
Chleansaid Wind Farm
ESB Asset Development UK Limited
Appendix 9.1: Ornithology



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1 INTRODUCTION

- 1.1.1 This Technical Appendix has been prepared to accompany **Chapter 9: Ornithology** of the Environmental Impact Assessment Report (EIAR) for the proposed Chleainsaid Wind Farm (hereafter 'Proposed Development').
- 1.1.2 It presents detailed methodologies and results of ornithology desk studies and field surveys completed between 2019 and 2021 to inform the design and assessment of the Proposed Development.
- 1.1.3 It should be read with reference to the following Figures, which are included within Volume 3 of the EIAR:
- **Figure 9.1:** Ornithological Statutory Designated Sites for Nature Conservation.
 - **Figure 9.2:** Existing Ornithological Records.
 - **Figure 9.3:** Vantage Point Flight Activity Survey Plan (Year 1 and 2).
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 - **Confidential Figure 9.2.1:** Existing Ornithological Records.
 - **Confidential Figure 9.2.2:** Breeding Annex I/Schedule 1 Raptor and Owl Observations.
- 1.1.4 Only common bird species names are referred to within the main text of this Appendix. **Technical Annex 1** provides a summary of all bird species referred to herein, within **Chapter 9: Ornithology** in Volume 1 of the EIAR and all other associated appendices and figures. Both common and species names are provided, together with a summary of their conservation status as relevant.
- 1.1.5 Information pertaining to the locations of sensitive breeding bird species, which is considered confidential, is provided in **Confidential Appendix 9.2** and associated figures (**Confidential Figures 9.2.1** and **9.2.2**). Such information will not be made publicly available, but will be provided to the Scottish Government, NatureScot and the Royal Society for the Protection of Birds (RSPB).

1.2 Site Overview

- 1.2.1 The 'site', as shown by the red line boundary in **Figures 9.1 - 9.6** of EIAR Volume 2, encompasses the 'turbine area' and 'access area', and lies 13 km north-east of Lairg, and immediately north of the settlement of Dalnessie, in Sutherland. The site largely comprises open bog, heathland and acid grassland habitats, which continues to the north and east, and is fringed by commercial forestry to the west and south-west. Sròn Leathad Chleainsaid is a named hill located along the northern boundary of the turbine area. The Allt nan Con-uisge is a watercourse which flows in the western part of the turbine area. The River Brora marks the south-eastern extent of the turbine area. There are no waterbodies on-site, although there lochans outside the turbine area, with the closest, Loch

na Fuaralachd and Loch Beag na Fuaralachd located in forestry to the south-west, and Loch Coire na Bruaiche to the east.

1.3 Key Guidance

1.3.1 Ornithology survey methodologies and subsequent interpretation of results has made reference to the following key industry standard guidance:

- Brown, A.F. & Shepherd, K.B. (1993). *A method for censusing upland breeding waders*. Bird Study 40, 189-195.
- SNH (2017). *Recommended bird survey methods to inform impact assessment of onshore wind farms*. Version 2. March 2017.
- Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. & Thompson, D. (2013). *Raptors: a field guide to survey and monitoring*. Third Edition. The Stationary Office, Edinburgh.
- Gilbert, G., Gibbons, D.W. & Evans, J. (1998). *Bird monitoring methods*. A manual of techniques for key UK species. RSPB, Sandy, Bedfordshire.
- Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble, D. & Win, I. (2015). The status of our bird populations: the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. *British Birds*, 114, pp. 723-747.
- SNH (2000). *Windfarms and Birds - Calculating a theoretical collision risk assuming no avoiding action*. SNH Guidance Note. Available at www.nature.scot/sites/default/files/2017-09/Guidance%20Note%20-%20Windfarms%20and%20birds%20-%20Calculating%20a%20theoretical%20collision%20risk%20assuming%20no%20avoiding%20action.pdf.
- SNH (2018). *Assessing significance of impacts from onshore wind farm outwith designated areas*. Guidance. Version 2 – February 2018.
- SNH (2016). *Assessing connectivity with Special Protection Areas (SPAs)*. Guidance. Version 3 – June 2016.

1.4 Target Species

1.4.1 Target species for survey were identified through desk study and consultation with NatureScot (letter correspondence, by email, in October 2019 and April 2020; see full consultation details in **Table 9.1** of **Chapter 9: Ornithology** in Volume 1 of the EIAR), on the basis of their known or likely presence, their likely sensitivity to the Proposed Development and those which are afforded a higher level of legislative protection, which is in accordance with current NatureScot guidance (SNH, 2017¹ and SNH, 2018²). Primarily, target species included those species listed on/as:

- Annex I of the EC Birds Directive (2009/147/EC);

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

² SNH (2018). *Assessing significance of impacts from onshore wind farm outwith designated areas*. Guidance. Version 2 – February 2018.

- Schedule 1 of the Wildlife and Countryside Act 1981 (as amended); and,
- Red-listed Birds of Conservation Concern (Stanbury *et al.* 2021³).

1.4.2 This has ensured inclusion of qualifying interests of designated sites for nature conservation (Table 9.1.8) and “Priority bird species for assessment when considering the development of onshore wind farms in Scotland” as per NatureScot guidance (SNH, 2018).

2 METHODOLOGY

2.1 Desk Study

2.1.1 In accordance with NatureScot guidance (SNH, 2017), a desk study was undertaken to enable a broad overview of likely bird populations and designated sites in proximity to the Proposed Development, in order to identify target species for survey and recording.

2.1.2 The desk study was also continued over the course of field surveys to provide updated context on field observations and ensure the scope of surveys remained appropriate to inform the design and assessment of the Proposed Development.

