



APPENDIX 7-3

**BIRD SURVEY RESULTS -
WINTER 2019-2020**

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Bird Survey Report Winter 2019-20

BIRD SURVEY REPORT

WINTER 2019/20

Seven Hills Wind Farm I and II

Prepared for: Seven Hills Wind Farm Ltd

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1.0 Introduction

SLR Consulting Ireland (SLR) was commissioned by Seven Hills Wind Farm Ltd. in October 2019 to carry out a winter bird survey programme for the proposed Seven Hills Wind Farm, Co. Roscommon during the winter period 2019-20. 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 of these 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 for each of the developments 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 2019/20 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 report for winter 2018/2019 (SLR Consulting, 2021). As such, in order to glean a comprehensive representation of winter bird activity at both proposed wind farm sites across the two winter seasons, the 2018/2019 report 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) 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.

The scope of survey work was the same as that conducted in 2018-19, with the addition of Greenland white-fronted goose roosting surveys at Lough Croan and nocturnal foraging surveys for golden plover. 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) – Project Manager and Lead Ornithologist

Sarah is a Senior Ecologist 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.

Daniel Alexander (DA) – Lead Bird Surveyor

Daniel has been working as a field surveyor on numerous projects for the last ten years. During this time, he has gained a breadth of experience conducting, planning, and supporting ecological surveys. Daniel has expertise in undertaking bird surveys, both breeding and wintering, and in recent years has been responsible for monitoring the breeding bird assemblage of a large ecological restoration project as part of the Mersey Gateway Project in the UK. Daniel now works for SLR as a Senior Field Ecologist. Supervised by Sarah Ingham, Daniel was lead bird surveyor at Seven Hills Wind Farm during the winter 2019/20 survey season.

Daniel Hulmes (DH) – Assistant Bird Surveyor

Daniel is a Senior Field Ornithologist and Terrestrial Ecologist. He has worked on a wide range of projects involving the survey and monitoring of birds in the UK, Ireland and internationally. Furthermore, as part of his previous work as an Ecologist, he gained experiencing in managing projects which included a large amount of report writing, survey planning and client interaction. Supervised by Sarah Ingham, Daniel assisted with bird surveys at Seven Hills Wind Farm during the winter 2019/20 survey season when required.

Jason Cahill (JC) – Assistant Bird Surveyor

Jason joined SLR in February 2020, and this is his first long-term role in ecological consultancy. Jason holds a BSc (Hons) 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 also assisted with bird surveys at Seven Hills Wind Farm during the winter 2019/2020 survey season when required.

2.2.2 Flight Activity Surveys

Vantage point (VP) locations were the same as those used in winter 2018-19, 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. The ZTVs were calculated with a surface offset of 30m and from a viewing height of 1.8m above ground level. The terrain model was derived from EU-DEM data with a vertical accuracy of ± 7 m. VP locations and viewing arcs are shown in Figure 1 and VP viewsheds are shown in Figure 2. The proposed site layout is also shown in Figures 1 and 2.

Initially, 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. In addition, there was a further 6 hours of watches carried out at each of the 6 VPs in March 2020 with the aim of observing and recording any movements of target bird species, such as geese and swans, across the proposed wind farm development sites during the spring migration period. As such, a total of 42 hours of survey effort was carried out at each VP during the 2019/20 winter season. The VP survey effort undertaken during the winter of 2019/20 is given below in Table 2-1.

Table 2-1: VP survey effort undertaken at the Seven Hills Wind Farms I and II sites October 2019 to March 2020

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	12:00	12:00	12:00	12:00	12:00	12:00
Total hrs	42:00	42:00	42:00	42:00	42:00	42:00
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 and spread across different times of the 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. 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.

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

In the absence of detailed information regarding turbine specifications at the time of undertaking the surveys, the recording height bands were determined based on the turbine specifications included in the previous

application (tip height 135m, lowest rotor swept height 35m) plus a little bit extra to allow some flexibility. Flight heights were therefore attributed to four distinct height bands as follows:

- 1 = < 25m (below the likely rotor swept area);
- 2 = 25m to 50m (the likely rotor swept area);
- 3 = 50m to 150m (the likely rotor swept area); and
- 4 = > 150m (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

Primary 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 Guidance (2017). Following the 2018-19 winter surveys, 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.

SNH 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 2019-20 surveys.

Furthermore, primary target species were specifically limited to species upon which effects are most likely to be potentially significant in EIA terms, e.g. whooper swan, Greenland white-fronted goose, Annex 1 raptor species and waders forming qualifying features for nearby SPAs. This enabled 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.

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*;
- Peregrine falcon *Falco peregrinus*;
- Hen harrier *Circus cyaneus*;
- Merlin *Falco columbarius*; and
- Short-eared owl *Asio flammeus*.

Secondary 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 when 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 monthly basis to establish if swans and geese were using the fields within 1 km of the wind farm boundary. Whooper swan and Greenland white-fronted goose are features of interest of several Special Protection Areas (SPAs) within 15 km of the site boundary (see Table 3-1). A 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. An initial survey was undertaken in October 2019 and repeated on a monthly basis until March 2020. The transect route, survey dates and survey results are shown in Figure 9. .

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 we obtained an unpublished study on the species (Burke *et al.*, 2014). The unpublished document accessed in 2019 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 and were repeated on a monthly basis until March 2020.

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, this 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. 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) reviews 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.

Watches of Lough Croan were carried out simultaneously from two vantage points on the local road north of Lough Croan monthly between December 2019 and March 2020. The watches were carried out at dusk and the following dawn each month for a duration of up to 2 hours. 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. Any flight-lines of geese to and from the roost along with 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. .

2.2.5 Golden Plover Nocturnal Foraging Surveys

Following small numbers of records of golden plover during daytime surveys in winter 2018-19, additional surveys were carried out in winter 2019-20 to determine whether golden plover activity at the site was significantly different at night.

Pre-defined transects were walked at night on three occasions between January and March 2020. The purpose of the survey was to identify if golden plover uses the site for foraging at night. The relatively rough topography and terrain present on Wind Farm II was considered a health and safety risk to surveyors working in such terrain at night. Therefore, the transects were focused on the site of the proposed Wind Farm I and as such, all proposed turbine locations and associated access tracks under consideration at that time were walked after dark by 2 surveyors.

A high-powered torch was used by one surveyor to slowly sweep across the landscape, while a second surveyor used binoculars to spot any birds visible in the torchlight. Any foraging golden plover flushed while the surveyors were walking the transect route were also recorded.

The transect route and survey results are shown in Figure 11.

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 48 hours out of the total of 216 during which the visibility was recorded

as “moderate” i.e. 1-3km and 2 non-consecutive hours during which the visibility was “poor” i.e. less than 1km. This comprises 23% of the total survey season and in most cases all of the relevant 2km viewing arc was visible. As such, this does not significantly affect the validity of the data collected. Please see details 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 proposed 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 public roads without any access to land and as such, not all fields within the 1km survey area were 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 the vantage point surveys and it is therefore considered unlikely that significant feeding flocks were overlooked.

As mentioned above in Section 2.2.5, the golden plover nocturnal survey was limited to Wind Farm I due to health and safety concerns relating to working at night in rough terrain at Wind Farm II. Unfortunately, this limitation was unavoidable.

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 km¹ 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	<ul style="list-style-type: none"> Shoveler <i>Anas clypeata</i> Golden Plover <i>Pluvialis apricaria</i> Greenland White-fronted Goose <i>Anser albifrons flavirostris</i> Wetland and Waterbirds
River Suck Callows SPA	004097	1.7km west	<ul style="list-style-type: none"> Whooper Swan <i>Cygnus cygnus</i> Wigeon <i>Anas penelope</i> Golden Plover <i>Pluvialis apricaria</i> Lapwing <i>Vanellus vanellus</i> Greenland White-fronted Goose <i>Anser albifrons flavirostris</i> Wetland and Waterbirds
Four Roads Turlough SPA	004140	1.9km north	<ul style="list-style-type: none"> Golden Plover <i>Pluvialis apricaria</i> Greenland White-fronted Goose <i>Anser albifrons flavirostris</i> Wetland and Waterbirds
Lough Ree SPA	004064	8km east	<ul style="list-style-type: none"> Little Grebe <i>Tachybaptus ruficollis</i> Whooper Swan <i>Cygnus cygnus</i> Wigeon <i>Anas penelope</i> Teal <i>Anas crecca</i> Mallard <i>Anas platyrhynchos</i> Shoveler <i>Anas clypeata</i> Goldeneye <i>Bucephala clangula</i> Coot <i>Fulica atra</i> Golden Plover <i>Pluvialis apricaria</i> Lapwing <i>Vanellus vanellus</i> 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	<ul style="list-style-type: none"> • Whooper Swan <i>Cygnus cygnus</i> • Wigeon <i>Anas penelope</i> • Golden Plover <i>Pluvialis apricaria</i> • Lapwing <i>Vanellus vanellus</i> • Black-tailed Godwit <i>Limosa limosa</i> • Black-headed Gull <i>Chroicocephalus ridibundus</i> • 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 columbianus*, 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 and waders 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 1, 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 in area 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. 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: Vantage Points 1 and 2

In total, four primary target species were recorded flying through the site during the survey period. The primary target species are shown in Table 3-2 alongside the total number of birds observed from both VPs and the total number of flights recorded.

Table 3-2: Primary target species and flights recorded from WFI VPs 1 and 2 - October 2019 to March 2020

Target Species	Total number of birds recorded	Total number of flights recorded
Whooper swan	16	5
Greenland white-fronted goose	72	1
Lapwing	10	1
Golden plover	140	5
Total	238	12

Results from surveys at Wind Farm I showed that whooper swan spent up to 15 seconds in Height Band 2 on three flights, dropping out of Height Band 2 (the likely rotor swept area) on two of those flights. The other two observations of whooper swan were recorded in Height Band 1. As shown in Figures 3, 5 and 6, all observations of whooper swan were recorded outside the 500m buffer zone around Wind Farm I.

A flock of 72 Greenland white-fronted geese were observed in March flying offsite to the north-west of the survey buffer around dusk. Given the direction of flight, it is likely that these birds were leaving Lough Croan to roost at the River Suck Callows (Figure 8). This flock was observed in Height Band 3.

As shown in Figures 6 and 7, four of the five observations of golden plover were recorded either on the edge or outside of the 500m buffer zone, with one flight-line entering the site in a north-easterly direction (Figure 6).

During the single observation of lapwing at Wind Farm I, the flock of 10 birds spent 45 seconds within Height Band 2. This observation was recorded from VP2 in October (Figure 3), within the eastern section of Wind Farm I.

3.2.1.2 Wind Farm II: Vantage Points 1 – 4

In total, three primary target species were recorded flying through the site during the six-month survey period. The primary target species are shown in Table 3-3 together with the total number of birds observed from both VPs and the total number of flights recorded.

Table 3-3: Target species and flights recorded from WFII VP1 – VP4 – October 2019 to March 2020

Target Species	Total number of birds recorded	Total number of flights recorded
Whooper swan	31	5
Golden plover	36	3
Lapwing	69	6
Total	136	14

There was a variety in whooper swan flock size, ranging from two to a flock of 11, with a total count of 31 throughout the 6-month period. As shown in Figures 4, 5 and 6, three of the five sightings of whooper swan were recorded within the boundaries of Wind Farm II, whilst the other two sightings were recorded within the 500m buffer. Three of the flocks recorded onsite spent between 60 and 90 seconds within Height Bands 2 or 3. The other three flocks were recorded in Height Band 1.

Golden plover was recorded on three occasions, once onsite and twice within the 500m buffer, during October surveys only (Figure 3) and only one of the flocks were observed flying within Height Bands 2 or 3.

Four of the six observations of lapwing were of flocks ranging from a single individual to three birds, while there were two observations of larger flocks (n=27 and n=35). There was a single observation of one individual lapwing recorded within Height Band 2 on site. The other five observations of lapwing were recorded within the 500m buffer (Figures 3 and 4), one of which was in Height Band 3 (the other observations were all in Height Band 1).

3.2.2 Secondary Target Species

Wind Farm I

Summary details of the eight secondary target species recorded through the season at Wind Farm I are presented in Table 3-4.

There were two species of gull recorded through the season (black-headed gull and lesser black-backed gull), with black-headed gull being the most abundant (36 observations of 1,956 birds). The vast majority of sightings of both species of gull were recorded offsite at Thomas Street Turlough, which is approximately 1.5km to the south of Wind Farm I.

Wigeon was recorded on one occasion throughout the entire survey season in a flock of 40-50 foraging at the turlough viewed from VP2 in February. There was no flight recorded within the flock.

Buzzard was the only species of raptor recorded at Wind Farm I, with three observations of five birds recorded throughout the six months of survey. All five birds were observed within Height Band 2.

A combined total of 65 raven were recorded in 35 observations. The majority of these were either on passage through the survey area or circling above.

Table 3-4: Secondary target species and flights recorded from WFI VPs 1 and 2 - October 2019 to March 2020

Target Species	Total number of birds recorded	Total number of flights recorded
Black-headed gull	1956	36
Lesser black-backed gull	12	7
Buzzard	5	3
Curlew	1	1
Mallard	6	2
Wigeon	50	1
Mute swan	1	1
Raven	65	35
Total	2094	85

Wind Farm II

Summary details of the eight secondary target species recorded through the season at Wind Farm I are presented in Table 3-5.

Black-headed gull was the most abundant secondary target species recorded at Wind Farm II with 37 records and a cumulative total of c. 339 individuals. Approximately 80% of records of black-headed gull flock-sizes ranged from 1-9 individuals, while the remaining 20% ranged from 12-42 individuals. The larger flocks were recorded from VP3 foraging and loafing over Feacle Lough, which is located within the 500m survey buffer. Of the 37 flights, 21 were in Height Band 1.

The second most abundant secondary target species recorded was curlew. There was a cumulative total of 290 birds recorded within 18 observations which utilise WFII as a winter foraging ground (mean flock size n = 16; range: 1-56). Given that their primary behaviour was feeding in the fields around the site, the majority of flights were recorded below Height Band 2 (<25m).

There were 2 flocks of wigeon recorded at WFII throughout the entire winter season in February and March (n=57 and n=4 respectively). Both flights were observed within Height Bands 2 and 3 within the survey buffer.

There were three flights of teal observed at Feacle Lough during the same survey period in March. All three flights were within Height Bands 2 and 3.

There was slightly more diversity of raptor species recorded at Wind Farm II than at Wind Farm I, with three species of raptor observed throughout the winter period. Buzzard was recorded on three occasions (n=4), kestrel on four occasions (n=4) and sparrowhawk on four occasions (n=4). All of these records were observed flying in Height Band 1.

Table 3-5: Secondary target species and flights recorded from WFII VPs 1-4 - October 2019 to March 2020

Target Species	Total number of birds recorded	Total number of flights recorded
Black-headed gull	339	37
Lesser black-backed gull	2	1
Herring gull	6	4
Buzzard	4	3
Kestrel	4	4
Sparrowhawk	4	4
Curlew	290	18
Snipe	1	1
Mallard	37	2
Wigeon	61	2
Teal	7	3
Cormorant	1	1
Grey heron	1	1
Raven	79	42
Total	836	123

3.3 Swan and Goose Feeding and Distribution Surveys

There were no Greenland white-fronted geese recorded within 1 km of the wind farm sites during the October 2019 to March 2020 feeding distribution surveys.

