough (Wind Farm I) and Feacle Lough (Wind Farm II). Records of lapwing were infrequent and concentrated within two months of the season, with three sightings at Wind Farm I in February and eight sightings at Wind Farm II in December. Similar to golden plover, the lapwing population in this area appears to be relatively small and sporadic.

Wigeon were observed during flight activity surveys on only one occasion at Wind Farm I and seven times throughout the season at Wind Farm II. None of the flights were recorded within either wind farm as all were associated with the waterbodies of Thomas Street Turlough and Feacle Lough.

There were three flights of peregrine falcon recorded throughout the season, one during surveys at Wind Farm I and two during surveys at Wind Farm II. All three were recorded offsite or within the 500m survey buffer.

Regarding secondary species, there were four secondary species recorded throughout the season at Wind Farm I. Of these, black-headed gull was the most frequently recorded and the most numerous species recorded, predominantly associated with Thomas Street Turlough. There were 12 secondary species recorded throughout the season at Wind Farm II. Black-headed gull was the most frequently recorded secondary species and curlew was the most numerous, with a maximum flock size of 100. These species were mostly associated with Feacle Lough.

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Scottish Natural Heritage (2016) Assessing Connectivity with Special Protection Areas (SPAs). Version 3 – June 2016. SNH Guidance. SNH, Battleby.

Scottish Natural Heritage (2017) Recommended bird survey methods to inform impact assessment of onshore wind farms. Version 2. SNH Guidance. SNH, Battleby.

SLR Consulting. 2021a. Seven Hills Wind Farm Bird Survey Report Winter 2018-19.

SLR Consulting. 2021b. Seven Hills Wind Farm Bird Survey Report Winter 2019-20.

6.0 Figures

584000 586000 588000 590000 592000 594000

750000 748000 746000

WIND FARM 1

WIND FARM 2

Lough Croan

Cuilleenirwon Lough

Curraghboy

Dysart

County Roscommon

County Galway

Shannon

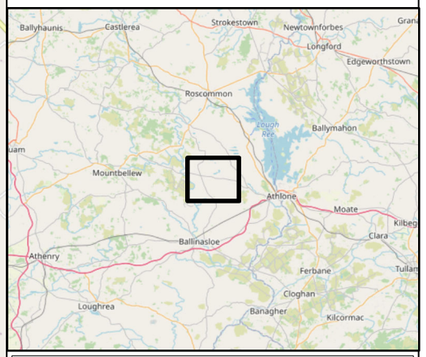
L2013 L2016 L2015 L2018 L2028 L2025

R357 R363 R362

N

LEGEND

- Turbine Location
- Site Infrastructure
- Site Infrastructure 500 m Buffer
- Site Infrastructure 1 km Buffer
- Vantage Point
- Vantage Points 2km View Arc



0 1 2

Kilometres

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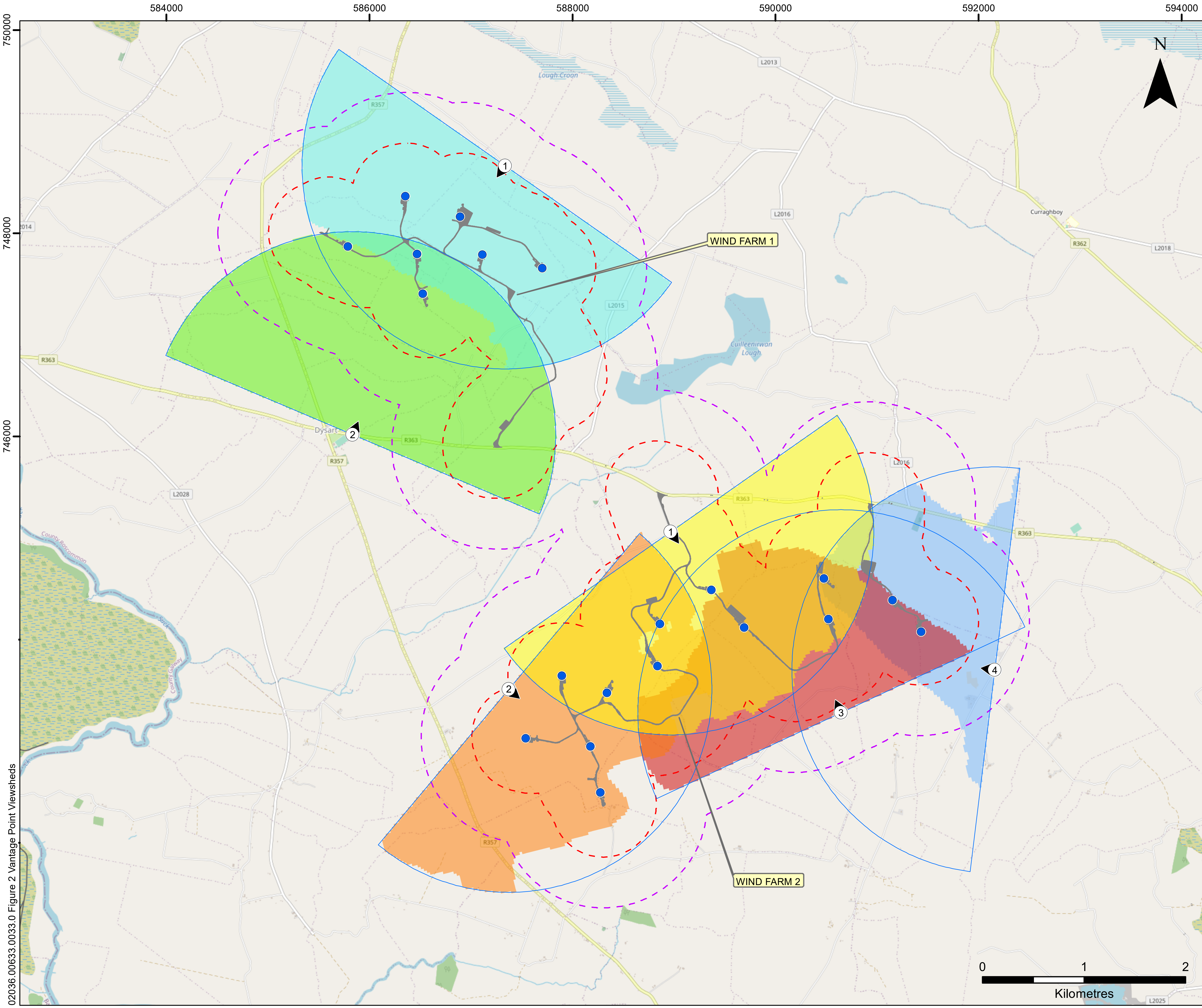
FIGURE 1 - SITE LAYOUT AND VANTAGE POINT LOCATIONS

Scale	Date
1:35,000 @ A3	MAY 2022

02036.00633.0029.0 Figure 1 Site Layout and Vantage Point Locations



NOTE

1. The Zones of Theoretical Visibility (ZTV) was calculated using ArcMAP 10.5.1 Spatial Analyst. The ZTV is calculated with a surface offset 18m & from a viewing height of 1.8m above ground level. The terrain model is derived from EU-DEM data with a vertical accuracy of ± 7m.

LEGEND

- Turbine Location
- Site Infrastructure
- Site Infrastructure 500 m Buffer
- Site Infrastructure 1 km Buffer
- Vantage Point
- Distance of Viewing Arc
- Theoretical Visibility from Wind Farm 1 VP1
- Theoretical Visibility from Wind Farm 1 VP2
- Theoretical Visibility from Wind Farm 2 VP1
- Theoretical Visibility from Wind Farm 2 VP2
- Theoretical Visibility from Wind Farm 2 VP3
- Theoretical Visibility from Wind Farm 2 VP4

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FIGURE 2 - VANTAGE POINT VIEWSHEDS

Scale 1:35,000 @ A3 | Date MAY 2022

02036.00633.0033.0 Figure 2 Vantage Point Viewsheds

584000 586000 588000 590000 592000

748000

746000

Lough Croan

R357

L2016

Curraghboy

R362

WIND FARM 1

L2015

Cuilleenirwan Lough

Dysart

R363

R357

L2028

L2016

R363

Sarck

County Galway

R357

WIND FARM 2

N

0 1 2

Kilometres

LEGEND

Turbine Location

Site Infrastructure

Site Infrastructure 500 m Buffer

Site Infrastructure 1 km Buffer

Whooper Swan Flight-line

Longford
Edgeworth
Roscommon
Ballymahon
Lough Ree
Mountbellew
Athlone
Moate
Ballinasloe
Ferbane
Cloghan
Loughrea
Banagher
Kilcormac

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FIGURE 3 - FLIGHT-LINES WHOOPER SWAN

Scale 1:30,000 @ A3

Date MAY 2022

02036.00633.0032.0 Figure 3-8 Flightlines

584000 586000 588000 590000 592000

748000

746000

Lough Croan

R357

L2016

Curraghboy

R362

WIND FARM 1

L2015

Cuilleenirwan Lough

Dysart

R363

R357

L2028

L2016

R363

Sluick

County Galway

WIND FARM 2

R357

0 1 2

Kilometres

N

LEGEND

- Turbine Location
- Site Infrastructure
- Site Infrastructure 500 m Buffer
- Site Infrastructure 1 km Buffer
- Greenland White-fronted Goose Flight-line

