



Cush Wind Farm

Environmental Impact Assessment Report

Annex 5.2: Baseline Bird Survey Reports

Cush Wind Limited

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BIRD SURVEY REPORT BREEDING SEASON 2020

Cush Wind Farm

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1.0 Introduction

SLR Consulting Ireland (SLR) was commissioned by Galetech Energy Developments in April 2020 to carry out a breeding bird survey programme for a proposed wind farm site at Cush, Co. Offaly during the breeding season in 2020.

1.1 Site Description and Project Background

The proposed wind farm development site is located in the townland of Cush approximately 4 km north of Birr, Co. Offaly. The habitats within the proposed development site include conifer plantations of varying age classes, cutaway bog and agricultural grasslands (Figure 1).

There are two first order streams (West Galros and Elish), and one second order stream (Rapemills), which flow through the proposed site. The West Galros Stream and the Elish Stream both rise in the eastern section of the proposed site and both are tributaries of the Rapemills Stream. The West Galros flows in a westerly direction through the northern section of the site for 2.5km to its confluence with the Rapemills Stream, while the Elish flows in a south-westerly direction for 1.1km to meet the Rapemills Stream. The Rapemills Stream flows along the southern boundary of the proposed site in a west / northwest direction increasing in size to a third order river before it enters the Middle Shannon Callows SPA (Site Code: 004096), approximately 8.8km downstream. The Rapemills River travels for a further 1.7km to enter the River Shannon at the town of Banagher, approximately 10.5km downstream of the proposed site.

The proposed Cush Wind Farm site includes a linear area that was previously surveyed for a proposed overhead line (SLR, 2018). Flight activity surveys were carried out at two vantage point locations along the proposed overhead line route corridor during breeding season 2018.

1.2 Scope of Work

The scope of work addressed in this baseline ornithology report is as follows:

- Breeding Bird Surveys – 2020 season which includes:
 - Vantage Point (VP) Watches at 2 VP locations.
 - Breeding Wader Surveys.
 - Breeding Raptor Searches (2 km).
- Maps of flight-lines and other relevant bird data prepared using GIS.

1.3 Purpose of the Report

The aim of this report is to provide robust baseline ornithological survey data for the breeding period 2020 at the proposed wind farm at Cush, Co. Offaly. These data will be used to inform the ecological impact assessment and appropriate assessment for the proposed wind farm. The assessment of potential impacts is beyond the scope of this report.

2.0 Methods

2.1 Desk-Based Review

The desk review collated any available information to date on the breeding bird movements around the proposed wind farm development site.

As previously mentioned in Section 1.1, flight activity surveys were undertaken during the breeding season of 2018 from two vantage points overlooking an overhead power line route which was proposed to pass through the proposed Cush Wind Farm site. The following report resulting from that bird survey was reviewed:

- SLR (2018) Cloghan Wind Farm and Long Oak Wind Farm Breeding Bird Survey Report 2018. Prepared for Galetech Energy Services Ltd.

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 accessed for information on sites designated for nature conservation.

2.2 Field Surveys

The scope of breeding bird surveys for the proposed wind farm, as set out in Section 1.2, is based on recommendations given in NatureScot (formerly Scottish Natural Heritage (SNH)) 2017¹. 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.

2.2.1 Field Survey Team: Evidence of Technical Competence and Experience

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

Sarah Ingham is currently a Senior Ecologist with SLR Consulting (Ireland) 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. She has extensive experience as a Project Manager/Ecology Lead on many wind farm developments throughout Ireland. Her role also involves advising the clients on best practice regarding the protection of ecological receptors during the construction activities, particularly wind farm construction.

Sarah managed this project through liaison with the client, coordination of the survey team, supervision of the health and safety of the team, carrying out various bird surveys onsite throughout the survey season, collating, quality controlling and assessing the survey data and writing this report.

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

Jason joined SLR in February 2020 as a Graduate Ecologist. Jason holds a BSc (Hons) in Field Biology with Wildlife Tourism from Institute of Technology Tralee. He has gained experience in various methods of bird surveys, including vantage point and transect surveys, and is also involved in data input and the drafting of bird survey reports.

Supervised by Sarah Ingham, Jason carried out the majority of the bird surveys at Cush Wind Farm during the 2020 bird breeding season.

¹ SNH (2017) *Recommended bird survey methods to inform impact assessment of onshore wind farms*. Version 2.

Daniel Hulmes (DH) – 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 breeding bird surveys at Cush Wind Farm in June 2020.

2.2.2 Flight Activity Surveys

A total of two vantage point (VP) locations were identified during a desk-based viewshed analysis using a bespoke GIS tool for calculating the visible area from each 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 $\pm 7m$. The adequacy of these VPs was checked through a ground-truthing site visit prior to the commencement of breeding bird surveys in May 2020 to ensure that they were appropriate for collecting flight activity data during surveys. VP locations and 2km viewing arcs are shown in Figure 1 and VP viewsheds are shown in Figure 2.

Ideally, breeding bird flight activity surveys should be undertaken monthly from April - September inclusive in line with the bird breeding season. However, due to the onset of Covid 19 travel restrictions across Ireland in March 2020, surveys in April were postponed until May. A total of 36 hours of watches were undertaken at each of the two VP locations during the breeding season (monthly visits May - September inclusive). This equates to a total of six hours per VP per month, with the exception of nine hours at VP1 in May and July and 12 hours at VP2 in May. The VP survey effort undertaken during the breeding season of 2020 is outlined below in Table 2-1.

Table 2-1: Flight activity survey effort undertaken at the proposed Cush Wind Farm site from May to September 2020 (hrs:mins).

Month	VP1	VP2
May	9:00	12:00
June	6:00	6:00
July	9:00	6:00
August	6:00	6:00
September	6:00	6:00
Total hrs	36:00	36:00
VP ITM Coordinates (Figure 1)	664276 E 644585 N	661361 N 646428 N

It is good practice to ensure that where possible each monthly six-hour survey period should be split over more than a single day and spread across the day. As such, the six-hour survey periods were divided into three-hour blocks, the times of 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. In this way, it was possible to glean a clear picture of bird movements from each VP across the diurnal period.

It is recommended that there should be suitable breaks of at least 30 minutes between watches to minimise observer fatigue (SNH, 2017). Watches can be suspended and then resumed to take account of changes in

visibility, e.g., fluctuations in the cloud base, passing rain shower or for the observer to rest. At SLR, we recommend that a combination of more than six hours VP watches should not be carried out by the same observer(s) over the course of a single 24-hour period.

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

In the absence of detailed information regarding turbine specifications at the time of commencing surveys, a precautionary approach was taken in relation to recording height bands. Height bands were determined based on turbine specifications allowing for the maximum rotor tip height of 150m and the lowest rotor swept height of 50m. Flight heights were therefore attributed to four distinct height bands as follows:

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

In addition, a summary of observations of secondary target species (see Section 2.2.2.1) 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 on site, in the 500m buffer or beyond;
- Flight behaviour; and
- Notes on observation.

2.2.2.1 Target Species

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

Primary Target Species

The list of primary target species was limited to species upon which effects are most likely to be potentially significant in EIA terms, thereby enabling recording to focus on the species of greatest importance.

Primary target species were specifically limited to species upon which effects are most likely to be potentially significant in EIA terms, e.g., breeding species forming qualifying features for nearby SPAs or species listed on Annex I of the Birds Directive. 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.

Primary target species for these VP surveys included the following bird species:

- all Annex 1 raptor/owl species;
- lapwing *Vanellus vanellus*;
- golden plover *Pluvialis apricaria*;
- curlew *Numenius arquata*;
- black-headed gull *Chroicocephalus ridibundus*; and
- herring gull *Larus argentatus*.

Although lapwing, curlew, black-headed gull and herring gull are not listed under Annex I of the Birds Directive, the breeding populations of these species are Red-listed in Ireland under the Birds of Conservation Concern 2014-2019 (Colhoun and Cummins, 2013) as numbers of breeding pairs within the Irish landscape have suffered a serious decline in recent years. As these species are the only Red listed species likely to occur in this area which are potentially vulnerable to impacts, any observations of these four species were also recorded as primary target species during the summer months.

Secondary Target Species

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

Secondary target species included:

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

2.2.3 Breeding Wader Surveys

Breeding wader surveys followed the lowland wet grassland survey methodology described in O'Brien and Smith (1992). The survey involved a walked transect to which covered all habitat potentially suitable for breeding waders within the wind farm site. The same transect was surveyed three times across the 2020 breeding season on 5 May, 29 May and 26 June.

As shown in Figure 4, there are large plantations of mature conifer forestry in the central, western, and southern areas of the site. These habitats not suitable for breeding waders and so were excluded from the survey. In addition, some fields adjacent to the forestry plantations were dominated by areas of cutover bog which are not suitable habitats for breeding waders and were also excluded from the survey. As such, transects were

undertaken in the western, eastern and northern sections of the site where semi-natural and wet grassland fields are present, habitats which are more attractive for breeding waders.

The location, movement and behaviour of all wader species were to be recorded onto field maps using standard BTO species codes. The following criteria was to be recorded for each species:

- Lapwing – the total numbers of birds seen from the transect;
- Snipe *Gallinago gallinago* – the number of drumming plus chipping birds heard or seen from the transect; and
- Other species – the number of pairs (where 'pairs' = (paired individuals/two), displaying birds, nests or broods and other single birds not in flocks).

Please see Figure 4 for an outline of the walked transect routes and Appendices I and II for metadata relating to these surveys.

2.2.4 Breeding Raptor Surveys

The survey methodology for breeding raptors used a driven transect with regular stops, to carry out watches of suitable habitat from appropriate viewpoints to identify potential nesting territories. A total of two stops were made along the driven transect around both wind farm sites overlooking potentially suitable breeding habitat. The outline of the driven survey route and associated viewpoints and the results of the surveys are presented in Figure 4.

A driven survey was used due to limitations to access to third party land within the 2 km buffer zone and the availability of a good road network in the vicinity of the site. It is also noted that suitable breeding habitat for Annex I raptors within the sites and 2 km buffer is very limited and visibility from the survey route was sufficient to cover the vast majority of potentially suitable breeding habitat within the survey area.

Suitable breeding habitat differs for each raptor species (Hardey *et al.*, 2013) and was limited within the survey area. Table 2-2 provides a summary of the potentially suitable raptor habitats within the 2km buffer zone of the sites and the approximate locations of these in relation to the viewpoints used during the survey.

Table 2-2: Potentially suitable habitats for breeding raptors within the study area, the viewpoints the habitats can be seen from and the target raptor species which could be expected within these habitats

Raptor Viewpoint No. (RVP)	Habitat type	Target raptor species
RVP1	Mature forestry plantation, mixed deciduous woodland, wet grassland with dense rush and bracken cover and a quarry.	Buzzard, sparrowhawk, kestrel, hen harrier and peregrine falcon
RVP2	Quarry [REDACTED]	Peregrine falcon and kestrel

Survey timings followed those in Hardey *et al.* (2013), as per SNH guidelines. This survey was repeated along the same routes on 5 May, 29 May, 26 June and 8 July. Please see Appendices I and II for metadata relating to these surveys.

The location, movement and behaviour of all raptor species observed were recorded onto the field maps using standard BTO species codes.

2.3 Survey Limitations

Most of the flight activity surveys were undertaken in optimal weather conditions with nine hours out of the total of 72 during which the visibility was recorded as moderate i.e., 1-3km. This comprises 12.5% 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.

Due to the onset of Covid 19 travel restrictions across Ireland in March 2020, surveys in April were postponed until May. Given that extra hours of survey effort were undertaken at each vantage point and two breeding wader and raptor surveys were also undertaken in May, it is deemed that the conclusions of the study have not been affected.

3.0 Results

3.1 Desk-Based Review

The proposed wind farm site is not within or immediately adjacent to any Special Protection Area (SPA). However, there are a total of five SPAs within a 15km radius of the proposed development site.

The five SPAs within 15km are shown in Table 3-1, which also shows the species of special conservation interest (SSCI) for each site. The majority of SSCIs for which these sites are designated are wintering species. As such, for the purposes of this report, which deals specifically with breeding birds, SSCI which are only present during the wintering season have been excluded from Table 3-1.

The two closest SPAs to the proposed development site are Dovegrove Callows SPA (Site Code: 004137) and All Saints Bog SPA (Site Code: 004103) at distances of 1.9km and 3.1km, respectively. Both of these sites are designated for the protection of Greenland white-fronted geese *Anser albifrons flavirostris* and as such, are not relevant to this breeding season report. River Little Brosna Callows SPA (Site Code: 004086) is located 4.1km to the west and is designated for a number of breeding wildfowl species.

Corncrake *Crex crex* is a SSCI of the Middle Shannon Callows SPA. Upon their arrival to suitable breeding habitat in Ireland following migration from sub-Saharan Africa, corncrake, a site faithful species, then become sedentary, rarely if ever, moving from the habitat they have chosen for breeding once they find a mate (Duffy, 2018). As such, given that the Middle Shannon Callows SPA is at a distance of 7.2km from the proposed wind farm site, dedicated corncrake surveys were not deemed necessary. There is also a lack of suitable habitat for corncrake (hay meadows) within the proposed wind farm site.

Hen Harrier *Circus cyaneus* is the sole SSCI of the Slieve Bloom Mountains SPA (Site Code: 004160). Typically, male hen harriers travel up to 9km from nests but have a home-range size that averages only 8 km², while the average home-range size for females is 4.5 km² (Arroyo *et al.*, 2014). As such, given the distance of 12km between the SPA and the proposed development site, it is unlikely that the proposed site will be used as a hunting ground by the Slieve Bloom Mountains SPA hen harrier population.

Table 3-1: SPAs within 15km of the proposed Cush Wind Farm site and their qualifying interests (species present during the breeding season only)

Site Name	Site Code	Distance/ Direction from Site Boundary	Species of Special Conservation Interest
Dovegrove Callows SPA	004137	1.9km south-west	<ul style="list-style-type: none"> Wetland and Waterbirds
All Saints Bog SPA	004103	3.1km west	<ul style="list-style-type: none"> Wetland and Waterbirds
River Little Brosna Callows SPA	004086	4.1km west	<ul style="list-style-type: none"> Wigeon <i>Anas penelope</i> Teal <i>Anas crecca</i> Pintail <i>Anas acuta</i> Shoveler <i>Anas clypeata</i> Lapwing <i>Vanellus vanellus</i> Black-tailed Godwit <i>Limosa limosa</i> Black-headed Gull <i>Chroicocephalus ridibundus</i> Wetland and Waterbirds

Site Name	Site Code	Distance/ Direction from Site Boundary	Species of Special Conservation Interest
Middle Shannon Callows SPA	004096	7.2km north west	<ul style="list-style-type: none"> • Corncrake <i>Crex crex</i> • Lapwing <i>Vanellus vanellus</i> • Black-tailed Godwit <i>Limosa limosa</i> • Black-headed Gull <i>Chroicocephalus ridibundus</i> • Wetland and Waterbirds
Slieve Bloom Mountains SPA	004160	12km east	<ul style="list-style-type: none"> • Hen Harrier <i>Circus cyaneus</i>

3.2 Field Surveys

3.2.1 Flight Activity Surveys

3.2.1.1 Primary Target Species

Flight lines of primary target species recorded at during the 2020 breeding season are mapped in Figures 3.

Lapwing was the only primary target species recorded during the flight activity surveys at the proposed Cush Wind Farm site throughout the 2020 breeding season. There were two sightings of this species which occurred during a single survey period in July and were observed 16 minutes apart. As such, it is possible that these were two sightings of the same individual. Both sightings were observed within the 500m buffer zone and below the likely rotor swept area.

3.2.1.2 Secondary Target Species

A total of five secondary target species were recorded during the flight activity surveys at the proposed Cush Wind Farm site throughout the 2020 breeding season. Summary details of these are presented in Table 3-2.

Buzzard was the most frequently recorded secondary target species with 42 observations (n=52). Approximately 75% of buzzards recorded were flying either above or below the likely rotor swept area in height bands 1, 2 or 4. During the June surveys at VP1, there were five sightings in a single survey period of a buzzard entering and leaving an area of mixed deciduous woodland within the 500m buffer zone of the site. There is a possibility that this may have been a nest site, however, as there was no definitive evidence of breeding observed during these sightings, such as carrying prey or courtship display, breeding could not be confirmed.

Raven was the second most frequently recorded secondary species with 12 observations (n=13). A total of eight of the 13 birds observed were recorded flying within the likely rotor swept area.

The only other raptor species recorded during flight activity surveys was kestrel, of which there were five observations of single individuals. Three of these individuals were observed flying within the likely rotor swept area and two observed below.

Lesser black-backed gull *Larus fuscus* was the only species of gull recorded on site, with a single observation of two individuals flying above the likely rotor swept height.

There were two observations of jay *Garrulus glandarius* recorded during the same survey period passing through the site below the likely rotor swept height.

Table 3-2: Secondary target species and flights recorded at the proposed Cush Wind Farm site – May to September 2020

Target Species	Total number of birds recorded	Total number of flights recorded
Buzzard	52	42
Kestrel	5	5
Raven	13	12
Jay	2	2
Lesser black-backed gull	2	1
Total	74	62

3.2.2 Breeding Wader Surveys

There were no waders recorded during the targeted breeding wader surveys throughout the breeding season.

3.2.3 Breeding Raptor Surveys

There was one species of raptor were recorded during the targeted breeding raptor surveys, namely buzzard, of which there was one sighting across the four surveys during the season.

The survey undertaken in early May (in place of the postponed April survey) yielded a sighting a single buzzard, flying north-westerly direction in the south-western section of the site.

As mentioned previously in Section 3.2.1, there was an observation of a possible buzzard breeding territory which was observed during the flight activity surveys. However, as definitive evidence of breeding behaviour was not observed, breeding could not be confirmed.

There were no further observations of any raptor species during the May, June or July surveys. Please see Figure 5 for transect route and locations of recorded sightings.

4.0 Summary and Conclusions

The aim of this report is to provide robust baseline ornithological survey data for the 2020 breeding season at the proposed wind farm site at Cush, Co. Offaly. These data will be used to inform the ecological impact assessment and appropriate assessment for the proposed wind farm. The assessment of potential effects of the proposed wind farm is beyond the scope of this report.

The proposed Cush Wind Farm site is set within a landscape of lowland intensive agriculture. Habitats onsite are a mosaic of improved agricultural grassland fields, cutover bog and mature conifer forestry plantation. There are two small streams in the vicinity of the proposed site (the West Galros and the Eglis), both of which rise in the east of the proposed site and flow in a westerly direction. These two streams are tributaries of a third stream, Rapemills Stream, which flows along the southern extents of the development site. The Rapemills Stream becomes the Rapemills River and flows in a north-westerly direction for approximately 10km meeting the River Shannon in the town of Banagher, Co. Offaly.

The proposed development site is not situated within any area designated for nature conservation, however, there are five SPAs within a 15km radius of the proposed site. The key species associated with these SPAs during the breeding season are corncrake, lapwing, black-tailed godwit, black-headed gull, wigeon, teal, pintail, shoveler and hen harrier.

The breeding bird survey methods employed during the 2020 survey season are based on recommendations given in NatureScot (formerly Scottish Natural Heritage (SNH)) 2017. 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. Breeding season surveys usually begin in April, however, due to the onset of Covid 19 restrictions in late March 2020, the April surveys were postponed until May. To account for this postponement, the survey effort in May was doubled at VP2 and an extra three hours were undertaken at VP1 in May and July. Surveys then ran until September.

There were three survey types undertaken on and around the proposed development site, namely flight activity, targeted breeding wader, and targeted breeding raptor. Flight activity surveys were undertaken from two vantage points overlooking the site. These vantage points were visited for six hours per month, with the exception, as mentioned above, of the extra survey hours undertaken in May and July. This resulted in a total survey effort of 36 hours per vantage point throughout the season.

Breeding wader surveys followed methodology described in O'Brien and Smith (1992). The survey involved a walked transect which covered all habitat potentially suitable for breeding waders within the wind farm site. The same transect was repeated three times across the 2020 breeding season, twice in May and once in June.

Breeding raptor surveys were repeated four times across the season, twice in May, once in June and once in July. The survey methodology for breeding raptors used a driven transect with regular stops, to carry out watches of suitable habitat from appropriate viewpoints to identify potential nesting territories. A total of two stops were made along the driven transect around the wind farm site overlooking potentially suitable breeding habitat.

This is the first season of bird surveys to be undertaken at this green-field site for this proposed project. However, flight activity surveys were undertaken during the breeding season of 2018 from two vantage points overlooking an overhead power line route which was proposed to pass through the proposed Cush Wind Farm site.

Results of flight activity surveys yielded two records of a single primary target species at the proposed Cush Wind Farm site during the breeding season 2020, namely lapwing. Both sightings of lapwing were recorded during the same survey period in July flying within the 500m buffer below the likely rotor swept area.

A total of five secondary target species were recorded during flight activity surveys, namely buzzard, kestrel, raven, jay, and lesser black-backed gull. Buzzard was the most frequently observed secondary target species (n = 52) followed by raven (n = 13). The majority of buzzard flights were recorded outside the likely rotor swept area. The only other raptor species recorded during flight activity surveys was kestrel, of which there were five

observations of single individuals. Three of these individuals were observed flying within the likely rotor swept area and two observed below. Lesser black-backed gull and jay were recorded once and twice respectively, with none recorded within the likely rotor swept area.

The targeted breeding wader and raptor surveys yielded similarly low observation rates throughout the season, with no waders recorded during the breeding wader surveys and a single buzzard recorded during the breeding raptor surveys in May. There were no observations of raptors during this survey type in June and July. There was no evidence of confirmed breeding raptors observed throughout the season. However, during flight activity surveys in June, a possible nest site was observed in the east of the site (see Figure 5).

These results are comparable with the results of surveys carried out in the vicinity of the proposed wind farm site during the breeding season of 2018, with lapwing recorded twice in both years. Although there are some differences also. In 2018, three raptor species (buzzard, kestrel, sparrowhawk) and two species of wader (lapwing, snipe) were observed. Numbers of buzzard recorded in 2018 (n=25) were half of those recorded in 2020 (n=52), whilst over three times the number of kestrel were recorded in 2018 (n=16) compared with 2020 (n=5). Sparrowhawk and snipe were not recorded in 2020.

In conclusion, the results of this study show that there are no regular flight paths of bird species of special conservation interest or conservation concern within the site proposed for the Cush Wind Farm development. That said, this is the first of two breeding season surveys to be carried out at the proposed wind farm site. As such, further surveys which will be carried out during the 2021 breeding season, will provide a more robust baseline representation of site usage by bird species.

5.0 References

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6.0 Figures

Figure 1: Cush Wind Farm Breeding Season 2020 Bird Report – Vantage Points and Viewing Arcs

Figure 2: Cush Wind Farm Breeding Season 2020 Bird Report – Viewshed Analysis






Figure 3: Cush Wind Farm Breeding Season 2020 Bird Report – Lapwing Flight Lines

Figure 4: Cush Wind Farm Breeding Season 2020 Bird Report – Breeding Wader Transect Route and Survey Results

Figure 5: Cush Wind Farm Breeding Season 2020 Bird Report – Breeding Raptor Transect Route and Survey Results



LEGEND

-  Site Infrastructure
-  Turbines
-  Site Infrastructure 500m Buffer
-  Vantage Point
-  Vantage Point Viewing



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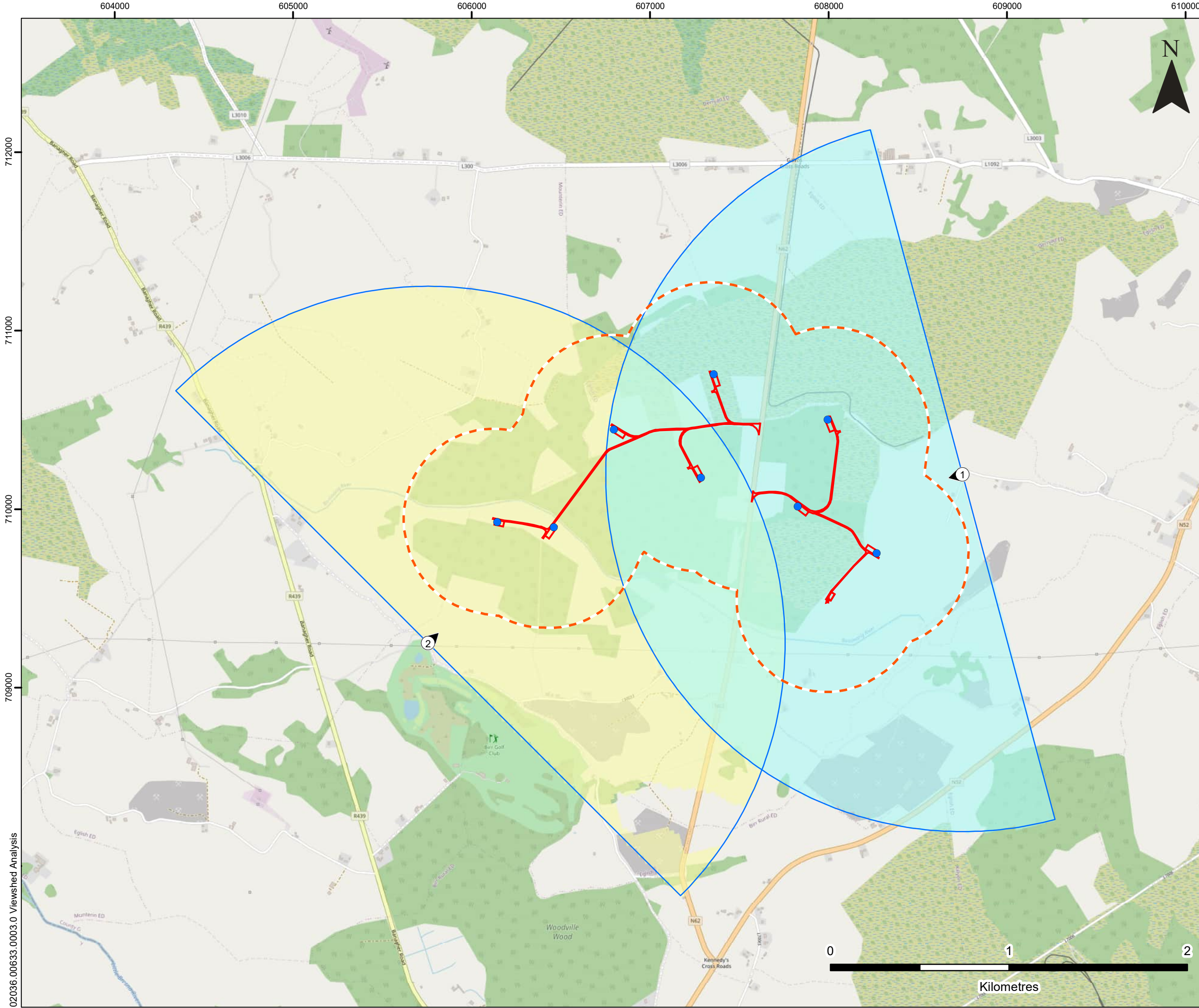
CUSH WIND FARM
 BREEDING SEASONS 2020
 BIRD SURVEY REPORT
**VANTAGE POINTS
 AND VIEWING ARCS**

FIGURE 1

Scale 1:20,000 @ A3 Date FEBRUARY 2021



02036.00633.0002.0 Vantage Points and Viewing Arcs



LEGEND

- Site Infrastructure
- Turbines
- Site Infrastructure 500m Buffer
- Vantage Point
- Vantage Point Viewing
- Area Visible from Vantage Point 1
- Area Visible from Vantage Point 2



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CUSH WIND FARM
BREEDING SEASONS 2020
BIRD SURVEY REPORT
VIEWSHED ANALYSIS

FIGURE 2








Scale 1:20,000 @ A3 Date FEBRUARY 2021



02036.00633.0003.0 Viewshed Analysis



LEGEND

-  Site Infrastructure
-  Turbines
-  Site Infrastructure 500m Buffer
-  Vantage Point
-  Vantage Point Viewing
-  Lapwing
-  Flight Line



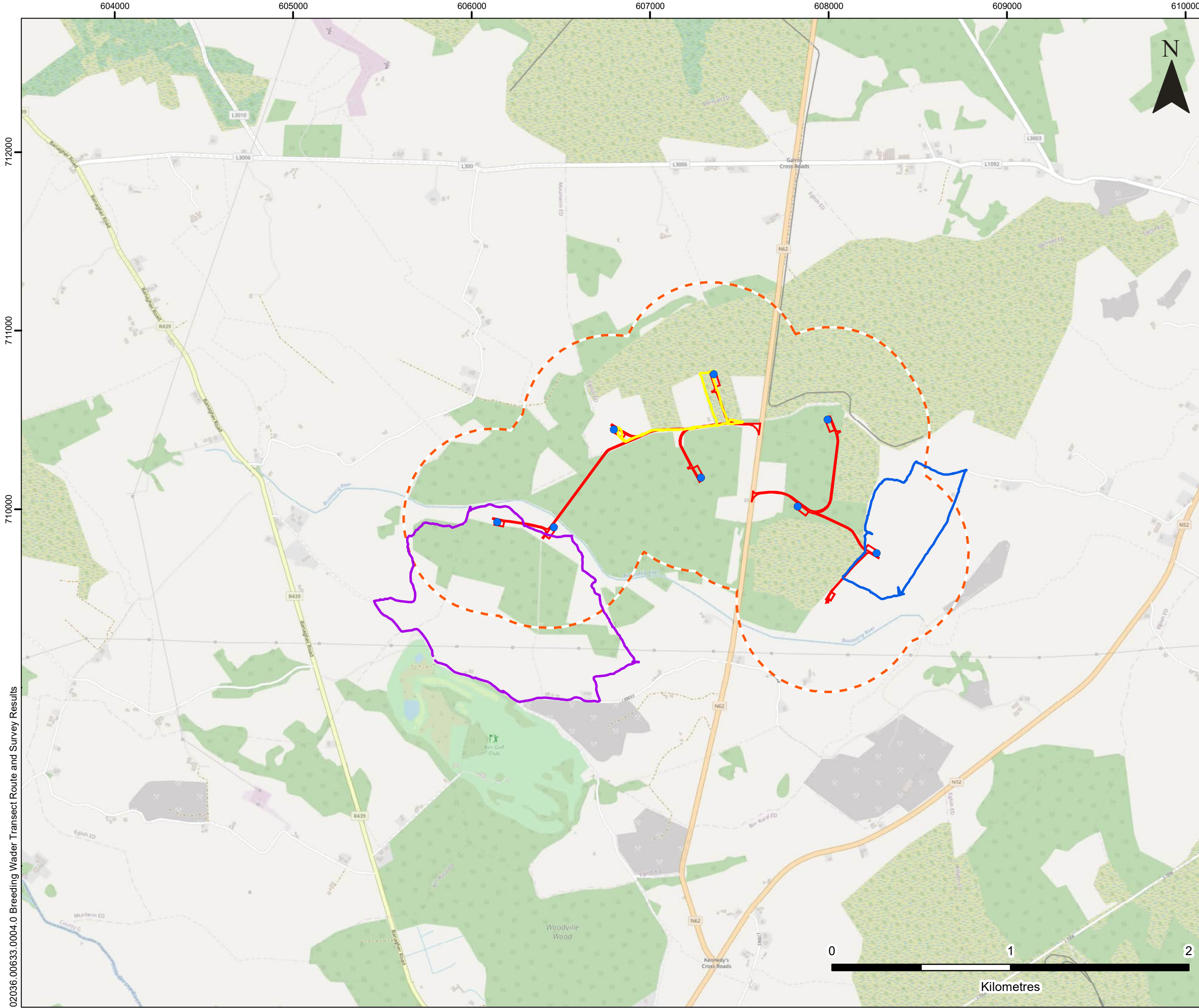
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BREEDING SEASONS 2020
BIRD SURVEY REPORT
LAPWING FLIGHT LINES







FIGURE 3
 Scale 1:20,000 @ A3 Date FEBRUARY 2021



02036.00633.0006.0 Lapwing Flight Lines



LEGEND

-  Site Infrastructure
-  Turbines
-  Site Infrastructure 500m Buffer
-  Breeding Wader Transect Route - North
-  Breeding Wader Transect Route - East
-  Breeding Wader Transect Route - West

No Waders recorded during these surveys.



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BREEDING SEASONS 2020
BIRD SURVEY REPORT
BREEDING WADER TRANSECT
ROUTE AND SURVEY RESULTS

FIGURE 4
Scale 1:20,000 @ A3 Date FEBRUARY 2021



02036.00633.0004.0 Breeding Wader Transect Route and Survey Results

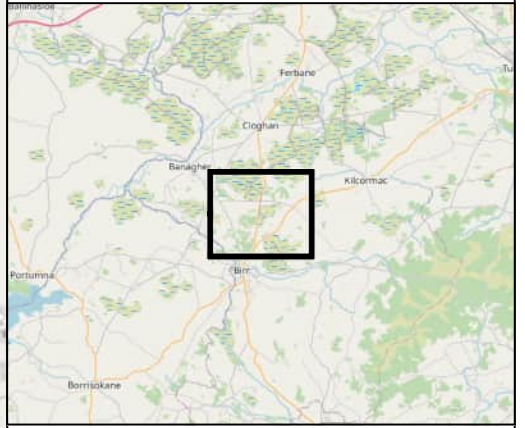


LEGEND

- Site Infrastructure
- Turbines
- Site Infrastructure 2km Buffer
- Breeding Raptor Transect Route
- Raptor Viewpoint

Species

- ◆ Buzzard
- Kestrel
- Flight Line



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BIRD SURVEY REPORT
BREEDING RAPTOR TRANSECT
ROUTE AND SURVEY RESULTS

FIGURE 5
Scale 1:30,000 @ A3 Date FEBRUARY 2021

APPENDIX I

Survey dates, times and observers

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

Date	Surveyor	Start	End	Survey Duration
06/05/20	SI	11:45	14:45	3
07/05/20	JC	09:40	12:40	3
14/05/20	JC	09:20	12:20	3
11/06/20	DH	13:20	16:20	3
25/06/20	DH	14:00	17:00	3
07/07/20	SI	08:45	11:45	3
08/07/20	JC	09:50	12:50	3
21/07/20	JC	08:55	11:55	3
17/08/20	JC	10:50	13:50	3
18/08/20	JC	13:30	16:30	3
07/09/20	JC	10:30	13:30	3
08/09/20	JC	11:55	14:55	3
Total Hours				36

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

Date	Surveyor	Start	End	Survey Duration
06/05/20	SI	15:15	15:15	3
07/05/20	JC	13:10	16:10	3
14/05/20	JC	13:50	16:50	3
15/05/20	JC	09:30	12:30	3
11/06/20	DH	10:00	13:00	3
25/06/20	DH	10:00	13:00	3
07/07/20	SI	12:15	15:15	3
21/07/20	JC	12:25	15:25	3
17/08/20	JC	14:20	17:20	3
18/08/20	JC	10:00	13:00	3
07/09/20	JC	14:00	17:00	3
08/09/20	JC	08:25	11:25	3
Total Hours				36

Table AI-3: Details of breeding wader surveys undertaken during the 2020 bird breeding season

Date	Surveyor	Start	End	Survey Duration
05/05/20	SI	09:00	13:00	4
29/05/20	SI	08:00	12:00	4
26/06/20	DH	08:30	12:30	4
Total Hours				12

Table AI-4: Details of breeding raptor surveys undertaken during the 2020 bird breeding season

Date	Surveyor	Start	End	Survey Duration
05/05/20	SI	14:15	18:15	4
29/05/20	SI	13:00	17:00	4
26/06/20	DH	13:00	17:00	4
08/07/20	SI	10:00	14:00	4
Total Hours				16

APPENDIX II

Weather Data

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

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
06/05/2020	SI	11:45	14:45	1	2	SE	0	3	2	2	0	0	16
06/05/2020	SI	11:45	14:45	2	2	SE	0	2	2	2	0	0	17
06/05/2020	SI	11:45	14:45	3	2	SE	0	1	2	2	0	0	17
07/05/2020	JC	09:40	12:40	1	3	SE	2	7	2	2	0	0	11
07/05/2020	JC	09:40	12:40	2	4	E	0	8	2	2	0	0	13
07/05/2020	JC	09:40	12:40	3	5	E	0	8	2	2	0	0	13
14/05/2020	JC	09:20	12:20	1	1	N	0	0	2	2	0	0	6
14/05/2020	JC	09:20	12:20	2	1	N	0	0	2	2	0	0	6
14/05/2020	JC	09:20	12:20	3	1	N	0	1	2	2	0	0	6
11/06/2020	DH	13:20	16:20	1	5	NW	0	8	2	2	0	0	16
11/06/2020	DH	13:20	16:20	2	5	NW	0	8	2	2	0	0	16
11/06/2020	DH	13:20	16:20	3	5	NW	0	8	2	2	0	0	16
25/06/2020	DH	14:00	17:00	1	3	W	0	8	2	2	0	0	24
25/06/2020	DH	14:00	17:00	2	4	W	0	7	2	2	0	0	25
25/06/2020	DH	14:00	17:00	3	4	W	2	8	2	2	0	0	24
07/07/2020	SI	08:45	11:45	1	1	S	3	8	1	1	0	0	11
07/07/2020	SI	08:45	11:45	2	1	S	3	8	1	1	0	0	11
07/07/2020	SI	08:45	11:45	3	1	S	3	8	1	1	0	0	12

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
08/07/2020	JC	09:50	12:50	1	2	NE	0	2	2	2	0	0	13
08/07/2020	JC	09:50	12:50	2	2	NE	0	2	2	2	0	0	13
08/07/2020	JC	09:50	12:50	3	2	SE	1	2	2	2	0	0	13
21/07/2020	JC	08:55	11:55	1	1	SW	0	4	2	2	0	0	11
21/07/2020	JC	08:55	11:55	2	2	SW	0	3	2	2	0	0	13
21/07/2020	JC	08:55	11:55	3	1	SW	0	4	2	2	0	0	14
17/08/2020	JC	10:50	13:50	1	2	NE	0	8	2	2	0	0	17
17/08/2020	JC	10:50	13:50	2	2	NE	2	8	2	2	0	0	17
17/08/2020	JC	10:50	13:50	3	2	NE	2	8	2	2	0	0	18
18/08/2020	JC	13:30	16:30	1	2	SW	0	6	2	2	0	0	21
18/08/2020	JC	13:30	16:30	2	2	SW	0	6	2	2	0	0	21
18/08/2020	JC	13:30	16:30	3	3	SW	0	5	2	2	0	0	22
07/09/2020	JC	10:30	13:30	1	3	SW	0	8	2	2	0	0	14
07/09/2020	JC	10:30	13:30	2	4	SW	1	8	1	1	0	0	15
07/09/2020	JC	10:30	13:30	3	4	SW	0	8	1	1	0	0	16
08/09/2020	JC	11:55	14:55	1	3	SW	0	8	2	2	0	0	18
08/09/2020	JC	11:55	14:55	2	3	SW	0	7	2	2	0	0	19
08/09/2020	JC	11:55	14:55	3	3	SW	0	7	2	2	0	0	19

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
Rain/ Precipitation			Cloud Cover		Visibility			Lying Snow		Frost			
None	0	Expressed in oktas (n/8)		Poor (<1km)	0	None	0	None	0	None	0	None	0
Drizzle	1	Cloud Height		Moderate (1-3km)	1	On site	1	On site	1	Ground	1	Ground	1
Light showers/snow	2	Height of cloud above		Good (>3km)	2	On higher ground	2	On higher ground	2	All day	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 VP2

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
06/05/2020	SI	15:15	18:15	1	2	SE	0	4	2	2	0	0	18
06/05/2020	SI	15:15	18:15	2	2	SE	0	5	2	2	0	0	16
06/05/2020	SI	15:15	18:15	3	2	SE	0	7	2	2	0	0	15
07/05/2020	JC	13:10	16:10	1	4	S	0	8	2	2	0	0	15
07/05/2020	JC	13:10	16:10	2	3	S	0	7	2	2	0	0	15
07/05/2020	JC	13:10	16:10	3	0	N/A	0	5	2	2	0	0	17
14/05/2020	JC	13:50	16:50	1	2	N	0	1	2	2	0	0	12
14/05/2020	JC	13:50	16:50	2	2	N	0	0	2	2	0	0	13
14/05/2020	JC	13:50	16:50	3	2	N	0	0	2	2	0	0	14
15/05/2020	JC	09:30	12:30	1	2	NW	0	8	2	2	0	0	8
15/05/2020	JC	09:30	12:30	2	2	NW	0	8	2	2	0	0	8
15/05/2020	JC	09:30	12:30	3	2	NW	0	8	2	2	0	0	11
11/06/2020	DH	10:00	13:00	1	4	S	0	2	2	2	0	0	18
11/06/2020	DH	10:00	13:00	2	4	SW	0	4	2	2	0	0	19
11/06/2020	DH	10:00	13:00	3	4	SW	0	5	2	2	0	0	19
25/06/2020	DH	10:00	13:00	1	3	W	0	6	2	2	0	0	21
25/06/2020	DH	10:00	13:00	2	3	W	0	5	2	2	0	0	23
25/06/2020	DH	10:00	13:00	3	3	W	0	6	2	2	0	0	24
07/07/2020	SI	12:15	15:15	1	0	N/A	1	8	1	1	0	0	12

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
07/07/2020	SI	12:15	15:15	2	0	N/A	1	8	1	1	0	0	12
07/07/2020	SI	12:15	15:15	3	0	N/A	1	8	1	1	0	0	12
21/07/2020	JC	12:25	15:25	1	2	SW	0	6	2	2	0	0	17
21/07/2020	JC	12:25	15:25	2	1	SW	0	6	2	2	0	0	18
21/07/2020	JC	12:25	15:25	3	1	SW	0	6	2	2	0	0	18
17/08/2020	JC	14:20	17:20	1	2	NE	0	8	2	2	0	0	18
17/08/2020	JC	14:20	17:20	2	2	NE	1	8	2	2	0	0	18
17/08/2020	JC	14:20	17:20	3	2	NE	2	8	2	2	0	0	17
18/08/2020	JC	10:00	13:00	1	1	SW	0	7	2	2	0	0	16
18/08/2020	JC	10:00	13:00	2	1	SW	0	5	2	2	0	0	17
18/08/2020	JC	10:00	13:00	3	1	SW	0	5	2	2	0	0	18
07/09/2020	JC	14:00	17:00	1	3	SW	1	8	1	1	0	0	17
07/09/2020	JC	14:00	17:00	2	3	SW	0	8	2	2	0	0	18
07/09/2020	JC	14:00	17:00	3	3	SW	0	8	2	2	0	0	19
08/09/2020	JC	08:25	11:25	1	3	SW	0	8	1	2	0	0	17
08/09/2020	JC	08:25	11:25	2	2	SW	0	8	2	2	0	0	18
08/09/2020	JC	08:25	11:25	3	2	SW	1	8	2	2	0	0	18

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°C)
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 All-3: Weather data collected during the breeding wader surveys undertaken during the 2020 breeding season

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
05/0520	SI	09:00	13:00	1	1	W	0	5	2	2	0	0	12
05/0520	SI	09:00	13:00	2	1	W	0	5	2	2	0	0	14
05/0520	SI	09:00	13:00	3	1	W	0	5	2	2	0	0	16
05/0520	SI	09:00	13:00	4	1	W	0	5	2	2	0	0	16
29/05/20	SI	08:00	12:00	1	3	SE	0	1	2	2	0	0	17
29/05/20	SI	08:00	12:00	2	3	SE	0	1	2	2	0	0	19
29/05/20	SI	08:00	12:00	3	3	SE	0	1	2	2	0	0	21
29/05/20	SI	08:00	12:00	4	3	SE	0	1	2	2	0	0	21
26/06/20	DH	08:30	12:30	1	3	NW	0	1	2	2	0	0	23
26/06/20	DH	08:30	12:30	2	3	NW	0	5	2	2	0	0	19
26/06/20	DH	08:30	12:30	3	3	NW	0	4	2	2	0	0	19
26/06/20	DH	08:30	12:30	4	3	NW	0	1	2	2	0	0	20
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 All-4: Weather data collected during the breeding raptor surveys undertaken during the 2020 breeding season

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°C)
05/05/20	SI	14:15	18:15	1	1	SW	0	7	2	2	0	0	17
05/05/20	SI	14:15	18:15	2	1	SW	0	6	2	2	0	0	18
05/05/20	SI	14:15	18:15	3	1	SW	0	3	2	2	0	0	19
05/05/20	SI	14:15	18:15	4	1	SW	0	7	2	2	0	0	119
29/05/20	SI	13:00	17:00	1	3	SE	0	1	2	2	0	0	21
29/05/20	SI	13:00	17:00	2	3	SE	0	1	2	2	0	0	23
29/05/20	SI	13:00	17:00	3	3	SE	0	1	2	2	0	0	24
29/05/20	SI	13:00	17:00	4	3	SE	0	1	2	2	0	0	24
26/06/20	DH	13:00	17:00	1	3	NW	0	1	2	2	0	0	23
26/06/20	DH	13:00	17:00	2	3	NW	0	5	2	2	0	0	23
26/06/20	DH	13:00	17:00	3	4	NW	0	4	2	2	0	0	23
26/06/20	DH	13:00	17:00	4	4	NW	0	1	2	2	0	0	23
08/07/20	SI	10:00	14:00	1	2	S	1	8	2	2	0	0	15
08/07/20	SI	10:00	14:00	2	2	S	0	8	2	2	0	0	15
08/07/20	SI	10:00	14:00	3	2	S	0	7	2	2	0	0	16
08/07/20	SI	10:00	14:00	4	2	S	1	8	2	2	0	0	17

Date	Surveyor	Start	End	Survey Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)
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										

APPENDIX III

Flight activity survey data

Primary Target Species

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

Date	Surveyor	Flight ID	Species	Num. Birds	M/F	Age	Obs. Time	Flight time (s)	Likely Rotor Swept Height (Y/N)
08/07/2020	JC	1	L	1	U	Ad	11:28	75	N
08/07/2020	JC	2	L	1	U	Ad	11:44	30	N

There were no primary target species recorded at VP2 of the proposed Cush Wind Farm site during the 2020 breeding season.

Secondary Target Species

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

Date	Survey Start	Survey End	Species	Count	5 Min Period	Likely Rotor Swept Height (Y/N)
06/05/2020	11:45	14:45	BZ	1	12:10-12:15	Y
06/05/2020	11:45	14:45	BZ	1	12:20-12:25	Y
06/05/2020	11:45	14:45	BZ	1	12:45-12:50	N
06/05/2020	11:45	14:45	BZ	1	13:20-13:25	N
06/05/2020	11:45	14:45	BZ	1	13:45-13:50	Y
07/05/2020	09:40	12:40	BZ	1	10:25-10:30	N
07/05/2020	09:40	12:40	RN	1	11:20-11:25	N
14/05/2020	09:20	12:20	BZ	2	10:10-10:15	N
14/05/2020	09:20	12:20	BZ	2	10:15-10:20	N
14/05/2020	09:20	12:20	BZ	2	10:30-10:35	N
14/05/2020	09:20	12:20	BZ	1	11:20-11:25	N
11/06/2020	13:20	16:20	BZ	1	14:15-14:20	N
11/06/2020	13:20	16:20	BZ	1	14:30-14:35	N
25/06/2020	14:00	17:00	RN	1	14:05-14:10	N
25/06/2020	14:00	17:00	LB	2	14:35-14:40	N
25/06/2020	14:00	17:00	BZ	1	16:40-16:45	Y
21/07/2020	08:55	11:55	RN	1	9:40-9:45	N
21/07/2020	08:55	11:55	BZ	1	11:35-11:40	N
17/08/2020	10:50	13:50	K	1	11:30-11:35	Y
07/09/2020	10:30	13:30	RN	1	13:15-13:20	Y
08/09/2020	11:55	14:55	BZ	1	12:25-12:30	Y
08/09/2020	11:55	14:55	BZ	1	12:50-12:55	N
08/09/2020	11:55	14:55	BZ	1	13:10-13:15	Y
08/09/2020	11:55	14:55	BZ	1	14:30-14:35	Y

Table AIII-1b: Secondary target species recorded during flight activity surveys undertaken at VP2

Date	Survey Start	Survey End	Species	Count	5 Min Period	Likely Rotor Swept Height (Y/N)
06/05/2020	15:15	18:15	BZ	1	16:50-16:55	N
06/05/2020	15:15	18:15	RN	1	16:55-17:00	N
07/05/2020	13:10	16:10	BZ	1	14:25-14:30	N
07/05/2020	13:10	16:10	BZ	1	14:55-15:00	N
07/05/2020	13:10	16:10	BZ	2	15:45-15:50	N
14/05/2020	13:50	16:50	K	1	14:10-14:15	Y
14/05/2020	13:50	16:50	BZ	1	14:25-12:30	N
14/05/2020	13:50	16:50	BZ	1	15:20-15:25	Y
14/05/2020	13:50	16:50	BZ	1	15:25-15:30	Y
14/05/2020	13:50	16:50	BZ	1	15:40-15:45	N
14/05/2020	13:50	16:50	BZ	1	16:05-16:10	N
14/05/2020	13:50	16:50	BZ	2	16:30-16:35	N
15/05/2020	09:30	12:30	J	1	09:45-9:50	N
15/05/2020	09:30	12:30	BZ	1	9:55-10:00	N
15/05/2020	09:30	12:30	J	1	10:05-10:10	N
15/05/2020	09:30	12:30	BZ	1	11:00-11:05	N
15/05/2020	09:30	12:30	RN	1	12:20-12:25	Y
11/06/2020	10:00	13:00	BZ	1	10:20-10:25	N
11/06/2020	10:00	13:00	RN	1	10:45-10:50	N
11/06/2020	10:00	13:00	BZ	1	11:15-11:20	N
11/06/2020	10:00	13:00	BZ	3	11:35-11:40	N
11/06/2020	10:00	13:00	BZ	1	12:05-12:10	N
21/07/2020	12:25	15:25	K	1	13:50-13:55	Y
21/07/2020	12:25	15:25	BZ	1	13:55-14:00	N
21/07/2020	12:25	15:25	BZ	3	14:30-14:35	N
21/07/2020	12:25	15:25	BZ	1	14:55-15:00	N
17/08/2020	14:20	17:20	BZ	2	15:05-15:10	N
18/08/2020	10:00	13:00	RN	2	10:15-10:20	Y
18/08/2020	10:00	13:00	RN	1	12:25-12:30	Y
07/09/2020	14:00	17:00	RN	1	14:10-14:15	Y
07/09/2020	14:00	17:00	RN	1	15:20-15:25	Y
08/09/2020	08:25	11:25	BZ	1	8:40-8:45	N
08/09/2020	08:25	11:25	K	1	10:25-10:30	N

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BIRD SURVEY REPORT WINTER SEASON 2020-2021

Cush Wind Farm

Development Location

Prepared for: Galetch Energy Developments

SLR Ref: 501.00494.00012
Version No:1
January 2022

SLR 

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APPENDICES

- Appendix 01: Figures
- Appendix 02: Survey dates times and observers
- Appendix 03: Weather data
- Appendix 04: Flight activity survey data

1.0 Introduction

SLR Consulting Ireland (SLR) was commissioned by Galetech Energy Developments to carry out a full suite of winter bird surveys for the proposed wind farm site at Cush, Co. Offaly during the winter season that spanned October 2020 to March 2021.

1.1 Site description and project background

The proposed wind farm development site is located in the townland of Cush approximately 4 km north of Birr, Co. Offaly. The habitats within the proposed development site include conifer plantations of varying age classes (c.327 ha), cutaway bog (c.102 ha) and agricultural grasslands (ca. 327 ha; refer to Appendix 1 Figure 1).

The proposed Cush Wind Farm site includes a linear area that was previously surveyed for a proposed overhead line¹. Flight activity surveys were carried out at two vantage point locations along the proposed overhead line route corridor during the breeding season 2018.

1.2 Scope of work

The scope of survey work was based on existing knowledge of the area and took into account current NatureScot (NS; formerly Scottish Natural Heritage, SNH) Guidance². The scope of survey work undertaken during the 2020/21 non-breeding season is provided in Table 1-1. Due to the proximity of designated sites that included Greenland white-fronted goose (*Anser albifrons flavirostris*) and whooper swan (*Cygnus cygnus*), feeding and distribution surveys were undertaken as recommended by NS guidelines.

Table 1-1
Scope of ornithological survey work, non-breeding season 2020/21

Survey Type	Summary Methodology (see Section 2 for further details)
Vantage Point (VP) surveys	Based on 6 hours of survey per month between October 2020 and March 2021 inclusive, from each of two VPs. Following modelling of areas of potential visibility, two VPs were considered to provide sufficient coverage of possible turbine locations under consideration at the time of survey (i.e. the area within the site boundary), plus appropriate buffer zones.
Feeding and distribution surveys	Feeding distribution surveys were carried out on a twice monthly basis to establish if swans and/or geese were using the fields for foraging within 500 m of the wind farm boundary.

¹ SLR (2018) *Cloghan Wind Farm and Long Oak Wind Farm Breeding Bird Survey Report 2018*. Prepared for Galetech Energy Services Ltd

² Scottish Natural Heritage (2017). *Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms V2*. Scottish Natural Heritage, Inverness.

1.3 Purpose of this report

This report outlines the surveys undertaken and methods used. It then summarises the survey data obtained and provides descriptions of the legal and conservation status of the species recorded.

The assessment of impacts resulting from the proposed development and the development of mitigation measures, if required, are beyond the scope of this report and will be covered in a separate Environmental Impact Assessment (EIA) Report in due course.

1.4 Target species

Primary target species

Primary target species were specifically limited to species upon which effects are most likely to be potentially significant in EIA and Appropriate Assessment (AA) terms, e.g., species forming qualifying features for nearby SPAs or species listed on Annex I of the Birds Directive³. The relevant SPAs are listed in Section 3.1 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.

Primary target species included the following:

- All Annex 1 raptor/owl species;
- Qualifying interest species for nearby SPAs:
 - Greenland white fronted goose;
 - Whooper swan;
 - Wigeon *Mareca penelope*;
 - Teal *Anas crecca*;
 - Pintail *Anas acuta*;
 - Shoveler *Anas clypeata*;
 - Golden plover *Pluvialis apricaria*;
 - Lapwing *Vanellus vanellus*;
 - Black tailed godwit *Limosa limosa*; and
 - Black headed gull *Chroicocephalus ridibundus*.

Secondary target species

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

Secondary target species included:

- Any other wildfowl, wader and gull species;

³ Annex 1 of The Birds Directive (Directive 2009/147/EC).

- Buzzard *Buteo buteo*;
- Sparrowhawk *Accipiter nisus*;
- Raven *Corvus corax*;
- Grey heron *Ardea cinerea*;
- Cormorant *Phalacrocorax carbo*;
- Kestrel *Falco tinnunculus*; and
- Snipe *Gallinago gallinago*.

Note that kestrel and snipe were recorded as secondary target species at the time of the surveys, but since have been red-listed under the Birds of Conservation Concern in Ireland (BoCCI) 4: 2020-2026⁴ scheme, as numbers within the Irish landscape have suffered a serious decline in recent years. As such, they have been included as primary target species for all subsequent and ongoing survey work.

⁴ Gilbert, G., Stanbury, A. and Lewis, L. (2021). Birds of Conservation Concern in Ireland 4: 2020–2026. Irish Birds 43: 1–22

2.0 Survey methodology

2.1 Desk-based review

The desk review collated any available information to date on the wintering bird movements around the proposed wind farm development site.

As previously mentioned in Section 1.2, flight activity surveys were undertaken previously from two vantage points overlooking an overhead power line route which was proposed to pass through the proposed Cush Wind Farm site. The following reports resulting from previous breeding bird surveys were reviewed for any relevant information that could be used to inform winter bird surveys:

- SLR (2018) Cloghan Wind Farm and Long Oak Wind Farm Breeding Bird Survey Report 2018. Prepared for Galetech Energy Services Ltd.
- SLR (2020) Cush Wind Farm Breeding Bird Survey Report 2020.

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 accessed for information on sites designated for nature conservation.

2.2 Survey dates and personnel

Surveys were undertaken by Jason Cahill (JC) BSc (Hons) and Aisling Kinsella (AK) BSc (Hons), MSc.

Details of survey dates and times are provided in Appendix 2 and a record of weather conditions during surveys is provided in Appendix 3.

2.3 Feeding distribution surveys

Whooper swan and Greenland white-fronted goose are features of interest of several Special Protection Areas (SPAs) within 15 km of the site boundary (refer to Table 3-1). A buffer of 500 m around the wind farm site was used for these surveys which were undertaken by driven transect twice per month, stopping on a regular basis to check all fields for goose and swan feeding activity. The transect route is shown in Appendix 1, survey dates in Appendix 2, weather conditions in Appendix 3 and survey results are shown in Appendix 4.

2.4 Flight activity surveys

VP locations and 2km viewing arcs are shown in Appendix 1 Figure 1 and VP viewsheds are shown in Figure 2.

A total of 72.5 hours of flight activity surveys were conducted from both VP locations during the 2020-21 non-breeding season (6 October 2020 to 12 March 2021 inclusive), as summarised in Table 2-1. The VP locations are shown in Appendix 1 along with their associated areas of visibility (the viewsheds) at 18 m above ground level, i.e. the lowest likely rotor swept height.

In order to avoid possible complications during any subsequent collision risk modelling, VP watches were timed such that surveys were not undertaken simultaneously from both VPs. This avoids double-counting birds and ensures that no disturbance is made to birds within viewsheds from presence of the observer.

VP watches aimed to quantify the flight activity of primary and secondary target species (as defined in Section 1.4) within the study area.

Table 2-1
Summary of VP surveys undertaken, non-breeding season 2020-2021

VP Number	Co-ordinates (ITM)	Hours of Survey Completed						
		Oct	Nov	Dec	Jan	Feb	Mar	Total
1	664276 E 644585 N	6	6	6	6	6	6.5	36.5
2	661361 N 646428 N	6	6	6	6	6	6	36

2.5 Survey limitations

With regard to viewshed coverage of the 500 m site infrastructure buffer, some gaps are apparent due to the steepness of the terrain; however these are relatively small and most lie within the buffer rather than within the site itself (refer to Appendix 1 Figure 1). Overall, it is considered that the vantage point data will be representative of the site as a whole and sufficient to inform a robust assessment of the proposed development.

Feeding distribution surveys were not undertaken in October. This represents an oversight. However, surveys were undertaken for five out of six winter months and a full suite of feeding distribution surveys is currently being undertaken for the winter of 2021/22. Therefore, it is considered feeding distribution data are sufficient to inform a robust assessment of the proposed development.

There were intermittent periods of poor visibility during some surveys (specifically 11 March 2021). However, these conditions were not persistent through the affected surveys and target species were still recorded. Therefore, these conditions are not considered to be significant limitations to the survey data obtained.

3.0 Results

3.1 Desk based results

The proposed wind farm site is not within or immediately adjacent to any SPA. However, there are a total of eight SPAs within a 20km⁵ radius of the proposed development site.

The five SPAs within 20km are shown in Table 3-1, which also shows the species of special conservation interest (SSCI) for each site. The majority of SSCIs for which these sites are designated are wintering species.

The two closest SPAs to the proposed development site are Dovegrove Callows SPA (Site Code: 004137) and All Saints Bog SPA (Site Code: 004103) at distances of 1.9km and 3.1km, respectively. Both of these sites are designated for the protection of Greenland white-fronted geese. River Little Brosna Callows SPA (Site Code: 004086) is located 4.1km to the west and is designated for a number of wildfowl species.

The Middle Shannon Callows SPA (Site Code: 004096), River Suck Callows SPA (Site Code: 004097), Lough Derg (Shannon) SPA (Site Code: 004058) and Mongan Bog SPA (Site Code: 00417) are designated for a number of wildfowl species.

Hen harrier *Circus cyaneus* is the sole SSCI of the Slieve Bloom Mountains SPA (Site Code: 004160). Hen harriers are likely to use the Slieve Bloom Mountain habitat more in the breeding season and travel more widely in winter. It was considered that the beginning and end of the season were times when hen harriers were more likely to be recorded. This species is also listed on Annex 1 and therefore is a primary target species.

Table 3-1

SPAs within 15km of the proposed Cush Wind Farm site and their qualifying interests (species present during the non-breeding season)

Site Name	Site Code	Distance/ Direction from Site Boundary	Species of Special Conservation Interest
Dovegrove Callows SPA	004137	1.9km south-west	<ul style="list-style-type: none"> Greenland white-fronted goose
All Saints Bog SPA	004103	3.1km west	<ul style="list-style-type: none"> Greenland white-fronted goose
River Little Brosna Callows SPA	004086	4.1km west	<ul style="list-style-type: none"> Whooper swan Wigeon Teal Pintail Shoveler Lapwing Golden plover Black-tailed godwit Black-headed gull Greenland white-fronted goose Wetland and waterbirds
Middle Shannon Callows	004096	7.2km north west	<ul style="list-style-type: none"> Whooper swan Wigeon

⁵ A 20km search radius was used as this represents the maximum core foraging distance used by Qualifying Interest species of SPAs in the UK and Ireland

Site Name	Site Code	Distance/ Direction from Site Boundary	Species of Special Conservation Interest
SPA			<ul style="list-style-type: none"> • Golden plover • Lapwing • Black-tailed godwit • Black-headed gull • Wetland and waterbirds
Slieve Bloom Mountains SPA	004160	12km east	<ul style="list-style-type: none"> • Hen harrier
River Suck Callows SPA	004097	17km northwest	<ul style="list-style-type: none"> • Whooper swan • Wigeon • Golden plover • Lapwing • Greenland white-fronted goose
Lough Derg (Shannon) SPA	004058	17.5km south west	<ul style="list-style-type: none"> • Cormorant • Tufted duck • Goldeneye • Common tern
Mongan Bog SPA	004017	19.2km north	<ul style="list-style-type: none"> • Greenland white-fronted goose

3.2 Field survey results

3.2.1 Feeding distribution surveys

The feeding distribution surveys did not record aggregations of swans or geese, only registering one mute swan (*Cygnus olor*) in December (17/12/20) to the south (Figure 6).

Peregrine falcon (*Falco peregrinus*), snipe and little egret (*Egretta garzetta*) were recorded as incidental species during the feeding distribution surveys but were not recorded during the flight activity surveys.

3.2.2 Flight activity surveys

Flight activity recorded from VP1 and VP2 combined by primary target species is summarised in Table 3-2. Primary target species flights from both VPs are shown in Appendix 1 Figures 3 to 5. Flight activity data are provided in more detail in Appendix 4 with full data retained in GIS and excel format for subsequent collision risk modelling, if required.

Table 3-2
Number of primary target species flights from VP1 and VP2 combined, October 2020 – March 2021

Species	Total number of flights							Total number of flights potentially at risk height*	Total number of birds recorded in flight
	October	November	December	January	February	March	Total		
Whooper swan	0	0	3	0	0	0	3	3	20
Lapwing	0	0	0	1	0	0	1	1	13
Hen harrier	0	0	0	0	0	2	2	2	1

*Precautionary risk height assumed to be between 15m-200m

3.2.3 Species accounts

A total of 6 flights by primary target species were recorded between October 2020 and March 2021. A summary description of flight activity by each species is presented below.

Whooper swan

Whooper swan flights were observed on three occasions in December from vantage point one, each flight comprised of a flock of between six and eight individuals. Two flights flew west to east and the third from east to west and the birds were in passage. The height was recorded as below 25m.

Lapwing

A single lapwing flight was observed in January from vantage point two, this comprised a flock of 13 individuals. The flight went from north to south at a height of between 50-100m for 30 seconds and 25-50m for 60 seconds.

Hen harrier

Two female hen harrier flights were recorded in March 2021 one each from either vantage point. In both instances the flight was classified as circling, occurred between 25-50m and was located above woodland to the north of the vantage point.

3.2.4 Secondary target species

Six secondary species were recorded, as follows (in order of frequency). A monthly breakdown is provided in Table 3-3.

- Buzzard: Recorded in every month, frequently two birds observed at any one time. Most frequently seen circling.
- Raven: Recorded in every month, frequently undertaking passage flights, often two birds observed flying together.
- Kestrel: Recorded singularly in most months, excluding October and February. Flight behaviours were predominately hunting with occasional passage flights.
- Grey heron: One observation of a single bird in February.

- Sparrowhawk: One observation of a single bird in January.
- Mallard: One observation of a single bird in February.