Whooper swans were recorded during the feeding distribution surveys in each month except for October. Figure 9 illustrates that there appear to be two main foraging areas for whooper swan approximately 1km from each of the proposed wind farm sites, namely at Lough Croan to the north of Wind Farm I and the Ballyglass River to the north of Wind Farm II. A small flock of four whooper swan was also recorded foraging in an agricultural grassland field just to the north of Wind Farm I during the December survey.

As mentioned above, Lough Croan is located approximately 1.5km north of Wind Farm I. There were three small flocks of whooper swan ranging in size from 2-5 birds observed foraging on the grasslands at Lough Croan in December 2019, January and February 2020. A larger flock of 32 was observed foraging in the same area in March 2020.

The Ballyglass River is located just over 1km to the north of Wind Farm II and is a relatively short 6.5km river which flows in a south western direction from Coolagarry Lough to the River Suck Callows SPA. Small to mid-sized flocks of whoopers swans ranging from 8-20 birds were observed foraging on the grassland callows adjacent to the Ballyglass River during the feeding distribution surveys in November 2019 – March 2020 (Figure 9).

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 December 2019 and March 2020.

Greenland white-fronted geese were recorded at Lough Croan in December 2019 and February 2020 only, with no sightings of geese during January or the two March surveys. Please see Figure 10 for flight-line results and flock sizes observed during these surveys.

A total of five flocks were observed at the lough in December, with four of these flocks ranging in size from 9 - 17. There was one larger flock of 120 observed arriving from the west during the dusk survey. There were two flocks recorded during February surveys. One of these was a flock of 40 birds flying west at dusk, however, due to fading light, it was not possible to confirm whether the flock left the site or if it moved to another part of the lough. Similarly, a small flock of 14 was observed moving west at dawn during the February survey, however, again as the flock went out of sight, it was not possible to confirm if the flock moved or left the area entirely.

3.5 Golden Plover Nocturnal Foraging Surveys

Golden plover nocturnal foraging surveys were undertaken at Wind Farm I monthly between January and March 2020. There was a total of four records of golden plover noted during these surveys (Figure 11), one record in January and three in March. There were no records in February.

In January, a single golden plover was heard calling in the eastern section of the site. During the March survey, there were two records of calling plovers, one in the west of the site and the second in the east. The third record in March was of a flock of three plovers which were flushed by surveyors north of where the second record was heard, and these were observed in torchlight flying north.

4.0 Summary and Conclusions

The aim of this report is to provide baseline ornithological survey data for the 2019/2020 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 2019/2020 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 2019 to March 2020. 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;
- Goose roost surveys at Lough Croan; and
- Golden plover nocturnal foraging surveys.

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 from October to February and 12 hours per month during the spring passage season in March. This resulted in a total survey effort of 42 hours per vantage point throughout the season.

Swan and goose feeding and distribution surveys were repeated 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.

Following receipt of an unpublished study on Greenland white-fronted geese (Burke *et al.*, 2014) goose roost watches of Lough Croan were carried out at Lough Croan between December 2019 and March 2020. 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.

Nocturnal surveys for golden plover were undertaken at Wind Farm I on three occasions between January and March 2020 to determine whether golden plover activity at the site was significantly different at night. Nocturnal survey was not possible at Wind Farm II due to the rough topography and terrain, which was considered a health and safety risk to surveyors.

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; and
- Lapwing.

There was only one record of Greenland white-fronted geese from any of the VP watches, a flock of 72 offsite to the north-west of the 500m buffer at Wind Farm I in March. They were also observed using Lough Croan during the dawn dusk goose roost surveys. This species was recorded using the lough during two of the four months of surveys, which suggests that although Lough Croan is potentially an established roost site, it does not appear to be 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 is used less so in more recent years. This may align with the sporadic use of the lough recorded during this survey.

In addition, all but one of the 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-west/east plane. The one flock which was not on an east/west plane was observed flying in from the north west. 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. Thus, it appears that these flocks move to the north of the proposed wind farms and do not transect the wind farm sites when moving between their feeding and roosting sites.

In relation to whooper swan, vantage point surveys showed low movements of this species across the two wind farm sites. This species was not observed traversing Wind Farm I as all observations were recorded offsite and outside of the 500m buffer of that proposed wind farm site. Of the five sightings of swans at Wind Farm II, three were recorded onsite. It is possible that these birds may be associated with the flocks which graze the agricultural grassland fields on the banks of the Ballyglass River to the north of Wind Farm II which may also be associated with the River Suck Callows SPA population.

Golden plover was recorded on five occasions at Wind Farm I and on three occasions at Wind Farm II during vantage point surveys throughout the entire survey season. Three of the eight sightings were recorded within the 500m buffer with only one flock recorded entering the site at Wind Farm I and none observed flying within Height Band 2. Furthermore, the targeted nocturnal surveys for golden plover at Wind Farm I yielded a total of just four records of six birds. These results suggest a small sporadic population of golden plover exists in the area surrounding the two wind farm sites. Records of lapwing were infrequent with a total of seven sightings throughout the survey season, one record at Wind Farm I and six at Wind Farm II. The largest of these flocks was 35 which occurred on one occasion at Wind Farm II in November. Similar to golden plover, the lapwing population in this area appears to be small and sporadic.

Regarding secondary target species, there were eight secondary target 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 14 secondary species recorded throughout the season at Wind Farm II. Raven was the most frequently recorded secondary species (42 records) and black-headed gull was the most numerous, with a combined total of 339 birds recorded, with the larger flocks recorded around Feacle Lough. Curlew was the next most frequently recorded species with 18 records of a combined total of 290 birds, which were mostly recorded feeding in the fields around the survey area.

5.0 References

- Burke, B., Egan, F., Norriss, D. H., Wilson J. and Walsh, A. (2014) A review of Greenland White-fronted Geese in Ireland 1982/83 – 2011/12. National Parks and Wildlife Service. November 2014.
- Colhoun and Cummins (2013) Birds of Conservation Concern in Ireland 2014–2019. *Irish Birds* 9: 523-544
- EcoFact Environmental Consultants Ltd (2012) Seven Hills Wind Farm (Phase I) Co. Roscommon Report to inform the Appropriate Assessment Process.
- EcoFact Environmental Consultants Ltd (2012) Seven Hills Wind Farm (Phase II) Co. Roscommon Report to inform the Appropriate Assessment Process.
- 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.
- 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 (2010) Response to issues arising from item (5) of a Request for Further Information (RFI) from Roscommon Co. Council (Planning Reference no. 10/541).
- 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.
- Inis Environmental Consultants Ltd (2018) Summary Report on Winter 2017/18 Findings at the Proposed Seven Hills I and II Windfarms, Co. Roscommon.
- Kyed Larsen, J. and Clausen, P. (2002) Potential Wind Park Impacts on Whooper Swans in Winter: The Risk of Collision. *Waterbirds: The International Journal of Waterbird Biology* Vol. 25, Special Publication 1: Proceedings of the Fourth International Swan Symposium 2001 (2002), pp. 327-330 (4 pages) Published By: Waterbird Society <https://www.jstor.org/stable/1522370>
- Lynas, P., Newton, S.F. and Robinson, J.A. (2009) The status of birds in Ireland: an analysis of conservation concern 2008-2013. *Irish Birds*, 8(2): 149-166.
- 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).
- 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).
- Scottish Natural Heritage (2014) Recommended bird survey methods to inform impact assessment of onshore wind farms.
- 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. 2021. Seven Hills Wind Farm Bird Survey Report Winter 2018-19.

6.0 Figures

Figure 1: Seven Hills Wind Farm Phase 1 and 2 Site Layout and Vantage Point Locations

Figure 2: Viewsheds from Vantage Points Overlooking Wind Farms I and II - 30m Offset

Figure 3: Target Species Flight-lines – October 2019

Figure 4: Target Species Flight-lines – November 2019

Figure 5: Target Species Flight-lines – December 2019

Figure 6: Target Species Flight-lines – January 2020

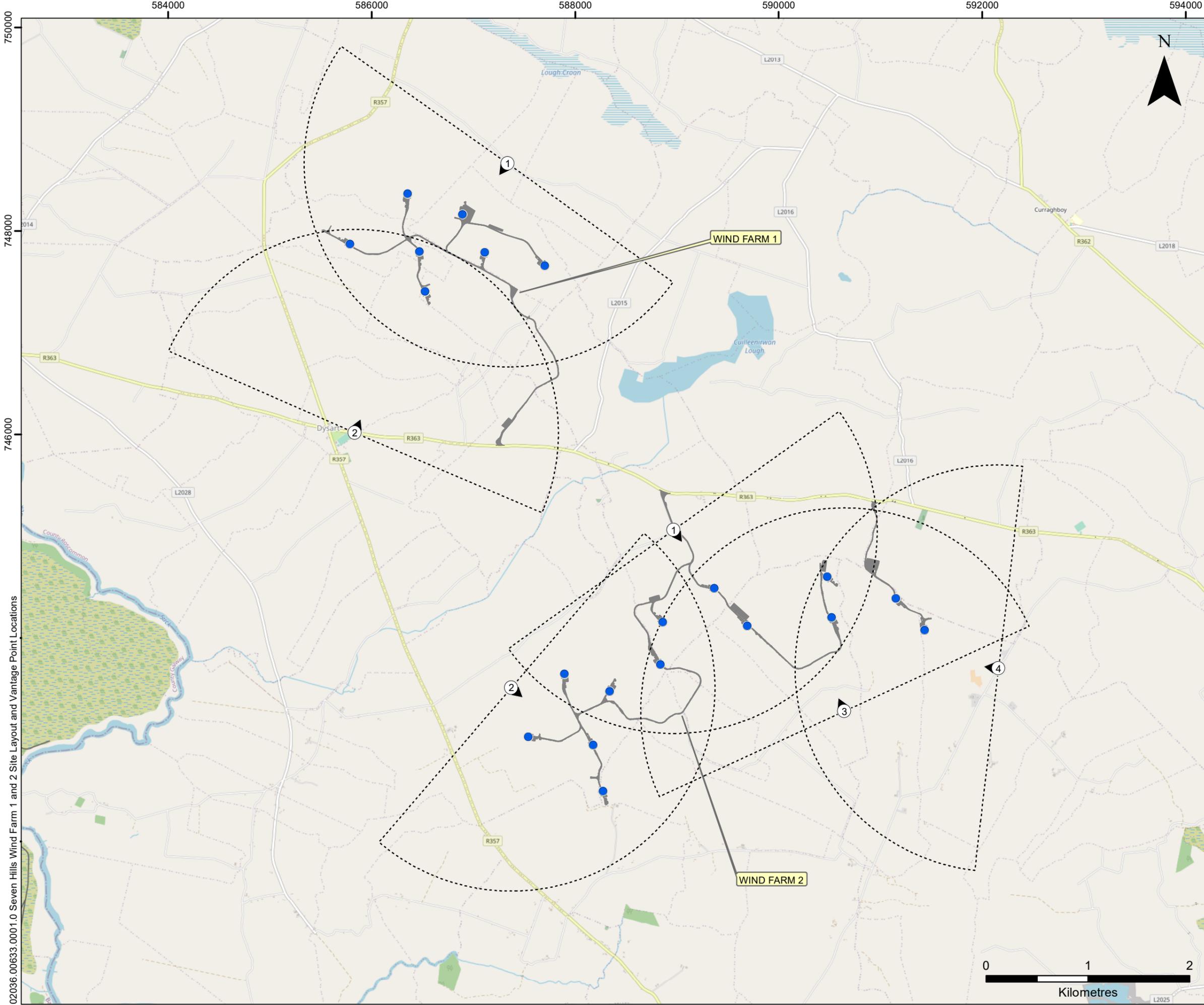
Figure 7: Target Species Flight-lines – February 2020

Figure 8: Target Species Flight-lines – March 2020

Figure 9: Swan and Goose Feeding Distribution Survey Winter 2019/2020 – Transect Route and Peak Counts

Figure 10: Greenland White-fronted Goose Roost Dawn/Dusk Survey Winter 2019/2020 – Vantage Point Locations and Flight-lines

Figure 11: Golden Plover Nocturnal Survey Winter 2019/2020 – Transect Route and Observation Locations



LEGEND

- Turbine Location
- Site Infrastructure
- Vantage Point
- Vantage Points 2km View Arc



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**FIGURE 1 - SITE LAYOUT AND
VANTAGE POINT LOCATIONS**



Scale 1:35,000 @ A3 Date MAY 2022

02036.00633.0001.0 Seven Hills Wind Farm 1 and 2 Site Layout and Vantage Point Locations

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748000

746000

584000

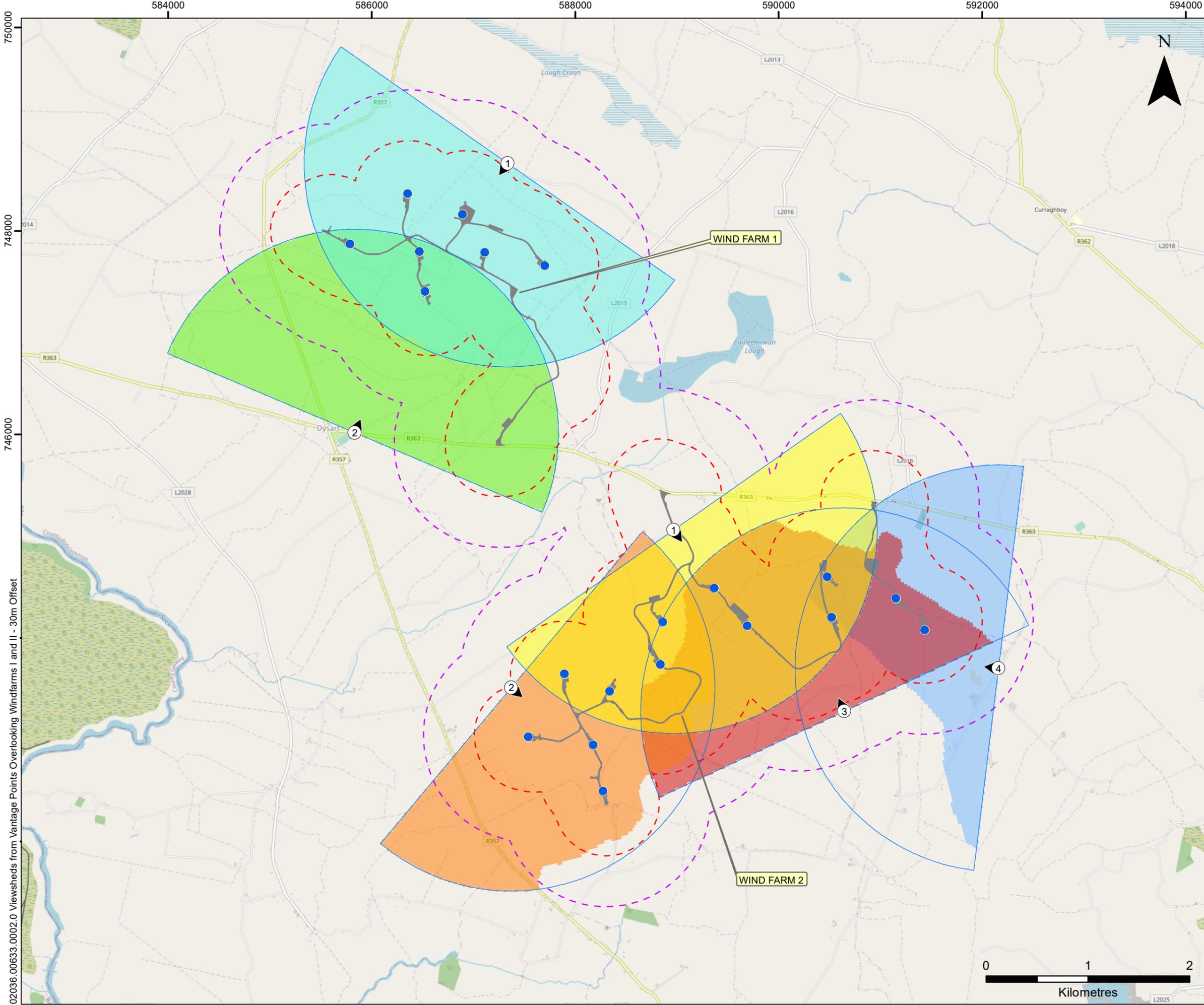
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NOTE
 1. The Zones of Theoretical Visibility (ZTV) was calculated using ArcMAP 10.5.1 Spatial Analyst. The ZTV is calculated with a surface offset 30m & from a viewing height of 1.8m above ground level. The terrain model is derived from EU-DEM data 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
 OVERLOOKING WINDFARMS I AND II**