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FIGURE 4 - FLIGHT-LINES GREENLAND WHITE-FRONTED GOOSE

Scale 1:30,000 @ A3

Date MAY 2022

02036.00633.0032.0 Figure 3-8 Flightlines

584000 586000 588000 590000 592000

748000

746000

Lough Croan

R357

L2016

Curraghboy

R362

WIND FARM 1

L2015

Cuilleenirwan Lough

Dysart

R363

R357

L2028

L2016

R363

Sluick

County Galway

WIND FARM 2

R357

0 1 2

Kilometres

N

LEGEND

- Turbine Location
- Site Infrastructure
- Site Infrastructure 500 m Buffer
- Site Infrastructure 1 km Buffer
- Golden Plover Flight-line

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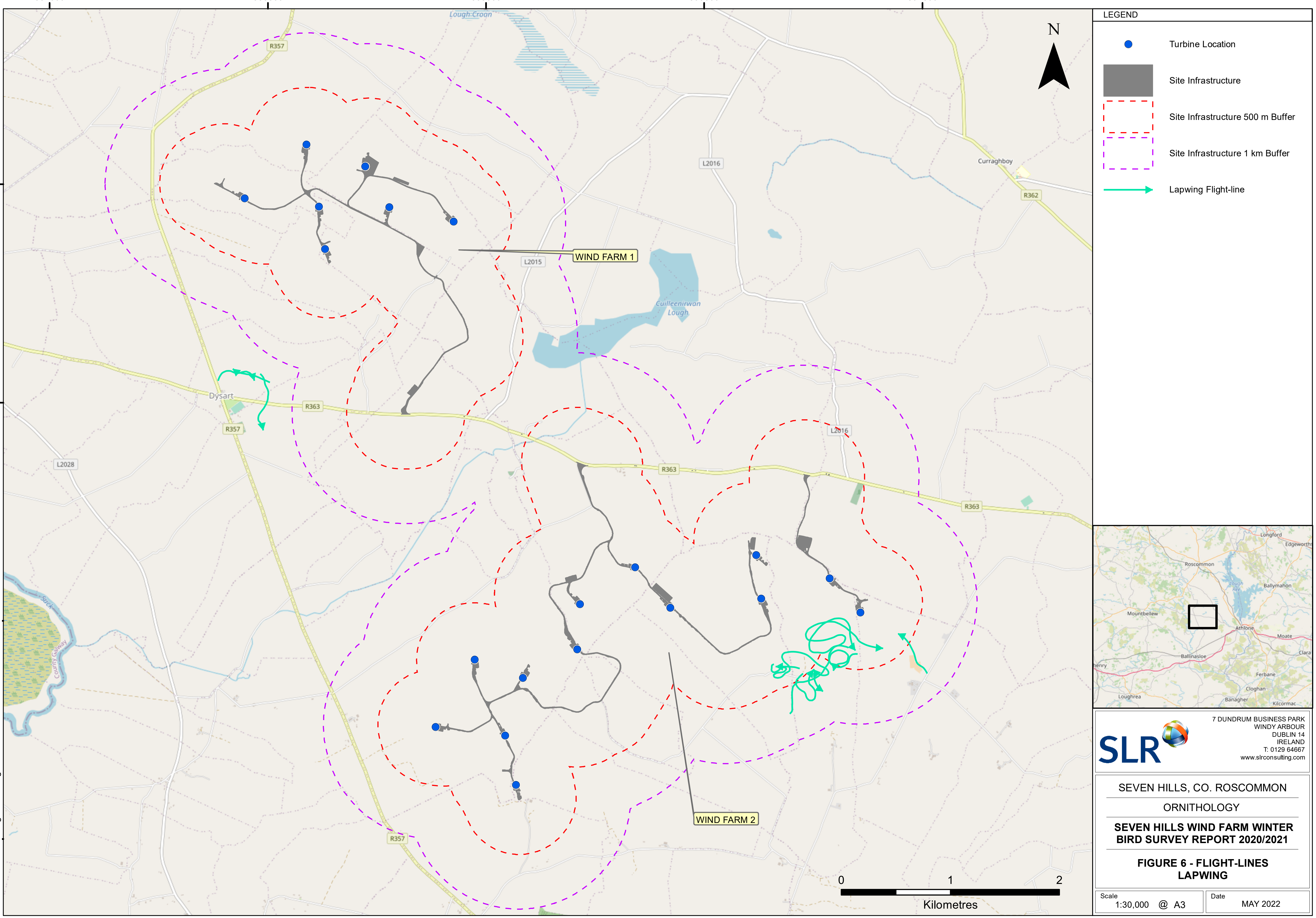
FIGURE 5 - FLIGHT-LINES GOLDEN PLOVER

Scale 1:30,000 @ A3

Date MAY 2022

02036.00633.0032.0 Figure 3-8 Flightlines



584000
586000
588000
590000
592000
748000
746000
N
Lough Croan
R357
L2016
Curraghboy
R362
WIND FARM 1
L2015
Cuilleenirwan Lough
Dysart
R363
R357
L2016
L2028
R363
R363
Suck
County Galway
R357
WIND FARM 2
0
1
2
Kilometres
LEGEND
Turbine Location
Site Infrastructure
Site Infrastructure 500 m Buffer
Site Infrastructure 1 km Buffer
Lapwing Flight-line
Longford
Roscommon
Ballymahon
Mountbellew
Athlone
Moate
Ballinasloe
Clara
Ferbane
Cloghan
Loughrea
Banagher
Kilcormac
02036.00633.0032.0 Figure 3-8 Flightlines

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FIGURE 6 - FLIGHT-LINES LAPWING

Scale	Date
1:30,000 @ A3	MAY 2022

584000 586000 588000 590000 592000

748000

746000

Lough Croan

R357

L2016

Curraghboy

R362

WIND FARM 1

L2015

Cuilleenirwan Lough

Dysart

R363

R357

L2028

L2016

R363

Sluick

County Galway

R357

WIND FARM 2

N

0 1 2

Kilometres

LEGEND

Turbine Location

Site Infrastructure

Site Infrastructure 500 m Buffer

Site Infrastructure 1 km Buffer

Wigeon Flight-line

Longford
Edgeworth
Roscommon
Ballymahon
Lough Ree
Mountbellew
Athlone
Moate
Ballinasloe
Clara
Ferbane
Cloghan
Loughrea
Banagher
Kilcormac

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FIGURE 7 - FLIGHT-LINES WIGEON

Scale 1:30,000 @ A3

Date MAY 2022

02036.00633.0032.0 Figure 3-8 Flightlines

584000 586000 588000 590000 592000

748000

746000

Lough Croan

R357

L2016

Curraghboy

R362

WIND FARM 1

L2015

Cuilleenirwan Lough

Dysart

R363

R357

L2028

L2016

R363

Sluick

County Galway

WIND FARM 2

R357

0 1 2

Kilometres

N

LEGEND

- Turbine Location
- Site Infrastructure
- Site Infrastructure 500 m Buffer
- Site Infrastructure 1 km Buffer
- Peregrine Flight-line

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FIGURE 8 - FLIGHT-LINES PEREGRINE