Table 3-3
Number of Secondary Target Species from VP1 and VP2 Combined, September 2020 – March 2021

Species	Number of 5-minute periods recorded by month							Maximum number of birds recorded in any one 50-minute period by month						
	October	November	December	January	February	March	Total	October	November	December	January	February	March	Max
Buzzard	5	5	2	10	19	22	63	2	2	1	2	2	3	3
Raven	3	6	5	2	6	2	24	2	2	2	2	2	1	2
Kestrel	0	1	1	4	0	3	9	0	1	1	1	0	1	1
Grey heron	0	0	0	0	1	0	1	0	0	0	0	1	0	1
Sparrowhawk	0	0	0	1	0	0	1	0	0	0	1	0	0	1
Mallard	0	0	0	0	1	0	1	0	0	0	0	1	0	1

4.0 Summary and conclusions

Flight activity surveys (VPs) and feeding distribution surveys for geese and swans, specifically Greenland white fronted geese and whooper swan, were carried out at the proposed Cush wind farm during the winter season. The winter season spanned from October 2020-March 2021 inclusive for the flight activity surveys and November 2020 to March 2021 for the foraging distribution surveys.

The following primary target species were recorded during the flight activity surveys:

- Whooper swan;
- Hen harrier; and
- Lapwing.

The most frequent flight activity was by whooper swan (3 flights recorded), with other primary target species activity even less. However, whooper swan flights did comprise of larger flocks (between six and eight individuals in each flight), as did lapwing (13 individuals in the one flight recorded).

Six secondary target species were recorded: buzzard, raven, kestrel, grey heron, sparrowhawk and mallard.

4.1 Legal and Conservation Status of Target Species Recorded

Table 4-1 summarises the legal and conservation status of the target species recorded during the flight activity surveys.

Table 4-1
Legal and conservation status of primary and secondary target species

Species	Legal and Conservation status on Ireland
Whooper swan	WA, Annex 1, BoCCI4 Amber
Lapwing	WA, BoCCI4 Red
Hen harrier	WA, Annex 1, BoCCI4 Amber
Peregrine falcon*	WA, Annex 1, BoCCI4 Green
Key	WA - the species is afforded general protection by the Wildlife Acts 2000 (as amended); Annex 1 – the species is listed in Annex 1 of the EC Birds Directive; and BoCCI4 status (green, amber or red) – indicates the current Birds of Conservation Concern in Ireland ⁴ status category. * only recorded in feeding distribution surveys.

Appendix 01
Figures



LEGEND

- Site Infrastructure
- Turbine Location
- Vantage Point
- Vantage Point Viewing Area

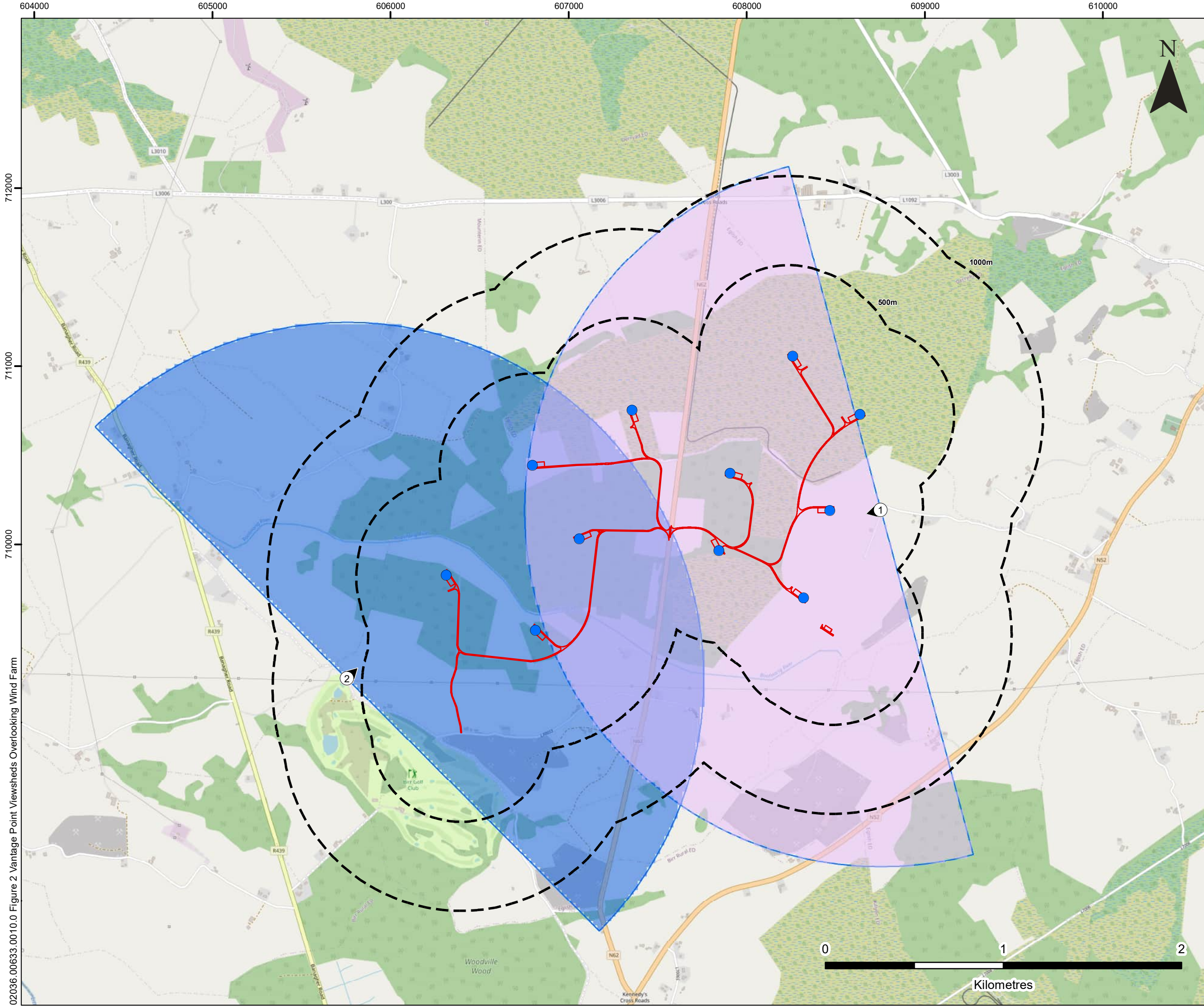


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CUSH WIND FARM
BIRD SURVEY REPORT
WINTER SEASON 2020/21
VANTAGE POINTS
AND VIEWING ARCS
FIGURE 1

Scale 1:20,000 @ A3 Date DECEMBER 2021

02036.00633.0009.0 Figure 1 Site Layout and Vantage Point Locations



LEGEND

- Site Infrastructure
- Site Infrastructure 1000m & 500m Buffer
- Turbine Location
- Vantage Point
- Vantage Point Viewing Area
- Theoretical Visibility from Wind Farm VP1
- Theoretical Visibility from Wind Farm VP2

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



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CUSH WIND FARM
BIRD SURVEY REPORT
WINTER SEASON 2020/21
VANTAGE POINT VIEWSHEDS
OVERLOOKING WIND FARM

FIGURE 2
 Scale 1:20,000 @ A3 Date DECEMBER 2021

02036.00633.0010.0 Figure 2 Vantage Point Viewsheds Overlooking Wind Farm



LEGEND

- Site Infrastructure
- Site Infrastructure 500m Buffer
- Turbine Location
- Vantage Point
- Flight Lines**
- Whooper Swan



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BIRD SURVEY REPORT
WINTER SEASON 2020/21
FLIGHT LINES: WHOOPER SWAN

FIGURE 3

Scale 1:15,000 @ A3 Date DECEMBER 2021

02036.00633.0011.0 Figure 3-5 Flightline



LEGEND

- Site Infrastructure
- Site Infrastructure 500m Buffer
- Turbine Location
- Vantage Point
- Flight Lines**
- Lapwing



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CUSH WIND FARM
BIRD SURVEY REPORT
WINTER SEASON 2020/21
FLIGHT LINES: LAPWING
FIGURE 4

Scale 1:15,000 @ A3 Date DECEMBER 2021

02036.00633.0011.0 Figure 3-5 Flightline



LEGEND

- Site Infrastructure
- Site Infrastructure 500m Buffer
- Turbine Location
- Vantage Point
- Flight Lines**
- Hen Harrier

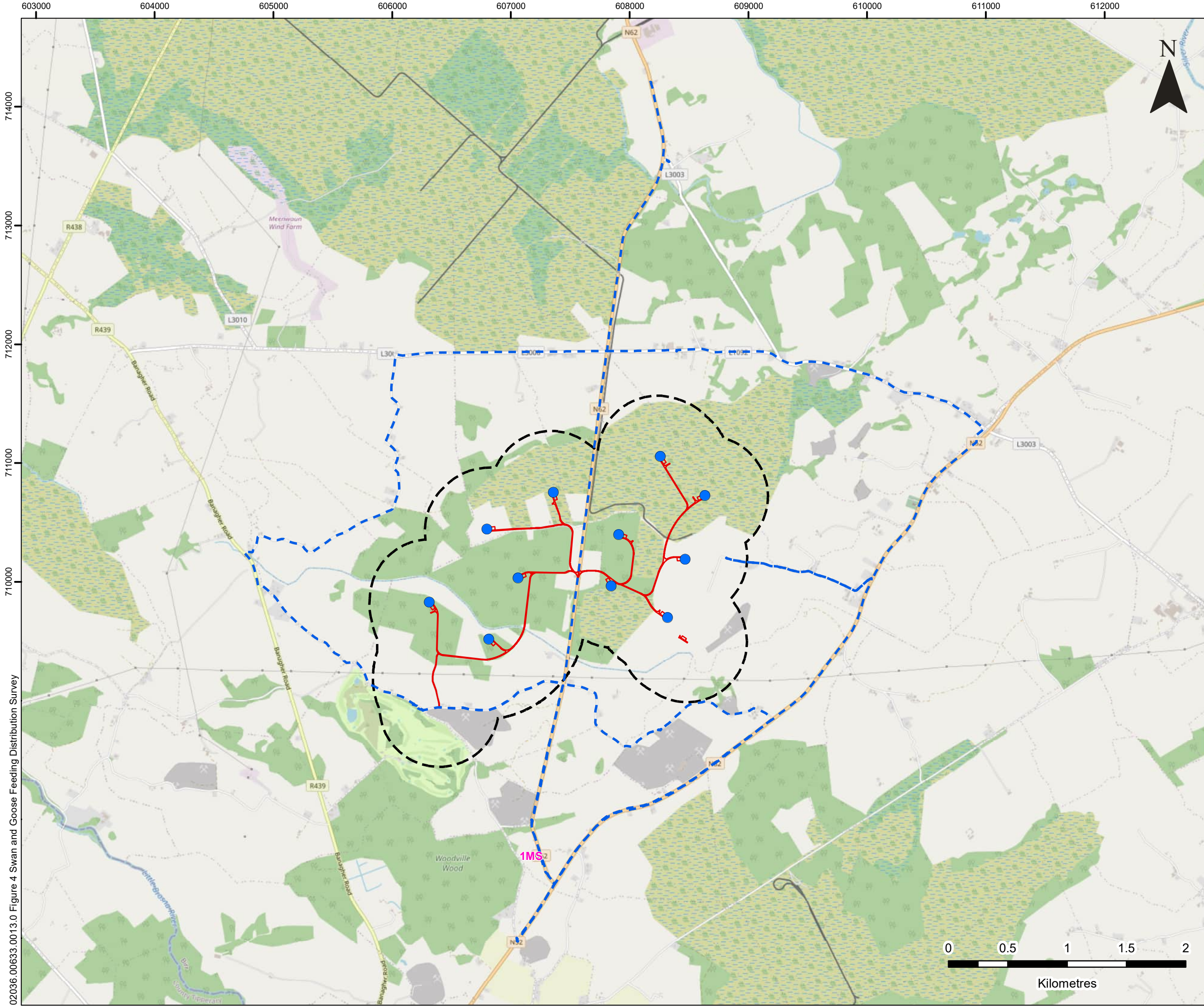


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BIRD SURVEY REPORT
WINTER SEASON 2020/21
FLIGHT LINES: HEN HARRIER

FIGURE 5
Scale 1:15,000 @ A3 Date DECEMBER 2021

02036.00633.0011.0 Figure 3-5 Flightline



LEGEND

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

**Swan and Goose Registrations
(Colour Denotes Survey Date)**

- 17/12/2020



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CUSH WIND FARM
BIRD SURVEY REPORT
WINTER SEASON 2020/21
SWAN AND GOOSE FEEDING
DISTRIBUTION SURVEY
- TRANSECT ROUTE AND
PEAK COUNTS

FIGURE 6

Scale 1:30,000 @ A3 Date DECEMBER 2021

02036.00633.0013.0 Figure 4 Swan and Goose Feeding Distribution Survey

Appendix 02

Survey dates times and observers

Table A2-1
Details of VP surveys undertaken from Vantage Point 1

Date	Surveyor	Start time	End time	No. Hours
06/10/2020	JC	10:00	13:00	03:00
08/10/2020	JC	13:00	16:00	03:00
05/11/2020	JC	13:00	16:00	03:00
25/11/2020	JC	09:40	12:40	03:00
08/12/2020	JC	09:25	12:25	03:00
09/12/2020	JC	12:45	15:45	03:00
20/01/2021	JC	10:20	13:20	03:00
22/01/2021	JC	11:10	14:10	03:00
09/02/2021	JC	10:20	13:20	03:00
11/02/2021	JC	11:30	14:30	03:00
11/03/2021	AK	13:30	16:30	03:00
12/03/2021	AK	09:30	13:00	03:30
Total hours				36.5

Table A2-2
Details of VP surveys undertaken from Vantage Point 2

Date	Surveyor	Start time	End time	No. Hours
06/10/2020	JC	13:30	16:30	03:00
08/10/2020	JC	09:30	12:30	03:00
05/11/2020	JC	09:30	12:30	03:00
25/11/2020	JC	13:15	16:15	03:00
08/12/2020	JC	12:55	15:55	03:00
09/12/2020	JC	09:15	12:15	03:00
20/01/2021	JC	13:50	16:50	03:00
21/01/2021	JC	09:30	12:30	03:00
09/02/2021	JC	13:55	16:55	03:00
10/02/2021	JC	09:00	12:00	03:00
10/03/2021	AK	13:00	16:00	03:00
11/03/2021	AK	09:45	12:45	03:00
Total hours				36

Table A2-3
Details of feeding distribution surveys

Date	Start time	Surveyor
04/11/2020	13:45	JC
13/11/2020	13:00	JC
10/12/2020	09:30	JC
17/12/2020	10:25	JC
06/01/2020	12:55	JC
21/01/2021	13:00	JC
05/02/2021	09:15	JC
11/02/2021	15:00	JC
05/03/2021	12:15	JC
12/03/2021	13:15	AK

Appendix 03
Weather data

Table A3-1
Weather data collected during flight activity surveys undertaken from VP 1

Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)	Notes
06/10/2020	10:00	13:00	1	3	W	0	8	2	2	0	0	11	
06/10/2020	10:00	13:00	2	3	SW	1	8	2	2	0	0	12	
06/10/2020	10:00	13:00	3	3	W	1	8	2	2	0	0	13	
08/10/2020	13:00	16:00	1	3	NW	0	3	2	2	0	0	12	
08/10/2020	13:00	16:00	2	3	NW	0	4	2	2	0	0	13	
08/10/2020	13:00	16:00	3	3	NW	0	4	2	2	0	0	13	
05/11/2020	13:00	16:00	1	1	SW	0	7	2	2	0	0	9	
05/11/2020	13:00	16:00	2	1	SW	0	8	2	2	0	0	12	
05/11/2020	13:00	16:00	3	1	SW	0	7	2	2	0	0	12	
25/11/2020	09:40	12:40	1	1	NW	0	2	2	2	0	1	2	
25/11/2020	09:40	12:40	2	2	NW	0	1	2	2	0	0	4	
25/11/2020	09:40	12:40	3	2	NW	0	2	2	2	0	0	5	
08/12/2020	09:25	12:25	1	3	SW	0	4	2	2	0	1	2	
08/12/2020	09:25	12:25	2	3	SW	0	3	2	2	0	0	4	
08/12/2020	09:25	12:25	3	4	W	0	6	2	2	0	0	5	
09/12/2020	12:45	15:45	1	4	SE	3	8	1	1	0	0	6	
09/12/2020	12:45	15:45	2	5	SE	3	8	1	1	0	0	6	
09/12/2020	12:45	15:45	3	5	SE	3	8	1	1	0	0	7	
20/01/2021	10:20	13:20	1	2	NW	1	8	2	2	0	0	3	
20/01/2021	10:20	13:20	2	2	NW	0	7	2	2	0	0	4	

Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)	Notes
20/01/2021	10:20	13:20	3	2	NW	0	7	2	2	0	0	4	
22/01/2021	11:10	14:10	1	2	N	0	3	2	2	0	0	3	
22/01/2021	11:10	14:10	2	3	N	0	2	2	2	0	0	3	
22/01/2021	11:10	14:10	3	3	N	0	2	2	2	0	0	4	
09/02/2021	10:20	13:20	1	4	E	2	8	1	1	1	0	2	Snow (no rain)
09/02/2021	10:20	13:20	2	4	E	2	8	1	1	1	0	2	Snow (no rain)
09/02/2021	10:20	13:20	3	3	E	0	6	2	2	0	0	3	
11/02/2021	11:30	14:30	1	5	E	0	7	2	2	0	0	2	
11/02/2021	11:30	14:30	2	5	E	0	8	2	2	0	0	2	Light snow at 13:00
11/02/2021	11:30	14:30	3	6	SE	2	8	1	1	0	0	2	Snow
11/03/2021	13:30	16:30	1	3	N	0	5	2	2	0	0	6	Heavy showers & increased wind 13:50
11/03/2021	13:30	16:30	2	4	NW	0	5	2	2	0	0	6	
11/03/2021	13:30	16:30	3	3	NW	0	3	2	2	0	0	6	
12/03/2021	09:30	13:00	1	3	E	0	7	2	2	0	0	6	
12/03/2021	09:30	13:00	2	3	E	0	5	2	2	0	0	6	
12/03/2021	09:30	13:00	3	3	E	0	7	2	1	0	0	6	Heavy shower 11:45-12:20
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 average height of viewshed			Good (>3km) 2			On higher ground 2			All day 2		
Heavy showers/snow 3		<150m 0											
Heavy rain/snow 4		150-500m 1											
		>500m 2											

Table A3-2
Weather data collected during flight activity surveys undertaken from VP 2

Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)	Notes
06/10/2020	13:30	16:30	1	3	W	1	8	2	2	0	0	13	
06/10/2020	13:30	16:30	2	3	W	0	5	2	2	0	0	14	
06/10/2020	13:30	16:30	3	4	NW	1	5	2	2	0	0	14	
08/10/2020	09:30	12:30	1	3	NW	0	8	2	2	0	0	9	
08/10/2020	09:30	12:30	2	3	NW	0	7	2	2	0	0	9	
08/10/2020	09:30	12:30	3	3	NW	0	5	2	2	0	0	9	
05/11/2020	09:30	12:30	1	1	SW	0	8	2	2	0	0	5	
05/11/2020	09:30	12:30	2	1	SW	0	6	2	2	0	0	7	
05/11/2020	09:30	12:30	3	1	SW	0	6	2	2	0	0	8	
25/11/2020	13:15	16:15	1	2	NW	0	2	2	2	0	0	7	
25/11/2020	13:15	16:15	2	2	N	1	4	2	2	0	0	8	
25/11/2020	13:15	16:15	3	2	N	0	4	2	2	0	0	9	
08/12/2020	12:55	15:55	1	4	W	0	3	2	2	0	0	6	
08/12/2020	12:55	15:55	2	4	NW	0	4	2	2	0	0	7	
08/12/2020	12:55	15:55	3	5	NW	0	4	2	2	0	0	6	
09/12/2020	09:15	12:15	1	3	S	0	8	2	2	0	0	3	
09/12/2020	09:15	12:15	2	3	S	2	8	2	2	0	0	5	
09/12/2020	09:15	12:15	3	2	S	2	8	1	1	0	0	6	
20/01/2021	13:50	16:50	1	2	NW	0	8	2	2	0	0	5	
20/01/2021	13:50	16:50	2	2	NW	0	8	2	2	0	0	5	
20/01/2021	13:50	16:50	3	2	NW	0	7	2	2	0	0	6	

Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Snow	Frost	Temp (°c)	Notes
21/01/2021	09:30	12:30	1	3	NE	0	3	2	2	0	0	3	
21/01/2021	09:30	12:30	2	3	NE	0	3	2	2	0	0	4	
21/01/2021	09:30	12:30	3	3	NE	0	4	2	2	0	0	4	
09/02/2021	13:55	16:55	1	4	E	0	5	2	2	0	0	3	
09/02/2021	13:55	16:55	2	5	NE	0	7	2	2	0	0	4	
09/02/2021	13:55	16:55	3	5	NE	0	5	2	2	0	0	4	
10/02/2021	09:00	12:00	1	2	NE	2	3	2	2	0	0	-2	Very light snow
10/02/2021	09:00	12:00	2	2	NE	0	3	2	2	0	0	-2	-1°C by 10:15
10/02/2021	09:00	12:00	3	2	NE	0	2	2	2	0	0	1	
10/03/2021	13:00	16:00	1	3	N	0	8	2	2	0	0	11	
10/03/2021	13:00	16:00	2	4	N	0	8	2	2	0	0	11	
10/03/2021	13:00	16:00	3	4	N	1	8	1	0	0	0	10	Heavy rain for 15 mins 15:15-15:30
11/03/2021	09:45	12:45	1	3	N	3	8	2	1	0	0	6	
11/03/2021	09:45	12:45	2	3	N	0	4	2	2	0	0	7	Heavy shower & poor visibility at 11:40
11/03/2021	09:45	12:45	3	2	N	1	6	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		
Drizzle 1		Cloud Height			Moderate (1-3km) 1			On site 1			Ground 1		
Light showers/snow 2		Height of cloud above average height of viewshed			Good (>3km) 2			On higher ground 2			All day 2		
Heavy showers/snow 3		<150m 0											
Heavy rain/snow 4		150-500m 1											
		>500m 2											

Table A3-3
Weather during feeding and distribution surveys

Date	Start	Precipitation	Wind	Wind direction	Cloud cover	Visibility	Temperature (C°)
04/11/2020	13:45	0	0	NW	3	2	11
13/11/2020	13:00	0	4		5	2	8
10/12/2020	09:30	0	2	SW	6	2	7
17/12/2020	10:25	0	2	SW	3	?	6
06/01/2020	12:55	0	1	SW	1	2	0
21/01/2021	13:00	0	2	NE	4	2	6
05/02/2021	09:15	0	2	W	6	2	4
11/02/2021	15:00	2	5	SE	8	1	4
05/03/2021	12:15	2	3	N	6	2	9
12/03/2021	13:15	?	?		?	?	?
Rain/ Precipitation None 0 Drizzle 1 Light showers/snow 2 Heavy showers/snow 3 Heavy rain/snow 4		Cloud Cover Expressed in oktas (n/8)		Visibility Poor (<1km) 0 Moderate (1-3km) 1 Good (>3km) 2			

Appendix 04
Flight activity survey data

Table A4-1
Flight activity survey data primary target species

Date	VP	Surveyor	Flight ID	Species	No.	Age (AD-adult U-unknown)	M/F/U M-Male F-female U-Unknown	StartTime (hr:min)	Flight duration (s)
08/12/2020	1	JC	1.CU011.1.1	WS	6	Ad	U	09:54	45
08/12/2020	1	JC	1.CU011.2.1	WS	8	Ad	U	10:02	45
08/12/2020	1	JC	1.CU011.3.1	WS	6	Ad	U	11:12	30
21/01/2021	2	JC	2.CU019.1.1	L.	13	U	U	11:55	90
11/03/2021	2	AK	2.CU033.1.1	HH	1	U	F	10:45	30
12/03/2021	1	AK	1.CU034.1.1	HH	1	U	F	11:31	30

Table A4- 3
Flight Activity secondary target species

Date	VP	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Location (on site, in buffer, or beyond)
06/10/2020	1	10:00	13:00	11:20	11:25	RN	1	Buffer
06/10/2020	1	10:00	13:00	12:20	12:35	BZ	2	Buffer
06/10/2020	1	10:00	13:00	12:45	12:50	BZ	2	Buffer
06/10/2020	2	13:30	16:10	13:40	13:45	BZ	1	Buffer
06/10/2020	2	13:30	16:10	14:40	14:45	BZ	2	Buffer
06/10/2020	2	13:30	16:10	14:50	14:55	BZ	2	Buffer
06/10/2020	2	13:30	16:10	16:10	16:15	RN	2	Buffer
06/10/2020	2	13:30	16:10	16:10	16:15	RN	2	Buffer
05/11/2020	2	09:30	12:30	09:50	09:55	BZ	2	Buffer
05/11/2020	2	09:30	12:30	11:10	11:15	RN	1	Buffer
05/11/2020	1	13:00	16:00	13:20	13:25	RN	1	Beyond
25/11/2020	2	09:40	12:40	09:40	09:45	K.	1	Beyond
25/11/2020	2	09:40	12:40	10:50	10:55	RN	1	Buffer
25/11/2020	2	09:40	12:40	11:05	11:10	RN	2	Buffer
25/11/2020	2	09:40	12:40	11:30	11:35	BZ	1	Buffer
25/11/2020	1	13:15	16:15	14:25	14:30	BZ	1	Buffer
25/11/2020	1	13:15	16:15	14:25	14:30	BZ	2	Buffer
25/11/2020	1	13:15	16:15	14:35	14:40	BZ	2	Buffer
25/11/2020	1	13:15	16:15	15:05	15:10	RN	1	Buffer
25/11/2020	1	13:15	16:15	15:20	15:25	RN	1	Buffer

Date	VP	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Location (on site, in buffer, or beyond)
08/12/2020	1	09:25	12:25	12:00	12:05	BZ	1	Buffer
08/12/2020	1	09:25	12:25	12:55	13:00	K.	1	Buffer
08/12/2020	2	12:55	15:55	13:00	13:05	RN	1	Buffer
08/12/2020	2	12:55	15:55	13:10	13:15	RN	1	Buffer
08/12/2020	2	12:55	15:55	14:55	15:00	RN	1	Buffer
09/12/2020	1	12:45	15:45	11:05	11:10	K.	1	Buffer
09/12/2020	1	12:45	15:45	14:40	14:45	RN	2	Buffer
09/12/2020	1	12:45	15:45	14:50	14:55	RN	2	Beyond
09/12/2020	1	12:45	15:45	15:05	15:10	BZ	1	Buffer
20/01/2021	1	10:20	13:20	10:20	10:25	RN	2	Buffer
20/01/2021	1	10:20	13:20	10:20	10:25	K.	1	Buffer
20/01/2021	1	10:20	13:20	10:35	10:40	RN	2	Beyond
20/01/2021	1	10:20	13:20	11:20	11:25	BZ	2	Buffer
20/01/2021	1	10:20	13:20	11:55	12:00	K.	1	Beyond
20/01/2021	1	10:20	13:20	12:30	12:35	BZ	1	Buffer
20/01/2021	1	10:20	13:20	12:35	12:40	BZ	2	Buffer
20/01/2021	1	10:20	13:20	13:05	13:10	BZ	2	Buffer
20/01/2021	2	13:50	16:50	14:30	14:35	BZ	1	Buffer
20/01/2021	2	13:50	16:50	15:10	15:15	SH	1	Buffer
20/01/2021	2	13:50	16:50	15:30	15:35	BZ	2	Buffer
20/01/2021	2	13:50	16:50	15:55	16:00	BZ	2	Buffer
20/01/2021	2	13:50	16:50	16:20	16:25	BZ	2	Buffer

Date	VP	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Location (on site, in buffer, or beyond)
21/01/2021	2	09:30	12:30	10:25	10:30	K.	1	Buffer
21/01/2021	2	09:30	12:30	10:35	10:40	K.	1	Buffer
21/01/2021	2	09:30	12:30	11:00	11:05	BZ	2	Buffer
21/01/2021	2	09:30	12:30	11:10	11:15	BZ	2	Buffer
09/02/2021	1	10:20	13:20	12:00	12:05	RN	2	Buffer, Beyond
09/02/2021	1	10:20	13:20	12:15	12:20	RN	1	Buffer
09/02/2021	1	10:20	13:20	12:20	12:25	BZ	1	Buffer
09/02/2021	1	10:20	13:20	13:15	13:20	RN	1	Buffer
09/02/2021	1	10:20	13:20	13:15	13:20	BZ	2	Buffer
09/02/2021	2	13:55	16:55	14:25	14:30	H.	1	Buffer
09/02/2021	2	13:55	16:55	14:55	15:00	RN	1	Buffer
09/02/2021	2	13:55	16:55	15:45	15:50	BZ	2	Buffer
09/02/2021	2	13:55	16:55	16:00	16:05	BZ	1	Buffer
10/02/2021	2	09:00	12:00	10:10	10:15	MA	1	Buffer, Beyond
10/02/2021	2	09:00	12:00	10:35	10:40	RN	1	Buffer
11/02/2021	1	11:30	14:30	11:25	11:30	BZ	1	Buffer
11/02/2021	1	11:30	14:30	11:25	11:30	BZ	2	Buffer
11/02/2021	1	11:30	14:30	11:30	11:35	BZ	2	Buffer
11/02/2021	1	11:30	14:30	12:05	12:10	RN	1	Buffer, Beyond
11/02/2021	1	11:30	14:30	12:25	12:30	BZ	1	Buffer
10/03/2021	2	13:00	16:00	13:20	13:25	BZ	1	Beyond
10/03/2021	2	13:00	16:00	13:35	13:40	BZ	1	Beyond

Date	VP	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Location (on site, in buffer, or beyond)
10/03/2021	2	13:00	16:00	14:30	14:35	BZ	1	Beyond
10/03/2021	2	13:00	16:00	14:35	14:40	K.	1	Buffer
10/03/2021	2	13:00	16:00	15:05	15:10	BZ	1	Buffer
10/03/2021	2	13:00	16:00	15:15	15:20	K.	1	Buffer
11/03/2021	1	13:30	16:30	13:40	13:45	BZ	1	On site, buffer
11/03/2021	1	13:30	16:30	13:45	13:50	BZ	2	On site
11/03/2021	1	13:30	16:30	14:00	14:05	BZ	2	On site
11/03/2021	1	13:30	16:30	14:10	14:15	BZ	1	Buffer
11/03/2021	1	13:30	16:30	15:00	15:05	BZ	1	Buffer
11/03/2021	1	13:30	16:30	15:10	15:15	BZ	1	Buffer
11/03/2021	1	13:30	16:30	15:30	15:35	BZ	2	On site, buffer
11/03/2021	1	13:30	16:30	15:40	15:45	BZ	3	Buffer
11/03/2021	1	13:30	16:30	15:45	15:50	BZ	3	Buffer
11/03/2021	1	13:30	16:30	16:10	16:15	BZ	2	Buffer
11/03/2021	2	09:45	12:45	10:30	10:35	BZ	1	Buffer, beyond
11/03/2021	2	09:45	12:45	10:40	10:45	BZ	1	Buffer
11/03/2021	2	09:45	12:45	11:00	11:05	RN	1	Beyond
11/03/2021	2	09:45	12:45	11:00	11:05	BZ	2	On site, buffer
11/03/2021	2	09:45	12:45	12:00	12:05	RN	1	Beyond
12/03/2021	1	09:30	13:00	10:20	10:25	K.	1	Beyond
12/03/2021	1	09:30	13:00	10:45	10:50	BZ	1	Beyond
12/03/2021	1	09:30	13:00	10:50	10:55	BZ	1	On site, buffer

Date	VP	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Location (on site, in buffer, or beyond)
12/03/2021	1	09:30	13:00	11:35	11:40	BZ	1	On site, buffer
12/03/2021	1	09:30	13:00	12:30	12:35	BZ	1	Buffer
12/03/2021	1	09:30	13:00	12:35	12:40	BZ	2	On site, buffer

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BIRD SURVEY REPORT

BREEDING 2021 AND NON-BREEDING 2021/22

Cush Wind Farm

Prepared for: Galetech Energy Developments

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- Appendix 01: Figures
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- Appendix 03: Weather data
- Appendix 04: Flight activity survey data

1.0 Introduction

Bird surveys have been previously undertaken at the proposed wind farm development site at Cush, Co. Offaly (hereafter ‘the Project Site’) by SLR Consulting Ireland (SLR) for the breeding 2020 and non-breeding 2020/21 seasons. The Project Site also includes a linear area that was previously surveyed for a proposed overhead line¹. Flight activity surveys were carried out at two vantage point locations along the proposed overhead line route corridor during the breeding season in 2018.

SLR was commissioned by Galetech Energy Developments to carry out a bird survey programme for the proposed wind farm at Cush, Co. Offaly (hereafter ‘the Project’) during the breeding season in 2021 and non-breeding season in 2021/22.

1.1 Background to the Commission

No previous planning permission has been sought on the application site for the development of wind farms by Galetech Energy Developments or any other party.

1.2 Site Description

The Project site located in the townland of Cush approximately 4 km north of Birr, Co. Offaly. The habitats within the proposed development site are dominated by conifer plantations of varying age classes (c.327 ha), cutaway bog (c.102 ha) and agricultural grasslands (ca. 327 ha; refer to Appendix 01 **Figure 1**).

1.3 Scope of work

The scope of survey work was based on existing knowledge of the area and took into account current NatureScot (NS; formerly Scottish Natural Heritage, SNH) Guidance², with details provided in **Table 1-1**. Due to the proximity of designated sites that support Greenland white-fronted goose (*Anser albifrons flavirostris*) and whooper swan (*Cygnus cygnus*), feeding distribution surveys were undertaken as recommended by NS guidelines. Hen harrier *Circus cyaneus* winter roost surveys were added to the scope of work following a few sightings of foraging harriers in the non-breeding season. Further details are provided in Sections 2.2 to 2.7

Table 1-1
Scope of Ornithological Survey Work April 2021 to March 2022

Survey Type	Summary Methodology (see Section 2 for further details)
Vantage Point (VP) surveys	Six hours of survey per month were carried out from each of the two VPs between April 2021 and March 2022 inclusive.
Breeding wader surveys	Three breeding wader surveys were carried out from May to June 2021 to search for lowland waders breeding within the Project Site.

¹ SLR (2018) *Cloghan Wind Farm and Long Oak Wind Farm Breeding Bird Survey Report 2018*. Prepared for Galetech Energy Services Ltd

² Scottish Natural Heritage (2017). *Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms V2*. Scottish Natural Heritage, Inverness.

Survey Type	Summary Methodology (see Section 2 for further details)
Breeding raptor surveys	Five breeding raptor surveys were carried out from May to July to search for any raptors breeding within 2 km of the Project Site.
Feeding distribution surveys	Feeding distribution surveys were carried out on a twice-monthly basis during the period October 2021 to March 2022 to search for swans and/or geese using the fields for foraging within 500 m of the Project Site.
Hen harrier winter roost surveys	Three monthly surveys were undertaken between January to March 2022 from a VP that provided coverage of possible roosting habitat within the NE of the Project Site.

1.4 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 NS guidance.

1.4.1 Primary Target Species

Primary target species was limited to species upon which effects are most likely to be potentially significant in EIA and Appropriate Assessment (AA) terms e.g., species forming qualifying features for nearby Special Protection Areas (SPAs) or species listed on Annex 1 of the Birds Directive³. 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.

Primary target species included the following bird species:

- All Annex 1 raptor/owl species;
- Qualifying interest species for nearby SPAs⁴; and
- Other raptors, waders or wildfowl red-listed on the latest Birds of Conservation Concern in Ireland (BoCCI)⁵ scheme.

1.4.2 Secondary Species

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

Secondary target species included:

- Any other wildfowl and wader species;

³ Annex 1 of the Birds Directive (Directive 2009/147/EC)

⁴ The relevant SPAs are listed in Section 3.1.

⁵ Gilbert, G., Stanbury, A. and Lewis, L. (2021). Birds of Conservation Concern in Ireland 2020–2026. Irish Birds 43: 1–22

- Common buzzard *Buteo buteo*;
- Eurasian sparrowhawk *Accipiter nisus*;
- Northern raven *Corvus corax*;
- Grey heron *Ardea cinerea*;
- Great cormorant *Phalacrocorax carbo*; and
- Gulls *Larus sp.*

1.5 Terminology

For this report, “flight line” refers to the line drawn to record avian movement during a VP survey. A single flight line may be used indicate the collective movement of a flock of birds. Each individual bird moving within the same flight line is referred to as “a flight”. Note that the “cumulative number of birds recorded in flight” reflects the occupancy of the study area by a particular species i.e. the total number of flights for all surveys in a given season added together. It does not equate to the total number of unique individuals and should not be used to infer abundance.

1.6 Purpose of this Report

This report outlines the surveys undertaken and methods used. It then summarises the survey data obtained and provides descriptions of the legal and conservation status of the species recorded.

The assessment of impacts resulting from the proposed development and the development of mitigation measures, if required, are beyond the scope of this report and will be covered in a separate Environmental Impact Assessment (EIA) Report in due course.

2.0 Methods

2.1 Desk-Based Review

The desk review collated any available information to date on the breeding and non-breeding bird populations and movements around the Project site.

The following reports resulting from previous breeding and non-breeding bird surveys were reviewed for any relevant information that could be used to inform the current bird surveys:

- SLR (2020) Cush Wind Farm Breeding Bird Survey Report 2020.
- SLR (2022) Cush Wind Farm Winter Bird Survey Report 2020-2021.
- SLR (2018) Cloghan Wind Farm and Long Oak Wind Farm Breeding Bird Survey Report 2018

The websites of the National Parks and Wildlife Service (NPWS)⁶, the UK and Ireland Bird Atlas 2007-2011⁷ and the National Biodiversity Data Centre (NBDC)⁸ were accessed for information on sites designated for nature conservation and notable bird species in the vicinity of the Project Site.

2.2 Field Survey Dates and Personnel

Surveys were undertaken by Jason Cahill (JC) BSc (Hons), Aisling Kinsella (AK) BSc (Hons) MSc and Faolan Linnane (FL) BSc (Hons) MSc.

Details of survey dates and times are provided in Appendix 02 and a record of weather conditions during surveys is provided in Appendix 03.

2.3 Flight Activity Surveys

VP locations, 2 km viewing arcs and viewsheds are shown in Appendix 01 **Figure 1**.

A total of 144 hours of flight activity surveys were conducted from both VP locations combined during the 2021 breeding season and 2021/2022 winter season, as summarised in **Table 2-1**.

In order to avoid possible complications during any subsequent collision risk modelling, VP watches were timed such that surveys were not undertaken simultaneously from both VPs. This avoids double-counting birds and ensures that no disturbance is made to birds within viewsheds from presence of the observer.

VP watches aimed to quantify the flight activity of primary and secondary target species (as defined in Section 1.4) 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 Project Site;
- The relative use by birds of different parts of the Project Site;

⁶ www.npws.ie Accessed 16/10/2022

⁷ <https://app.bto.org/mapstore/StoreServlet> Accessed 16/10/2022

⁸ <http://maps.biodiversityireland.ie/#/Map> Accessed 16/10/2022

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

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

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

In the absence of detailed information regarding turbine specifications at the time of commencing surveys, a precautionary approach was taken in relation to recording height bands. For the breeding season, height bands were determined based on turbine specifications allowing for the maximum rotor tip height of 150 m and the lowest rotor swept height of 50 m. Following the completion of breeding season, additional information was made available on the likely turbine dimensions. Height bands were updated allowing for the maximum rotor tip height of 200 m and a lowest rotor swept height of 28 m. The relation of the height bands to the latest turbine specification is shown below.

Flight heights were attributed to four distinct height bands for the breeding season as follows:

- 1 = <25 m (below the likely rotor swept area);
- 2 = 25 m to 50 m (potentially within the likely rotor swept area, at least in part);
- 3 = 50 m to 150 m (within the likely rotor swept area); and
- 4 = >150 m (potentially within the likely rotor swept area, at least in part).

Flight heights were therefore attributed to four distinct height bands for the non-breeding season as follows:

- 1 = < 20 m (below the likely rotor swept area);
- 2 = 20 m to 150 m (potentially within the likely rotor swept area, at least in part);
- 3 = 150 m to 200 m (within the likely rotor swept area); and
- 4 = > 200 m (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 and around the Project Site, in accordance with current NS guidance.

Table 2-1
Summary of VP Surveys Undertaken, Breeding Season 2021 and Non-Breeding Season 2021-22

VP Number	Co-ordinates (ITM)	Hours of Survey Completed													
		Breeding season 2021							Non-Breeding Season 2021/22						
		Apr	May	June	July	Aug	Sept ⁹	Total	Oct	Nov	Dec	Jan	Feb	Mar	Total
1	664276 E 644585 N	6	6	6	6	6	6	36	6	6	6	6	6	6	36
2	661361 N 646428 N	6	6	6	6	6	6	36	6	6	6	6	6	6	36

⁹ While it is unlikely birds were breeding in September, it has been included here as part of the survey effort for the breeding season.

2.4 Breeding Wader Surveys

Breeding wader surveys followed the methodology described in O'Brien and Smith (1992)¹⁰. The survey involved a walked transect which covered all habitat potentially suitable for breeding waders within the Project Site.

There are large plantations of mature conifer forestry in the central, western, and southern areas of the Project Site. These habitats are not suitable for breeding waders¹¹ and so were excluded from the survey. There are some areas of recolonising cutover bog which were as considered suitable habitats for breeding waders. As such, transects were undertaken where habitats which are more suited to breeding waders. These transects are located in the western, eastern and northern sections of the Project Site where semi-natural and wet grassland fields are present and also, passing near to areas of recolonising cutover bog.

The transect route was repeated three times across the 2021 breeding season on 13th May, 1st June and 17th June.

The location, movement and behaviour of all wader species were recorded onto field maps using standard BTO species codes. The following criteria was recorded for each species:

- Northern lapwing *Vanellus vanellus* – the total numbers of birds seen from the transect;
- Common snipe *Gallinago gallinago* – the number of drumming plus chipping birds heard or seen from the transect; and
- Other species – the number of pairs (where 'pairs' = (paired individuals/2), displaying birds, nests or broods and other single birds not in flocks).

For birds to be considered as “confirmed breeding”, one or more of the following criteria needed to be met:

- They were observed displaying or singing on more than one visit;
- Nests, eggs, or young were located;
- Adults repeatedly alarm called;
- Distraction displays were seen; and/ or
- Territorial disputes were observed.

Birds were considered to be probably or possibly (i.e. unconfirmed) breeding if:

- They were observed displaying or singing on one visit (i.e. possibly breeding) or more than one visit (i.e. probably breeding) (with the exception of obvious passage migrants in spring); or
- A pair of birds was observed in suitable habitat for nesting.

Other records were considered to be of non-breeding birds, failed breeders, birds loafing, feeding or on passage to other areas.

Please see Appendix 01 **Figure 3** for an outline of the walked transect and Appendices 02 and 03 for metadata relating to these surveys.

¹⁰ O'Brien, M. and Smith, K. W. (1992) Changes in the status of waders breeding on wet lowland grasslands in England and Wales between 1982 and 1989, *Bird Study*, 39:3, 165-176

¹¹ Apart from potentially for woodcock, which were not the target of surveys here.

2.5 Breeding Raptor Surveys

The survey methodology for breeding raptors used was a driven transect with regular stops, to carry out watches of suitable habitat from appropriate viewpoints to identify potential nesting territories in suitable breeding habitat¹². The locations of these viewpoints are presented in Appendix 01 **Figure 4** together with the outline of the driven survey route and the results of the surveys.

A driven survey was used due to limitations to access to third party land within the 2 km buffer zone and the availability of a good road network in the vicinity of the Project Site. Visibility from the survey route was sufficient to cover the vast majority of potentially suitable breeding habitat within the survey area.

Survey timings followed NS guidelines. This survey was repeated along the same routes on 13th April, 1st June, 16th June, 19th and 20th July. Details of survey dates, times and observers are provided in Appendix 02 and a record of weather conditions during surveys is provided in Appendix 03.

The location, movement and behaviour of all raptor species observed were recorded onto the field maps using standard BTO species codes.

2.6 Feeding Distribution Surveys

NS guidance recommends that for whooper swan, Greenland white-fronted goose and other geese species, feeding distribution surveys should be undertaken in areas of suitable habitat when the survey area lies within the core foraging distance of SPAs or other major roosts for these species, unless it can be established from existing data that the area is not utilised for feeding. As there are SPAs for swans and geese located close to the Project Site, feeding distribution surveys were undertaken.

A buffer of 500 m around the Project Site was used for these surveys, which were undertaken by driven transects twice per month, stopping on a regular basis to check all fields for goose and swan feeding activity. The transect route is shown in Appendix 01 **Figure 5**, survey dates in Appendix 02, weather conditions in Appendix 03 and survey results are shown in Appendix 04.

2.7 Hen Harrier Winter Roost Surveys

NS guidance states surveys should be carried out at potential communal hen harrier roost sites within 2 km of the Project Site. A handful of hen harrier sightings (foraging birds only) were made in the previous winter season (2020/21) and one more was made in October 2021. Consequently, monthly surveys were carried out from January 2021 to March 2022 to determine whether harriers were roosting in the survey area.

The only suitable habitat that could be used for roosting was in the northeast of the Project Site where cutover bog had recolonised into scrubber vegetation. An additional VP location was chosen to provide coverage of this area (refer to Appendix 01 **Figure 6**) and surveys were undertaken 40 minutes prior to sunset following the Irish hen harrier winter survey methodology¹³.

2.8 Survey Limitations

With regard to viewshed coverage of the 500 m Project Site infrastructure buffer, some gaps are apparent due to the terrain; however, these are relatively small and most lie within the buffer rather than within the Project

¹² Hardey, J., Crick, H.Q.P., Wernham, C., Riley, H., Etheridge, B., Thompson, D. (2013). Raptors: A field guide for surveys and monitoring (3rd Edition). The Stationery Office Edinburgh.

¹³ <http://ihhws.ie/>. Accessed 25/07/2022.

Site itself (refer to Appendix 01 **Figure 1**). Overall, it is considered that the vantage point data are representative of the Project Site as a whole and sufficient to inform a robust assessment of the Project.

There were intermittent periods of poor visibility during some surveys i.e. less than 1 km. This corresponded to 1 hour out of 72 (1.4%) in the breeding season and 5 hours out of 72 (6.9%) in the non-breeding season. However, these conditions were not persistent through the affected surveys and target species were still recorded. Therefore, these conditions are not considered to be significant limitations to the survey data obtained.

3.0 Results

3.1 Desk Based Results

The Project Site is not within or immediately adjacent to any SPA. However, there are a total of seven SPAs within a 20 km¹⁴ radius with details shown in **Table 3-1**.

The closest SPAs to the Project Site are Dovegrove Callows SPA (Site Code: 004137), River Little Brosna Callows SPA (Site Code: 004086) and All Saints Bog SPA (Site Code: 004103) at distances of 1.5 km, 3.1 km and 3.1 km, respectively. Dovegrove Callows SPA and All Saints Bog SPA are designated for the protection of Greenland white-fronted geese, whereas the River Little Brosna Callows SPA is designated for a number of gull, wader and wildfowl species.

Table 3-1

SPAs within 20km of the Project Site and their Qualifying Interests (Species Present During the Breeding and Non-Breeding Season)

Site Name	Site Code	Distance/Direction from Site Boundary	Species of Special Conservation Interest
Dovegrove Callows SPA	004137	1.5 km southwest	<ul style="list-style-type: none"> Greenland white-fronted goose
All Saints Bog SPA	004103	3.1 km west	<ul style="list-style-type: none"> Greenland white-fronted goose
River Little Brosna Callows SPA	004086	3.1 km west	<ul style="list-style-type: none"> Whooper swan Eurasian wigeon <i>Mareca penelope</i> Eurasian teal <i>Anas crecca</i> Northern pintail <i>Anas acuta</i> Northern shoveler <i>Anas clypeata</i> Northern lapwing European golden plover <i>Pluvialis apricaria</i> Black-tailed godwit <i>Limosa limosa</i> Black-headed gull <i>Chroicocephalus ridibundus</i> Greenland white-fronted goose
Middle Shannon Callows SPA	004096	6.6 km northwest	<ul style="list-style-type: none"> Whooper swan Eurasian wigeon Corncrake <i>Crex crex</i> European golden plover Northern lapwing Black-tailed godwit Black-headed gull
Slieve Bloom Mountains SPA	004160	11.7 km east	<ul style="list-style-type: none"> Hen harrier

¹⁴ A 20km search radius was used as this represents the maximum core foraging distance used by Qualifying Interest species of SPAs in the UK and Ireland

Site Name	Site Code	Distance/Direction from Site Boundary	Species of Special Conservation Interest
River Suck Callows SPA	004097	17.3 km northwest	<ul style="list-style-type: none"> Whooper swan Eurasian wigeon European golden plover Northern lapwing Greenland white-fronted goose
Lough Derg (Shannon) SPA	004058	17.5 km southwest	<ul style="list-style-type: none"> Great cormorant <i>Phalacrocorax carbo</i> Tufted duck <i>Aythya fuligula</i> Common goldeneye <i>Bucephala clangula</i> Common tern <i>Sterna hirundo</i>

3.2 Breeding Season Flight Activity Surveys

Flight activity recorded from VP1 and VP2 combined by primary target species is summarised in **Table 3-2**. Primary target species flights from both VPs are shown in Appendix 01 Figures 2.1 to 2.4. Flight activity data are provided in more detail in Appendix 04 with full data retained in GIS and excel format for subsequent collision risk modelling.

3.2.1 Primary Target Species

A total of 75 flights by five primary target species were recorded between April and September 2021.

Table 3-2
Number of Primary Target Species Flights from VP1 and VP2 Combined, April 2021 – September 2021

Species	Number of flight lines by month							Time at risk height* (s)	Cumulative number of birds recorded in flight
	April	May	June	July	August	September	Total		
Black-headed gull	15	0	21	6	0	0	42	4,185	81
European golden plover	1	0	0	0	0	0	1	120	5
Common kestrel <i>Falco tinnunculus</i>	2	0	0	2	1	2	7	420	7
Northern lapwing	11	0	7	4	1	1	24	1,080	37
Common snipe	0	0	1	0	0	0	1	0	1
Total	29	0	29	12	2	3	75	5,805	131

A summary description of flight activity by each species is presented below.

Black-Headed Gull

Black-headed gull flights were recorded in April, June and July 2022. The majority of flights consisted of single birds commuting low over improved agricultural grasslands and cutover bog, although there were a few of larger groups of birds (up to 14 flights per flight line).

European Golden Plover

A single European golden plover flight line was recorded in April 2022 only. This consisted of five birds and it is likely the species was transiting through the area.

Common Kestrel

Common kestrel was recorded in the months of April, July, August and September 2022. This consisted of a few flight lines of single birds hunting over the Project Site, mainly in the southwest.

Northern Lapwing

Northern lapwings were recorded in every month except May 2022. Most flight lines were recorded at VP1, which overlooks an area of recolonising cutover bog where lapwing have nested historically.

Common Snipe

A single snipe flight line was recorded in June 2022 only, with the solitary bird staying low (height band 1) and flying for 15 seconds over an agricultural field.

3.2.2 Secondary Target Species

Six secondary species were recorded, as follows (in order of frequency). A monthly breakdown is provided in

Table 3-3.

- Common buzzard: Recorded in every month, mostly of two birds observed at any one time. Most frequently seen circling.
- Northern raven: Recorded in every month except June 2021, frequently undertaking passage flights, occasionally in small groups.
- Common gull *Larus canus*: Recorded in every month except May and June 2021. Most frequently observed as single birds in the fields surrounding the Project Site.
- Grey heron: Recorded in every month except June 2021. Typically seen as a single bird commuting within the Project Site.
- Lesser black-backed gull *Larus fuscus*: Recorded in June-August 2021 in very low numbers. No observations were within the Project Site.
- Herring gull *Larus argentatus*: Recorded in May and August 2021, all as single birds transiting through the Project Site.
- Mallard *Anas platyrhynchos*: Two observations were made in April 2021, of a pair and a trio flying across the Project Site.
- Eurasian sparrowhawk: Single birds were recorded in August and September 2021 hunting within and adjacent to the Project site.
- Great black-backed gull *Larus maritimus*: A single observation was recorded in June 2021 of four birds transiting within the Project Site.

Table 3-3
Number of Secondary Target Species from VP1 and VP2 Combined, April 2021 – September 2021

Species	Number of 5-minute periods recorded by month							Peak count of birds recorded in any 5-minute period by month						
	April	May	June	July	August	September	Total	April	May	June	July	August	September	Max
Common buzzard	8	9	7	8	5	1	38	2	2	3	2	2	1	3
Northern raven	2	6	0	2	7	3	20	1	2	0	1	14	2	14
Common gull	1	0	0	6	1	3	11	1	0	0	2	1	26	26
Grey heron	2	1	0	1	2	1	7	1	1	0	2	2	1	2
Lesser black-backed gull	0	0	1	1	1	0	3	0	0	1	1	4	0	4
Herring gull	0	2	0	0	1	0	3	0	1	0	0	1	0	1
Mallard	2	0	0	0	0	0	2	3	0	0	0	0	0	3
Eurasian sparrowhawk	0	0	0	0	1	1	2	0	0	0	0	1	1	1
Great black-backed gull	0	0	1	0	0	0	1	0	0	4	0	0	0	4

3.3 Non-Breeding Season Flight Activity Surveys

Flight activity recorded from VP1 and VP2 combined by primary target species is summarised in **Table 3-4**. Primary target species flights from both VPs are shown in Appendix 01 Figures **2.1** to **2.4**. Flight activity data are provided in more detail in Appendix 04 with full data retained in GIS and excel format for subsequent collision risk modelling.

3.3.1 Primary Target Species

A total of 48 flights by 8 primary target species were recorded between October 2021 and March 2022.

Table 3-4
Number of Primary Target Species Flights from VP1 and VP2 Combined, October 2021 – March 2022

Species	Total number of flight lines by month							Time at risk height* (s)	Cumulative number of birds recorded in flight
	October	November	December	January	February	March	Total		
Black-headed gull	0	0	6	0	0	1	7	510	78
European golden plover	0	0	0	2	0	0	2	690	>2,042
Hen harrier	1	0	0	0	0	1	2	810	2
Common kestrel	3	2	0	11	3	3	22	2,640	22
Northern lapwing	1	0	0	0	0	0	1	480	27
Peregrine falcon <i>Falco peregrinus</i>	0	1	1	1	1	5	9	2,700	9
Common snipe	3	0	0	0	0	0	3	90	17
Whooper swan	0	0	0	1	0	1	2	270	16
Total	8	3	7	15	4	11	48	8,190	>2,213

*Precautionary risk height assumed to be between 28 m – 200 m

A summary description of flight activity by each species is presented below.

Black-Headed Gull

Black-headed gull flight lines were recorded in December 2021 and March 2022. The majority of flight lines consisted of small flocks of birds transiting over agricultural fields in the southwest of the Project Site.

European Golden Plover

Two European golden plover flight lines were recorded in January 2022 in the southwest of the Project Site. One comprised 42 flights and the other of >2,000 flights at an average height of 35 m. It is likely the species was transiting through the area, as they were never observed in the winter season again.

Hen Harrier

Two hen harrier flight lines were recorded – one in October 2021 and one in March 2022. Both were of single, ringtail birds. The March flight line was at heights of approximately 150 m and it is likely the bird was transiting through the area as opposed to using the habitats for hunting.

Common Kestrel

Common kestrels were recorded in all months except December 2021. All observations were of single birds and in most months, only a handful of flight lines were observed, with the exception of January 2022 where 11 flight lines were recorded. Kestrels were typically recorded flying at heights of 20 m, hunting over the Project Site.

Northern Lapwing

Northern lapwings were recorded in October 2021 only, consisting of a single flight line of 27 birds. This small flock flew into the northern part of the Project Site, circled and headed due north again.

Peregrine Falcon

Peregrines were recorded in all months except October 2021. All flight lines were of single birds and distributed across the entire Project Site at a variety of flight heights.

Common Snipe

Three flight lines of common snipe were recorded in October 2021 only. All flights were above agricultural fields in the east of the Project Site at heights of approximately 15 m.

Whooper Swan

Two flight lines of whooper swan were recorded, with one in January and the other in March 2022. Both were in the west of the Project Site and comprised of four and 12 flights, respectively, at average flight heights of 35 m.

3.3.2 Secondary Target Species

Six secondary species were recorded, as follows (in order of frequency). A monthly breakdown is provided in **Table 3-5**.

- Common buzzard: Recorded in every month, most frequently as two birds together. Most frequently seen circling.
- Northern raven: Recorded in every month, usually as a pair.
- Mallard: Recorded in October-December 2021 and March 2022 as pairs or in a small group.
- Great cormorant: Recorded in December 2021, and January and March 2021. Likely commuting to watercourses surrounding the Project Site.
- Eurasian sparrowhawk: Single birds were recorded in November and December 2021, hunting and commuting.
- Grey heron: Recorded in October 2021, and January-February 2022 as single birds commuting within and adjacent to the Project Site.
- Little egret *Egretta garzetta*: Recorded in December 2021 only, as single birds on the cutover bog within the Project Site.
- Common gull: Recorded in December 2021 only as a flock of eight birds transiting through the 500 m buffer and outside the Project Site.

Table 3-5
Number of Secondary Target Species from VP1 and VP2 Combined, October 2021 – March 2022

Species	Number of 5-minute periods recorded by month							Peak count of birds recorded in any 5-minute period by month						
	October	November	December	January	February	March	Total	October	November	December	January	February	March	Max
Common buzzard	12	2	3	6	10	17	50	2	2	2	1	3	5	5
Northern raven	2	2	9	6	4	2	25	2	1	2	2	2	2	2
Mallard	1	2	1	0	0	7	11	2	2	2	0	0	5	5
Great cormorant	0	0	3	3	0	5	11	0	0	2	1	0	1	2
Eurasian sparrowhawk	0	4	1	0	0	0	5	0	1	1	0	0	0	1
Grey heron	2	0	0	1	1	0	4	1	0	0	1	1	0	1
Little egret	0	0	4	0	0	0	4	0	0	1	0	0	0	1
Common gull	0	0	1	0	0	0	1	0	0	8	0	0	0	8

3.4 Breeding Wader Surveys

A total of two wader species were recorded during the breeding wader surveys.

Common Snipe

There were three snipe observations made near the northwest of the Project Site in May and June 2021; however, these were of individual birds flushed by surveyors and they were not observed 'drumming' or exhibiting any other kind of breeding behaviour.

Northern Lapwing

Three observations of lapwing were made during surveys in May 2021. One adult and two chicks were recorded in the east of the Project Site, with the other two observations consisting of a calling lapwing (heard not seen) and a flight line of an adult bird that had been foraging on an agricultural field outside the Project Site.

Incidental Records of Other Species

During the survey, the following incidental records were made of other (non-wader) species of conservation concern:

- Gulls: black-headed gulls and other gull species; and
- Raptors: common buzzard and common kestrel.

3.5 Breeding Raptor Surveys

A total of three species of raptor were recorded during the targeted breeding raptor surveys.

Common Buzzard

There were nine buzzard observations made between May-July 2021, but no confirmed evidence of breeding was recorded during these months.

It is likely that at least one pair held a territory to the west of the Project Site within the 2 km survey buffer, as an observation of two birds circling and calling together was made in June and another in July 2021 of two birds calling nearby.

All other observations were of birds either perched on trees/telegraph poles or circling.

Common Kestrel

Kestrel was observed hunting or perched on trees/telegraph poles during May-July 2021 on six occasions, but there was no evidence of breeding by this species within 2 km of the Project Site.

Peregrine Falcon

This species was recorded once in July 2021 hunting to the south of the Project Site, although the observation was sufficiently fleeting that the bird's sex was unconfirmed.

Incidental Records of Other Species

During the survey visits the following incidental records were made of other (non-raptor) species of conservation concern:

- Waders: grey heron and northern lapwing;
- Gulls: lesser black-backed gull; and
- Wildfowl: mallard.

3.6 Feeding Distribution Surveys

The feeding distribution surveys did not record any aggregations of swans or geese.

Incidental Records of Other Species

No other incidental records of other (non-swan/goose) species of conservation concern were made during surveys.

3.7 Hen Harrier Winter Roost Surveys

No evidence of hen harrier roosts (communal or solitary) was recorded during surveys.

Incidental Records of Other Species

During the survey visits the following incidental records were made of other (non-raptor) species of conservation concern:

- Waders: northern lapwing;
- Raptors: merlin *Falco columbarius*; and
- Wildfowl: mallard and great cormorant.

4.0 Summary and Conclusions

Flight activity surveys (VPs), breeding wader, breeding raptor, hen harrier winter roost and feeding distribution surveys for geese and swans, specifically Greenland white fronted geese and whooper swan, were carried out at the Project Site during the breeding 2021 and non-breeding 2021/22 seasons.

The following primary target species were recorded during the breeding season flight activity surveys:

- Black-headed gull;
- European golden plover;
- Common kestrel;
- Northern lapwing; and;
- Common snipe.

The following primary target species were recorded during the non-breeding flight activity surveys:

- Black-headed gull;
- European golden plover;
- Hen harrier;
- Common kestrel;
- Northern lapwing;
- Peregrine falcon;
- Common snipe; and
- Whooper swan.

The most frequent flight activity in both seasons was from black-headed gulls. However, the flight line with the largest number of individual flights was for European golden plover in January 2021 (>2,000 birds). This was likely a one-off observation of birds on passage, as no other large golden plover observations were recorded during surveys.

Eleven secondary target species were recorded across both seasons: common buzzard, northern raven, common gull, grey heron, lesser black-backed gull, herring gull, mallard, Eurasian sparrowhawk, great black-backed gull, great cormorant and little egret.

Breeding lapwing (one nest) were recorded in the east of the Project Site and common buzzards were suspected to breed (as evidenced by territories) in the west of the Project Site (at least one pair).

No aggregations of feeding swans or geese were recorded during dedicated feeding distribution surveys and no hen harrier roosts were detected during dedicated winter roost surveys.

Incidental records made of species of conservation concern during taxon-specific surveys included:

- Gulls: black-backed gull and lesser black-backed gull;
- Raptors: common buzzard, common kestrel and merlin;
- Waders: grey heron and northern lapwing; and
- Wildfowl: great cormorant and mallard.

4.1 Legal and Conservation Status of Target Species Recorded

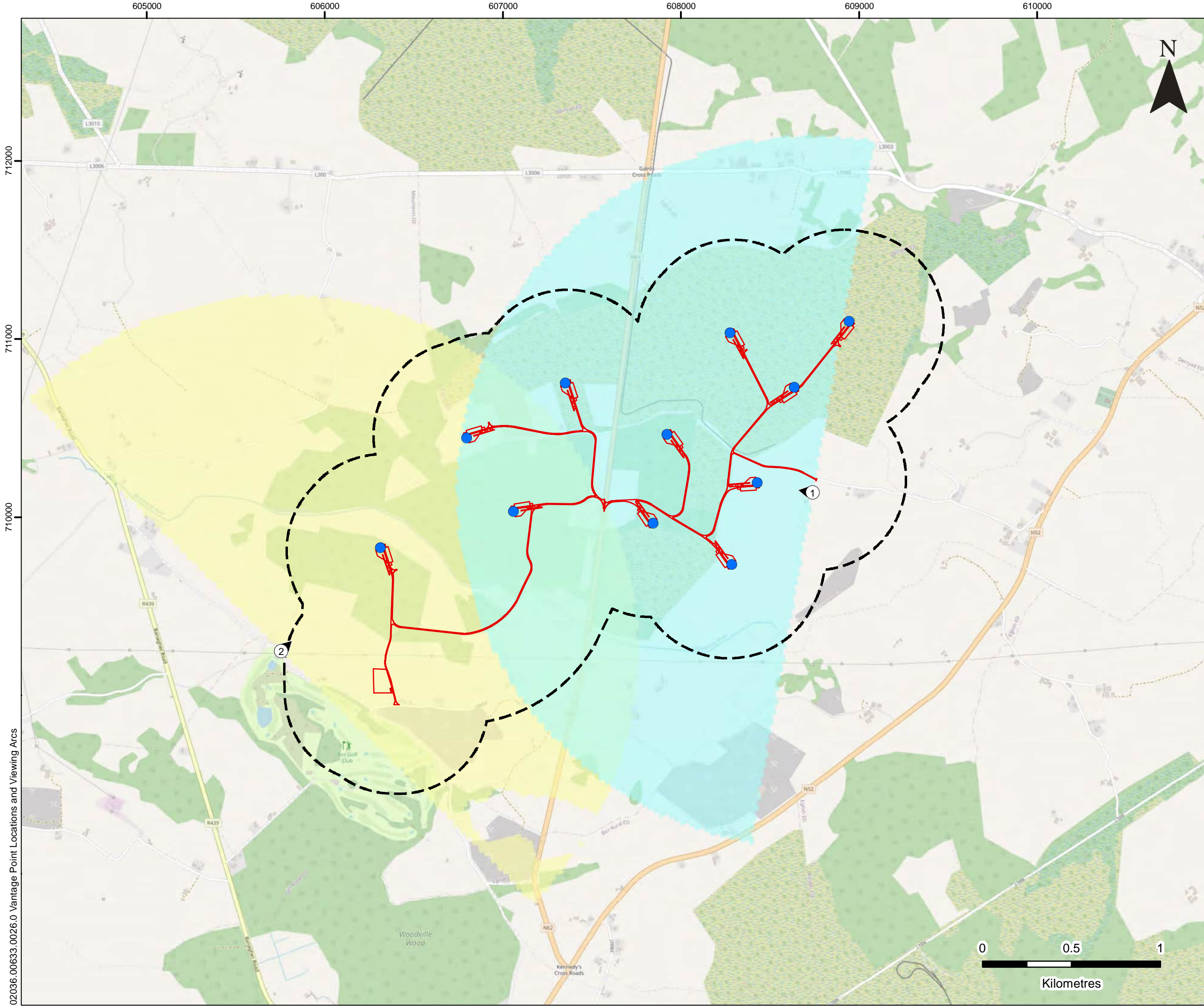
Table 4-1 summarises the legal and conservation status of the primary and secondary target species recorded during the range of ornithological surveys mentioned above. Note that all bird species in Ireland are afforded general protection by the Wildlife Acts 2000 (as amended).