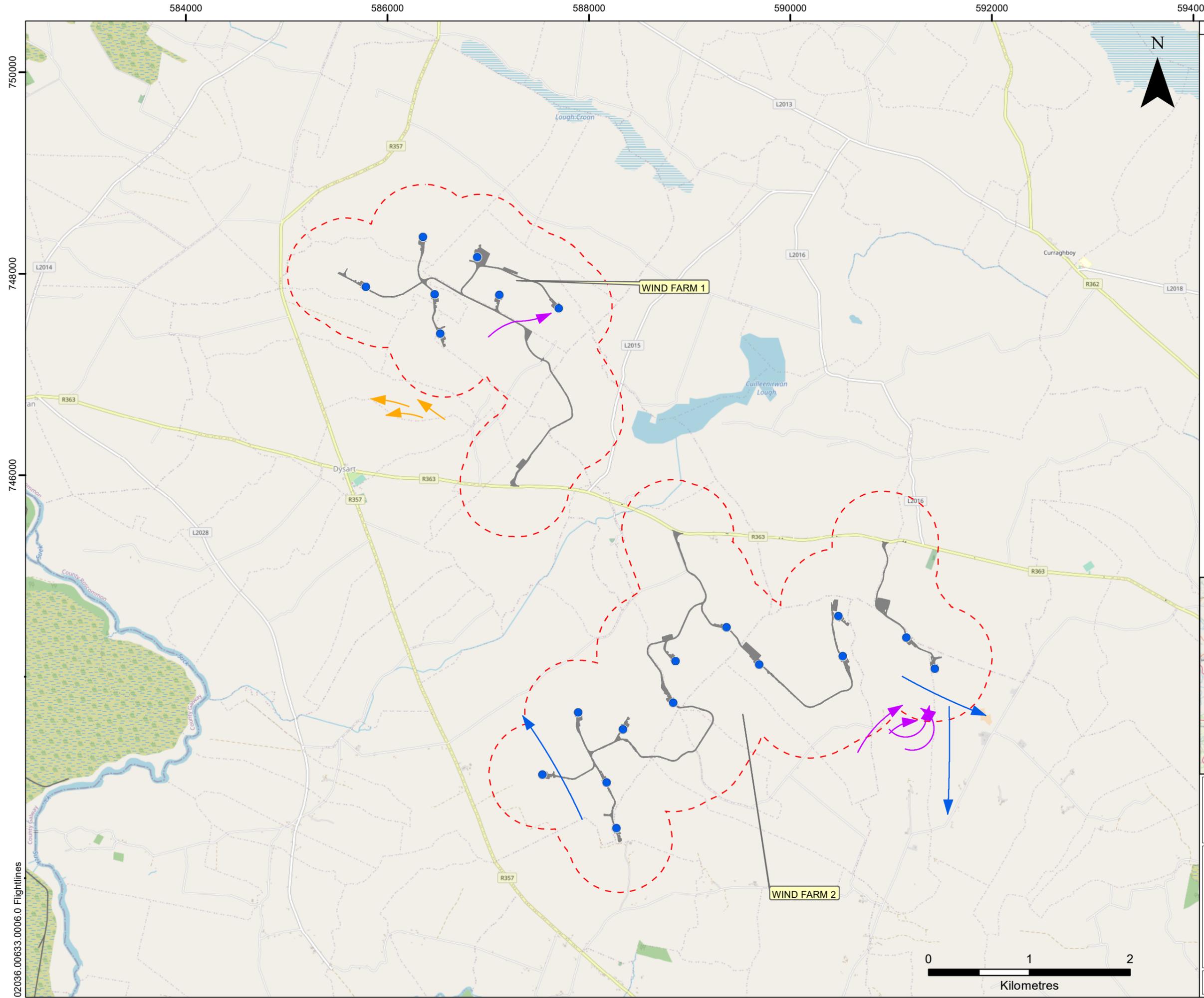
Scale 1:35,000 @ A3 Date MAY 2022



02036.00633.0002.0 Viewsheds from Vantage Points Overlooking Windfarms I and II - 30m Offset

750000
748000
746000

584000 586000 588000 590000 592000 594000



LEGEND

- Turbine Location
- Site Infrastructure
- Site Infrastructure 500 m Buffer

Species

- ➔ Golden Plover
- ➔ Lapwing
- ➔ Whooper Swan



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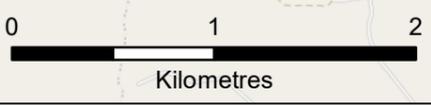
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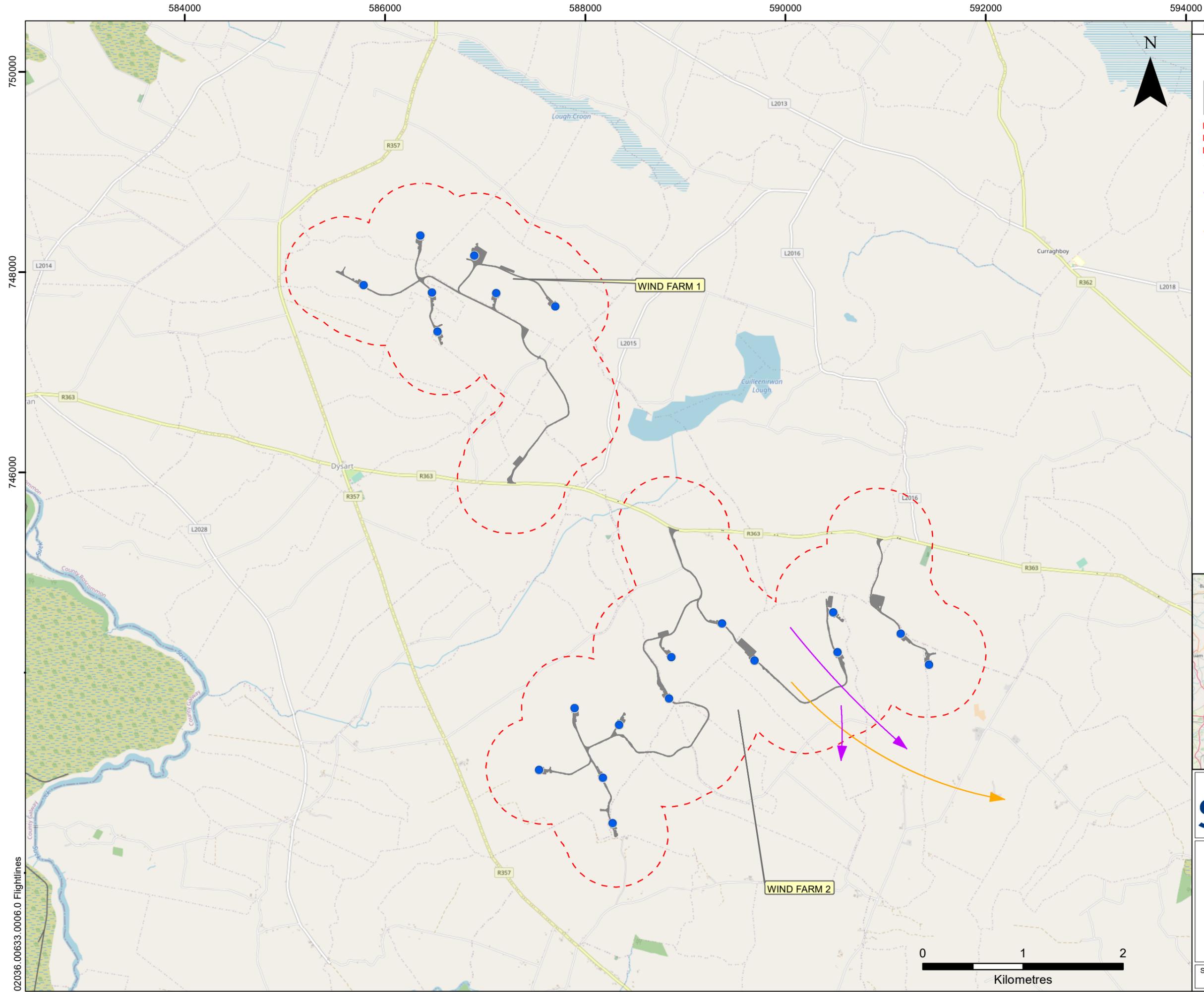
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FIGURE 3 - FLIGHT-LINES OCTOBER 2019

Scale 1:35,000 @ A3 Date MAY 2022



02036.00633.0006.0 Flightlines

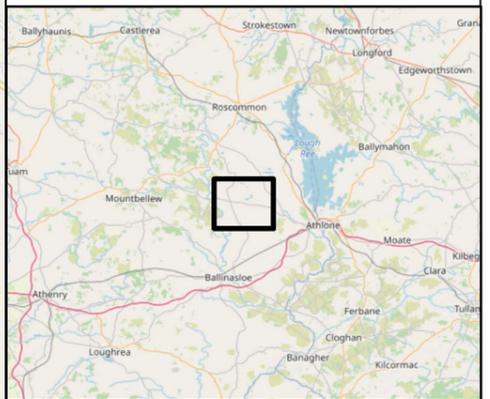


LEGEND

- Turbine Location
- Site Infrastructure
- Site Infrastructure 500 m Buffer

Species

- Lapwing
- Whooper Swan



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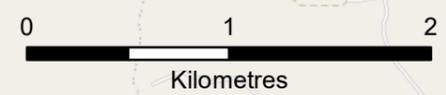
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**FIGURE 4 - FLIGHT-LINES
NOVEMBER 2019**

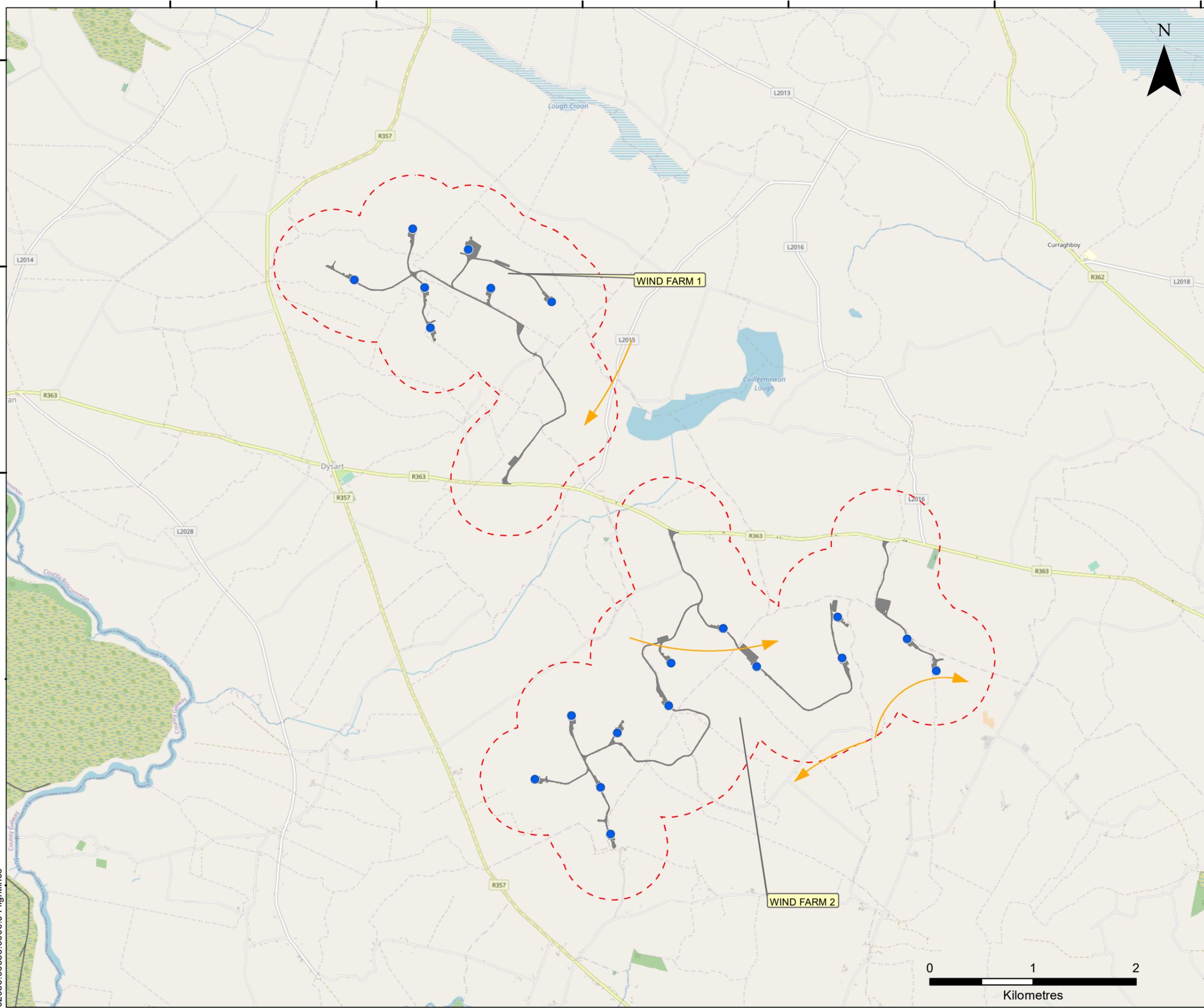
Scale: 1:35,000 @ A3	Date: MAY 2022
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02036.00633.0006.0 Flightlines

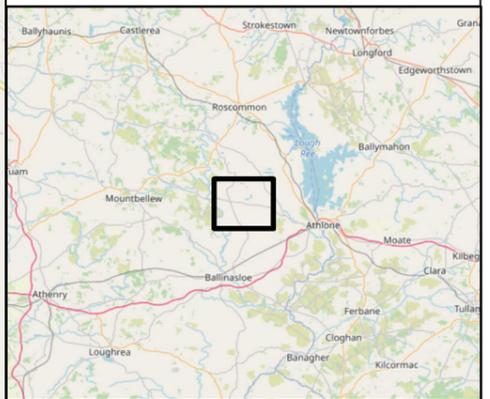
584000 586000 588000 590000 592000 594000

750000
748000
746000
02036.00633.0006.0 Flightlines



LEGEND

- Turbine Location
- Site Infrastructure
- Site Infrastructure 500 m Buffer
- Species**
- ➔ Whooper Swan