Scale	Date
1:30,000 @ A3	MAY 2022

02036.00633.0032.0 Figure 3-8 Flightlines

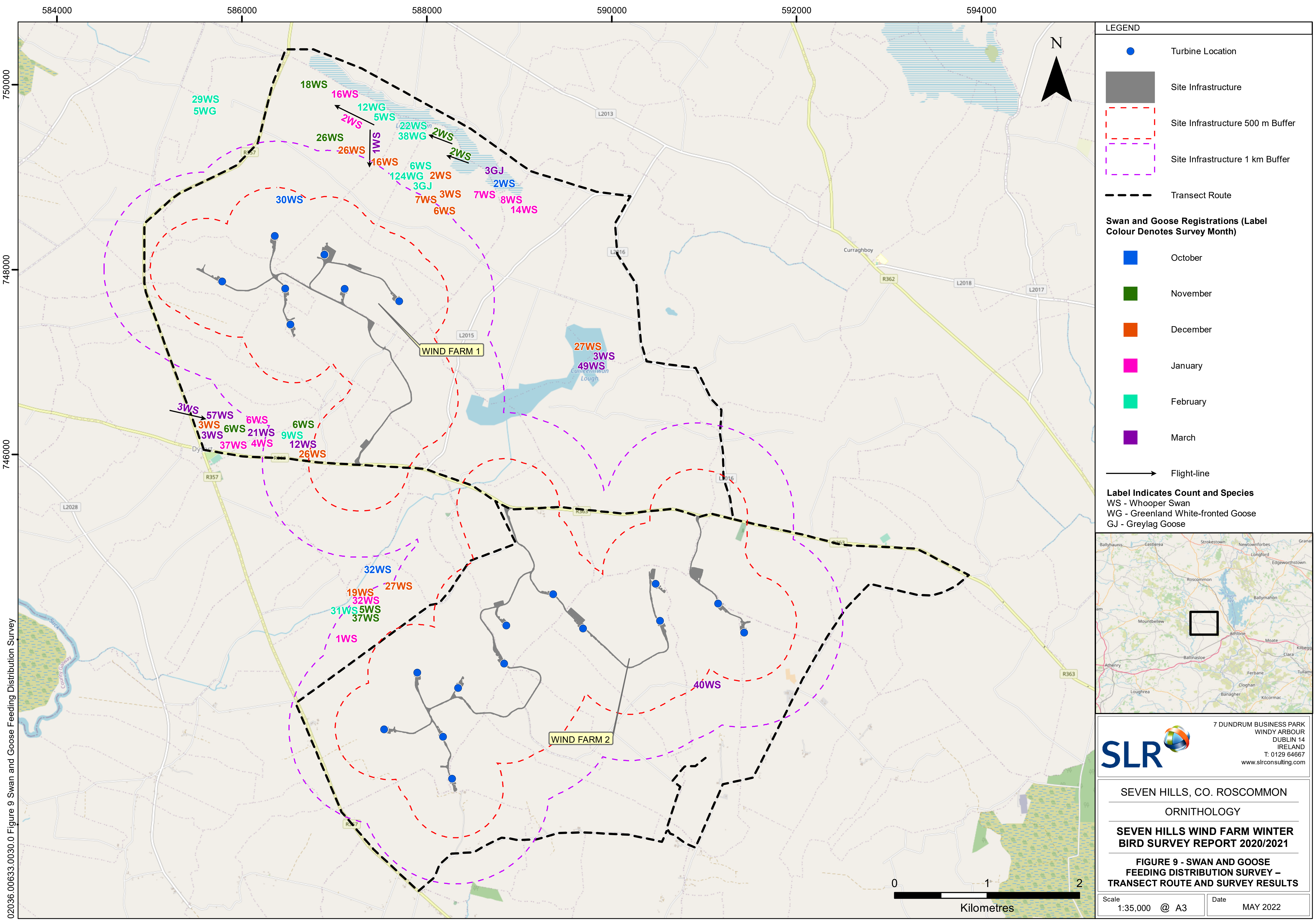
584000
586000
588000
590000
592000
594000
750000
748000
746000
N
LEGEND
Turbine Location
Site Infrastructure
Site Infrastructure 500 m Buffer
Site Infrastructure 1 km Buffer
Transect Route
Swan and Goose Registrations (Label Colour Denotes Survey Month)
October
November
December
January
February
March
Flight-line
Label Indicates Count and Species
WS - Whooper Swan
WG - Greenland White-fronted Goose
GJ - Greylag Goose
WIND FARM 1
WIND FARM 2
29WS
5WG
18WS
16WS
12WG
5WS
2WS
22WS
38WG
2WS
2WS
26WS
26WS
1WS
16WS
6WS
124WG
2WS
3GJ
3GJ
2WS
7WS
3WS
7WS
8WS
6WS
14WS
30WS
27WS
3WS
49WS
3WS
57WS
6WS
3WS
6WS
21WS
6WS
3WS
9WS
37WS
4WS
12WS
26WS
32WS
27WS
19WS
32WS
31WS
5WS
37WS
1WS
40WS
L2013
L2016
L2015
L2018
L2017
R362
R357
L2028
R363
Curraghboy
0
1
2
Kilometres
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FIGURE 9 - SWAN AND GOOSE FEEDING DISTRIBUTION SURVEY – TRANSECT ROUTE AND SURVEY RESULTS
Scale 1:35,000 @ A3
Date MAY 2022
02036.00633.0030.0 Figure 9 Swan and Goose Feeding Distribution Survey

584000 586000 588000 590000

752000

750000

N

West

East

WIND FARM 1

95 40 36 4 70 80 55 11 50 50 50 4

0 1 2

Kilometres

LEGEND

- Turbine Location
- Site Infrastructure
- Site Infrastructure 500 m Buffer
- Site Infrastructure 1 km Buffer
- Vantage Point

Greenland White-fronted Goose Flightline (Label Indicates Count)

- January 2021 - Dusk
- January 2021 - Dawn
- February 2021 - Dusk
- March 2021 - Dawn

No sightings of Greenland White-fronted Geese recorded during October – December 2020 surveys.

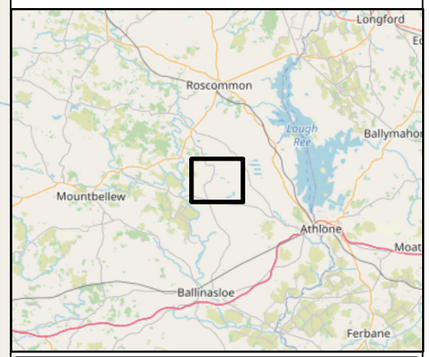

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FIGURE 10 - GREENLAND WHITE-FRONTED GOOSE ROOST DAWN/DUSK SURVEY AT LOUGH CROAN VANTAGE POINT LOCATIONS AND FLIGHT-LINES

Scale 1:25,000 @ A3

Date MAY 2022

02036.00633.0031.0 Figure 10 Greenland White-fronted Goose Roost Dawn Dusk Survey

APPENDIX I

Survey dates, times and observers

Table AI-1: Details of VP surveys undertaken from Wind Farm I Vantage Point 1

Date	Surveyor	Start	End	Survey Duration
06/10/20	SI	09:10	12:10	03:00
19/10/20	SI	14:00	17:00	03:00
24/11/20	SI	07:15	10:15	03:00
25/11/20	SI	07:15	10:15	03:00
11/12/20	SI	09:00	12:00	03:00
17/12/20	SI	12:30	15:30	03:00
19/01/21	SI	09:30	12:30	03:00
21/01/21	SI	12:45	15:45	03:00
12/02/21	SI	09:00	12:00	03:00
17/02/21	SI	15:00	18:00	03:00
09/03/21	SI	10:00	13:00	03:00
16/03/21	SI	13:45	16:45	03:00
Total Hours				**36**

Table AI-2: Details of VP surveys undertaken from Wind Farm I Vantage Point 2

Date	Surveyor	Start	End	Survey Duration
05/10/20	SI	11:00	14:00	03:00
06/10/20	SI	12:40	15:40	03:00
21/11/20	SI	14:00	17:00	03:00
24/11/20	SI	13:30	16:30	03:00
11/12/20	SI	13:00	16:00	03:00
17/12/20	SI	09:00	12:00	03:00
20/01/21	SI	13:00	16:00	03:00
21/01/21	SI	09:00	12:00	03:00
12/02/21	SI	12:30	15:30	03:00
17/02/21	SI	10:00	13:00	03:00
10/03/21	SI	13:00	16:00	03:00
16/03/21	SI	10:15	13:15	03:00
Total Hours				**36**

Table AI-3: Details of VP surveys undertaken from Wind Farm II Vantage Point 1

Date	Surveyor	Start	End	Survey Duration
07/10/20	SI	13:00	16:00	03:00
14/10/20	SI	10:15	13:15	03:00
25/11/20	SI	11:00	14:00	03:00
26/11/20	SI	09:00	12:00	03:00
07/12/20	SI	09:10	12:10	03:00
16/12/20	SI	09:30	12:30	03:00
22/01/21	SI	09:15	12:15	03:00
29/01/21	SI	14:30	17:30	03:00
10/02/21	SI	10:00	13:00	03:00
11/02/21	SI	14:30	17:30	03:00
17/03/21	SI	11:20	14:20	03:00
18/03/21	SI	11:50	14:50	03:00
Total Hours				**36**

Table AI-4: Details of VP surveys undertaken from Wind Farm II, Vantage Point 2

Date	Surveyor	Start	End	Survey Duration
07/10/20	SI	09:30	12:30	03:00
14/10/20	SI	14:15	17:15	03:00
27/11/20	SI	09:00	12:00	03:00
26/11/20	SI	12:30	15:30	03:00
07/12/20	SI	13:00	16:00	03:00
10/12/20	SI	08:45	11:45	03:00
22/01/21	SI	12:45	15:45	03:00
29/01/21	SI	09:10	12:10	03:00
10/02/21	SI	13:30	16:30	03:00
11/02/21	SI	09:20	12:20	03:00
17/03/21	SI	14:50	17:50	03:00
18/03/21	SI	08:20	11:20	03:00
Total Hours				**36**

Table AI-5: Details of VP surveys undertaken from Wind Farm II, Vantage Point 3

Date	Surveyor	Start	End	Survey Duration
21/10/20	SI	10:30	13:30	03:00
22/10/20	SI	13:00	16:00	03:00
19/11/20	SI	09:45	12:45	03:00
20/11/20	SI	12:40	15:40	03:00
08/12/20	SI	13:15	16:15	03:00
09/12/20	SI	09:30	12:30	03:00
27/01/21	SI	14:30	17:30	03:00
28/01/21	SI	09:30	12:30	03:00
18/02/21	SI	12:50	15:50	03:00
19/02/21	SI	09:30	12:30	03:00
11/03/21	SI	12:15	15:15	03:00
12/03/21	SI	08:45	11:45	03:00
Total Hours				**36**

Table AI-6: Details of VP surveys undertaken from Wind Farm II, Vantage Point 4

Date	Surveyor	Start	End	Survey Duration
21/10/20	SI	14:00	17:00	03:00
22/10/20	SI	09:30	12:30	03:00
19/11/20	SI	13:20	16:20	03:00
20/11/20	SI	09:00	12:00	03:00
08/12/20	SI	09:40	12:40	03:00
09/12/20	SI	13:00	16:00	03:00
27/01/21	SI	11:00	14:00	03:00
28/01/21	SI	13:15	16:15	03:00
18/02/21	SI	09:10	12:10	03:00
19/02/21	SI	13:00	16:00	03:00
11/03/21	SI	08:45	11:45	03:00
12/03/21	SI	12:20	15:20	03:00
Total Hours				**36**