Table 4-1
Legal and Conservation Status of Target Species

Primary or Secondary Target	Species (BTO code)	Legal and Conservation status in Ireland
Primary	European golden plover (GP)	Annex 1, BoCCI4 Red
	Northern lapwing (L.)	BoCCI4 Red
	Common snipe (SN)	BoCCI4 Red
	Common kestrel (K.)	BoCCI4 Red
	Hen harrier (HH)	Annex 1, BoCCI4 Amber
	Whooper swan (WS)	Annex 1, BoCCI4 Amber
	Peregrine falcon (PE)	Annex 1, BoCCI4 Green
	Black-headed gull (BH)	BoCCI4 Amber
	Merlin (ML)	Annex 1, BoCCI4 Amber
Secondary	Common buzzard (BZ)	BoCCI4 Green
	Northern raven (RN)	BoCCI4 Green
	Common gull (CM)	BoCCI4 Amber
	Grey heron (H.)	BoCCI4 Green
	Lesser black-backed gull (LB)	BoCCI4 Amber
	Herring gull (HG)	BoCCI4 Amber
	Mallard (MA)	BoCCI4 Amber
	Eurasian sparrowhawk (SH)	BoCCI4 Green
	Great black-backed gull (GB)	BoCCI4 Green

Primary or Secondary Target	Species (BTO code)	Legal and Conservation status in Ireland
	Great cormorant (CA)	BoCCI4 Amber
	Little egret (ET)	Annex 1, BoCCI4 Green
Key	WA - the species is afforded general protection by the Wildlife Acts 2000 (as amended); Annex 1 – the species is listed in Annex 1 of the EC Birds Directive; and BoCCI4 status (green, amber or red) – indicates the current Birds of Conservation Concern in Ireland ⁵ status category.	

Appendix 01
Figures



NOTES

1. The ZTV is calculated with a surface offset 20m & from a viewing height of 1.8m above ground level. The terrain model is derived from EU-DEM data with a vertical accuracy of $\pm 7m$. The ZTV was calculated using ArcMAP 10.5.1 software.

- LEGEND**
- Site Infrastructure
 - Site Infrastructure 500m Buffer
 - Turbine Location
 - Vantage Point
 - Area Visible from Vantage Point 1
 - Area Visible from Vantage Point 2



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**BIRD SURVEY REPORT
BREEDING SEASON 2021 &
NON-BREEDING SEASON 2021/22**

**VANTAGE POINT LOCATIONS
& VIEWING ARCS**

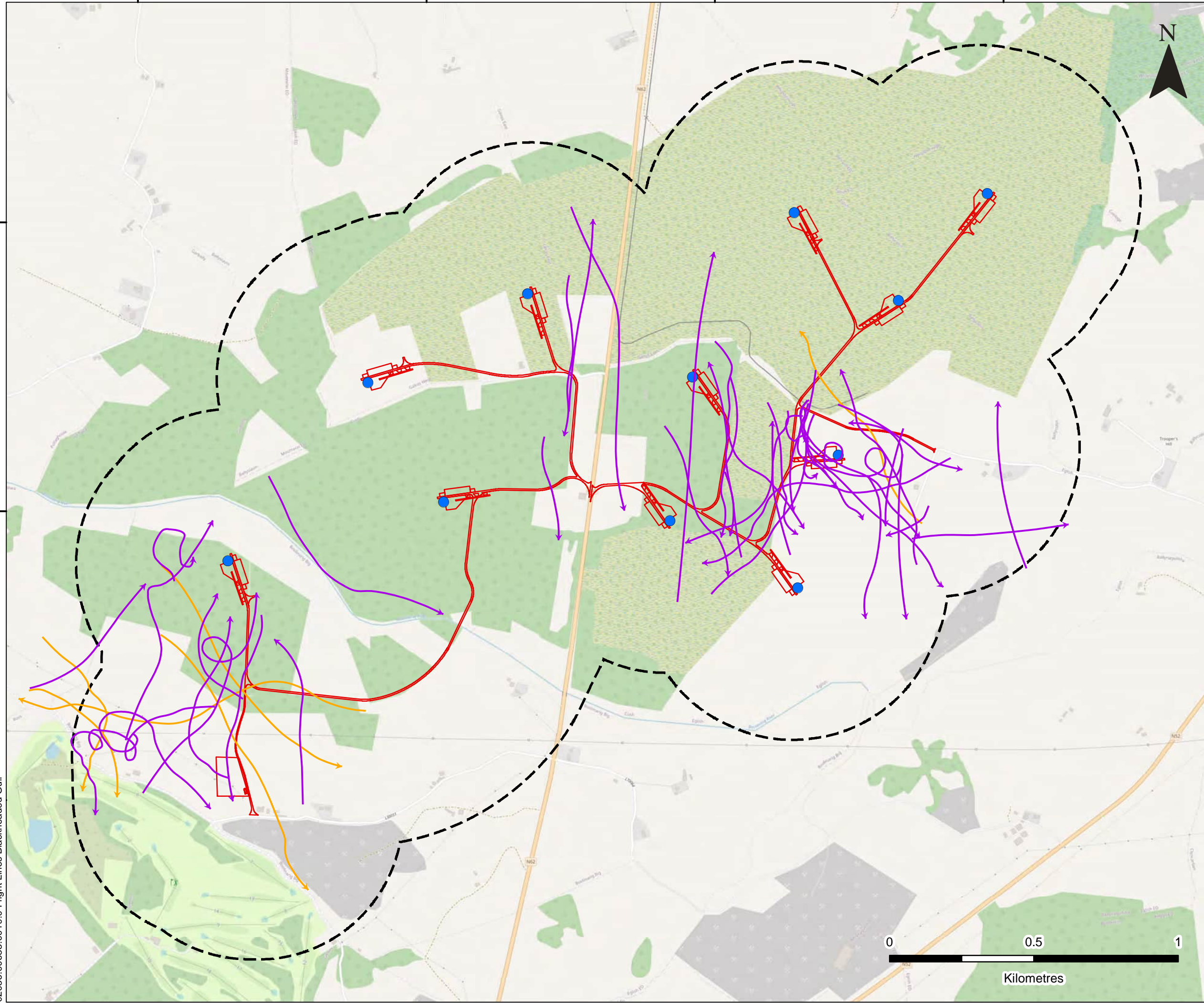
FIGURE 1

Scale 1:20,000 @ A3 Date JULY 2022

02036.00633.0026.0 Vantage Point Locations and Viewing Arcs

606000 607000 608000 609000

710000 711000



LEGEND

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

Flight Lines

- Black-headed Gull (Breeding Season 2021)
- Black-headed Gull (Non-Breeding Season 2021/22)



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**FLIGHT LINES
BLACK-HEADED GULL**

FIGURE 2.1

Scale 1:12,500 @ A3	Date JULY 2022
------------------------	-------------------

02036.00633.0019.0 Flight Lines Blackheaded Gull

606000

607000

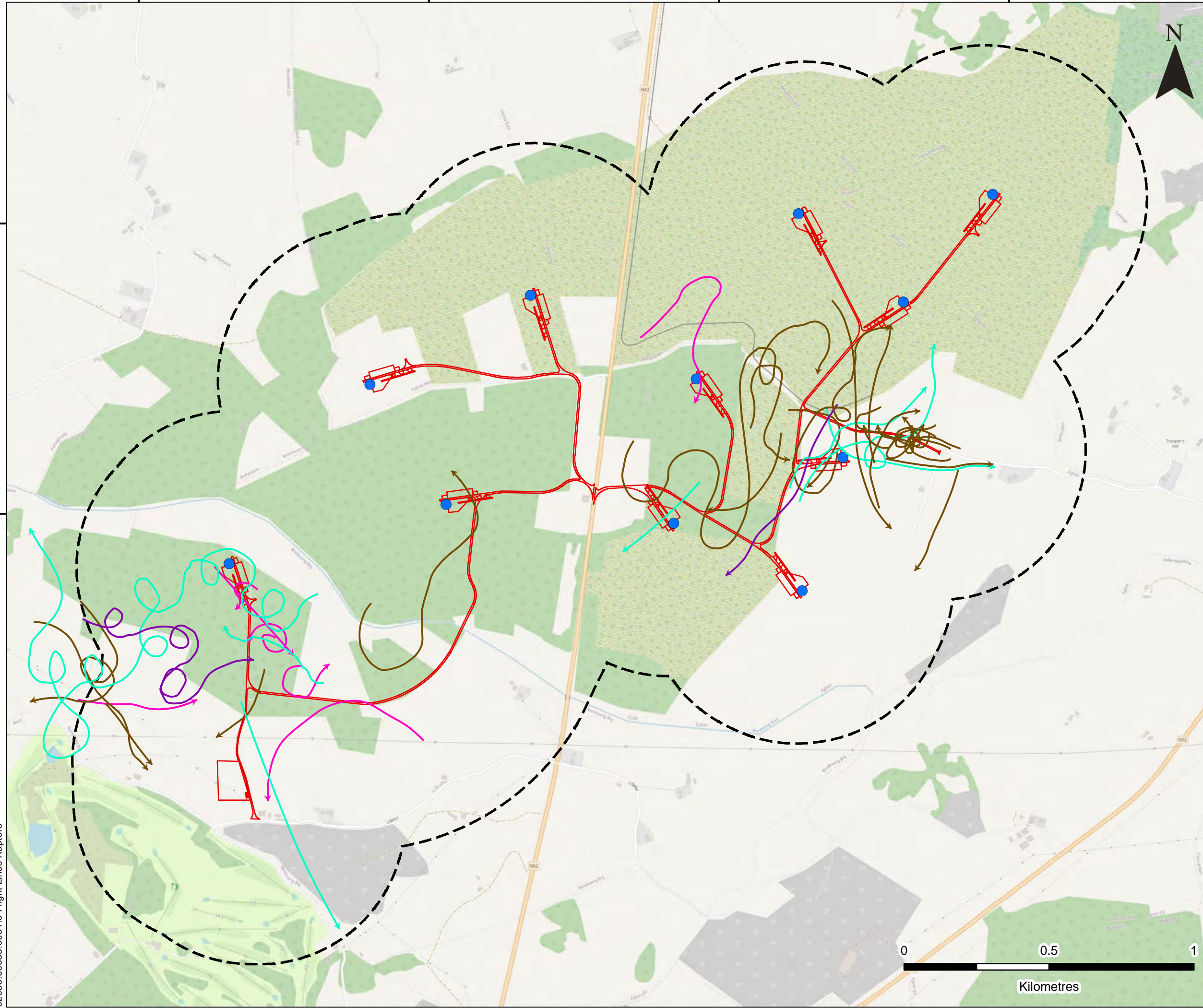
608000

609000

711000

710000

02036.00633.0031.0 Flight Lines Raptors



LEGEND

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

Flight Lines

- Kestrel (Breeding Season 2021)
- Hen Harrier (Non-Breeding Season 2021/22)
- Kestrel (Non-Breeding Season 2021/22)
- Peregrine (Non-Breeding Season 2021/22)



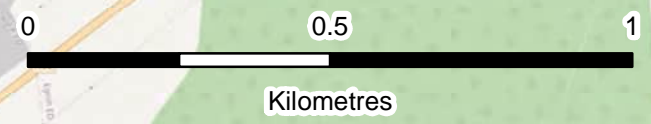
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**BIRD SURVEY REPORT
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**FLIGHT LINES
RAPTORS**

FIGURE 2.2



Scale 1:12,500 @ A3 Date JULY 2022



LEGEND

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

Flight Lines

- Golden Plover (Breeding Season 2021)
- Lapwing (Breeding Season 2021)
- Snipe (Breeding Season 2021)
- Golden Plover (Non-Breeding Season 2021/22)
- Lapwing (Non-Breeding Season 2021/22)
- Snipe (Non-Breeding Season 2021/22)



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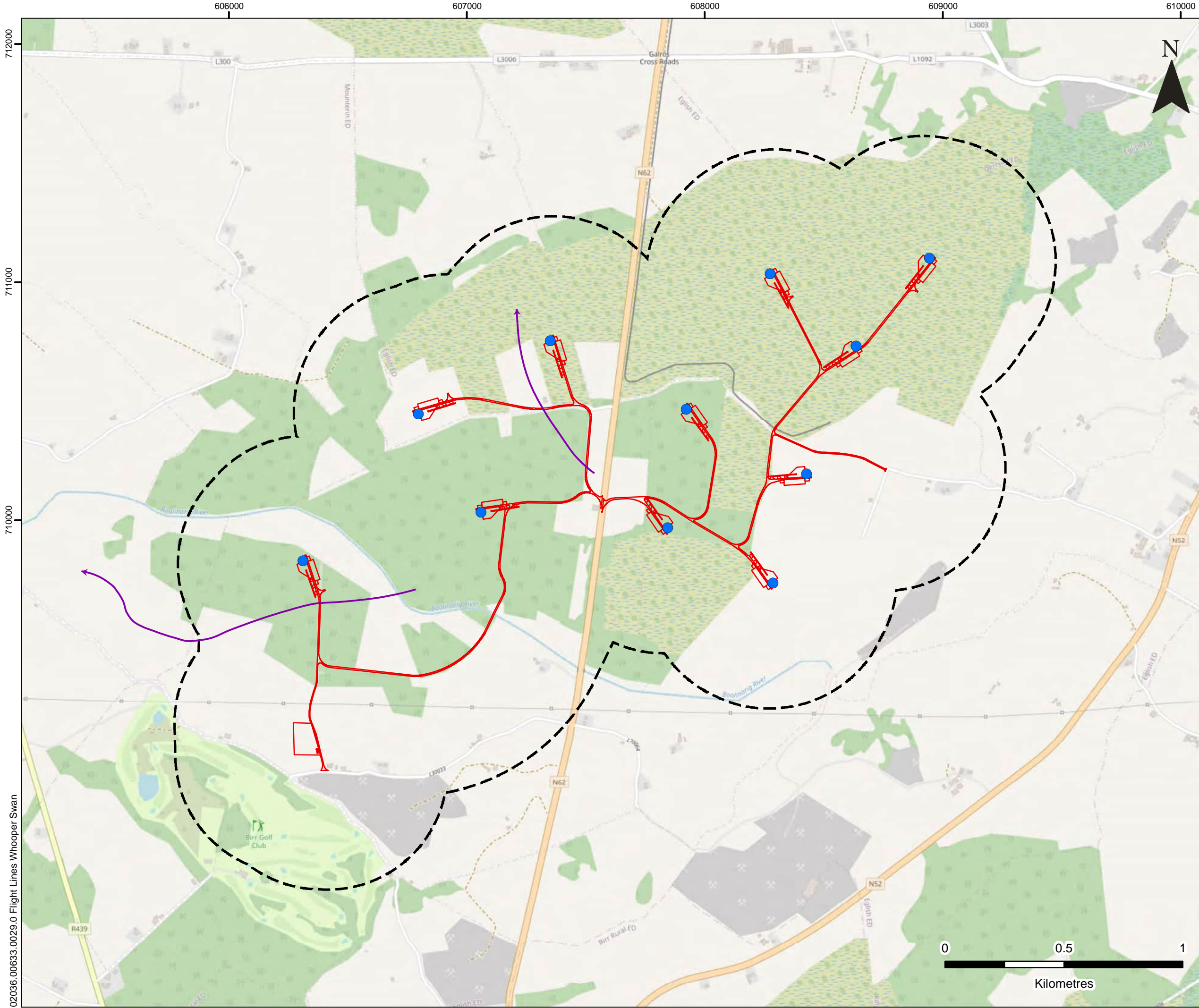
**BIRD SURVEY REPORT
BREEDING SEASON 2021 &
NON-BREEDING SEASON 2021/22**

**FLIGHT LINES
WADERS**

FIGURE 2.3

Scale 1:15,000 @ A3 Date JULY 2022

02036.00633.0020.0 Flight Lines Waders



LEGEND

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

Flight Lines

- Whooper Swan (Non-Breeding Season 2021/22)



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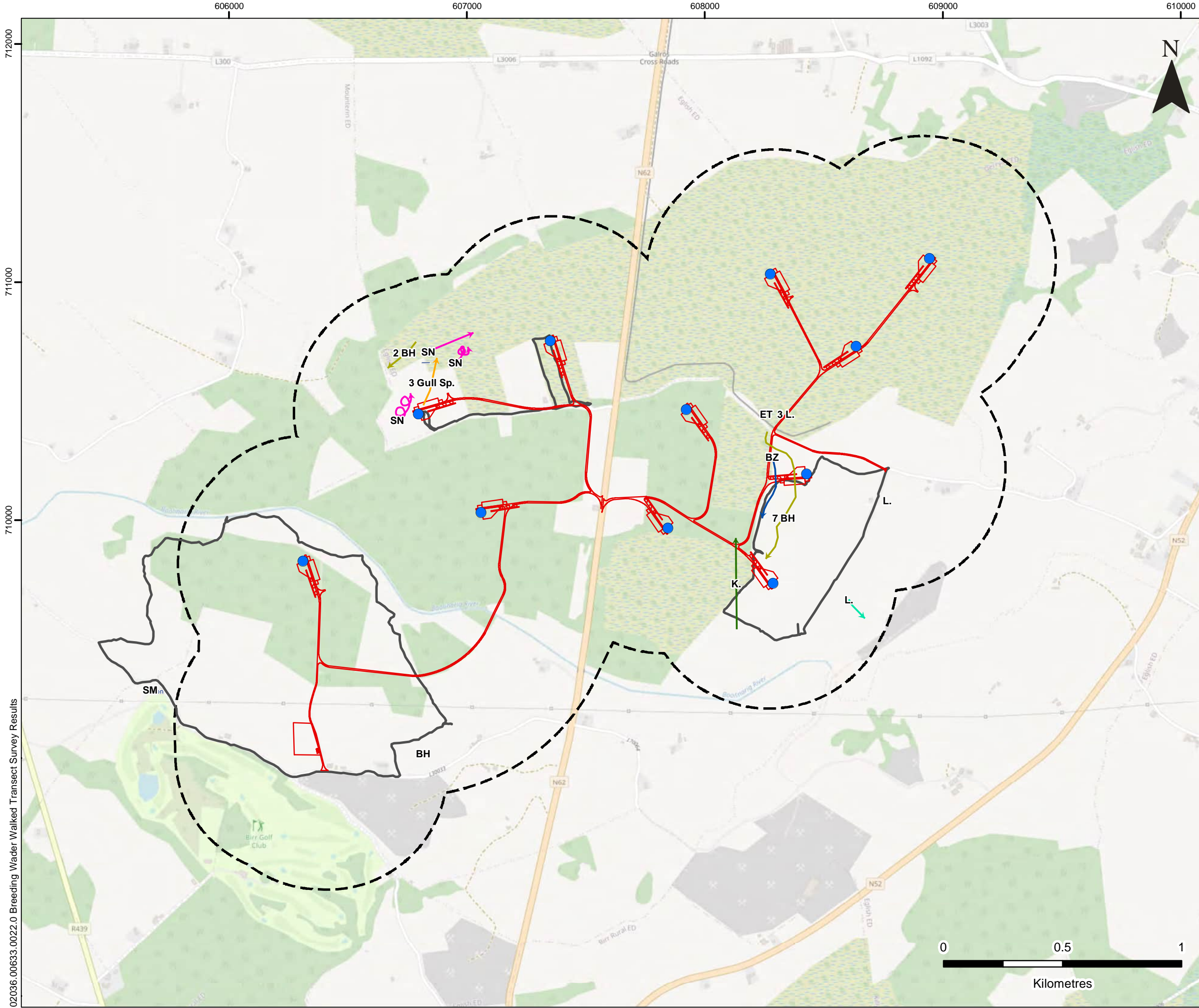
**FLIGHT LINES
WHOOPER SWAN**

FIGURE 2.4

Scale 1:15,000 @ A3	Date JULY 2022
---------------------	----------------



02036.00633.0029.0 Flight Lines Whooper Swan



LEGEND

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

BTO Species Activity

- Calling
- on Occupied Nest with Adult

Wader Records

- Lapwing (L.)
- Snipe (SN)

Incidental Records

- Black-headed Gull (BH)
- Buzzard (BZ)
- Gull Sp.
- Kestrel (K.)



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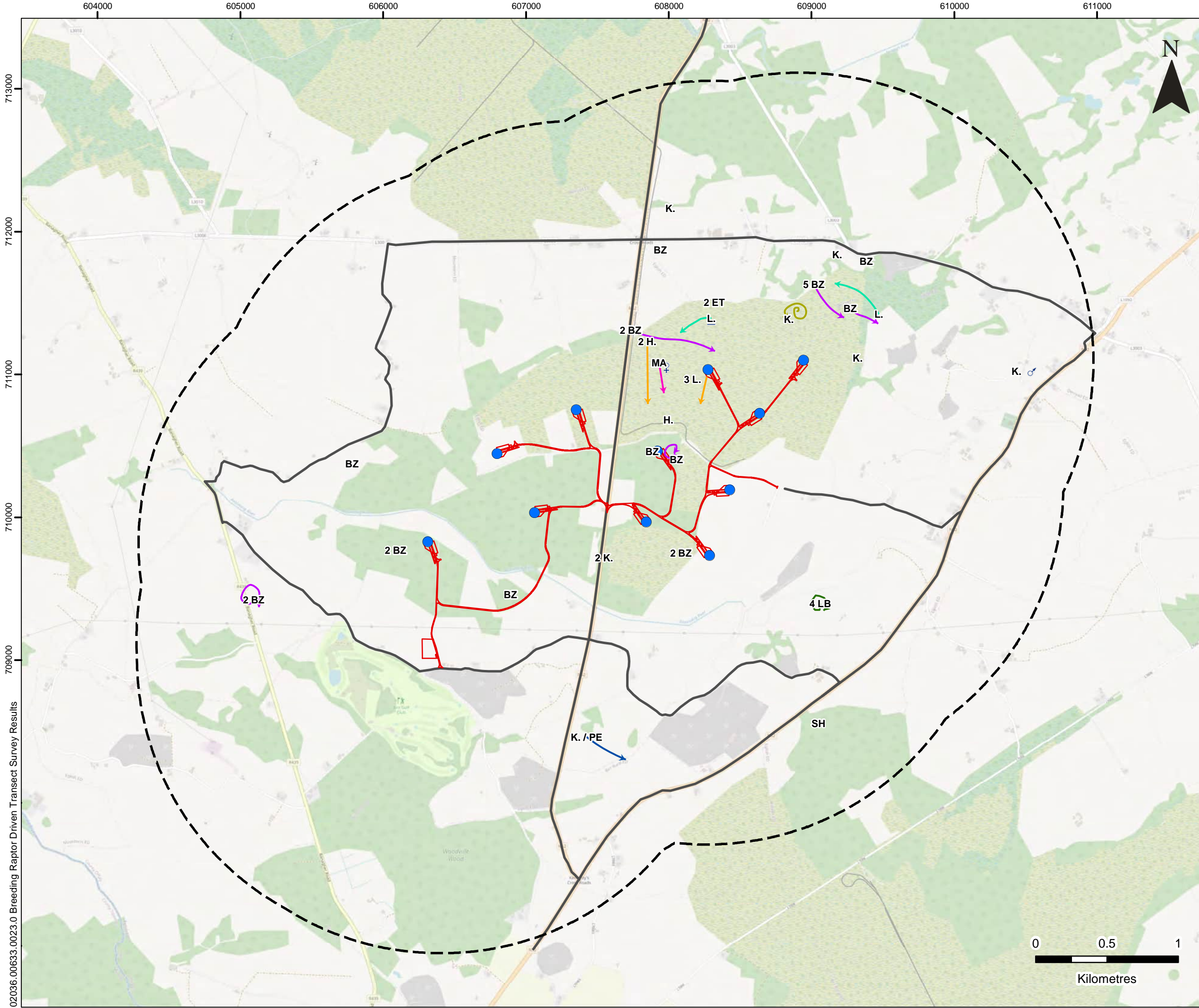
**BIRD SURVEY REPORT
BREEDING SEASON 2021 &
NON-BREEDING SEASON 2021/22**

**BREEDING WADER WALKED
TRANSECT SURVEY RESULTS**

FIGURE 3

Scale 1:15,000 @ A3 Date JULY 2022

02036.00633.0022.0 Breeding Wader Walked Transect Survey Results



LEGEND

- Site Infrastructure
- Site Infrastructure 2km Buffer
- Turbine Location
- Transect Route

BTO Species Activity

- ♂ Male
- ♀ Female
- Calling

Raptor Records

- Buzzard (BZ)
- Kestrel (K.)
- Peregrine (PE)

Incidental Records

- Grey Heron (H.)
- Lapwing (L.)
- Lesser Black-backed Gull (LB)
- Mallard (MA)



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**BIRD SURVEY REPORT
BREEDING SEASON 2021 &
NON-BREEDING SEASON 2021/22**

**BREEDING RAPTOR DRIVEN
TRANSECT SURVEY RESULTS**

FIGURE 4

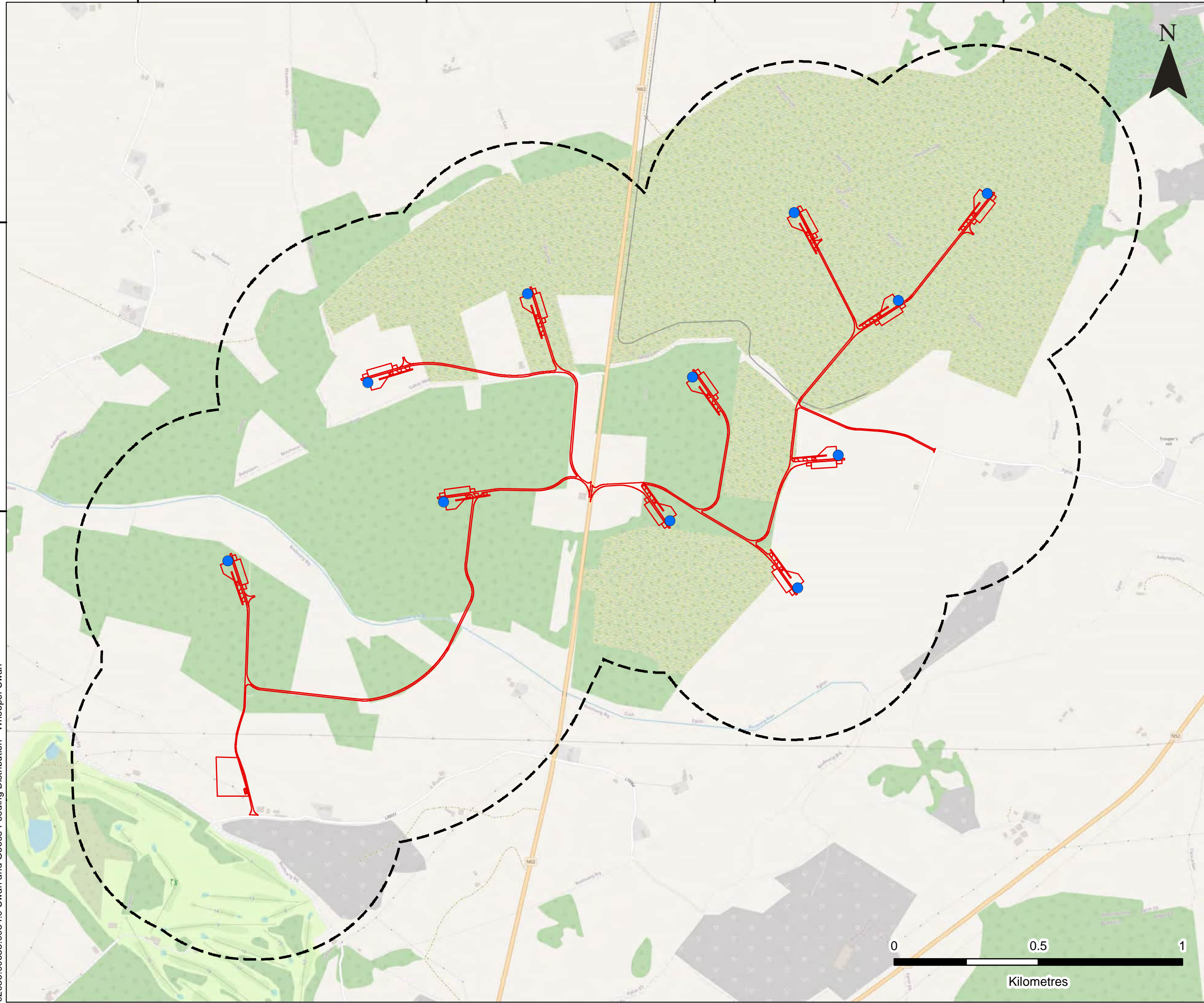
Scale 1:25,000 @ A3	Date JULY 2022
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02036.00633.0023.0 Breeding Raptor Driven Transect Survey Results

606000 607000 608000 609000

711000
710000

02036.00633.0034.0 Swan and Goose Feeding Distribution - Whooper Swan



LEGEND

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

***No Swans or Geese were Recorded.**



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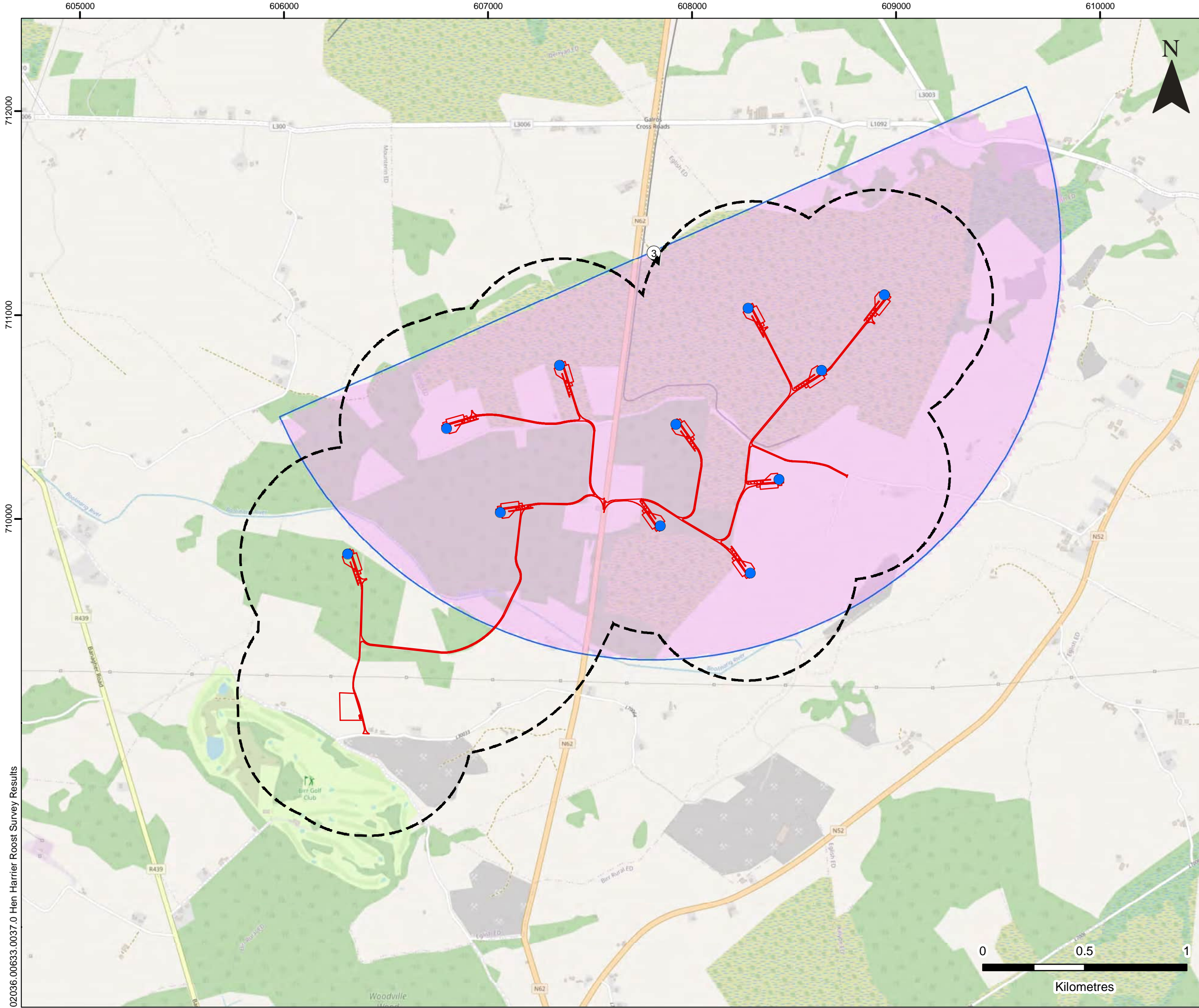
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**BIRD SURVEY REPORT
BREEDING SEASON 2021 &
NON-BREEDING SEASON 2021/22**

**SWAN & GOOSE FEEDING
DISTRIBUTION SURVEY RESULTS**

FIGURE 5

Scale 1:12,500 @ A3	Date JULY 2022
---------------------	----------------



LEGEND

- Site Infrastructure
- Site Infrastructure 500m Buffer
- Turbine Location
- Vantage Point
- Vantage Point Viewing Area
- Area Visible from Vantage Point 3

***No Hen Harriers were Recorded.**



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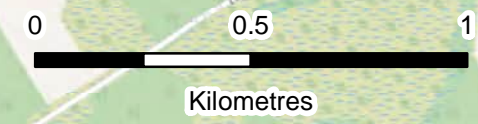
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**BIRD SURVEY REPORT
 BREEDING SEASON 2021 &
 NON-BREEDING SEASON 2021/22**

**HEN HARRIER ROOST
 SURVEY RESULTS**

FIGURE 6

Scale 1:17,500 @ A3	Date JULY 2022
---------------------	----------------



02036.00633.0037.0 Hen Harrier Roost Survey Results

Appendix 02

Survey dates times and observers

Table A2-1
Details of VP Surveys Undertaken from Vantage Point 1

Season	Date	Surveyor	Start time	End time	No. Hours	
Breeding 2021	29/04/2021	AK	16:30	19:30	03:00	
	30/04/2021	AK	06:50	09:50	03:00	
	11/05/2021	JC	11:00	14:00	03:00	
	12/05/2021	JC	16:10	19:10	03:00	
	15/06/2021	AK	12:05	15:05	03:00	
	16/06/2021	AK	07:00	10:00	03:00	
	19/07/2021	AK	19:00	21:30	02:30	
	20/07/2021	AK	10:30	14:00	03:30	
	18/08/2021	AK	06:35	09:35	03:00	
	16/08/2021	AK	17:35	20:35	03:00	
	14/09/2021	AK	16:45	19:45	03:00	
	15/09/2021	AK	10:35	13:35	03:00	
	Total hours					36
	Non-breeding 2021/22	13/10/2021	AK	15:40	18:40	03:00
14/10/2021		AK	08:00	11:00	03:00	
12/11/2021		AK	08:00	11:00	03:00	
26/11/2021		AK	07:50	10:50	03:00	
10/12/2021		AK	08:15	11:15	03:00	
16/12/2021		AK	09:30	12:30	03:00	
18/01/2022		AK	10:00	13:00	03:00	
19/01/2022		AK	12:30	15:30	03:00	
03/02/2022		AK	14:30	17:30	03:00	
04/02/2022		AK	07:45	10:45	03:00	
03/03/2022		AK	07:00	10:00	03:00	
16/03/2022		AK	13:30	16:30	03:00	
Total hours					36	

Table A2-2
Details of VP Surveys Undertaken from Vantage Point 2

Season	Date	Surveyor	Start time	End time	No. Hours
Breeding 2021	29/04/2021	AK	11:35	14:35	03:00
	30/04/2021	AK	10:45	13:45	03:00
	11/05/2021	JC	16:10	19:10	03:00
	12/05/2021	JC	08:05	11:05	03:00
	15/06/2021	AK	19:00	22:00	03:00
	17/06/2021	AK	13:50	16:50	03:00
	19/07/2021	AK	09:20	12:20	03:00
	20/07/2021	AK	06:40	09:40	03:00
	18/08/2021	AK	10:05	13:05	03:00
	17/08/2021	AK	11:10	14:10	03:00
	14/09/2021	AK	11:10	14:10	03:00
	15/09/2021	AK	07:05	10:05	03:00
	Total hours				
Non-breeding 2021/22	14/10/2021	AK	11:30	14:30	03:00
	29/10/2021	AK	08:35	11:35	03:00
	11/11/2021	AK	13:45	16:45	03:00
	12/11/2021	AK	11:30	14:30	03:00
	16/12/2021	AK	13:00	16:00	03:00
	17/12/2021	AK	08:30	11:30	03:00
	06/01/2022	AK	13:30	16:30	03:00
	19/01/2022	AK	09:00	12:00	03:00
	03/02/2022	AK	10:30	13:30	03:00
	16/02/2022	AK	11:15	14:15	03:00
	02/03/2022	AK	12:30	15:30	03:00
	03/03/2022	AK	10:30	13:30	03:00
	Total hours				

Table A2-3
Details of Breeding Wader Surveys

Date	Start time	Surveyor
13/05/2021	07:40	JC
01/06/2021	08:25	JC
17/06/2021	06:40	AK

Table A2-4
Details of Breeding Raptor Surveys

Date	Start time	Surveyor
13/05/2021	13:35	AK
01/06/2021	12:35	AK
16/06/2021	10:50	AK
19/07/2021	14:10	AK
20/07/2021	14:15	AK

Table A2-5
Details of Feeding Distribution Surveys

Date	Start time	Surveyor
13/10/2021	11:30	JC
11/11/2021	11:15	AK
26/11/2021	11:00	AK
10/12/2021	11:20	AK
17/12/2021	11:35	AK
06/01/2022	10:00	AK
18/01/2022	13:30	AK
04/02/2022	10:55	AK
16/02/2022	14:40	AK
02/03/2022	15:35	AK
16/03/2022	11:50	AK

Table A2-6
Details of Hen Harrier Winter Root Surveys

Date	Start time	Surveyor
18/01/2022	16:07	AK/FL
16/02/2022	16:45	AK/FL
02/03/2022	17:15	AK/FL

Appendix 03
Weather data

Table A3-1
Weather Data Collected During Flight Activity Surveys Undertaken from VP 1

Season	Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)	Notes
Breeding	29/04/2021	16:30	19:30	1	2	NE	1	7	2	2	0	0	10	
	29/04/2021	16:30	19:30	2	2	N	2	8	2	1	0	0	9	
	29/04/2021	16:30	19:30	3	3	N	1	7	2	2	0	0	8	Light shower majority of hour
	30/04/2021	06:50	09:50	1	0	n/a	0	3	2	2	0	1	3	
	30/04/2021	06:50	09:50	2	1	N	0	2	2	2	0	0	6	
	30/04/2021	06:50	09:50	3	1	N	0	1	2	2	0	0	8	
	11/05/2021	11:00	14:00	1	4	SE	0	3	2	2	0	0	12	
	11/05/2021	11:00	14:00	2	4	SE	0	4	2	2	0	0	13	
	11/05/2021	11:00	14:00	3	3	SE	0	4	2	2	0	0	14	
	12/05/2021	16:10	19:10	1	2	E	0	6	2	2	0	0	12	
	12/05/2021	16:10	19:10	2	2	E	0	5	2	2	0	0	12	
	12/05/2021	16:10	19:10	3	3	SE	0	4	2	2	0	0	11	
	15/06/2021	12:05	15:05	1	4	NE	0	7	2	2	0	0	16	

¹⁵ Key: None = 0; Drizzle = 1; Light showers/snow = 2; Heavy showers/snow = 3; Heavy rain/snow = 4.

¹⁶ Expressed in oktas (n/8)

¹⁷ Key: Height of cloud above average height of viewshed. <150m = 0; 150-500m = 1; >500m = 2.

¹⁸ Key: Poor (<1km) = 0; Moderate (1-3km) = 1; Good (>3km) = 2.

¹⁹ Key: Lying snow. None = 0; On site = 1; On higher ground = 2.

²⁰ Key: None = 0; Ground = 1; All day = 2.

Season	Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°C)	Notes
	15/06/2021	12:05	15:05	2	3	NE	0	7	2	2	0	0	16	
	15/06/2021	12:05	15:05	3	4	NE	0	7	2	2	0	0	20	
	16/06/2021	07:00	10:00	1	2	E	0	6	2	2	0	0	11	
	16/06/2021	07:00	10:00	2	2	E	0	6	2	2	0	0	12	
	16/06/2021	07:00	10:00	3	3	E	0	7	2	2	0	0	13	
	19/07/2021	19:00	21:30	1	1	NE	0	1	2	2	0	0	27	
	19/07/2021	19:00	21:30	2	0	n/a	0	2	2	2	0	0	27	
	19/07/2021	19:00	21:30	3	0	n/a	0	2	2	2	0	0	26	
	20/07/2021	10:30	14:00	1	1	S	0	0	n/a	2	0	0	24	
	20/07/2021	10:30	14:00	2	0	n/a	0	0	n/a	2	0	0	26	
	20/07/2021	10:30	14:00	3	1	SW	0	1	2	2	0	0	27	
	20/07/2021	10:30	14:00	4	1	SW	0	2	2	2	0	0	27	
	18/08/2021	06:35	09:35	1	33	NE	1	8	2	2	0	0	12	
	18/08/2021	06:35	09:35	2	2	NE	0	8	2	2	0	0	12	
	18/08/2021	06:35	09:35	3	2	NE	0	8	2	2	0	0	12	
	16/08/2021	17:35	20:35	1	3	NE	0	8	2	2	0	0	16	
	16/08/2021	17:35	20:35	2	3	NE	0	8	2	2	0	0	16	
	16/08/2021	17:35	20:35	3	3	NE	0	8	2	2	0	0	15	
	14/09/2021	16:45	19:45	1	1	S	3	8	1	1	0	0	18	
	14/09/2021	16:45	19:45	2	0	n/a	0	7	2	2	0	0	18	
	14/09/2021	16:45	19:45	3	0	n/a	0	6	2	2	0	0	18	
	15/09/2021	10:35	13:35	1	0	n/a	0	8	2	2	0	0	16	
	15/09/2021	10:35	13:35	2	1	SW	0	8	2	2	0	0	16	

Season	Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)	Notes
	15/09/2021	10:35	13:35	3	1	SW	0	7	2	2	0	0	16	
Non-breeding	13/10/2021	15:40	18:40	1	1	SW	0	8	2	2	0	0	13	
	13/10/2021	15:40	18:40	2	1	SW	0	8	2	2	0	0	13	
	13/10/2021	15:40	18:40	3	1	SW	0	8	1	2	0	0	13	
	14/10/2021	08:00	11:00	1	0	n/a	0	8	1	2	0	0	11	
	14/10/2021	08:00	11:00	2	0	n/a	0	8	1	2	0	0	11	
	14/10/2021	08:00	11:00	3	1	S	0	8	1	2	0	0	12	
	12/11/2021	08:00	11:00	1	4	SW	2	8	1	1	0	0	11	
	12/11/2021	08:00	11:00	2	4	SW	2	8	1	2	0	0	12	
	12/11/2021	08:00	11:00	3	4	SW	3	8	1	0	0	0	12	
	26/11/2021	07:50	10:50	1	4	NW	2	8	2	2	0	0	7	
	26/11/2021	07:50	10:50	2	4	NW	2	6	2	2	0	0	8	Gusting up to BF7
	26/11/2021	07:50	10:50	3	4	NW	0	3	2	2	0	0	7	Gusting up to BF8
	10/12/2021	08:15	11:15	1	2	W	0	2	2	2	0	0	2	
	10/12/2021	08:15	11:15	2	3	W	0	4	2	2	0	0	3	
	10/12/2021	08:15	11:15	3	2	W	0	3	2	2	0	0	3	
	16/12/2021	09:30	12:30	1	2	S	0	8	2	2	0	0	9	
	16/12/2021	09:30	12:30	2	2	S	0	8	2	2	0	0	9	
	16/12/2021	09:30	12:30	3	2	S	0	8	2	2	0	0	9	
	18/01/2022	10:00	13:00	1	3	S	1	6	2	2	0	0	8	
	18/01/2022	10:00	13:00	2	3	S	2	8	2	2	0	0	8	
18/01/2022	10:00	13:00	3	3	S	1	8	2	2	0	0	8		
19/01/2022	12:30	15:30	1	2	NW	0	2	2	2	0	0	7		

Season	Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)	Notes
	19/01/2022	12:30	15:30	2	3	NW	1	6	2	2	0	0	7	
	19/01/2022	12:30	15:30	3	3	NW	1	6	2	2	0	0	7	
	03/02/2022	14:30	17:30	1	4	SW	0	7	2	2	0	0	1	
	03/02/2022	14:30	17:30	2	4	SW	2	8	2	2	0	0	1	Gusts up to BF6
	03/02/2022	14:30	17:30	3	4	SW	2	8	2	2	0	0	9	Gusts up to BF7
	04/02/2022	07:45	10:45	1	3	W	0	5	2	2	0	1	3	
	04/02/2022	07:45	10:45	2	3	W	0	4	2	2	0	0	3	
	04/02/2022	07:45	10:45	3	4	W	0	2	2	2	0	0	4	Gusts up to BF6
	03/03/2022	07:00	10:00	1	1	W	0	3	2	2	0	0	4	
	03/03/2022	07:00	10:00	2	1	W	0	2	2	2	0	0	4	
	03/03/2022	07:00	10:00	3	1	W	0	1	2	2	0	0	4	
	16/03/2022	13:30	16:30	1	1	NW	0	2	2	2	0	0	10	Warm & sunny
	16/03/2022	13:30	16:30	2	2	W	0	2	2	2	0	0	10	
	16/03/2022	13:30	16:30	3	2	W	0	2	2	2	0	0	10	

Table A3-2
Weather data collected during flight activity surveys undertaken from VP 2

Season	Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)	Notes
Breeding	29/04/2021	11:35	14:35	1	1	NNE	0	6	2	2	0	0	11	
	29/04/2021	11:35	14:35	2	1	NNE	0	6	2	2	0	0	11	
	29/04/2021	11:35	14:35	3	1	NNE	2	6	2	2	0	0	11	Light shower at 14:20
	30/04/2021	10:45	13:45	1	2	NE	0	4	2	2	0	0	11	

Season	Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)	Notes
	30/04/2021	10:45	13:45	2	2	NE	0	4	2	2	0	0	10	
	30/04/2021	10:45	13:45	3	4	S	2	7	2	2	0	0	11	
	11/05/2021	16:10	19:10	1	3	SE	0	3	2	2	0	0	15	
	11/05/2021	16:10	19:10	2	3	SE	0	4	2	2	0	0	13	
	11/05/2021	16:10	19:10	3	3	SE	0	4	2	2	0	0	13	
	12/05/2021	08:05	11:05	1	3	E	3	8	1	1	0	0	4	
	12/05/2021	08:05	11:05	2	4	E	3	8	1	1	0	0	6	
	12/05/2021	08:05	11:05	3	3	E	2	6	2	2	0	0	7	
	15/06/2021	19:00	22:00	1	2	N	0	7	2	2	0	0	18	
	15/06/2021	19:00	22:00	2	2	N	0	7	2	2	0	0	18	
	15/06/2021	19:00	22:00	3	2	N	0	8	2	2	0	0	17	
	17/06/2021	13:50	16:50	1	1	E	0	6	2	2	0	0	15	
	17/06/2021	13:50	16:50	2	2	E	0	6	2	2	0	0	16	
	17/06/2021	13:50	16:50	3	2	E	1	7	2	2	0	0	16	
	19/07/2021	09:20	12:20	1	0	n/a	0	0	n/a	2	0	0	21	
	19/07/2021	09:20	12:20	2	0	n/a	0	0	n/a	2	0	0	23	
	19/07/2021	09:20	12:20	3	1	NE	0	3	2	2	0	0	25	
	20/07/2021	06:40	09:40	1	0	n/a	0	0	n/a	1	0	0	17	sun/ heat haze
	20/07/2021	06:40	09:40	2	0	n/a	0	0	n/a	1	0	0	18	sun/ heat haze
	20/07/2021	06:40	09:40	3	0	n/a	0	0	n/a	2	0	0	21	
	18/08/2021	10:05	13:05	1	1	NE	0	8	2	2	0	0	14	
	18/08/2021	10:05	13:05	2	1	NE	0	7	2	2	0	0	15	
	18/08/2021	10:05	13:05	3	0	n/a	0	8	2	2	0	0	16	

Season	Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)	Notes
	17/08/2021	11:10	14:10	1	2	S	0	8	2	2	0	0	16	
	17/08/2021	11:10	14:10	2	2	S	1	8	2	1	0	0	16	
	17/08/2021	11:10	14:10	3	2	S	0	8	2	2	0	0	16	
	14/09/2021	11:10	14:10	1	1	S	0	7	2	2	0	0	17	
	14/09/2021	11:10	14:10	2	1	S	0	6	2	2	0	0	18	
	14/09/2021	11:10	14:10	3	0	n/a	0	7	2	2	0	0	18	
	15/09/2021	07:05	10:05	1	0	n/a	1	8	0	0	0	0	15	
	15/09/2021	07:05	10:05	2	0	n/a	1	8	1	1	0	0	15	
	15/09/2021	07:05	10:05	3	0	n/a	1	8	1	2	0	0	15	
Non-breeding	14/10/2021	11:30	14:30	1	1	S	0	8	1	2	0	0	13	
	14/10/2021	11:30	14:30	2	1	S	0	8	1	2	0	0	14	
	14/10/2021	11:30	14:30	3	1	S	0	8	1	2	0	0	14	
	11/11/2021	13:45	16:45	1	4	S	0	7	2	2	0	0	13	
	11/11/2021	13:45	16:45	2	4	S	0	8	2	2	0	0	13	
	11/11/2021	13:45	16:45	3	4	S	2	8	1	1	0	0	13	
	12/11/2021	11:30	14:30	1	4	W	1	8	1	2	0	0	13	
	12/11/2021	11:30	14:30	2	4	W	0	8	2	2	0	0	13	
	12/11/2021	11:30	14:30	3	4	W	1	6	2	2	0	0	13	
	16/12/2021	13:00	16:00	1	1	SE	0	8	2	2	0	0	10	
	16/12/2021	13:00	16:00	2	1	SE	0	8	2	2	0	0	10	
	16/12/2021	13:00	16:00	3	1	SE	0	8	2	2	0	0	10	
	17/12/2021	08:30	11:30	1	2	SE	0	6	2	2	0	0	7	
	17/12/2021	08:30	11:30	2	2	SE	0	6	2	2	0	0	7	

Season	Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)	Notes
	17/12/2021	08:30	11:30	3	2	SE	0	6	2	2	0	0	7	
	06/01/2022	13:30	16:30	1	4	SW	3	8	1	2	0	0	6	
	06/01/2022	13:30	16:30	2	4	SW	3	4	2	2	0	0	6	snow shower 15:10
	06/01/2022	13:30	16:30	3	3	SW	3	3	2	2	0	0	4	
	19/01/2022	09:00	12:00	1	2	NW	0	6	2	2	0	0	6	
	19/01/2022	09:00	12:00	2	2	NW	0	6	2	2	0	0	6	
	19/01/2022	09:00	12:00	3	2	NW	0	2	2	2	0	0	6	
	03/02/2022	10:30	13:20	1	3	SW	3	8	0	0	0	0	10	
	03/02/2022	10:30	13:20	2	4	SW	0	6	1	2	0	0	10	
	03/02/2022	10:30	13:20	3	4	SW	0	6	2	2	0	0	10	
	16/02/2022	11:15	14:15	1	4	SW	3	8	0	0	0	0	13	Gusts up to BF7 (Storm Dudley but visibility at least 500m and wind below gale force threshold)
	16/02/2022	11:15	14:15	2	4	SW	3	8	0	0	0	0	13	Gusts up to BF7 (Storm Dudley but visibility at least 500m and wind below gale force threshold)
	16/02/2022	11:15	14:15	3	4	SW	2	8	1	1	0	0	13	Gusts up to BF7 (Storm Dudley but visibility at least 500m and wind below gale force threshold)
	02/03/2022	12:30	15:30	1	2	SE	2	8	1	2	0	0	10	
	02/03/2022	12:30	15:30	2	2	SE	0	8	1	2	0	0	10	
	02/03/2022	12:30	15:30	3	2	SE	0	8	1	2	0	0	10	

Season	Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)	Notes
	03/03/2022	10:30	13:30	1	1	NW	0	1	2	2	0	0	7	clear & calm
	03/03/2022	10:30	13:30	2	1	NW	0	3	2	2	0	0	8	
	03/03/2022	10:30	13:30	3	1	NW	0	3	2	2	0	0	11	

Table A3-3
Weather During Breeding Wader Surveys

Date	Start	End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)
13/05/2021	07:40	11:45	All	2	SE	0	6	2	2	0	0	5
01/06/2021	08:25	11:50	All	1	NE	0	2	2	2	0	0	14
17/06/2021	06:40	12:00	1	2		0	1	2	2	0	0	10
17/06/2021	06:40	12:00	2	2	E	0	1	2	2	0	0	11
17/06/2021	06:40	12:00	3	2	E	0	5	1	2	0	0	14
17/06/2021	06:40	12:00	4	1	E	0	5	2	2	0	0	14
17/06/2021	06:40	12:00	5	1	E	0	5	2	2	0	0	14

Table A3-4
Weather During Breeding Raptor Surveys

Date	Start	End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)
13/05/2021	13:35	16:00	All	2	SW	0	4	2	2	0	0	12
01/06/2021	12:35	15:15	All	1	NE	0	2	2	2	0	0	20
16/06/2021	10:50	16:15	1	3	E	0	7	2	2	0	0	14

Date	Start	End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)
16/06/2021	10:50	16:15	2	3	E	0	7	2	2	0	0	14
16/06/2021	10:50	16:15	3	2	E	0	6	2	2	0	0	15
19/07/2021	14:10	17:35	1	1	NE	0	2	2	2	0	0	27
19/07/2021	14:10	17:35	2	1	NE	0	2	2	2	0	0	28
19/07/2021	14:10	17:35	3	1	NE	0	1	2	2	0	0	28
19/07/2021	14:10	17:35	4	1	NE	0	1	2	2	0	0	28
20/07/2021	14:15	15:30	1	1	SW	0	2	2	2	0	0	28

**Table A3-5
Weather During Feeding and Distribution Surveys**

Date	Start	End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)
13/10/2021	11:30	13:30	1	0	n/a	0	8	2	2	0	0	13
13/10/2021	11:30	13:30	2	0	n/a	0	8	2	2	0	0	13
11/11/2021	11:15	13:45	1	4	S	3	8	1	1	0	0	13
11/11/2021	11:15	13:45	2	4	S	0	5	2	2	0	0	13
11/11/2021	11:15	13:45	3	4	S	0	7	2	2	0	0	13
26/11/2021	11:00	13:30	1	4	NW	2	2	2	2	0	0	7
26/11/2021	11:00	13:30	2	4	NW	2	8	2	2	0	0	7
26/11/2021	11:00	13:30	3	4	NW	0	6	2	2	0	0	7
10/12/2021	11:20	13:20	1	3	W	0	3	2	2	0	0	5
10/12/2021	11:20	13:20	2	3	W	0	3	2	2	0	0	7
17/12/2021	11:35	13:05	1	2	E	0	6	2	2	0	0	7
17/12/2021	11:35	13:05	2	2	E	0	6	2	2	0	0	7
06/01/2022	10:00	13:15	1	4	SW	2	8	1	2	0	0	8
06/01/2022	10:00	13:15	2	4	SW	3	5	2	2	0	0	7
06/01/2022	10:00	13:15	3	4	SW	3	6	2	2	0	0	6
06/01/2022	10:00	13:15	4	4	SW	0	4	2	2	0	0	6
18/01/2022	13:30	15:30	1	4	S	1	8	2	2	0	0	10
18/01/2022	13:30	15:30	2	4	S	2	7	2	2	0	0	9
04/02/2022	10:55	12:40	1	4	W	0	4	2	2	0	0	4
04/02/2022	10:55	12:40	2	4	W	0	3	2	2	0	0	6

Date	Start	End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)
16/02/2022	14:40	16:40	1	4	W	2	7	1	2	0	0	12
16/02/2022	14:40	16:40	2	4	W	2	6	1	2	0	0	9
02/03/2022	15:35	17:10	1	2	SE	0	8	1	2	0	0	10
02/03/2022	15:35	17:10	2	2	SE	0	8	1	2	0	0	10
16/03/2022	11:50	13:25	1	1	NW	0	2	2	2	0	0	7
16/03/2022	11:50	13:25	2	1	NW	0	2	2	2	0	0	7

Table A3-6
Weather During Hen Harrier Winter Roost Surveys

Date	Start	End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)
18/01/2022	16:07	17:30	1	3	S	0	8	1	2	0	0	10
18/01/2022	16:07	17:30	2	3	S	0	7	1	1	0	0	9
16/02/2022	16:45	18:30	1	4	w	3	7	1	1	0	0	9
16/02/2022	16:45	18:30	2	4	w	2	6	1	1	0	0	8
02/03/2022	17:15	18:45	1	2	SE	0	8	1	2	0	0	9
02/03/2022	17:15	18:45	2	2	SE	0	8	1	1	0	0	7

Appendix 04
Flight activity survey data

Table A4-1
Flight activity survey data primary target species

Date	VP	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
29/04/2021	1	AK	1.CU035.1.1	BH	1	Ad	U	16:53	45
29/04/2021	1	AK	1.CU035.2.1	BH	1	Ad	U	17:03	45
29/04/2021	1	AK	1.CU035.3.1	BH	1	Ad	U	17:08	60
29/04/2021	1	AK	1.CU035.4.1	BH	1	Ad	U	17:17	30
29/04/2021	1	AK	1.CU035.5.1	BH	2	Ad	U	17:59	45
29/04/2021	1	AK	1.CU035.6.1	BH	1	Ad	U	18:19	15
29/04/2021	1	AK	1.CU035.7.1	BH	1	Ad	U	18:20	30
29/04/2021	1	AK	1.CU035.8.1	BH	1	Ad	U	18:22	45
29/04/2021	1	AK	1.CU035.9.1	L.	2	Ad	U	19:07	75
29/04/2021	2	AK	2.CU036.1.1	K.	1	Ad	U	11:39	45
29/04/2021	2	AK	2.CU036.2.1	K.	1	Ad	U	12:41	60
29/04/2021	2	AK	2.CU036.3.1	BH	1	Ad	U	13:53	105
30/04/2021	1	AK	1.CU037.1.1	L.	2	Ad	U	06:58	45
30/04/2021	1	AK	1.CU037.2.1	L.	2	Ad	U	07:07	60
30/04/2021	1	AK	1.CU037.3.1	L.	2	Ad	U	07:09	45
30/04/2021	1	AK	1.CU037.4.1	L.	1	Ad	U	07:22	15
30/04/2021	1	AK	1.CU037.5.1	BH	1	Ad	U	07:32	30
30/04/2021	1	AK	1.CU037.6.1	L.	2	Ad	U	07:38	45
30/04/2021	1	AK	1.CU037.7.1	GP	5	Ad	U	07:53	60

Date	VP	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
30/04/2021	1	AK	1.CU037.8.1	L.	2	Ad	U	07:54	15
30/04/2021	1	AK	1.CU037.9.1	L.	1	Ad	U	07:59	15
30/04/2021	1	AK	1.CU037.10.1	L.	2	Ad	U	08:15	45
30/04/2021	1	AK	1.CU037.11.1	BH	1	Ad	U	08:20	75
30/04/2021	1	AK	1.CU037.12.1	L.	2	Ad	U	08:28	30
30/04/2021	1	AK	1.CU037.13.1	L.	2	Ad	U	09:13	60
30/04/2021	1	AK	1.CU037.14.1	BH	1	Ad	U	09:14	75
30/04/2021	1	AK	1.CU038.1.1	BH	1	Ad	U	12:37	60
30/04/2021	1	AK	1.CU038.2.1	BH	1	Ad	U	12:55	105
30/04/2021	1	AK	1.CU038.3.1	BH	1	Ad	U	13:04	75
15/06/2021	2	AK	2.CU047.1.1	BH	1	Ad	U	12:36	90
15/06/2021	2	AK	2.CU047.2.1	BH	5	Ad	U	12:55	60
15/06/2021	2	AK	2.CU047.3.1	BH	1	Ad	U	13:06	75
15/06/2021	2	AK	2.CU047.4.1	BH	2	Ad	U	14:18	60
15/06/2021	2	AK	2.CU047.5.1	L.	1	U	U	14:36	15
15/06/2021	2	AK	2.CU047.6.1	BH	1	Ad	U	14:50	15
15/06/2021	2	AK	2.CU047.7.1	BH	1	Ad	U	14:54	15
15/06/2021	2	AK	2.CU048.1.1	BH	3	Ad	U	20:29	30

Date	VP	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
15/06/2021	2	AK	2.CU048.2.1	BH	1	Ad	U	20:46	45
15/06/2021	2	AK	2.CU048.3.1	SN	1	Ad	U	21:32	15
16/06/2021	2	AK	2.CU049.1.1	L.	1	Ad	U	06:51	15
16/06/2021	2	AK	2.CU049.2.1	L.	1	Imm	U	07:03	15
16/06/2021	2	AK	2.CU049.3.1	L.	1	Imm	U	07:07	45
16/06/2021	2	AK	2.CU049.4.1	BH	1	Ad	U	07:38	45
16/06/2021	2	AK	2.CU049.5.1	L.	1	Imm	U	08:04	15
16/06/2021	2	AK	2.CU049.6.1	L.	1	Imm	U	08:27	60
16/06/2021	2	AK	2.CU049.7.1	BH	1	Ad	U	08:36	90
16/06/2021	2	AK	2.CU049.8.1	BH	1	Ad	U	08:45	75
16/06/2021	2	AK	2.CU049.9.1	BH	1	Ad	U	08:55	75
16/06/2021	2	AK	2.CU049.10.1	BH	1	Ad	U	09:10	60
16/06/2021	2	AK	2.CU049.11.1	BH	2	Ad	U	09:16	30
16/06/2021	2	AK	2.CU049.12.1	BH	1	Ad	U	09:29	75
16/06/2021	2	AK	2.CU049.13.1	L.	1	Imm	U	09:31	60
16/06/2021	2	AK	2.CU049.14.1	BH	1	Ad	U	09:47	120
17/06/2021	2	AK	2.CU050.1.1	BH	1	Ad	U	14:49	75
17/06/2021	2	AK	2.CU050.2.1	BH	2	Ad	U	15:04	60