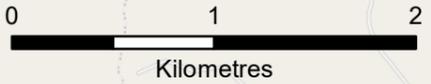
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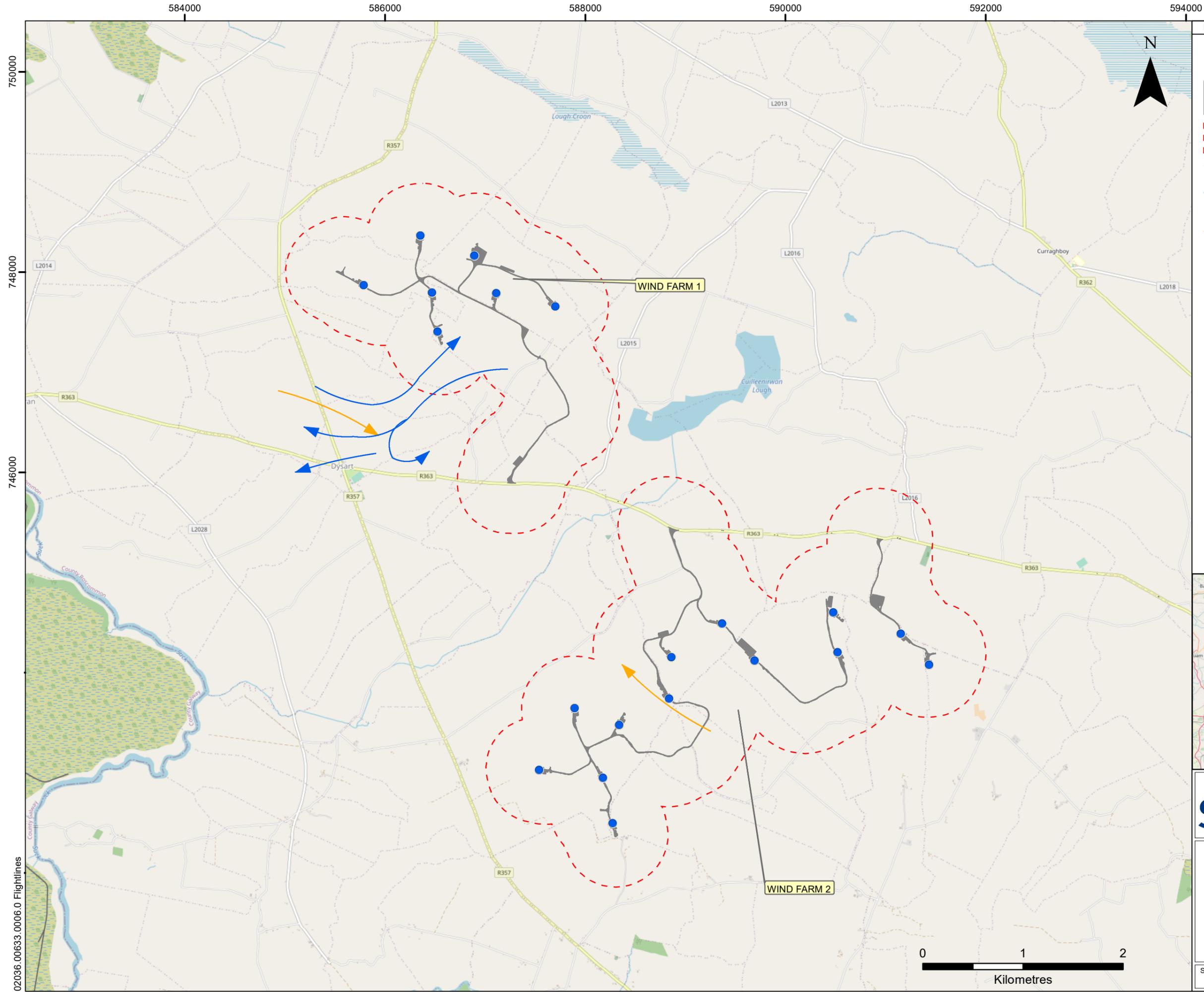
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**FIGURE 5 - FLIGHT-LINES
DECEMBER 2019**



Scale 1:35,000 @ A3	Date MAY 2022
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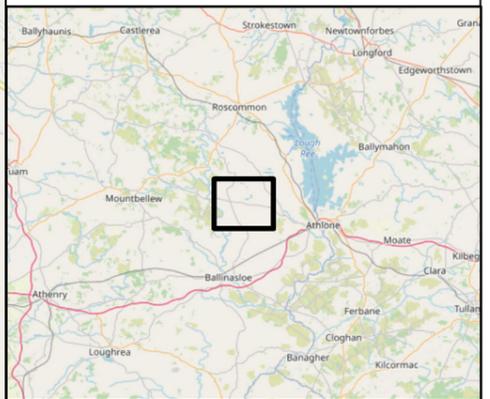


LEGEND

- Turbine Location
- Site Infrastructure
- Site Infrastructure 500 m Buffer

Species

- ➔ Golden Plover
- ➔ Whooper Swan



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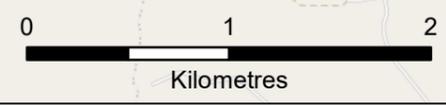
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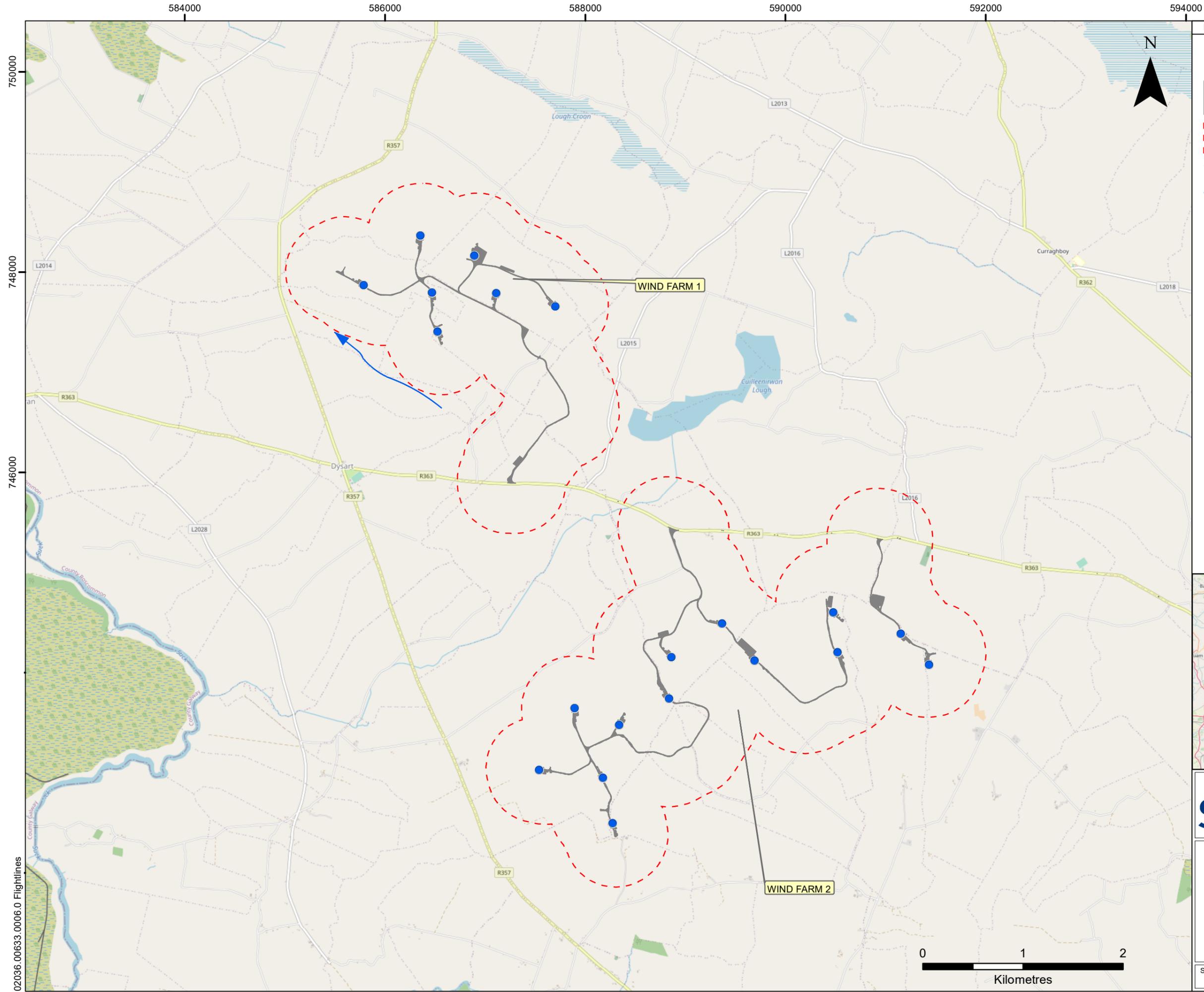
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FIGURE 6 - FLIGHT-LINES JANUARY 2020

Scale 1:35,000 @ A3 Date MAY 2022



02036.00633.0006.0 Flightlines

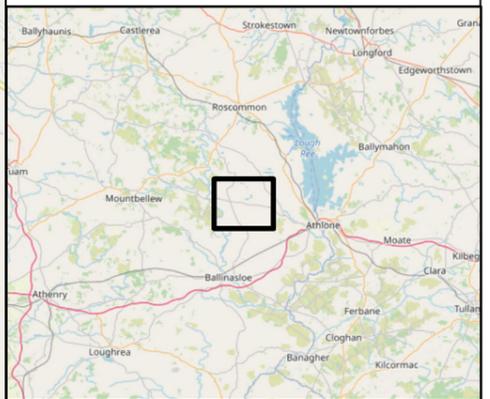


LEGEND

- Turbine Location
- Site Infrastructure
- Site Infrastructure 500 m Buffer

Species

- ➔ Golden Plover



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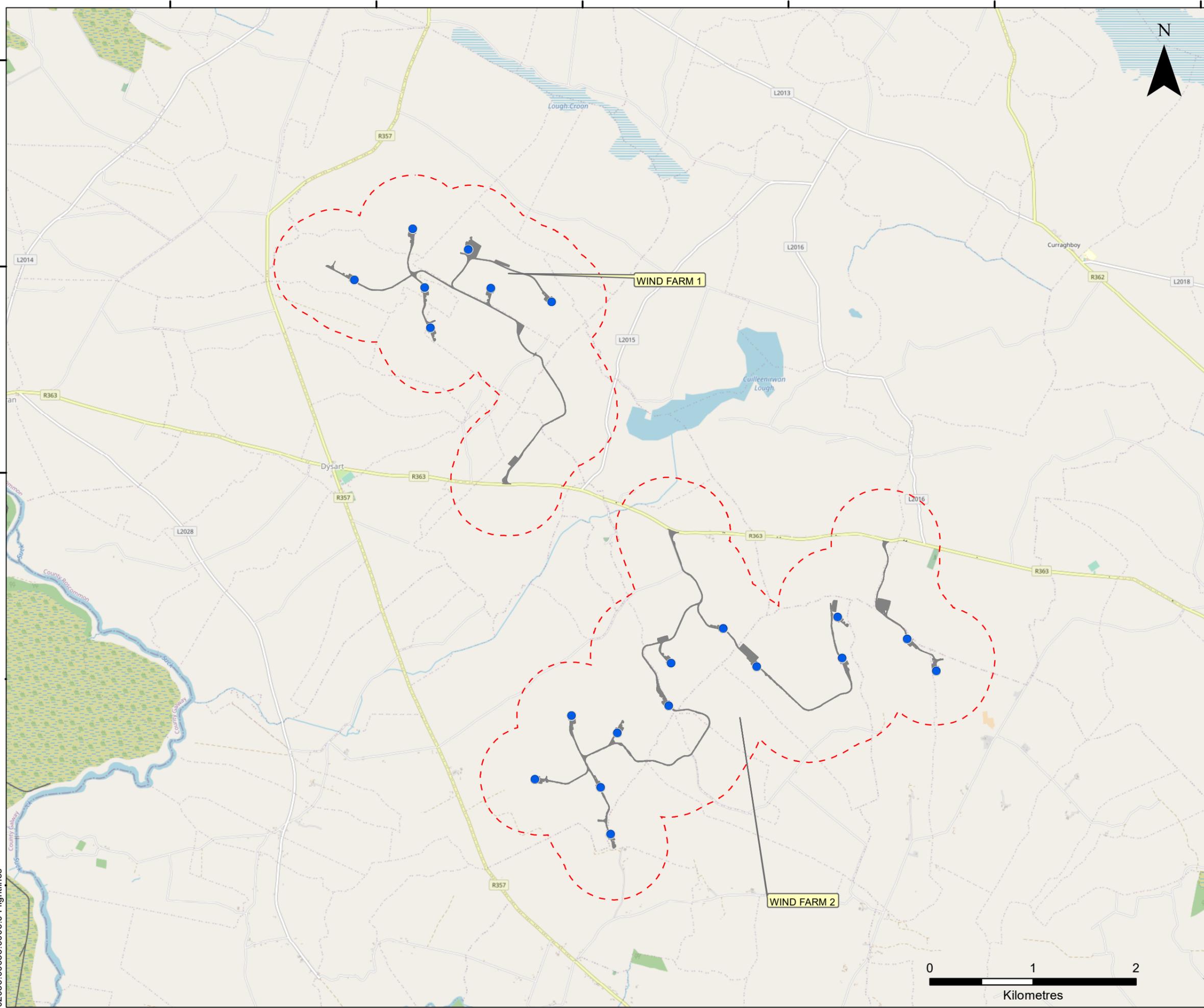
**FIGURE 7 - FLIGHT-LINES
FEBRUARY 2020**