Table AI-7: Details of swan and goose feeding and distribution surveys undertaken during winter 2020/2021

Date	Surveyor	Start	End	Survey Duration
05/10/20	SI	14:30	17:30	03:00
30/10/20	SI	13:00	15:30	02:30
12/11/20	SI	11:00	14:00	03:00
18/11/20	SI	11:00	14:00	03:00
10/12/20	SI	12:00	15:00	03:00
16/12/20	SI	13:00	15:00	02:00
20/01/21	SI	09:30	12:30	03:00
29/01/21	SI	12:30	14:15	01:45
11/02/21	SI	12:25	14:30	02:05
17/02/21	SI	13:00	15:00	02:00
10/03/21	SI	10:10	12:10	02:00
17/03/21	SI	09:15	11:15	02:00
Total Hours				**29:20**

Table AI-8: Details of Greenland white-fronted goose roost surveys undertaken during winter 2020/2021

Date	Surveyor	Start	End	Survey Duration
30/10/20	SI + JC	07:00	08:30	01:30
30/10/20	SI + JC	16:30	18:00	01:30
26/11/20	SI + JC	16:00	17:30	01:30
27/11/20	SI + JC	07:15	08:30	01:15
16/12/20	SI + JC	15:45	17:30	01:45
17/12/20	SI + JC	07:30	09:15	01:45
21/01/21	SI + JC	16:45	18:00	01:15
22/01/21	SI + JC	07:30	09:00	01:30
10/02/21	SI + JC	17:00	18:30	01:30
10/03/21	SI + AK	17:15	19:15	02:00
11/03/21	SI + AK	06:15	08:15	02:00
12/03/21	SI	06:15	08:00	01:45
Total Hours				**19:15**

APPENDIX II

Weather Data

Table AII-1: Weather data collected during flight activity surveys undertaken at WF1 VP1

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°C)
06/10/2020	SI	09:10	12:10	1	3	W	0	7	2	2	0	0	12
06/10/2020	SI	09:10	12:10	2	3	W	1	8	2	2	0	0	12
06/10/2020	SI	09:10	12:10	3	3	W	0	7	2	2	0	0	12
19/10/2020	SI	14:00	17:00	1	2	SW	0	2	2	2	0	0	8
19/10/2020	SI	14:00	17:00	2	2	SW	0	3	2	2	0	0	8
19/10/2020	SI	14:00	17:00	3	4	SW	2	6	2	2	0	0	7
24/11/2020	SI	07:15	10:15	1	2	W	3	8	0	0	0	0	7
24/11/2020	SI	07:15	10:15	2	3	W	3	8	1	1	0	0	7
24/11/2020	SI	07:15	10:15	3	3	W	3	8	1	1	0	0	8
25/11/2020	SI	07:15	10:15	1	2	W	3	8	0	0	0	0	6
25/11/2020	SI	07:15	10:15	2	2	W	3	8	1	1	0	0	6
25/11/2020	SI	07:15	10:15	3	2	W	3	8	1	1	0	0	6
11/12/2020	SI	09:00	12:00	1	2	E	0	8	2	2	0	0	10
11/12/2020	SI	09:00	12:00	2	2	E	2	8	2	2	0	0	10
11/12/2020	SI	09:00	12:00	3	2	E	0	8	2	2	0	0	10
17/12/2020	SI	12:30	15:30	1	1	S	1	8	2	2	0	0	9
17/12/2020	SI	12:30	15:30	2	1	S	1	8	1	1	0	0	9
17/12/2020	SI	12:30	15:30	3	1	S	1	8	1	1	0	0	9
19/01/2021	SI	09:30	12:30	1	1	W	0	5	2	2	0	0	5

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°C)
19/01/2021	SI	09:30	12:30	2	1	W	0	7	2	2	0	0	5
19/01/2021	SI	09:30	12:30	3	2	W	0	7	2	2	0	0	6
21/01/2021	SI	12:45	15:45	1	2	W	0	3	2	2	0	0	5
21/01/2021	SI	12:45	15:45	2	2	W	0	4	2	2	0	0	5
21/01/2021	SI	12:45	15:45	3	1	W	0	2	2	2	0	0	5
12/02/2021	SI	09:00	12:00	1	2	SE	0	8	2	2	0	0	2
12/02/2021	SI	09:00	12:00	2	2	SE	0	8	2	2	0	0	2
12/02/2021	SI	09:00	12:00	3	2	SE	0	8	2	2	0	0	3
17/02/2021	SI	15:00	18:00	1	2	S	0	3	2	0	0	0	8.5
17/02/2021	SI	15:00	18:00	2	3	S	0	7	2	0	0	0	8.5
17/02/2021	SI	15:00	18:00	3	3	S	0	7	2	0	0	0	8.5
09/03/2021	SI	10:00	13:00	1	4	W	0	8	1	1	0	0	8
09/03/2021	SI	10:00	13:00	2	4	W	3	8	2	1	0	0	8
09/03/2021	SI	10:00	13:00	3	4	W	2	8	1	1	0	0	8
16/03/2021	SI	13:45	16:45	1	1	NW	0	1	2	0	0	0	14
16/03/2021	SI	13:45	16:45	2	1	NW	0	1	2	0	0	0	14
16/03/2021	SI	13:45	16:45	3	1	NW	0	0	0	0	0	0	14

Rain/ Precipitation
None 0
Drizzle 1
Light showers/snow 2
Heavy showers/snow 3
Heavy rain/snow 4

Cloud Cover
Expressed in oktas (n/8)

Cloud Height
Height of cloud above average height of viewshed
<150m 0

Visibility
Poor (<1km) 0
Moderate (1-3km) 1
Good (>3km) 2

Lying Snow
None 0
On site 1
On higher ground 2

Frost
None 0
Ground 1
All day 2

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°C)
			150-500m >500m	1 2									

Table AII-1: Weather data collected during flight activity surveys undertaken at WF1 VP2

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°C)
05/10/2020	SI	11:00	14:00	1	2	W	0	8	2	2	0	0	12
05/10/2020	SI	11:00	14:00	2	2	SW	0	8	2	2	0	0	11
05/10/2020	SI	11:00	14:00	3	2	S	0	7	2	2	0	0	12
06/10/2020	SI	12:40	15:40	1	1	W	0	7	2	2	0	0	12
06/10/2020	SI	12:40	15:40	2	2	W	0	7	2	2	0	0	13
06/10/2020	SI	12:40	15:40	3	1	W	0	7	2	2	0	0	15
21/11/2020	SI	14:00	17:00	1	1	NW	2	7	2	2	0	0	8
21/11/2020	SI	14:00	17:00	2	2	NW	2	7	2	2	0	0	8
21/11/2020	SI	14:00	17:00	3	1	NW	0	7	2	2	0	0	8
24/11/2020	SI	13:30	16:30	1	1	W	0	6	2	2	0	0	7
24/11/2020	SI	13:30	16:30	2	1	W	0	5	2	2	0	0	7
24/11/2020	SI	13:30	16:30	3	1	W	0	5	2	2	0	0	7
11/12/2020	SI	13:00	16:00	1	2	E	0	8	2	2	0	0	11
11/12/2020	SI	13:00	16:00	2	2	E	0	8	2	2	0	0	11

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°C)
11/12/2020	SI	13:00	16:00	3	2	E	0	8	2	2	0	0	11
17/12/2020	SI	09:00	12:00	1	1	S	0	7	2	2	0	0	4
17/12/2020	SI	09:00	12:00	2	1	S	0	8	2	2	0	0	5
17/12/2020	SI	09:00	12:00	3	1	S	0	8	2	2	0	0	5
20/01/2021	SI	13:00	16:00	1	1	W	0	6	2	2	0	0	4
20/01/2021	SI	13:00	16:00	2	1	W	0	5	2	2	0	0	4
20/01/2021	SI	13:00	16:00	3	1	W	0	5	2	2	0	0	4
21/01/2021	SI	09:00	12:00	1	2	W	0	4	2	2	0	0	2
21/01/2021	SI	09:00	12:00	2	2	W	0	4	2	2	0	0	2
21/01/2021	SI	09:00	12:00	3	2	W	0	3	2	2	0	0	3
12/02/2021	SI	12:30	15:30	1	2	SE	0	8	2	2	0	0	3
12/02/2021	SI	12:30	15:30	2	1	SE	0	8	2	2	0	0	4
12/02/2021	SI	12:30	15:30	3	1	SE	0	8	2	2	0	0	4
17/02/2021	SI	10:00	13:00	1	1	S	0	2	2	2	0	0	8
17/02/2021	SI	10:00	13:00	2	1	S	0	2	2	2	0	0	8
17/02/2021	SI	10:00	13:00	3	2	S	0	2	2	2	0	0	10
10/03/2021	SI	13:00	16:00	1	2	W	0	8	2	2	0	0	10
10/03/2021	SI	13:00	16:00	2	3	W	1	8	1	1	0	0	10
10/03/2021	SI	13:00	16:00	3	4	W	3	8	1	1	0	0	10
16/03/2021	SI	10:15	13:15	1	1	NW	0	0	0	2	0	0	12
16/03/2021	SI	10:15	13:15	2	2	NW	0	0	0	2	0	0	12