2.1.3 The desk study has included a review of key sources summarised in Table 9.1.1.

2.1.4 Available EIA documentation (based on surveys carried out from April 2009 to March 2011) for the Dalnessie Wind Farm (Planning Ref. 12/00890/S36) application, withdrawn in April 2014, has been reviewed together with additional peer reviewed literature and industry guidance, referred to where relevant. The turbine area of the Proposed Development is within the application boundary of the Dalnessie Wind Farm, but only forms the western extent of the Dalnessie Wind Farm application site, which was more extensive, extending into open habitats to the north and north-east.

Table 9.1.1: Desk study key sources and information sought.

Key Source	Information Sought	Search Area
SNH Sitelink ⁴	Proximity to statutory designated sites for nature conservation with qualifying ornithological interests.	Within 10 km of the turbine area, extended to 20 km for internationally designated sites with migratory geese qualifying interests.
Highland Biological Recording Group (HBRG)	Existing ornithological records and non-statutory designated sites.	Within 2 km of the turbine area, extended to 6 km for Annex I/Schedule 1 raptors.
RSPB	Existing ornithological records.	Within 6 km of the centre of the turbine area (NC 61617 17726) for all species, extended to 10 km for eagle species.
Highland Raptor Study Group (HRSG)	Existing records of breeding and roosting raptors and owls.	Within 2 km of the centre of the turbine area (NC 61617 17726) for all species, extended to 6 km for

³ Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble, D. & Win, I. (2015). The status of our bird populations: the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. *British Birds*, **114**, pp. 723-747.

⁴ <https://sitelink.nature.scot/home> (Accessed June 2021).

Key Source	Information Sought	Search Area
		eagle species.
Forestry and Land Scotland (FLS)	Existing black grouse records.	Within the FLS forestry block to west of turbine area.

2.2 Field Surveys

- 2.2.1 Detailed knowledge of bird populations, distributions and flight activity has been derived from field surveys undertaken between 2019 and 2021, in order to predict the potential effects of the Proposed Development upon ornithological features.
- 2.2.2 The identification of target species and scope of surveys undertaken was informed through consultation with NatureScot (in October 2019 and April 2020), proximity to designated sites and existing knowledge of sensitive species as derived from desk study (all consultation is summarised in **Table 9.1** of **Chapter 9: Ornithology** in Volume 1 the EIA).
- 2.2.3 Field surveyor knowledge and experience of bird - habitat associations further informed and guided survey effort over the course of surveys.
- 2.2.4 Field surveys undertaken for the Proposed Development comprise coverage of study areas required in accordance with NatureScot guidance (SNH, 2017), and the surrounding wider area where appropriate. Details of each study area are presented in the corresponding survey methodologies and shown on **Figures 9.3** and **9.4** of EIA Volume 3.

Field Survey Personnel

- 2.2.5 All field surveys have been completed by experienced and professional ornithologists named in **Technical Annex 3**; all of whom are all fully conversant in recognised bird survey methodologies for proposed wind farm developments.

Methodologies

- 2.2.6 The following field surveys were completed between 2019 and 2021:
- Vantage Point (VP) flight activity surveys.
 - Moorland breeding bird surveys.
 - Annex I/ Schedule 1 Breeding raptor and owl searches.
 - Breeding diver searches.
 - Breeding black grouse surveys.
- 2.2.7 Surveys were undertaken in accordance with recommendations outlined within NatureScot guidance (SNH, 2017).

VP Flight Activity Surveys

- 2.2.8 VP flight activity surveys were undertaken from September 2019 to August 2021 providing coverage of one full and one partial breeding season (reduced survey effort in 2020 due to travel restrictions resulting from the Covid-19 pandemic; see **Field Survey Limitations** section 2.2.48), and two full non-breeding seasons.

VP Locations and Viewsheds

- 2.2.9 During both survey years, two VP locations were utilised, as shown in **Figure 9.3** of EIAR Volume 3 and detailed within **Table 9.1.2**.
- 2.2.10 VP locations and areas of visibility have provided comprehensive visual coverage of the VP study area required for the Proposed Development in accordance with current NatureScot guidance (SNH, 2017); defined as a 500 m buffer around the outermost proposed turbine locations (as shown in **Figure 9.3** of EIAR Volume 3). Given the slight overlap between VP viewsheds, the VPs were not surveyed simultaneously.
- 2.2.11 Modelled areas of visibility within the 2 km viewsheds from each VP location are illustrated in **Figures 9.3**.

Table 9.1.2: VP locations during Year 1 and 2 surveys.

VP	Grid Reference	Viewshed Orientation
1	NC 62736 16611	North-west.
2	NC 60367 17854	East.

Survey Effort

- 2.2.12 The total survey effort (hours) completed at each VP location between September 2019 and August 2021 is summarised in **Table 9.1.3**. Each VP survey session was up to three-hours in duration.
- 2.2.13 Full details of all survey times, field surveyors used and weather conditions are presented in **Technical Annex 3**.
- 2.2.14 The total VP survey effort completed at each VP was 81 hours in Year 1 and 90 hours in Year 2. This level of survey effort, and the reduction in VP hours in Year 1 (due to Covid-19 travel restrictions) was discussed and agreed with NatureScot (see **Chapter 9: Ornithology** in Volume 1 the EIAR).
- 2.2.15 Survey times were dispersed throughout the day and were also completed in a range of weather conditions, but always conducive to survey and safe access.
- 2.2.16 In accordance with current NatureScot guidance (SNH, 2017), flight lines were mapped for all target species passing through the VP survey area. Details of species, number of birds, flight height in bands (at, below or above collision risk height), duration and direction were noted on standardised recording forms and field plans.
- 2.2.17 The following height bands (HT) were used in the field to record target species activity at, below or above collision risk height for subsequent use in the calculation of collision mortality risks. Height bands used in the field were based on a proposed turbine height of up to 200 m. Given the Proposed Development is for 12 x 200 m tip height turbines and 4 x 180 m tip height turbines, to ensure the lower rotor sweep height of the smaller turbine (180 m tip height) is considered, height bands HT1 – HT5 incorporate the rotor sweep:
- HT1 <30 m.
 - HT2 30 to 60 m.
 - HT3 60 to 150 m.
 - HT4 150 to 180 m.
 - HT5 180 to 200 m.