Date	VP	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
17/06/2021	2	AK	2.CU050.3.1	BH	1	Ad	U	15:53	75
17/06/2021	2	AK	2.CU050.4.1	BH	1	Ad	U	16:12	60
17/06/2021	2	AK	2.CU050.5.1	BH	1	Ad	U	16:19	45
19/07/2021	1	AK	1.CU053.1.1	BH	14	Imm	U	18:58	45
19/07/2021	1	AK	1.CU053.2.1	BH	1	Imm	U	19:06	30
19/07/2021	1	AK	1.CU053.3.1	L.	1	Ad	U	19:29	120
19/07/2021	1	AK	1.CU053.4.1	BH	3	Ad	U	19:31	60
19/07/2021	1	AK	1.CU053.5.1	L.	2	Ad	U	19:49	45
19/07/2021	1	AK	1.CU053.6.1	L.	1	Ad	U	20:11	30
19/07/2021	1	AK	1.CU053.7.1	L.	4	Ad	U	20:25	75
19/07/2021	1	AK	1.CU053.8.1	BH	1	Ad	U	20:42	45
19/07/2021	1	AK	1.CU053.9.1	BH	5	Imm	U	21:13	30
19/07/2021	2	AK	2.CU054.1.1	K.	1	U	U	09:36	15
19/07/2021	2	AK	2.CU054.2.1	K.	1	Ad	F	10:12	30
20/07/2021	1	AK	1.CU055.1.1	BH	11	2 Ad., 9 Imm.	U	11:13	90
18/08/2021	1	AK	1.CU059.1.1	L.	1	Ad	U	07:27	15
17/08/2021	2	AK	2.CU062.1.1	K.	1	Ad	U	11:36	15
14/09/2021	2	AK	2.CU063.1.1	K.	1	Ad	M	12:20	30
15/09/2021	1	AK	1.CU066.1.1	K.	1	Ad	U	11:09	120
15/09/2021	1	AK	1.CU066.2.1	L.	1	Ad	U	11:27	30
13/10/2021	1	AK	1.CU068.1.1	HH	1	Ringtail	Ringtail	15:53	11

Date	VP	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
13/10/2021	1	AK	1.CU068.2.1	K.	1	U	U	16:11	4
13/10/2021	1	AK	1.CU068.3.1	SN	7	U	U	16:33	39
13/10/2021	1	AK	1.CU068.4.1	SN	7	U	U	16:35	8
13/10/2021	1	AK	1.CU068.5.1	L.	27	U	U	17:07	200
13/10/2021	1	AK	1.CU068.6.1	SN	3	U	U	17:56	14
14/10/2021	1	AK	1.CU069.1.1	K.	1	Ad	F	10:07	79
14/10/2021	2	AK	2.CU070.1.1	K.	1	U	U	11:37	18
11/11/2021	2	AK	2.CU072.1.1	K.	1	Ad	M	13:57	10
11/11/2021	2	AK	2.CU072.2.1	K.	1	Ad	M	15:05	20
26/11/2021	a	AK	a.CU075.1.1	PE	1	Ad	U	11:32	40
10/12/2021	1	AK	1.CU077.1.1	PE	1	U	U	10:12	48
16/12/2021	1	AK	1.CU079.1.1	BH	2	Ad	U	12:02	35
16/12/2021	2	AK	2.CU080.1.1	BH	46	U	U	15:34	50
17/12/2021	2	AK	2.CU082.2.1	BH	1	Ad	U	09:29	20
17/12/2021	2	AK	2.CU082.3.1	BH	5	U	U	09:38	35
17/12/2021	2	AK	2.CU082.4.1	BH	8	U	U	09:42	10
17/12/2021	2	AK	2.CU082.5.1	BH	3	U	U	09:51	48
06/01/2022	2	AK	2.CU084.1.1	PE	1	U	U	16:19	20
18/01/2022	1	AK	1.CU085.1.1	GP	2000+	U	U	11:58	
18/01/2022	1	AK	1.CU085.2.1	K.	1	Ad	M	12:18	60
18/01/2022	1	AK	1.CU085.3.1	K.	1	Ad	M	12:39	90

Date	VP	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
19/01/2022	1	AK	1.CU088.1.1	K.	1	U	U	12:42	60
19/01/2022	1	AK	1.CU088.2.1	K.	1	U	U	12:43	60
19/01/2022	1	AK	1.CU088.3.1	K.	1	Ad	M	12:56	195
19/01/2022	1	AK	1.CU088.4.1	K.	1	Ad	M	13:11	100
19/01/2022	1	AK	1.CU088.5.1	K.	1	Ad	M	13:27	45
19/01/2022	1	AK	1.CU088.6.1	K.	1	Ad	M	13:43	30
19/01/2022	1	AK	1.CU088.7.1	K.	1	Ad	M	14:15	75
19/01/2022	1	AK	1.CU088.8.1	K.	1	Ad	M	14:30	60
19/01/2022	1	AK	1.CU088.9.1	K.	1	Ad	M	14:51	120
19/01/2022	2	AK	2.CU089.1.1	WS	4	Ad	U	09:41	75
19/01/2022	2	AK	2.CU089.2.1	GP	42	U	U	10:32	45
03/02/2022	1	AK	1.CU090.1.1	PE	1	Ad	U	15:12	35
03/02/2022	1	AK	1.CU090.2.1	K.	1	Ad	M	16:48	30
03/02/2022	2	AK	2.CU091.1.1	K.	1	U	U	12:39	110
16/02/2022	2	AK	2.CU094.1.1	K.	1	Ad	M	11:50	75
02/03/2022	2	AK	2.CU099.2.1	WS	12	U	U	13:12	60
03/03/2022	1	AK	1.CU100.7.1	PE	1	U	U	09:49	420
03/03/2022	1	AK	1.CU100.7.2	PE	1	U	U	09:49	420
03/03/2022	2	AK	2.CU101.1.1	BH	13	U	U	11:17	60
03/03/2022	2	AK	2.CU101.2.1	PE	1	U	U	12:03	570
03/03/2022	2	AK	2.CU101.2.2	PE	1	U	U	12:03	570

Date	VP	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
03/03/2022	2	AK	2.CU101.3.2	HH	1	Ringtail	Ringtail	12:09	270
03/03/2022	2	AK	2.CU101.4.1	PE	1	U	U	12:52	22
16/03/2022	1	AK	1.CU103.1.1	K.	1	Ad	M	14:21	35
16/03/2022	1	AK	1.CU103.2.1	K.	1	Ad	U	14:33	310
16/03/2022	1	AK	1.CU103.3.1	K.	1	Ad	U	15:17	115

Table A4- 3
Flight Activity secondary target species

Date	VP	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Location (on site, in buffer, or beyond)
08/10/2021	2	09:30	12:30	10:05	10:10	BZ	1	Buffer
08/10/2021	2	09:30	12:30	10:25	10:30	BZ	1	Buffer
08/10/2021	2	09:30	12:30	11:35	11:40	BZ	2	Buffer
08/10/2021	2	09:30	12:30	11:40	11:45	RN	2	Buffer
08/10/2021	1	13:00	16:00	13:05	13:10	BZ	2	Buffer
08/10/2021	1	13:00	16:00	13:20	13:25	BZ	2	Buffer
08/10/2021	1	13:00	16:00	15:05	15:10	RN	2	Buffer
08/10/2021	1	13:00	16:00	15:15	15:20	BZ	1	Buffer
08/10/2021	1	13:00	16:00	15:20	15:25	BZ	2	Buffer
08/10/2021	1	13:00	16:00	15:55	16:00	BZ	2	Buffer
29/04/2021	1	16:30	19:30	17:15	17:20	H.	1	Buffer, beyond
29/04/2021	1	16:30	19:30	18:30	18:35	MA	3	On site
29/04/2021	2	11:35	14:35	11:55	12:00	RN	1	Buffer, beyond
29/04/2021	2	11:35	14:35	12:05	12:10	RN	1	Beyond
29/04/2021	2	11:35	14:35	12:20	12:25	BZ	1	Beyond
29/04/2021	2	11:35	14:35	12:25	12:30	BZ	2	On site
29/04/2021	2	11:35	14:35	12:50	12:55	BZ	1	Buffer
29/04/2021	2	11:35	14:35	12:55	13:00	BZ	2	On site, buffer
29/04/2021	2	11:35	14:35	13:15	13:20	BZ	1	On site
30/04/2021	1	06:50	09:50	09:00	09:05	CM	1	Buffer, beyond

Date	VP	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Location (on site, in buffer, or beyond)
30/04/2021	1	10:45	13:45	11:45	11:50	H.	1	On site
30/04/2021	1	10:45	13:45	11:50	11:55	BZ	1	On site
30/04/2021	1	10:45	13:45	12:35	12:40	BZ	2	On site, buffer
30/04/2021	1	10:45	13:45	12:40	12:45	BZ	2	Buffer
30/04/2021	1	10:45	13:45	13:40	13:45	MA	2	Buffer, beyond
11/05/2021	1	11:00	14:00	11:25	11:30	HG	1	On site
11/05/2021	1	11:00	14:00	11:55	12:00	BZ	2	Buffer
11/05/2021	1	11:00	14:00	12:10	12:15	BZ	2	Buffer
11/05/2021	1	11:00	14:00	13:05	13:10	HG	1	Buffer
11/05/2021	1	11:00	14:00	13:20	13:25	BZ	1	Beyond
11/05/2021	1	11:00	14:00	13:40	13:45	K.	1	Buffer
11/05/2021	2	16:10	19:10	16:20	16:25	RN	2	Beyond
11/05/2021	2	16:10	19:10	16:40	16:45	RN	1	Buffer
11/05/2021	2	16:10	19:10	17:10	17:15	BZ	1	Buffer
11/05/2021	2	16:10	19:10	18:25	18:30	RN	1	Buffer
12/05/2021	2	08:05	11:05	09:10	09:15	BZ	1	Beyond
12/05/2021	2	08:05	11:05	09:30	09:35	H.	1	Beyond
12/05/2021	2	08:05	11:05	10:20	10:25	BZ	1	Buffer
12/05/2021	2	08:05	11:05	10:20	10:25	RN	1	Beyond
12/05/2021	2	08:05	11:05	10:40	10:45	RN	1	Buffer
12/05/2021	2	08:05	11:05	10:55	11:00	RN	1	Buffer
12/05/2021	1	16:10	19:10	16:40	16:45	BZ	2	Beyond

Date	VP	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Location (on site, in buffer, or beyond)
12/05/2021	1	16:10	19:10	16:45	16:50	BZ	2	Buffer
12/05/2021	1	16:10	19:10	18:30	18:35	BZ	2	Beyond
15/06/2021	1	12:05	15:05	12:20	12:25	GB	4	On site
15/06/2021	1	12:05	15:05	12:35	12:40	BZ	1	On site
15/06/2021	1	12:05	15:05	12:40	12:45	BZ	1	Buffer, beyond
15/06/2021	1	12:05	15:05	12:45	12:50	BZ	1	Buffer
15/06/2021	1	12:05	15:05	13:30	13:35	BZ	1	On site
15/06/2021	1	12:05	15:05	14:05	14:10	BZ	1	Buffer
15/06/2021	1	12:05	15:05	14:35	14:40	LB	1	Buffer
16/06/2021	1	07:00	10:00	08:05	08:10	BZ	1	Beyond
17/06/2021	2	13:50	16:50	13:50	13:55	BZ	3	Buffer, beyond
19/07/2021	1	19:00	21:30	18:55	19:00	CM	1	Buffer
19/07/2021	1	19:00	21:30	19:10	19:15	CM	1	Buffer
19/07/2021	1	19:00	21:30	19:45	19:50	LB	1	Buffer, beyond
19/07/2021	1	19:00	21:30	19:55	20:00	CM	1	Buffer, beyond
19/07/2021	1	19:00	21:30	20:05	20:10	CM	2	Buffer, beyond
19/07/2021	1	19:00	21:30	20:10	20:15	H.	2	On site, buffer
19/07/2021	1	19:00	21:30	20:20	20:25	CM	1	On site
19/07/2021	1	19:00	21:30	20:45	20:50	CM	1	Buffer, beyond
19/07/2021	2	09:20	12:20	10:30	10:35	RN	1	Buffer
19/07/2021	2	09:20	12:20	10:40	10:45	BZ	1	On site
19/07/2021	2	09:20	12:20	11:55	12:00	BZ	1	Buffer, beyond

Date	VP	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Location (on site, in buffer, or beyond)
19/07/2021	2	09:20	12:20	12:05	12:10	BZ	2	On site, buffer
19/07/2021	2	09:20	12:20	12:15	12:20	BZ	1	On site, buffer
20/07/2021	1	10:30	14:00	12:10	12:15	BZ	1	On site
20/07/2021	1	10:30	14:00	13:15	13:20	BZ	1	On site
20/07/2021	1	10:30	14:00	13:35	13:40	BZ	1	On site
20/07/2021	1	10:30	14:00	13:45	13:50	BZ	2	On site
20/07/2021	2	06:40	09:40	07:10	07:15	RN	1	Buffer
18/08/2021	1	06:35	09:35	08:45	08:50	RN	2	Beyond
18/08/2021	1	06:35	09:35	09:15	09:20	RN	1	On site, buffer
16/08/2021	1	17:35	20:35	17:40	17:45	CM	1	On site
16/08/2021	1	17:35	20:35	18:10	18:15	LB	4	Buffer, beyond
18/08/2021	2	10:05	13:05	10:10	10:15	RN	14	On site, buffer, beyond
18/08/2021	2	10:05	13:05	10:20	10:25	RN	2	On site, buffer
18/08/2021	2	10:05	13:05	10:35	10:40	RN	1	On site, buffer
18/08/2021	2	10:05	13:05	10:50	10:55	BZ	2	On site
18/08/2021	2	10:05	13:05	11:00	11:05	BZ	1	On site
18/08/2021	2	10:05	13:05	11:45	11:50	BZ	1	On site
18/08/2021	2	10:05	13:05	11:50	11:55	BZ	1	On site
18/08/2021	2	10:05	13:05	12:35	12:40	H.	2	On site, buffer, beyond
17/08/2021	2	11:10	14:10	11:35	11:40	BZ	1	Buffer
17/08/2021	2	11:10	14:10	11:35	11:40	SH	1	Buffer
17/08/2021	2	11:10	14:10	11:50	11:55	H.	1	On site

Date	VP	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Location (on site, in buffer, or beyond)
17/08/2021	2	11:10	14:10	12:25	12:30	RN	3	Buffer
17/08/2021	2	11:10	14:10	12:35	12:40	RN	4	On site, buffer
17/08/2021	2	11:10	14:10	12:45	12:50	HG	1	Buffer, beyond
14/09/2021	1	16:45	19:45	17:10	17:15	SH	1	On site
14/09/2021	1	16:45	19:45	17:10	17:15	RN	1	Buffer, beyond
14/09/2021	1	16:45	19:45	17:55	18:00	RN	2	Buffer
14/09/2021	1	16:45	19:45	19:35	19:40	CM	26	On site, buffer, beyond
15/09/2021	2	07:05	10:05	07:50	07:55	CM	1	Buffer
15/09/2021	2	07:05	10:05	08:05	08:10	H.	1	On site, buffer
15/09/2021	2	07:05	10:05	08:20	08:25	RN	1	On site, buffer
15/09/2021	1	10:35	13:35	11:15	11:20	CM	1	Buffer
15/09/2021	1	10:35	13:35	12:05	12:10	BZ	1	On site, buffer
13/10/2021	1	15:40	18:40	16:05	16:10	BZ	1	On site
13/10/2021	1	15:40	18:40	16:15	16:20	BZ	1	On site
13/10/2021	1	15:40	18:40	16:20	16:25	BZ	1	On site
13/10/2021	1	15:40	18:40	17:30	17:35	H.	1	On site, buffer, beyond
14/10/2021	1	08:00	11:00	10:25	10:30	MA	1	On site
14/10/2021	2	11:30	14:30	12:30	12:35	H.	1	On site, buffer, beyond
14/10/2021	2	11:30	14:30	13:40	13:45	BZ	1	Beyond
11/11/2021	2	13:45	16:45	14:35	14:40	BZ	2	On site
11/11/2021	2	13:45	16:45	14:40	14:45	BZ	2	On site
12/11/2021	1	08:00	11:00	08:15	08:20	SH	1	On site

Date	VP	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Location (on site, in buffer, or beyond)
12/11/2021	1	08:00	11:00	08:35	08:40	SH	1	On site
12/11/2021	1	08:00	11:00	09:40	09:45	SH	1	On site, buffer
12/11/2021	1	08:00	11:00	09:35	09:40	MA	2	On site
12/11/2021	1	08:00	11:00	10:10	10:15	MA	2	On site
12/11/2021	2	11:30	14:30	11:30	11:35	RN	1	On site
26/11/2021	1	07:50	10:50	10:05	10:10	RN	1	On site, buffer, beyond
26/11/2021	1	07:50	10:50	10:05	10:10	SH	1	Buffer, beyond
10/12/2021	1	08:15	11:15	09:20	09:25	RN	1	On site, buffer
10/12/2021	1	08:15	11:15	09:25	09:30	BZ	1	On site
10/12/2021	1	08:15	11:15	10:35	10:40	RN	2	On site, buffer
10/12/2021	1	08:15	11:15	10:55	11:00	RN	2	On site, buffer, beyond
10/12/2021	1	08:15	11:15	11:00	11:05	RN	1	On site, buffer, beyond
16/12/2021	1	09:30	12:30	09:30	09:35	ET	1	On site
16/12/2021	1	09:30	12:30	09:50	09:55	ET	1	On site
16/12/2021	1	09:30	12:30	10:00	10:05	RN	1	On site
16/12/2021	1	09:30	12:30	10:40	10:45	BZ	2	On site
16/12/2021	1	09:30	12:30	11:20	11:25	RN	1	On site
16/12/2021	1	09:30	12:30	11:35	11:40	SH	1	On site
16/12/2021	1	09:30	12:30	11:40	11:45	ET	1	On site
16/12/2021	1	09:30	12:30	11:40	11:45	BZ	1	On site
16/12/2021	1	09:30	12:30	11:55	12:00	ET	1	On site
16/12/2021	2	13:00	16:00	15:10	15:15	CA	1	On site, buffer, beyond

Date	VP	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Location (on site, in buffer, or beyond)
16/12/2021	2	13:00	16:00	15:30	15:35	RN	2	On site, buffer, beyond
17/12/2021	2	08:30	11:30	09:00	09:05	MA	2	On site
17/12/2021	2	08:30	11:30	09:05	09:10	RN	1	On site, buffer, beyond
17/12/2021	2	08:30	11:30	09:25	09:30	CA	2	On site, buffer, beyond
17/12/2021	2	08:30	11:30	09:40	09:45	CM	8	Buffer, beyond
17/12/2021	2	08:30	11:30	09:45	09:50	CA	1	On site
17/12/2021	2	08:30	11:30	09:55	10:00	RN	1	On site
06/01/2022	2	13:30	16:30	14:55	15:00	BZ	1	On site
06/01/2022	2	13:30	16:30	16:00	16:05	BZ	1	On site, buffer
06/01/2022	2	13:30	16:30	16:10	16:15	H.	1	On site, buffer
18/01/2022	1	10:00	13:00	12:10	12:15	BZ	1	On site
18/01/2022	1	10:00	13:00	12:10	12:15	RN	2	On site
18/01/2022	1	10:00	13:00	12:40	12:45	RN	2	On site, buffer
19/01/2022	1	12:30	15:30	12:40	12:45	CA	1	On site, buffer, beyond
19/01/2022	1	12:30	15:30	13:00	13:05	CA	1	On site, buffer, beyond
19/01/2022	1	12:30	15:30	13:10	13:15	RN	2	Buffer, Beyond
19/01/2022	1	12:30	15:30	14:15	14:20	BZ	1	On site, buffer
19/01/2022	1	12:30	15:30	14:20	14:25	RN	1	On site, buffer, beyond
19/01/2022	1	12:30	15:30	15:30	15:35	CA	1	Buffer, beyond
19/01/2022	2	09:00	12:00	09:35	09:40	BZ	1	Buffer
19/01/2022	2	09:00	12:00	10:00	10:05	RN	2	Buffer, beyond
19/01/2022	2	09:00	12:00	10:05	10:10	RN	1	Buffer, beyond

Date	VP	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Location (on site, in buffer, or beyond)
19/01/2022	2	09:00	12:00	10:40	10:45	BZ	1	Buffer
03/02/2022	1	14:30	17:30	15:00	15:05	RN	1	On site
03/02/2022	1	14:30	17:30	15:05	15:10	BZ	2	Buffer
03/02/2022	1	14:30	17:30	15:15	15:20	BZ	2	Buffer
03/02/2022	1	14:30	17:30	15:30	15:35	BZ	1	Buffer
03/02/2022	1	14:30	17:30	16:10	16:15	BZ	1	Buffer
03/02/2022	1	14:30	17:30	17:10	17:15	RN	2	Buffer
03/02/2022	2	10:30	13:30	11:15	11:20	BZ	2	On site
03/02/2022	2	10:30	13:30	11:25	11:30	RN	2	On site
03/02/2022	2	10:30	13:30	11:30	11:35	BZ	1	On site
03/02/2022	2	10:30	13:30	11:30	11:35	BZ	3	On site, buffer, beyond
03/02/2022	2	10:30	13:30	11:35	11:40	BZ	2	On site, buffer, beyond
03/02/2022	2	10:30	13:30	11:55	12:00	RN	2	On site, buffer, beyond
03/02/2022	2	10:30	13:30	12:30	12:35	BZ	1	On site
04/02/2022	1	07:45	10:45	10:00	10:05	H.	1	On site, buffer
16/02/2022	2	11:15	14:15	11:45	11:50	BZ	2	Buffer
02/03/2022	2	12:30	15:30	13:25	13:30	BZ	1	Buffer, beyond
02/03/2022	2	12:30	15:30	14:35	14:40	CA	1	Buffer
02/03/2022	2	12:30	15:30	14:40	14:45	BZ	1	On site
02/03/2022	2	12:30	15:30	14:50	14:55	CA	1	On site, buffer, beyond
02/03/2022	2	12:30	15:30	15:10	15:15	BZ	1	On site, buffer, beyond
03/03/2022	1	07:00	10:00	07:35	07:40	MA	2	On site, buffer, beyond

Date	VP	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Location (on site, in buffer, or beyond)
03/03/2022	1	07:00	10:00	07:40	07:45	MA	2	On site, buffer, beyond
03/03/2022	1	07:00	10:00	07:40	07:45	MA	1	On site, buffer, beyond
03/03/2022	1	07:00	10:00	07:45	07:50	MA	4	On site, buffer, beyond
03/03/2022	1	07:00	10:00	08:00	08:05	MA	1	On site, buffer, beyond
03/03/2022	1	07:00	10:00	08:05	08:10	NMA	2	On site, buffer, beyond
03/03/2022	1	07:00	10:00	08:45	08:50	CA	1	On site, buffer, beyond
03/03/2022	1	07:00	10:00	09:00	09:05	CA	1	On site, buffer, beyond
03/03/2022	2	10:30	13:30	10:35	10:40	BZ	1	On site
03/03/2022	2	10:30	13:30	11:10	11:15	BZ	1	Buffer, beyond
03/03/2022	2	10:30	13:30	11:20	11:25	BZ	1	On site
03/03/2022	2	10:30	13:30	11:25	11:30	BZ	2	On site, buffer, beyond
03/03/2022	2	10:30	13:30	11:30	11:35	CA	1	On site, buffer, beyond
03/03/2022	2	10:30	13:30	11:35	11:40	BZ	1	Buffer
03/03/2022	2	10:30	13:30	11:40	11:45	BZ	1	On site, buffer
03/03/2022	2	10:30	13:30	11:45	11:50	BZ	3	On site, buffer
03/03/2022	2	10:30	13:30	11:50	11:55	BZ	5	On site, buffer, beyond
03/03/2022	2	10:30	13:30	12:00	12:05	BZ	5	On site, buffer
03/03/2022	2	10:30	13:30	12:05	12:10	BZ	3	On site, buffer
03/03/2022	2	10:30	13:30	12:05	12:10	RN	2	On site, buffer
03/03/2022	2	10:30	13:30	12:15	12:20	BZ	3	On site, buffer, beyond
03/03/2022	2	10:30	13:30	12:15	12:20	RN	2	On site, buffer
03/03/2022	2	10:30	13:30	12:30	12:35	BZ	1	On site, buffer

Date	VP	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Location (on site, in buffer, or beyond)
03/03/2022	2	10:30	13:30	12:50	12:55	BZ	2	Buffer
03/03/2022	2	10:30	13:30	12:55	13:00	BZ	1	On site
16/03/2022	1	13:30	16:30	15:45	15:50	MA	5	On site
16/03/2022	1	13:30	16:30	16:20	16:25	MA	1	On site

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BIRD SURVEY REPORT

BREEDING 2022

Cush Wind Farm

Prepared for: Galetch Energy Developments

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1.0 Introduction

Bird surveys have been previously undertaken at the proposed wind farm development site at Cush, Co. Offaly (hereafter 'the Project Site') by SLR Consulting Ireland (SLR) for the breeding 2020, non-breeding 2020/21, breeding 2021, and non-breeding 2021/22 seasons. The Project Site also includes a linear area that was previously surveyed for a proposed overhead line¹. Flight activity surveys were carried out at two vantage point locations along the proposed overhead line route corridor during the breeding season in 2018.

SLR was commissioned by Galetech Energy Developments to carry out a bird survey programme for the proposed wind farm at Cush, Co. Offaly (hereafter 'the Project') during the breeding season in 2022.

1.1 Background to the Commission

No previous planning permission has been sought on the application site for the development of wind farms by Galetech Energy Developments or any other party.

1.2 Site Description

The Project site located in the townland of Cush approximately 4 km north of Birr, Co. Offaly. The habitats within the proposed development site are dominated by conifer plantations of varying age classes (c.327 ha), cutaway bog (c.102 ha) and agricultural grasslands (ca. 327 ha; refer to Appendix 01 **Figure 1**).

1.3 Scope of work

The scope of survey work was based on existing knowledge of the area and took into account current NatureScot (NS; formerly Scottish Natural Heritage, SNH) Guidance², with details provided in **Table 1-1**. Further details are provided in Sections 2.2 to 2.5.

Table 1-1
Scope of Ornithological Survey Work May to August 2022

Survey Type	Summary Methodology (see Section 2 for further details)
Vantage Point (VP) surveys	12 hours of survey per month were carried out from each of the three VPs between May and June 2022. Six hours of survey per month were carried out from each VP between July and August 2022.
Breeding wader surveys	Three breeding wader surveys were carried out from May to June 2022 to search for lowland waders breeding within the Project Site.
Breeding raptor surveys	Five breeding raptor surveys were carried out from May to July to search for any raptors breeding within 2 km of the Project Site. An additional survey was undertaken at [REDACTED] Quarry in August to search for breeding peregrine falcon <i>Falco peregrinus</i> .

¹ SLR (2018) *Cloghan Wind Farm and Long Oak Wind Farm Breeding Bird Survey Report 2018*. Prepared for Galetech Energy Services Ltd

² Scottish Natural Heritage (2017). *Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms V2*. Scottish Natural Heritage, Inverness.

1.4 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 NS guidance.

1.4.1 Primary Target Species

Primary target species was limited to species upon which effects are most likely to be potentially significant in EIA and Appropriate Assessment (AA) terms e.g., species forming qualifying features for nearby Special Protection Areas (SPAs) or species listed on Annex 1 of the Birds Directive³. 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.

Primary target species included the following bird species:

- All Annex 1 raptor/owl species;
- Qualifying interest species for nearby SPAs⁴; and
- Other raptors, waders or wildfowl red-listed on the latest Birds of Conservation Concern in Ireland (BoCCI)⁵ scheme.

1.4.2 Secondary Species

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

Secondary target species included:

- Any other wildfowl and wader species;
- Common buzzard *Buteo buteo*;
- Eurasian sparrowhawk *Accipiter nisus*;
- Northern raven *Corvus corax*;
- Grey heron *Ardea cinerea*;
- Great cormorant *Phalacrocorax carbo*; and
- Gulls *Larus* sp.

NS guidance states that “it is generally considered the passerine species are not significantly impacted by wind farms”. It goes on to state that “survey of woodland passerines, especially in commercial conifer forest is generally not required”. The only exception is if the desk study identifies that the Project Site is in a key area for a Schedule 1 woodland passerine species. As Schedule 1 refers to UK legislation, it is prudent to assume

³ Annex 1 of the Birds Directive (Directive 2009/147/EC)

⁴ The relevant SPAs are listed in Section 3.1.

⁵ Gilbert, G., Stanbury, A. and Lewis, L. (2021). Birds of Conservation Concern in Ireland 2020–2026. Irish Birds 43: 1–22

that passerines red-listed under the latest Birds of Conservation Concern in Ireland (BoCCI) scheme⁶ should be considered as equivalent. No such species were returned during the desk-based review or data request. NS guidance also states that “surveys of farmland passerines especially on more intensive arable habitat are generally not required”. Based on the above, while not the targets, any red-listed passerines were recorded as incidental species during other surveys.

1.5 Terminology

For this report, “flight line” refers to the line drawn to record avian movement during a VP survey. A single flight line may be used to indicate the collective movement of a flock of birds. Each individual bird moving within the same flight line is referred to as “a flight”. Note that the “cumulative number of flights” reflects the occupancy of the study area by a particular species. It is not equivalent to the total number of unique individuals and should not be used to infer abundance.

1.6 Purpose of this Report

This report outlines the surveys undertaken and methods used. It then summarises the survey data obtained and provides descriptions of the legal and conservation status of the species recorded.

The assessment of impacts resulting from the proposed development and the development of mitigation measures, if required, are beyond the scope of this report and will be covered in a separate Environmental Impact Assessment (EIA) Report in due course.

⁶ Gilbert, G., Stanbury, A. and Lewis, L. (2021). Birds of Conservation Concern in Ireland 2020–2026. Irish Birds 43: 1–22

2.0 Methods

2.1 Desk-Based Review

The desk review collated any available information to date on the breeding and non-breeding bird populations and movements around the Project site.

The following reports resulting from previous breeding and non-breeding bird surveys were reviewed for any relevant information that could be used to inform the current bird surveys:

- SLR (2020) Cush Wind Farm Breeding Bird Survey Report 2020.
- SLR (2022) Cush Wind Farm Winter Bird Survey Report 2020-2021.
- SLR (2022) Cush Wind Farm Breeding and Winter Bird Survey Report 2021-2022.
- SLR (2018) Cloghan Wind Farm and Long Oak Wind Farm Breeding Bird Survey Report 2018

The websites of the National Parks and Wildlife Service (NPWS)⁷, the UK and Ireland Bird Atlas 2007-2011⁸ and the National Biodiversity Data Centre (NBDC)⁹ were accessed for information on sites designated for nature conservation and notable bird species in the vicinity of the Project Site.

2.2 Field Survey Dates and Personnel

Surveys were undertaken by Jonathon Dunn (JD) PhD, Aisling Kinsella (AK) BSc (Hons) MSc, Darragh Nagle (DN) BSc (Hons), and Maeve Maher-McWilliams BSc (Hons) MSc.

Details of survey dates and times are provided in Appendix 02 and a record of weather conditions during surveys is provided in Appendix 03.

2.3 Flight Activity Surveys

VP locations, 2 km viewing arcs and viewsheds are shown in Appendix 01 **Figure 1**.

A total of 108 hours of flight activity surveys were conducted from all VP locations combined during the 2022 breeding season, as summarised in **Table 2-1**.

In order to avoid possible complications during any subsequent collision risk modelling, VP watches were timed such that surveys were not undertaken simultaneously from both VPs. This avoids double-counting birds and ensures that no disturbance is made to birds within viewsheds from presence of the observer.

VP watches aimed to quantify the flight activity of primary and secondary target species (as defined in Section 1.4) 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 Project Site;
- The relative use by birds of different parts of the Project Site;

⁷ www.npws.ie Accessed 16/10/2022

⁸ <https://app.bto.org/mapstore/StoreServlet> Accessed 16/10/2022

⁹ <http://maps.biodiversityireland.ie/#/Map> Accessed 16/10/2022

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

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

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

In the absence of detailed information regarding turbine specifications at the time of commencing surveys, a precautionary approach was taken in relation to recording height bands. For the 2022 breeding season, height bands were determined allowing for the maximum rotor tip height of 200 m and a lowest rotor swept height of 28 m. The relation of the height bands to the latest turbine specification is shown below.

Flight heights were attributed to four distinct height bands for the breeding season as follows:

- 1 = <25 m (below the likely rotor swept area);
- 2 = 25 m to 160 m (potentially within the likely rotor swept area, at least in part);
- 3 = 160 m to 200 m (within the likely rotor swept area); and
- 4 = >200 m (potentially within the likely rotor swept area, at least in part).

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 and around the Project Site, in accordance with current NS guidance.

Table 2-1
Summary of VP Surveys Undertaken during the Breeding Season 2022

Month	VP1 (hours)	VP2 (hours)	VP3 (hours)
May	12:00	12:00	12:00
June	12:00	12:00	12:00
July	6:00	6:00	6:00
August	6:00	6:00	6:00
Total hrs	36:00	36:00	36:00
VP locations ITM (Figure 1)	608735 E 710130 N	605883 N 709097 N	607798 E 711305 N

2.4 Breeding Wader Surveys

Breeding wader surveys followed the methodology described in O'Brien and Smith (1992)¹⁰. The survey involved a walked transect which covered all habitat potentially suitable for breeding waders within the Project Site.

There are large plantations of mature conifer forestry in the central, western, and southern areas of the Project Site. These habitats are not suitable for breeding waders¹¹ and so were excluded from the survey. There are some areas of recolonising cutover bog which were as considered suitable habitats for breeding waders. As such, transects were undertaken where habitats which are more suited to breeding waders. These transects are located in the western, eastern and northern sections of the Project Site where semi-natural and wet grassland fields are present and also, passing near to areas of recolonising cutover bog.

The transect route was repeated three times across the 2022 breeding season on 9th May, 17th May and 8th June.

The location, movement and behaviour of all wader species were recorded onto field maps using standard BTO species codes. The following criteria was recorded for each species:

- Northern lapwing *Vanellus vanellus* – the total numbers of birds seen from the transect;
- Common snipe *Gallinago gallinago* – the number of drumming plus chipping birds heard or seen from the transect; and
- Other species – the number of pairs (where 'pairs' = (paired individuals/2), displaying birds, nests or broods and other single birds not in flocks).

For birds to be considered as “confirmed breeding”, one or more of the following criteria needed to be met:

- They were observed displaying or singing on more than one visit;
- Nests, eggs, or young were located;
- Adults repeatedly alarm called;
- Distraction displays were seen; and/ or
- Territorial disputes were observed.

Birds were considered to be probably or possibly (i.e. unconfirmed) breeding if:

- They were observed displaying or singing on one visit (i.e. possibly breeding) or more than one visit (i.e. probably breeding) (with the exception of obvious passage migrants in spring); or
- A pair of birds was observed in suitable habitat for nesting.

Other records were considered to be of non-breeding birds, failed breeders, birds loafing, feeding or on passage to other areas.

Please see Appendix 01 **Figure 3** for an outline of the walked transect and Appendices 02 and 03 for metadata relating to these surveys.

¹⁰ O'Brien, M. and Smith, K. W. (1992) Changes in the status of waders breeding on wet lowland grasslands in England and Wales between 1982 and 1989, *Bird Study*, 39:3, 165-176

¹¹ Apart from potentially for woodcock, which were not the target of surveys here.

2.5 Breeding Raptor Surveys

The survey methodology for breeding raptors used was a driven transect with regular stops, to carry out watches of suitable habitat from appropriate viewpoints to identify potential nesting territories in suitable breeding habitat¹². The locations of these viewpoints are presented in Appendix 01 **Figure 4** together with the outline of the driven survey route and the results of the surveys.

A driven survey was used due to limitations to access to third party land within the 2 km buffer zone and the availability of a good road network in the vicinity of the Project Site. Visibility from the survey route was sufficient to cover the vast majority of potentially suitable breeding habitat within the survey area.

Survey timings followed NS guidelines. This survey was repeated along the same routes on once on 9th May, 17th May and 7th June, and twice on 14th July (dawn and dusk). An additional survey was undertaken on 2nd August at ██████████ Quarry (located 1 km south of the Project Site) to search for evidence of breeding peregrine falcon. Details of survey dates, times and observers are provided in Appendix 02 and a record of weather conditions during surveys is provided in Appendix 03.

The location, movement and behaviour of all raptor species observed were recorded onto the field maps using standard BTO species codes.

2.6 Survey Limitations

Regarding viewshed coverage of the 500 m Project Site infrastructure buffer, some gaps are apparent in the southwest of the Project Site; however, there is visibility of the 500 m buffer around all turbine locations (refer to Appendix 01 **Figure 1**). Overall, it is considered that the vantage point data are representative of the Project Site as a whole and sufficient to inform a robust assessment of the Project.

No surveys were completed in April 2022. However, the survey effort was doubled up in May and June, which ensured that the required number of surveys was completed before the end of the breeding season.

Most vantage point surveys were undertaken in optimal weather conditions. However, during such an extensive series of surveys carried out it was inevitable that some surveys were completed in suboptimal conditions. There were three hours out of the total of 108 during which the visibility was recorded as “moderate”, i.e. 1-3 km. This comprises 2.8% of the total survey effort but in almost all cases all the relevant 2 km viewing arc was visible, and this is not considered to significantly affect the validity of the data collected. There were no recorded hours of “poor” visibility during the surveys i.e., less than 1 km. Further details regarding weather conditions during surveys are provided in Appendix 02.

¹² Hardey, J., Crick, H.Q.P., Wernham, C., Riley, H., Etheridge, B., Thompson, D. (2013). Raptors: A field guide for surveys and monitoring (3rd Edition). The Stationery Office Edinburgh.

3.0 Results

3.1 Desk Based Results

The Project Site is not within or immediately adjacent to any SPA. However, there are a total of seven SPAs within a 20 km¹³ radius with details shown in **Table 3-1**.

The closest SPAs to the Project Site are Dovegrove Callows SPA (Site Code: 004137), River Little Brosna Callows SPA (Site Code: 004086) and All Saints Bog SPA (Site Code: 004103) at distances of 1.5 km, 3.1 km and 3.1 km, respectively. Dovegrove Callows SPA and All Saints Bog SPA are designated for the protection of wintering Greenland white-fronted geese *Anser albifrons flavirostris*, whereas the River Little Brosna Callows SPA is designated for several wintering gull, wader and wildfowl species.

Table 3-1
SPAs within 20 km of the Project Site and their Qualifying Interests (Species Present During the Breeding Season)

Site Name	Site Code	Distance/Direction from Site Boundary	Species of Special Conservation Interest Relevant to the Breeding Season
Dovegrove Callows SPA	004137	1.5 km southwest	<ul style="list-style-type: none"> N/A
All Saints Bog SPA	004103	3.1 km west	<ul style="list-style-type: none"> N/A
River Little Brosna Callows SPA	004086	3.1 km west	<ul style="list-style-type: none"> N/A
Middle Shannon Callows SPA	004096	6.6 km northwest	<ul style="list-style-type: none"> Corncrake <i>Crex crex</i> Northern lapwing
Slieve Bloom Mountains SPA	004160	11.7 km east	<ul style="list-style-type: none"> Hen harrier <i>Circus cyaneus</i>
River Suck Callows SPA	004097	17.3 km northwest	<ul style="list-style-type: none"> N/A
Lough Derg (Shannon) SPA	004058	17.5 km southwest	<ul style="list-style-type: none"> Great cormorant <i>Phalacrocorax carbo</i> Tufted duck <i>Aythya fuligula</i> Common tern <i>Sterna hirundo</i>

3.2 Breeding Season Flight Activity Surveys

Flight activity recorded from all VPs combined by primary target species is summarised in **Table 3-2**. Primary target species flights from both VPs are shown in Appendix 01 Figures **2.1** to **2.4**. Flight activity data are provided in more detail in Appendix 04 with full data retained in GIS and excel format for subsequent collision risk modelling.

¹³ A 20 km search radius was used as this represents the maximum core foraging distance used by Qualifying Interest species of SPAs in the UK and Ireland

3.2.1 Primary Target Species

A total of 459 flight lines by six primary target species were recorded between May and August 2022.

Table 3-2
Number of Primary Target Species Flights from All VPs Combined, May to August 2022

Species	Number of flight lines by month				Total number of flight lines	Time at risk height* (s)	Cumulative number of flights
	May	June	July	August			
Black-headed gull	129	60	3	0	192	5,310	470
Common kestrel <i>Falco tinnunculus</i>	16	35	9	6	66	6,480	66
Northern lapwing	62	44	24	1	131	1,575	224
Peregrine falcon	1	3	1	0	5	240	5
Common ringed plover <i>Charadrius hiaticula</i>	0	10	2	0	12	15	19
Common snipe	8	37	7	0	52	4,485	63
Total	216	189	46	7	458	18,105	847

* precautionary risk height assumed to be between 28 – 200 m

A summary description of flight activity by each species is presented below.

Black-Headed Gull

A total of 192 black-headed gull flight lines were recorded from May to July 2022, with a cumulative total of 470 flights. A total of 108 flight lines (56%) were recorded within potential collision risk heights. The highest number of flight lines was recorded in May, with numbers declining in later months. Most flight lines consisted of a small number of birds, but there were a few larger flocks recorded (up to 34 flights per flight line). Flight durations varied with a maximum duration of 480 seconds.

Common Kestrel

A total of 66 common kestrel flight lines were recorded during the flight activity surveys, with all observations consisting of a single bird. A total of 51 flight lines (77%) were recorded within potential collision risk heights. Flight durations varied with a maximum duration of 446 seconds.

Northern Lapwing

A total of 131 northern lapwing flight lines were recorded during the flight activity surveys, with a cumulative total of 224 flights. Most flight lines were recorded at VP3, which overlooks an area of cutover bog. The highest number of flight lines was recorded in May, with numbers declining in later months. Most flight lines consisted

of a single bird, but there were a few larger flocks recorded (up to 13 flights per flight line). A total of 25 flight lines (19%) were recorded within potential collision risk heights.

Peregrine Falcon

Five peregrine falcon flight lines were recorded from May to July 2022, with all observations consisting of a single bird. Four flight lines were recorded within potential collision risk heights, and all of these were observed from VP3.

Common Ringed Plover

A total of 12 common ringed plover flight lines were recorded during June and July 2022, with a cumulative total of 19 flights. All flight lines were recorded at VP3, and most flights were recorded in June. Only one flight line was recorded at potential collision risk height, and it consisted of two flights within the 500 m survey buffer. Most flight lines lasted less than 15 seconds, and the longest flight duration recorded was 25 seconds.

Common Snipe

A total of 52 common snipe flight lines were recorded from May to July 2022, with a cumulative total of 63 flights. The highest number of flight lines was recorded in June, and all flights were recorded from either VP1 or VP3. A total of 33 flight lines (63%) were recorded within potential collision risk heights. Flight durations varied with a maximum duration of 814 seconds.

3.2.2 Secondary Target Species

Secondary species activity at the Project Site is summarised in **Table 3-3**. There were 10 secondary species recorded throughout the season. Common buzzard was the most frequently recorded secondary species (in 204 five-minute periods out of a possible 1,296). The highest number of birds recorded in one observation was 19 mallards *Anas platyrhynchos*.

Table 3-3
Secondary Species Activity Summary for VP1 and VP2 Combined – May to August 2022

Species	Number of 5 min periods recorded	Peak count of birds recorded in any 5 min period	Comments
Common buzzard	204	4	Activity in all months, within the Project Site, survey buffer and beyond.
Common gull <i>Larus canus</i>	1	1	Activity in May only, within the Project Site.
Little egret <i>Egretta garzetta</i>	1	1	Activity in June only, within the Project Site.
Grey heron	15	3	Activity in all months, within the Project Site and survey buffer.
Great black-backed gull <i>Larus marinus</i>	3	2	Activity in August only, within the Project Site and survey buffer.
Common gull	1	5	Activity in August only, within the Project Site and survey buffer.

Species	Number of 5 min periods recorded	Peak count of birds recorded in any 5 min period	Comments
Herring gull <i>Larus argentatus</i>	15	8	Activity in all months, within the Project Site and survey buffer.
Lesser black-backed gull <i>Larus fuscus</i>	25	4	Activity in all months, within the Project Site and survey buffer.
Mallard	12	19	Activity in all months except July, within the Project Site, survey buffer and beyond.
Northern raven	43	4	Activity in all months, within the Project Site, survey buffer and beyond.
Eurasian sparrowhawk	9	1	Activity in all months, within the Project Site and survey buffer.

3.3 Breeding Wader Surveys

A total of three wader species were recorded during the breeding wader surveys. All wader observations were recorded during the two surveys in May.

Eurasian Curlew

Two observations of Eurasian curlew were made during the survey on 9th May. Two birds were recorded from the north transect within the Project Site, and one bird was recorded from the east transect in an agricultural field approximately 100 m from the site infrastructure. No evidence of breeding was recorded for this species.

Common Snipe

A single common snipe was recorded flying briefly over the survey area north-west of the Project Site on 17th May. No evidence of breeding was recorded for this species. No drumming behaviour was recorded during flight activity surveys.

Northern Lapwing

A probable northern lapwing territory was identified within 500 m survey buffer to the north of the Project Site, as evidenced by frequent flight activity and aggressive behaviour. A single bird was also observed flying further south.

Incidental Records of Other Species

No incidental records of non-target surveys were recorded during the breeding wader surveys.

3.4 Breeding Raptor Surveys

A total of four species of raptor were recorded during the targeted breeding raptor surveys.

Common Buzzard

There were 17 common buzzard observations made between May-July 2022, but no confirmed evidence of breeding was recorded during these months. Two possible territories were identified within 500 m of the Project Site in May. Three birds were observed circling over suitable nest habitat in July, but no nests or young birds were recorded.

Common Kestrel

Common kestrel was observed hunting during May-July 2022 on six occasions, but there was no evidence of breeding by this species within 2 km of the Project Site.

Peregrine Falcon

A single peregrine falcon was observed flying towards [REDACTED] Quarry in July 2022. During the survey at the quarry in August, one bird was recorded perched on a ledge. A possible nest site and several used roosts were also recorded.

Eurasian Sparrowhawk

A single Eurasian sparrowhawk was observed circling over woodland within 2 km of the Project Site, but there was no evidence of breeding by this species within 2 km of the Project Site.

Incidental Records of Other Species

Incidental records were made of sandwich tern *Sterna sandvicensis*, northern lapwing and little egret during the surveys in May. A barn owl *Tyto alba* was recorded hunting on 18th May during a bat activity transect undertaken after a breeding raptor survey.

4.0 Summary and Conclusions

Flight activity surveys (VPs), breeding wader and breeding raptor surveys were carried out at the Project Site during the breeding season in 2022.

The following primary target species were recorded during the breeding season flight activity surveys:

- Black-headed gull;
- Common kestrel;
- Northern lapwing;
- Peregrine falcon;
- Common ringed plover; and
- Common snipe.

Black-headed gull was the most frequently recorded species and the most numerous species, with a peak count of 34 flights being recorded in a single flight line.

Ten secondary target species were recorded during the breeding season: common buzzard, common gull, little egret, great black-backed gull, grey heron, herring gull, lesser black-backed gull, mallard, northern raven and Eurasian sparrowhawk.

Northern lapwing was probably breeding (as evidenced by a territory and aggressive behaviour) within 500 m of the Project Site in the same location where a nest and chicks were recorded previously. Common buzzards were suspected to breed (i.e. territories were present) within 500 m of the Project Site, and peregrine falcon were suspected to breed (one possible nest) in [REDACTED] Quarry located 1 km south of the Project Site.

Incidental records made of species of conservation concern during taxon-specific surveys included sandwich tern, little egret, northern lapwing and barn owl.

4.1 Legal and Conservation Status of Target Species Recorded

Table 4-1 summarises the legal and conservation status of the primary and secondary target species recorded during the range of ornithological surveys mentioned above. Note that all bird species in Ireland are afforded general protection by the Wildlife Acts 2000 (as amended).

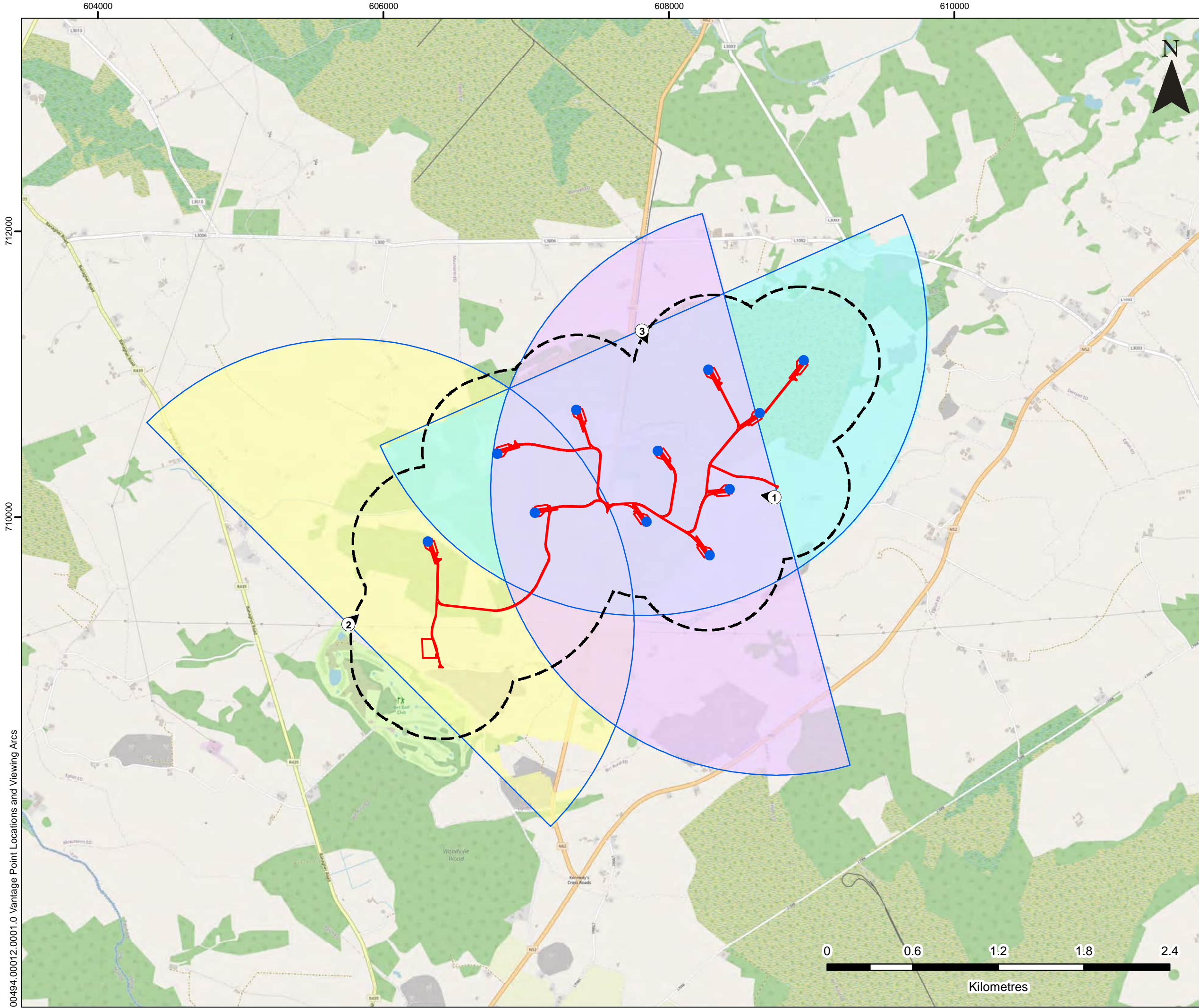
Table 4-1
Legal and Conservation Status of Target Species

Primary or Secondary Target	Species (BTO code)	Legal and Conservation status in Ireland
Primary	Black-headed gull (BH)	BoCCI4 Amber
	Common kestrel (K.)	BoCCI4 Red
	Northern lapwing (L.)	BoCCI4 Red
	Peregrine falcon (PE)	Annex 1, BoCCI4 Green
	Common ringed plover (RP)	BoCCI4 Amber
	Common snipe (SN)	BoCCI4 Red
Secondary	Common buzzard (BZ)	BoCCI4 Green
	Common gull (CM)	BoCCI4 Amber
	Little egret (ET)	Annex 1, BoCCI4 Green
	Great black-backed gull (GB)	BoCCI4 Green
	Grey heron (H.)	BoCCI4 Green
	Herring gull (HG)	BoCCI4 Amber
	Lesser black-backed gull (LB)	BoCCI4 Amber
	Mallard (MA)	BoCCI4 Amber
	Northern raven (RN)	BoCCI4 Green
	Eurasian sparrowhawk (SH)	BoCCI4 Green
Incidentals	Sandwich tern (TE)	Annex 1, BoCCI4 Amber
	Barn owl (BO)	BoCCI4 Red

Primary or Secondary Target	Species (BTO code)	Legal and Conservation status in Ireland
Key		Annex 1 – the species is listed in Annex 1 of the EC Birds Directive; and BoCCI4 status (green, amber or red) – indicates the current Birds of Conservation Concern in Ireland ⁵ status category.

APPENDIX 01

Figures



NOTES

The ZTV is calculated with a surface offset 28m & from a viewing height of 1.8m above ground level. The terrain model is derived from EU Copernicus 28 m data with a vertical accuracy of $\pm 7m$. The ZTV was calculated using ArcMAP 10.5.1 software

The analysis does not take into account the screening effects of vegetation, buildings or other screening features.

- LEGEND**
- Site Infrastructure
 - Site Infrastructure 500 m Buffer
 - Turbine Location
 - Vantage Point (VP)
 - VP 2 km Viewing Arc
 - Theoretical Visibility from VP 1
 - Theoretical Visibility from VP 3
 - Theoretical Visibility from VP 2



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**CUSH WIND FARM ORNITHOLOGY
BREEDING BIRD SURVEYS**

**VANTAGE POINT LOCATIONS AND
VIEWING ARCS**

FIGURE 1

Scale 1:25,000 @ A3 Date JANUARY 2023



00494.00012.0001.0 Vantage Point Locations and Viewing Arcs

604000

606000

608000

610000

712000

710000

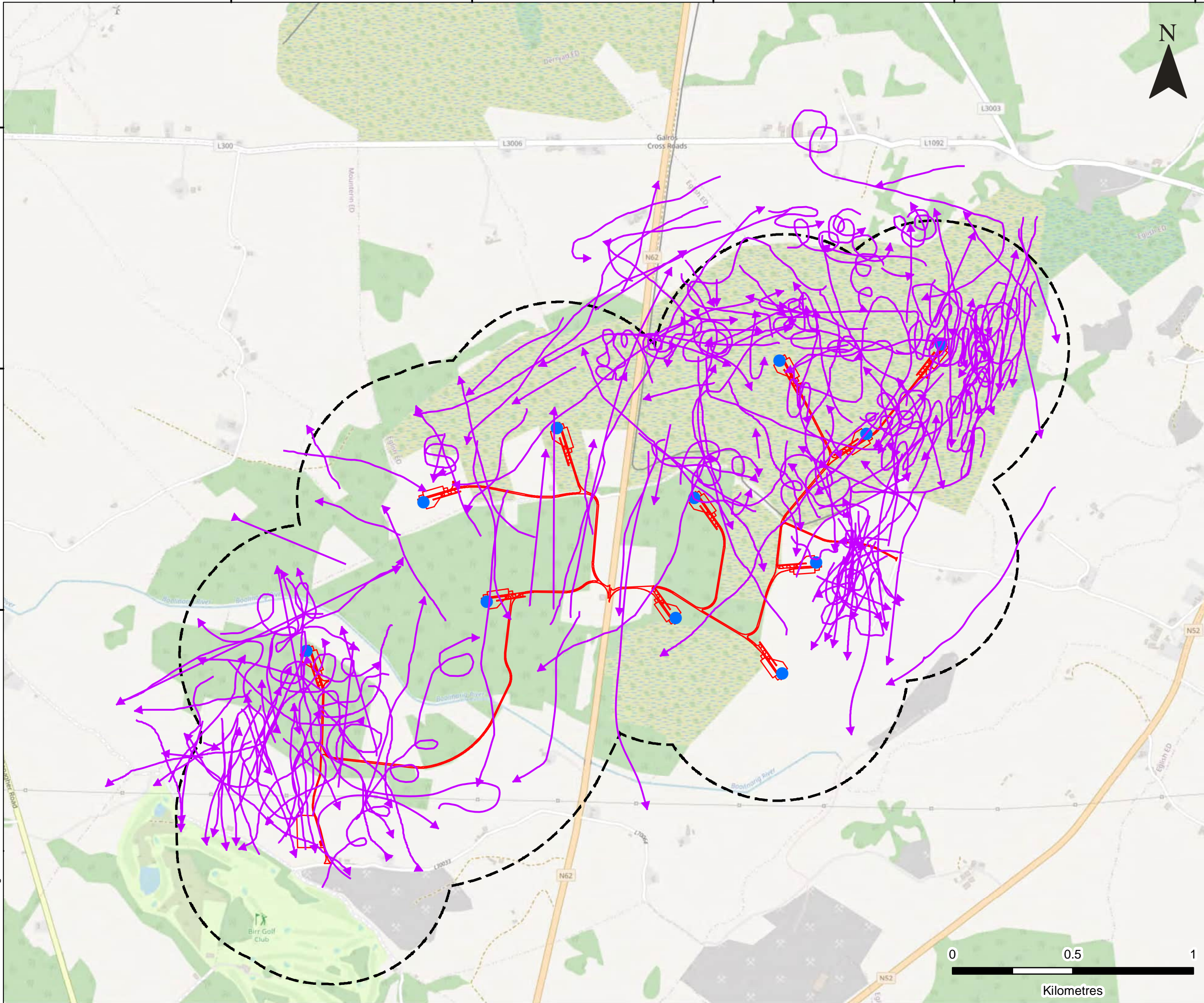
606000 607000 608000 609000 610000

712000

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710000

00494.00012.0004.0 VP Flightlines



LEGEND

- Site Infrastructure
- Site Infrastructure 500 m Buffer
- Turbine Locations
- Species Flightline**
- Black-headed Gull



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CUSH WIND FARM ORNITHOLOGY
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BLACK-HEADED GULL FLIGHTLINES

FIGURE 2.2

Scale 1:15,000 @ A3	Date JANUARY 2023
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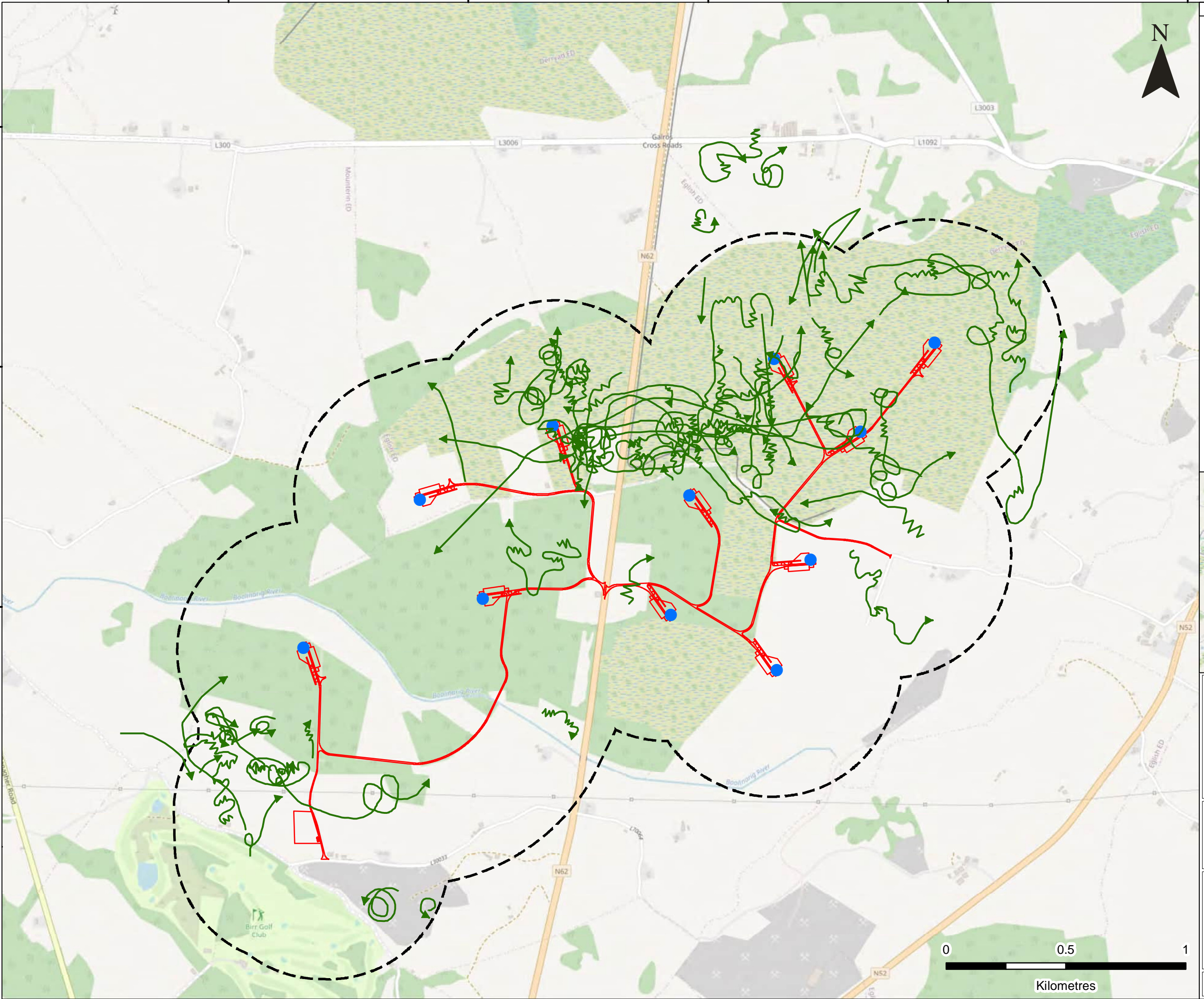
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00494.00012.0004.0 VP Flightlines



LEGEND

- Site Infrastructure
- Site Infrastructure 500 m Buffer
- Turbine Locations
- Species Flightline**
- Kestrel



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**CUSH WIND FARM ORNITHOLOGY
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KESTREL FLIGHTLINES

FIGURE 2.3

Scale 1:15,000 @ A3 Date JANUARY 2023



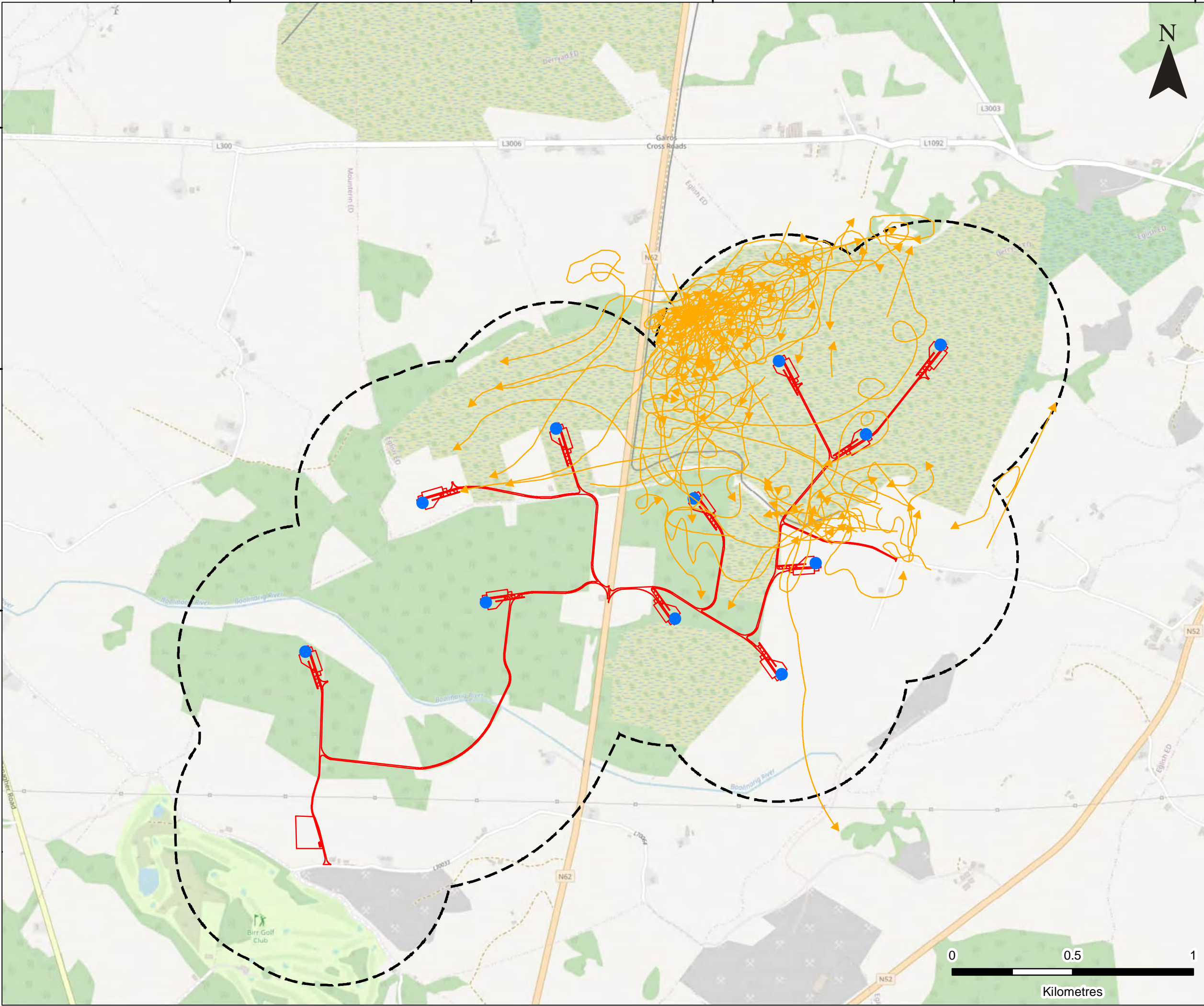
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00494.00012.0004.0 VP Flightlines