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
16/03/2021	SI	10:15	13:15	3	2	NW	0	0	0	2	0	0	13

Rain/ Precipitation
None 0
Drizzle 1
Light showers/snow 2
Heavy showers/snow 3
Heavy rain/snow 4

Cloud Cover
Expressed in oktas (n/8)
Cloud Height
Height of cloud above average height of viewshed
<150m 0
150-500m 1
>500m 2

Visibility
Poor (<1km) 0
Moderate (1-3km) 1
Good (>3km) 2

Lying Snow
None 0
On site 1
On higher ground 2

Frost
None 0
Ground 1
All day 2

Table AII-1: Weather data collected during flight activity surveys undertaken at WF2 VP1

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
07/10/2020	SI	13:00	16:00	1	1	W	0	8	2	2	0	0	12
07/10/2020	SI	13:00	16:00	2	1	W	2	8	2	2	0	0	12
07/10/2020	SI	13:00	16:00	3	1	W	0	8	2	2	0	0	12
14/10/2020	SI	10:15	13:15	1	1	W	0	1	2	2	0	0	8
14/10/2020	SI	10:15	13:15	2	2	W	0	6	2	2	0	0	8
14/10/2020	SI	10:15	13:15	3	1	W	0	4	2	2	0	0	8
25/11/2020	SI	11:00	14:00	1	1	W	0	2	2	1	0	1	1
25/11/2020	SI	11:00	14:00	2	1	W	0	2	2	2	0	1	1
25/11/2020	SI	11:00	14:00	3	1	W	0	3	2	2	0	1	1

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°C)
26/11/2020	SI	09:00	12:00	1	1	W	0	8	2	2	0	2	3
26/11/2020	SI	09:00	12:00	2	1	W	0	5	2	2	0	2	3
26/11/2020	SI	09:00	12:00	3	1	W	0	8	2	2	0	0	4
07/12/2020	SI	09:10	12:10	1	4	NE	0	3	2	2	0	1	1
07/12/2020	SI	09:10	12:10	2	4	NE	0	4	2	2	0	0	1
07/12/2020	SI	09:10	12:10	3	3	NE	0	3	2	2	0	0	2
16/12/2020	SI	09:30	12:30	1	3	W	0	7	2	2	0	0	4
16/12/2020	SI	09:30	12:30	2	3	W	0	6	2	2	0	0	5
16/12/2020	SI	09:30	12:30	3	3	NW	0	5	2	2	0	0	5
22/01/2021	SI	09:15	12:15	1	0	N/A	0	3	2	2	0	1	-1
22/01/2021	SI	09:15	12:15	2	1	W	0	3	2	2	0	1	0
22/01/2021	SI	09:15	12:15	3	1	W	0	1	2	2	0	0	2
29/01/2021	SI	14:30	17:30	1	1	W	1	3	2	2	0	0	9
29/01/2021	SI	14:30	17:30	2	1	W	2	4	2	2	0	0	10
29/01/2021	SI	14:30	17:30	3	1	W	0	7	2	2	0	0	10
10/02/2021	SI	10:00	13:00	1	4	NE	0	3	2	2	0	1	-1
10/02/2021	SI	10:00	13:00	2	4	NE	0	4	2	2	0	0	1
10/02/2021	SI	10:00	13:00	3	3	NE	0	3	2	2	0	0	1
11/02/2021	SI	14:30	17:30	1	4	SE	3	8	2	1	0	0	1
11/02/2021	SI	14:30	17:30	2	4	SE	0	8	2	2	0	0	1
11/02/2021	SI	14:30	17:30	3	4	SE	3	8	2	1	0	0	1

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°C)
17/03/2021	SI	11:20	14:20	1	3	W	0	7	2	2	0	0	9
17/03/2021	SI	11:20	14:20	2	3	W	0	6	2	2	0	0	10
17/03/2021	SI	11:20	14:20	3	3	NW	0	5	2	2	0	0	10
18/03/2021	SI	11:50	14:50	1	4	N	0	8	2	2	0	0	10
18/03/2021	SI	11:50	14:50	2	4	N	0	7	2	2	0	0	9
18/03/2021	SI	11:50	14:50	3	4	N	0	7	2	2	0	0	9

Rain/ Precipitation
None 0
Drizzle 1
Light showers/snow 2
Heavy showers/snow 3
Heavy rain/snow 4

Cloud Cover
Expressed in oktas (n/8)
Cloud Height
Height of cloud above average height of viewshed
<150m 0
150-500m 1
>500m 2

Visibility
Poor (<1km) 0
Moderate (1-3km) 1
Good (>3km) 2

Lying Snow
None 0
On site 1
On higher ground 2

Frost
None 0
Ground 1
All day 2

Table AII-1: Weather data collected during flight activity surveys undertaken at WF2 VP2

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°C)
07/10/2020	SI	09:30	12:30	1	2	W	0	7	2	2	0	0	11
07/10/2020	SI	09:30	12:30	2	2	W	0	6	2	2	0	0	11
07/10/2020	SI	09:30	12:30	3	2	W	0	7	2	2	0	0	12
14/10/2020	SI	14:15	17:15	1	1	W	0	2	2	2	0	0	3

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
14/10/2020	SI	14:15	17:15	2	1	W	0	6	2	2	0	0	4
14/10/2020	SI	14:15	17:15	3	1	W	0	7	2	2	0	0	5
27/11/2020	SI	09:00	12:00	1	1	SE	0	6	2	2	0	0	4
27/11/2020	SI	09:00	12:00	2	1	SE	0	7	2	2	0	0	4
27/11/2020	SI	09:00	12:00	3	2	S	0	7	2	2	0	0	3
26/11/2020	SI	12:20	15:30	1	1	W	0	6	2	2	0	0	8
26/11/2020	SI	12:20	15:30	2	1	W	0	7	2	2	0	0	9
26/11/2020	SI	12:20	15:30	3	1	W	0	5	2	2	0	0	9
07/12/2020	SI	13:00	16:00	1	1	W	0	2	2	2	0	0	4
07/12/2020	SI	13:00	16:00	2	1	W	0	6	2	2	0	0	4
07/12/2020	SI	13:00	16:00	3	1	W	0	7	2	2	0	0	5
10/12/2020	SI	08:45	11:45	1	1	W	0	6	2	2	0	0	7
10/12/2020	SI	08:45	11:45	2	1	W	1	8	1	1	0	0	7
10/12/2020	SI	08:45	11:45	3	1	W	0	5	2	2	0	0	9
22/01/2021	SI	12:45	15:45	1	1	W	0	2	2	2	0	0	3
22/01/2021	SI	12:45	15:45	2	1	W	0	6	2	2	0	0	4
22/01/2021	SI	12:45	15:45	3	1	W	0	7	2	2	0	0	5
29/01/2021	SI	09:10	12:10	1	1	W	0	6	2	2	0	0	8
29/01/2021	SI	09:10	12:10	2	1	W	1	8	1	1	0	0	9
29/01/2021	SI	09:10	12:10	3	1	W	0	5	2	2	0	0	9
10/02/2021	SI	13:30	16:30	1	3	NE	0	4	2	2	0	0	3

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
10/02/2021	SI	13:30	16:30	2	4	NE	0	5	2	2	0	0	2
10/02/2021	SI	13:30	16:30	3	3	NE	0	4	2	2	0	0	1
11/02/2021	SI	09:20	12:20	1	5	SE	0	2	2	2	0	0	-1
11/02/2021	SI	09:20	12:20	2	4	SE	0	2	2	2	0	0	-1
11/02/2021	SI	09:20	12:20	3	4	SE	0	2	2	2	0	0	-1
17/03/2021	SI	14:50	17:50	1	2	NW	0	3	2	2	0	0	12
17/03/2021	SI	14:50	17:50	2	1	NW	0	2	2	2	0	0	12
17/03/2021	SI	14:50	17:50	3	1	NW	0	3	2	2	0	0	11
18/03/2021	SI	08:20	11:20	1	1	N	1	8	1	1	0	0	8.5
18/03/2021	SI	08:20	11:20	2	1	N	0	8	1	1	0	0	8.5
18/03/2021	SI	08:20	11:20	3	2	N	0	8	1	1	0	0	9

Rain/ Precipitation
None 0
Drizzle 1
Light showers/snow 2
Heavy showers/snow 3
Heavy rain/snow 4

Cloud Cover
Expressed in oktas (n/8)
Cloud Height
Height of cloud above average height of viewshed
<150m 0
150-500m 1
>500m 2

Visibility
Poor (<1km) 0
Moderate (1-3km) 1
Good (>3km) 2

Lying Snow
None 0
On site 1
On higher ground 2

Frost
None 0
Ground 1
All day 2

Table AII-1: Weather data collected during flight activity surveys undertaken at WF2, VP3