- HT 6 >200 m.

Table 9.1.3: VP flight activity survey effort summary.

VP	2019				2020								Year 1 Total
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	
1	6	9	9	9	9	6	9	0	0	9	9	6	81
2	6	9	9	9	9	6	9	0	0	9	9	6	81
VP	2020				2021								Year 2 Total
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	
1	9	9	6	6	6	6	9	9	6	9	9	6	90
2	9	9	6	6	6	6	9	9	6	9	9	6	90

Target Species

- 2.2.18 Target species for recording included all Annex 1/Schedule 1 raptors, waders, divers, black grouse, owls, swans, geese and ducks (excluding mallard and feral waterfowl species) as observed during VP flight activity surveys.
- 2.2.19 Target species included greylag goose. Greylag geese in Scotland comprise three populations:
- the Icelandic migratory population present between October and April, predominantly in Scotland and northern England;
 - the north-west Scotland remnant population, which predominantly occur within western Scotland and in mainland northern Scotland; and
 - the re-established (naturalised) introduced population, which is widespread throughout Britain and Ireland (Mitchell & Hearn, 2004).
- 2.2.20 The local passage and non-breeding populations between October and April are considered to potentially comprise part of the Icelandic migratory population.

Secondary Species

- 2.2.21 Secondary species were also noted in approximately fifteen-minute summary intervals, with the number of birds present and general behaviour recorded in order to build an overall picture of activity. Fifteen-minute periods were considered appropriate to ensure surveyors were fully alert to target species activity, which took priority during survey.
- 2.2.22 Secondary species are defined here as commoner raptors (e.g. buzzard, kestrel and sparrowhawk), all gulls, feral species and mallard, along with any large concentrations of Schedule 1 or Red-listed passerines as recorded during survey.

Collision Risk Mortality

- 2.2.23 For species for which there is sufficient (considered ≥ 4 flights) “at collision risk” flight activity data, collision risk mortality as a result of birds colliding with rotor blades will be assessed using Collision Risk Model (CRM) Analysis as detailed in Band *et al.* (2007).
- 2.2.24 CRM Analysis has accordingly been undertaken for golden eagle and hen harrier with explanation and results presented in **Technical Appendix 9.3** in Volume 2 of the EIAR.

Moorland Breeding Bird Surveys

- 2.2.25 Moorland Breeding Bird Surveys (MBBS) to inform the design and assessment of the Proposed Development have been undertaken in 2020 and 2021.
- 2.2.26 The study area has comprised coverage of the turbine area, extended to include accessible areas of open habitats within 500 m as shown in **Figure 9.4** of EIAR Volume 3 and in accordance with current NatureScot guidance (SNH, 2017). Given the extent of the study area and terrain, searches were completed by a team of surveyors and/or over two days.
- 2.2.27 The methodology employed has followed the adapted Brown and Shepherd (1993⁵) method for censusing upland breeding waders, based upon the recommendations set out in Calladine *et al.* (2009⁶) as recommended in NatureScot guidance applicable at the time of survey (SNH, 2017). The methodology is suitable for moorland and open country species including, waders, skuas, gulls and some wildfowl species however, incidental observations of any raptors, owls or notable passerines (i.e. Schedule 1 and BoCC red-listed) were also recorded.
- 2.2.28 A series of staggered visits were completed during each survey year, between April and July. Surveys were carried out in 2020 only in June and July, and this is discussed further in the **Field Survey Limitations** section at paragraph 2.2.48.
- 2.2.29 During each survey visit a pre-determined route was walked through the study area, with all birds seen or heard, and their behaviours (e.g. displaying, carrying food etc.) mapped in the field, using standard British Trust for Ornithology (BTO) notation.
- 2.2.30 All surveys were undertaken during daylight hours and in fine conditions conducive to survey. Survey effort is summarised in **Table 9.1.4**. Full details of all survey times, field surveyors used and weather conditions are presented in **Technical Annex 3**.

Table 9.1.4: Moorland breeding bird survey effort.

Year	Visit	Date	Start Time (24hrs)	End Time (24hrs)
Year 1	1	18/06/2020	10:30	17:30
	2	14/07/2020	10:00	17:25
		16/07/2020	09:55	13:15
Year 2	1	28/04/2021	08:30	15:45
	2	15/05/2021	09:00	15:00
	3	09/06/2021	10:30	16:30
		10/06/2021	09:10	15:25
	4	08/07/2021	08:50	16:55

⁵ Brown, A.F. & Shepherd, K.B. (1993). A method for censusing upland breeding waders. *Bird Study* 40, 189-195.

⁶ Calladine, J., Garner, G., Wernham, C. & Thiel, A. (2009) The influence of survey frequency on population estimates of moorland breeding birds. *Bird Study*, 56 (3), pp. 381-388.

Annex I/ Schedule 1 Breeding Raptor and Owl Searches

- 2.2.31 Breeding raptor and owl searches to inform the design and assessment of the Proposed Development were undertaken in 2020 and 2021 with reference to species-specific methodologies outlined in Hardey *et al.* (2013⁷), as per NatureScot guidance (SNH, 2017).
- 2.2.32 Search visits were staggered across the core breeding season (March to July, inclusive). Given the extent of the study area and terrain, searches were completed by a team of surveyors and/or over a number of days.
- 2.2.33 Survey effort is summarised in **Table 9.1.5**. Full details of all survey times, field surveyors used and weather conditions are presented in **Technical Annex 3**. Surveys 2020 did not include April and May, and this is discussed further in the **Field Survey Limitations** section at paragraph 2.2.48.
- 2.2.34 The breeding raptor and owl study area has comprised coverage of the turbine area and areas out to at least 2 km for all raptor species, extended out to 6 km for breeding eagle species as shown in **Figure 9.4** of EIAR Volume 3 and in accordance with current NatureScot guidance (SNH, 2017).
- 2.2.35 Search effort and areas have been informed through desk study records obtained from RSPB and the HRSG and through consultation with NatureScot.