LEGEND

- Site Infrastructure
- Site Infrastructure 500 m Buffer
- Turbine Locations

Species Flightline

- Lapwing



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**CUSH WIND FARM ORNITHOLOGY
BREEDING BIRD SURVEYS 2022**

LAPWING FLIGHTLINES

FIGURE 2.4

Scale 1:15,000 @ A3 Date JANUARY 2023



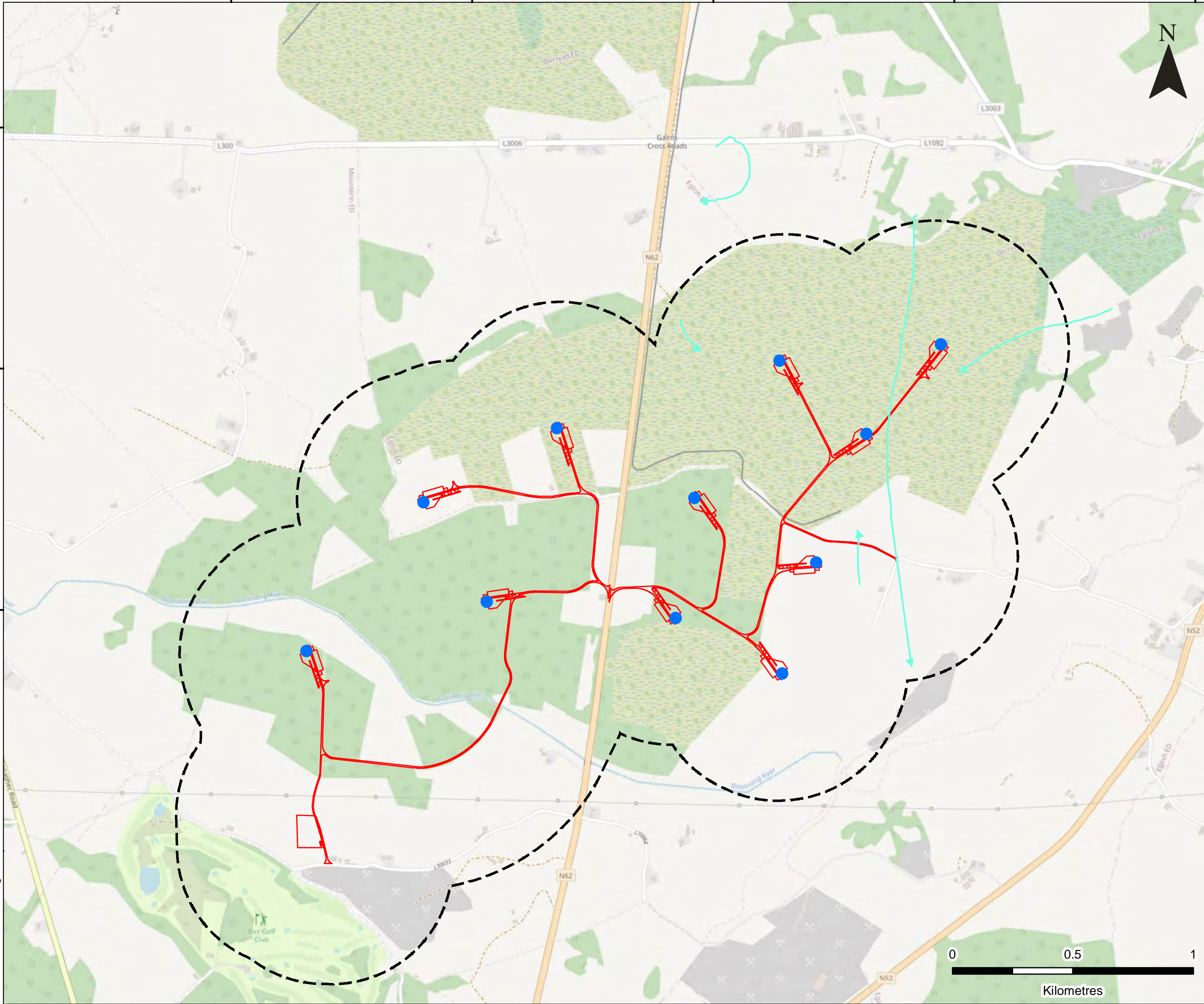
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712000

711000

710000

00494.00012.0004.0 VP Flightlines



LEGEND

- Site Infrastructure
- Site Infrastructure 500 m Buffer
- Turbine Locations

Species Flightline

- Peregrine



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**CUSH WIND FARM ORNITHOLOGY
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PEREGRINE FLIGHTLINES

FIGURE 2.6

Scale 1:15,000 @ A3	Date JANUARY 2023
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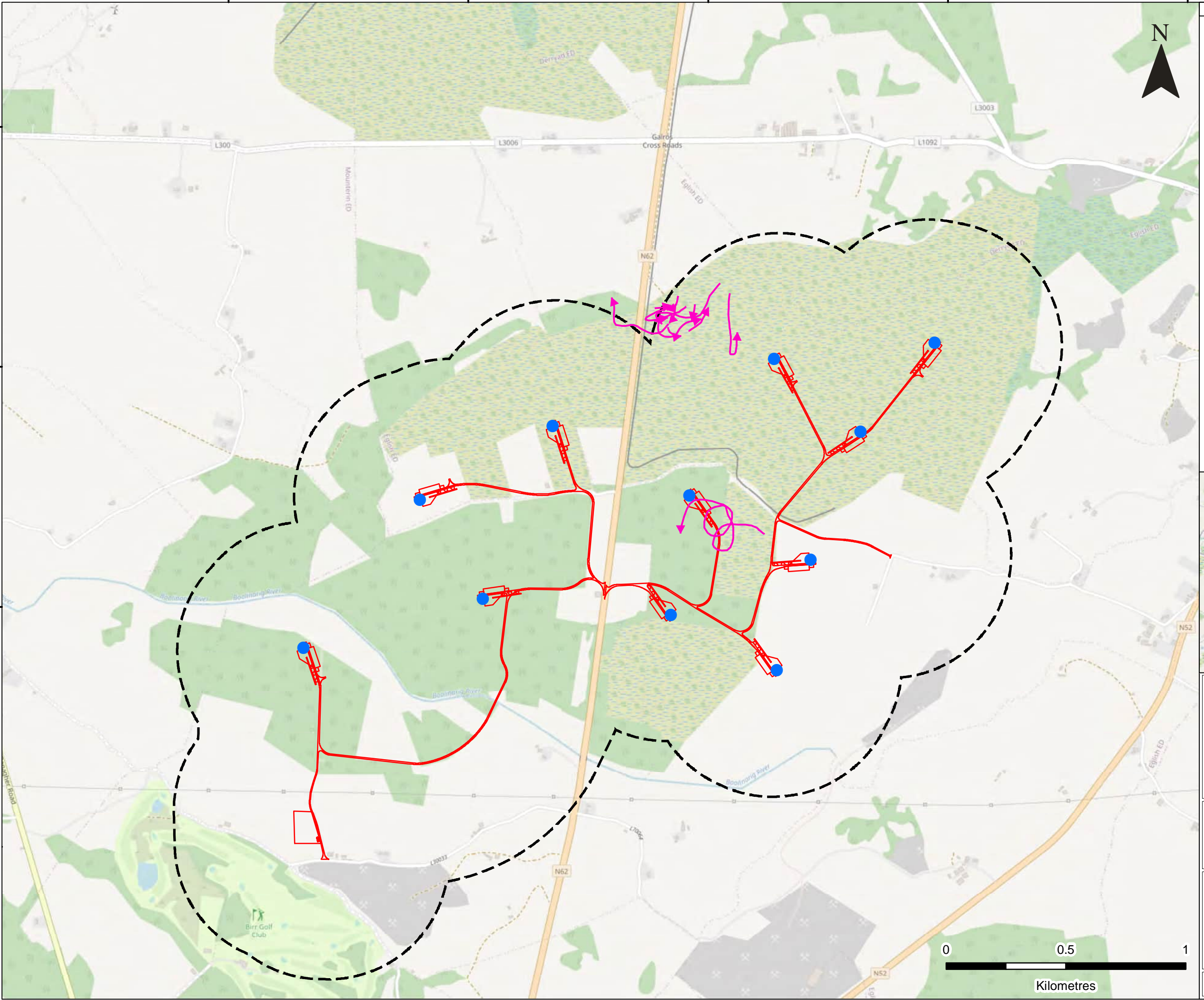
606000 607000 608000 609000 610000

712000

711000

710000

00494.00012.0004.0 VP Flightlines



LEGEND

- Site Infrastructure
- Site Infrastructure 500 m Buffer
- Turbine Locations

Species Flightline

- Ringed Plover



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**CUSH WIND FARM ORNITHOLOGY
BREEDING BIRD SURVEYS 2022
RINGED PLOVER FLIGHTLINES**

FIGURE 2.7

Scale	1:15,000 @ A3	Date	JANUARY 2023
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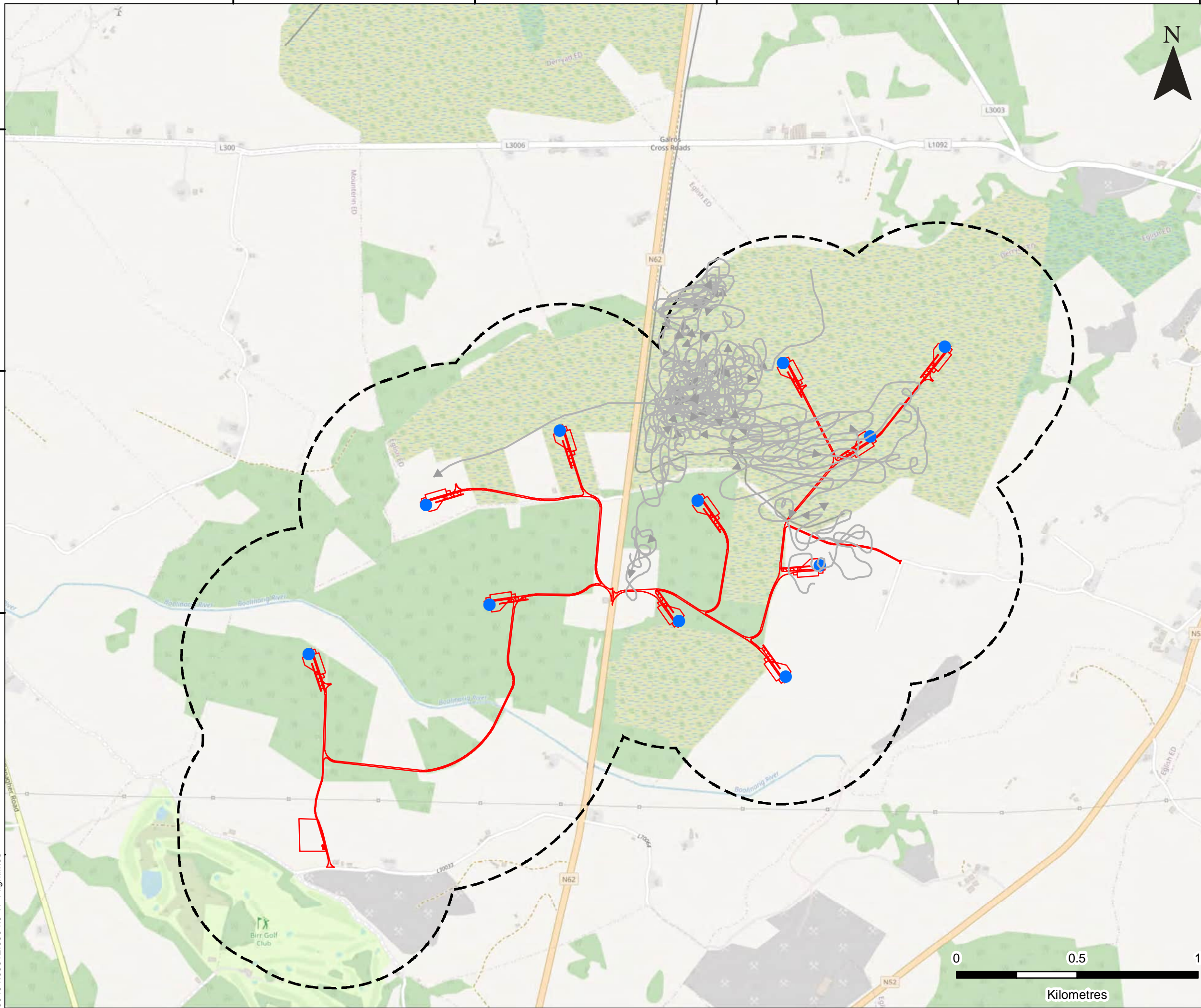
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00494.00012.0004.0 VP Flightlines



LEGEND

- Site Infrastructure
- Site Infrastructure 500 m Buffer
- Turbine Locations

Species Flightline

- Snipe



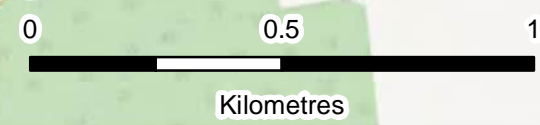
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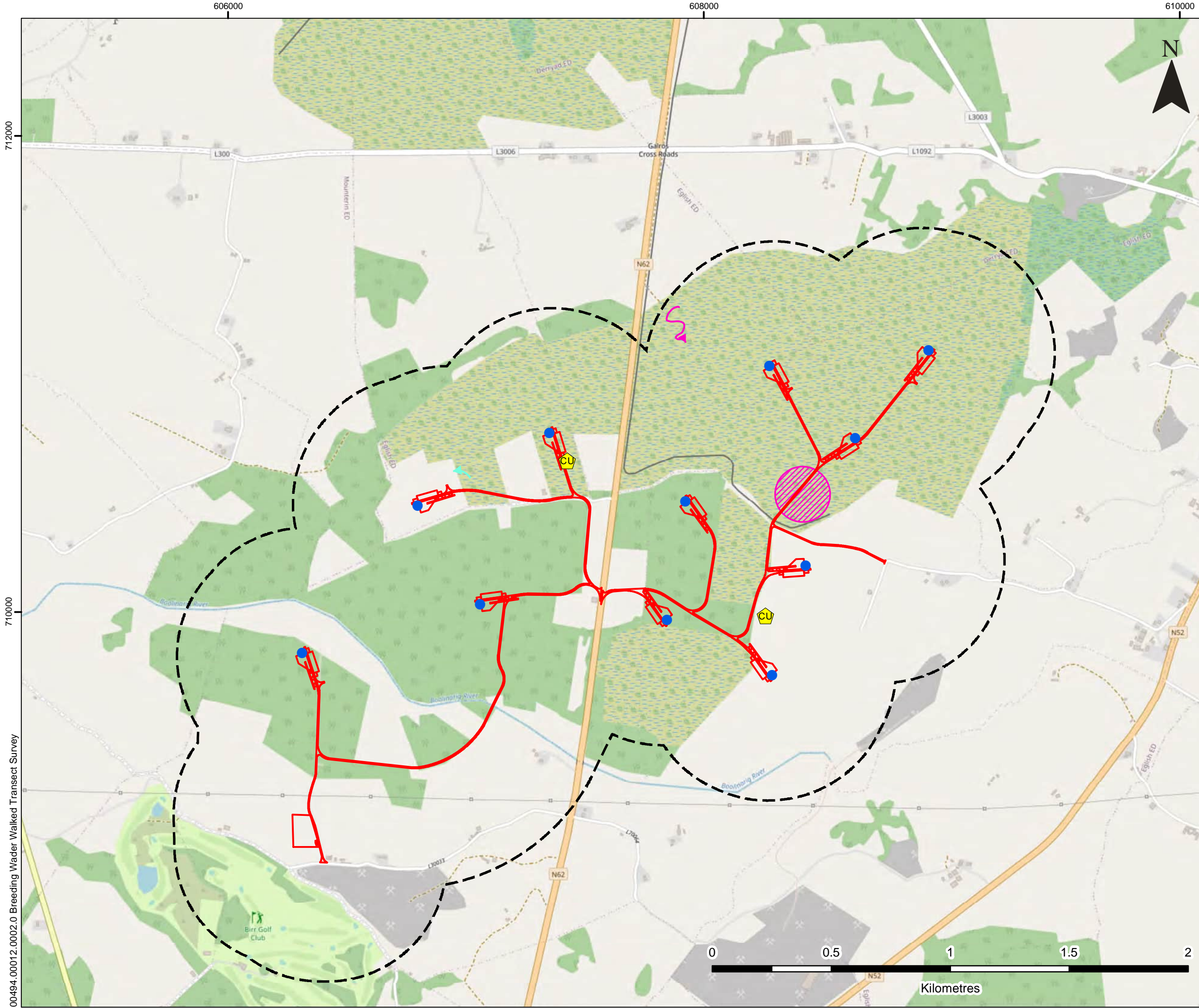
CUSH WIND FARM ORNITHOLOGY
BREEDING BIRD SURVEYS 2022

SNIPES FLIGHTLINES

FIGURE 2.8

Scale 1:15,000 @ A3 Date JANUARY 2023





LEGEND

- Site Infrastructure
- Site Infrastructure 500 m Buffer
- Turbine Location
- Wader Point**
- CU Curlew
- Wader Flight Line**
- Lapwing
- Snipe
- Lapwing Territory**
- Lapwing



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**CUSH WIND FARM ORNITHOLOGY
BREEDING BIRD SURVEYS
BREEDING WADER WALKED
TRANSECT SURVEY**

FIGURE 3
Scale 1:15,000 @ A3 Date JANUARY 2023



00494.00012.0002.0 Breeding Wader Walked Transect Survey

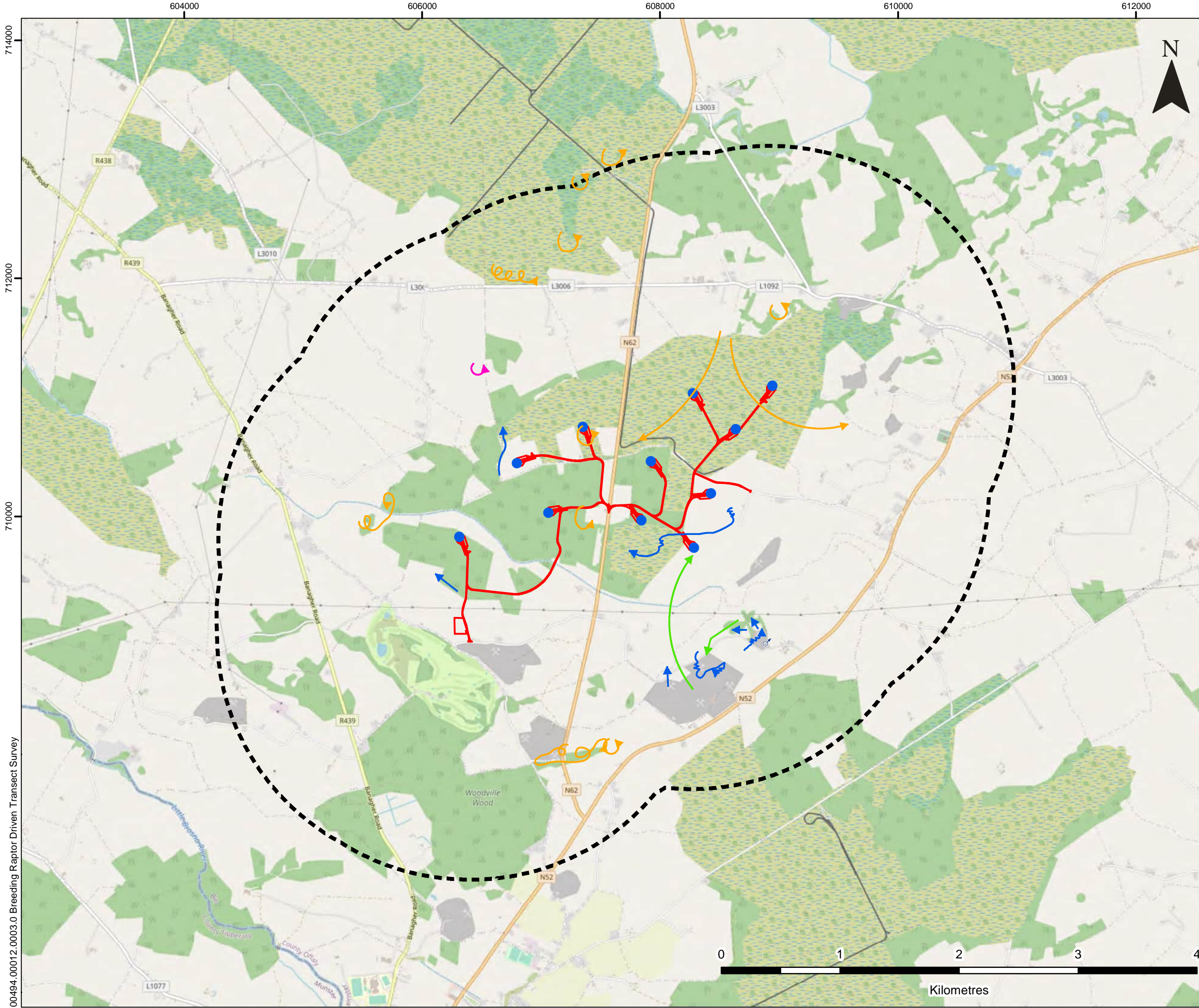
606000

608000

610000

712000

710000



LEGEND

- Site Infrastructure
- Site Infrastructure 2 km Buffer
- Turbine Location
- <all other values>

Species Code

- Buzzard
- Kestrel
- Peregrine
- Sparrowhawk

BTO Activity Code

- ♂ Male



SLR 7 DUNDRUM BUSINESS PARK
 WINDY ARBOUR
 DUBLIN D14 N2Y7
 IRELAND
 T: 0129 64667
 www.slrconsulting.com

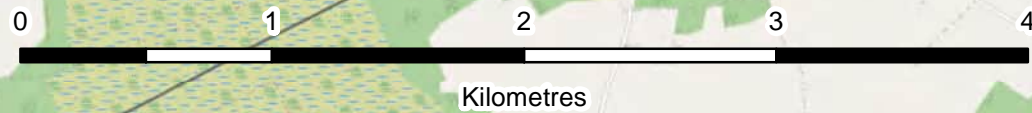
**CUSH WIND FARM ORNITHOLOGY
 BREEDING BIRD SURVEYS
 BREEDING RAPTOR DRIVEN
 TRANSECT SURVEY**

FIGURE 4
 Scale 1:30,000 @ A3 Date JANUARY 2023

00494.00012.0003.0 Breeding Raptor Driven Transect Survey

714000
712000
710000

604000 606000 608000 610000 612000



APPENDIX 02

Survey dates times and observers¹⁴

¹⁴ Surveyor initials are given in Section 2.2

Table A2-1
Details of VP Surveys Undertaken from Vantage Point 1

Date	Surveyor	Start time	End time	No. Hours
17/05/2022	JD	11:30	14:30	03:00
19/05/2022	AK	14:00	17:00	03:00
25/05/2022	MMW	14:15	17:15	03:00
26/05/2022	MMW	08:50	11:50	03:00
13/06/2022	MMW	19:00	22:00	03:00
15/06/2022	MMW	10:10	13:10	03:00
27/06/2022	MMW	15:15	18:15	03:00
29/06/2022	MMW	06:15	09:15	03:00
12/07/2022	MMW	12:50	15:50	03:00
13/07/2022	MMW	06:30	09:30	03:00
02/08/2022	MMW	18:30	21:30	03:00
03/08/2022	MMW	10:10	13:10	03:00
Total hours				36

Table A2-2
Details of VP Surveys Undertaken from Vantage Point 2

Date	Surveyor	Start time	End time	No. Hours
20/05/2022	JD	12:30	15:30	03:00
19/05/2022	AK	10:30	13:30	03:00
24/05/2022	MMW	14:20	17:20	03:00
25/05/2022	MMW	10:15	13:15	03:00
14/06/2022	MMW	15:10	18:10	03:00
15/06/2022	MMW	06:05	09:05	03:00
27/06/2022	MMW	19:00	22:00	03:00
28/06/2022	MMW	09:45	12:45	03:00
11/07/2022	MMW	12:30	15:30	03:00
13/07/2022	MMW	10:00	13:00	03:00
01/08/2022	MMW	17:30	20:30	03:00
02/08/2022	MMW	15:00	18:00	03:00
Total hours				36

Table A2-3
Details of VP Surveys Undertaken from Vantage Point 3

Date	Surveyor	Start time	End time	No. Hours
18/05/2022	JD	09:00	12:00	03:00
20/05/2022	JD	16:00	19:00	03:00
24/05/2022	MMW	10:15	13:15	03:00
26/05/2022	MMW	12:50	15:50	03:00
13/06/2022	MMW	15:30	18:30	03:00
14/06/2022	MMW	19:00	22:00	03:00
28/06/2022	MMW	06:10	09:10	03:00
29/06/2022	MMW	09:45	12:45	03:00
11/07/2022	MMW	16:00	19:00	03:00
12/07/2022	MMW	09:20	12:20	03:00
01/08/2022	MMW	11:30	14:30	03:00
03/08/2022	MMW	06:40	09:40	03:00
Total hours				36

Table A2-4
Details of Breeding Wader Surveys

Date	Surveyor	Start time	End time	No. Hours
09/05/2022	DN	18:00	21:00	03:00
17/05/2022	JD	18:30	21:30	03:00
08/06/2022	MMW	05:30	07:35	02:05
08/06/2022	MMW	20:00	20:55	00:55
08/06/2022	MMW	21:15	22:05	00:50
Total hours				09:50

Table A2-4
Details of Breeding Raptor Surveys

Date	Surveyor	Start time	End time	No. Hours
09/05/2022	DN	12:20	16:00	03:40
17/05/2022	JD	14:30	18:30	04:00
07/06/2022	MMW	10:15	14:30	04:15
14/07/2022	MMW	07:00	10:00	03:00
14/07/2022	MMW	17:00	22:00	05:00
02/08/2022	MMW	10:00	12:30	02:30
Total hours				22:25

APPENDIX 03

Weather data

Table A3-1
Weather Data Collected During Flight Activity Surveys Undertaken from VP1

Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)
17/05/2022	11:30	14:30	1	3	S	0	8	2	2	0	0	14
17/05/2022	11:30	14:30	2	2	S	0	8	2	2	0	0	13
17/05/2022	11:30	14:30	3	2	S	1	8	1	2	0	0	12
19/05/2022	14:00	17:00	1	3	SW	0	6	2	2	0	0	16
19/05/2022	14:00	17:00	2	3	SW	0	6	2	2	0	0	16
19/05/2022	14:00	17:00	3	4	SW	0	6	2	2	0	0	16
25/05/2022	14:15	17:15	1	5	SW	0	5	1	2	0	0	14
25/05/2022	14:15	17:15	2	5	SW	0	7	1	2	0	0	13
25/05/2022	14:15	17:15	3	4	SW	0	7	1	2	0	0	13
26/05/2022	08:50	11:50	1	4	SW	1	8	1	1	0	0	13
26/05/2022	08:50	11:50	2	4	SW	3	8	1	1	0	0	13
26/05/2022	08:50	11:50	3	5	SW	0	8	1	2	0	0	14
13/06/2022	19:00	22:00	1	2	SW	0	8	1	2	0	0	14
13/06/2022	19:00	22:00	2	2	SW	0	8	1	2	0	0	14

¹⁵ Key: None = 0; Drizzle = 1; Light showers/snow = 2; Heavy showers/snow = 3; Heavy rain/snow = 4.

¹⁶ Expressed in oktas (n/8)

¹⁷ Key: Height of cloud above average height of viewshed. <150m = 0; 150-500m = 1; >500m = 2.

¹⁸ Key: Poor (<1km) = 0; Moderate (1-3km) = 1; Good (>3km) = 2.

¹⁹ Key: Lying snow. None = 0; On site = 1; On higher ground = 2.

²⁰ Key: None = 0; Ground = 1; All day = 2.

Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)
13/06/2022	19:00	22:00	3	2	SW	0	7	1	2	0	0	13
15/06/2022	10:10	13:10	1	2	SE	0	5	2	2	0	0	17
15/06/2022	10:10	13:10	2	3	S	0	6	2	2	0	0	18
15/06/2022	10:10	13:10	3	2	S	0	4	2	2	0	0	19
27/06/2022	15:15	18:15	1	4	W	1	8	1	2	0	0	16
27/06/2022	15:15	18:15	2	4	W	0	8	1	2	0	0	16
27/06/2022	15:15	18:15	3	4	W	3	8	1	2	0	0	15
29/06/2022	06:15	09:15	1	2	S	0	3	2	2	0	0	12
29/06/2022	06:15	09:15	2	2	S	0	5	2	2	0	0	12
29/06/2022	06:15	09:15	3	2	S	0	7	1	2	0	0	13
12/07/2022	12:50	15:50	1	3	S	0	7	2	2	0	0	20
12/07/2022	12:50	15:50	2	2	S	0	7	2	2	0	0	20
12/07/2022	12:50	15:50	3	4	S	0	8	2	2	0	0	19
13/07/2022	06:30	09:30	1	3	SW	0	7	2	2	0	0	13
13/07/2022	06:30	09:30	2	2	SW	0	8	2	2	0	0	12
13/07/2022	06:30	09:30	3	2	SW	0	2	2	2	0	0	16
02/08/2022	18:30	21:30	1	5	SW	0	7	2	2	0	0	19
02/08/2022	18:30	21:30	2	4	SW	0	6	2	2	0	0	19
02/08/2022	18:30	21:30	3	4	SW	0	7	2	2	0	0	19
03/08/2022	10:10	13:10	1	3	SW	2	7	1	2	0	0	17
03/08/2022	10:10	13:10	2	4	SW	0	7	1	2	0	0	17
03/08/2022	10:10	13:10	3	3	SW	0	7	2	2	0	0	18

Table A3-2
Weather Data Collected During Flight Activity Surveys Undertaken from VP2

Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ²¹	Cloud Cover ²²	Cloud Height ²³	Visibility ²⁴	Snow ²⁵	Frost ²⁶	Temp (°c)
20/05/2022	12:30	15:30	1	3	SW	0	4	2	2	0	0	13
20/05/2022	12:30	15:30	2	3	SW	1	7	1	2	0	0	13
20/05/2022	12:30	15:30	3	3	SW	0	6	1	2	0	0	13
19/05/2022	10:30	13:30	1	3	SW	0	5	2	2	0	0	14
19/05/2022	10:30	13:30	2	3	SW	0	5	2	2	0	0	16
19/05/2022	10:30	13:30	3	3	SW	0	6	2	2	0	0	16
24/05/2022	14:20	17:20	1	3	SW	0	5	1	2	0	0	16
24/05/2022	14:20	17:20	2	3	SW	0	5	1	2	0	0	15
24/05/2022	14:20	17:20	3	3	SW	0	6	1	2	0	0	15
25/05/2022	10:15	13:15	1	5	SW	2	7	1	2	0	0	13
25/05/2022	10:15	13:15	2	5	SW	2	8	1	2	0	0	13
25/05/2022	10:15	13:15	3	5	SW	0	8	1	2	0	0	13
14/06/2022	15:10	18:10	1	2	SW	0	8	1	2	0	0	17
14/06/2022	15:10	18:10	2	2	SW	0	8	1	2	0	0	17

²¹ Key: None = 0; Drizzle = 1; Light showers/snow = 2; Heavy showers/snow = 3; Heavy rain/snow = 4.

²² Expressed in oktas (n/8)

²³ Key: Height of cloud above average height of viewshed. <150m = 0; 150-500m = 1; >500m = 2.

²⁴ Key: Poor (<1km) = 0; Moderate (1-3km) = 1; Good (>3km) = 2.

²⁵ Key: Lying snow. None = 0; On site = 1; On higher ground = 2.

²⁶ Key: None = 0; Ground = 1; All day = 2.

Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ²¹	Cloud Cover ²²	Cloud Height ²³	Visibility ²⁴	Snow ²⁵	Frost ²⁶	Temp (°c)
14/06/2022	15:10	18:10	3	1	SW	0	7	1	2	0	0	18
15/06/2022	06:05	09:05	1	0	n/a	0	7	2	2	0	0	10
15/06/2022	06:05	09:05	2	0	n/a	0	7	2	2	0	0	10
15/06/2022	06:05	09:05	3	1	S	0	8	2	2	0	0	10
27/06/2022	19:00	22:00	1	4	SW	0	8	1	2	0	0	13
27/06/2022	19:00	22:00	2	3	SW	3	8	1	2	0	0	13
27/06/2022	19:00	22:00	3	3	SW	2	8	1	2	0	0	12
28/06/2022	09:45	12:45	1	4	SW	0	7	1	2	0	0	16
28/06/2022	09:45	12:45	2	3	SW	0	7	1	2	0	0	16
28/06/2022	09:45	12:45	3	3	SW	3	8	1	2	0	0	16
11/07/2022	12:30	15:30	1	3	SW	0	7	2	2	0	0	22
11/07/2022	12:30	15:30	2	4	S	0	7	2	2	0	0	24
11/07/2022	12:30	15:30	3	3	S	0	5	2	2	0	0	24
13/07/2022	10:00	13:00	1	2	SW	0	4	2	2	0	0	17
13/07/2022	10:00	13:00	2	2	SW	0	2	2	2	0	0	18
13/07/2022	10:00	13:00	3	2	SW	0	3	2	2	0	0	19
01/08/2022	17:30	20:30	1	3	SW	0	8	2	2	0	0	19
01/08/2022	17:30	20:30	2	4	SW	2	8	2	2	0	0	19
01/08/2022	17:30	20:30	3	3	SW	3	8	1	1	0	0	19
02/08/2022	15:00	18:00	1	4	S	0	6	2	2	0	0	20
02/08/2022	15:00	18:00	2	5	S	0	5	2	2	0	0	18
02/08/2022	15:00	18:00	3	4	S	0	6	2	2	0	0	19

Table A3-3
Weather Data Collected During Flight Activity Surveys Undertaken from VP3

Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ²⁷	Cloud Cover ²⁸	Cloud Height ²⁹	Visibility ³⁰	Snow ³¹	Frost ³²	Temp (°c)
18/05/2022	09:00	12:00	1	4	S	0	4	2	2	0	0	12
18/05/2022	09:00	12:00	2	4	S	0	5	1	2	0	0	14
18/05/2022	09:00	12:00	3	4	S	0	7	1	2	0	0	15
20/05/2022	16:00	19:00	1	3	E	0	7	1	2	0	0	15
20/05/2022	16:00	19:00	2	3	NE	0	8	1	2	0	0	14
20/05/2022	16:00	19:00	3	3	NE	0	8	1	2	0	0	13
24/05/2022	10:15	13:15	1	2	NW	0	7	1	2	0	0	13
24/05/2022	10:15	13:15	2	3	NW	0	5	2	2	0	0	15
24/05/2022	10:15	13:15	3	3	NW	0	6	2	2	0	0	15
26/05/2022	12:50	15:50	1	4	SW	0	8	1	2	0	0	15
26/05/2022	12:50	15:50	2	4	SW	0	6	1	2	0	0	16
26/05/2022	12:50	15:50	3	4	SW	0	3	2	2	0	0	16
13/06/2022	15:30	18:30	1	2	SW	0	8	1	2	0	0	15
13/06/2022	15:30	18:30	2	2	SW	0	8	1	2	0	0	15

²⁷ Key: None = 0; Drizzle = 1; Light showers/snow = 2; Heavy showers/snow = 3; Heavy rain/snow = 4.

²⁸ Expressed in oktas (n/8)

²⁹ Key: Height of cloud above average height of viewshed. <150m = 0; 150-500m = 1; >500m = 2.

³⁰ Key: Poor (<1km) = 0; Moderate (1-3km) = 1; Good (>3km) = 2.

³¹ Key: Lying snow. None = 0; On site = 1; On higher ground = 2.

³² Key: None = 0; Ground = 1; All day = 2.

Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ²⁷	Cloud Cover ²⁸	Cloud Height ²⁹	Visibility ³⁰	Snow ³¹	Frost ³²	Temp (°c)
13/06/2022	15:30	18:30	3	3	SW	0	8	1	2	0	0	14
14/06/2022	19:00	22:00	1	1	SW	0	7	1	2	0	0	18
14/06/2022	19:00	22:00	2	1	SW	0	8	1	2	0	0	17
14/06/2022	19:00	22:00	3	1	SW	0	7	1	2	0	0	16
28/06/2022	06:10	09:10	1	4	S	2	8	1	2	0	0	13
28/06/2022	06:10	09:10	2	4	S	2	8	1	2	0	0	14
28/06/2022	06:10	09:10	3	4	S	3	7	1	2	0	0	14
29/06/2022	09:45	12:45	1	2	SW	0	8	1	2	0	0	14
29/06/2022	09:45	12:45	2	2	SW	3	8	1	2	0	0	17
29/06/2022	09:45	12:45	3	2	SW	0	8	1	2	0	0	18
11/07/2022	16:00	19:00	1	3	S	0	6	2	2	0	0	24
11/07/2022	16:00	19:00	2	4	S	0	7	2	2	0	0	23
11/07/2022	16:00	19:00	3	3	S	0	8	2	2	0	0	22
12/07/2022	09:20	12:20	1	2	S	0	6	2	2	0	0	18
12/07/2022	09:20	12:20	2	2	S	0	7	2	2	0	0	19
12/07/2022	09:20	12:20	3	3	SW	0	8	2	2	0	0	20
01/08/2022	11:30	14:30	1	3	SW	0	8	1	2	0	0	19
01/08/2022	11:30	14:30	2	4	SW	0	5	2	2	0	0	20
01/08/2022	11:30	14:30	3	4	SW	0	6	2	2	0	0	20
03/08/2022	06:40	09:40	1	4	SW	0	7	2	2	0	0	15
03/08/2022	06:40	09:40	2	4	SW	0	8	1	2	0	0	15
03/08/2022	06:40	09:40	3	3	SW	1	8	1	2	0	0	17

**Table A3-4
Weather During Breeding Wader Surveys**

Date	Start	End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)
09/05/2022	18:00	21:00	All	4	S	1	8	1	2	0	0	13
17/05/2022	18:30	21:30	1	2	S	0	7	1	2	0	0	14
17/05/2022	18:30	21:30	2	2	S	0	6	1	2	0	0	13
17/05/2022	18:30	21:30	3	2	S	0	6	1	2	0	0	12

**Table A3-4
Weather During Breeding Raptor Surveys**

Date	Start	End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)
09/05/2022	12:20	16:00	1	5	S	0	8	1	1	0	0	13
09/05/2022	12:20	16:00	2	4	S	0	8	2	2	0	0	13
09/05/2022	12:20	16:00	3	4	S	1	8	1	2	0	0	13
17/05/2022	1	3	S	1	8	1	2	0	0	12	1	3
17/05/2022	2	3	S	1	8	1	2	0	0	12	2	3
17/05/2022	3	3	S	2	8	1	2	0	0	12	3	3
17/05/2022	4	3	S	0	8	1	2	0	0	12	4	3
14/07/2022	07:00	10:00	All	3	SW	2	8	1	2	0	0	16
14/07/2022	17:00	22:00	All	3	S	0	8	2	2	0	0	23
02/08/2022	10:00	12:30	1	2	SW	1	8	1	2	0	0	17

APPENDIX 04

Flight activity survey data³³

³³ Surveyor initials are given in Section 2.2 and BTO code information is given in Section 4.1

Table A4-1
Primary target species recorded during flight activity surveys undertaken at VP1

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
17/05/2022	JD	1	BH	1	AD	U	11:51	45
17/05/2022	JD	2	BH	1	AD	U	11:55	10
17/05/2022	JD	3	BH	1	AD	U	12:00	15
17/05/2022	JD	4	L.	1	AD	U	12:04	80
17/05/2022	JD	5	BH	3	AD	U	12:13	90
17/05/2022	JD	6	L.	1	AD	U	12:36	80
17/05/2022	JD	7	BH	3	AD	U	12:36	45
17/05/2022	JD	8	BH	3	AD	U	12:49	25
17/05/2022	JD	9	BH	1	AD	U	13:08	100
19/05/2022	AK	1	BH	1	AD	U	14:21	20
19/05/2022	AK	2	BH	1	AD	U	14:30	5
19/05/2022	AK	3	BH	1	AD	U	14:43	20
19/05/2022	AK	4	BH	1	AD	U	14:48	43
19/05/2022	AK	5	L.	1	AD	U	14:54	5
19/05/2022	AK	6	BH	1	AD	U	14:56	45
19/05/2022	AK	7	BH	1	AD	U	15:03	9
19/05/2022	AK	8	BH	1	AD	U	15:07	25
19/05/2022	AK	9	L.	1	AD	U	15:13	12
19/05/2022	AK	10	BH	1	AD	U	15:18	28

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
19/05/2022	AK	11	MA	1	AD	U	15:32	15
19/05/2022	AK	12	BH	8	U	U	15:34	100
19/05/2022	AK	13	BH	3	AD	U	15:39	35
19/05/2022	AK	14	BH	1	AD	U	15:41	32
25/05/2022	MMW	1	BH	2	AD	U	14:27	87
25/05/2022	MMW	2	K.	1	AD	M	14:38	10
25/05/2022	MMW	3	K.	1	AD	M	14:41	171
25/05/2022	MMW	4	BH	2	AD	U	14:46	12
25/05/2022	MMW	5	BH	1	AD	U	14:57	66
25/05/2022	MMW	6	L.	1	AD	U	14:59	101
25/05/2022	MMW	7	BH	9	AD	U	15:28	18
25/05/2022	MMW	8	L.	1	AD	U	15:43	39
25/05/2022	MMW	9	L.	1	AD	U	15:47	5
25/05/2022	MMW	10	L.	1	AD	U	16:00	20
25/05/2022	MMW	11	BH	1	AD	U	16:00	30
25/05/2022	MMW	12	BH	3	AD	U	16:08	54
25/05/2022	MMW	13	BH	5	AD	U	16:36	15
25/05/2022	MMW	14	BH	10	AD	U	16:42	60
25/05/2022	MMW	15	BH	1	AD	U	16:52	19
25/05/2022	MMW	16	L.	1	AD	U	16:56	3
25/05/2022	MMW	17	BH	2	AD	U	17:03	30

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
25/05/2022	MMW	18	L.	1	AD	U	17:07	14
26/05/2022	MMW	1	K.	1	AD	M	08:52	72
26/05/2022	MMW	2	BH	1	AD	U	08:55	10
26/05/2022	MMW	3	L.	1	AD	U	09:08	22
26/05/2022	MMW	4	BH	3	AD	U	09:09	11
26/05/2022	MMW	5	L.	1	AD	U	09:09	29
26/05/2022	MMW	6	BH	1	AD	U	09:16	15
26/05/2022	MMW	7	BH	1	AD	U	09:17	23
26/05/2022	MMW	8	BH	1	AD	U	09:20	8
26/05/2022	MMW	9	BH	1	AD	U	09:23	46
26/05/2022	MMW	10	BH	1	AD	U	09:24	34
26/05/2022	MMW	11	BH	2	AD	U	09:29	52
26/05/2022	MMW	12	K.	1	AD	F	09:34	165
26/05/2022	MMW	13	SN	1	AD	U	09:46	39
26/05/2022	MMW	14	SN	1	AD	U	09:51	37
26/05/2022	MMW	15	SN	2	AD	U	09:54	14
26/05/2022	MMW	16	SN	2	AD	U	09:59	160
26/05/2022	MMW	17	BH	1	AD	U	10:00	33
26/05/2022	MMW	18	L.	1	AD	U	10:05	19
26/05/2022	MMW	19	SN	3	AD	U	10:40	56
26/05/2022	MMW	20	SN	1	AD	U	10:43	144

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
26/05/2022	MMW	21	L.	1	AD	U	10:45	17
26/05/2022	MMW	22	L.	3	AD	U	10:48	25
26/05/2022	MMW	23	SN	1	AD	U	10:56	110
26/05/2022	MMW	24	L.	1	AD	U	11:09	64
26/05/2022	MMW	25	L.	1	AD	U	11:27	68
26/05/2022	MMW	26	L.	1	AD	U	11:31	13
26/05/2022	MMW	27	BH	1	AD	U	11:35	5
26/05/2022	MMW	28	L.	1	AD	U	11:43	48
13/06/2022	MMW	1	L.	1	AD	U	19:22	35
13/06/2022	MMW	2	L.	3	AD	U	19:24	48
13/06/2022	MMW	3	L.	2	AD	U	19:25	74
13/06/2022	MMW	4	BH	1	AD	U	19:28	69
13/06/2022	MMW	5	SN	2	AD	U	19:31	421
13/06/2022	MMW	5	SN	2	AD	U	19:31	421
13/06/2022	MMW	6	L.	1	AD	U	19:44	5
13/06/2022	MMW	7	SN	1	AD	U	19:49	10
13/06/2022	MMW	8	SN	1	AD	U	19:55	151
13/06/2022	MMW	9	BH	1	AD	U	20:00	12
13/06/2022	MMW	10	SN	1	AD	U	20:02	337
13/06/2022	MMW	10	SN	1	AD	U	20:02	337
13/06/2022	MMW	11	K.	1	AD	F	20:11	169

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
13/06/2022	MMW	12	SN	1	AD	U	20:17	490
13/06/2022	MMW	12	SN	1	AD	U	20:17	490
13/06/2022	MMW	13	L.	1	AD	U	20:31	52
13/06/2022	MMW	14	BH	1	AD	U	20:39	17
13/06/2022	MMW	15	SN	1	AD	U	20:39	59
13/06/2022	MMW	16	BH	2	AD	U	20:47	64
13/06/2022	MMW	17	K.	1	AD	U	20:57	78
13/06/2022	MMW	18	L.	1	AD	U	21:09	6
13/06/2022	MMW	19	L.	1	AD	U	21:25	11
15/06/2022	MMW	1	L.	1	AD	U	10:48	12
15/06/2022	MMW	2	L.	2	AD	U	10:53	33
15/06/2022	MMW	3	K.	1	AD	U	11:09	255
15/06/2022	MMW	4	BH	2	AD	U	11:09	20
15/06/2022	MMW	5	BH	5	U	U	11:56	76
15/06/2022	MMW	6	BH	2	1st summer	U	12:00	48
15/06/2022	MMW	7	BH	1	AD	U	12:01	29
15/06/2022	MMW	8	BH	1	AD	U	12:16	17
15/06/2022	MMW	9	BH	2	AD	U	12:33	63
15/06/2022	MMW	10	K.	1	AD	U	12:40	91
15/06/2022	MMW	11	K.	1	AD	U	12:44	427
15/06/2022	MMW	11	K.	1	AD	U	12:44	427

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
15/06/2022	MMW	12	BH	2	AD	U	12:46	240
15/06/2022	MMW	13	BH	1	AD	U	13:01	56
27/06/2022	MMW	1	BH	1	AD	U	15:27	20
27/06/2022	MMW	2	L.	1	AD	U	15:39	99
27/06/2022	MMW	3	K.	1	AD	U	15:45	71
27/06/2022	MMW	4	K.	1	AD	U	15:49	24
27/06/2022	MMW	5	L.	2	AD	U	15:53	43
27/06/2022	MMW	6	BH	2	AD	U	16:02	36
27/06/2022	MMW	7	BH	3	AD	U	16:35	121
27/06/2022	MMW	8	BH	1	AD	U	16:45	19
27/06/2022	MMW	9	BH	1	AD	U	16:57	37
27/06/2022	MMW	10	BH	6	AD	U	18:00	16
27/06/2022	MMW	11	BH	1	AD	U	18:06	34
27/06/2022	MMW	12	BH	3	AD	U	18:11	75
29/06/2022	MMW	1	BH	2	AD	U	06:27	47
29/06/2022	MMW	2	SN	2	AD	U	06:31	29
29/06/2022	MMW	3	PE	1	AD	U	06:46	12
29/06/2022	MMW	4	SN	1	AD	U	06:50	16
29/06/2022	MMW	5	SN	1	AD	U	06:52	32
29/06/2022	MMW	6	BH	1	AD	U	06:56	186
29/06/2022	MMW	7	SN	2	AD	U	07:02	99

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
29/06/2022	MMW	8	SN	1	AD	U	07:14	15
29/06/2022	MMW	9	BH	1	AD	U	07:19	27
29/06/2022	MMW	10	SN	1	AD	U	07:23	114
29/06/2022	MMW	11	BH	1	AD	U	07:31	84
29/06/2022	MMW	12	BH	1	AD	U	08:04	29
29/06/2022	MMW	13	SN	1	AD	U	08:16	16
29/06/2022	MMW	14	SN	1	AD	U	08:20	143
29/06/2022	MMW	15	SN	1	AD	U	08:28	66
29/06/2022	MMW	16	L.	1	AD	U	08:30	79
29/06/2022	MMW	17	SN	2	AD	U	08:36	175
29/06/2022	MMW	18	SN	1	AD	U	08:43	121
29/06/2022	MMW	19	BH	1	AD	U	08:45	43
29/06/2022	MMW	20	SN	1	AD	U	08:57	26
29/06/2022	MMW	21	SN	2	AD	U	08:53	657
29/06/2022	MMW	21	SN	2	AD	U	08:53	657
29/06/2022	MMW	21	SN	2	AD	U	08:53	657
12/07/2022	MMW	1	K.	1	AD	U	13:14	71
12/07/2022	MMW	2	K.	1	AD	U	14:03	54
12/07/2022	MMW	3	L.	7	U	U	14:04	41
12/07/2022	MMW	4	K.	1	AD	M	14:12	168
12/07/2022	MMW	5	K.	1	AD	U	14:25	23

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
12/07/2022	MMW	6	L.	2	U	U	15:24	29
13/07/2022	MMW	1	L.	13	U	U	07:14	132
13/07/2022	MMW	2	L.	2	U	U	08:05	109
13/07/2022	MMW	3	L.	8	U	U	08:30	171
13/07/2022	MMW	4	BH	2	AD	U	09:25	51
03/08/2022	MMW	1	K.	1	U	U	11:46	35
03/08/2022	MMW	2	K.	1	U	U	11:46	30
03/08/2022	MMW	3	K.	1	AD	U	12:15	88
03/08/2022	MMW	4	K.	1	AD	M	12:40	142
03/08/2022	MMW	5	K.	1	AD	U	13:05	255
03/08/2022	MMW	5	K.	1	AD	U	14:05	255

Table A4-2
Primary target species recorded during flight activity surveys undertaken at VP2

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
20/05/2022	JD	1	BH	3	AD	U	14:00	75
20/05/2022	JD	2	BH	5	AD	U	14:22	140
19/05/2022	AK	1	BH	2	AD	U	10:42	55
19/05/2022	AK	2	BH	1	AD	U	10:46	80
19/05/2022	AK	3	BH	1	AD	U	11:13	35
19/05/2022	AK	4	BH	4	AD	U	11:23	83
19/05/2022	AK	5	BH	5	AD	U	11:43	20
19/05/2022	AK	6	BH	4	AD	U	11:50	114
19/05/2022	AK	7	BH	1	AD	U	11:53	27
19/05/2022	AK	8	BH	1	AD	U	12:12	55
19/05/2022	AK	9	BH	3	AD	U	12:15	20
19/05/2022	AK	10	K.	1	U	U	12:43	15
19/05/2022	AK	11	BH	2	AD	U	13:16	30
24/05/2022	MMW	1	BH	1	AD	U	15:05	28
24/05/2022	MMW	2	BH	1	AD	U	15:11	32
24/05/2022	MMW	3	BH	1	AD	U	15:18	125
24/05/2022	MMW	4	BH	1	AD	U	15:21	13
24/05/2022	MMW	5	BH	2	AD	U	15:35	34
24/05/2022	MMW	6	K.	1	AD	M	15:37	237

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
24/05/2022	MMW	7	K.	1	AD	U	15:52	6
24/05/2022	MMW	8	BH	1	AD	U	16:29	3
24/05/2022	MMW	9	BH	1	AD	U	16:34	31
24/05/2022	MMW	10	BH	1	AD	U	16:43	18
24/05/2022	MMW	11	BH	1	AD	U	16:52	5
25/05/2022	MMW	1	BH	1	AD	U	10:17	14
25/05/2022	MMW	2	BH	1	AD	U	10:29	6
25/05/2022	MMW	3	BH	1	AD	U	10:35	23
25/05/2022	MMW	4	BH	1	AD	U	10:46	33
25/05/2022	MMW	5	BH	9	AD	U	11:09	22
25/05/2022	MMW	6	BH	1	AD	U	11:49	5
25/05/2022	MMW	7	BH	1	AD	U	11:55	49
25/05/2022	MMW	8	BH	1	AD	U	12:08	11
25/05/2022	MMW	9	BH	2	AD	U	12:12	30
25/05/2022	MMW	10	BH	2	AD	U	12:17	31
25/05/2022	MMW	11	BH	1	AD	U	12:25	155
25/05/2022	MMW	12	BH	1	AD	U	12:29	51
25/05/2022	MMW	13	BH	2	AD	U	12:55	163
25/05/2022	MMW	14	BH	1	AD	U	13:06	14
25/05/2022	MMW	15	BH	1	AD	U	13:10	22
25/05/2022	MMW	16	BH	1	AD	U	13:12	9

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
14/06/2022	MMW	1	BH	1	AD	U	15:15	28
14/06/2022	MMW	2	BH	1	AD	U	15:55	21
14/06/2022	MMW	3	BH	3	AD	U	16:17	44
14/06/2022	MMW	4	BH	1	AD	U	16:46	47
14/06/2022	MMW	5	BH	1	AD	U	16:54	26
14/06/2022	MMW	6	BH	1	AD	U	17:00	60
14/06/2022	MMW	7	BH	1	AD	U	17:10	13
14/06/2022	MMW	8	K.	1	AD	U	17:13	144
14/06/2022	MMW	9	BH	1	AD	U	17:28	35
14/06/2022	MMW	10	BH	1	AD	U	17:54	45
14/06/2022	MMW	11	BH	1	AD	U	18:03	37
15/06/2022	MMW	1	BH	6	AD	U	06:09	121
15/06/2022	MMW	2	BH	3	AD	U	06:48	159
15/06/2022	MMW	3	BH	1	AD	U	07:04	58
15/06/2022	MMW	4	BH	2	AD	U	07:37	15
15/06/2022	MMW	5	K.	1	AD	M	07:49	46
15/06/2022	MMW	6	K.	1	AD	M	07:52	31
15/06/2022	MMW	7	K.	1	AD	U	08:03	10
15/06/2022	MMW	8	K.	1	AD	U	08:08	6
15/06/2022	MMW	9	BH	1	AD	U	08:39	14
27/06/2022	MMW	1	K.	1	AD	U	19:36	58

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
27/06/2022	MMW	2	BH	1	AD	U	20:10	63
27/06/2022	MMW	3	K.	1	AD	U	20:29	11
27/06/2022	MMW	4	BH	2	AD	U	21:13	32
28/06/2022	MMW	1	BH	1	AD	U	10:03	31
28/06/2022	MMW	2	K.	1	AD	U	10:22	19
28/06/2022	MMW	3	BH	1	AD	U	11:29	34
28/06/2022	MMW	4	BH	3	AD	U	12:05	97
11/07/2022	MMW	1	K.	1	AD	U	13:01	26
11/07/2022	MMW	2	BH	7	AD	U	15:02	23
13/07/2022	MMW	1	BH	1	AD	U	10:38	61
13/07/2022	MMW	2	K.	1	AD	M	12:34	437
13/07/2022	MMW	2	K.	1	AD	M	12:34	437
13/07/2022	MMW	3	K.	1	AD	U	12:44	29
02/08/2022	MMW	1	K.	1	AD	U	15:52	14

Table A4-3
Primary target species recorded during flight activity surveys undertaken at VP3

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
18/05/2022	JD	1	K.	1	U	U	09:00	90
18/05/2022	JD	2	K.	1	U	U	09:04	60
18/05/2022	JD	3	BH	2	AD	U	09:14	120
18/05/2022	JD	4	K.	1	AD	M	09:27	45
18/05/2022	JD	5	PE	1	AD	M	09:27	30
18/05/2022	JD	6	BH	2	AD	U	09:33	87
18/05/2022	JD	7	BH	1	AD	U	09:47	10
18/05/2022	JD	8	BH	1	AD	U	10:11	48
18/05/2022	JD	9	BH	3	AD	U	10:55	25
18/05/2022	JD	10	BH	2	AD	U	11:47	5
20/05/2022	JD	1	L.	2	AD	U	16:00	10
20/05/2022	JD	2	L.	1	AD	U	16:05	10
20/05/2022	JD	3	BH	1	AD	U	16:05	20
20/05/2022	JD	4	L.	3	AD	U	16:38	30
20/05/2022	JD	5	L.	2	AD	U	16:40	20
20/05/2022	JD	6	BH	7	AD	U	16:40	120
20/05/2022	JD	7	BH	2	AD	U	16:40	20
20/05/2022	JD	8	L.	2	AD	U	17:00	20

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
20/05/2022	JD	9	L.	2	AD	U	17:00	60
20/05/2022	JD	10	L.	2	AD	U	17:05	240
20/05/2022	JD	11	BH	2	AD	U	18:00	35
24/05/2022	MMW	1	L.	1	AD	U	10:18	12
24/05/2022	MMW	2	L.	1	AD	U	10:19	29
24/05/2022	MMW	3	L.	1	AD	U	10:20	3
24/05/2022	MMW	4	L.	1	AD	U	10:22	55
24/05/2022	MMW	5	L.	1	AD	U	10:24	34
24/05/2022	MMW	6	L.	1	AD	U	10:28	22
24/05/2022	MMW	7	L.	1	AD	U	10:31	17
24/05/2022	MMW	8	L.	1	AD	U	10:33	9
24/05/2022	MMW	9	L.	1	AD	U	10:36	6
24/05/2022	MMW	10	L.	1	AD	U	10:39	11
24/05/2022	MMW	11	L.	1	AD	U	10:43	27
24/05/2022	MMW	12	L.	1	AD	U	10:45	51
24/05/2022	MMW	13	L.	1	AD	U	10:48	3
24/05/2022	MMW	14	L.	1	AD	U	10:57	39
24/05/2022	MMW	15	BH	2	AD	U	10:57	480
24/05/2022	MMW	15	BH	2	AD	U	10:57	480
24/05/2022	MMW	16	L.	1	AD	U	10:56	42
24/05/2022	MMW	17	BH	2	AD	U	11:00	36

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
24/05/2022	MMW	18	L.	1	AD	U	11:00	49
24/05/2022	MMW	19	BH	1	AD	U	11:02	66
24/05/2022	MMW	20	L.	1	AD	U	11:03	5
24/05/2022	MMW	21	BH	3	AD	U	11:07	92
24/05/2022	MMW	22	BH	4	AD	U	11:10	59
24/05/2022	MMW	23	L.	1	AD	U	11:11	13
24/05/2022	MMW	24	BH	2	AD	U	11:12	4
24/05/2022	MMW	25	L.	1	AD	U	11:13	2
24/05/2022	MMW	26	BH	5	AD	U	11:16	57
24/05/2022	MMW	27	L.	1	AD	U	11:17	27
24/05/2022	MMW	28	BH	1	AD	U	11:18	78
24/05/2022	MMW	29	BH	4	AD	U	11:18	65
24/05/2022	MMW	30	BH	3	AD	U	11:22	44
24/05/2022	MMW	31	L.	2	AD	U	11:22	38
24/05/2022	MMW	32	L.	1	AD	U	11:23	24
24/05/2022	MMW	33	L.	1	AD	U	11:29	55
24/05/2022	MMW	34	L.	1	AD	U	11:32	27
24/05/2022	MMW	35	BH	1	AD	U	11:33	12
24/05/2022	MMW	36	BH	1	AD	U	11:34	33
24/05/2022	MMW	37	BH	2	AD	U	11:38	64
24/05/2022	MMW	38	BH	3	AD	U	11:43	22

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
24/05/2022	MMW	39	BH	4	AD	U	11:47	73
24/05/2022	MMW	40	L.	1	AD	U	11:56	26
24/05/2022	MMW	41	BH	4	AD	U	12:02	31
24/05/2022	MMW	42	BH	2	AD	U	12:03	7
24/05/2022	MMW	43	L.	1	AD	U	12:04	18
24/05/2022	MMW	44	L.	1	AD	U	12:08	13
24/05/2022	MMW	45	BH	1	AD	U	12:09	129
24/05/2022	MMW	46	BH	2	AD	U	12:17	55
24/05/2022	MMW	47	BH	3	AD	U	12:28	156
24/05/2022	MMW	48	BH	7	AD	U	12:33	242
24/05/2022	MMW	49	L.	1	AD	U	12:34	11
24/05/2022	MMW	50	BH	2	AD	U	12:37	63
24/05/2022	MMW	51	BH	2	AD	U	12:43	30
24/05/2022	MMW	52	BH	1	AD	U	12:52	44
24/05/2022	MMW	53	BH	1	AD	U	12:58	28
24/05/2022	MMW	54	BH	1	AD	U	13:02	71
24/05/2022	MMW	55	L.	1	AD	U	13:05	23
24/05/2022	MMW	56	BH	1	AD	U	13:06	49
26/05/2022	MMW	1	BH	3	AD	U	12:57	48
26/05/2022	MMW	2	SN	1	AD	U	12:57	3
26/05/2022	MMW	3	BH	22	U	U	13:06	91

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
26/05/2022	MMW	4	K.	1	AD	U	13:12	47
26/05/2022	MMW	5	BH	2	AD	U	13:16	19
26/05/2022	MMW	6	L.	2	AD	U	13:21	142
26/05/2022	MMW	7	L.	1	AD	U	13:30	54
26/05/2022	MMW	8	L.	1	AD	U	13:31	16
26/05/2022	MMW	9	BH	3	AD	U	13:34	33
26/05/2022	MMW	10	K.	1	AD	U	13:36	11
26/05/2022	MMW	11	BH	1	AD	U	13:41	18
26/05/2022	MMW	12	L.	1	AD	U	13:45	27
26/05/2022	MMW	13	K.	1	AD	U	13:46	45
26/05/2022	MMW	14	BH	34	AD	U	13:50	44
26/05/2022	MMW	15	BH	1	AD	U	13:53	10
26/05/2022	MMW	16	BH	1	AD	U	13:58	13
26/05/2022	MMW	17	BH	1	AD	U	14:00	35
26/05/2022	MMW	18	BH	1	AD	U	14:07	22
26/05/2022	MMW	19	K.	1	AD	F	14:15	81
26/05/2022	MMW	20	K.	1	AD	F	14:21	367
26/05/2022	MMW	20	K.	1	AD	F	14:21	367
26/05/2022	MMW	21	L.	1	AD	U	14:27	3
26/05/2022	MMW	22	K.	1	AD	F	14:28	42
26/05/2022	MMW	23	L.	1	AD	U	14:28	17