Scale 1:35,000 @ A3 Date MAY 2022

02036.00633.0006.0 Flightlines

584000 586000 588000 590000 592000 594000

750000
748000
746000
02036.00633.0006.0 Flightlines



LEGEND

- Turbine Location
- Site Infrastructure
- Site Infrastructure 500 m Buffer

Species

- No Target Species Recorded



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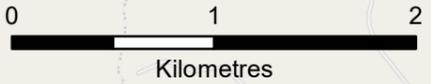
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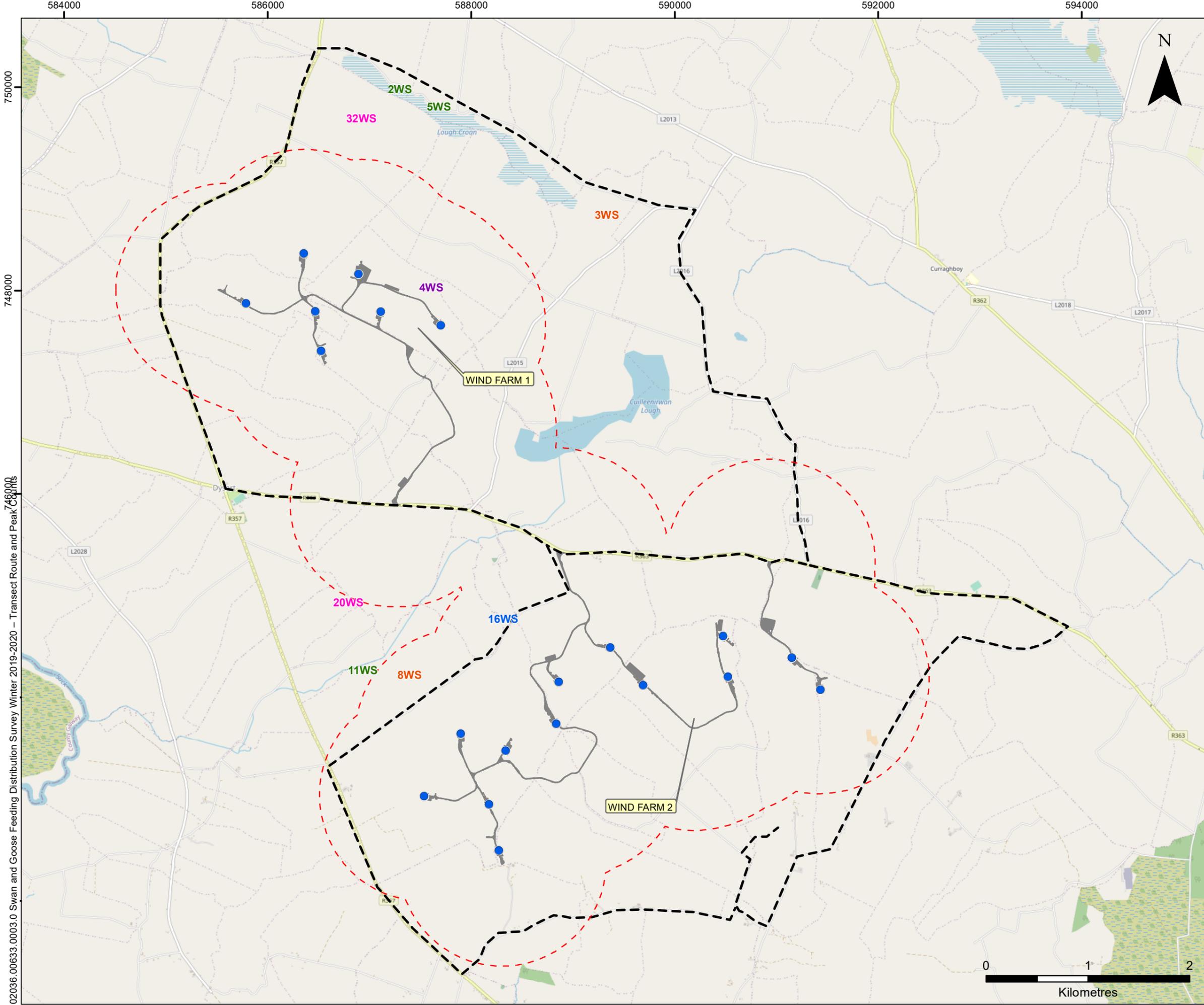
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**FIGURE 8 - FLIGHT-LINES
MARCH 2020**



Scale 1:35,000 @ A3 Date MAY 2022



LEGEND

- Turbine Location
- Site Infrastructure
- Site Infrastructure 1 km Buffer
- Transect Route

Swan and Goose Registrations (Label Colour Denotes Survey Date)

- 12/11/2019
- 11/12/2019
- 29/01/2020
- 25/02/2020
- 12/03/2020

Label Indicates Count and Species
WS - Whooper Swan



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FIGURE 9 - SWAN AND GOOSE FEEDING DISTRIBUTION SURVEY – TRANSECT ROUTE AND PEAK COUNTS

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

02036.00633.0003.0 Swan and Goose Feeding Distribution Survey Winter 2019-2020 – Transect Route and Peak Counts

584000

586000

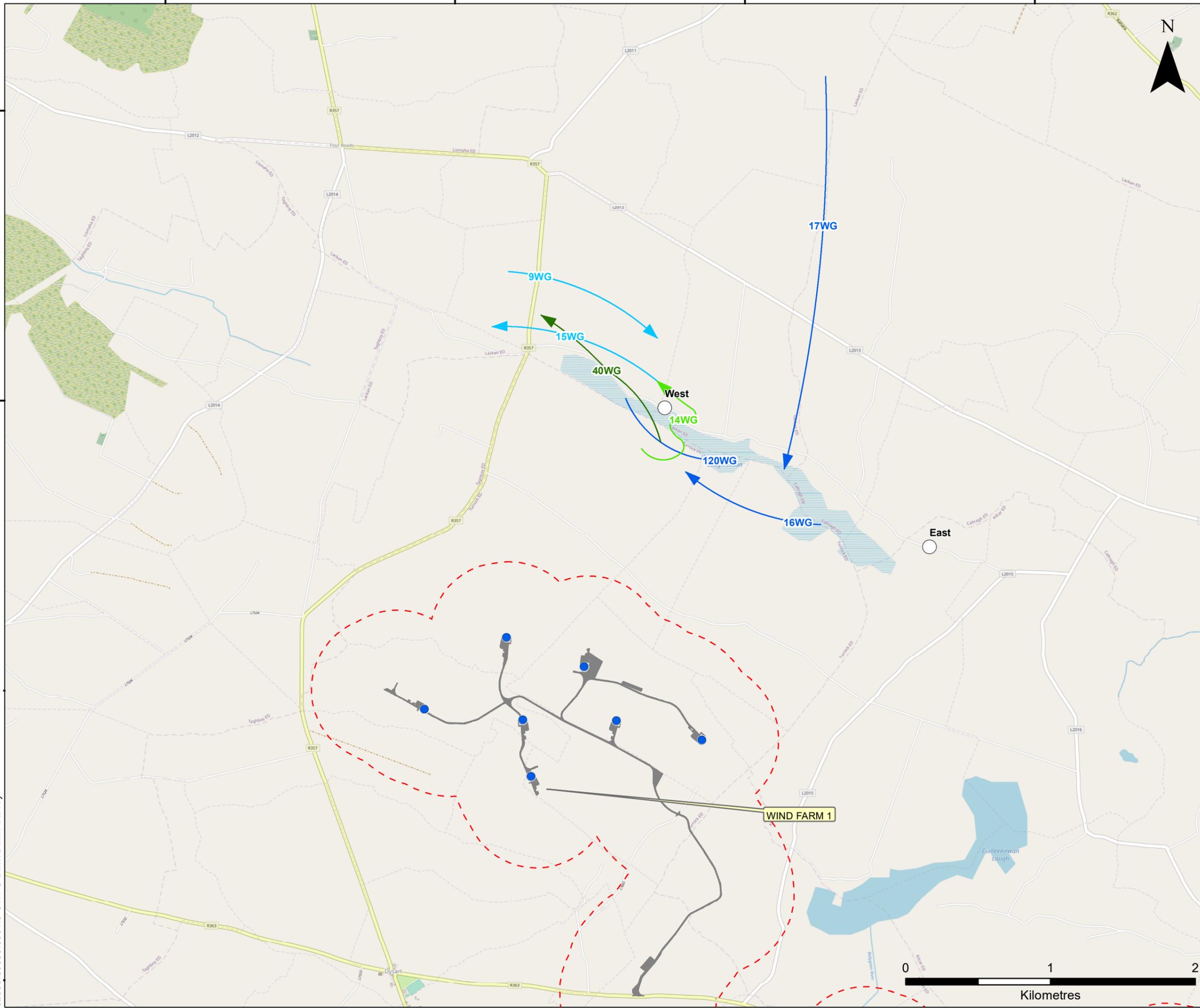
588000

590000

752000

750000

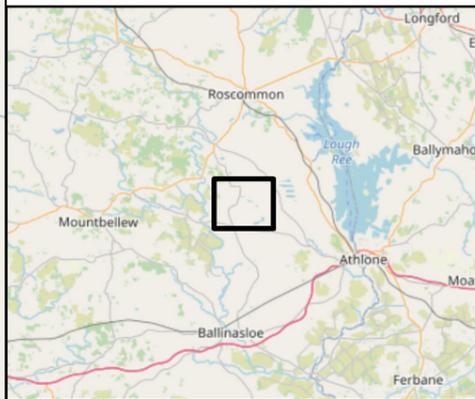
02036.00633.0004.0 GWFG Dusk Dawn Survey



LEGEND

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

- Species**
- WG White-fronted Goose
- Label Colour Denotes Survey Date and Type**
- December 2019 - Dawn
 - December 2019 - Dusk
 - February 2020 - Dawn
 - February 2020 - Dusk



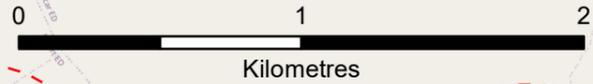
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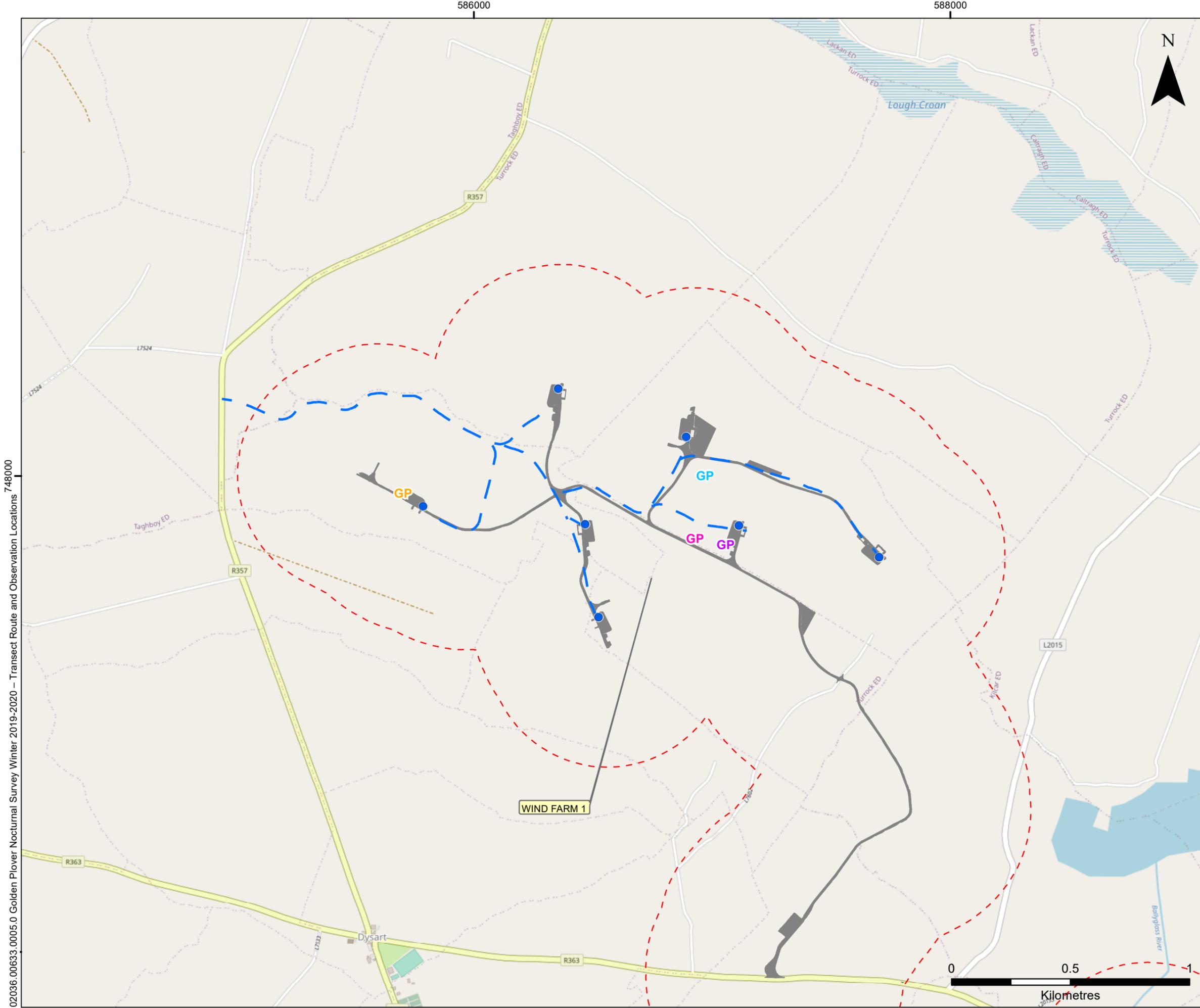
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FIGURE 10 - GREENLAND WHITE-FRONTED GOOSE ROOST DAWN/DUSK SURVEY AT LOUGH CROAN VANTAGE POINT LOCATIONS AND FLIGHT-LINES

Scale 1:25,000 @ A3 Date MAY 2022



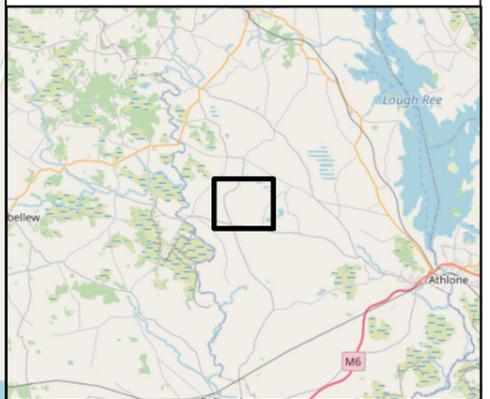


LEGEND

- Turbine Location
- Site Infrastructure
- Site Infrastructure 500 m Buffer
- - - Transect Route

Species Observation Point

- GP Golden Plover
- 27/01/02 @ 18:34 – GP x1 Heard Calling
- 23/03/20 @ 20:22 – GP x1 Heard Calling
- 23/03/20 @ 21:29 – GP x1 Heard Calling
- 23/03/20 @ 21:40 – GP x3 Flushed and Flew North



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FIGURE 11 - GOLDEN PLOVER NOCTURNAL SURVEY TRANSECT ROUTE AND OBSERVATION LOCATIONS

Scale 1:15,000 @ A3 Date MAY 2022



02036.00633.0005.0 Golden Plover Nocturnal Survey Winter 2019-2020 – Transect Route and Observation Locations 748000

APPENDIX I

Survey dates, times and observers

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

Date	Surveyor	Start	End	Survey Duration
29/10/2019	SI	10:00	13:00	3
29/10/2019	SI	13:30	16:30	3
12/11/2019	DA	09:11	12:11	3
13/11/2019	DA	09:10	12:10	3
10/12/2019	DA	08:50	11:50	3
12/12/2019	DA	11:31	14:31	3
28/01/2020	DA	08:45	11:45	3
30/01/2020	DA	11:01	14:01	3
26/02/2020	DA	15:30	18:30	3
27/02/2020	DA	06:30	09:30	3
10/03/2020	DH	15:50	18:50	3
13/03/2020	DH	06:25	09:25	3
23/03/2020	SI	06:30	09:30	3
24/03/2020	SI	16:00	19:00	3
Total Hours				42

Table AI-2: Details of VP surveys undertaken from Wind Farm 1 Vantage Point 2

Date	Surveyor	Start	End	Survey Duration
30/10/2019	SI	09:00	12:00	3
30/10/2019	SI	13:30	16:30	3
12/11/2019	SI	13:30	16:30	3
13/11/2019	SI	09:30	12:30	3
09/12/2019	SI	09:00	12:00	3
10/12/2019	SI	12:30	15:30	3
27/01/2020	SI	09:00	12:00	3
28/01/2020	SI	13:00	16:00	3
24/02/2020	SI	15:30	18:30	3
25/02/2020	SI	07:00	10:00	3
11/03/2020	SI	16:00	19:00	3
12/03/2020	SI	06:20	09:20	3
23/03/2020	SI	16:00	19:00	3
24/03/2020	SI	06:30	09:30	3
Total Hours				42