Table 9.1.5: Breeding raptor and owl search effort summary.

Year	Visit	Date	Start Time (24hrs)	End Time (24hrs)
Year 1	1	05/03/2020	09:10	15:25
	2	24/03/2020	09:00	16:35
	3	25/06/2020	08:45	14:45
	4	21/07/2020	09:25	15:30
	5	29/07/2020	10:45	16:45
Year 2	1	23/03/2021	11:45	17:45
	2	24/03/2021	10:15	16:15
	3	21/04/2021	10:30	16:30
	4	16/05/2021	08:45	14:45
	5	26/05/2021	11:15	17:30
	6	03/06/2021	11:40	17:40
	7	16/06/2021	10:15	16:15
	8	09/07/2021	07:30	13:30

Breeding Diver Searches

- 2.2.36 Searches for breeding divers were undertaken in June 2020, and April and May 2021, at all suitable waterbodies within, and out to, a 2 km buffer of the turbine area (as shown in **Figure 9.4** of EIAR Volume 3), following species-specific survey methodologies detailed in Gilbert *et al.* (1998⁸).

⁷ Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. & Thompson, D. (2013). *Raptors: a field guide to survey and monitoring. Third Edition*. The Stationary Office, Edinburgh

⁸ Gilbert, G., Gibbons, D.W. & Evans, J. (1998). *Bird monitoring methods*. A manual of techniques for key UK species. RSPB, Sandy, Bedfordshire.

Although NatureScot guidance (SNH, 2017) recommends 1 km buffer from the turbine area, the study area was extended to 2 km given the proximity of designated sites with qualifying breeding diver interest (i.e. Lairg and Strath Brora Lochs Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI)).

- 2.2.37 Searches sought to establish breeding occupancy by red-throated and black-throated diver and to determine breeding outcomes where possible.
- 2.2.38 Survey effort is summarised in **Table 9.1.6**. Detailed survey effort including survey conditions are presented in **Technical Annex 3**.

Table 9.1.6: Breeding diver search summary.

Year	Visit	Date	Start Time (24hrs)	End Time (24hrs)
Year 1	1	24/06/2020	15:30	18:30
	2	29/07/2020 ⁹	10:45	16:45
Year 2	1	02/04/2021	15:30	19:30
	2	20/05/2021	12:45	17:50
	3	03/06/2021 ⁹	11:40	17:40

Breeding Diver Focal Loch Watches

- 2.2.39 If breeding diver occupancy was confirmed, focal watches overlooking occupied breeding lochans were undertaken to record incoming and outgoing flights of provisioning adult divers during the incubation and chick-rearing periods (July to August) in accordance with NatureScot guidance (SNH, 2017).

Breeding Black Grouse Surveys

- 2.2.40 Searches for black grouse leks to inform the design and assessment of the Proposed Development were undertaken in 2020 and 2021, with reference to species-specific methodologies outlined in Gilbert *et al.* (1998), as per NatureScot guidance (SNH, 2017).
- 2.2.41 A reconnaissance visit carried out in 7th August 2019, where a habitat appraisal of the areas of suitable habitat (e.g. open moorland, woodland edges and tracks) for black grouse was identified.
- 2.2.42 In each survey year, three search visits were undertaken between mid-March and early-April to record peak numbers of lekking males within the study area.
- 2.2.43 During searches all areas of suitable habitat (as identified during the reconnaissance visit in August 2019) within the study area were visited at dawn. All black grouse observed were recorded, with leks more than 500 m apart treated as separate leks.
- 2.2.44 Survey effort is summarised in **Table 9.1.7**. Full details of all survey times, field surveyors used and weather conditions are presented in **Technical Annex 3**.
- 2.2.45 The breeding black grouse study area has comprised the site and accessible areas out to 1.5 km as shown in **Figure 9.4** of EIAR Volume 3 and in accordance with NatureScot guidance (SNH, 2017).

⁹ Waterbodies checked during breeding raptor and owl searches.

Table 9.1.7: Breeding black grouse search effort summary.

Year	Visit	Date	Start Time (24hrs)	End Time (24hrs)
Year 1	1	24/03/2020	05:05	08:05
	2	25/03/2020	05:05	08:05
	3	26/03/2020	05:00	08:00
Year 2	1	16/03/2021	05:30	08:30
	2	26/03/2021	05:00	08:00
	3	09/04/2021	05:25	08:25

Additional Surveys

- 2.2.46 The site is not located in area of known importance for foraging migratory greylag or pink-footed geese (e.g. as per Mitchell, 2012¹⁰). The broad habitats within the site are also considered to be unsuitable for wintering and migrant foraging waterfowl. Feeding distribution surveys for geese and swans have therefore not been undertaken. Year 1 and 2 VP flight activity surveys did also not record large frequent movements of migratory waterfowl.
- 2.2.47 Surveys of woodland passerines, particularly in sites supporting commercial plantation woodland are not required in accordance with NatureScot guidance (SNH, 2017) and have not been undertaken. Observations of any notable species (incl. Schedule 1 species) were however noted during the MBBS and/or other ornithological surveys where observed.