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
26/05/2022	MMW	24	BH	2	AD	U	14:36	48
26/05/2022	MMW	25	BH	9	AD	U	14:39	63
26/05/2022	MMW	26	BH	8	AD	U	14:53	65
26/05/2022	MMW	27	BH	31	AD	U	15:07	61
26/05/2022	MMW	28	L.	1	AD	U	15:16	19
26/05/2022	MMW	29	BH	1	AD	U	15:27	50
26/05/2022	MMW	30	BH	1	AD	U	15:38	34
26/05/2022	MMW	31	BH	2	AD	U	15:49	48
13/06/2022	MMW	1	K.	1	AD	F	15:55	143
13/06/2022	MMW	2	K.	1	AD	F	16:08	237
13/06/2022	MMW	2	K.	1	AD	F	16:08	237
13/06/2022	MMW	3	K.	1	AD	F	16:13	8
13/06/2022	MMW	4	SN	1	AD	U	16:26	3
13/06/2022	MMW	5	BH	1	AD	U	16:28	29
13/06/2022	MMW	6	RP	1	AD	U	16:33	8
13/06/2022	MMW	7	PE	1	AD	U	16:43	55
13/06/2022	MMW	8	PE	1	AD	U	17:00	61
13/06/2022	MMW	9	BH	1	AD	U	17:10	42
13/06/2022	MMW	10	BH	1	AD	U	17:28	44
13/06/2022	MMW	11	BH	1	AD	U	17:32	10
13/06/2022	MMW	12	K.	1	AD	F	17:34	5

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
13/06/2022	MMW	13	K.	1	AD	M	17:35	9
13/06/2022	MMW	14	K.	1	AD	F	17:35	3
13/06/2022	MMW	15	BH	1	AD	U	17:37	16
13/06/2022	MMW	16	SN	1	AD	U	17:46	130
13/06/2022	MMW	17	SN	1	AD	U	17:55	73
13/06/2022	MMW	18	SN	2	AD	U	17:58	249
13/06/2022	MMW	19	L.	1	AD	U	18:15	16
13/06/2022	MMW	20	SN	1	AD	U	18:17	28
13/06/2022	MMW	21	K.	1	AD	F	18:25	293
14/06/2022	MMW	1	K.	1	AD	F	19:04	6
14/06/2022	MMW	2	SN	1	AD	U	19:10	10
14/06/2022	MMW	3	RP	1	AD	U	19:12	3
14/06/2022	MMW	4	SN	1	AD	U	19:19	34
14/06/2022	MMW	5	SN	1	AD	U	19:21	4
14/06/2022	MMW	6	BH	2	AD	U	19:22	52
14/06/2022	MMW	7	SN	1	AD	U	19:29	4
14/06/2022	MMW	8	K.	1	AD	U	19:32	267
14/06/2022	MMW	9	K.	1	AD	F	19:38	159
14/06/2022	MMW	10	K.	1	AD	F	19:41	446
14/06/2022	MMW	10	K.	1	AD	F	19:41	446
14/06/2022	MMW	11	K.	1	AD	U	19:48	5

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
14/06/2022	MMW	12	BH	1	AD	U	19:52	18
14/06/2022	MMW	13	L.	1	AD	U	19:58	31
14/06/2022	MMW	14	K.	1	AD	M	19:59	289
14/06/2022	MMW	15	SN	1	AD	U	20:01	10
14/06/2022	MMW	16	L.	1	AD	U	20:10	36
14/06/2022	MMW	17	K.	1	AD	F	20:13	257
14/06/2022	MMW	18	BH	1	AD	U	20:17	5
14/06/2022	MMW	19	L.	1	AD	U	20:17	46
14/06/2022	MMW	20	K.	1	AD	U	20:31	207
14/06/2022	MMW	21	K.	1	AD	U (M?)	20:37	33
14/06/2022	MMW	22	BH	1	AD	U	20:45	74
14/06/2022	MMW	23	BH	2	AD	U	20:58	25
14/06/2022	MMW	24	BH	2	AD	U	21:02	22
28/06/2022	MMW	1	L.	2	AD	U	06:19	43
28/06/2022	MMW	2	RP	2	AD	U	06:20	5
28/06/2022	MMW	3	L.	1	AD	U	06:22	11
28/06/2022	MMW	4	L.	1	AD	U	06:27	46
28/06/2022	MMW	5	L.	1	AD	U	06:30	15
28/06/2022	MMW	6	L.	2	AD	U	06:31	50
28/06/2022	MMW	7	RP	1	AD	U	06:31	5
28/06/2022	MMW	8	L.	1	AD	U	06:33	17

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
28/06/2022	MMW	9	RP	2	AD	U	06:33	10
28/06/2022	MMW	10	L.	3	AD	U	06:37	63
28/06/2022	MMW	11	L.	11	U	U	06:43	88
28/06/2022	MMW	12	L.	1	AD	U	06:48	12
28/06/2022	MMW	13	RP	3	AD	U	06:57	16
28/06/2022	MMW	14	SN	1	AD	U	06:58	54
28/06/2022	MMW	15	L.	1	AD	U	07:16	28
28/06/2022	MMW	16	SN	1	AD	U	07:24	7
28/06/2022	MMW	17	L.	1	AD	U	07:35	5
28/06/2022	MMW	18	RP	2	AD	U	07:35	15
28/06/2022	MMW	19	L.	1	AD	U	07:41	12
28/06/2022	MMW	20	BH	2	AD	U	07:42	31
28/06/2022	MMW	21	SN	1	AD	U	07:46	78
28/06/2022	MMW	22	SN	1	AD	U	07:50	33
28/06/2022	MMW	23	K.	1	AD	U	07:57	232
28/06/2022	MMW	24	SN	1	AD	U	07:57	27
28/06/2022	MMW	25	L.	1	U	U	08:10	6
28/06/2022	MMW	26	SN	1	AD	U	08:16	237
28/06/2022	MMW	27	SN	1	AD	U	08:26	74
28/06/2022	MMW	28	L.	1	U	U	08:27	43
28/06/2022	MMW	29	L.	1	AD	U	08:33	11

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
28/06/2022	MMW	30	L.	1	AD	U	08:37	34
28/06/2022	MMW	31	BH	1	AD	U	08:48	44
28/06/2022	MMW	32	RP	1	AD	U	08:57	10
28/06/2022	MMW	33	SN	1	AD	U	09:05	17
29/06/2022	MMW	1	L.	1	AD	U	09:47	40
29/06/2022	MMW	2	L.	1	AD	U	09:59	11
29/06/2022	MMW	3	L.	1	AD	U	10:18	6
29/06/2022	MMW	4	L.	1	AD	U	10:37	5
29/06/2022	MMW	5	L.	1	AD	U	10:42	34
29/06/2022	MMW	6	L.	2	AD	U	10:48	26
29/06/2022	MMW	7	RP	1	AD	U	10:50	3
29/06/2022	MMW	8	L.	1	AD	U	10:50	5
29/06/2022	MMW	9	L.	2	AD	U	10:58	21
29/06/2022	MMW	10	RP	1	AD	U	11:03	6
29/06/2022	MMW	11	L.	1	AD	U	11:04	17
29/06/2022	MMW	12	L.	3	AD	U	11:06	4
29/06/2022	MMW	13	L.	1	AD	U	11:08	78
29/06/2022	MMW	14	K.	1	AD	U	11:21	163
29/06/2022	MMW	15	SN	2	AD	U	11:59	102
29/06/2022	MMW	16	BH	2	AD	U	12:19	63
29/06/2022	MMW	17	K.	1	AD	F	12:25	21

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
29/06/2022	MMW	18	K.	1	AD	F	12:26	244
29/06/2022	MMW	19	L.	1	AD	U	12:26	7
11/07/2022	MMW	1	L.	1	U	U	16:06	9
11/07/2022	MMW	2	L.	1	AD	U	16:18	12
11/07/2022	MMW	3	L.	1	AD	U	17:01	26
11/07/2022	MMW	4	L.	1	U	U	17:06	10
11/07/2022	MMW	5	L.	3	U	U	17:27	93
11/07/2022	MMW	6	L.	2	U	U	17:49	78
11/07/2022	MMW	7	SN	1	U	U	18:06	88
11/07/2022	MMW	8	PE	1	AD	U	18:21	130
11/07/2022	MMW	9	K.	1	U	U	18:43	101
11/07/2022	MMW	10	K.	1	U	U	18:57	35
12/07/2022	MMW	1	L.	1	AD	U	07:22	5
12/07/2022	MMW	2	L.	4	AD	U	09:34	52
12/07/2022	MMW	3	SN	1	AD	U	09:45	44
12/07/2022	MMW	4	SN	1	AD	U	09:48	6
12/07/2022	MMW	5	L.	5	AD	U	09:51	161
12/07/2022	MMW	6	L.	5	AD	U	09:51	148
12/07/2022	MMW	7	L.	1	AD	U	09:57	45
12/07/2022	MMW	8	L.	1	AD	U	10:02	50
12/07/2022	MMW	9	L.	2	AD	U	10:05	140

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	StartTime (hr:min)	Flight duration (s)
12/07/2022	MMW	10	L.	5	AD	U	10:23	11
12/07/2022	MMW	11	L.	3	AD	U	10:25	65
12/07/2022	MMW	12	SN	1	AD	M	10:30	814
12/07/2022	MMW	12	SN	1	AD	M	10:30	814
12/07/2022	MMW	12	SN	1	AD	M	10:30	814
12/07/2022	MMW	13	SN	1	AD	U	10:57	13
12/07/2022	MMW	14	SN	1	AD	M	10:59	554
12/07/2022	MMW	14	SN	1	AD	M	10:59	554
12/07/2022	MMW	15	RP	2	AD	U	11:18	22
12/07/2022	MMW	16	L.	1	AD	U	11:22	14
12/07/2022	MMW	17	SN	1	AD	U	11:58	10
12/07/2022	MMW	18	L.	10	U	U	12:05	8
12/07/2022	MMW	19	L.	1	U	U	12:10	16
12/07/2022	MMW	20	L.	3	U	U	12:10	123
12/07/2022	MMW	21	RP	2	AD	U	12:11	25
03/08/2022	MMW	1	L.	1	U	U	08:21	34

Table A4-4
Secondary target species recorded during flight activity surveys undertaken at VP1

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
17/05/2022	11:30	14:30	11:45	11:50	BZ	1	2	On site
17/05/2022	11:30	14:30	12:00	12:05	BZ	1	1	On site
17/05/2022	11:30	14:30	12:15	12:20	RN	1	1	On site
17/05/2022	11:30	14:30	12:20	12:25	BZ	1	1,2	On site, buffer
17/05/2022	11:30	14:30	12:25	12:30	BZ	1	1	On site
17/05/2022	11:30	14:30	12:35	12:40	BZ	2	1,2	On site
17/05/2022	11:30	14:30	12:55	13:00	BZ	1	1	On site
19/05/2022	14:00	17:00	15:05	15:10	BZ	1	2	Beyond
19/05/2022	14:00	17:00	16:25	16:30	BZ	1	2	On site
19/05/2022	14:00	17:00	16:35	16:40	BZ	1	2	On site
25/05/2022	14:15	17:15	14:20	14:25	BZ	1	2	On site, buffer
25/05/2022	14:15	17:15	14:40	14:45	BZ	1	3	On site, buffer
25/05/2022	14:15	17:15	14:45	14:50	MA	1	1	On site
25/05/2022	14:15	17:15	14:50	14:55	BZ	1	2	On site
25/05/2022	14:15	17:15	14:50	14:55	LB	2	2	On site, buffer
25/05/2022	14:15	17:15	15:00	15:05	BZ	1	2	On site
25/05/2022	14:15	17:15	15:10	15:15	BZ	1	3	On site, buffer
25/05/2022	14:15	17:15	15:10	15:15	BZ	1	2	On site, buffer
25/05/2022	14:15	17:15	15:20	15:25	BZ	1	2	On site
25/05/2022	14:15	17:15	15:45	15:50	BZ	1	2	On site

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
25/05/2022	14:15	17:15	15:55	16:00	BZ	2	2	On site
25/05/2022	14:15	17:15	16:15	16:20	BZ	1	2	On site, buffer
25/05/2022	14:15	17:15	16:20	16:25	BZ	2	2	On site
25/05/2022	14:15	17:15	16:20	16:25	BZ	1	3	On site, buffer
25/05/2022	14:15	17:15	16:45	16:50	BZ	1	2	On site
25/05/2022	14:15	17:15	16:50	16:55	BZ	1	2	On site
25/05/2022	14:15	17:15	17:00	17:05	HG	2	2	On site, buffer
26/05/2022	08:50	11:50	10:05	10:10	RN	1	2	On site, buffer
26/05/2022	08:50	11:50	10:05	10:10	H.	1	2	Buffer
26/05/2022	08:50	11:50	10:45	10:50	LB	4	1	On site
26/05/2022	08:50	11:50	10:45	10:50	HG	5	1	On site
26/05/2022	08:50	11:50	11:30	11:35	BZ	1	2	On site, buffer
26/05/2022	08:50	11:50	11:35	11:40	MA	1	1	On site, buffer
26/05/2022	08:50	11:50	11:40	11:45	BZ	1	3	Buffer, beyond
13/06/2022	19:00	22:00	19:05	19:10	BZ	1	2	Buffer
13/06/2022	19:00	22:00	19:10	19:15	H.	1	2	On site, buffer
13/06/2022	19:00	22:00	20:35	20:40	MA	1	1	On site
13/06/2022	19:00	22:00	20:45	20:50	LB	1	2	On site
15/06/2022	10:10	13:10	10:20	10:25	BZ	1	2	On site, buffer
15/06/2022	10:10	13:10	10:25	10:30	BZ	2	2	Buffer
15/06/2022	10:10	13:10	10:50	10:55	BZ	2	2	Buffer, beyond
15/06/2022	10:10	13:10	10:50	10:55	BZ	1	2	On site, buffer

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
15/06/2022	10:10	13:10	10:55	11:00	BZ	1	3	On site, buffer
15/06/2022	10:10	13:10	10:55	11:00	RN	1	1	Buffer
15/06/2022	10:10	13:10	11:00	11:05	BZ	2	2	On site
15/06/2022	10:10	13:10	11:10	11:15	BZ	2	2	On site
15/06/2022	10:10	13:10	11:10	11:15	BZ	2	1	On site, buffer
15/06/2022	10:10	13:10	11:20	11:25	BZ	2	2	On site
15/06/2022	10:10	13:10	11:20	11:25	BZ	3	3	Buffer
15/06/2022	10:10	13:10	11:25	11:30	BZ	3	2	On site
15/06/2022	10:10	13:10	11:25	11:30	BZ	1	2	On site
15/06/2022	10:10	13:10	11:35	11:40	BZ	1	2	On site
15/06/2022	10:10	13:10	11:45	11:50	BZ	1	2	On site
15/06/2022	10:10	13:10	11:55	12:00	BZ	1	3	On site
15/06/2022	10:10	13:10	12:05	12:10	BZ	2	2	On site
15/06/2022	10:10	13:10	12:10	12:15	BZ	2	2	On site
15/06/2022	10:10	13:10	12:10	12:15	BZ	2	1	On site
15/06/2022	10:10	13:10	12:20	12:25	BZ	2	2	Buffer
15/06/2022	10:10	13:10	12:25	12:30	BZ	2	2	Buffer
15/06/2022	10:10	13:10	12:25	12:30	BZ	1	2	Buffer, beyond
15/06/2022	10:10	13:10	12:35	12:40	BZ	2	2	Buffer, beyond
15/06/2022	10:10	13:10	12:35	12:40	RN	1	2	Buffer, beyond
15/06/2022	10:10	13:10	12:40	12:45	BZ	1	2	Buffer
15/06/2022	10:10	13:10	12:55	13:00	BZ	2	2	Buffer

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
15/06/2022	10:10	13:10	12:55	13:00	BZ	2	2	On site
15/06/2022	10:10	13:10	13:00	13:05	BZ	1	2	On site
15/06/2022	10:10	13:10	13:05	13:10	BZ	4	2	On site
15/06/2022	10:10	13:10	13:05	13:10	BZ	4	2	Buffer
27/06/2022	15:15	18:15	15:15	15:20	BZ	1	2	On site, buffer
27/06/2022	15:15	18:15	15:20	15:25	BZ	2	2	On site
27/06/2022	15:15	18:15	15:20	15:25	BZ	2	3	Buffer, beyond
27/06/2022	15:15	18:15	15:25	15:30	BZ	2	2	On site
27/06/2022	15:15	18:15	15:25	15:30	BZ	2	2	Buffer, beyond
27/06/2022	15:15	18:15	15:35	15:40	BZ	1	2	Buffer, beyond
27/06/2022	15:15	18:15	15:40	15:45	BZ	2	2	Buffer, beyond
27/06/2022	15:15	18:15	15:40	15:45	BZ	2	2	On site, buffer
27/06/2022	15:15	18:15	15:50	15:55	BZ	1	2	On site
27/06/2022	15:15	18:15	15:50	15:55	BZ	1	2	Buffer, beyond
27/06/2022	15:15	18:15	16:00	16:05	BZ	1	2	On site
27/06/2022	15:15	18:15	16:05	16:10	BZ	2	2	On site
27/06/2022	15:15	18:15	16:30	16:35	BZ	2	2	Buffer
27/06/2022	15:15	18:15	16:40	16:45	BZ	2	2	Buffer, beyond
27/06/2022	15:15	18:15	16:40	16:45	BZ	2	2	On site, buffer
27/06/2022	15:15	18:15	16:50	16:55	BZ	1	2	On site
27/06/2022	15:15	18:15	16:50	16:55	BZ	1	2	Buffer
27/06/2022	15:15	18:15	16:55	17:00	BZ	1	2	On site

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
27/06/2022	15:15	18:15	17:00	17:05	BZ	1	2	Buffer
27/06/2022	15:15	18:15	17:10	17:15	RN	1	1	On site
27/06/2022	15:15	18:15	17:20	17:25	BZ	1	2	On site
27/06/2022	15:15	18:15	17:35	17:40	BZ	1	2	On site, buffer
27/06/2022	15:15	18:15	17:40	17:45	BZ	1	2	On site
27/06/2022	15:15	18:15	18:00	18:05	BZ	1	1	On site
27/06/2022	15:15	18:15	18:05	18:10	BZ	1	1	On site
27/06/2022	15:15	18:15	18:10	18:15	BZ	1	2	Buffer, beyond
29/06/2022	06:15	09:15	07:15	07:20	MA	1	2	On site
29/06/2022	06:15	09:15	07:20	07:25	HG	2	2	On site
29/06/2022	06:15	09:15	07:50	07:55	BZ	1	2	Buffer
29/06/2022	06:15	09:15	08:15	08:20	HG	1	2	On site
29/06/2022	06:15	09:15	08:25	08:30	BZ	1	2	Buffer
29/06/2022	06:15	09:15	08:30	08:35	BZ	1	2	Buffer
29/06/2022	06:15	09:15	09:10	09:15	BZ	1	2	On site, buffer
12/07/2022	12:50	15:50	12:50	12:55	BZ	1	1	On site, buffer
12/07/2022	12:50	15:50	13:10	13:15	BZ	1	1	On site
12/07/2022	12:50	15:50	13:20	13:25	BZ	1	1	Buffer, beyond
12/07/2022	12:50	15:50	13:25	13:30	BZ	1	2	Buffer
12/07/2022	12:50	15:50	13:35	13:40	SH	1	2	On site, buffer
12/07/2022	12:50	15:50	13:55	14:00	LB	1	2	On site
12/07/2022	12:50	15:50	14:05	14:10	BZ	1	2	On site, buffer

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
12/07/2022	12:50	15:50	14:25	14:30	BZ	1	2	Buffer, beyond
12/07/2022	12:50	15:50	14:55	15:00	BZ	1	2	Buffer, beyond
12/07/2022	12:50	15:50	15:20	15:25	HG	1	2	On site, buffer
12/07/2022	12:50	15:50	15:45	15:50	BZ	1	2	Buffer
13/07/2022	06:30	09:30	06:50	06:55	H	1	1	On site
13/07/2022	06:30	09:30	08:05	08:10	H	1	1	On site
13/07/2022	06:30	09:30	09:20	09:25	LB	1	2	On site
02/08/2022	18:30	21:30	19:05	19:10	SH	1	1	Buffer
02/08/2022	18:30	21:30	19:10	19:15	RN	1	2	On Site
02/08/2022	18:30	21:30	19:20	19:25	RN	1	2	Buffer
02/08/2022	18:30	21:30	20:00	20:05	BZ	1	2	On site, buffer
03/08/2022	10:10	13:10	10:20	10:25	RN	1	1	On site
03/08/2022	10:10	13:10	10:50	10:55	RN	1	2	On site, buffer
03/08/2022	10:10	13:10	11:05	11:10	BZ	2	2	On site, buffer
03/08/2022	10:10	13:10	11:05	11:10	BZ	2	2	Buffer, beyond
03/08/2022	10:10	13:10	11:10	11:15	RN	1	2	On site
03/08/2022	10:10	13:10	11:25	11:30	MA	3	1	Buffer
03/08/2022	10:10	13:10	11:35	11:40	H.	1	2	On site, buffer
03/08/2022	10:10	13:10	11:45	11:50	BZ	1	2	Buffer, beyond
03/08/2022	10:10	13:10	11:55	12:00	RN	2	2	Buffer, beyond
03/08/2022	10:10	13:10	12:30	12:35	MA	3	1	On site, buffer
03/08/2022	10:10	13:10	12:35	12:40	RN	1	2	On site, buffer

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
03/08/2022	10:10	13:10	12:50	12:55	LB	2	2	On site, buffer
03/08/2022	10:10	13:10	12:50	12:55	LB	2	2	On site, buffer

Table A4-5
Secondary target species recorded during flight activity surveys undertaken at VP2

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
20/05/2022	12:30	15:30	12:40	12:45	BZ	1	2	On site, buffer
20/05/2022	12:30	15:30	13:20	13:25	BZ	1	2	On site, buffer
20/05/2022	12:30	15:30	15:00	15:05	RN	2	2	On site
19/05/2022	10:30	13:30	10:50	10:55	BZ	1	2,3	On site, buffer
19/05/2022	10:30	13:30	11:15	11:20	BZ	3	2	On site, buffer
19/05/2022	10:30	13:30	11:45	11:50	BZ	1	1	Buffer
19/05/2022	10:30	13:30	11:50	11:55	BZ	2	1,2	Buffer, beyond
19/05/2022	10:30	13:30	11:55	12:00	BZ	1	2	On site
19/05/2022	10:30	13:30	12:00	12:05	BZ	1	2	On site
19/05/2022	10:30	13:30	12:35	12:40	SH	1	1	On site, buffer
24/05/2022	14:20	17:20	14:20	14:25	BZ	1	2	On site
24/05/2022	14:20	17:20	14:40	14:45	BZ	1	4	On site
24/05/2022	14:20	17:20	14:45	14:50	BZ	2	2	On site
24/05/2022	14:20	17:20	14:50	14:55	BZ	2	2	On site

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
24/05/2022	14:20	17:20	15:05	15:10	RN	1	2	On site
24/05/2022	14:20	17:20	15:15	15:20	H.	1	2	On site
24/05/2022	14:20	17:20	15:15	15:20	RN	1	2	On site
24/05/2022	14:20	17:20	15:30	15:35	BZ	1	3	On site
24/05/2022	14:20	17:20	15:40	15:45	BZ	1	3	On site
24/05/2022	14:20	17:20	15:45	15:50	BZ	1	2	On site
24/05/2022	14:20	17:20	15:50	15:55	BZ	2	2	On site
24/05/2022	14:20	17:20	15:55	16:00	BZ	1	4	On site
24/05/2022	14:20	17:20	16:00	16:05	BZ	1	4	On site
24/05/2022	14:20	17:20	16:05	16:10	BZ	1	3	On site
24/05/2022	14:20	17:20	16:15	16:20	BZ	1	3	On site
24/05/2022	14:20	17:20	16:45	16:50	BZ	1	4	Buffer
24/05/2022	14:20	17:20	16:55	17:00	BZ	1	3	Buffer
24/05/2022	14:20	17:20	17:10	17:15	RN	1	1	On site
24/05/2022	14:20	17:20	17:15	17:20	RN	2	2	Buffer
25/05/2022	10:15	13:15	10:25	10:30	RN	1	1	On site
25/05/2022	10:15	13:15	10:35	10:40	RN	3	2	On site
25/05/2022	10:15	13:15	10:50	10:55	RN	2	1	On site
25/05/2022	10:15	13:15	10:55	11:00	RN	3	1	On site
25/05/2022	10:15	13:15	11:00	11:05	LB	1	2	On site, buffer
25/05/2022	10:15	13:15	11:05	11:10	LB	3	2	Buffer
25/05/2022	10:15	13:15	11:20	11:25	BZ	1	2	On site

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
25/05/2022	10:15	13:15	11:30	11:35	BZ	1	2	On site, buffer
25/05/2022	10:15	13:15	11:45	11:50	BZ	1	2	Buffer
25/05/2022	10:15	13:15	11:55	12:00	BZ	1	3	Buffer
25/05/2022	10:15	13:15	12:15	12:20	BZ	1	2	On site
25/05/2022	10:15	13:15	12:50	12:55	RN	1	1	On site, buffer
14/06/2022	15:10	18:10	15:25	15:30	BZ	1	2	Buffer
14/06/2022	15:10	18:10	15:35	15:40	RN	1	2	On site
14/06/2022	15:10	18:10	15:40	15:45	LB	1	2	On site, buffer
14/06/2022	15:10	18:10	15:45	15:50	BZ	1	2	Buffer
14/06/2022	15:10	18:10	15:50	15:55	HG	2	2	On site, buffer
14/06/2022	15:10	18:10	16:00	16:05	BZ	1	3	Buffer
14/06/2022	15:10	18:10	16:10	16:15	BZ	1	2	Buffer
14/06/2022	15:10	18:10	16:15	16:20	BZ	1	3	On site, buffer
14/06/2022	15:10	18:10	16:20	16:25	RN	2	2	Buffer
14/06/2022	15:10	18:10	16:20	16:25	BZ	1	2	On site
14/06/2022	15:10	18:10	16:40	16:45	BZ	1	2	On site
14/06/2022	15:10	18:10	16:45	16:50	BZ	1	3	Buffer
15/06/2022	06:05	09:05	06:25	06:30	H.	3	2	On site
15/06/2022	06:05	09:05	06:30	06:35	ET	1	1	On site
15/06/2022	06:05	09:05	06:35	06:40	LB	1	2	On site, buffer
15/06/2022	06:05	09:05	06:35	06:40	H.	1	1	On site
15/06/2022	06:05	09:05	07:40	07:45	BZ	1	1	On site

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
15/06/2022	06:05	09:05	07:45	07:50	BZ	1	1	On site
15/06/2022	06:05	09:05	07:50	07:55	BZ	1	1	On site
15/06/2022	06:05	09:05	08:45	08:50	HG	2	2	On site
27/06/2022	19:00	22:00	19:05	19:10	BZ	1	2	Buffer
27/06/2022	19:00	22:00	19:10	19:15	BZ	1	2	Buffer
27/06/2022	19:00	22:00	19:25	19:30	HG	2	2	On site, buffer
27/06/2022	19:00	22:00	20:35	20:40	H.	1	2	On site
28/06/2022	09:45	12:45	10:30	10:35	RN	1	2	On site
28/06/2022	09:45	12:45	10:35	10:40	BZ	1	2	On site
28/06/2022	09:45	12:45	11:35	11:40	BZ	1	2	On site, buffer
28/06/2022	09:45	12:45	11:55	12:00	M	1	1	On site
28/06/2022	09:45	12:45	12:30	12:35	BZ	1	2	On site, buffer
28/06/2022	09:45	12:45	12:35	12:40	BZ	1	2	On site
11/07/2022	12:30	15:30	14:05	14:10	BZ	1	2	On site
11/07/2022	12:30	15:30	15:00	15:05	HG	1	2	On site
13/07/2022	10:00	13:00	10:40	10:45	HG	3	2	On site
13/07/2022	10:00	13:00	11:05	11:10	RN	1	2	On site
13/07/2022	10:00	13:00	11:30	11:35	BZ	1	2	On site
13/07/2022	10:00	13:00	11:35	11:40	BZ	1	2	On site
13/07/2022	10:00	13:00	12:55	13:00	BZ	1	2	On site, buffer
01/08/2022	17:30	20:30	19:25	19:30	HG	1	2	On site
01/08/2022	17:30	20:30	20:20	20:25	H.	1	2	On site

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
02/08/2022	15:00	18:00	15:10	15:15	RN	2	2	Buffer
02/08/2022	15:00	18:00	15:15	15:20	RN	2	1	On site
02/08/2022	15:00	18:00	15:20	15:25	RN	2	2	On site
02/08/2022	15:00	18:00	15:25	15:30	BZ	1	2	On site, buffer
02/08/2022	15:00	18:00	15:40	15:45	BZ	1	2	On Site
02/08/2022	15:00	18:00	15:45	15:50	BZ	1	2	On Site
02/08/2022	15:00	18:00	15:50	15:55	BZ	1	2	Buffer
02/08/2022	15:00	18:00	16:15	16:20	BZ	1	3	On site
02/08/2022	15:00	18:00	16:40	16:45	LB	2	2	On site, buffer
02/08/2022	15:00	18:00	16:45	16:50	LB	2	2	Buffer
02/08/2022	15:00	18:00	17:35	17:40	LB	1	3	On site
02/08/2022	15:00	18:00	17:40	17:45	LB	1	3	On site

Table A4-6
Secondary target species recorded during flight activity surveys undertaken at VP3

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
18/05/2022	09:00	12:00	09:00	09:05	RN	2	1	Buffer, beyond
18/05/2022	09:00	12:00	09:50	09:55	RN	1	2	Beyond
18/05/2022	09:00	12:00	10:40	10:45	BZ	2	2	Buffer
18/05/2022	09:00	12:00	10:25	10:30	RN	2	1	On site
20/05/2022	16:00	19:00	16:40	16:45	BZ	4	2	On site, buffer
24/05/2022	10:15	13:15	10:45	10:50	H.	2	1	On site
24/05/2022	10:15	13:15	11:05	11:10	BZ	1	3	Beyond
24/05/2022	10:15	13:15	11:10	11:15	BZ	1	2	Beyond
24/05/2022	10:15	13:15	11:20	11:25	RN	1	2	On site
24/05/2022	10:15	13:15	11:40	11:45	MA	1	1	On site
24/05/2022	10:15	13:15	12:00	12:05	H.	1	1	On site
24/05/2022	10:15	13:15	12:00	12:05	RN	1	2	On site
24/05/2022	10:15	13:15	12:20	12:25	RN	1	2	Beyond
24/05/2022	10:15	13:15	12:25	12:30	BZ	1	2	On site
24/05/2022	10:15	13:15	12:30	12:35	BZ	1	2	Buffer
24/05/2022	10:15	13:15	12:45	12:50	RN	3	2	On site
24/05/2022	10:15	13:15	13:00	13:05	BZ	1	2	On site
24/05/2022	10:15	13:15	13:10	13:15	BZ	1	2	Buffer
26/05/2022	12:50	15:50	13:05	13:10	BZ	1	2	Buffer, beyond
26/05/2022	12:50	15:50	13:05	13:10	HG	1	1	Onsite, buffer

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
26/05/2022	12:50	15:50	13:25	13:30	BZ	2	2	Buffer
26/05/2022	12:50	15:50	13:25	13:30	BZ	2	2	On site
26/05/2022	12:50	15:50	13:30	13:35	RN	1	1	On site
26/05/2022	12:50	15:50	13:40	13:45	BZ	3	2	Buffer
26/05/2022	12:50	15:50	13:40	13:45	BZ	3	2	On site, buffer
26/05/2022	12:50	15:50	13:40	13:45	BZ	3	2	Beyond
26/05/2022	12:50	15:50	13:45	13:50	LB	4	2	On site
26/05/2022	12:50	15:50	13:50	13:55	HG	8	1	On site
26/05/2022	12:50	15:50	13:50	13:55	CM	1	1	On site
26/05/2022	12:50	15:50	14:40	14:45	BZ	1	2	Buffer
26/05/2022	12:50	15:50	14:45	14:50	BZ	1	2	Buffer
26/05/2022	12:50	15:50	15:00	15:05	BZ	2	2	On site, buffer
26/05/2022	12:50	15:50	15:00	15:05	RN	1	1	On site
26/05/2022	12:50	15:50	15:10	15:15	BZ	1	2	On site
26/05/2022	12:50	15:50	15:25	15:30	SH	1	1	On site, buffer
26/05/2022	12:50	15:50	15:40	15:45	BZ	1	3	On site, buffer
26/05/2022	12:50	15:50	15:45	15:50	BZ	1	2	Buffer
13/06/2022	15:30	18:30	15:30	15:35	BZ	1	2	Buffer
13/06/2022	15:30	18:30	15:35	15:40	BZ	2	2	On site, buffer
13/06/2022	15:30	18:30	15:35	15:40	H.	1	2	On site
13/06/2022	15:30	18:30	15:40	15:45	BZ	2	2	On site, buffer
13/06/2022	15:30	18:30	15:45	15:50	BZ	3	2	On site, buffer

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
13/06/2022	15:30	18:30	16:45	16:50	BZ	1	1	On site, buffer
13/06/2022	15:30	18:30	17:00	17:05	SH	1	1	Buffer
13/06/2022	15:30	18:30	17:15	17:20	BZ	1	2	Buffer
13/06/2022	15:30	18:30	17:40	17:45	H.	1	1	On site
13/06/2022	15:30	18:30	17:40	17:45	BZ	1	2	On site
13/06/2022	15:30	18:30	17:55	18:00	HG	2	2	On site, buffer
13/06/2022	15:30	18:30	18:00	18:05	BZ	2	2	On site, buffer
13/06/2022	15:30	18:30	18:10	18:15	BZ	1	2	Buffer
13/06/2022	15:30	18:30	18:15	18:20	BZ	1	2	On site
13/06/2022	15:30	18:30	18:20	18:25	BZ	1	2	Buffer
13/06/2022	15:30	18:30	18:25	18:30	BZ	1	2	Buffer
14/06/2022	19:00	22:00	20:10	20:15	LB	1	2	On site
14/06/2022	19:00	22:00	20:20	20:25	BZ	1	1	On site
14/06/2022	19:00	22:00	20:20	20:25	BZ	1	2	On site
14/06/2022	19:00	22:00	21:15	21:20	HG	2	1	On site
28/06/2022	06:10	09:10	07:35	07:40	BZ	1	2	On site, buffer
28/06/2022	06:10	09:10	07:40	07:45	BZ	1	2	On site, buffer
28/06/2022	06:10	09:10	07:40	07:45	MA	1	1	On site
28/06/2022	06:10	09:10	07:45	07:50	BZ	1	2	Buffer
29/06/2022	09:45	12:45	10:35	10:40	MA	2	1	On site
29/06/2022	09:45	12:45	11:10	11:15	BZ	2	2	On site, buffer
29/06/2022	09:45	12:45	11:10	11:15	BZ	2	2	On site, buffer

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
29/06/2022	09:45	12:45	11:20	11:25	BZ	2	2	On site, buffer
29/06/2022	09:45	12:45	11:25	11:30	BZ	2	2	On site, buffer
29/06/2022	09:45	12:45	12:30	12:35	BZ	2	2	On site, buffer
11/07/2022	16:00	19:00	16:30	16:35	BZ	1	2	On site
11/07/2022	16:00	19:00	16:35	16:40	LB	4	2	On site
11/07/2022	16:00	19:00	16:35	16:40	BZ	1	2	On site
11/07/2022	16:00	19:00	16:40	16:45	BZ	1	1	On site
11/07/2022	16:00	19:00	17:00	17:05	BZ	1	2	On site
11/07/2022	16:00	19:00	17:05	17:10	BZ	1	2	On site
11/07/2022	16:00	19:00	17:50	17:55	BZ	1	2	On site
11/07/2022	16:00	19:00	17:55	18:00	SH	1	2	On site
11/07/2022	16:00	19:00	18:00	18:05	SH	1	2	On site
12/07/2022	09:20	12:20	09:20	09:25	LB	1	1	On site
12/07/2022	09:20	12:20	09:30	09:35	SH	1	1	On site
12/07/2022	09:20	12:20	11:00	11:05	H	1	1	On site
12/07/2022	09:20	12:20	11:15	11:20	LB	2	2	On site
12/07/2022	09:20	12:20	11:25	11:30	LB	1	2	On site
12/07/2022	09:20	12:20	11:40	11:45	BZ	1	2	On site, buffer
12/07/2022	09:20	12:20	11:45	11:50	BZ	1	2	On site, buffer
12/07/2022	09:20	12:20	12:15	12:20	BZ	1	2	On site
01/08/2022	11:30	14:30	12:05	12:10	RN	1	2	On site
01/08/2022	11:30	14:30	12:30	12:35	BZ	1	2	Buffer

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
01/08/2022	11:30	14:30	12:45	12:50	BZ	1	2	On site
01/08/2022	11:30	14:30	13:05	13:10	SH	1	1	On site
01/08/2022	11:30	14:30	13:15	13:20	BZ	2	2	On site
01/08/2022	11:30	14:30	13:15	13:20	RN	1	2	On site
01/08/2022	11:30	14:30	13:15	13:20	BZ	2	2	Buffer
01/08/2022	11:30	14:30	13:20	13:25	LB	1	2	On site, buffer
01/08/2022	11:30	14:30	13:40	13:45	BZ	1	2	On site, buffer
01/08/2022	11:30	14:30	14:25	14:30	GB	2	2	Buffer
01/08/2022	11:30	14:30	14:25	14:30	GB	2	2	On site
03/08/2022	06:40	09:40	07:05	07:10	LB	1	2	Buffer
03/08/2022	06:40	09:40	07:25	07:30	MA	19	2	On site, buffer
03/08/2022	06:40	09:40	07:40	07:45	LB	3	2	On site, buffer
03/08/2022	06:40	09:40	07:50	07:55	LB	2	2	On site, buffer
03/08/2022	06:40	09:40	08:00	08:05	MA	6	2	On site, buffer
03/08/2022	06:40	09:40	08:15	08:20	MA	2	2	Buffer, beyond
03/08/2022	06:40	09:40	08:50	08:55	RN	1	2	On site
03/08/2022	06:40	09:40	08:55	09:00	RN	1	2	On site
03/08/2022	06:40	09:40	09:10	09:15	GB	1	2	On site, buffer
03/08/2022	06:40	09:40	09:10	09:15	RN	4	2	On site

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Bird Survey Report Non-Breeding 2022/23

Cush Wind Farm

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0	29 August 2023	Alice Magee	Aisling Kinsella	Dr Jonathon Dunn

Basis of Report

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1.0 Introduction

SLR Environmental Consulting (Ireland) Ltd. (SLR) was commissioned by Galetech Energy Developments Ltd to carry out a bird survey programme for the proposed wind farm at Cush, Co. Offaly (hereafter ‘the Project’) during the non-breeding season in 2022/23. The purpose of this report is to describe these surveys and the resulting ornithological baseline.

1.1 Background to the Commission

No previous planning permission has been sought on the application site for the development of wind farms by Galetech Energy Developments Ltd or any other party.

Bird surveys have been previously undertaken at the proposed wind farm development site at Cush, Co. Offaly (hereafter ‘the Project Site’) by SLR for the breeding 2020, non-breeding 2020/21, breeding 2021, non-breeding 2021/22, and breeding 2022 seasons. The Project Site also includes a linear area that was previously surveyed for a proposed overhead line¹. Flight activity surveys were carried out at two vantage point locations along the proposed overhead line route corridor during the breeding season in 2018.

1.2 Site Description

The Project Site is located in the townland of Cush approximately 4 km north of Birr, Co. Offaly at approximate ITM coordinates 608237, 709946. The habitats within the Project Site are dominated by conifer plantations of varying age classes (c.327 ha), cutaway bog (c.102 ha) and agricultural grasslands (ca. 327 ha; refer to Appendix A **Figure 1**). The Project Site is not designated for nature conservation.

1.3 Terminology

For this report, “flight line” refers to the line drawn to record avian movement during a vantage point (VP) survey. A single flight line may be used to indicate the collective movement of a flock of birds. Each individual bird moving within the same flight line is referred to as “a flight”. Note that the “cumulative number of flights” reflects the occupancy of the study area by a particular species. It is not equivalent to the total number of unique individuals and should not be used to infer abundance.

1.4 Purpose of this Report

This report outlines the surveys undertaken and methods used. It then summarises the survey data obtained and provides descriptions of the legal and conservation status of the species recorded.

The assessment of impacts resulting from the Project and the development of mitigation measures, if required, are beyond the scope of this report and will be covered in a separate Environmental Impact Assessment (EIA) Report in due course.

¹ SLR (2018) *Cloghan Wind Farm and Long Oak Wind Farm Breeding Bird Survey Report 2018*. Prepared for Galetech Energy Services Ltd



2.0 Methods

2.1 Scope of Work

The scope of survey work was based on existing knowledge of the area and took into account current NatureScot (NS; formerly Scottish Natural Heritage, SNH) Guidance², with details provided in **Table 2-1**. Further details are provided in Section 2.0.

Surveys were undertaken by Senior Ecologist Aisling Kinsella (AK) BSc (Hons) MSc, Senior Field Ecologist Faolán Linnane BSc (Hons) MSc, Project Ecologist Darragh Nagle (DN) BSc (Hons), and Graduate Ecologist Hugo Brooks (HB) BSc (Hons).

Details of survey dates and times are provided in Appendix B and a record of weather conditions during surveys is provided in Appendix C.

Table 2-1: Scope of Ornithological Survey Work October 2022 to March 2023

Survey Type	Summary Methodology (see Section 2 for further details)
Vantage Point (VP) surveys	Six hours of survey per month were carried out from each of the three VPs between October 2022 and March 2023.
Feeding distribution surveys	Feeding distribution surveys were carried out on a twice-monthly basis during the period October 2022 to March 2023 to search for swans and/or geese using the fields for foraging within 500 m of the Project Site.
Nocturnal golden plover surveys	Two nocturnal golden plover surveys (one in January and one in March) were carried out during the 2022/23 non-breeding season.

2.2 Desk-Based Review

The desk review collated any available information to date on the breeding and non-breeding bird populations and movements around the Project Site.

The following reports resulting from previous breeding and non-breeding bird surveys were reviewed for any relevant information that could be used to inform the current bird surveys:

- SLR (2018) Cloghan Wind Farm and Long Oak Wind Farm Breeding Bird Survey Report 2018.
- SLR (2020) Cush Wind Farm Breeding Bird Survey Report 2020.
- SLR (2022) Cush Wind Farm Winter Bird Survey Report 2020-2021.
- SLR (2022) Cush Wind Farm Breeding and Winter Bird Survey Report 2021-2022.
- SLR (2022) Cush Wind Farm Breeding Bird Survey Report 2022.

² Scottish Natural Heritage (2017). *Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms V2*. Scottish Natural Heritage, Inverness.



The websites of the National Parks and Wildlife Service (NPWS)³, the UK and Ireland Bird Atlas 2007-2011⁴ and the National Biodiversity Data Centre (NBDC)⁵ were accessed for information on sites designated for nature conservation and notable bird species in the vicinity of the Project Site.

2.3 Flight Activity Surveys

VP locations, 2 km viewing arcs and viewsheds are shown in Appendix A **Figure 1**.

A total of 108 hours of flight activity surveys were conducted from all VP locations combined during the 2022/23 non-breeding season, as summarised in **Table 2-2**.

In order to avoid possible complications during any subsequent collision risk modelling, VP watches were timed such that surveys were not undertaken simultaneously from both VPs. This avoids double-counting birds and ensures that no disturbance is made to birds within viewsheds from presence of the observer.

VP watches aimed to quantify the flight activity of primary and secondary target species (as defined below) 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 Project Site;
- The relative use by birds of different parts of the Project 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.

Target species for the surveys were defined by legal and/or conservation status and vulnerability to impacts caused by wind turbines, as defined in NS guidance.

Primary target species were limited to species upon which effects are most likely to be potentially significant in EIA and Appropriate Assessment (AA) terms e.g., species forming qualifying features for nearby Special Protection Areas (SPAs) or species listed on Annex 1 of the Birds Directive⁶. 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.

Primary target species included the following bird species:

- All Annex 1 raptor/owl species;
- Qualifying interest species for nearby SPAs⁷; and
- Other raptors, waders or wildfowl red-listed on the latest Birds of Conservation Concern in Ireland (BoCCI)⁸ scheme.

³ www.npws.ie (Last accessed August 2023)

⁴ <https://app.bto.org/mapstore/StoreServlet> Accessed 29/08/2023

⁵ <http://maps.biodiversityireland.ie/#/Map> Accessed 29/08/2023

⁶ Annex 1 of the Birds Directive (Directive 2009/147/EC)

⁷ The relevant SPAs are listed in Section 3.1.

⁸ Gilbert, G., Stanbury, A. and Lewis, L. (2021). Birds of Conservation Concern in Ireland 2020–2026. Irish Birds 43: 1–22



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

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

Local circumstances may indicate that survey information should also be acquired on other species, especially those of regional conservation concern. Such species are termed secondary species. Recording of secondary species is subsidiary to recording of primary target species. 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 and around the Project Site, in accordance with current NS guidance.

Secondary target species included:

- Any other wildfowl and wader species;
- Common buzzard *Buteo buteo*;
- Eurasian sparrowhawk *Accipiter nisus*;
- Northern raven *Corvus corax*;
- Grey heron *Ardea cinerea*; and
- Gulls *Larus* sp.

NS guidance states that “it is generally considered the passerine species are not significantly impacted by wind farms”. It goes on to state that “survey of woodland passerines, especially in commercial conifer forest is generally not required”. The only exception is if the desk study identifies that the Project Site is in a key area for a Schedule 1 woodland passerine species. As Schedule 1 refers to UK legislation, it is prudent to assume that passerines red-listed under the latest Birds of Conservation Concern in Ireland (BoCCI) scheme⁸ should be considered as equivalent. No such species were returned during the desk-based review or data request. NS guidance also states that “surveys of farmland passerines especially on more intensive arable habitat are generally not required”. Based on the above, while not the targets, any red-listed passerines were recorded as incidental species during other surveys.

In the absence of detailed information regarding turbine specifications at the time of commencing surveys, a precautionary approach was taken in relation to recording height bands. For the 2022/23 non-breeding season, height bands were determined allowing for the maximum rotor tip height of 200 m and a lowest rotor swept height of 28 m. The relation of the height bands to the latest turbine specification is shown below.

Flight heights were attributed to four distinct height bands for the non-breeding season as follows:

- 1 = <25 m (below the likely rotor swept area);
- 2 = 25 m to 160 m (potentially within the likely rotor swept area, at least in part);
- 3 = 160 m to 200 m (within the likely rotor swept area); and
- 4 = >200 m (above the likely rotor swept area).



Table 2-2: Summary of VP Surveys Undertaken during the Non-Breeding Season 2022/23

Month	VP1 (hours)	VP2 (hours)	VP3 (hours)
October	06:00	06:00	06:00
November	09:00	06:00	06:00
December	03:00	06:00	06:00
January	06:00	03:00	09:00
February	06:00	06:00	03:00
March	06:00	09:00	06:00
Total hrs	36:00	36:00	36:00
VP locations ITM (Figure 1)	608735 E 710130 N	605883 N 709097 N	607798 E 711305 N



2.4 Feeding Distribution Surveys

NS guidance recommends that for whooper swan *Cygnus cygnus*, Greenland white-fronted goose *Anser albifrons flavirostris* and other geese species, feeding distribution surveys should be undertaken in areas of suitable habitat when the survey area lies within the core foraging distance of SPAs or other major roosts for these species, unless it can be established from existing data that the area is not utilised for feeding. As there are SPAs for swans and geese located close to the Project Site, feeding distribution surveys were undertaken.

A buffer of 500 m around the Project Site was used for these surveys, which were undertaken by driven transects twice per month, stopping on a regular basis to check all fields for goose and swan feeding activity. The transect route is shown in Appendix A **Figure 18**, survey dates in Appendix B, weather conditions in Appendix C.

2.5 Nocturnal Golden Plover Surveys

Survey transects were identified that were representative of potentially suitable winter habitats (see Gillings et al., 2007)⁹ for European golden plover *Pluvialis apricaria* and northern lapwing *Vanellus vanellus* (see **Figure 19**). Transects were focused on pastures and bog habitats.

Surveys were undertaken using a Helion 2 XP50 Pro Thermal Monocular. This enables birds to be readily detected by their body heat at up to c. 350 m range. Where birds were detected, images were recorded as videos.

Each transect was walked twice, once in January 2023 and once in March 2023, after dark using the thermal monocular to detect and identify the presence of target species. Birds were also detected and identified by sound, as appropriate. Nocturnal surveys were conducted by a pair of surveyors on the basis of health and safety.

Two golden plover surveys were completed. Full details of survey dates, times and observers are provided in Appendix B and details of the weather conditions during surveys are provided in Appendix C.

2.6 Survey Limitations

Most VP surveys were undertaken in optimal weather conditions. However, during such an extensive series of surveys carried out it was inevitable that some surveys were completed in suboptimal conditions. There were 16 hours out of the total of 108 during which the visibility was recorded as “moderate”, i.e. 1-3 km. This comprises 14% of the total survey effort but in almost all cases all the relevant 2 km viewing arc was visible. There were intermittent periods of poor visibility during some surveys i.e. less than 1 km, which corresponded to three hours out of 108 (2.7%). However, these conditions were not persistent through the affected surveys and target species were still recorded. Therefore, these conditions are not considered to be significant limitations to the survey data obtained. Details regarding weather conditions during surveys are provided in Appendix C.

⁹ Gillings, S., Fuller, R.J. and Sutherland, W.J. (2007). Winter field use and habitat selection by Eurasian Golden Plovers *Pluvialis apricaria* and Northern Lapwings *Vanellus vanellus* on arable farmland. *Ibis*. 149: 509 – 520.



3.0 Results

3.1 Desk Based Results

3.1.1 Natura 2000 Sites

The Project Site is not within or immediately adjacent to any SPA. However, there are a total of seven SPAs within a 20 km¹⁰ radius with details shown in **Table 3-1**.

The closest SPAs to the Project Site are Dovegrove Callows SPA (Site Code: 004137), River Little Brosna Callows SPA (Site Code: 004086) and All Saints Bog SPA (Site Code: 004103) at distances of 1.5 km, 3.1 km and 3.1 km, respectively. Dovegrove Callows SPA and All Saints Bog SPA are designated for the protection of wintering Greenland white-fronted geese, whereas the River Little Brosna Callows SPA is designated for several wintering gull, wader and wildfowl species.

Table 3-1: SPAs within 20 km of the Project Site and their Qualifying Interests (Species Present During the Non-Breeding Season)

Site Name	Site Code	Distance/Direction from Site Boundary	Species of Special Conservation Interest Relevant to the Non-Breeding Season
Dovegrove Callows SPA	004137	1.5 km southwest	<ul style="list-style-type: none"> Greenland white-fronted goose
All Saints Bog SPA	004103	3.1 km west	<ul style="list-style-type: none"> Greenland white-fronted goose
River Little Brosna Callows SPA	004086	3.1 km west	<ul style="list-style-type: none"> Whooper swan Eurasian wigeon <i>Mareca penelope</i> Eurasian teal <i>Anas crecca</i> Northern pintail <i>Anas acuta</i> Northern shoveler <i>Anas clypeata</i> European golden plover Northern lapwing Black-tailed godwit <i>Limosa limosa</i> Black-headed gull <i>Chroicocephalus ridibundus</i> Greenland white-fronted goose
Middle Shannon Callows SPA	004096	6.6 km northwest	<ul style="list-style-type: none"> Whooper swan Eurasian wigeon European golden plover Northern lapwing Black-tailed godwit Black-headed gull
Slieve Bloom Mountains SPA	004160	11.7 km east	<ul style="list-style-type: none"> Hen harrier <i>Circus cyaneus</i>
River Suck Callows SPA	004097	17.3 km northwest	<ul style="list-style-type: none"> Whooper swan Eurasian wigeon European golden plover Northern lapwing Greenland white-fronted goose
Lough Derg (Shannon) SPA	004058	17.5 km southwest	<ul style="list-style-type: none"> Great cormorant <i>Phalacrocorax carbo</i> Tufted duck <i>Aythya fuligula</i>

¹⁰ A 20 km search radius was used as this represents the maximum core foraging distance used by Qualifying Interest species of SPAs in the UK and Ireland



Site Name	Site Code	Distance/Direction from Site Boundary	Species of Special Conservation Interest Relevant to the Non-Breeding Season
			<ul style="list-style-type: none"> Common goldeneye <i>Bucephala clangula</i>

3.1.2 Other Nature Conservation Sites

The Project Site is not within or immediately adjacent to any Natural Heritage Area (NHA) or proposed NHA (pNHA). However, there are a total of eight NHAs and 52 pNHAs within a 20 km radius, with details shown in **Table 3-2**.

River Little Brosna Callows NHA is located 9.4 km west of the Project Site and is the only NHA within a 20 km radius which is designated for its bird populations. The site has internationally important populations of Greenland white-fronted goose and black-tailed godwit, and a further seven species have populations of national importance: whooper swan, Eurasian wigeon, Eurasian teal, northern pintail, northern shoveler, European golden plover and lapwing¹¹. All remaining NHAs within a 20 km radius are designated for peatlands.

The Project Site is not within or immediately adjacent to any Ramsar site. The Slieve Bloom Mountains Ramsar site is located 11.7 km east of the Project Site and is contained within the boundaries of the Slieve Bloom Mountains SPA. There are no other Ramsar sites within a 20 km radius of the Project Site.

¹¹ NPWS (2014) Site Synopsis: River Little Brosna Callows SPA [000564] National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.



Table 3-2: NHAs and pNHAs within 20 km of the Project Site and their Qualifying Interests (Sites Designated for Ornithological Qualifying Interests Only)¹²

Site Name	Site Code	Distance/Direction from Site Boundary	Qualifying Interests
Woodville Woods pNHA	000927	0.35 km south	Common snipe <i>Gallinago gallinago</i>
River Little Brosna Callows NHA	000564	9.4 km west	Peatlands [4] Birds [12]
Lough Nahinch (Tipperary) pNHA	000936	15.5 km southwest	Common redshank <i>Tringa totanus</i> Common snipe Water rail <i>Rallus arquaticus</i>
Pallas Lough pNHA		18.1 km northeast	Mallard <i>Anas platyrhynchos</i> Eurasian teal Eurasian wigeon Western marsh harrier <i>Circus aeruginosus</i>

3.1.3 Species Records

The NBDC database was searched for records of bird species within the 10 km grid squares which overlap the Project Site (N00 and N01). All bird species are protected under the Wildlife Acts 1976 – 2018 but for the purposes of this report, only records of species that are Red or Amber-listed in Birds of Conservation Concern in Ireland or listed on Annex 1 of the Birds Directive are included in the results. Only records within the last 10 years are considered within this report as older records are unlikely to be relevant. Details of the results are shown in **Table 3-3**.

Table 3-3: Species recorded within the 10 km grid squares N00 and N01 (Species Present During the Non-Breeding Season)

Species name	Season	Grid square	Last Record Year	Designation
Barn owl <i>Tyto alba</i>	Breeding	N01	2019	BoCCI4 Red
Black-headed gull	Breeding and wintering	N01	2022	BoCCI4 Amber
Black-tailed godwit	Wintering	N00	2019	BoCCI4 Red
Common gull <i>Larus canus</i>	Breeding and wintering	N00	2019	BoCCI4 Amber
Common kestrel <i>Falco tinnunculus</i>	Breeding	N00, N01	2023	BoCCI4 Red
Common kingfisher <i>Alcedo atthis</i>	Breeding	N00, N01	2022	Annex 1, BoCCI4 Amber

¹² Only pNHAs that do not overlap with SPAs are shown.



Species name	Season	Grid square	Last Record Year	Designation
Common linnet <i>Linaria cannabina</i>	Breeding	N00, N01	2019	BoCCI4 Amber
Common pochard <i>Aythya ferrina</i>	Breeding and wintering	N00, N01	2019	BoCCI4 Red
Common redshank	Breeding and wintering	N00	2019	BoCCI4 Red
Common snipe	Breeding and wintering	N01	2022	BoCCI4 Red
Common starling <i>Sturnus vulgaris</i>	Breeding	N00, N01	2019	BoCCI4 Amber
Dunlin <i>Calidris alpina</i>	Breeding and wintering	N00, N01	2019	BoCCI4 Red
Eurasian curlew <i>Numenius arquata</i>	Breeding and wintering	N01	2019	BoCCI4 Red
Eurasian skylark <i>Alauda arvensis</i>	Breeding	N01	2019	BoCCI4 Amber
Eurasian teal	Breeding and wintering	N00, N01	2019	BoCCI4 Amber
Eurasian wigeon	Breeding and wintering	N00, N01	2019	BoCCI4 Amber
European golden plover	Breeding and wintering	N01	2019	Annex 1, BoCCI4 Red
Gadwall <i>Mareca strepera</i>	Breeding and wintering	N00, N01	2019	BoCCI4 Amber
Greenland white-fronted goose	Wintering	N00, N01	2019	Annex 1, BoCCI4 Amber
Greylag goose <i>Anser anser</i>	Wintering	N00, N01	2019	BoCCI4 Amber
Hen harrier	Breeding	N01	2014	BoCCI4 Amber
House sparrow <i>Passer domesticus</i>	Breeding	N00, N01	2022	BoCCI4 Amber
Little egret <i>Egretta garzetta</i>	Breeding and wintering	N00	2020	Annex 1, BoCCI4 Green
Mallard	Breeding and wintering	N00, N01	2023	BoCCI4 Amber
Meadow pipit <i>Anthus pratensis</i>	Breeding	N00, N01	2019	BoCCI4 Red
Merlin <i>Falco columbarius</i>	Breeding	N01	2017	Annex 1, BoCCI4 Amber
Mute swan <i>Cygnus olor</i>	Breeding and wintering	N00, N01	2022	BoCCI4 Amber
Northern lapwing	Breeding and wintering	N00, N01	2022	BoCCI4 Red



Species name	Season	Grid square	Last Record Year	Designation
Northern pintail	Wintering	N00, N01	2019	BoCCI4 Amber
Northern shoveler	Breeding and wintering	N00, N01	2019	BoCCI4 Red
Peregrine falcon <i>Falco peregrinus</i>	Breeding	N00, N01	2023	Annex 1, BoCCI4 Green
Tufted duck	Breeding and wintering	N01	2018	BoCCI4 Amber
Whooper swan	Wintering	N00, N01	2021	Annex 1, BoCCI4 Amber
Willow warbler <i>Phylloscopus trochilus</i>	Breeding	N00, N01	2019	BoCCI4 Amber
Yellowhammer <i>Emberiza citrinella</i>	Breeding	N00, N01	2021	BoCCI4 Red
Key	Season – indicates which season was assessed for each species under the Birds of Conservation Concern in Ireland ¹³ ; Annex 1 – the species is listed in Annex 1 of the EC Birds Directive; and BoCCI4 status (green, amber or red) – indicates the current Birds of Conservation Concern in Ireland status category.			

¹³ Gilbert, G., Stanbury, A. and Lewis, L. (2021). Birds of Conservation Concern in Ireland 2020–2026. Irish Birds 43: 1–22



3.2 Flight Activity Surveys

Flight activity recorded from all VPs combined by primary target species is summarised in **Table 3-4**. Primary target species flights from both VPs are shown in Appendix A Figures **2** to **17**. Flight activity data are provided in more detail in Appendix D with full data retained in GIS and excel format for subsequent collision risk modelling.

3.2.1 Primary Target Species

A total of 159 flight lines by 16 primary target species were recorded between October 2022 and March 2023. Common kestrel and northern lapwing were the most frequently recorded primary target species, with a total of 38 flight lines recorded for each species. European golden plover was the most numerous species, with a peak count of 3,500 flights recorded in a single flight line.



Table 3-4: Number of Primary Target Species Flights from All VPs Combined, October 2022 to March 2023

Species	Number of flight lines by month						Total number of flight lines	Time at risk height* (s)	Cumulative number of flights
	Oct	Nov	Dec	Jan	Feb	Mar			
Black-headed gull	0	0	2	1	0	2	5	480	37
Common kestrel	10	11	5	6	2	4	38	2,250	39
Common snipe	3	0	5	2	0	1	11	360	12
Eurasian teal	0	0	0	1	0	0	1	420	42
Eurasian wigeon	1	0	0	0	0	0	1	15	13
European golden plover	14	5	2	0	1	1	23	3,375	4,661
Great cormorant	0	2	4	3	2	0	11	585	11
Great white egret <i>Ardea alba</i>	1	0	0	0	0	0	1	0	1
Greylag goose	0	0	0	1	0	0	1	135	3
Hen harrier	2	0	1	5	0	0	8	255	8
Little egret	0	2	1	0	0	0	3	345	5
Mallard	2	1	0	1	0	1	5	240	13
Merlin	1	1	2	0	0	0	4	45	4
Northern lapwing	0	5	18	0	0	15	38	2,205	696
Peregrine falcon	0	2	3	0	0	0	5	60	5
Whooper swan	1	1	1	1	0	0	4	390	20
Total	35	30	44	21	5	24	159	23,625	5,570

* precautionary risk height assumed to be between 28 – 200 m

A summary description of flight activity by each species is presented below.

3.2.1.1 Black-Headed Gull

A total of five black-headed gull flight lines were recorded from December 2022 to March 2023, with a cumulative total of 37 flights. All flight lines were recorded at VP1, which overlooks agricultural fields and an area of cutover bog. A total of four flight lines (80%) were recorded within potential collision risk heights. Most flight lines consisted of a small number of birds, but one flight line in January consisted of 23 flights. Flight line durations varied with a maximum duration of 196 seconds.

3.2.1.2 Common Kestrel

A total of 38 common kestrel flight lines were recorded during the flight activity surveys, with a cumulative total of 39 flights. The highest number of flight lines occurred in November 2022. A total of 21 flight lines (55%) were recorded within potential collision risk heights. Flight durations varied with a maximum duration of 330 seconds.



3.2.1.3 Common Snipe

A total of 11 common snipe flight lines were recorded during the flight activity surveys, with a cumulative total of 12 flights. A total of nine flight lines (81%) were recorded within potential collision risk heights. Flight durations varied with a maximum duration of 72 seconds.

3.2.1.4 Eurasian Teal

One flight line consisting of 42 flights was recorded at VP1 in January 2023 flying over the agricultural fields within the Site. The flight line was within potential collision risk heights and lasted 420 seconds.

3.2.1.5 Eurasian Wigeon

One flight line consisting of 13 flights was recorded at VP1 in October 2022 flying over the cutover bog within the Site. The flight line was within potential collision risk heights for 15 seconds out of a total of 31 seconds.

3.2.1.6 European Golden Plover

A total of 23 European golden plover flight lines were recorded during the flight activity surveys, with a cumulative total of 4,658 flights. The highest number of flight lines occurred in October 2022, with numbers declining in later months. Most flock sizes ranged from four to 250 birds, but one flock in November consisted of 3,500 birds. A total of 21 flight lines (91%) were recorded within potential collision risk heights. Flight durations varied with a maximum duration of 510 seconds.

3.2.1.7 Hen Harrier

A total of eight hen harrier flight lines were recorded from October 2022 to January 2023, with all observations consisting of a single flight. The highest number of flight lines occurred in January 2023, and most flights were recorded at VP3, which overlooks an area of cutover bog. A total of six flights (75%) were recorded within potential collision risk heights. Flight durations varied with a maximum duration of 195 seconds.

3.2.1.8 Great Cormorant

A total of 11 great cormorant flight lines were recorded during the flight activity surveys, with all observations consisting of a single flight. A total of 10 flight lines (91%) were recorded within potential collision risk heights. Flight durations varied with a maximum duration of 137 seconds. Most flight lines were recorded at VP2, which overlooks Boolinarig River.

3.2.1.9 Great White Egret

A single great white egret was recorded at VP3 in October 2022 flying south over an area of cutover bog within the Project Site. The flight line was below potential collision risk heights and lasted for 15 seconds. No other observations of this species were recorded during the 2022/23 non-breeding season.

3.2.1.10 Greylag Goose

One flight line consisting of three flights was recorded in January 2023 from VP2. The birds were flying within potential collision risk heights towards an area of cutover bog in the east of the Project Site. No other observations of this species were recorded during the 2022/23 non-breeding season.