Table AI-3: Details of VP surveys undertaken from Wind Farm 2 Vantage Point 1

Date	Surveyor	Start	End	Survey Duration
28/10/2019	DA	09:41	12:41	3
29/10/2019	DA	12:32	15:32	3
14/11/2019	DA	09:20	12:20	3
15/11/2019	DA	10:57	13:57	3
09/12/2019	DA	09:29	12:29	3
11/12/2019	DA	12:14	15:14	3
27/01/2020	DA	13:21	16:21	3
28/01/2020	DA	08:30	11:30	3
24/02/2020	DA	09:51	12:51	3
25/02/2020	DA	13:31	16:31	3
11/03/2020	DH	09:30	12:30	3
13/03/2020	DH	09:50	12:50	3
25/03/2020	SI	09:30	12:30	3
26/03/2020	SI	13:00	16:00	3
Total Hours				42

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

Date	Surveyor	Start	End	Survey Duration
28/10/2019	DA	13:01	16:01	3
29/10/2019	DA	09:21	12:21	3
14/11/2019	DA	12:31	15:31	3
15/11/2019	DA	07:46	10:46	3
9/12/2019	DA	12:39	15:39	3
11/12/2019	DA	09:05	12:05	3
29/01/2020	DA	13:20	16:20	3
30/01/2020	DA	07:42	10:42	3
24/02/2020	DA	13:12	16:12	3
26/02/2020	DA	08:21	11:21	3
11/03/2020	DH	13:00	16:00	3
12/03/2020	DH	13:05	16:05	3
25/03/2020	SI	13:00	16:00	3
26/03/2020	SI	09:30	12:30	3
Total Hours				42

Table AI-5: Details of VP surveys undertaken from Wind Farm 2 Vantage Point 3

Date	Surveyor	Start	End	Survey Duration
30/10/2019	DA	12:42	15:42	3
31/10/2019	DA	08:31	11:31	3
12/11/2019	DA	12:25	15:25	3
13/11/2019	DA	12:26	15:26	3
10/12/2020	DA	12:04	15:04	3
12/12/2020	DA	08:10	11:10	3
28/01/2020	DA	12:01	15:01	3
29/01/2020	DA	09:21	12:21	3
25/02/2020	DA	10:12	13:12	3
26/02/2020	DA	12:00	15:00	3
10/03/2020	DA	11:50	14:50	3
12/03/2020	DH	09:25	12:25	3
27/03/2020	SI	09:30	12:30	3
30/03/2020	SI	13:00	16:00	3
Total Hours				42

Table AI-6: Details of VP surveys undertaken from Wind Farm 2 Vantage Point 4

Date	Surveyor	Start	End	Survey Duration
30/10/2019	DA	09:36	12:36	3
31/10/2019	DA	11:50	14:02	3
12/11/2019	SI	10:00	13:00	3
13/11/2019	SI	13:00	16:00	3
09/12/2019	SI	12:30	15:30	3
10/12/2019	SI	09:00	12:00	3
27/01/2020	SI	13:00	16:00	3
28/01/2020	SI	09:10	12:10	3
24/02/2020	SI	12:00	15:00	3
25/02/2020	SI	10:30	13:10	3
11/03/2020	SI	12:15	15:15	3
12/03/2020	SI	13:00	16:00	3
27/03/2020	SI	13:00	16:00	3
30/03/2020	SI	09:30	12:30	3
Total Hours				42

APPENDIX II

Weather Data

Table All-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)
29/10/2019	SI	10:00	13:00	1	2	N	0	3	2	2	0	0	8
29/10/2019	SI	10:00	13:00	2	1	N	0	3	2	2	0	0	9
29/10/2019	SI	10:00	13:00	3	2	N	0	4	2	2	0	0	9
29/10/2019	SI	13:30	16:30	1	2	E	0	4	2	2	0	0	9
29/10/2019	SI	13:30	16:30	2	3	E	0	5	2	2	0	0	9
29/10/2019	SI	13:30	16:30	3	2	E	0	6	2	2	0	0	9
12/11/2019	DA	09:11	12:11	1	2	NE	0	2	2	2	0	0	5
12/11/2019	DA	09:11	12:11	2	2	NE	0	3	2	2	0	0	6
12/11/2019	DA	09:11	12:11	3	2	NE	0	5	2	2	0	0	7
13/11/2019	DA	09:10	12:20	1	2	E	1	8	1	1	0	0	5
13/11/2019	DA	09:10	12:10	2	2	E	2	8	1	1	0	0	6
13/11/2019	DA	09:10	12:10	3	2	E	3	8	1	1	0	0	7
10/12/2019	DA	08:50	11:50	1	6	SW	4	8	1	1	0	0	13
10/12/2019	DA	08:50	11:50	2	6	SW	4	8	1	1	0	0	13
10/12/2019	DA	08:50	11:50	3	4	SW	3	8	1	1	0	0	13

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
12/12/2019	DA	11:31	14:31	1	3	E	0	6	1	2	0	0	7
12/12/2019	DA	11:31	14:31	2	3	E	1	7	1	2	0	0	7
12/12/2019	DA	11:31	14:31	3	3	E	0	7	1	2	0	0	7
28/01/2020	DA	08:45	11:45	1	3	SE	0	7	1	2	0	0	3
28/01/2020	DA	08:45	11:45	2	3	SE	0	4	1	2	0	0	5
28/01/2020	DA	08:45	11:45	3	4	SE	2	6	1	2	0	0	5
30/01/2020	DA	11:01	14:01	1	3	SW	0	7	1	1	0	0	3
30/01/2020	DA	11:01	14:01	2	3	SW	1	8	1	1	0	0	4
30/01/2020	DA	11:01	14:01	3	3	SW	0	8	1	1	0	0	5
26/02/2020	DA	15:30	18:30	1	2	SW	1	8	1	1	0	0	5
26/02/2020	DA	15:30	18:30	2	2	SW	0	8	1	1	0	0	4
26/02/2020	DA	15:30	18:30	3	2	SW	0	8	1	1	0	0	4
27/02/2020	DA	06:30	09:30	1	1	SW	0	0		1	0	2	1
27/02/2020	DA	06:30	09:30	2	2	SW	0	2	2	2	0	2	2
27/02/2020	DA	06:30	09:30	3	2	SW	0	2	2	2	0	2	2
10/03/2020	DH	15:50	18:50	1	5	NW	0	7	2	2	0	0	4

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
10/03/2020	DH	15:50	18:50	2	5	NW	0	5	2	2	0	0	2
10/03/2020	DH	15:50	18:50	3	5	NW	0	4	2	2	0	0	1
13/03/2020	DH	06:25	09:25	1	5	SW	2	8	2	2	0	0	2
13/03/2020	DH	06:25	09:25	2	5	SW	0	5	2	2	0	0	2
Rain/ Precipitation			Cloud Cover			Visibility			Lying Snow			Frost	
None	0	Expressed in oktas (n/8)			Poor (<1km)	0	None	0	None	0	None	0	
Drizzle	1	Cloud Height			Moderate (1-3km)	1	On site	1	Ground	1			
Light showers/snow	2	Height of cloud above			Good (>3km)	2	On higher ground	2	All day	2			
Heavy showers/snow	3	average height of viewshed											
Heavy rain/snow	4	<150m	0										
		150-500m	1										
		>500m	2										

Table AII-2: 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)
30/10/2019	SI	09:00	12:00	1	3	E	0	5	2	2	0	0	8
30/10/2019	SI	09:00	12:00	2	3	E	0	6	2	2	0	0	9
30/10/2019	SI	09:00	12:00	3	4	E	0	6	2	2	0	0	9
30/10/2019	SI	13:30	16:30	1	2	E	0	8	2	2	0	0	11
30/10/2019	SI	13:30	16:30	2	2	E	0	8	2	2	0	0	11
30/10/2019	SI	13:30	16:30	3	1	E	0	8	2	2	0	0	10
12/11/2019	SI	10:00	13:00	1	1	NW	2	4	2	2	0	0	6
12/11/2019	SI	10:00	13:00	2	2	NW	2	4	2	2	0	0	7
12/11/2019	SI	10:00	13:00	3	2	NW	0	5	2	2	0	0	8
13/11/2019	SI	09:30	12:30	1	0	S	2	8	2	2	0	0	5
13/11/2019	SI	09:30	12:30	2	0	S	4 or 3	8	2	1	0	0	5
13/11/2019	SI	09:30	12:30	3	0	S	0	8	2	1	0	0	5
09/12/2019	SI	09:00	12:00	1	1	NW	0	1	2	2	0	0	5
09/12/2019	SI	09:00	12:00	2	1	NW	0	1	2	2	0	0	5
09/12/2019	SI	09:00	12:00	3	1	NW	0	1	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)
10/12/2019	SI	12:30	15:30	1	2	W	3	8	1	2	0	0	8
10/12/2019	SI	12:30	15:30	2	2	W	3	8	1	2	0	0	8
10/12/2019	SI	12:30	15:30	3	2	W	3	8	1	2	0	0	6
27/01/2020	SI	09:00	12:00	1	1	SW	2	7	1	2	0	0	2.5
27/01/2020	SI	09:00	12:00	2	1	SW	0	5	2	2	0	0	3
27/01/2020	SI	09:00	12:00	3	1	SW	0	4	2	2	0	0	4
28/01/2020	SI	13:00	16:00	1	1	W	0	4	2	2	0	0	4
28/01/2020	SI	13:00	16:00	2	1	W	0	3	2	2	0	0	4
28/01/2020	SI	13:00	16:00	3	2	W	0	3	2	2	0	0	4
24/02/2020	SI	15:30	18:30	1	1	WNW	0	2	2	2	0	0	5
24/02/2020	SI	15:30	18:30	2	1	NW	0 - 2	2	2	2	0	0	5
24/02/2020	SI	15:30	18:30	3	1	NW	0	8	2	2	0	0	3
25/02/2020	SI	07:00	10:00	1	0	W	0	6	2	2	0	0	2.5
25/02/2020	SI	07:00	10:00	2	2	W	0	5	2	2	0	0	2
25/02/2020	SI	07:00	10:00	3	1	W	2	7	2	2	0	0	3
11/03/2020	SI	16:00	19:00	1	0	W	0	8	2	2	0	0	4

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
11/03/2020	SI	16:00	19:00	2	0	W	2	8	2	2	0	0	5
11/03/2020	SI	16:00	19:00	3	1	W	3	8	1	1	0	0	5
12/03/2020	SI	06:20	09:20	1	0	W	2	5	2	2	0	0	4
12/03/2020	SI	06:20	09:20	2	0	W	0	1	2	2	0	0	4
12/03/2020	SI	06:20	09:20	3	1	W	5	3	2	2	0	0	4
30/10/2019	SI	09:00	12:00	1	3	E	0	5	2	2	0	0	8
30/10/2019	SI	09:00	12:00	2	3	E	0	6	2	2	0	0	9
30/10/2019	SI	09:00	12:00	3	4	E	0	6	2	2	0	0	9
Rain/ Precipitation				Cloud Cover		Visibility		Lying Snow		Frost			
None	0			Expressed in oktas (n/8)		Poor (<1km)	0	None	0	None	0		
Drizzle	1			Cloud Height		Moderate (1-3km)	1	On site	1	Ground	1		
Light showers/snow	2			Height of cloud above		Good (>3km)	2	On higher ground	2	All day	2		
Heavy showers/snow	3			average height of viewshed									
Heavy rain/snow	4			<150m	0								
				150-500m	1								
				>500m	2								

Table AII-3: 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)
28/10/2019	DA	09:41	12:41	1	1	2	E	0	4	2	2	0	0
28/10/2019	DA	09:41	12:41	2	2	2	E	0	3	2	2	0	0
28/10/2019	DA	09:41	12:41	3	3	2	E	0	3	2	2	0	0
29/10/2019	DA	12:32	15:32	1	1	3	E	0	4	1	2	0	0
29/10/2019	DA	12:32	15:32	2	2	4	E	0	5	1	2	0	0
29/10/2019	DA	12:32	15:32	3	3	4	E	0	6	1	2	0	0
14/11/2019	DA	09:20	12:20	1	1	1	E	0	0	2	2	0	0
14/11/2019	DA	09:20	12:20	2	2	1	E	0	0	2	2	0	0
14/11/2019	DA	09:20	12:20	3	3	1	E	0	0	2	2	0	0
15/11/2019	DA	10:57	13:57	1	1	1	E	0	0	2	2	0	0
15/11/2019	DA	10:57	13:57	2	2	1	E	0	0	2	2	0	0
15/11/2019	DA	10:57	13:57	3	3	2	E	0	1	2	2	0	0
09/12/2019	DA	09:29	12:29	1	1	0	SE	0	1	2	2	0	0
09/12/2019	DA	09:29	12:29	2	2	0	SE	0	2	2	2	0	0
09/12/2019	DA	09:29	12:29	3	3	0	SE	0	2	2	2	0	0

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
11/12/2019	DA	12:14	15:14	1	1	2	SW	0	3	1	2	0	0
11/12/2019	DA	12:14	15:14	2	2	2	SW	0	3	1	2	0	0
11/12/2019	DA	12:14	15:14	3	3	3	SW	3	7	1	1	0	0
27/01/2020	DA	13:21	16:21	1	1	2	SW	0	5	1	1	0	0
27/01/2020	DA	13:21	16:21	2	2	2	SW	0	5	1	1	0	0
27/01/2020	DA	13:21	16:21	3	3	3	SW	0	5	1	1	0	0
24/02/2020	DA	09:51	12:51	1	1	5	SW	0	6	1	2	0	0
24/02/2020	DA	09:51	12:51	2	2	4	SW	0	4	1	2	0	0
24/02/2020	DA	09:51	12:51	3	3	4	SW	0	4	1	2	0	0
25/02/2020	DA	13:31	16:31	1	1	3	SW	0	6	1	2	0	0
25/02/2020	DA	13:31	16:31	2	2	3	SW	3	8	0	0	0	0
25/02/2020	DA	13:31	16:31	3	3	3	SW	2	8	1	1	0	0
11/03/2020	DH	09:30	12:30	1	1	5	NW	0	8	2	2	0	0
11/03/2020	DH	09:30	12:30	2	2	5	NW	0	7	2	2	0	0
11/03/2020	DH	09:30	12:30	3	3	4	NW	3	8	2	2	0	0
13/03/2020	DH	09:50	12:50	1	1	4	W	0	8	2	2	0	0

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
13/03/2020	DH	09:50	12:50	2	2	4	W	0	8	2	2	0	0
13/03/2020	DH	09:50	12:50	3	3	4	W	2	6	2	2	0	0
Rain/ Precipitation			Cloud Cover			Visibility			Lying Snow			Frost	
None	0	Expressed in oktas (n/8)			Poor (<1km)	0	None	0	None	0	None	0	
Drizzle	1	Cloud Height			Moderate (1-3km)	1	On site	1	Ground	1			
Light showers/snow	2	Height of cloud above			Good (>3km)	2	On higher ground	2	All day	2			
Heavy showers/snow	3	average height of viewshed											
Heavy rain/snow	4	<150m	0										
		150-500m	1										
		>500m	2										