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°C)
21/10/2020	SI	10:30	13:30	1	2	NW	1	8	2	1	0	0	7
21/10/2020	SI	10:30	13:30	2	2	NW	1	7	2	1	0	0	7
21/10/2020	SI	10:30	13:30	3	2	NW	2	7	2	2	0	0	8
07/10/2020	SI	13:00	14:15	1	2	W	0	4	2	2	0	0	10
07/10/2020	SI	13:00	14:15	2	2	W	0	6	2	2	0	0	9
19/11/2020	SI	09:45	12:45	1	2	SW	0	3	2	2	0	0	5
19/11/2020	SI	09:45	12:45	2	1	SW	0	7	2	2	0	0	5
19/11/2020	SI	09:45	12:45	3	1	SW	0	4	2	2	0	0	5
20/11/2020	SI	12:40	15:40	1	3	SW	0	8	1	2	0	0	12
20/11/2020	SI	12:40	15:40	2	4	SW	0	8	2	2	0	0	12
20/11/2020	SI	12:40	15:40	3	4	SW	0	8	2	2	0	0	12
08/12/2020	SI	13:15	16:15	1	2	NW	0	2	2	2	0	0	5
08/12/2020	SI	13:15	16:15	2	1	NW	2	7	2	2	0	0	6
08/12/2020	SI	13:15	16:15	3	2	NW	0	3	2	2	0	0	6
09/12/2020	SI	09:30	12:30	1	1	W	2	8	2	2	0	0	4
09/12/2020	SI	09:30	12:30	2	1	W	2	8	2	2	0	0	4
09/12/2020	SI	09:30	12:30	3	1	W	2	8	2	2	0	0	4
27/01/2021	SI	14:00	17:00	1	1	W	2	8	0	0	0	0	8
27/01/2021	SI	14:00	17:00	2	1	W	2	8	1	1	0	0	8
27/01/2021	SI	14:00	17:00	3	1	W	2	8	1	1	0	0	8

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°C)
28/01/2021	SI	09:30	12:30	1	1	S	0	8	2	2	0	0	10
28/01/2021	SI	09:30	12:30	2	1	S	0	8	2	2	0	0	10
28/01/2021	SI	09:30	12:30	3	1	S	0	8	2	2	0	0	11
18/01/2021	SI	12:50	15:50	1	3	SW	0	5	2	2	0	0	7
18/01/2021	SI	12:50	15:50	2	2	SW	2	4	2	2	0	0	8
18/01/2021	SI	12:50	15:50	3	2	SW	0	5	2	2	0	0	8
19/01/2021	SI	09:30	12:30	1	2	S	2	8	2	2	0	0	10
19/01/2021	SI	09:30	12:30	2	4	S	2	8	2	2	0	0	10
19/01/2021	SI	09:30	12:30	3	3	S	3	8	1	1	0	0	10
11/03/2021	SI	12:15	15:15	1	3	W	0	4	2	2	0	0	6.5
11/03/2021	SI	12:15	15:15	2	3	W	3	8	2	2	0	0	6
11/03/2021	SI	12:15	15:15	3	3	W	0	3	2	2	0	0	6
12/03/2021	SI	08:45	11:45	1	1	W	6	6	2	2	0	0	3.5
12/03/2021	SI	08:45	11:45	2	2	W	5	5	2	2	0	0	3.5
12/03/2021	SI	08:45	11:45	3	2	W	5	5	2	0	0	0	3.5

Rain/ Precipitation
None 0
Drizzle 1
Light showers/snow 2
Heavy showers/snow 3
Heavy rain/snow 4

Cloud Cover
Expressed in oktas (n/8)
Cloud Height
Height of cloud above average height of viewshed
<150m 0
150-500m 1
>500m 2

Visibility
Poor (<1km) 0
Moderate (1-3km) 1
Good (>3km) 2

Lying Snow
None 0
On site 1
On higher ground 2

Frost
None 0
Ground 1
All day 2

Table AII-1: Weather data collected during flight activity surveys undertaken at WF2, VP4

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°C)
21/10/2020	SI	14:00	17:00	1	1	NW	2	7	2	2	0	0	8
21/10/2020	SI	14:00	17:00	2	2	NW	2	7	2	2	0	0	8
21/10/2020	SI	14:00	17:00	3	1	NW	0	7	2	2	0	0	8
22/10/2020	SI	09:30	12:30	1	1	W	0	2	2	2	0	0	10
22/10/2020	SI	09:30	12:30	2	1	W	0	2	2	2	0	0	10
22/10/2020	SI	09:30	12:30	3	1	W	0	1	2	2	0	0	11
20/11/2020	SI	09:00	12:00	1	2	SW	1	8	1	0	0	0	11
20/11/2020	SI	09:00	12:00	2	2	SW	1	8	1	1	0	0	11
20/11/2020	SI	09:00	12:00	3	2	SW	0	8	2	1	0	0	12
19/11/2020	SI	13:20	16:20	1	1	W	0	5	2	2	0	0	7
19/11/2020	SI	13:20	16:20	2	1	W	0	8	2	2	0	0	8
19/11/2020	SI	13:20	16:20	3	1	W	0	8	2	2	0	0	8
08/12/2020	SI	09:40	12:40	1	1	NW	0	4	1	2	0	0	6
08/12/2020	SI	09:40	12:40	2	2	NW	2	5	1	2	0	0	6
08/12/2020	SI	09:40	12:40	3	2	NW	0	4	1	2	0	0	6
09/12/2020	SI	13:00	16:00	1	1	W	1	8	1	1	0	0	5
09/12/2020	SI	13:00	16:00	2	1	W	1	8	1	1	0	0	5
09/12/2020	SI	13:00	16:00	3	1	W	1	8	1	1	0	0	5
27/01/2021	SI	11:00	14:00	1	1	S	1	8	0	0	0	0	8
27/01/2021	SI	11:00	14:00	2	1	S	1	8	0	0	0	0	8

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°C)
27/01/2021	SI	11:00	14:00	3	1	S	1	8	0	1	0	0	9
28/01/2021	SI	13:15	16:15	1	1	S	0	8	2	2	0	0	10
28/01/2021	SI	13:15	16:15	2	1	S	3	8	2	2	0	0	10
28/01/2021	SI	13:15	16:15	3	1	S	3	8	1	1	0	0	10
18/01/2021	SI	09:10	12:10	1	2	SE	0	7	2	2	0	0	4.5
18/01/2021	SI	09:10	12:10	2	2	SE	0	8	2	2	0	0	5
18/01/2021	SI	09:10	12:10	3	2	SE	0	4	2	2	0	0	5
19/01/2021	SI	13:00	16:00	1	3	S	2	8	1	1	0	0	10
19/01/2021	SI	13:00	16:00	2	1	S	0	7	2	2	0	0	10
19/01/2021	SI	13:00	16:00	3	2	S	0	8	2	2	0	0	11
11/03/2021	SI	08:45	11:45	1	1	W	0	4	2	2	0	0	4.5
11/03/2021	SI	08:45	11:45	2	2	W	2	6	2	2	0	0	5
11/03/2021	SI	08:45	11:45	3	2	W	3	5	2	2	0	0	5
12/03/2021	SI	12:20	15:20	1	2	W	0	6	2	2	0	0	7.5
12/03/2021	SI	12:20	15:20	2	2	W	0	3	2	2	0	0	7.5
12/03/2021	SI	12:20	15:20	3	2	W	0	7	2	2	0	0	7.5

Rain/ Precipitation
None 0
Drizzle 1
Light showers/snow 2
Heavy showers/snow 3
Heavy rain/snow 4

Cloud Cover
Expressed in oktas (n/8)
Cloud Height
Height of cloud above average height of viewshed
<150m 0

Visibility
Poor (<1km) 0
Moderate (1-3km) 1
Good (>3km) 2

Lying Snow
None 0
On site 1
On higher ground 2

Frost
None 0
Ground 1
All day 2

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°C)
			150-500m >500m	1 2									

APPENDIX III

Flight activity survey data

Primary Target Species

Table AII-1: Primary target species recorded during flight activity surveys undertaken at WF1 VP1

Date	Surveyor	Flight ID	Species	Num. Birds	Age	Sex	Obs. Time	Flight time (s)
06/10/2020	SI	1	GP	17	U	U	09:33	60

Table AII-2: Primary target species recorded during flight activity surveys undertaken at WF1 VP2

Date	Surveyor	Flight ID	Species	Num. Birds	Age	Sex	Obs. Time	Flight time (s)
05/10/2020	SI	1	WS	9	Ad	U	11:55	90
05/10/2020	SI	2	GP	15	U	U	12:46	45
06/10/2020	SI	1	WS	1	Ad	U	14:05	90
17/12/2020	SI	1	GP	60	U	U	09:15	45
17/12/2020	SI	2	WS	4	Ad	U	09:32	105
17/12/2020	SI	3	WS	2	Ad	U	10:00	75
17/12/2020	SI	4	WS	3	Ad	U	10:04	60
17/12/2020	SI	5	WS	5	Ad	U	10:07	75
17/12/2020	SI	7	WS	5	Ad	U	11:08	60
17/12/2020	SI	8	WS	5	Ad	U	11:29	75
12/02/2021	SI	1	L.	10	U	U	14:17	45
12/02/2021	SI	2	L.	10	U	U	14:24	45
12/02/2021	SI	3	GP	15	U	U	15:06	60
12/02/2021	SI	4	PE	1	Ad	F	15:07	60
17/02/2021	SI	1	WS	2	Ad	U	11:24	75
17/02/2021	SI	2	L.	40	Ad	U	12:17	30
10/03/2021	SI	1	WS	6	Ad	U	13:£1	45
10/03/2021	SI	2	WS	2	Ad	U	13:46	30
10/03/2021	SI	3	WS	4	Ad	U	14:01	30
10/03/2021	SI	4	WS	6	Ad	U	15:12	30
10/03/2021	SI	5	WN	35	Ad	U	15:20	30
10/03/2021	SI	6	WS	4	Ad	U	15:30	30