Field Survey Limitations

- 2.2.48 Restrictions on travel in April and May 2020, due to the Covid-19 pandemic meant that ornithology surveys could not be undertaken during these two months. However, surveys were undertaken in April and May 2021, resulting in surveys over a full breeding season (Year 2) and surveys over a partial breeding season (Year 1). Additional hours were not undertaken in the latter part of the breeding season in Year 1, as NatureScot in their consultation (see **Chapter 9: Ornithology** in Volume 1 of the EIAR) stated that this would have a risk of underestimating flight activity (given flight activity tends to be high earlier in the breeding season, such as in April). Instead, it was agreed through consultation with NatureScot that surveys over a full breeding season in Year 2 would be carried out, which would act to compensate for (and would provide a comparison to) the surveys covering a partial breeding season in Year 1.
- 2.2.49 All habitats within the turbine area were accessible. The wider study areas used for the MBBS (500 m), Annex 1/ Schedule 1 Breeding Raptor and Owl Searches (2 km and 6 km), Breeding Diver Searches (2 km) and Breeding Black Grouse Searches (1.5 km) were surveyed from suitable locations within the turbine area boundary or public rights of way (PRoWs), scanning the study areas with the use of optics (telescope and binoculars). The study areas in Year 1 and Year 2 were consistent and are as shown in **Figures 9.1 - 9.6** of EIAR Volume 3.
- 2.2.50 Given the good visibility across the study area from the PRoWs this is not considered a limitation to the results obtained.

¹⁰ Mitchell, C. & Hearn, R.D. (2004) *Greylag goose Anser anser (Iceland population) in Britain and Ireland 1960/61 - 1999/2000*. Waterbird Review Series, WWT/JNCC, Slimbridge.

2.2.51 Plantation woodland habitats within the study areas was surveyed by traversing tracks and clearings rather than walking directly through dense plantation habitat, due to logistical and health and safety considerations. The study area was appropriately covered from the accessible tracks and clearings and this is not therefore considered a limitation to the results obtained.

3 RESULTS

3.1 Desk Study

Statutory Designated Sites for Nature Conservation

3.1.1 This section should be read with reference to **Figure 9.1** of EIAR Volume 3.

3.1.2 A review of NatureScot’s Sitelink identifies that the site does not form part of any statutory designated site for nature conservation with ornithological qualifying interests.

3.1.3 **Table 9.1.8** summarises statutory designated sites with ornithological features of interest located within 10 km of the turbine area, extended to 20 km for internationally designated sites with migratory goose interests.

3.1.4 Distances specified within **Table 9.1.8** are taken from the turbine area to the designation boundary at its nearest point.

Table 9.1.8: Designated sites for nature conservation.

SPA – Special Protection Area; SSSI – Site of Special Scientific Interest.

Designated Site	Distance and Direction from the Turbine Area	Ornithological Qualifying Interests
Lairg and Strath Brora Lochs SPA and SSSI	3.1 km, south-west	Breeding black-throated diver.
Strath Carnaig and Strath Fleet Moors SPA and SSSI	6 km, south	Breeding hen harrier.
Caithness and Sutherland Peatlands SPA and Ramsar	8.3 km, east	<p>Breeding populations of:</p> <ul style="list-style-type: none"> • Red-throated diver; • Black-throated diver; • Hen harrier; • Golden eagle; • Merlin; • Golden plover; • Wood sandpiper; • Short-eared owl; • Dunlin; and, • North Scottish Greylag goose (qualifying feature of the Ramsar) <p>Migratory populations of:</p> <ul style="list-style-type: none"> • Common scoter; • Greenshank; and, • Wigeon.
Skinsdale Peatlands SSSI	8.3 km, east	<p>Breeding populations of:</p> <ul style="list-style-type: none"> • Dunlin.

Designated Site	Distance and Direction from the Turbine Area	Ornithological Qualifying Interests
		<ul style="list-style-type: none"> • Golden plover. • Greenshank. <p>Breeding bird assemblage, incl. golden eagle and merlin.</p>
Cnoc an Alaskie SSSI	8.6 km, west	<p>Breeding population of:</p> <ul style="list-style-type: none"> • Greenshank. <p>Breeding bird assemblage, incl. golden eagle, merlin and wood sandpiper</p>
Grudie Peatlands SSSI	10 km, south-west	<p>Breeding populations of:</p> <ul style="list-style-type: none"> • Dunlin. • Golden plover. • Greenshank.
Dornoch Firth and Loch Fleet SPA and Ramsar	19.3km, south-east	<p>Breeding populations of:</p> <ul style="list-style-type: none"> • Osprey. <p>Migratory/wintering populations of:</p> <ul style="list-style-type: none"> • Bar-tailed godwit. • Greylag goose. • Wigeon. • Waterbird assemblage, incl. curlew, teal, redshank, dunlin and oystercatcher.

Non-statutory Designated Sites for Nature Conservation

- 3.1.5 The data request submitted to the HBRG identifies that the site does not form part of any non-statutory designated sites for nature conservation with ornithological interests.
- 3.1.6 In further review of non-statutory designated sites, the site is also not located within 2 km of any such site with ornithological interests.

Existing Ornithological Records

HBRG

- 3.1.7 The data request submitted to the HBRG returned no records from within the desk study survey area (as defined in **Table 9.1.1**).

RSPB

- 3.1.8 The data request submitted to the RSPB returned records of 12 species, including golden eagle, hen harrier and black-throated diver within the desk study survey area (as defined in **Table 9.1.1**).
- 3.1.9 Further record details are provided in **Technical Annex 2**. Information pertaining to sensitive records of breeding golden eagle and black-throated diver, which are considered confidential, is provided in **Confidential Appendix 9.2** and in **Confidential Figure 9.2.1**, with non-sensitive information presented in **Figure 9.2** of EIAR Volume 3.

HRSG

- 3.1.10 The data request submitted to the HRSG returned no records within the desk study survey area (as defined in **Table 9.1.1**). However, records of a known golden eagle nest site located on the periphery of the survey area were provided.
- 3.1.11 Records of the breeding golden eagle are considered confidential and as such sensitive information are detailed within **Confidential Appendix 9.2** and in **Confidential Figure 9.2.1**.