Table AII-4: 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)
28/10/2019	DA	13:01	16:01	1	3	E	0	2	2	2	0	0	9
28/10/2019	DA	13:01	16:01	2	4	E	0	1	2	2	0	0	9
28/10/2019	DA	13:01	16:01	3	4	E	0	1	2	2	0	0	9
29/10/2019	DA	09:21	12:21	1	1	E	0	1	2	2	0	0	6
29/10/2019	DA	09:21	12:21	2	3	E	0	1	2	2	0	0	8
29/10/2019	DA	09:21	12:21	3	3	E	0	1	2	2	0	0	9
14/11/2019	DA	12:31	15:31	1	2	E	0	1	2	2	0	0	7
14/11/2019	DA	12:31	15:31	2	3	E	0	1	2	2	0	0	7
14/11/2019	DA	12:31	15:31	3	3	E	0	1	2	2	0	0	7
15/11/2019	DA	07:46	10:46	1	1	E	0	0	2	2	0	1	0
15/11/2019	DA	07:46	10:46	2	1	E	0	0	2	2	0	0	3
15/11/2019	DA	07:46	10:46	3	1	E	0	0	2	2	0	0	5
09/12/2019	DA	12:39	15:39	1	1	SE	0	1	2	2	0	0	8
09/12/2019	DA	12:39	15:39	2	1	SE	0	3	2	2	0	0	8
09/12/2019	DA	12:39	15:39	3	2	SE	0	2	2	2	0	0	7

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
11/12/2019	DA	09:05	12:05	1	2	SW	0	5	1	2	0	0	6
11/12/2019	DA	09:05	12:05	2	2	SW	0	4	1	2	0	0	7
11/12/2019	DA	09:05	12:05	3	2	SW	0	6	1	2	0	0	7
29/01/2020	DA	13:20	16:20	1	3	SW	1	8	1	1	0	0	7
29/01/2020	DA	13:20	16:20	2	3	SW	0	7	1	1	0	0	7
29/01/2020	DA	13:20	16:20	3	3	SW	0	8	1	1	0	0	7
30/01/2020	DA	07:42	10:42	1	2	SW	0	5	1	2	0	0	3
30/01/2020	DA	07:42	10:42	2	3	SW	0	4	1	2	0	0	3
30/01/2020	DA	07:42	10:42	3	3	SW	0	6	1	2	0	0	4
24/02/2020	DA	13:12	16:12	1	4	SW	0	4	1	2	0	0	9
24/02/2020	DA	13:12	16:12	2	4	SW	0	3	1	2	0	0	9
24/02/2020	DA	13:12	16:12	3	4	SW	0	5	1	2	0	0	8
26/02/2020	DA	08:21	11:21	1	2	SW	0	3	2	2	0	2	2
26/02/2020	DA	08:21	11:21	2	2	SW	0	3	2	2	0	0	3
26/02/2020	DA	08:21	11:21	3	2	SW	0	2	2	2	0	0	4
11/03/2020	DH	13:00	16:00	1	4	W	0	2	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)
11/03/2020	DH	13:00	16:00	2	4	W	2	2	2	2	0	0	6
11/03/2020	DH	13:00	16:00	3	4	NW	0	2	2	2	0	0	6
12/03/2020	DH	13:05	16:05	1	5	W	0	8	2	2	0	0	5
12/03/2020	DH	13:05	16:05	2	5	W	3	7	2	2	0	0	6
12/03/2020	DH	13:05	16:05	3	5	W	2	7	2	2	0	0	6
Rain/ Precipitation			Cloud Cover			Visibility			Lying Snow			Frost	
None	0	Expressed in oktas (n/8)			Poor (<1km)	0	None	0	None	0	None	0	
Drizzle	1	Cloud Height			Moderate (1-3km)	1	On site	1	Ground	1			
Light showers/snow	2	Height of cloud above			Good (>3km)	2	On higher ground	2	All day	2			
Heavy showers/snow	3	average height of viewshed											
Heavy rain/snow	4	<150m	0										
		150-500m	1										
		>500m	2										

Table AII-5: 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)
30/10/2019	DA	12:42	15:42	1	5	E	0	5	1	2	0	0	10
30/10/2019	DA	12:42	15:42	2	5	E	0	5	1	2	0	0	10
30/10/2019	DA	12:42	15:42	3	5	E	0	5	1	2	0	0	10
31/10/2019	DA	08:31	11:31	1	2	E	1	8	1	1	0	0	8
31/10/2019	DA	08:31	11:31	2	2	E	1	8	1	1	0	0	8
31/10/2019	DA	08:31	11:31	3	2	E	0	8	1	1	0	0	8
12/11/2019	DA	12:25	15:25	1	2	NE	0	6	1	2	0	0	9
12/11/2019	DA	12:25	15:25	2	2	NE	0	4	1	2	0	0	9
12/11/2019	DA	12:25	15:25	3	2	NE	0	3	1	2	0	0	9
10/12/2019	DA	12:04	15:04	1	5	SW	3	8	1	1	0	0	12
10/12/2019	DA	12:04	15:04	2	4	SW	2	8	1	1	0	0	10
10/12/2019	DA	12:04	15:04	3	4	SW	3	8	1	1	0	0	8
12/12/2019	DA	08:10	11:10	1	1	E	0	7	1	2	0	0	6
12/12/2019	DA	08:10	11:10	2	2	E	0	8	1	2	0	0	7
12/12/2019	DA	08:10	11:10	3	3	E	0	8	1	2	0	0	7

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
28/01/2020	DA	12:01	15:01	1	3	SE	0	3	1	2	0	0	5
28/01/2020	DA	12:01	15:01	2	3	SE	0	4	1	2	0	0	5
28/01/2020	DA	12:01	15:01	3	3	SE	0	6	1	2	0	0	5
29/01/2020	DA	09:21	12:21	1	2	SE	0	8	2	2	0	0	8
29/01/2020	DA	09:21	12:21	2	3	SE	0	8	2	2	0	0	8
29/01/2020	DA	09:21	12:21	3	3	SE	0	8	2	2	0	0	8
25/02/2020	DA	10:12	13:12	1	3	SW	1	8	1	2	0	0	3
25/02/2020	DA	10:12	13:12	2	3	SW	1	8	1	2	0	0	3
25/02/2020	DA	10:12	13:12	3	3	SW	2	8	1	2	0	0	4
26/02/2020	DA	12:00	15:00	1	2	SW	0	3	2	2	0	0	6
26/02/2020	DA	12:00	15:00	2	2	SW	0	5	2	2	0	0	6
26/02/2020	DA	12:00	15:00	3	2	SW	2	7	1	1	0	0	6
10/03/2020	DH	11:50	14:40	1	5	W	0	8	2	2	0	0	5
10/03/2020	DH	11:50	14:50	2	5	W	2	8	2	2	0	0	6
10/03/2020	DH	11:50	14:50	3	5	NW	2	8	2	2	0	0	6
12/03/2020	DH	09:25	12:25	1	5	NW	3	8	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)
12/03/2020	DH	09:25	12:25	2	5	NW	0	3	2	2	0	0	5
12/03/2020	DH	09:25	12:25	3	5	NW	0	6	2	2	0	0	6
Rain/ Precipitation			Cloud Cover			Visibility			Lying Snow			Frost	
None	0	Expressed in oktas (n/8)			Poor (<1km)	0	None	0	None	0	None	0	
Drizzle	1	Cloud Height			Moderate (1-3km)	1	On site	1	Ground	1			
Light showers/snow	2	Height of cloud above			Good (>3km)	2	On higher ground	2	All day	2			
Heavy showers/snow	3	average height of viewshed											
Heavy rain/snow	4	<150m	0										
		150-500m	1										
		>500m	2										

Table AII-6: 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)
30/10/2019	DA	09:36	12:36	1	3	E	0	6	1	2	0	0	8
30/10/2019	DA	09:36	12:36	2	3	E	0	7	1	2	0	0	9
30/10/2019	DA	09:36	12:36	3	3	E	0	7	1	2	0	0	9
31/10/2019	DA	11:50	14:02	1	2	E	0	8	1	1	0	0	8
31/10/2019	DA	11:50	14:02	2	2	E	0	8	1	1	0	0	8
31/10/2019	DA	11:50	14:02	3	2	E	0	8	1	1	0	0	9
13/11/2019	SI	13:00	16:00	1	0	S	0	8	2	2	0	0	5
13/11/2019	SI	13:00	16:00	2	0	S	1	8	1	0	0	0	5
13/11/2019	SI	13:00	16:00	3	0	S	0	8	1	1	0	0	5
09/12/2019	SI	12:30	15:30	1	1	NW	0	1	2	2	0	0	6
09/12/2019	SI	12:30	15:30	2	1	NW	0	1	2	2	0	0	6
09/12/2020	SI	12:30	15:30	3	1	NW	0	1	2	2	0	0	5
10/12/2019	SI	09:00	12:00	1	4	SW	3-4	1	1	1	0	0	11
10/12/2019	SI	09:00	12:00	2	4	SW	3	1	1	1	0	0	12
10/12/2019	SI	09:00	12:00	3	4	SW	3	1	1	1	0	0	13

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
27/01/2020	SI	13:00	16:00	1	3-4	W	0	8	2	2	0	0	1
27/01/2020	SI	13:00	16:00	2	2	W	0	7	2	2	0	0	2
27/01/2020	SI	13:00	16:00	3	1	W	2	8	2	2	0	0	2
28/01/2020	SI	09:10	12:10	1	0	W	0	4	2	2	0	0	2.5
28/01/2020	SI	09:10	12:10	2	1	W	0	3	2	2	0	0	3
28/01/2020	SI	09:10	12:10	3	1	W	0	2	2	2	0	0	2
24/02/2020	SI	12:00	15:00	1	2	NW	0	7	2	2	0	0	5
24/02/2020	SI	12:00	15:00	2	2	NW	0	6	2	2	0	0	7
24/02/2020	SI	12:00	15:00	3	2	NW	0	5	2	2	0	0	7
25/02/2020	SI	10:30	13:30	1	1	W	2	8	2	2	0	0	3
25/02/2020	SI	10:30	13:30	2	1	W	2	7	2	2	0	0	3
25/02/2020	SI	10:30	13:30	3	1	W	2	8	2	2	0	0	2
11/03/2020	SI	12:15	15:15	1	1	W	3	8	2	2	0	0	7
11/03/2020	SI	12:15	15:15	2	2	W	2	5	2	2	0	0	5
11/03/2020	SI	12:15	15:15	3	1	W	3	8	2	1	0	0	4
12/03/2020	SI	13:00	16:00	1	1	W	0	8	2	2	0	0	7

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
12/03/2020	SI	13:00	16:00	2	1	W	3	8	2	2	0	0	7
12/03/2020	SI	13:00	16:00	3	1	W	0	8	2	2	0	0	7
Rain/ Precipitation			Cloud Cover			Visibility			Lying Snow			Frost	
None	0	Expressed in oktas (n/8)			Poor (<1km)	0	None	0	None	0	None	0	
Drizzle	1	Cloud Height			Moderate (1-3km)	1	On site	1	Ground	1			
Light showers/snow	2	Height of cloud above			Good (>3km)	2	On higher ground	2	All day	2			
Heavy showers/snow	3	average height of viewshed											
Heavy rain/snow	4	<150m	0										
		150-500m	1										
		>500m	2										

APPENDIX III

Flight activity survey data

Table AIII-1a: Primary target species flight activity data from WF1 VP1

Date	Surveyor	Flight ID	Species	Num. Birds	M/F	Age	Obs. Time	Flight time (s)	Collision Risk Zone (CRZ) (Y/N)
12/12/2019	DA	1	WS	4	U	U	13:03	30	N
10/03/2020	DH	1	NW	72	U	U	17:44	60	Y

Table AIII-2a: Primary target species flight activity data from WF1 VP2

Date	Surveyor	Flight ID	Species	Num. Birds	M/F	Age	Obs. Time	Flight time (s)	Collision Risk Zone (CRZ) (Y/N)
29/10/2019	SI	1	WS	4	U	AD	15:01	30	N
29/10/2019	SI	2	WS	2	U	AD	16:01	30	N
29/10/2019	SI	3	WS	2	U	AD	16:22	60	N
30/10/2019	SI	1	L.	10	U	U	11:45	45	N
27/01/2020	SI	1	WS	4	U	Ad	10:28	30	N
27/01/2020	SI	2	GP	30	U	U	11:38	45	N
27/01/2020	SI	3	GP	50	U	U	11:48	75	N
27/01/2020	SI	4	GP	40	U	U	11:51	60	N
28/01/2020	SI	1	GP	8	U	U	13:47	45	N
24/02/2020	SI	1	GP	12	U	U	17:54	45	N

Table AIII-3a: Primary target species flight activity data from WF2 VP1

Date	Surveyor	Flight ID	Species	Num. Birds	M/F	Age	Obs. Time	Flight time (s)	Collision Risk Zone (CRZ) (Y/N)
09/12/2019	DA	1	WS	4	U	U	10:21	60	N

Table AIII-4a: Primary target species flight activity data from WF2 VP2

Date	Surveyor	Flight ID	Species	Num. Birds	M/F	Age	Obs. Time	Flight time (s)	Collision Risk Zone (CRZ) (Y/N)
29/10/2019	DA	1	GP	15	U	U	10:50	105	N
30/01/2020	DA	1	WS	11	AD	U	09:31	90	N

Table AIII-5a: Primary target species flight activity data from WF2 VP3

Date	Surveyor	Flight ID	Species	Num. Birds	M/F	Age	Obs. Time	Flight time (s)	Collision Risk Zone (CRZ) (Y/N)
30/10/2019	DH	1	L	1	U	U	12:52	75	N
30/10/2019	DH	2	GP	4	U	U	13:51	45	N
31/10/2019	DH	1	L	2	U	U	09:34	60	N
31/10/2019	DH	2	GP	17	U	U	09:35	105	Y
31/10/2019	DH	6	L	3	U	U	10:49	90	N

Date	Surveyor	Flight ID	Species	Num. Birds	M/F	Age	Obs. Time	Flight time (s)	Collision Risk Zone (CRZ) (Y/N)
31/10/2019	DH	7	L	27	U	U	11:02	0	N
12/11/2019	DH	3	L	35	U	AD	13:42	105	Y
12/11/2019	DH	5	L	1	U	AD	14:09	45	N
12/12/2019	DH	1	WS	9	U	U	09:39	75	N
12/12/2019	DH	2	WS	2	U	U	09:46	60	N

Table AIII-6: Primary target species flight activity data from WF2 VP4

Date	Surveyor	Flight ID	Species	Num. Birds	M/F	Age	Obs. Time	Flight time (s)	Collision Risk Zone (CRZ) (Y/N)
12/11/2019	SI	2	WS	5	U	AD	12:31	90	Y

Table AIII-1b: Secondary target species flight activity data from WF1 VP1

Date	Survey start	Survey end	Species	Count	5 min period	Likely Rotor Swept Height (Y/N)
29/10/2019	10:00	13:00	RN	3	11:10-11:15	N
29/10/2019	10:00	13:00	RN	1	12:40-12:45	Y
12/11/2019	09:11	12:11	RN	1	09:42 - 09:47	N
12/11/2019	09:11	12:11	RN	1	10:05 - 10:10	N
10/12/2019	08:50	11:50	BH	1	09:55-10:00	N
12/12/2019	11:31	14:31	RN	1	11:40-11:45	Y
12/12/2019	11:31	14:31	RN	2	11:49-11:54	Y
28/01/2020	08:45	11:45	RN	4	8:59-9:04	Y
28/01/2020	08:45	11:45	BZ	1	10:08-10:13	Y
28/01/2020	08:45	11:45	BZ	1	10:37-10:42	Y
30/01/2020	11:01	13:01	RN	3	09:32-09:37	Y
26/02/2020	15:30	18:30	RN	1	15:41 - 15:51	N
26/02/2020	15:30	18:30	RN	2	15:57-16:02	N
26/02/2020	15:30	18:30	RN	1	16:31-16:36	N
26/02/2020	15:30	18:30	RN	1	17:14-17:19	N
26/02/2020	15:30	18:30	RN	1	17:21-17:26	N
27/02/2020	06:30	09:30	RN	3	06:30-06:35	Y
27/02/2020	06:30	09:30	RN	1	06:42-06:47	N
27/02/2020	06:30	09:30	BZ	3	07:10-07:15	Y
27/02/2020	06:30	09:30	RN	2	07:19-07:24	Y
27/02/2020	06:30	09:30	LB	2	08:06-08:11	Y