Table AII-2: Primary target species recorded during flight activity surveys undertaken at WF2 VP1

Date	Surveyor	Flight ID	Species	Num. Birds	Sex	Age	Obs. Time	Flight time (s)
17/03/2021	SI	1	PE	1	U	Ad	13:04	165

Table AII-3: Primary target species recorded during flight activity surveys undertaken at WF2 VP2

Date	Surveyor	Flight ID	Species	Num. Birds	Age	Sex	Obs. Time	Flight time (s)
27/11/2020	SI	1	WS	6	3 Ad; 3 Juv	U	10:52	60

Table AII-2: Primary target species recorded during flight activity surveys undertaken at WF2 VP3

Date	Surveyor	Flight ID	Species	Num. Birds	Age	Sex	Obs. Time	Flight time (s)
19/11/2020	SI	1	WS	5	Ad	U	10:10	45
08/12/2020	SI	3	L	50	Ad	U	14:16	45
08/12/2020	SI	4	L	20	Ad	U	14:16	45
08/12/2020	SI	6	GP	40	U	U	14:20	135
08/12/2020	SI	7	L	50	U	U	15:27	75
08/12/2020	SI	8	WS	5	Ad	U	15:42	60
08/12/2020	SI	9	L	40	Ad	U	15:45	60
08/12/2020	SI	10	GP	10	Ad	U	15:48	75
09/12/2020	SI	1	L	50	U	U	09:54	150
09/12/2020	SI	2	GP	35	U	U	09:58	240
09/12/2020	SI	3	L	50	U	U	10:03	135
09/12/2020	SI	4	WN	120	U	U	10:45	120
09/12/2020	SI	5	GP	35	U	U	10:45	60
09/12/2020	SI	6	L	50	U	U	10:47	90
09/12/2020	SI	7	WN	17	U	U	11:34	60
09/12/2020	SI	8	WS	5	Ad	U	12:10	75
27/01/2021	SI	1	WN	21	U	U	14:54	45
28/01/2021	SI	1	WS	4	Ad	U	10:52	75
28/01/2021	SI	2	WS	1	Ad	U	11:45	60
18/02/2021	SI	1	WS	7	Ad	U	13:24	75
18/02/2021	SI	2	WN	30	Ad	U	14:28	45
19/02/2021	SI	1	WN	3	Ad	M	10:16	30
12/03/2021	SI	1	WS	2	Ad	U	09:15	45
12/03/2021	SI	2	WN	60	U	U	09:33	30
12/03/2021	SI	3	WN	40	U	U	10:29	30

Table AII-2: Primary target species recorded during flight activity surveys undertaken at WF2 VP4

Date	Surveyor	Flight ID	Species	Num. Birds	M/F	Age	Obs. Time	Flight time (s)
21/10/2020	SI	1	WG	50	U	U	15:50	45
22/10/2020	SI	1	PE	1	U	Ad	10:57	60
08/12/2020	SI	3	L	3	U	Ad	11:26	60
27/01/2021	SI	1	GP	2	U	Ad	13:33	45

Secondary Target Species

Table AIII-1b: Secondary target species recorded during flight activity surveys undertaken at WF1 VP1

Date	Survey Start	Survey End	Species	Count	5 min period
06/10/20	09:30	12:30	SN	1	10:00
06/10/20	09:30	12:30	RN	2	10:35
06/10/20	12:45	15:45	RN	1	11:15
06/10/20	12:45	15:45	BZ	1	11:30
18/11/20	12:45	15:45	RN	1	15:40
18/11/20	12:45	15:45	K	1	15:40
24/11/20	12:45	15:45	RN	2	08:55
17/12/20	12:45	15:45	RN	2	13:20
19/01/21	09:00	12:00	RN	3	10:05
19/01/21	15:00	18:00	BZ	1	11:15
21/01/21	15:00	18:00	RN	1	12:50
21/01/21	15:00	18:00	RN	4	13:25
21/01/21	10:00	13:00	BZ	1	14:15
21/01/21	10:00	13:00	RN	1	14:45
21/01/21	13:45	14:05	RN	2	15:05
21/01/21	13:45	14:05	BZ	1	15:40
12/02/21	13:45	14:05	RN	3	11:45
17/02/21	13:45	14:05	BH	2	15:30
17/02/21	13:45	14:05	RN	3	16:45
17/02/21	09:30	12:30	RN	1	17:05
09/03/21	09:30	12:30	RN	1	10:15
09/03/21	12:45	15:45	BZ	1	11:45
16/03/21	12:45	15:45	RN	1	14:00
16/03/21	12:45	15:45	BZ	1	14:25
16/03/21	12:45	15:45	BZ	1	14:30
16/03/21	12:45	15:45	BZ	1	15:00
16/03/21	12:45	15:45	BZ	1	15:05

Table AIII-2b: Secondary target species recorded during flight activity surveys undertaken at WF1 VP2

Date	Survey Start	Survey End	Species	Count	5 min period
05/10/20	11:00	14:00	RN	2	12:15
05/10/20	11:00	14:00	BZ	1	13:30

Date	Survey Start	Survey End	Species	Count	5 min period
05/10/20	11:00	14:00	BZ	2	13:45
21/10/20	14:00	17:00	K	1	15:25
17/12/20	09:00	12:00	RN	1	09:20
20/01/21	13:00	16:00	BH	5	13:05
20/01/21	13:00	16:00	BH	4	13:10
20/01/21	13:00	16:00	BH	2	13:25
20/01/21	13:00	16:00	BZ	2	14:30
20/01/21	13:00	16:00	BZ	2	15:05
21/01/21	09:00	12:00	BH	10	09:05
21/01/21	09:00	12:00	RN	2	10:10
12/02/21	12:30	15:30	BH	3	13:00
12/02/21	12:30	15:30	BH	2	13:45
12/02/21	12:30	15:30	BH	7	13:50
12/02/21	12:30	15:30	BH	25	13:55
12/02/21	12:30	15:30	BH	15	14:50
12/02/21	12:30	15:30	BH	3	14:55
12/02/21	12:30	15:30	BH	20	15:05
17/02/21	10:00	13:00	BH	2	10:00
17/02/21	10:00	13:00	BH	3	10:15
17/02/21	10:00	13:00	BH	10	10:25
17/02/21	10:00	13:00	BH	3	10:50
17/02/21	10:00	13:00	BH	2	11:20
17/02/21	10:00	13:00	BH	8	11:40
17/02/21	10:00	13:00	BH	2	12:05
17/02/21	10:00	13:00	BH	8	12:15
17/02/21	10:00	13:00	BH	2	12:40
10/03/21	13:00	16:00	BH	1	13:00
10/03/21	13:00	16:00	BH	40	13:10
10/03/21	13:00	16:00	BH	22	13:15
10/03/21	13:00	16:00	BH	60	13:20
10/03/21	13:00	16:00	BH	10	15:30
16/03/21	10:15	13:15	BH	2	10:15
16/03/21	10:15	13:15	BH	4	10:30
16/03/21	10:15	13:15	BH	3	11:40
16/03/21	10:15	13:15	BH	8	11:55

Date	Survey Start	Survey End	Species	Count	5 min period
16/03/21	10:15	13:15	BH	3	12:15
16/03/21	10:15	13:15	BH	4	12:45
16/03/21	10:15	13:15	LB	4	12:50
16/03/21	10:15	13:15	BH	3	13:05

Table AIII-3b: Secondary target species recorded during flight activity surveys undertaken at WF2 VP1

Date	Survey Start	Survey End	Species	Count	5 min period
25/11/20	11:00	14:00	K	1	12:25
25/11/20	11:00	14:00	K	1	12:40
25/11/20	11:00	14:00	RN	2	12:45
25/11/20	11:00	14:00	K	1	12:45
25/11/20	11:00	14:00	CO	2	12:45
26/11/20	09:00	12:00	RN	2	10:05
26/11/20	09:00	12:00	K	1	10:45
26/11/20	09:00	12:00	BZ	2	11:10
26/11/20	09:00	12:00	RN	2	11:30
22/01/21	09:15	12:15	RN	1	10:10
22/01/21	09:15	12:15	RN	2	10:25
22/01/21	09:15	12:15	RN	2	11:00
22/01/21	09:15	12:15	H	1	11:00
10/02/21	10:00	13:00	H	2	10:30
10/02/21	10:00	13:00	BH	1	11:15
10/02/21	10:00	13:00	RN	1	11:35
10/02/21	10:00	13:00	RN	2	11:40
10/02/21	10:00	13:00	BZ	1	11:50
10/02/21	10:00	13:00	H	1	12:00
11/02/21	14:30	17:30	BH	4	15:45
17/03/21	11:20	14:20	H	1	11:40
17/03/21	11:20	14:20	BZ	2	12:10
17/03/21	11:20	14:20	BZ	2	12:15
17/03/21	11:20	14:20	BZ	2	12:20
17/03/21	11:20	14:20	BZ	2	12:25
17/03/21	11:20	14:20	RZ	2	12:30
17/03/21	11:20	14:20	BZ	1	12:50
17/03/21	11:20	14:20	K	1	13:15