FLS

- 3.1.12 The data request submitted to the FLS returned records of black grouse within the desk study survey area (as defined in **Table 9.1.1**), including 24 lek records.
- 3.1.13 Further record details are provided in **Technical Annex 2**. Information pertaining to sensitive records of breeding black grouse, which are considered confidential, is provided in **Confidential Appendix 9.2** and in **Confidential Figure 9.1.1**, with non-sensitive information presented in **Figure 9.2** of EIAR Volume 3.

Dalnessie Wind Farm

- 3.1.14 A summary of the main results from the ornithology surveys undertaken to support the now withdrawn Dalnessie Wind Farm EIA Report Chapter (RPS, 2011¹¹) are presented in **Table 9.1.9** while noting that the study areas for this previous application were not the same as those study areas for the Proposed Development.
- 3.1.15 The ornithology surveys which supported the withdrawn Dalnessie Wind Farm development were:
- MBBS carried out April to July 2009 and 2010.
 - VP Flight Activity Surveys carried out April 2009 to March 2011.
 - Breeding Raptor Searches carried out May to August 2009, and April to July 2010.
 - Black Grouse Surveys carried out April and May 2010.
 - Breeding Diver Surveys carried out June to July 2009 and 2010.
 - Winter Walkovers carried out November/December 2009 and March 2010.

Table 9.1.9: Survey results which supported the Dalnessie Wind Farm.

Species	Information
Whooper swan	Peak of 22 birds recorded during winter walkovers. No flights recorded.
Pink-footed goose	21 flights recorded.
Greylag goose	30 flights recorded.
Black grouse	3 leks within 1.5 km of Dalnessie Wind Farm development (comprising 1 – 4 males).
Wigeon	5 flights recorded and 1 territory in 2010 (none in 2009).
Teal	1 flight recorded, and 1 and 3 territories respectively in 2009 and 2010.
Red-throated diver	6 flights recorded. Details regarding breeding diver searches not available.

¹¹ RPS (2011) *Dalnessie Wind Farm Technical Appendix*.

Species	Information
Black-throated diver	No flights recorded. Details regarding breeding diver searches not available.
Red kite	2 flights recorded. No evidence of breeding.
Hen harrier	39 flights recorded. No evidence of breeding.
Goshawk	4 flights recorded. No evidence of breeding.
Golden eagle	241 flights recorded, and 1 territory and 3 territories respectively in 2009 and 2010 (although no further details of the sensitive territory locations are available) ¹² .
Osprey	2 flights recorded. No evidence of breeding.
Honey buzzard	2 flights recorded. No evidence of breeding.
Golden plover	101 flights recorded, and 25 and 45 territories respectively in 2009 and 2010.
Lapwing	14 flights recorded, and 5 territories in 2009 (none in 2010).
Curlew	21 flights recorded, and 7 and 2 territories respectively in 2009 and 2010.
Dunlin	24 flights recorded, and 20 and 18 territories respectively in 2009 and 2010.
Common sandpiper	2 flights recorded, and 6 and 13 territories respectively in 2009 and 2010.
Greenshank	37 flights recorded, and 12 and 7 territories respectively in 2009 and 2010.
Oystercatcher	8 flights recorded, and 2 territories in 2009 (none in 2010).
Snipe	16 flights recorded, and 16 and 17 territories respectively in 2009 and 2010.
Barn owl	No flights recorded, but territory within 2 km of Dalnessie Wind Farm development in 2009 (no territory identified in 2010).
Merlin	30 flights recorded, and 1 and 4 territories respectively in 2009 and 2010.
Peregrine	6 flights recorded, but no evidence of breeding.
Gulls and skuas	4 common gull territories in 2009 and 2010, and 1 great skua flight recorded.

3.2 Field Surveys

VP Flight Activity Surveys

Target Species

- 3.2.1 Target Species flight activity recorded during the VP survey period (September 2019 to August 2021) from all VPs combined is summarised in **Table 9.1.10**.
- 3.2.2 The total number of all flights, total number of birds recorded and the total flight time, from all VP locations combined is presented. This includes some flights which were detected outside of the VP study area and which are not at-risk of collision. **Table 9.1.11** provides the list of those 'at-risk'

¹² Given the main turbine area in the withdrawn Dalnessie Wind Farm development was approximately 3.5 km to the north-east of the Proposed Development, it may be that the identified golden eagle territories extended to the east and north from the turbine area of the withdrawn Dalnessie Wind Farm development and therefore >6 km from the Proposed Development.

flights, thus consisting of flights inside the VP study area (within 290 m of outermost turbines) and recorded at height bands 1-5.

3.2.3 Detailed flight records are presented in **Technical Annex 4**. Flight lines for each species over the entire survey period are illustrated in **Figures 9.5a – 9.5d** of EIA Volume 3.

Table 9.1.10: Target species flight activity summary.

Species	Total No. of Flights	Total No. of Birds	Total Flight Time (s) ¹³
Whooper swan	4	22	2,893
Pink-footed goose	7	587	119,521
Greylag goose	8	70	10,639
Black-throated diver	1	2	364
Goosander	1	1	33
Grey heron	2	2	102
Red kite	5	6	961
Hen harrier	24	25	4,829
Golden eagle	58	67	30,802
White-tailed eagle	7	7	1,917
Short-toed eagle ¹⁴	1	1	1,200
Golden plover	6	8	671
Lapwing	20	23	2,400
Curlew	4	4	304
Dunlin	4	4	64
Wood sandpiper	1	1	192
Greenshank	1	1	57
Snipe	22	24	4,745
Merlin	1	1	40

Table 9.1.11: Target species at-risk flight activity summary.