Date	Survey start	Survey end	Species	Count	5 min period	Likely Rotor Swept Height (Y/N)
27/02/2020	06:30	09:30	RN	3	08:07-08:12	Y

Table AIII-2b: Secondary target species flight activity data from WF1 VP2

Date	Survey start	Survey end	Species	Count	5 min period	Likely Rotor Swept Height (Y/N)
30/10/2019	09:00	12:00	RN	2	10:05-10:10	N
30/10/2019	09:00	12:00	RN	2	10:45-10:50	N
30/10/2019	09:00	12:00	RN	3	11:50-11:55	N
30/10/2019	13:30	16:30	RN	1	13:35-13:40	N
30/10/2019	13:30	16:30	RN	1	14:10-14:15	N
30/10/2019	13:30	16:30	RN	1	14:15-14:20	N
30/10/2019	13:30	16:30	RN	3	14:25-14:30	N
13/11/2019	09:30	12:30	MA	2	10:30-10:35	N
13/11/2019	09:30	12:30	RN	1	11:35-11:40	N
09/12/2019	09:00	12:00	MA	4	11:12 -11:17	Y
09/12/2019	09:00	12:00	BH	5	10:15 - 10:20	Y
09/12/2019	09:00	12:00	RN	2	10:15 - 10:20	Y
09/12/2019	09:00	12:00	RN	1	11:00 - 11:05	Y
09/12/2019	09:00	12:00	RN	1	11:05 - 11:10	Y
09/12/2019	09:00	12:00	RN	1	11:20 - 11:25	Y
09/12/2019	09:00	12:00	BH	7	11:45 - 11:50	Y
09/12/2019	09:00	12:00	BH	2	11:50 - 11:55	Y
10/12/2019	12:30	15:30	BH	1	13:50 - 13:55	Y
10/12/2019	12:30	15:30	RN	1	14:15 - 14:20	N
27/01/2020	09:00	12:00	BH	15	09:00 - 09:05	N
27/01/2020	09:00	12:00	RN	1	09:40 - 09:45	Y
27/01/2020	09:00	12:00	LB	1	10:10 - 10:15	N
27/01/2020	09:00	12:00	RN	4	10:25 - 10:30	N
27/01/2020	09:00	12:00	BH	4	11:00 - 11:05	N
27/01/2020	09:00	12:00	BH	11	11:05 - 11:10	N
27/01/2020	09:00	12:00	BH	25	11:05 - 11:10	Y
27/01/2020	09:00	12:00	BH	2	11:25 - 11:30	N
27/01/2020	09:00	12:00	BH	23	11:55 - 12:00	N
28/01/2020	13:00	16:00	BH	50	13:00 - 13:05	N
28/01/2020	13:00	16:00	BH	60	13:35 - 13:40	N

Date	Survey start	Survey end	Species	Count	5 min period	Likely Rotor Swept Height (Y/N)
28/01/2020	13:00	16:00	BH	17	13:45 - 13:50	N
28/01/2020	13:00	16:00	BH	30	14:00 - 14:05	Y
28/01/2020	13:00	16:00	BH	150	14:10 - 14:15	N
28/01/2020	13:00	16:00	BH	1	14:20 - 14:25	Y
28/01/2020	13:00	16:00	BH	4	15:10 -15:15	N
28/01/2020	13:00	16:00	BH	5	15:40 - 15:45	N
28/01/2020	13:00	16:00	BH	1	15:50 - 15:55	N
24/02/2020	15:30	18:30	BH	300 - 500	15:30 - 15:35	N
24/02/2020	15:30	18:30	WN	40 - 50	15:30 - 15:35	N
24/02/2020	15:30	18:30	RN	2	16:25 - 16:30	N
24/02/2020	15:30	18:30	RN	6	16:45 - 16:50	N
25/02/2020	07:00	10:00	BH	50-70	07:15 - 07:20	N
25/02/2020	07:00	10:00	MS	1	07:30 - 07:35	N
25/02/2020	07:00	10:00	LB	1	07:55 - 08:00	N
25/02/2020	07:00	10:00	BH	120-150	08:00 - 08:05	N
25/02/2020	07:00	10:00	RN	1	08:05 - 08:10	N
25/02/2020	07:00	10:00	BH	1	08:10 - 08:15	N
25/02/2020	07:00	10:00	LB	2	08:50 - 08:55	N
25/02/2020	07:00	10:00	BH	10	09:00 - 09:05	N
25/02/2020	07:00	10:00	LB	1	09:00 - 09:05	N
11/03/2020	16:00	19:00	BH	4	16:00 - 16:05	N
11/03/2020	16:00	19:00	BH	3	16:05 - 16:10	N
11/03/2020	16:00	19:00	BH	10	16:10 - 16:15	N
11/03/2020	16:00	19:00	LB	4	16:15 - 16:20	N
11/03/2020	16:00	19:00	BH	20	16:30 - 16:35	N
11/03/2020	16:00	19:00	BH	4	16:55 - 17:00	N
11/03/2020	16:00	19:00	BH	105	17:10 -17:15	Y
11/03/2020	16:00	19:00	BH	10	18:05 - 18:10	N
12/03/2020	06:20	09:20	BH	30	6:30 - 6:35	N
12/03/2020	06:20	09:20	BH	200-250	6:45 - 6:50	N
12/03/2020	06:20	09:20	CU	1	7:10 - 7:15	N
12/03/2020	06:20	09:20	BH	200-250	7:40 - 7:45	Y
12/03/2020	06:20	09:20	LB	1	7:50 - 7:55	N
12/03/2020	06:20	09:20	BH	100-125	8:20 - 8:25	N

Table AIII-3b: Secondary target species flight activity data from WF2 VP1

Date	Survey start	Survey end	Species	Count	5 min period	Likely Rotor Swept Height (Y/N)
28/10/2019	09:41	12:41	RN	2	11:02 - 11:07	Y
28/10/2019	09:41	12:41	RN	1	11:58 - 12:03	Y
29/10/2019	12:32	15:32	SH	1	13:05 - 13:10	N
29/10/2019	12:32	15:32	RN	2	13:33 - 13:38	N
29/10/2019	12:32	15:32	K	1	13:33 - 13:38	Y
14/11/2019	09:20	12:20	BH	7	10:47 - 10:53	N
14/11/2019	09:20	12:20	SH	1	10:49 - 10:54	N
15/11/2019	10:57	13:57	RN	1	11:25 - 11:30	Y
15/11/2019	10:57	13:57	BZ	1	12:03 - 12:08	Y
09/12/2019	09:29	12:29	RN	2	10:11-10:16	N
09/12/2019	09:29	12:29	SH	1	11:31-11:36	Y
11/12/2019	12:14	15:14	RN	1	12:20-12:25	Y
11/12/2019	12:14	15:14	BH	9	13:23-13:27	Y
11/12/2019	12:14	15:14	RN	2	14:01-14:02	N
27/01/2020	13:21	16:21	RN	2	14:40-14:45	Y
27/01/2020	13:21	16:21	RN	1	16:10-16:15	N
24/02/2020	09:51	12:51	BH	4	10:21-10:26	N
24/02/2020	09:51	12:51	RN	1	11:47-11:52	N
25/02/2020	13:31	16:31	WN	57	12:51 - 12:56	Y

Table AIII-4b: Secondary target species flight activity data from WF2 VP2

Date	Survey start	Survey end	Species	Count	5 min period	Likely Rotor Swept Height (Y/N)
28/10/2019	13:01	16:01	RN	1	14:45 - 14:50	Y
28/10/2019	13:01	16:01	RN	1	15:08 - 14:50	Y
28/10/2019	13:01	16:01	K	1	14:44 - 14:49	Y
29/10/2019	09:21	12:21	RN	5	10:11 - 10:16	N
29/10/2019	09:21	12:21	RN	4	10:28 - 10:33	Y
29/10/2019	09:21	12:21	RN	2	12:07 - 12:13	N
14/11/2019	12:31	15:31	RN	2	13:08 - 13:13	Y
15/11/2019	07:46	10:46	RN	1	10:19 - 10:24	N
15/11/2019	07:46	10:46	K	1	10:25 - 10:30	Y
09/12/2019	12:39	15:39	RN	1	13:51-13:56	N

Date	Survey start	Survey end	Species	Count	5 min period	Likely Rotor Swept Height (Y/N)
11/12/2019	09:05	12:05	BH	12	10:07-10:12	N
11/12/2019	09:05	12:05	RN	1	10:23-10:27	N
11/12/2019	09:05	12:05	RN	2	10:47-10:53	N
29/01/2020	13:20	16:20	SH	1	14:37-14:42	N
30/01/2020	07:42	10:42	RN	4	08:12-08:17	Y
24/02/2020	13:12	16:12	RN	2	14:30-14:35	N
24/02/2020	13:12	16:12	RN	3	16:01-16:05	N
26/02/2020	08:21	11:21	RN	1	10:15 - 10:20	N
26/02/2020	08:21	11:21	RN	2	10:48 - 10:53	N
26/02/2020	08:21	11:21	RN	1	11:07 - 11:12	N
11/03/2020	13:00	16:00	SN	1	15:52 - 15:57	Y

Table AIII-5b: Secondary target species flight activity data from WF2 VP3

Date	Survey start	Survey end	Species	Count	5 min period	Likely Rotor Swept Height (Y/N)
30/10/2019	12:42	15:42	BZ	1	12:51 - 12:56	N
30/10/2019	12:42	15:42	LB	2	13:36 - 13:41	N
30/10/2019	12:42	15:04	CU	11	14:17 - 14:22	N
31/10/2019	08:31	11:31	CU	1	9:31 - 9:36	N
31/10/2019	08:31	11:31	CU	1	09:33 - 9:38	N
31/10/2019	08:31	11:31	CU	25	10:08 - 10:13	N
12/11/2019	12:25	15:25	BH	25	12:40 - 12:45	N
12/11/2019	12:25	15:25	CU	2	12:58 - 13:03	N
12/11/2019	12:25	15:25	CU	15	13:29 - 13:34	N
12/11/2019	12:25	15:25	CU	45	13:59 - 14:04	N
13/11/2019	12:26	12:31	RN	4	13:12 - 13:17	Y
13/11/2019	12:26	12:31	RN	2	13:45 - 13:56	Y
10/12/2019	12:05	15:05	BH	2	12:32 - 12:37	N
10/12/2019	12:05	15:05	BH	1	12:55 - 13:00	N
10/12/2019	12:05	15:05	BH	28	14:26 - 14:31	N
12/12/2019	08:10	11:10	BH	12	09:40 - 09:45	N
12/12/2019	08:10	11:10	BH	24	09:53 - 09:58	N
12/12/2019	08:10	11:10	BH	31	10:11 - 10:16	N
12/12/2019	08:10	11:10	RN	1	10:29 - 10:34	N
12/12/2019	08:10	11:10	RN	1	10:57-11:02	N

Date	Survey start	Survey end	Species	Count	5 min period	Likely Rotor Swept Height (Y/N)
12/12/2019	08:10	11:10	CA	1	10:06 - 10:11	N
28/01/2020	12:01	15:01	BH	6	12:21 - 12:26	N
28/01/2020	12:01	15:01	BH	12	13:25 -13:30	N
28/01/2020	12:01	15:01	H	1	14:12 - 14:17	N
29/01/2020	09:21	12:21	RN	1	10:45 - 10:50	N
29/01/2020	09:21	12:21	CU	9	10:51 - 10:56	Y
29/01/2020	09:21	12:21	CU	23	10:59 - 11:04	Y
25/02/2020	10:12	13:12	BH	2	10:30 - 10:35	N
25/02/2020	10:12	13:12	RN	1	11:00 - 11:05	N
25/02/2020	10:12	13:12	MA	23	10:57 - 11:02	Y
25/02/2020	10:12	13:12	MA	14	12:09 - 12:14	Y
25/02/2020	10:12	13:12	CU	42	12:46 - 12:51	Y
26/02/2020	12:00	15:00	RN	2	12:20 - 12:25	N
26/02/2020	12:00	15:00	RN	1	12:28 - 12:32	N
26/02/2020	12:00	15:00	CU	56	12:50 - 12:55	Y
10/03/2020	11:50	14:50	CU	1	13:22 - 13:27	N
12/03/2020	09:25	12:25	T	2	9:43 - 9:48	Y
12/03/2020	09:25	12:25	T	3	9:51 - 9:56	Y
12/03/2020	09:25	12:25	WN	4	10:07 - 10:12	Y
12/03/2020	09:25	12:25	T	2	10:42 - 10:47	Y

Table AIII-6: Secondary target species flight activity data from WF2 VP4

Date	Survey start	Survey end	Species	Count	5 min period	Likely Rotor Swept Height (Y/N)
31/10/2019	11:50	14:02	RN	1	12:21 - 12:26	N
12/11/2019	10:00	13:00	RN	1	13:30-10:35	N
12/11/2019	10:00	13:00	CU	1	11:07 - 11:12	N
09/12/2019	12:30	15:30	RN	6	13:25 - 13:30	Y
09/12/2019	12:30	15:30	RN	2	13:45 - 13:50	N
10/12/2019	09:00	12:00	BH	2	10:50 - 10:55	N
27/01/2020	13:00	16:00	BH	1	13:45 - 13:50	N
27/01/2020	13:00	16:00	BH	1	13:55 - 14:00	N
27/01/2020	13:00	16:00	BH	1	14:10 - 14:15	N
28/01/2020	09:10	12:10	BH	4	9:35 - 9:40	N
28/01/2020	09:10	12:10	BH	4	9:35 - 9:40	N

Date	Survey start	Survey end	Species	Count	5 min period	Likely Rotor Swept Height (Y/N)
28/01/2020	09:10	12:10	BH	1	10:05 - 10:10	N
28/01/2020	09:10	12:10	BH	42	10:10 - 10:15	N
28/01/2020	09:10	12:10	BH	1	10:20 - 10:25	N
28/01/2020	09:10	12:10	BH	35	10:30 - 10:35	N
28/01/2020	09:10	12:10	BH	8	10:35 - 10:40	N
28/01/2020	09:10	12:10	BH	2	10:40 - 10:45	N
28/01/2020	09:10	12:10	BH	2	11:00 - 11:05	N
28/01/2020	09:10	12:10	BH	2	11:30 - 11:35	N
28/01/2020	09:10	12:10	BH	5	11:30 - 11:35	N
28/01/2020	09:10	12:10	BH	5	11:30 - 11:35	N
24/02/2020	12:00	15:00	BH	3	unrecorded	N
24/02/2020	12:00	15:00	BH	5	unrecorded	N
24/02/2020	12:00	15:00	BH	5	unrecorded	N
24/02/2020	12:00	15:00	BH	3	unrecorded	N
24/02/2020	12:00	15:00	RN	1	unrecorded	N
24/02/2020	12:00	15:00	RN	2	unrecorded	N
11/03/2020	12:15	15:15	HG	2	12:30 - 12:35	N
11/03/2020	12:15	15:15	HG	1	13:15 - 13:20	N
11/03/2020	12:15	15:15	HG	1	14:45 - 14:50	N
11/03/2020	12:15	15:15	HG	2	14:55 - 15:00	N

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