3.2.1.11 Little Egret

A total of three little egret flight lines were recorded in November and December 2022 from VP2. Two flight lines consisted of two flights and one flightline consisted of a single flight. All flight lines were recorded within potential collision risk heights.



3.2.1.12 Mallard

A total of five mallard flightlines were recorded during the flight activity surveys, with a cumulative total of 13 flights. Three flight lines (60%) were recorded within potential collision risk heights.

3.2.1.13 Merlin

A total of four merlin flight lines were recorded during the flight activity surveys from October to December 2022, with all flight lines consisting of a single flight. All flight lines were recorded at VP3. One flight line (25%) was recorded within potential collision risk heights.

3.2.1.14 Northern Lapwing

A total of 38 northern lapwing flight lines were recorded during the flight activity surveys in November 2022, December 2022 and March 2023, with a cumulative total of 696 flights. Most flight lines consisted of a small number of birds, but there were a few larger flocks recorded (up to 250 flights per flight line). A total of 26 flight lines (68%) were recorded within potential collision risk heights.

3.2.1.15 Peregrine Falcon

A total of five peregrine falcon flight lines were recorded in November and December 2022, with all observations consisting of a single flight. Four flight lines were recorded from VP1 and one was recorded from VP3. One flight line (20%) was recorded within potential collision risk heights at VP1.

3.2.1.16 Whooper Swan

A total of four whooper swan flight lines were recorded during the flight activity surveys from October 2022 to January 2023, with a cumulative total of 20 flights. Three flight lines (75%) were recorded within potential collision risk heights. Flight durations varied with a maximum duration of 205 seconds.

3.2.2 Secondary Target Species

Secondary species activity at the Project Site is summarised in **Table 3-5**. There were four secondary species recorded throughout the season. Common buzzard was the most frequently recorded secondary species (in 63 five-minute periods out of a possible 1,296). Northern raven was the most numerous species, with a peak count of seven birds recorded in one five-minute period.

Table 3-5: Secondary Species Activity Summary for VP1 and VP2 Combined – October 2022 to March 2023

Species	Number of 5 min periods recorded	Peak count of birds recorded in any 5 min period	Comments
Common buzzard	63	3	Activity in all months, within the Project Site, survey buffer and beyond.
Grey heron	21	2	Activity in all months except February, within the Project Site, survey buffer and beyond.
Northern raven	24	7	Activity in all months, within the Project Site, survey buffer and beyond.
Eurasian sparrowhawk	10	2	Activity in all months except February, within the Project Site, survey buffer and beyond.



3.3 Feeding Distribution Surveys

The feeding distribution surveys did not record any aggregations of swans or geese.

3.3.1 Incidental Records of Other Species

During the survey visits, the following incidental records were made of other species of conservation concern:

- Raptors: buzzard, kestrel, merlin, peregrine falcon and sparrowhawk;
- Waders: common snipe and northern lapwing; and
- Wildfowl: grey heron

3.4 Nocturnal Golden Plover Surveys

No European golden plover activity was recorded during surveys.

3.4.1 Incidental Records of Other Species

Incidental observations of common snipe, Eurasian curlew, northern lapwing and hen harrier were recorded during one survey in March 2023.



4.0 Summary and Conclusions

Flight activity surveys (VPs), feeding distribution surveys and nocturnal golden plover surveys were carried out at the Project Site during the non-breeding season in 2022/23.

The following primary target species were recorded during the non-breeding season flight activity surveys:

- Black-headed gull;
- Common snipe
- Common kestrel;
- Great cormorant;
- Eurasian teal;
- Eurasian wigeon;
- European golden plover;
- Great white egret;
- Greylag goose;
- Hen harrier;
- Little egret;
- Mallard;
- Merlin;
- Northern lapwing;
- Peregrine falcon; and
- Whooper swan

Common kestrel and northern lapwing were the most frequently recorded species, with a total of 38 flight lines recorded for each species. European golden plover was the most numerous species, with a peak count of 3,500 being recorded in a single flight line.

Four secondary target species were recorded during the non-breeding season: common buzzard, grey heron, northern raven and Eurasian sparrowhawk.

No aggregations of swans or geese were recorded during the feeding distribution surveys. No golden plover activity was recorded during the nocturnal golden plover surveys.

Incidental records made of species of conservation concern during taxon-specific surveys included the following:

- Raptors: buzzard, hen harrier, kestrel, merlin, peregrine falcon, and sparrowhawk;
- Waders: common snipe, Eurasian curlew and northern lapwing; and
- Wildfowl: grey heron



5.0 Legal and Conservation Status of Target Species Recorded

Table 5-1 summarises the legal and conservation status of the primary and secondary target species recorded during the range of ornithological surveys mentioned above. Note that all bird species in Ireland are afforded general protection by the Wildlife Acts 2000 (as amended).

Table 5-1: Legal and Conservation Status of Target Species

Primary or Secondary Target	Species (BTO code)	Legal and Conservation status in Ireland
Primary	Black-headed gull (BH)	BoCCI4 Amber
	Common kestrel (K.)	BoCCI4 Red
	Common snipe (SN)	BoCCI4 Red
	Eurasian teal (T.)	BoCCI4 Amber
	Eurasian wigeon (WN)	BoCCI4 Amber
	European golden plover (GP)	Annex 1, BoCCI4 Red
	Great cormorant (CA)	BoCCI4 Amber
	Great white egret (HW)	Annex 1, not assessed under BoCCI4
	Greylag goose (GJ)	BoCCI4 Amber
	Hen harrier (HH)	Annex 1, BoCCI4 Amber
	Little egret (ET)	Annex 1, BoCCI4 Green
	Mallard (MA)	BoCCI4 Amber
	Merlin (ML)	Annex 1, BoCCI4 Amber
	Northern lapwing (L.)	BoCCI4 Red
	Peregrine falcon (PE)	Annex 1, BoCCI4 Green
Whooper swan (WS)	Annex 1, BoCCI4 Amber	
Secondary	Common buzzard (BZ)	BoCCI4 Green
	Grey heron (H.)	BoCCI4 Green



Primary or Secondary Target	Species (BTO code)	Legal and Conservation status in Ireland
	Northern raven (RN)	BoCCI4 Green
	Eurasian sparrowhawk (SH)	BoCCI4 Green
Incidentals	Eurasian curlew (CU)	BoCCI4 Red
Key		Annex 1 – the species is listed in Annex 1 of the EC Birds Directive; and BoCCI4 status (green, amber or red) – indicates the current Birds of Conservation Concern in Ireland ⁸ status category.





Appendix A Figures

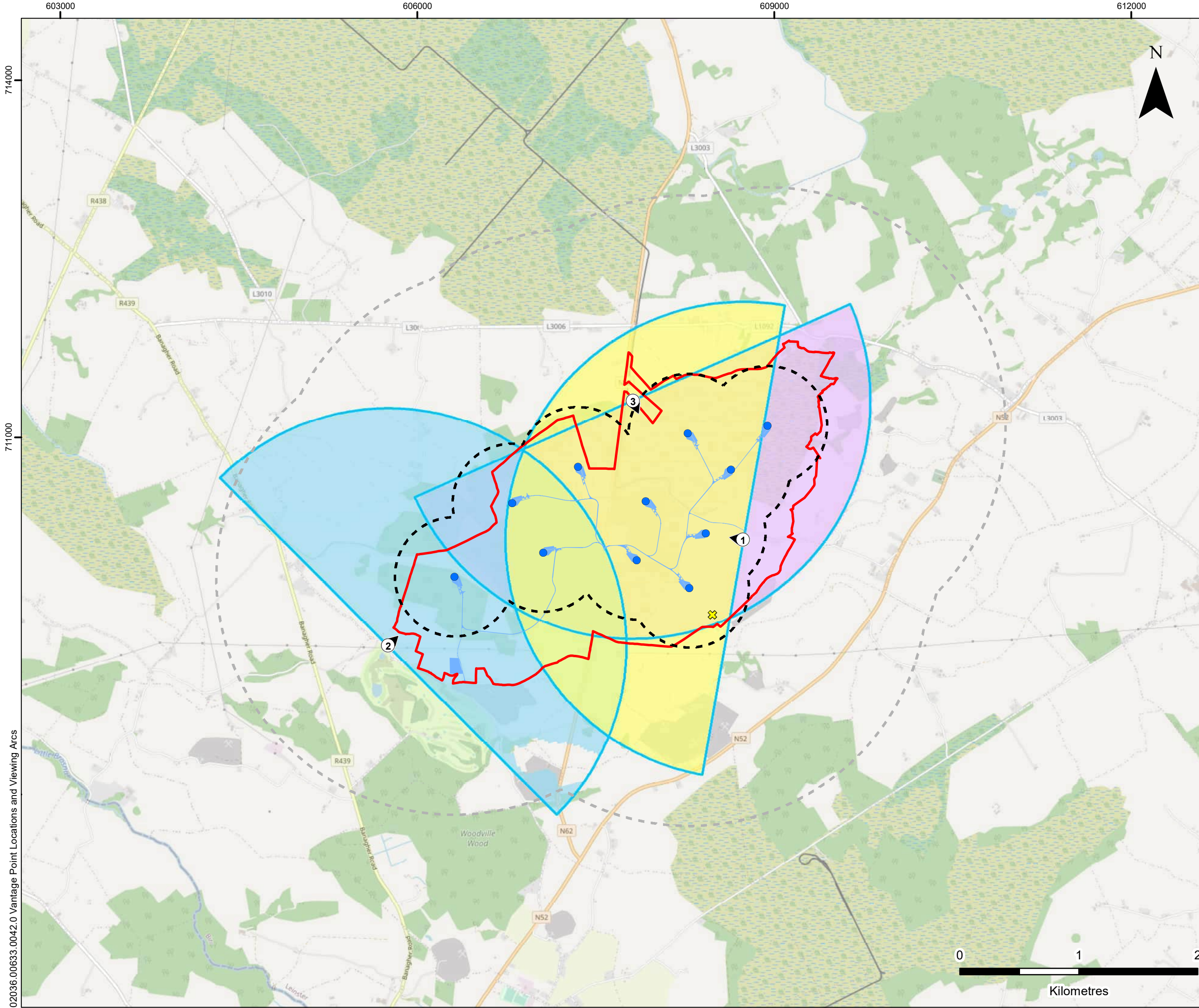
Bird Survey Report Non-Breeding 2022/23

Cush Wind Farm

Galetech Energy Developments Ltd

SLR Project No.: 501.V64760.00001

5 September 2023



NOTES
 1. The ZTV is calculated with a surface offset of 28m & 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. The ZTV was calculated using ArcMAP 10.5.1 software.

- LEGEND**
- Site Boundary
 - Proposed Turbine Location 500m Buffer
 - Proposed Turbine Location 2 km Buffer
 - Proposed Turbine Location
 - ✕ Proposed Met Mast
 - Vantage Point (VP) Location
 - Proposed Site Infrastructure
 - Vantage Point 2 km Viewing Arc
 - Theoretical Visibility from VP1
 - Theoretical Visibility from VP2
 - Theoretical Visibility from VP3



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CUSH WIND FARM
WINTER BIRD SURVEYS
VANTAGEPOINTS

FIGURE 1

Scale 1:30,000 @ A3 Date SEPTEMBER 2023

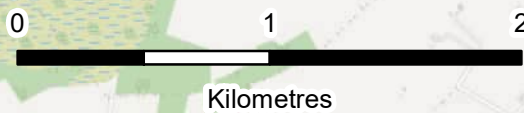
02036.00633.0042.0 Vantage Point Locations and Viewing Arcs

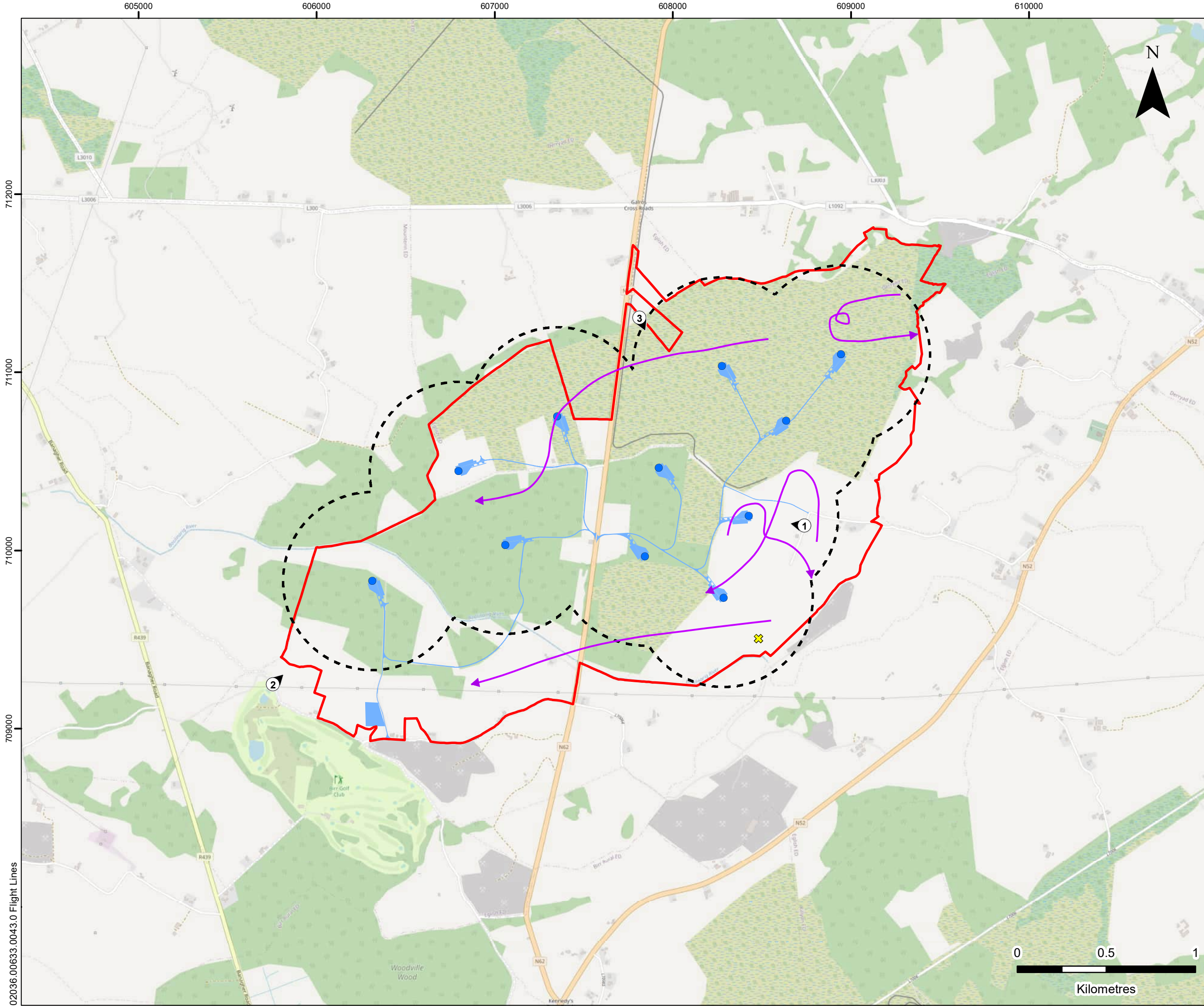
603000

606000

609000

612000





LEGEND

- Site Boundary
- Proposed Turbine Location 500m Buffer
- Proposed Turbine Location
- Proposed Met Mast
- Vantage Point (VP) Location
- Proposed Site Infrastructure

Flight Lines

- Black-headed Gull



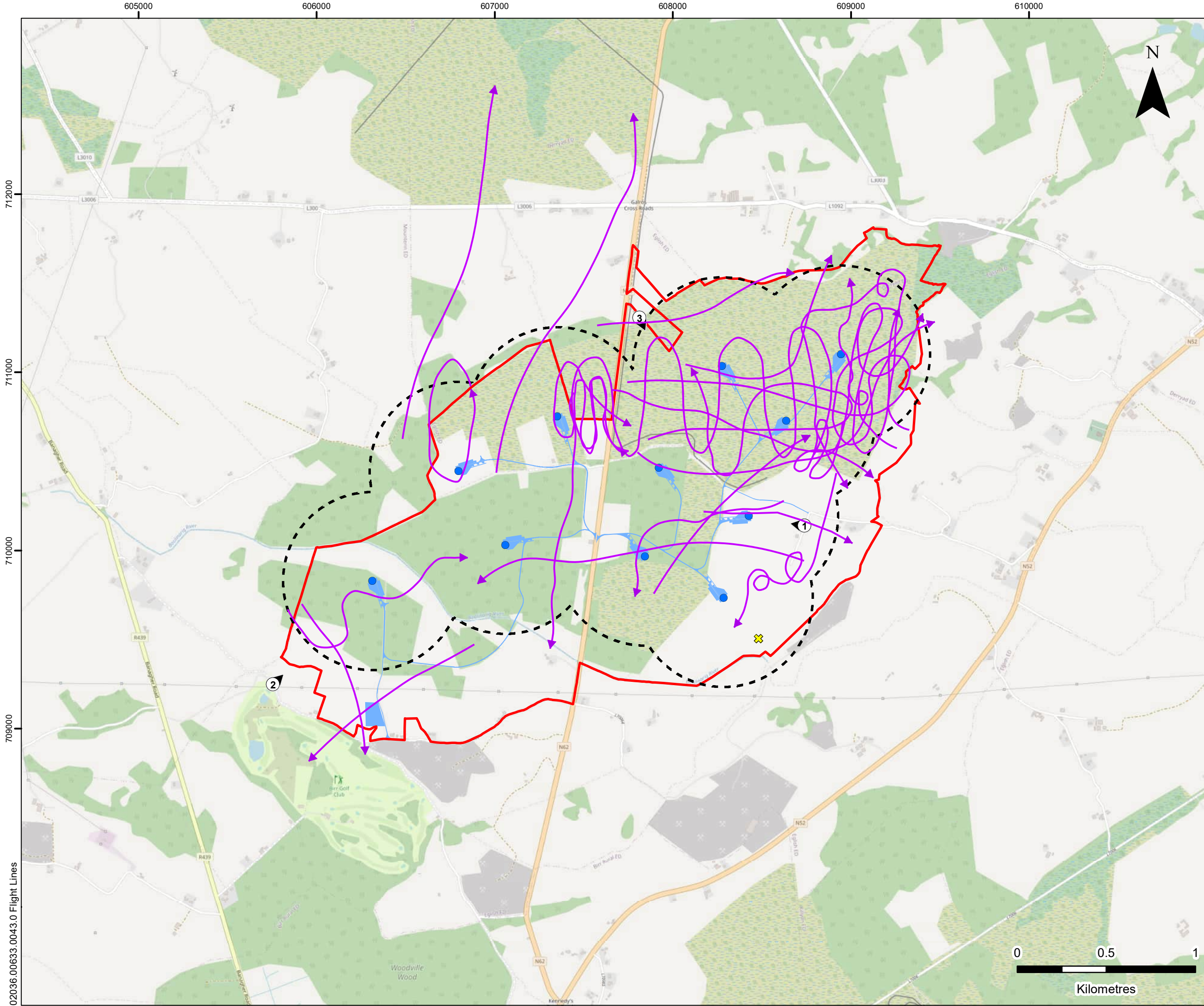
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CUSH WIND FARM
WINTER BIRD SURVEYS
FLIGHT LINES: BLACK-HEADED GULL

FIGURE 2

Scale 1:20,000 @ A3 Date SEPTEMBER 2023





LEGEND

- Site Boundary
- Proposed Turbine Location 500m Buffer
- Proposed Turbine Location
- ✕ Proposed Met Mast
- Vantage Point (VP) Location
- Proposed Site Infrastructure

Flight Lines

- Golden Plover



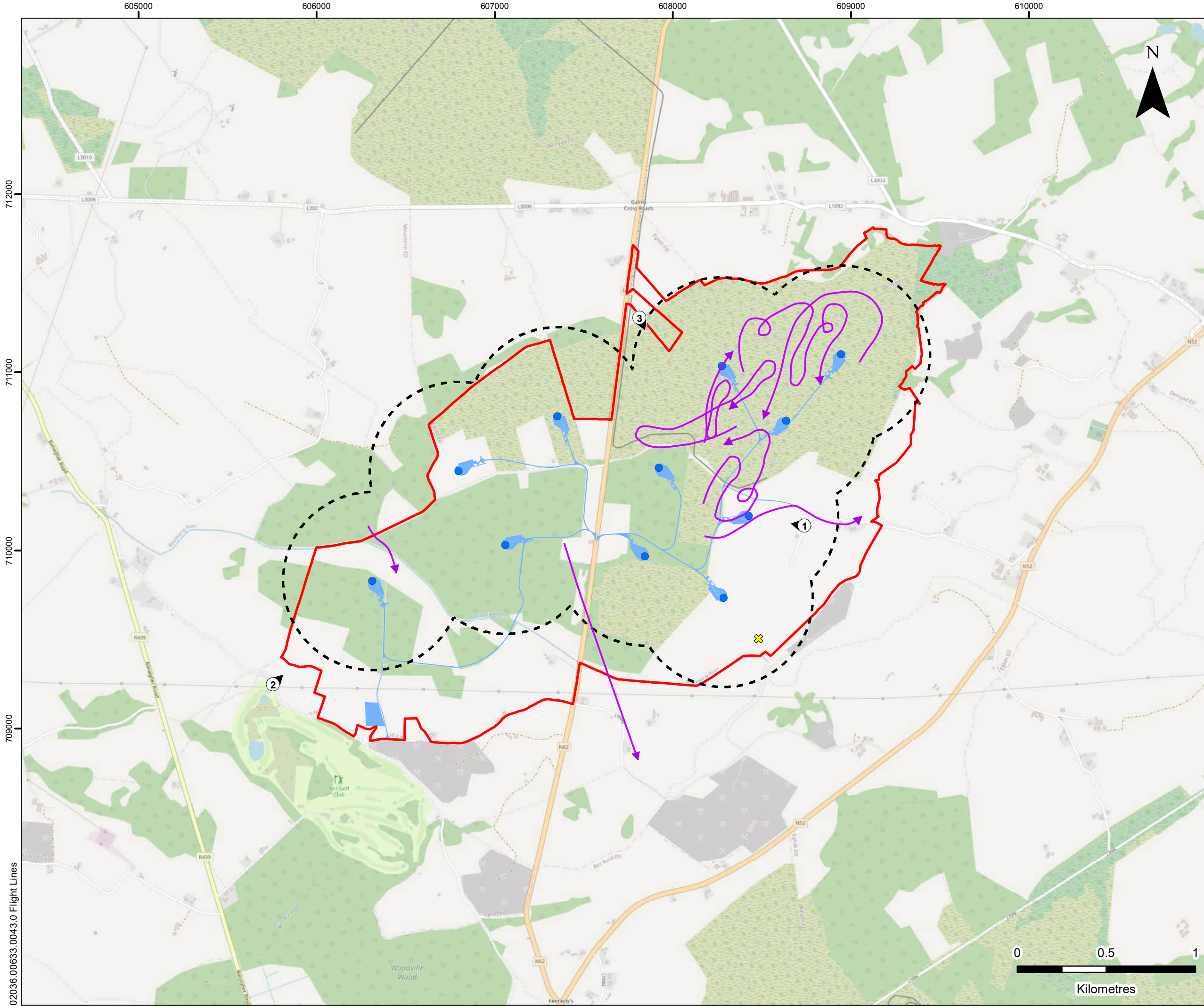
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CUSH WIND FARM
WINTER BIRD SURVEYS
FLIGHT LINES: GOLDEN PLOVER

FIGURE 3

Scale 1:20,000 @ A3 Date SEPTEMBER 2023

02036.00633.0043.0 Flight Lines



LEGEND

- Site Boundary
- Proposed Turbine Location 500m Buffer
- Proposed Turbine Location
- Proposed Met Mast
- Vantage Point (VP) Location
- Proposed Site Infrastructure

Flight Lines

- Hen Harrier



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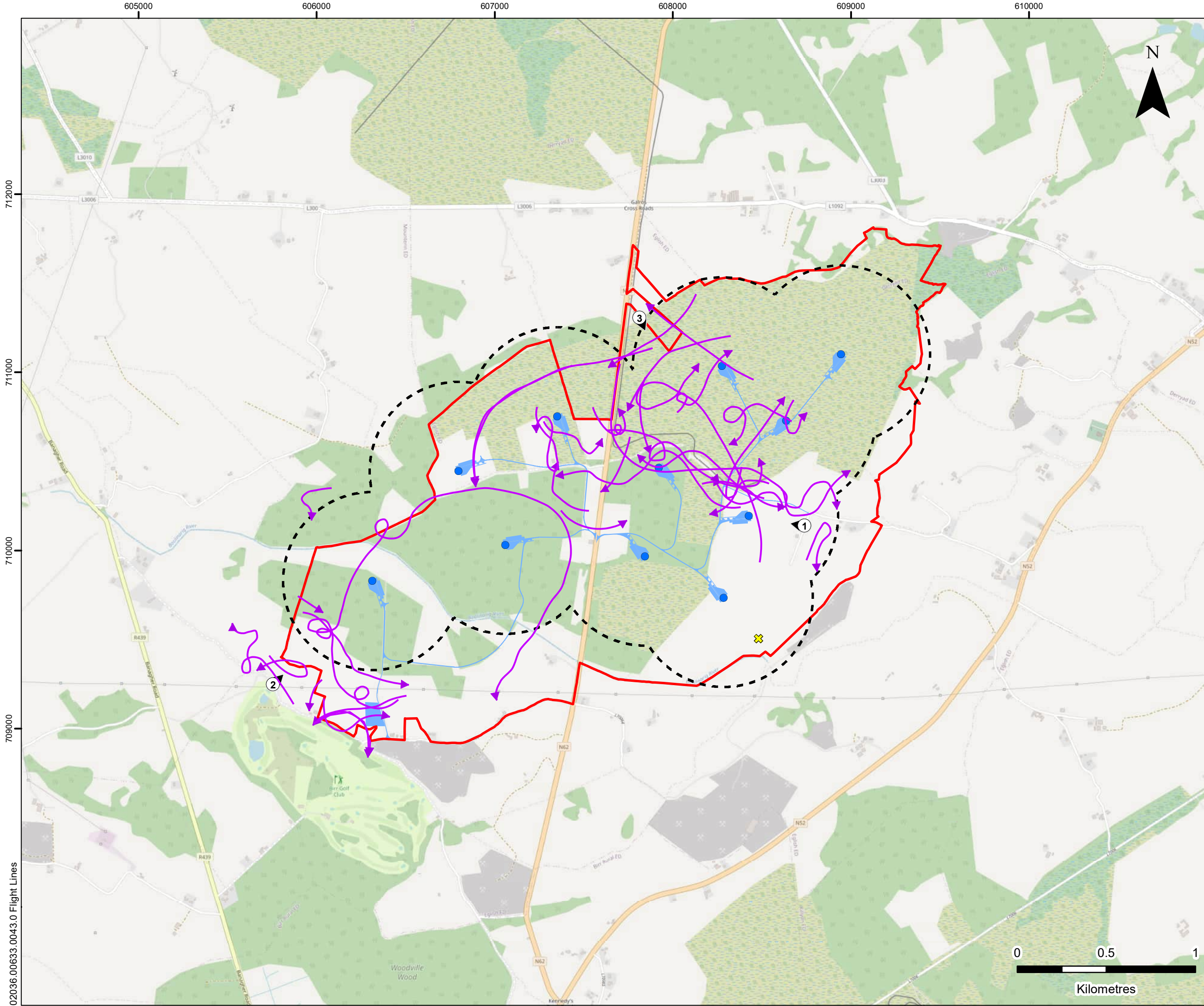
CUSH WIND FARM
WINTER BIRD SURVEYS
FLIGHT LINES: HEN HARRIER

FIGURE 4

Scale 1:20,000 @ A3 Date SEPTEMBER 2023



02036.00633.0043.0 Flight Lines



LEGEND

- Site Boundary
- Proposed Turbine Location 500m Buffer
- Proposed Turbine Location
- Proposed Met Mast
- Vantage Point (VP) Location
- Proposed Site Infrastructure

Flight Lines

- Kestrel



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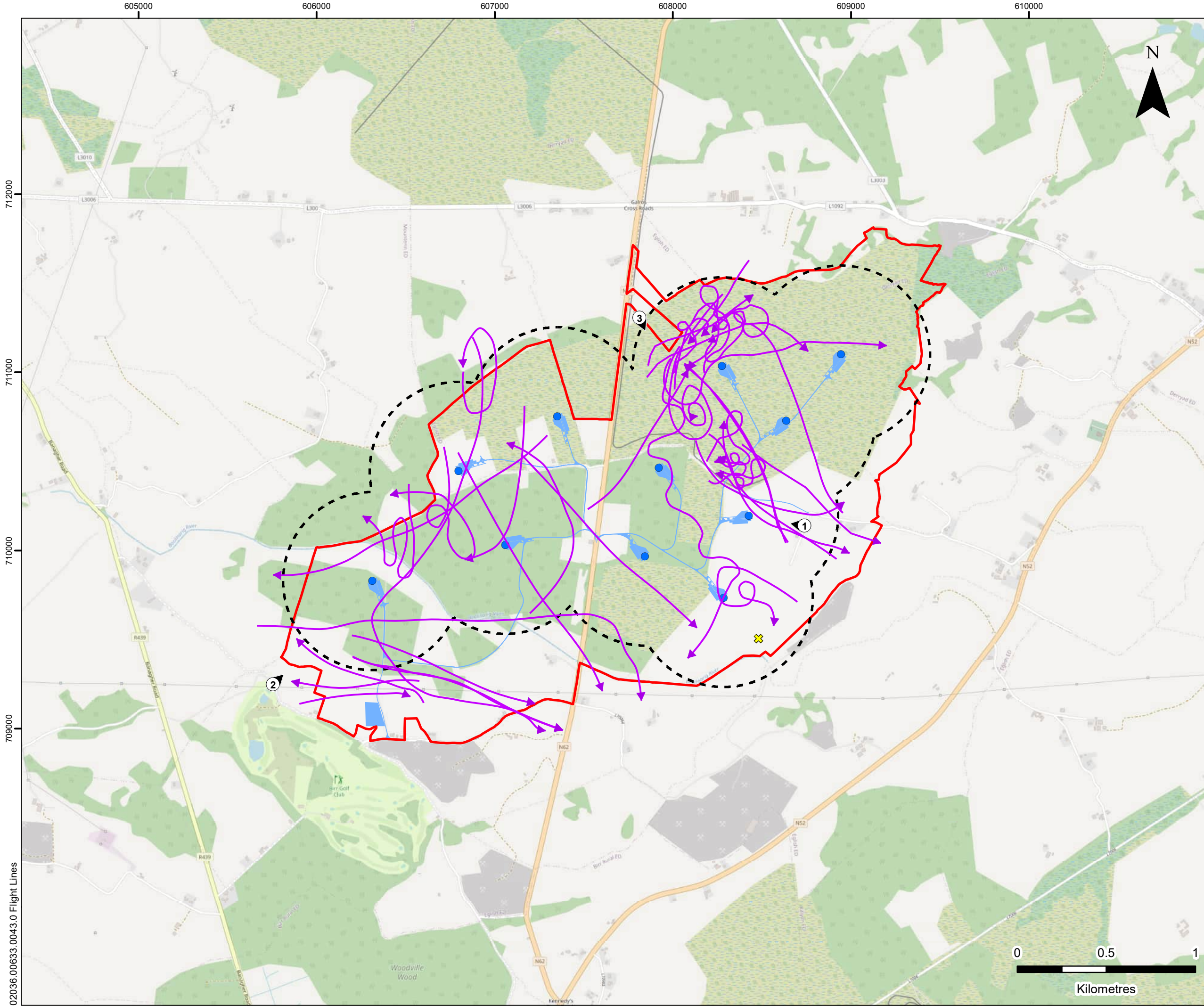
CUSH WIND FARM
WINTER BIRD SURVEYS
FLIGHT LINES: KESTREL

FIGURE 5

Scale 1:20,000 @ A3 Date SEPTEMBER 2023



02036.00633.0043.0 Flight Lines



LEGEND

- Site Boundary
- Proposed Turbine Location 500m Buffer
- Proposed Turbine Location
- Proposed Met Mast
- Vantage Point (VP) Location
- Proposed Site Infrastructure

Flight Lines

- Lapwing

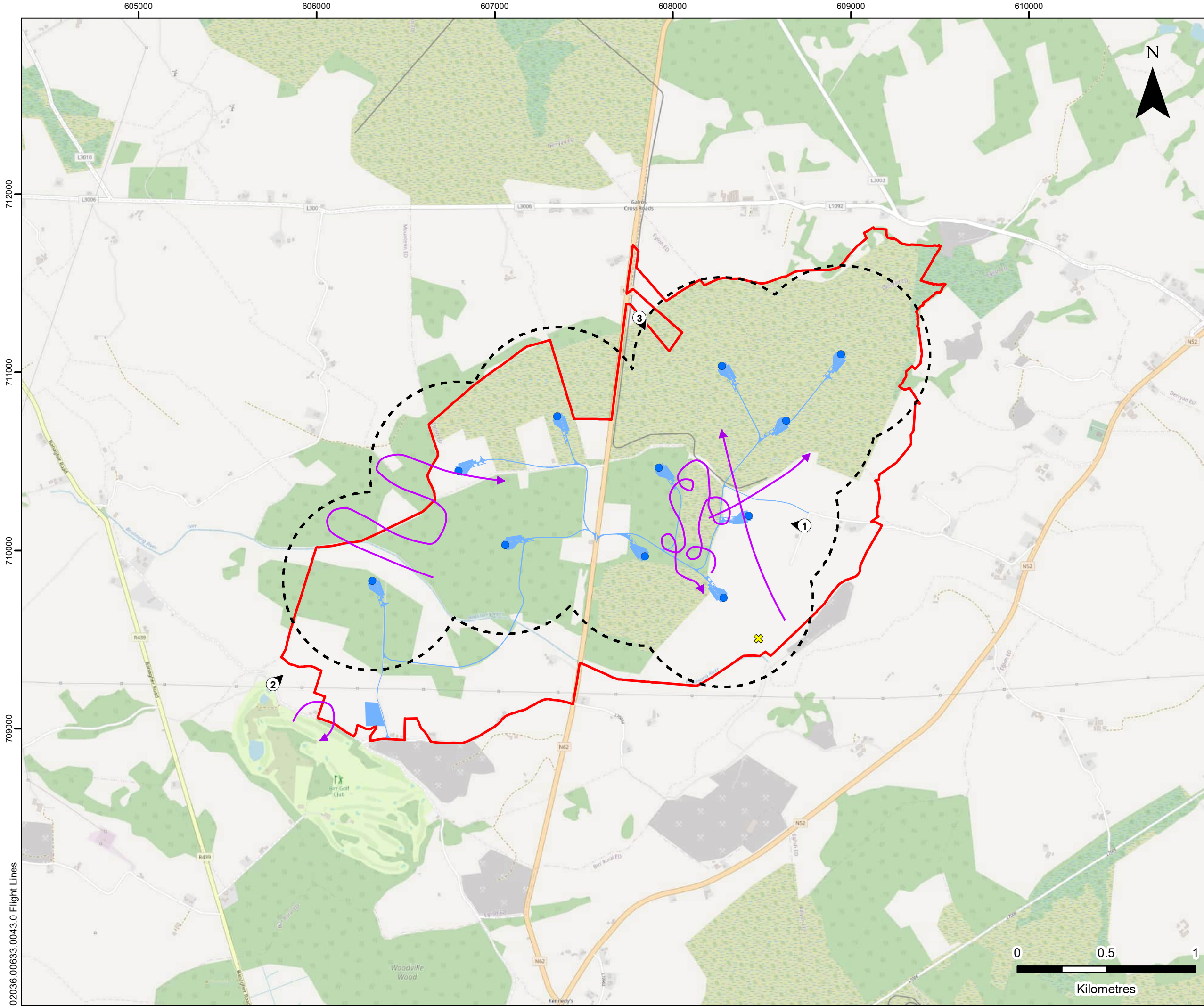


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CUSH WIND FARM
WINTER BIRD SURVEYS
FLIGHT LINES: LAPWING

FIGURE 6

Scale 1:20,000 @ A3 Date SEPTEMBER 2023



LEGEND

- Site Boundary
- Proposed Turbine Location 500m Buffer
- Proposed Turbine Location
- ✕ Proposed Met Mast
- ▲ Vantage Point (VP) Location
- Proposed Site Infrastructure

Flight Line

- Mallard



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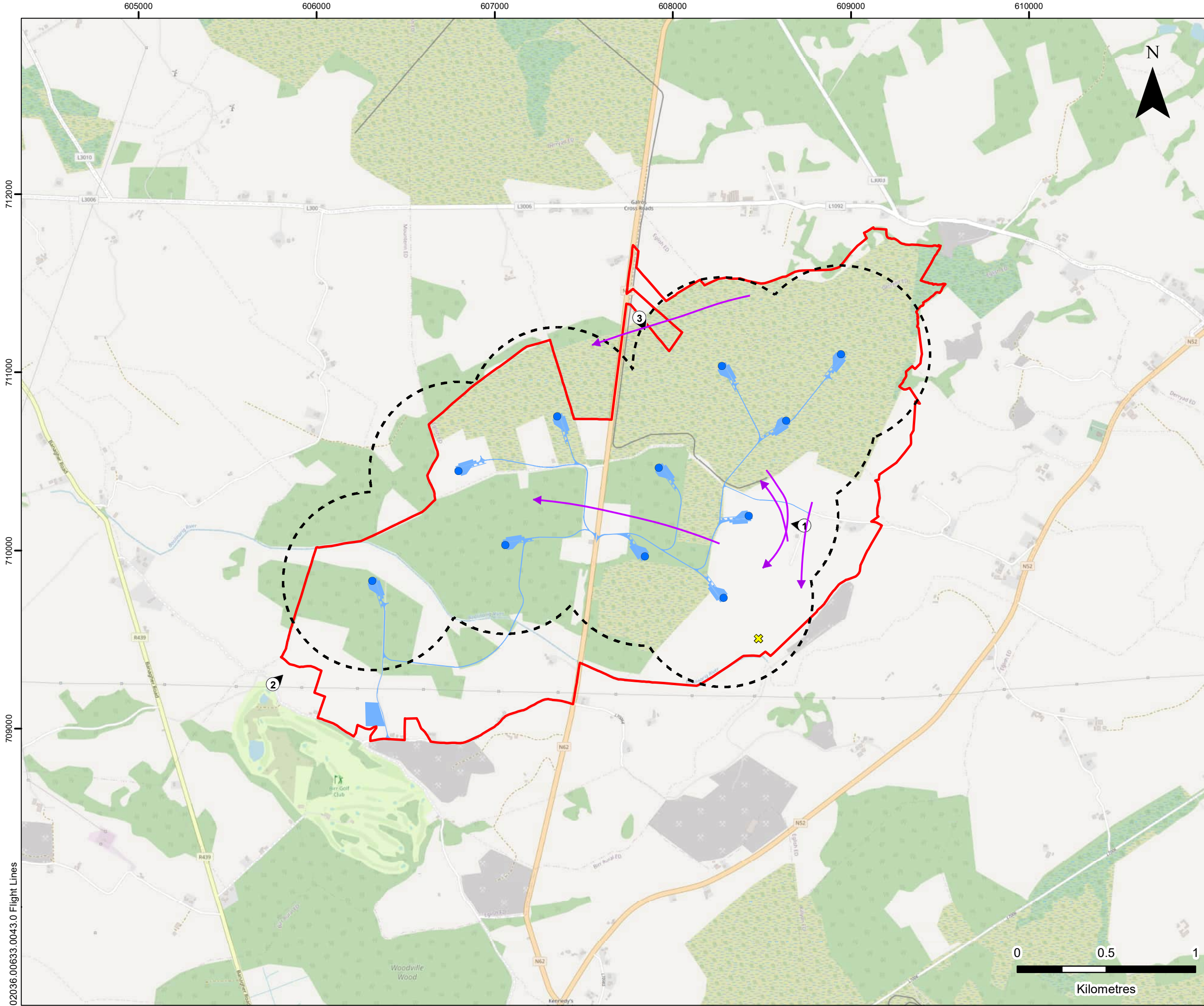
CUSH WIND FARM
WINTER BIRD SURVEYS
FLIGHT LINES: MALLARD

FIGURE 7

Scale 1:20,000 @ A3	Date SEPTEMBER 2023
------------------------	------------------------



02036.00633.0043.0 Flight Lines



LEGEND

- Site Boundary
- Proposed Turbine Location 500m Buffer
- Proposed Turbine Location
- Proposed Met Mast
- Vantage Point (VP) Location
- Proposed Site Infrastructure

Flight Lines

- Peregrine



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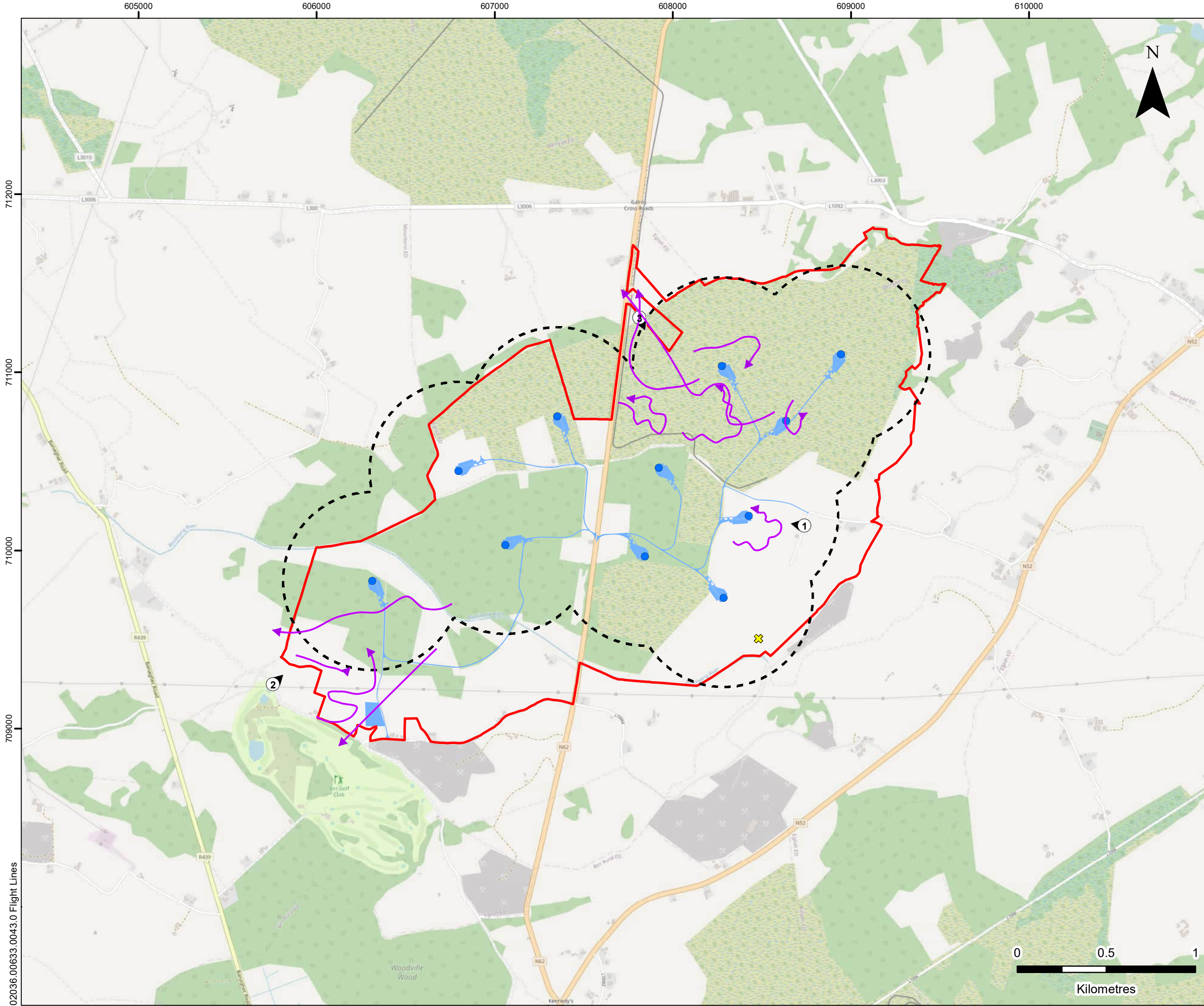
CUSH WIND FARM
WINTER BIRD SURVEYS
FLIGHT LINES: PEREGRINE

FIGURE 8

Scale 1:20,000 @ A3 Date SEPTEMBER 2023



02036.00633.0043.0 Flight Lines



LEGEND

- Site Boundary
- Proposed Turbine Location 500m Buffer
- Proposed Turbine Location
- ✕ Proposed Met Mast
- Vantage Point (VP) Location
- Proposed Site Infrastructure

Flight Lines

- ➔ Snipe



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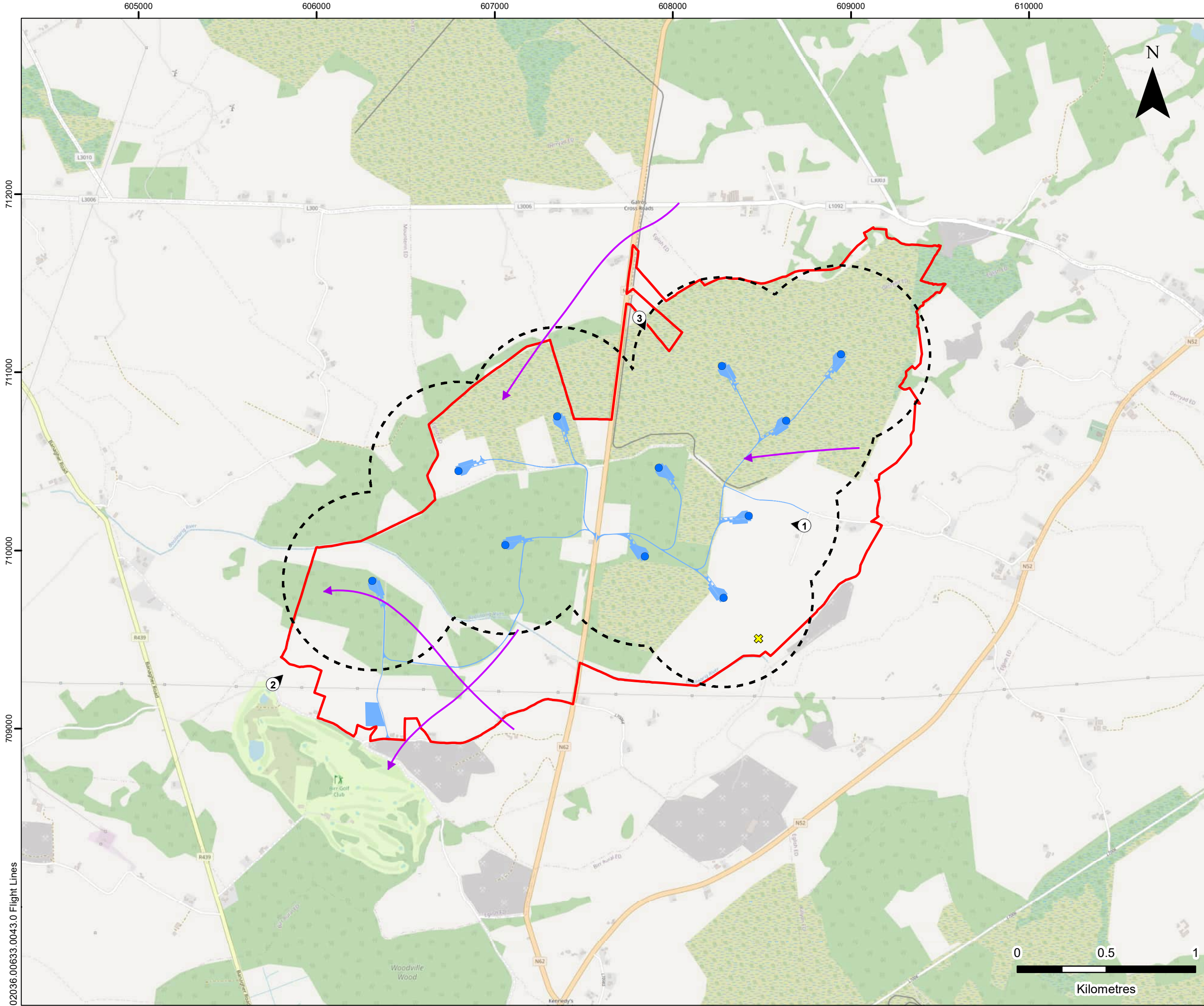
CUSH WIND FARM
WINTER BIRD SURVEYS
FLIGHT LINES: SNIPE

FIGURE 9

Scale 1:20,000 @ A3 Date SEPTEMBER 2023



02036.00633.0043.0 Flight Lines



LEGEND

- Site Boundary
- Proposed Turbine Location 500m Buffer
- Proposed Turbine Location
- ✕ Proposed Met Mast
- Vantage Point (VP) Location
- Proposed Site Infrastructure

Flight Lines

- ➔ Whooper Swan



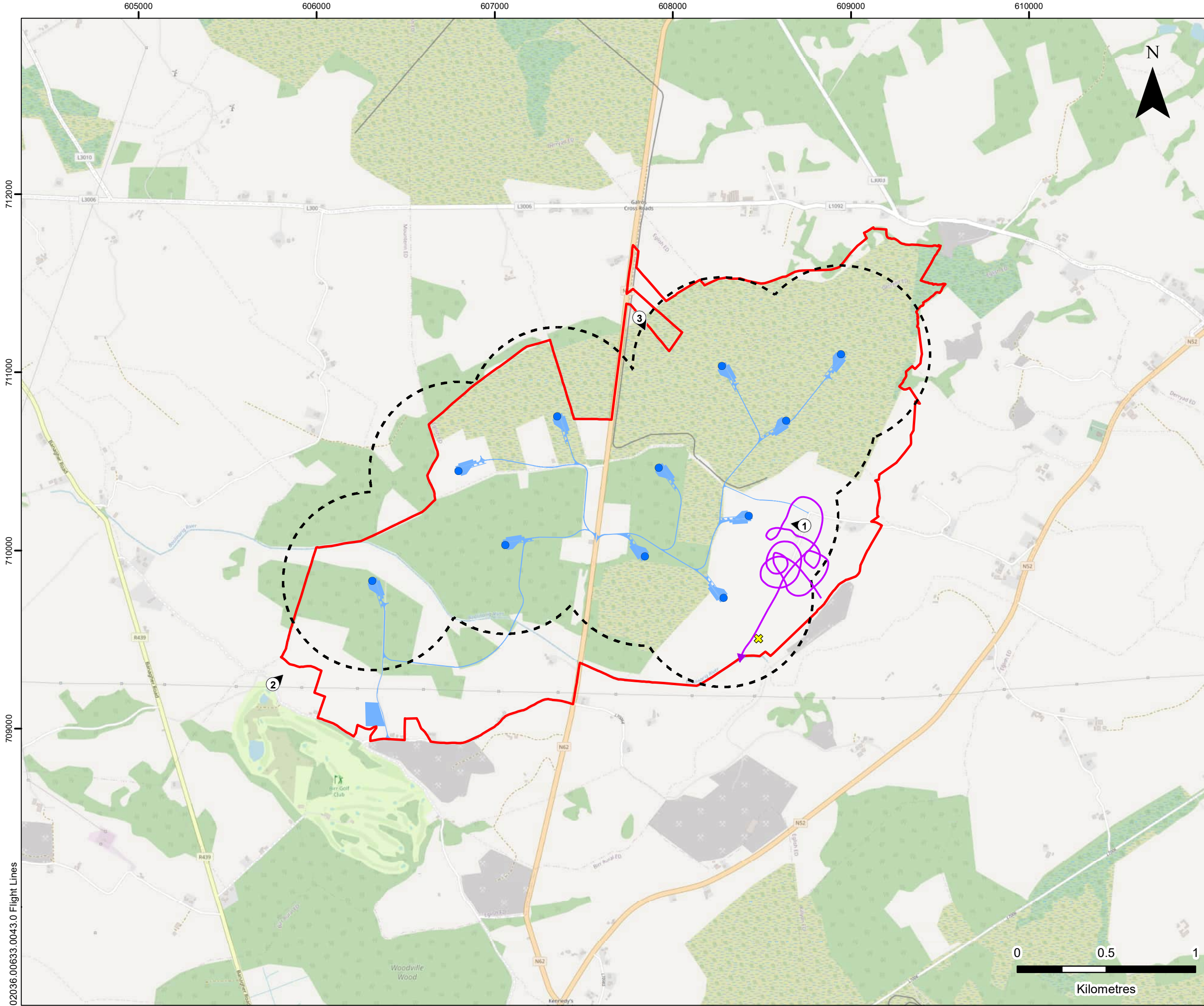
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CUSH WIND FARM
WINTER BIRD SURVEYS
FLIGHT LINES: WHOOPER SWAN

FIGURE 10

Scale 1:20,000 @ A3 Date SEPTEMBER 2023





LEGEND

- Site Boundary
- Proposed Turbine Location 500m Buffer
- Proposed Turbine Location
- ✕ Proposed Met Mast
- Vantage Point (VP) Location
- Proposed Site Infrastructure

Flight Lines

- Teal



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CUSH WIND FARM
WINTER BIRD SURVEYS
FLIGHT LINES: TEAL

FIGURE 11

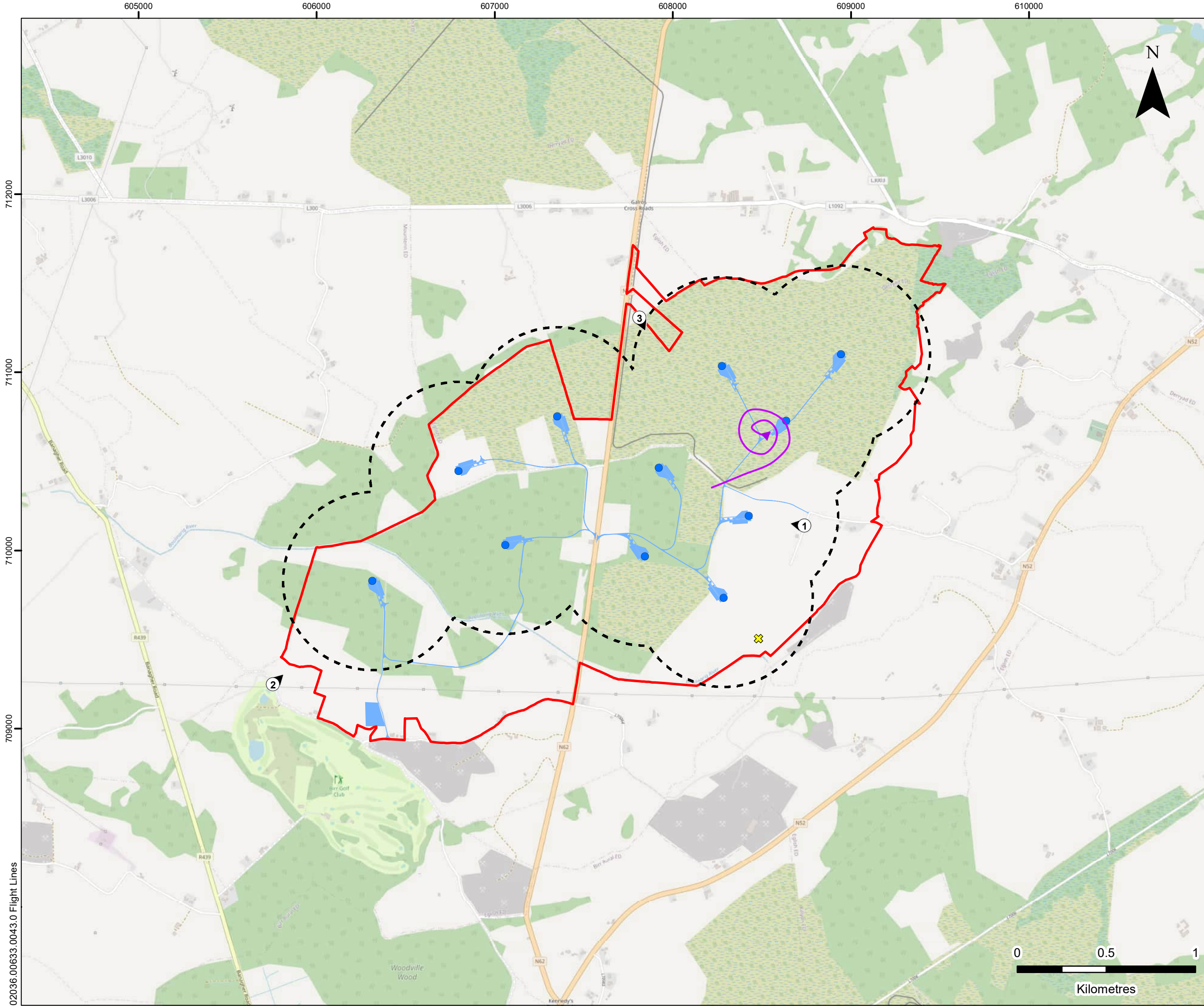
Scale 1:20,000 @ A3 Date SEPTEMBER 2023

02036.00633.0043.0 Flight Lines

605000
606000
607000
608000
609000
610000

712000
711000
710000
709000





LEGEND

- Site Boundary
- Proposed Turbine Location 500m Buffer
- Proposed Turbine Location
- ✕ Proposed Met Mast
- Vantage Point (VP) Location
- Proposed Site Infrastructure

Flight Lines

- ➔ Wigeon



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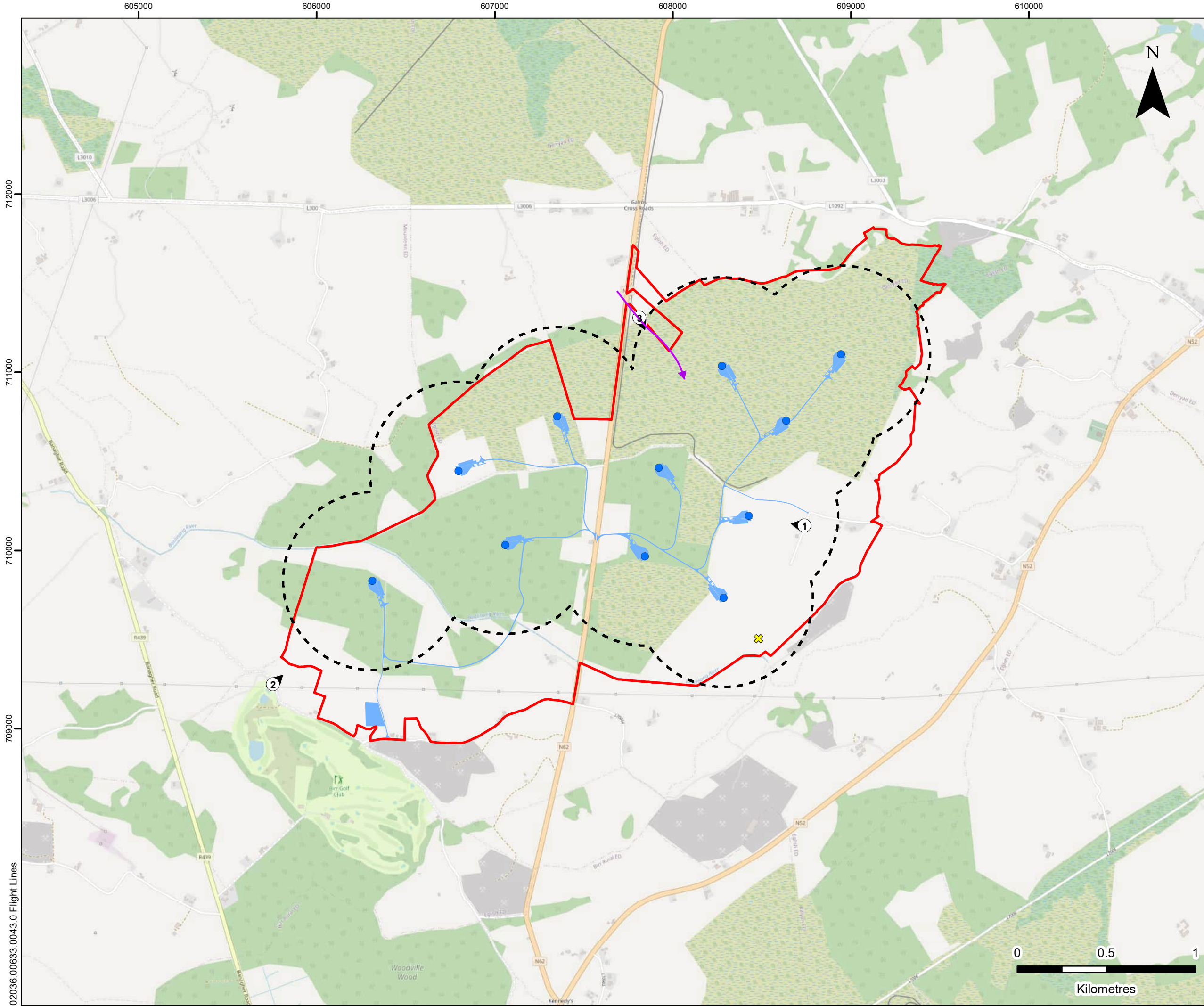
CUSH WIND FARM
WINTER BIRD SURVEYS
FLIGHT LINES: WIGEON

FIGURE 12

Scale 1:20,000 @ A3 Date SEPTEMBER 2023



02036.00633.0043.0 Flight Lines



LEGEND

- Site Boundary
- Proposed Turbine Location 500m Buffer
- Proposed Turbine Location
- Proposed Met Mast
- Vantage Point (VP) Location
- Proposed Site Infrastructure

Flight Lines

- Great White Egret



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 WINDY ARBOUR
 DUBLIN D14 N2Y7
 IRELAND
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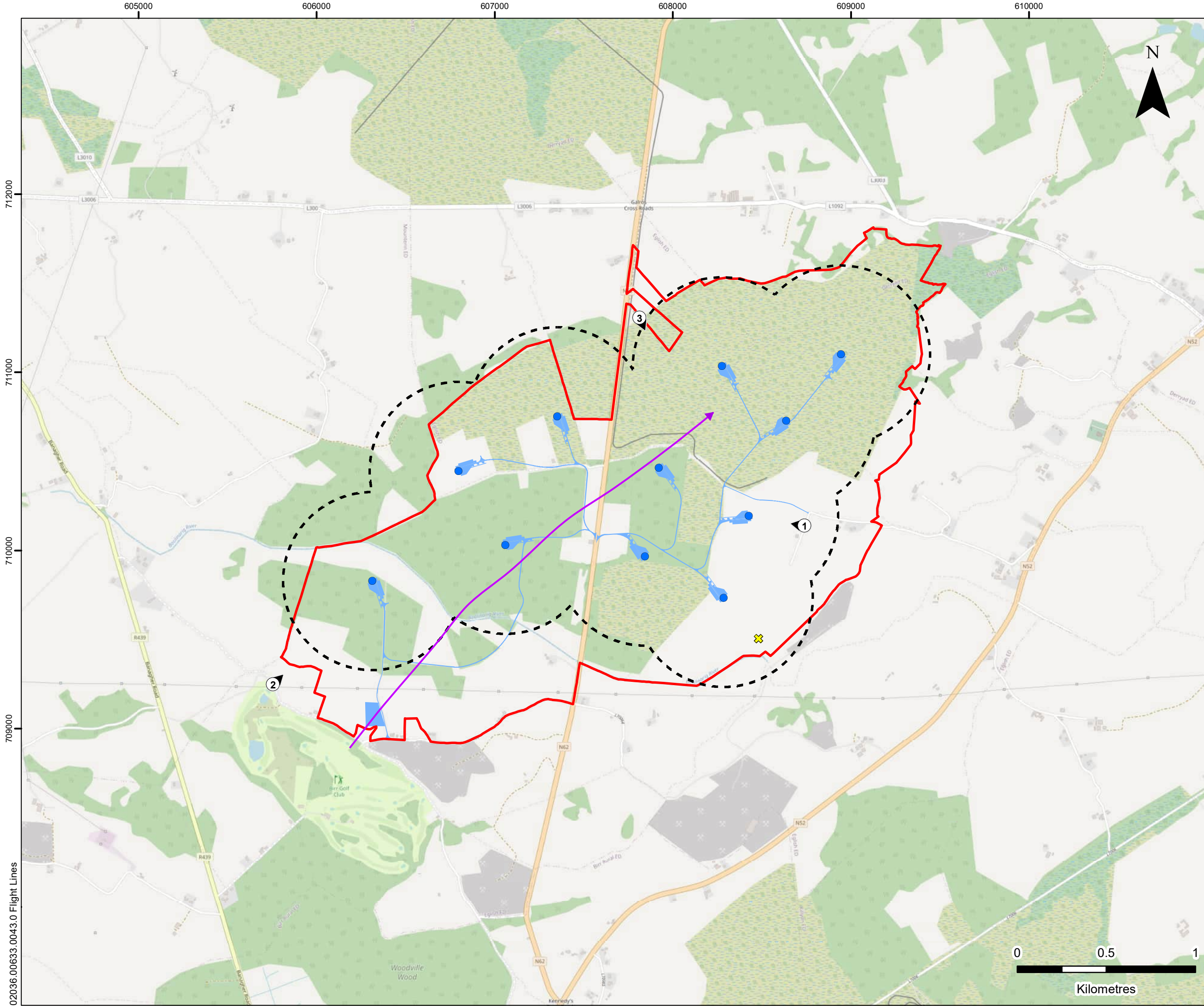
CUSH WIND FARM
WINTER BIRD SURVEYS
FLIGHT LINES: GREAT WHITE EGRET