Species	Total No. of Flights	Total No. of Birds	Total Flight Time At-risk Height (s) ¹²
Whooper swan	2	7	768
Greylag goose	6	45	7,402
Black-throated diver	1	2	364
Grey heron	1	1	58
Red kite	3	4	726

¹³ Total time multiplied by the number of birds.

¹⁴ This European species is an extremely rare vagrant to the UK, with this record constituting the first ever bird recorded (and photographed) in Scotland. Records of vagrant species are, by definition, rare and transient and therefore not of conservation importance however rare the species may be in a UK context. Subsequently this species is not discussed further.

Species	Total No. of Flights	Total No. of Birds	Total Flight Time At-risk Height (s) ¹²
Hen harrier	9	10	2,847
Golden eagle	31	35	15,881
White-tailed eagle	3	3	962
Short-toed eagle	1	1	1,200
Lapwing	10	12	1,437
Curlew	1	1	54
Wood sandpiper	1	1	192
Snipe	14	16	3,478

Secondary Species

3.2.4 Low levels of activity of the following secondary species were also recorded:

- Sparrowhawk.
- Buzzard.
- Common gull.
- Kestrel.
- Raven.

Moorland Breeding Bird Surveys

3.2.5 The MBBS undertaken in 2020 and 2021 recorded a relatively limited range of open moorland breeding species, with most breeding territories in open habitats (and clear-felled areas) on the periphery of the turbine area.

3.2.6 A summary of breeding territory numbers of target species recorded within the study area is summarised in **Table 9.1.12**, and approximate locations of these breeding territories are illustrated, respectively for 2020 and 2021, in **Figures 9.6a** and **9.6b** of EIAR Volume 3.

Table 9.1.12: Breeding territories recorded within the MBBS study area.

Species	No. of Territories	
	Year 1 (2020)	Year 2 (2021)
Teal	1	2
Golden plover	4	11
Lapwing	1	6
Curlew	1	2
Dunlin	1	3
Wood sandpiper	0	1
Common sandpiper	1	3
Greenshank	1	0

Oystercatcher	0	1
Snipe	6	15

Annex I / Schedule 1 Breeding Raptor and Owl Searches

- 3.2.7 Six species of Annex I/ Schedule 1 raptor and a single Annex I species of owl were recorded during breeding raptor and owl searches undertaken in 2020 and 2021, consisting of golden eagle, white-tailed eagle, hen harrier, peregrine, merlin, red kite and short-eared owl.
- 3.2.8 Golden eagles were recorded displaying in open habitat outside the turbine area, to the east, in March 2020, with display flight also recorded along the northern boundary of the turbine area in July 2021. In March 2021 (during a VP flight activity survey), a pair of golden eagles were recorded mating on the north-west slope of Sròn Leathad Chleansaid along the northern turbine area boundary. The golden eagle activity recorded was predominantly in the wider open habitat to the east of the turbine area, but also included along Sròn Leathad Chleansaid in the north of the turbine area. Although no nest site (or suspected nest site) was identified in either 2020 or 2021, it is considered that open habitat east of the turbine area and outside, and adjacent to, the north-eastern boundary of the turbine area along Sròn Leathad Chleansaid formed part of a breeding golden eagle pair's territory in 2021 and possibly also in 2020.
- 3.2.9 Merlin was recorded as breeding in 2021 with an active nest located in the breeding raptor and owl study area (approximately 500 m from the nearest proposed turbine location). Although a merlin was recorded as mobbing a buzzard 2 km south of the turbine area in 2020 there was no definitive evidence of breeding.
- 3.2.10 Individual flights of male and female hen harrier in the study area were recorded in 2021, with individual flights of red kite, peregrine, white-tailed eagle (principally immature birds) and short-eared owl also recorded in 2021. No evidence of breeding was recorded for any of these species.
- 3.2.11 A summary of breeding territory numbers for raptors and owls recorded within the breeding raptor and owl study area is presented in **Table 9.1.13**, and given the sensitivity of the information related to the merlin nest further details are provided in **Confidential Appendix 9.2** and in **Confidential Figure 9.1.2**. Note, no golden eagle nest sites were identified within 6 km of the Proposed Development in 2010 or 2021 (nor were there any golden eagle nest site records from the HRSG), but the study area is considered to form part of a breeding golden eagle pair's territory.

Table 9.1.13: Breeding territories recorded within the breeding raptor and owl study area.

Species	No. of Territories	
	2020	2021
Golden eagle	1	1
Merlin	0	1

Breeding Diver Searches

- 3.2.12 Breeding diver searches undertaken in 2020 recorded no divers within the study area. In 2021, a pair of red-throated divers was recorded on Loch Gaineamhach at NC 58241 24562 in June, but outside the breeding diver study area, 5.5 km to the north-west of the turbine area. The birds were recorded loafing and swimming, with no evidence of breeding.
- 3.2.13 Breeding diver focal breeding loch watches were therefore not undertaken in 2020 or 2021.

Breeding Black Grouse Surveys

- 3.2.14 Searches for black grouse leks in 2020 and 2021 recorded no black grouse within the study area.
- 3.2.15 A male black grouse was recorded incidentally when a surveyor was leaving the site on completion of a VP flight activity survey, in November 2020 (at NC 58768 17908), within a clear-fell section of the forestry compartment, outside the turbine area, to the south-west. Given the grouse was recorded in November; the record signifies a non-lekking individual. Furthermore, a single female black grouse was recorded in clear-fell habitat incidentally when surveyors were carrying out a breeding raptor and owl search in June 2021 at NC 56814 21108, approximately 4 km north-west of the turbine area. No evidence of a black grouse lek site was identified, and this was assumed to be a roaming female bird.