Date	Survey Start	Survey End	Species	Count	5 min period
17/03/21	11:20	14:20	RN	2	13:20
17/03/21	11:20	14:20	BZ	1	13:25
17/03/21	11:20	14:20	BZ	1	13:25
17/03/21	11:20	14:20	BZ	1	14:00
18/03/21	11:50	14:50	BZ	1	12:05
18/03/21	11:50	14:50	K	1	12:20
18/03/21	11:50	14:50	RN	2	12:30
18/03/21	11:50	14:50	BZ	2	12:35
18/03/21	11:50	14:50	BZ	1	13:10
18/03/21	11:50	14:50	RN	1	13:10
18/03/21	11:50	14:50	BZ	1	13:40
18/03/21	11:50	14:50	K	1	13:40
18/03/21	11:50	14:50	BZ	2	13:50
18/03/21	11:50	14:50	LB	2	13:50
18/03/21	11:50	14:50	BZ	1	13:55
18/03/21	11:50	14:50	BZ	1	14:10
18/03/21	11:50	14:50	K	1	14:15
18/03/21	11:50	14:50	LB	1	14:15
18/03/21	11:50	14:50	BZ	2	14:20
18/03/21	11:50	14:50	K	1	14:20
18/03/21	11:50	14:50	LB	2	14:40

Table AIII-4b: Secondary target species recorded during flight activity surveys undertaken at WF2 VP2

Date	Survey Start	Survey End	Species	Count	5 min period
07/10/20	09:30	12:30	RN	3	09:30
07/10/20	09:30	12:30	RN	1	10:35
27/11/20	09:00	12:00	RN	1	09:55
27/11/20	09:00	12:00	CA	1	10:05
27/11/20	09:00	12:00	RN	1	10:20
27/11/20	09:00	12:00	RN	1	10:40
26/11/20	12:30	15:10	RN	1	12:24
26/11/20	12:30	15:10	RN	2	13:00
26/11/20	12:30	15:10	RN	1	13:15
26/11/20	12:30	15:10	RN	1	13:20
26/11/20	12:30	15:10	RN	1	13:25

Date	Survey Start	Survey End	Species	Count	5 min period
26/11/20	12:30	15:10	RN	2	14:05
26/11/20	12:30	15:10	RN	1	15:20
22/01/21	12:45	15:45	K	1	13:10
29/01/21	09:10	12:10	RN	2	11:00
29/01/21	09:10	12:10	K	1	14:45
10/02/21	13:30	16:30	RN	1	14:20
10/02/21	13:30	16:30	RN	2	14:35
11/02/21	09:20	12:20	RN	5	09:45
11/02/21	09:20	12:20	BZ	1	10:25
11/02/21	09:20	12:20	RN	3	11:15
17/03/21	14:50	17:50	K	1	15:55
17/03/21	14:50	17:50	BZ	1	15:55
17/03/21	14:50	17:50	LB	1	16:05
17/03/21	14:50	17:50	RN	14	16:10
17/03/21	14:50	17:50	RN	2	17:20
18/03/21	08:20	11:20	RN	4	10:10
18/03/21	08:20	11:20	RN	1	10:40

Table AIII-5b: Secondary target species recorded during flight activity surveys undertaken at WF2 VP3

Date	Survey Start	Survey End	Species	Count	5 min period
22/10/20	13:00	14:15	H	1	13:05
22/10/20	13:00	14:15	BZ	2	13:15
22/10/20	13:00	14:15	BZ	2	13:25
19/11/20	09:45	12:45	RN	2	11:15
19/11/20	09:45	12:45	RN	1	11:40
19/11/20	09:45	12:45	RN	1	11:45
19/11/20	09:45	12:45	CU	14	11:50
20/11/20	12:40	15:40	K	1	12:45
20/11/20	12:40	15:40	H	1	12:50
20/11/20	12:40	15:40	RN	1	12:50
20/11/20	12:40	15:40	CU	20	13:00
20/11/20	12:40	15:40	CU	1	13:55
20/11/20	12:40	15:40	CU	8	14:30
20/11/20	12:40	15:40	RN	1	15:15
08/12/20	13:15	16:15	CU	40	13:55

Date	Survey Start	Survey End	Species	Count	5 min period
08/12/20	13:15	16:15	RN	2	16:05
09/12/20	09:30	12:30	RN	2	10:10
09/12/20	09:30	12:30	MA	2	11:10
09/12/20	09:30	12:30	MS	2	11:20
09/12/20	09:30	12:30	CU	50	11:35
27/01/21	14:00	17:00	RN	1	15:40
27/01/21	14:00	17:00	BH	2	15:45
27/01/21	14:00	17:00	H	1	15:55
27/01/21	14:00	17:00	CA	1	16:00
28/01/21	09:30	12:30	BH	1	10:30
28/01/21	09:30	12:30	BZ	1	11:55
28/01/21	09:30	12:30	CU	100	12:00
28/01/21	09:30	12:30	BH	1	12:10
18/02/21	12:50	15:50	RN	1	12:55
18/02/21	12:50	15:50	BH	2	13:10
18/02/21	12:50	15:50	BH	18	13:30
18/02/21	12:50	15:50	CU	10	14:00
18/02/21	12:50	15:50	BH	15	14:15
18/02/21	12:50	15:50	BH	2	15:25
18/02/21	12:50	15:50	BH	3	15:40
18/02/21	12:50	15:50	MA	4	15:40
18/02/21	12:50	15:50	CU	20	15:40
19/02/21	09:30	12:30	BH	11	09:40
19/02/21	09:30	12:30	RN	2	09:50
19/02/21	09:30	12:30	HG	1	10:10
19/02/21	09:30	12:30	BH	2	10:25
11/03/21	12:15	15:15	BH	4	12:20
11/03/21	12:15	15:15	MA	2	12:45
11/03/21	12:15	15:15	MA	3	13:10
11/03/21	12:15	15:15	BH	8	14:05
11/03/21	12:15	15:15	BH	2	14:40
11/03/21	12:15	15:15	BH	20	14:55
12/03/21	08:15	11:45	BH	2	08:50
12/03/21	08:15	11:45	MA	2	08:55
12/03/21	08:15	11:45	BH	50	09:20

Date	Survey Start	Survey End	Species	Count	5 min period
12/03/21	08:15	11:45	MA	2	09:30
12/03/21	08:15	11:45	CU	2	09:50
12/03/21	08:15	11:45	CU	2	10:05
12/03/21	08:15	11:45	BZ	1	10:10
12/03/21	08:15	11:45	MA	3	10:15
12/03/21	08:15	11:45	MA	2	11:05

Table AIII-6b: Secondary target species recorded during flight activity surveys undertaken at WF2 VP4

Date	Survey Start	Survey End	Species	Count	5 min period
21/10/20	14:00	17:00	K	1	15:25
22/10/20	09:30	12:30	RN	1	11:05
22/10/20	09:30	12:30	BZ	1	12:00
20/11/20	09:00	12:00	LB	1	11:50
08/12/20	09:40	12:40	RN	1	10:55
08/12/20	09:40	12:40	RN	1	11:05
08/12/20	09:40	12:40	LB	1	11:45
08/12/20	09:40	12:40	RN	1	11:55
08/12/20	09:40	12:40	LB	1	12:10
09/12/20	13:00	16:00	RN	1	13:50
09/12/20	13:00	16:00	RN	1	14:20
09/12/20	13:00	16:00	K	1	15:40
27/01/21	11:00	14:00	RN	1	11:05
27/01/21	11:00	14:00	HG	1	11:15
27/01/21	11:00	14:00	BH	6	12:30
27/01/21	11:00	14:00	RN	1	13:30
28/01/21	13:15	16:15	BH	3	14:50
28/01/21	13:15	16:15	CA	6	15:45
28/01/21	13:15	16:15	CA	2	15:55
18/02/21	09:10	12:10	RN	1	09:15
18/02/21	09:10	12:10	BH	1	09:20
18/02/21	09:10	12:10	BH	4	09:20
18/02/21	09:10	12:10	RN	2	09:45
18/02/21	09:10	12:10	RN	1	10:00
18/02/21	09:10	12:10	BH	1	10:40
18/02/21	09:10	12:10	BH	1	11:50

Date	Survey Start	Survey End	Species	Count	5 min period
19/02/21	13:00	16:00	BH	1	13:50
19/02/21	13:00	16:00	BH	2	13:50
19/02/21	13:00	16:00	BH	2	13:55
19/02/21	13:00	16:00	BH	2	14:00
19/02/21	13:00	16:00	BH	3	15:15
19/02/21	13:00	16:00	BH	4	15:45
12/03/21	12:20	15:20	LB	1	13:30
12/03/21	12:20	15:20	RN	1	13:40
12/03/21	12:20	15:20	BH	10	14:10
12/03/21	12:20	15:20	BH	14	14:30

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