FIGURE 13

Scale 1:20,000 @ A3 Date SEPTEMBER 2023



02036.00633.0043.0 Flight Lines



LEGEND

- Site Boundary
- Proposed Turbine Location 500m Buffer
- Proposed Turbine Location
- ✕ Proposed Met Mast
- Vantage Point (VP) Location
- Proposed Site Infrastructure

Flight Lines

- ➔ Greylag Goose



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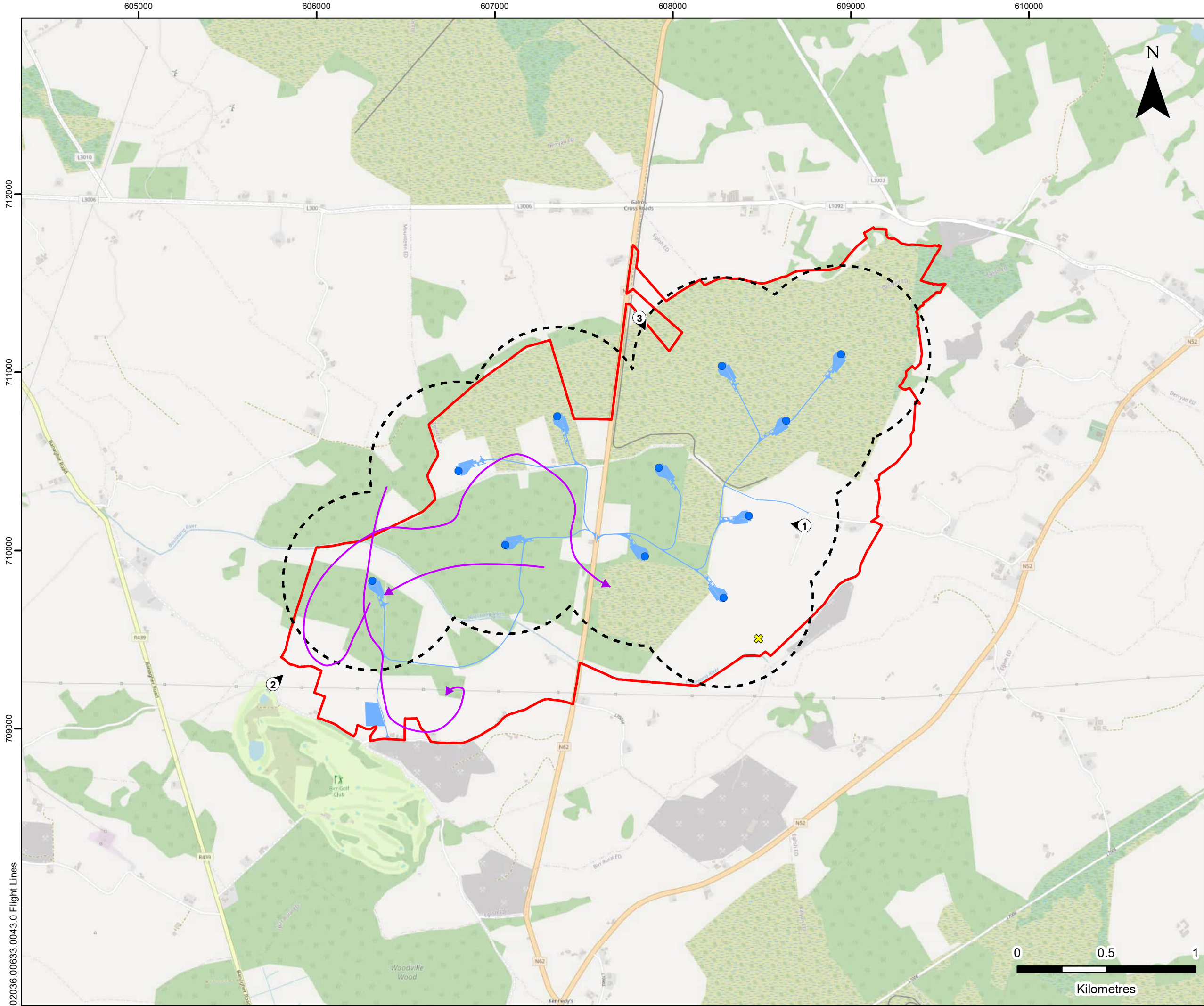
CUSH WIND FARM
WINTER BIRD SURVEYS
FLIGHT LINES: GREYLAG GOOSE

FIGURE 14

Scale 1:20,000 @ A3	Date SEPTEMBER 2023
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02036.00633.0043.0 Flight Lines



LEGEND

- Site Boundary
- Proposed Turbine Location 500m Buffer
- Proposed Turbine Location
- ✕ Proposed Met Mast
- Vantage Point (VP) Location
- Proposed Site Infrastructure

Flight Lines

- ➔ Little Egret



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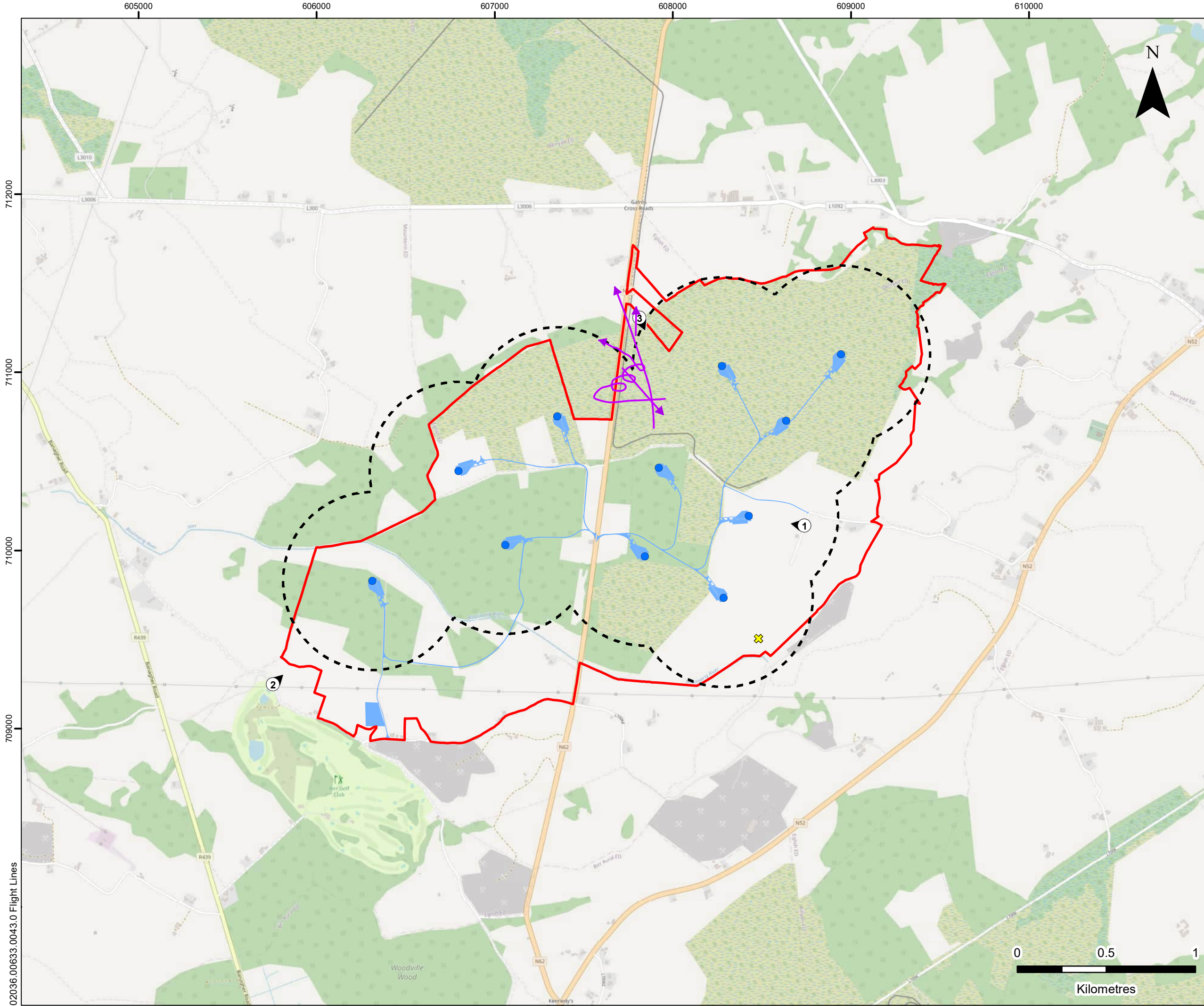
CUSH WIND FARM
WINTER BIRD SURVEYS
FLIGHT LINES: LITTLE EGRET

FIGURE 15

Scale 1:20,000 @ A3 Date SEPTEMBER 2023



02036.00633.0043.0 Flight Lines



LEGEND

- Site Boundary
- Proposed Turbine Location 500m Buffer
- Proposed Turbine Location
- ✕ Proposed Met Mast
- Vantage Point (VP) Location
- Proposed Site Infrastructure
- Flight Line**
- ➔ Merlin



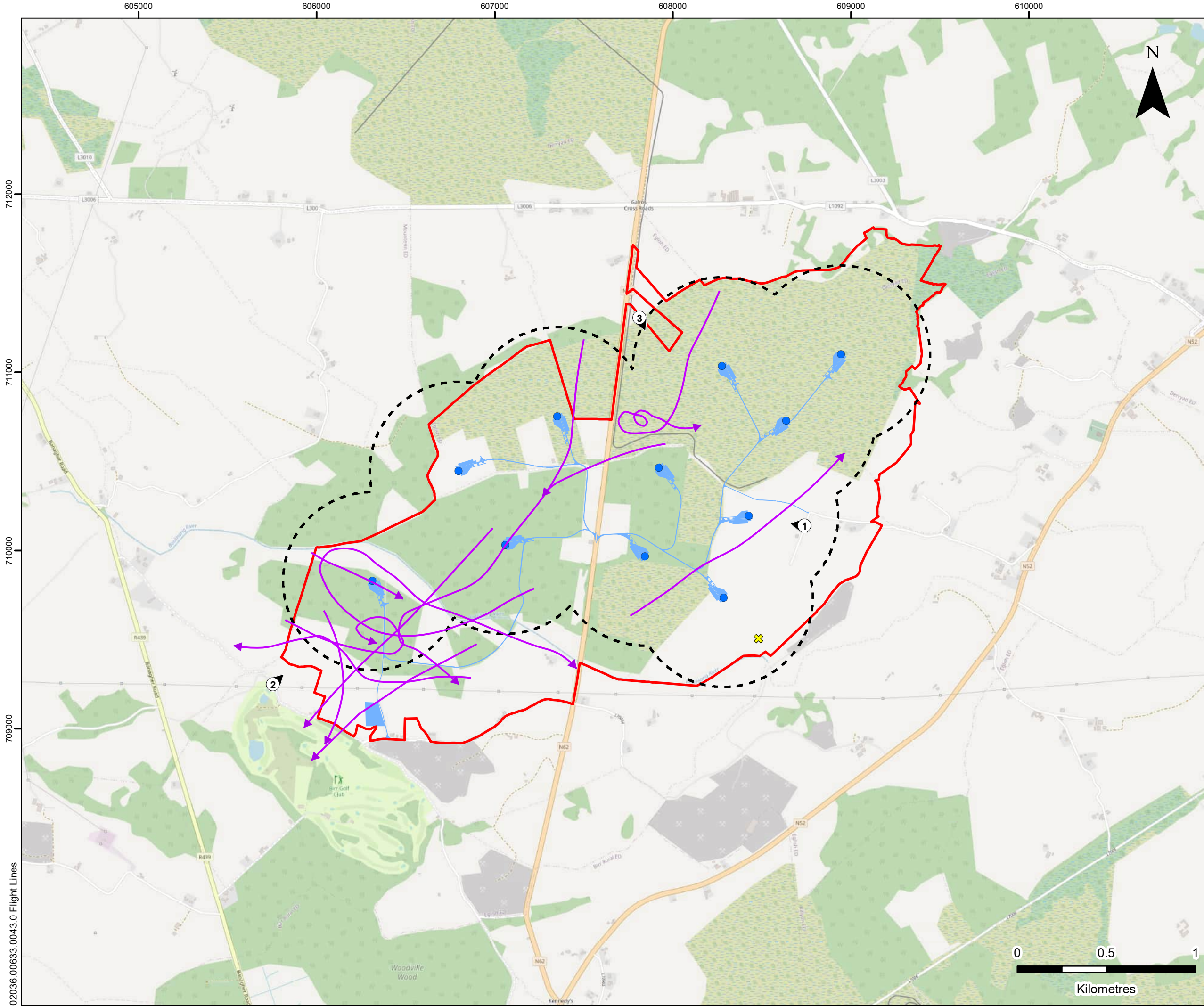
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 T: 0129 64667
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CUSH WIND FARM
WINTER BIRD SURVEYS
FLIGHT LINES: MERLIN

FIGURE 16

Scale 1:20,000 @ A3	Date SEPTEMBER 2023
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LEGEND

- Site Boundary
- Proposed Turbine Location 500m Buffer
- Proposed Turbine Location
- Proposed Met Mast
- Vantage Point (VP) Location
- Proposed Site Infrastructure

Flight Lines

- Cormorant



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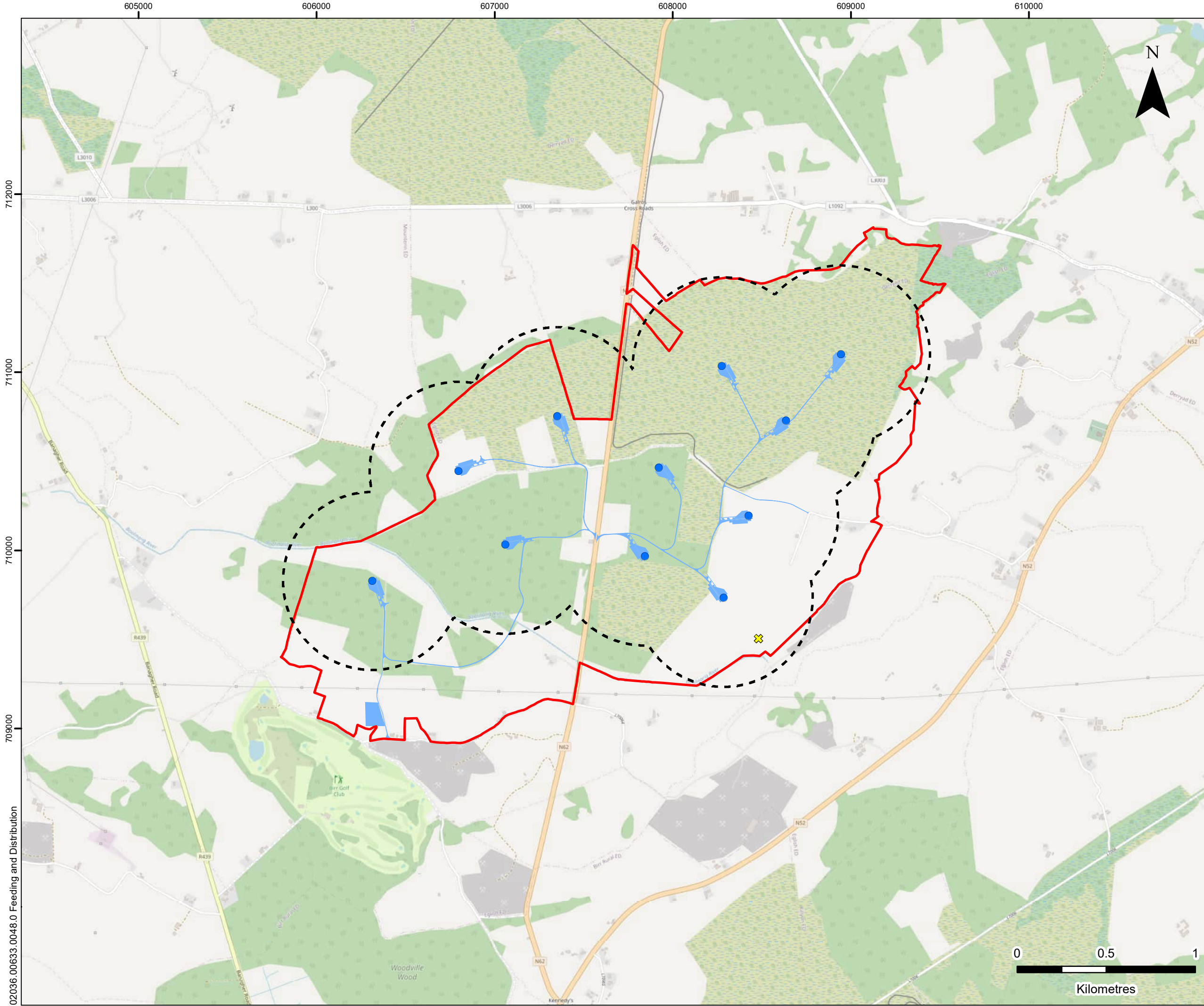
CUSH WIND FARM
WINTER BIRD SURVEYS
FLIGHT LINES: CORMORANT

FIGURE 17







Scale 1:20,000 @ A3 Date SEPTEMBER 2023



02036.00633.0043.0 Flight Lines



LEGEND

-  Site Boundary
-  Proposed Turbine Location 500m Buffer
-  Proposed Turbine Location
-  Proposed Met Mast
-  Vantage Point (VP) Location
-  Proposed Site Infrastructure

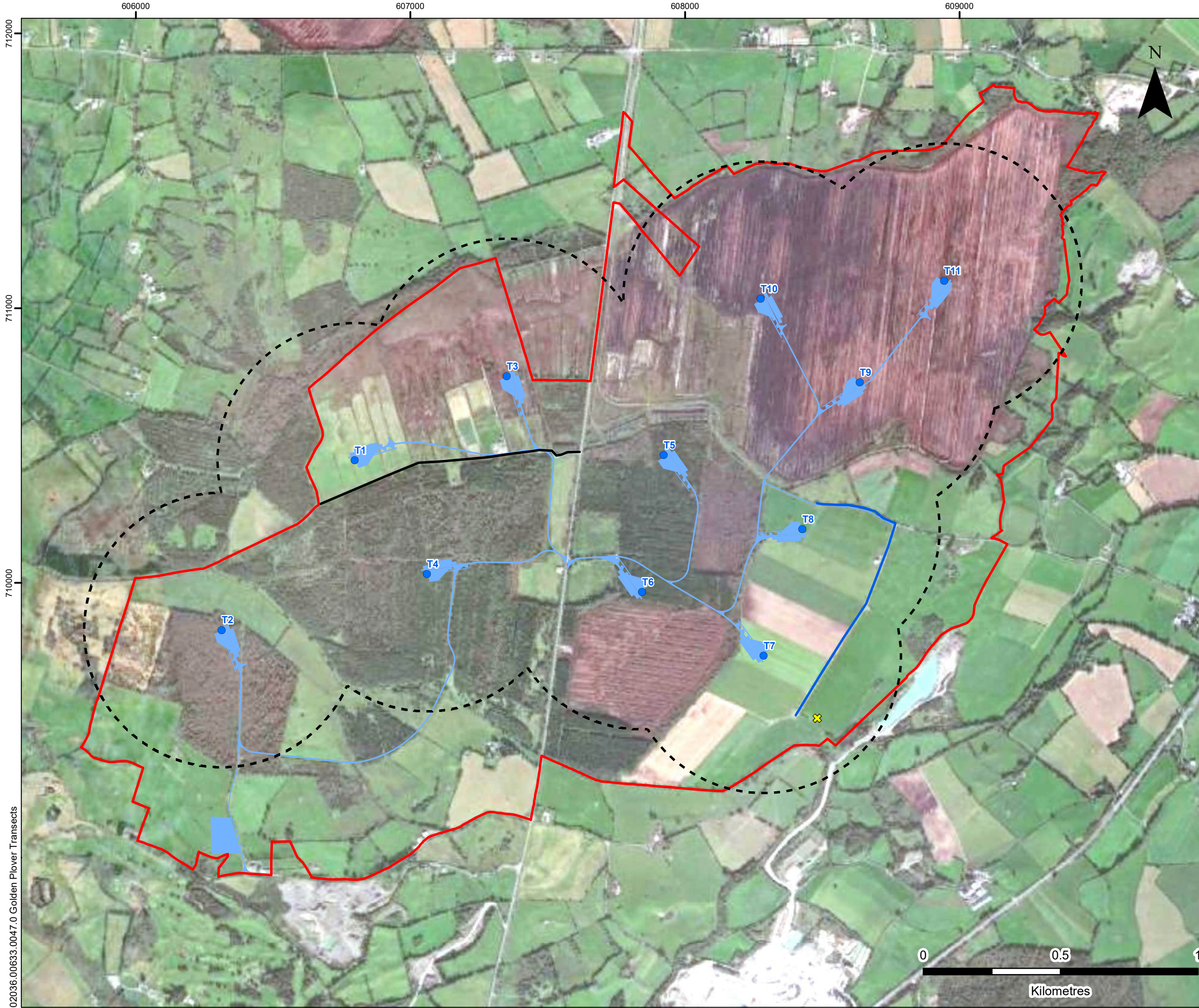
No Swans or Geese were recorded.



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CUSH WIND FARM
WINTER BIRD SURVEYS
SWAN & GEESE FEEDING
AND DISTRIBUTION SURVEY RESULTS

FIGURE 18
 Scale 1:20,000 @ A3 Date APRIL 2023



LEGEND

- Site Boundary
- Proposed Turbine Location 500 m Buffer
- Proposed Turbine Location
- ✕ Proposed Met Mast
- Proposed Site Infrastructure
- Golden Plover Transect West
- Golden Plover Transect East



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CUSH WIND FARM
WINTER BIRD SURVEYS
NOCTURNAL GOLDER PLOVER SURVEY

FIGURE 19

Scale 1:13,000 @ A3	Date SEPTEMBER 2023
---------------------	---------------------



02036.00633.0047.0 Golden Plover Transects

712000

711000

710000

606000

607000

608000

609000



Appendix B Survey dates, times and observers¹⁴

Bird Survey Report Non-Breeding 2022/23

Cush Wind Farm

Galetech Energy Developments Ltd

SLR Project No.: 501.V64760.00001

5 September 2023

¹⁴ Surveyor initials are given in Section 2.1

Table B-1: Details of VP Surveys Undertaken from Vantage Point 1

Date	Surveyor	Start time	End time	No. Hours
04/10/2022	AK	16:00	19:00	03:00
20/10/2022	AK	15:30	18:30	03:00
01/11/2022	AK	10:15	13:15	03:00
16/11/2022	AK	07:50	10:50	03:00
29/11/2022	AK	13:20	16:20	03:00
12/12/2022	AK	13:15	16:15	03:00
03/01/2023	AK	13:15	16:15	03:00
26/01/2023	AK	14:15	17:15	03:00
02/02/2023	AK	08:00	11:00	03:00
15/02/2023	AK	11:30	14:30	03:00
14/03/2023	AK	10:30	13:30	03:00
16/03/2023	AK	06:35	09:35	03:00
Total hours				36

Table B-2: Details of VP Surveys Undertaken from Vantage Point 2

Date	Surveyor	Start time	End time	No. Hours
04/10/2022	AK	12:30	15:30	03:00
21/10/2022	AK	10:15	13:15	03:00
15/11/2022	AK	10:15	13:15	03:00
16/11/2022	AK	11:20	14:20	03:00
02/12/2022	AK	09:00	12:00	03:00
16/12/2022	AK	10:45	13:45	03:00
04/01/2023	AK	08:40	11:40	03:00
02/02/2023	AK	11:15	14:15	03:00
16/02/2023	AK	09:30	12:30	03:00
03/03/2023	AK	07:00	10:00	03:00
14/03/2023	AK	15:30	18:30	03:00
15/03/2023	AK	10:30	13:30	03:00
Total hours				36



Table B-3: Details of VP Surveys Undertaken from Vantage Point 3

Date	Surveyor	Start time	End time	No. Hours
18/10/2022	AK	15:25	18:25	03:00
19/10/2022	AK	07:45	10:45	03:00
01/11/2022	AK	14:00	17:00	03:00
15/11/2022	AK	13:45	16:45	03:00
01/12/2022	AK	13:30	16:30	03:00
15/12/2022	AK	13:45	16:45	03:00
04/01/2023	AK	13:20	16:20	03:00
26/01/2023	AK	11:05	14:05	03:00
31/01/2023	AK	14:15	17:15	03:00
15/02/2023	AK	15:00	18:00	03:00
15/03/2023	AK	13:40	16:40	03:00
16/03/2023	AK	09:55	12:55	03:00
Total hours				36

Table B-4: Details of Feeding Distribution Surveys

Date	Surveyor	Start time	End time	No. Hours
05/10/2022	AK	10:40	13:00	02:20
21/10/2022	AK	13:25	15:30	02:05
03/11/2022	AK	08:50	11:20	02:30
16/11/2022	AK	14:30	16:00	01:30
02/12/2022	AK	12:10	13:45	01:35
16/12/2022	AK	13:55	15:30	01:35
04/01/2023	AK	11:50	13:15	01:25
20/01/2023	DN	10:00	11:50	01:50
02/02/2023	AK	14:20	15:30	01:10
16/02/2023	AK	12:45	13:50	01:05
03/03/2023	AK	11:30	12:45	01:15
14/03/2023	AK	13:40	15:15	01:35
Total hours				19:55



Table B-5: Details of Nocturnal Golden Plover Surveys

Date	Surveyor	Start time	End time	No. Hours
03/01/2023	AK/FL	16:45	18:30	01:45
13/03/2023	AK/HB	19:20	21:00	01:40
Total hours				03:25





Appendix C Weather data

Bird Survey Report Non-Breeding 2022/23

Cush Wind Farm

Galetech Energy Developments Ltd

SLR Project No.: 501.V64760.00001

5 September 2023

Table C-1: Weather Data Collected During Flight Activity Surveys Undertaken from VP1

Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)
04/10/2022	16:00	19:00	1	1	SW	2	8	1	1	0	0	15
04/10/2022	16:00	19:00	2	1	SW	2	8	1	1	0	0	15
04/10/2022	16:00	19:00	3	1	SW	3	8	1	1	0	0	12
20/10/2022	15:30	18:30	1	3	E	0	4	2	2	0	0	15
20/10/2022	15:30	18:30	2	2	E	0	6	2	2	0	0	15
20/10/2022	15:30	18:30	3	2	SE	0	3	2	2	0	0	14
01/11/2022	10:15	13:15	1	2	S	0	6	2	2	0	0	10
01/11/2022	10:15	13:15	2	2	S	0	8	2	2	0	0	10
01/11/2022	10:15	13:15	3	2	SW	1	8	2	2	0	0	12
16/11/2022	07:50	10:50	1	1	SE	0	2	2	2	0	1	4
16/11/2022	07:50	10:50	2	1	S	0	2	2	2	0	1	4

¹⁵ Key: None = 0; Drizzle = 1; Light showers/snow = 2; Heavy showers/snow = 3; Heavy rain/snow = 4.

¹⁶ Expressed in oktas (n/8)

¹⁷ Key: Height of cloud above average height of viewshed. <150m = 0; 150-500m = 1; >500m = 2.

¹⁸ Key: Poor (<1km) = 0; Moderate (1-3km) = 1; Good (>3km) = 2.

¹⁹ Key: Lying snow. None = 0; On site = 1; On higher ground = 2.

²⁰ Key: None = 0; Ground = 1; All day = 2.



Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)
16/11/2022	07:50	10:50	3	1	S	0	2	2	2	0	0	4
29/11/2022	13:20	16:20	1	2	SE	0	8	2	2	0	0	6
29/11/2022	13:20	16:20	2	2	SE	0	8	1	2	0	0	6
29/11/2022	13:20	16:20	3	2	SE	0	8	1	2	0	0	6
12/12/2022	13:15	16:15	1	2	NE	0	6	0	1	1	2	1
12/12/2022	13:15	16:15	2	2	NE	0	6	0	1	1	2	1
12/12/2022	13:15	16:15	3	1	NE	0	6	0	1	1	2	0
03/01/2023	13:15	16:15	1	3	S	2	8	1	2	0	0	11
03/01/2023	13:15	16:15	2	3	S	2	8	1	1	0	0	11
03/01/2023	13:15	16:15	3	3	S	3	8	1	1	0	0	12
26/01/2023	14:15	17:15	1	2	N	0	8	1	2	0	0	7
26/01/2023	14:15	17:15	2	2	N	0	8	1	2	0	0	8
26/01/2023	14:15	17:15	3	2	N	0	8	1	2	0	0	8
02/02/2023	08:00	11:00	1	3	SW	0	8	2	2	0	0	9
02/02/2023	08:00	11:00	2	4	SW	2	8	1	1	0	0	9
02/02/2023	08:00	11:00	3	4	SW	1	8	1	2	0	0	9
15/02/2023	11:30	14:30	1	4	SW	0	3	2	2	0	0	9
15/02/2023	11:30	14:30	2	5	SW	0	6	2	2	0	0	9
15/02/2023	11:30	14:30	3	5	SW	0	6	2	2	0	0	9



Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)
14/03/2023	10:30	13:30	1	3	W	0	6	2	2	0	0	5
14/03/2023	10:30	13:30	2	4	W	4	8	0	0	0	0	5
14/03/2023	10:30	13:30	3	4	W	0	8	2	2	0	0	5
16/03/2023	06:35	09:35	1	3	S	0	8	1	2	0	0	11
16/03/2023	06:35	09:35	2	3	S	0	7	1	2	0	0	11
16/03/2023	06:35	09:35	3	3	S	2	8	1	2	0	0	11



Table C-2: Weather Data Collected During Flight Activity Surveys Undertaken from VP2

Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ²¹	Cloud Cover ²²	Cloud Height ²³	Visibility ²⁴	Snow ²⁵	Frost ²⁶	Temp (°c)
04/10/2022	12:30	15:30	1	2	SW	0	8	1	2	0	0	15
04/10/2022	12:30	15:30	2	1	SW	0	8	1	2	0	0	15
04/10/2022	12:30	15:30	3	1	SW	2	8	1	2	0	0	15
21/10/2022	10:15	13:15	1	3	E	3	8	1	1	0	0	14
21/10/2022	10:15	13:15	2	3	E	0	5	2	2	0	0	14
21/10/2022	10:15	13:15	3	3	SE	0	5	1	2	0	0	14
15/11/2022	10:15	13:15	1	0	n/a	0	2	2	2	0	0	8
15/11/2022	10:15	13:15	2	0	n/a	0	2	2	2	0	0	8
15/11/2022	10:15	13:15	3	1	S	0	1	2	2	0	0	9
16/11/2022	11:20	14:20	1	1	SE	0	1	2	2	0	0	7
16/11/2022	11:20	14:20	2	1	S	0	2	2	2	0	0	9
16/11/2022	11:20	14:20	3	1	S	0	2	2	2	0	0	9

²¹ Key: None = 0; Drizzle = 1; Light showers/snow = 2; Heavy showers/snow = 3; Heavy rain/snow = 4.

²² Expressed in oktas (n/8)

²³ Key: Height of cloud above average height of viewshed. <150m = 0; 150-500m = 1; >500m = 2.

²⁴ Key: Poor (<1km) = 0; Moderate (1-3km) = 1; Good (>3km) = 2.

²⁵ Key: Lying snow. None = 0; On site = 1; On higher ground = 2.

²⁶ Key: None = 0; Ground = 1; All day = 2.



Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ²¹	Cloud Cover ²²	Cloud Height ²³	Visibility ²⁴	Snow ²⁵	Frost ²⁶	Temp (°c)
02/12/2022	09:00	12:00	1	1	SE	0	6	2	2	0	0	7
02/12/2022	09:00	12:00	2	1	SE	0	5	2	2	0	0	7
02/12/2022	09:00	12:00	3	1	SE	0	4	2	2	0	0	8
16/12/2022	10:45	13:45	1	0	NA	0	1	2	2	1	2	0
16/12/2022	10:45	13:45	2	0	NA	0	2	2	2	1	2	0
16/12/2022	10:45	13:45	3	0	NA	0	2	2	2	1	2	1
04/01/2023	08:40	11:40	1	4	SW	0	8	1	2	0	0	10
04/01/2023	08:40	11:40	2	4	SW	0	6	1	2	0	0	10
04/01/2023	08:40	11:40	3	4	SW	0	6	1	2	0	0	10
02/02/2023	11:15	14:15	1	3	SW	0	8	2	2	0	0	9
02/02/2023	11:15	14:15	2	3	SW	2	8	2	2	0	0	10
02/02/2023	11:15	14:15	3	3	SW	2	8	0	0	0	0	10
16/02/2023	09:30	12:30	1	2	W	0	8	2	2	0	0	9
16/02/2023	09:30	12:30	2	2	W	0	6	2	2	0	0	9
16/02/2023	09:30	12:30	3	2	W	0	6	2	2	0	0	9
03/03/2023	07:00	10:00	1	1	NE	0	8	1	2	0	0	4
03/03/2023	07:00	10:00	2	1	NE	0	8	1	2	0	0	4
03/03/2023	07:00	10:00	3	1	NE	0	8	2	2	0	0	4
14/03/2023	15:30	18:30	1	4	NW	0	4	2	2	0	0	6



Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ²¹	Cloud Cover ²²	Cloud Height ²³	Visibility ²⁴	Snow ²⁵	Frost ²⁶	Temp (°c)
14/03/2023	15:30	18:30	2	4	NW	0	3	2	2	0	0	6
14/03/2023	15:30	18:30	3	2	NW	0	2	2	2	0	0	6
15/03/2023	10:30	13:30	1	4	SE	3	8	1	1	0	0	6
15/03/2023	10:30	13:30	2	4	SE	3	8	1	1	0	0	6
15/03/2023	10:30	13:30	3	3	SE	2	8	1	1	0	0	6



Table A3-3: Weather Data Collected During Flight Activity Surveys Undertaken from VP3

Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ²⁷	Cloud Cover ²⁸	Cloud Height ²⁹	Visibility ³⁰	Snow ³¹	Frost ³²	Temp (°c)
18/10/2022	15:25	18:25	1	3	E	0	6	2	2	0	0	15
18/10/2022	15:25	18:25	2	3	E	0	4	2	2	0	0	15
18/10/2022	15:25	18:25	3	3	E	0	3	2	2	0	0	15
19/10/2022	07:45	10:45	1	4	SE	3	8	1	1	0	0	13
19/10/2022	07:45	10:45	2	4	E	3	8	1	2	0	0	12
19/10/2022	07:45	10:45	3	4	E	2	8	1	2	0	0	12
01/11/2022	14:00	17:00	1	2	SW	0	8	2	2	0	0	10
01/11/2022	14:00	17:00	2	2	W	0	6	2	2	0	0	10
01/11/2022	14:00	17:00	3	2	W	1	8	2	2	0	0	9
15/11/2022	13:45	16:45	1	2	S	0	3	2	2	0	0	9
15/11/2022	13:45	16:45	2	2	S	2	6	2	2	0	0	9
15/11/2022	13:45	16:45	3	2	S	0	3	2	2	0	0	8

²⁷ Key: None = 0; Drizzle = 1; Light showers/snow = 2; Heavy showers/snow = 3; Heavy rain/snow = 4.

²⁸ Expressed in oktas (n/8)

²⁹ Key: Height of cloud above average height of viewshed. <150m = 0; 150-500m = 1; >500m = 2.

³⁰ Key: Poor (<1km) = 0; Moderate (1-3km) = 1; Good (>3km) = 2.

³¹ Key: Lying snow. None = 0; On site = 1; On higher ground = 2.

³² Key: None = 0; Ground = 1; All day = 2.



Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ²⁷	Cloud Cover ²⁸	Cloud Height ²⁹	Visibility ³⁰	Snow ³¹	Frost ³²	Temp (°c)
01/12/2022	13:30	16:30	1	2	S	0	6	2	2	0	0	10
01/12/2022	13:30	16:30	2	2	S	0	5	2	2	0	0	10
01/12/2022	13:30	16:30	3	2	S	0	5	2	2	0	0	10
15/12/2022	13:45	16:45	1	2	NW	0	5	1	2	2	2	1
15/12/2022	13:45	16:45	2	2	NW	0	4	1	2	2	2	0
15/12/2022	13:45	16:45	3	2	NW	0	7	1	2	2	2	-1
04/01/2023	13:20	16:20	1	4	SW	0	7	1	2	0	0	10
04/01/2023	13:20	16:20	2	4	SW	1	6	1	2	0	0	10
04/01/2023	13:20	16:20	3	4	SW	0	4	2	2	0	0	9
26/01/2023	11:05	14:05	1	1	N	0	7	1	2	0	0	5
26/01/2023	11:05	14:05	2	1	N	0	8	1	2	0	0	7
26/01/2023	11:05	14:05	3	1	N	0	8	1	2	0	0	7
31/01/2023	14:15	17:15	1	4	W	0	5	2	2	0	0	8
31/01/2023	14:15	17:15	2	4	W	1	6	1	2	0	0	7
31/01/2023	14:15	17:15	3	4	W	1	6	1	2	0	0	7
15/02/2023	15:00	18:00	1	3	SW	0	8	2	2	0	0	9
15/02/2023	15:00	18:00	2	3	SW	2	8	2	2	0	0	9
15/02/2023	15:00	18:00	3	3	SW	2	8	1	2	0	0	8
15/03/2023	13:40	16:40	1	4	SE	3	8	1	1	0	0	8



Date	Survey Start	Survey End	Hr	Wind Speed	Wind Direction	Rain ²⁷	Cloud Cover ²⁸	Cloud Height ²⁹	Visibility ³⁰	Snow ³¹	Frost ³²	Temp (°c)
15/03/2023	13:40	16:40	2	4	SE	3	8	0	0	0	0	8
15/03/2023	13:40	16:40	3	4	SE	3	8	1	1	0	0	8
16/03/2023	09:55	12:55	1	3	S	0	6	1	2	0	0	12
16/03/2023	09:55	12:55	2	3	S	1	8	1	2	0	0	12
16/03/2023	09:55	12:55	3	3	S	2	8	2	2	0	0	12

Table C-4: Weather During Feeding Distribution Surveys

Date	Start	End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)
05/10/2022	10:40	13:00	1	3	SW	0	4	2	2	0	0	11
05/10/2022	10:40	13:00	2	3	SW	2	5	1	2	0	0	12
05/10/2022	10:40	13:00	3	3	SW	2	7	2	2	0	0	12
21/10/2022	13:25	15:30	1	3	SE	2	6	2	2	0	0	14
21/10/2022	13:25	15:30	2	3	SE	1	6	2	2	0	0	14
03/11/2022	08:50	11:20	1	2	SE	0	3	2	2	0	0	6
03/11/2022	08:50	11:20	2	2	SE	0	3	2	2	0	0	7
03/11/2022	08:50	11:20	3	2	SE	0	5	2	2	0	0	8
16/11/2022	14:30	16:00	1	1	SE	0	2	2	2	0	0	9



Date	Start	End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)
16/11/2022	14:30	16:00	2	1	SE	0	2	2	2	0	0	8
02/12/2022	12:10	13:45	1	1	SE	0	6	2	2	0	0	9
02/12/2022	12:10	13:45	2	1	SE	0	8	2	2	0	0	10
16/12/2022	13:55	15:30	1	0	NA	0	2	2	2	0	2	2
16/12/2022	13:55	15:30	2	0	NA	0	2	2	2	0	2	2
04/01/2023	11:50	13:15	1	4	SW	1	7	1	2	0	0	11
04/01/2023	11:50	13:15	2	4	SW	0	8	1	2	0	0	11
20/01/2023	10:00	11:50	1	2	W	0	8	2	2	0	0	7
20/01/2023	10:00	11:50	2	3	W	1	8	2	2	0	0	8
02/02/2023	14:20	15:30	1	3	SW	0	8	2	2	0	0	10
16/02/2023	12:45	13:50	1	2	W	0	6	2	2	0	0	9
03/03/2023	11:30	12:45	1	1	NE	0	8	2	2	0	0	6
03/03/2023	11:30	12:45	2	1	NE	0	8	2	2	0	0	6
14/03/2023	13:40	15:15	1	4	NW	0	4	2	2	0	0	6
14/03/2023	13:40	15:15	2	4	NW	0	4	2	2	0	0	6



Table C-5: Weather During Nocturnal Golden Plover Surveys

Date	Start	End	Hr	Wind Speed	Wind Direction	Rain ¹⁵	Cloud Cover ¹⁶	Cloud Height ¹⁷	Visibility ¹⁸	Snow ¹⁹	Frost ²⁰	Temp (°c)
03/01/2023	16:45	18:30	1	3	S	2	8	1	0	0	0	11
03/01/2023	16:45	18:30	2	3	S	2	8	1	0	0	0	10
13/03/2023	19:20	21:00	1	2	W	0	4	2	0	0	0	3
13/03/2023	19:20	21:00	2	2	W	0	4	2	0	0	0	3





Appendix D Flight activity survey data³³

Bird Survey Report Non-Breeding 2022/23

Cush Wind Farm

Galetech Energy Developments Ltd

SLR Project No.: 501.V64760.00001

5 September 2023

³³ Surveyor initials are given in Section 2.1 and BTO code information is given in Section 5.0

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

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	Start Time (hr:min)	Flight duration (s)
04/10/2022	AK	1	GP	250	U	U	16:28	173
04/10/2022	AK	2	WN	13	U	U	17:04	31
04/10/2022	AK	3	MA	2	AD	M&F	17:39	18
20/10/2022	AK	1	GP	36	U	U	16:10	230
20/10/2022	AK	2	K.	1	U	U	16:23	50
20/10/2022	AK	3	GP	24	U	U	17:11	186
20/10/2022	AK	4	HH	1	Ringtail	Ringtail	17:15	58
20/10/2022	AK	5	GP	15	U	U	17:44	190
20/10/2022	AK	6	K.	1	U	U	18:00	70
20/10/2022	AK	7	WS	9	U	U	18:06	205
01/11/2022	AK	1	GP	56	U	U	10:42	270
01/11/2022	AK	2	GP	29	U	U	10:56	180
01/11/2022	AK	3	GP	26	U	U	11:09	56
01/11/2022	AK	4	K.	1	AD	M	11:14	62
01/11/2022	AK	5	K.	1	AD	M	11:59	59
01/11/2022	AK	6	K.	1	AD	M	12:09	190
01/11/2022	AK	7	K.	1	U	U	12:57	37



Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	Start Time (hr:min)	Flight duration (s)
16/11/2022	AK	1	GP	88	U	U	08:09	173
16/11/2022	AK	2	L.	8	U	U	09:14	195
16/11/2022	AK	3	L.	13	U	U	09:23	94
16/11/2022	AK	4	PE	1	U	U	09:56	50
29/11/2022	AK	1	K.	1	U	U	13:29	62
29/11/2022	AK	2	WS	4	U	U	13:41	93
29/11/2022	AK	3	L.	250	U	U	14:01	173
29/11/2022	AK	4	GP	3500	U	U	14:48	236
29/11/2022	AK	5	L.	58	U	U	14:49	265
29/11/2022	AK	6	CA	1	U	U	15:31	137
12/12/2022	AK	1	BH	1	AD	U	13:46	46
12/12/2022	AK	2	L.	11	U	U	14:06	37
12/12/2022	AK	3	BH	2	A YR 1	U	14:16	37
12/12/2022	AK	4	PE	1	U	U	14:56	24
12/12/2022	AK	5	L.	7	U	U	15:16	76
12/12/2022	AK	6	PE	1	A	F	15:18	12
12/12/2022	AK	7	GP	4	U	U	15:23	25
12/12/2022	AK	8	L.	12	U	U	15:23	48



Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	Start Time (hr:min)	Flight duration (s)
12/12/2022	AK	9	L.	2	U	U	15:30	39
12/12/2022	AK	10	PE	1	A	F	16:04	26
12/12/2022	AK	11	L.	22	U	U	16:07	47
03/01/2023	AK	1	K.	1	A	M	13:29	119
03/01/2023	AK	2	K.	1	A	M	13:47	18
03/01/2023	AK	3	T.	42	U	U	14:36	508
03/01/2023	AK	3	T.	42	U	U	14:36	508
03/01/2023	AK	4	MA	2	A	M&F	14:40	33
03/01/2023	AK	5	K.	1	U	U	14:46	48
26/01/2023	AK	1	K.	1	U	U	15:26	90
26/01/2023	AK	2	BH	23	U	U	15:33	196
02/02/2023	AK	1	CA	1	A	U	09:36	53
02/02/2023	AK	2	GP	27	U	U	10:26	127
14/03/2023	AK	1	K.	1	A	M	11:29	90
14/03/2023	AK	2	K.	1	A	M	12:07	185
14/03/2023	AK	3	K.	1	U	U	12:14	136
14/03/2023	AK	4	L.	48	U	U	12:19	68
14/03/2023	AK	5	BH	3	U	U	12:36	36



Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	Start Time (hr:min)	Flight duration (s)
14/03/2023	AK	6	L.	8	U	U	12:27	78
14/03/2023	AK	7	L.	36	U	U	12:29	126
14/03/2023	AK	10	L.	1	U	U	12:36	18
14/03/2023	AK	11	L.	1	U	U	12:41	26
14/03/2023	AK	12	BH	8	U	U	12:52	152
14/03/2023	AK	13	K.	1	U	U	13:04	166
16/03/2023	AK	1	GP	250	U	U	07:38	41
16/03/2023	AK	2	L.	2	U	U	08:11	49
16/03/2023	AK	3	L.	2	U	U	08:31	52
16/03/2023	AK	4	L.	4	U	U	08:49	76



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

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	Start Time (hr:min)	Flight duration (s)
04/10/2022	AK	1	MA	1	AD	F	13:20	8
21/10/2022	AK	1	HH	1	Ringtail	U	11:38	20
21/10/2022	AK	2	K.	1	AD	U	12:23	23
21/10/2022	AK	3	K.	1	AD	U	12:29	26
21/10/2022	AK	4	GP	18	U	U	13:07	156
15/11/2022	AK	1	K.	1	AD	F	12:08	32
15/11/2022	AK	2	K.	1	AD	F	12:24	11
15/11/2022	AK	3	K.	1	AD	F	12:30	26
16/11/2022	AK	1	CA	1	U	U	13:14	77
16/11/2022	AK	2	ET	2	U	U	13:54	50
16/11/2022	AK	3	ET	2	U	U	14:13	196
02/12/2022	AK	1	K.	1	AD	M	09:41	24
02/12/2022	AK	2	K.	1	AD	M	09:48	26
02/12/2022	AK	3	GP	160	U	U	09:49	194
02/12/2022	AK	4	K.	1	AD	F	10:24	26
02/12/2022	AK	5	L.	6	U	U	10:37	97



Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	Start Time (hr:min)	Flight duration (s)
02/12/2022	AK	6	CA	1	U	U	10:59	107
02/12/2022	AK	7	CA	1	U	U	11:14	46
02/12/2022	AK	8	K.	1	AD	F	11:53	12
16/12/2022	AK	1	L.	1	U	U	11:19	42
16/12/2022	AK	2	WS	5	3 A,2 Imm	U	11:22	78
16/12/2022	AK	3	L.	2	U	U	11:43	58
16/12/2022	AK	4	HH	1	A	M	12:06	33
16/12/2022	AK	5	L.	15	U	U	12:12	72
16/12/2022	AK	6	L.	3	U	U	12:13	78
16/12/2022	AK	7	SN	1	U	U	12:14	17
16/12/2022	AK	8	L.	1	U	U	12:38	43
16/12/2022	AK	9	L.	5	U	U	12:43	62
16/12/2022	AK	10	SN	1	U	U	13:15	27
16/12/2022	AK	11	SN	1	U	U	13:23	72
16/12/2022	AK	12	L.	1	U	U	13:28	34
16/12/2022	AK	13	ET	1	A	U	13:37	99
16/12/2022	AK	14	SN	1	U	U	13:40	36



Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	Start Time (hr:min)	Flight duration (s)
04/01/2023	AK	1	CA	1	A	U	09:32	33
04/01/2023	AK	2	CA	1	A	U	10:03	16
04/01/2023	AK	3	GJ	3	U	U	10:36	126
04/01/2023	AK	4	CA	1	A	U	11:29	58
02/02/2023	AK	1	CA	1	U	U	12:55	32
16/02/2023	AK	1	K.	1	A	M	10:58	28
16/02/2023	AK	2	K.	2	A	M&F	10:22	176
03/03/2023	AK	1	L.	93	U	U	07:33	176
15/03/2023	AK	1	L.	36	U	U	11:44	84
15/03/2023	AK	2	MA	3	U	U	12:58	81



Table D-3: Primary target species recorded during flight activity surveys undertaken at VP3

Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	Start Time (hr:min)	Flight duration (s)
18/10/2022	AK	1	K.	1	AD	U	16:21	63
18/10/2022	AK	2	SN	1	AD	U	16:23	46
18/10/2022	AK	3	K.	1	AD	F	16:36	196
18/10/2022	AK	4	GP	56	U	U	16:37	510
18/10/2022	AK	4	GP	56	U	U	16:37	510
18/10/2022	AK	5	GP	5	U	U	16:48	90
18/10/2022	AK	6	GP	11	U	U	16:53	53
18/10/2022	AK	7	K.	1	AD	F	16:53	110
18/10/2022	AK	8	GP	16	U	U	16:59	76
18/10/2022	AK	9	GP	24	U	U	17:05	109
18/10/2022	AK	10	GP	4	U	U	17:31	200
18/10/2022	AK	11	K.	1	AD	F	18:03	74
18/10/2022	AK	12	K.	1	AD	F	18:07	139
18/10/2022	AK	13	K.	1	AD	F	18:17	136
19/10/2022	AK	1	ML	1	U	U	07:40	5
19/10/2022	AK	2	SN	1	U	U	08:33	37



Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	Start Time (hr:min)	Flight duration (s)
19/10/2022	AK	3	GP	10	U	U	09:06	156
19/10/2022	AK	4	GP	36	U	U	09:20	86
19/10/2022	AK	5	SN	1	U	U	09:49	50
19/10/2022	AK	6	GP	16	U	U	10:19	199
19/10/2022	AK	7	HW	1	U	U	10:36	15
01/11/2022	AK	1	PE	1	AD	F	14:03	63
01/11/2022	AK	2	K.	1	AD	M	14:09	37
01/11/2022	AK	3	K.	1	AD	M	14:24	330
01/11/2022	AK	3	K.	1	AD	M	14:24	330
01/11/2022	AK	4	K.	1	AD	M	14:34	85
15/11/2022	AK	1	ML	1	U	U	14:08	35
15/11/2022	AK	2	MA	5	U	U	14:36	128
15/11/2022	AK	3	L.	12	U	U	16:24	99
01/12/2022	AK	1	CA	1	AD	U	14:04	74
01/12/2022	AK	2	CA	1	AD	U	14:32	34
01/12/2022	AK	3	ML	1	AD	U	15:28	64
15/12/2022	AK	1	L.	1	U	U	14:12	26



Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	Start Time (hr:min)	Flight duration (s)
15/12/2022	AK	2	L.	3	U	U	14:46	38
15/12/2022	AK	3	L.	6	U	U	15:22	43
15/12/2022	AK	4	L.	8	U	U	15:45	47
15/12/2022	AK	5	K.	1	A	F	15:47	22
15/12/2022	AK	6	ML	1	U	U	16:12	8
15/12/2022	AK	7	L.	5	U	U	16:27	34
15/12/2022	AK	8	SN	1	U	U	16:28	22
26/01/2023	AK	1	WS	2	A	U	13:02	21
31/01/2023	AK	1	HH	1	A	M	14:56	110
31/01/2023	AK	2	HH	1	A	M	15:02	184
31/01/2023	AK	3	HH	1	A	M	15:06	148
31/01/2023	AK	4	SN	2	U	U	15:06	51
31/01/2023	AK	5	HH	1	A	M	15:17	194
31/01/2023	AK	6	SN	1	U	U	15:18	36
31/01/2023	AK	7	K.	1	U	U	15:18	41
31/01/2023	AK	8	HH	1	A	M	15:26	105
31/01/2023	AK	9	K.	1	U	U	15:38	12



Date	Surveyor	Flight ID	BTO Code	No. Birds	Age (Ad = adult; Imm = immature)	Sex (M = male; F = female; U = unknown)	Start Time (hr:min)	Flight duration (s)
16/03/2023	AK	1	L.	1	U	U	09:56	18
16/03/2023	AK	2	L.	6	U	U	10:10	62
16/03/2023	AK	3	SN	1	U	U	10:10	11
16/03/2023	AK	4	L.	2	U	U	10:18	58
16/03/2023	AK	5	L.	1	U	U	10:41	39
16/03/2023	AK	6	L.	3	U	U	10:42	34



Table D-4: Secondary target species recorded during flight activity surveys undertaken at VP1

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
04/10/2022	16:00	19:00	16:45	16:50	BZ	1	1	1
20/10/2022	15:30	18:30	15:45	15:50	BZ	1	1	2
01/11/2022	10:15	13:15	11:05	11:10	H.	1	1	1
01/11/2022	10:15	13:15	11:55	12:00	BZ	1	1	1
16/11/2022	07:50	10:50	08:20	08:25	BZ	2	2	1
16/11/2022	07:50	10:50	08:30	08:35	SH	1	1	1
16/11/2022	07:50	10:50	10:15	10:20	RN	1	1	1
16/11/2022	07:50	10:50	10:25	10:30	H.	1	1	2
29/11/2022	13:20	16:20	13:40	13:45	BZ	1	1	2
29/11/2022	13:20	16:20	14:05	14:10	BZ	1	1	1
29/11/2022	13:20	16:20	14:10	14:15	BZ	1	1	1
29/11/2022	13:20	16:20	14:10	14:15	RN	1	1	1,2
29/11/2022	13:20	16:20	14:25	14:30	BZ	1	1	2
29/11/2022	13:20	16:20	14:25	14:30	RN	1	1	2
03/01/2023	13:15	16:15	14:40	14:45	RN	1	1	1
03/01/2023	13:15	16:15	15:30	15:35	SH	1	1	1
15/02/2023	11:30	14:30	11:30	11:35	BZ	3	3	2



Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
15/02/2023	11:30	14:30	12:30	12:35	BZ	3	3	2, 3
15/02/2023	11:30	14:30	13:30	13:35	RN	3	3	2
14/03/2023	10:30	13:30	10:35	10:40	BZ	1	1	2
14/03/2023	10:30	13:30	10:55	11:00	BZ	3	3	2
14/03/2023	10:30	13:30	12:25	12:30	BZ	2	2	2
14/03/2023	10:30	13:30	12:45	12:50	BZ	3	3	2
14/03/2023	10:30	13:30	12:50	12:55	BZ	1	1	2
14/03/2023	10:30	13:30	12:55	13:00	RN	2	2	2
14/03/2023	10:30	13:30	12:55	13:00	BZ	3	3	2, 3
14/03/2023	10:30	13:30	13:00	13:05	RN	5	5	2, 3
14/03/2023	10:30	13:30	13:00	13:05	BZ	1	1	2, 3
14/03/2023	10:30	13:30	13:05	13:10	BZ	1	1	3
14/03/2023	10:30	13:30	13:05	13:10	H.	1	1	2
14/03/2023	10:30	13:30	13:20	13:25	BZ	2	2	2
14/03/2023	10:30	13:30	13:25	13:30	BZ	1	1	1
16/03/2023	06:35	09:35	08:40	08:45	H.	1	1	2
16/03/2023	06:35	09:35	09:15	09:20	BZ	1	1	2



Table D-5: Secondary target species recorded during flight activity surveys undertaken at VP2

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
04/10/2022	12:30	15:30	12:45	12:50	SH	1	1	1
04/10/2022	12:30	15:30	14:40	14:45	SH	1	1	1
21/10/2022	10:15	13:15	11:45	11:50	RN	7	7	1, 2
21/10/2022	10:15	13:15	11:50	11:55	BZ	1	1	2, 3
21/10/2022	10:15	13:15	12:30	12:35	BZ	1	1	2
21/10/2022	10:15	13:15	12:30	12:35	RN	2	2	2
15/11/2022	10:15	13:15	11:10	11:15	BZ	2	2	2
15/11/2022	10:15	13:15	12:15	12:20	BZ	2	2	1, 2
16/11/2022	11:20	14:20	12:10	12:15	BZ	2	2	3
16/11/2022	11:20	14:20	12:15	12:20	BZ	2	2	1, 2
16/11/2022	11:20	14:20	12:20	12:25	BZ	2	2	1, 2
16/11/2022	11:20	14:20	12:25	12:30	SH	1	1	1
16/11/2022	11:20	14:20	12:30	12:35	SH	1	1	3
16/11/2022	11:20	14:20	12:40	12:45	BZ	2	2	1
02/12/2022	09:00	12:00	09:55	10:00	SH	2	2	2
02/12/2022	09:00	12:00	09:55	10:00	RN	1	1	1
02/12/2022	09:00	12:00	11:05	11:10	BZ	1	1	2



Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
02/12/2022	09:00	12:00	11:10	11:15	BZ	1	1	1
02/12/2022	09:00	12:00	11:30	11:35	SH	1	1	1,2
02/12/2022	09:00	12:00	11:45	11:50	BZ	1	1	1
02/12/2022	09:00	12:00	11:45	11:50	RN	1	1	1
02/12/2022	09:00	12:00	11:50	11:55	RN	2	2	2
02/12/2022	09:00	12:00	11:55	12:00	RN	2	2	2
16/12/2022	10:45	13:45	11:40	11:45	RN	1	1	1
16/12/2022	10:45	13:45	11:45	11:50	RN	2	2	1
16/12/2022	10:45	13:45	12:25	12:30	RN	2	2	1
16/12/2022	10:45	13:45	13:40	13:45	SH	1	1	1
04/01/2023	08:40	11:40	09:25	09:30	SH	1		2
04/01/2023	08:40	11:40	09:40	09:45	RN	2		1
04/01/2023	08:40	11:40	10:00	10:05	SH	2		2
04/01/2023	08:40	11:40	11:00	11:05	RN	1		2
04/01/2023	08:40	11:40	11:00	11:05	BZ	1		1, 2
04/01/2023	08:40	11:40	11:05	11:10	BZ	1		2
04/01/2023	08:40	11:40	11:10	11:15	BZ	1		2
04/01/2023	08:40	11:40	11:15	11:20	BZ	2		1, 2



Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
04/01/2023	08:40	11:40	11:20	11:25	BZ	1		2
04/01/2023	08:40	11:40	11:20	11:25	RN	2		2
04/01/2023	08:40	11:40	11:25	11:30	BZ	2		2, 3
02/02/2023	11:15	14:15	12:10	12:15	BZ	1	1	2
02/02/2023	11:15	14:15	12:25	12:30	BZ	1	1	2
02/02/2023	11:15	14:15	13:50	13:55	BZ	1	1	2
16/02/2023	09:30	12:30	09:55	10:00	RN	1	1	2
16/02/2023	09:30	12:30	10:55	11:00	BZ	1	1	2
16/02/2023	09:30	12:30	11:05	11:10	BZ	2	2	2
16/02/2023	09:30	12:30	11:30	11:35	BZ	1	1	2
16/02/2023	09:30	12:30	11:40	11:45	RN	3	3	2
16/02/2023	09:30	12:30	11:45	11:50	RN	2	2	1, 2
16/02/2023	09:30	12:30	11:50	11:55	BZ	1	1	2
16/02/2023	09:30	12:30	11:55	12:00	BZ	3	3	2, 3
16/02/2023	09:30	12:30	12:15	12:20	BZ	3	3	2, 3
03/03/2023	07:00	10:00	09:35	09:40	BZ	1	1	2
14/03/2023	15:30	18:30	15:35	15:40	BZ	1	1	3
14/03/2023	15:30	18:30	15:55	16:00	BZ	1	1	3



Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
14/03/2023	15:30	18:30	16:10	16:15	H.	1	1	1
14/03/2023	15:30	18:30	16:15	16:20	RN	2	2	2
14/03/2023	15:30	18:30	16:20	16:25	BZ	1	1	3
14/03/2023	15:30	18:30	16:25	16:30	BZ	1	1	3
15/03/2023	10:30	13:30	11:35	11:40	SH	1	1	1
15/03/2023	10:30	13:30	12:05	12:10	H.	1	1	2



Table D-6: Secondary target species recorded during flight activity surveys undertaken at VP3

Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
18/10/2022	15:25	18:25	16:55	17:00	H.	1	1	1
18/10/2022	15:25	18:25	17:05	17:10	BZ	1	1	2
18/10/2022	15:25	18:25	17:40	17:45	H.	1	1	1, 2
19/10/2022	07:45	10:45	09:10	09:15	RN	1	1	1
19/10/2022	07:45	10:45	09:30	09:35	BZ	1	1	1
19/10/2022	07:45	10:45	10:20	10:25	BZ	2	2	1, 2
19/10/2022	07:45	10:45	10:25	10:30	BZ	2	2	1, 2
15/11/2022	13:45	16:45	13:05	13:10	H.	1	1	1
15/11/2022	13:45	16:45	15:00	15:05	BZ	1	1	2
15/11/2022	13:45	16:45	16:10	16:15	RN	1	1	1
01/12/2022	13:30	16:30	13:50	13:55	BZ	1	1	2
01/12/2022	13:30	16:30	14:20	14:25	BZ	1	1	2
01/12/2022	13:30	16:30	14:40	14:45	RN	3	3	2
01/12/2022	13:30	16:30	15:00	15:05	BZ	1	1	1,2
15/12/2022	13:45	16:45	14:15	14:20	BZ	1	1	1
04/01/2023	13:20	16:20	14:35	14:40	BZ	1	1	2



Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
04/01/2023	13:20	16:20	14:50	14:55	H.	1	1	1
04/01/2023	13:20	16:20	16:00	16:05	RN	2	2	1
26/01/2023	11:05	14:05	11:05	11:10	H.	1	1	1
26/01/2023	11:05	14:05	11:20	11:25	H.	1	1	1
26/01/2023	11:05	14:05	11:55	12:00	H.	1	1	1
26/01/2023	11:05	14:05	12:00	12:05	H.	1	1	1
26/01/2023	11:05	14:05	12:10	12:15	H.	1	1	1
26/01/2023	11:05	14:05	13:20	13:25	H.	1	1	1
26/01/2023	11:05	14:05	13:30	13:35	H.	1	1	1
26/01/2023	11:05	14:05	13:30	13:35	BZ	1	1	2
26/01/2023	11:05	14:05	13:35	13:40	BZ	3	3	1, 2
26/01/2023	11:05	14:05	13:45	13:50	BZ	2	2	2
26/01/2023	11:05	14:05	13:50	13:55	BZ	1	1	1
26/01/2023	11:05	14:05	13:50	13:55	H.	1	1	1
26/01/2023	11:05	14:05	13:50	13:55	H.	1	1	1
31/01/2023	14:15	17:15	14:15	17:15	H.	2	2	1
31/01/2023	14:15	17:15	15:45	15:50	BZ	1	1	2
15/03/2023	13:40	16:40	13:40	13:45	H.	1	1	1



Date	Survey start	Survey end	5 min period start time	5 min period end time	Species	Count Max	Height band	Location (on site, in buffer or beyond)
16/03/2023	09:55	12:55	10:00	10:05	BZ	1	1	1
16/03/2023	09:55	12:55	10:45	10:50	BZ	1	1	2





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