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ANNEX 1 – BIRD SPECIES SUMMARY

Table A1.1 provides a list of bird species referred to within **Chapter 9: Ornithology** in Volume 1, and associated appendices in Volume 2, of the EIAR. Both common and species names are presented along with a summary of each species relevant conservation status using the following abbreviations:

- Annex I - species listed on Annex I of the Birds Directive.
- Schedule 1, 1A, A1 - species listed on Schedule 1, Schedule 1A or Schedule A1 of the Wildlife and Countryside Act 1981 (as amended).
- BoCC - BoCCs as listed by leading bird conservation organisations in the UK, including the RSPB and BTO. Red and Amber categories are given (Stanbury *et al.*, 2021).
- SBL - species listed on the Scottish Biodiversity List.
- LBAP – bird species selected for action in the Highland Nature Local Biodiversity Action Plan (2021-2026)¹⁵.

Table A1.1: Summary of bird species.

Common Name	Species Name	Conservation Status
Whooper swan	<i>Cygnus cygnus</i>	Annex I, BoCC – Amber, SBL
Greylag goose	<i>Anser anser</i>	S1 ¹⁶ , BoCC – Amber
Pink-footed goose	<i>Anser brachyrhynchus</i>	BoCC – Amber
Teal	<i>Anas crecca</i>	BoCC – Amber
Wigeon	<i>Anas penelope</i>	BoCC – Amber
Mallard	<i>Anas platyrhynchos</i>	BoCC – Amber
Black grouse	<i>Tetrao tetrix</i>	Annex I, BoCC – Red, SBL, LBAP
Red-throated diver	<i>Gavia stellata</i>	Annex I, S1, SBL, LBAP
Black-throated diver	<i>Gavia arctica</i>	Annex I, S1, BoCC – Amber, SBL, LBAP
Grey heron	<i>Ardea cinerea</i>	-
White-tailed eagle	<i>Haliaeetus albicilla</i>	Annex I, S1, S1A, SA1, BoCC – Amber, SBL, LBAP
Hen harrier	<i>Circus cyaneus</i>	Annex I, S1, S1A, BoCC – Red, SBL, LBAP
Red kite	<i>Milvus milvus</i>	Annex I, S1, S1A, SBL, LBAP
Goshawk	<i>Accipiter gentilis</i>	Annex I, S1, LBAP
Sparrowhawk	<i>Accipiter nisus</i>	BoCC – Amber
Buzzard	<i>Buteo buteo</i>	-
Honey buzzard	<i>Pernis aprivorus</i>	Annex I, S1, BoCC – Amber, SBL
Golden eagle	<i>Aquila chrysaetos</i>	Annex I, S1, S1A, SA1, SBL, LBAP
Short-toed eagle	<i>Circaetus gallicus</i>	Annex I
Osprey	<i>Pandion haliaetus</i>	Annex I, S1, BoCC – Amber, SBL

¹⁵ <https://www.highlandenvironmentforum.info/biodiversity/action-plan/> (Accessed November 2021).

¹⁶ In Outer Hebrides, Caithness and Sutherland and Wester Ross only.

Common Name	Species Name	Conservation Status
Oystercatcher	<i>Haematopus ostralegus</i>	BoCC – Amber, LBAP
Golden plover	<i>Pluvialis apricaria</i>	Annex I, SBL, LBAP
Lapwing	<i>Vanellus vanellus</i>	BoCC – Red, SBL, LBAP
Curlew	<i>Numenius arquata</i>	BoCC – Red, SBL, LBAP
Dunlin	<i>Calidris alpina</i>	BoCC – Red, SBL, LBAP
Common sandpiper	<i>Actitis hypoleucos</i>	BoCC - Amber
Wood sandpiper	<i>Tringa glareola</i>	Annex I, S1, BoCC – Amber, SBL, LBAP
Redshank	<i>Tringa totanus</i>	BoCC – Amber, LBAP
Greenshank	<i>Tringa nebularia</i>	S1, BoCC – Amber, LBAP
Snipe	<i>Gallinago gallinago</i>	BoCC – Amber, LBAP
Bar-tailed godwit	<i>Limosa lapponica</i>	Annex I, BoCC – Amber, SBL
Common gull	<i>Larus canus</i>	BoCC – Amber
Great skua	<i>Stercorarius skua</i>	BoCC – Amber
Barn owl	<i>Tyto alba</i>	S1, SBL
Short-eared owl	<i>Asio flammeus</i>	Annex I, BoCC – Amber, SBL
Kestrel	<i>Falco tinnunculus</i>	BoCC – Amber, SBL
Merlin	<i>Falco columbarius</i>	Annex I, S1, BoCC – Red, SBL, LBAP
Peregrine	<i>Falco peregrinus</i>	Annex I, S1, SBL, LBAP
Raven	<i>Corvus corax</i>	-

ANNEX 2 – EXISTING ORNITHOLOGICAL RECORDS

Table A2.1 provides a summary of existing ornithological records returned by RSPB, FLS and HRSG (note, no records were returned from the HBRG). Only records post-2010 are considered. Only species regarded as target species are included within **Table A2.1**.

Information regarding nest sites for sensitive species (Schedule 1 raptors, black-throated diver and black grouse leks) considered in this **Annex 2**, is summarised in **Confidential Appendix 9.2** and **Confidential Figure 9.2.1**.

Table A2.1: Summary of existing ornithological records (RSPB, FLS and HRSG).

Species	No. of Records	Date Range	Summary
Greylag goose	1	2016	-
Wigeon	2	2016-2017	-
Teal	1	2017	-
Grey heron	2	2016-2017	-
Black grouse	27	2015-2021	24 lek records, and three non-lek records (1-2 females).
Black-throated diver	6	2011-2017	Breeding records.
Red-breasted merganser	1	2016	Possible breeding.
White-tailed eagle	1	2017	Individual flying over-head.
Golden eagle	2	2010	Breeding records.
Hen harrier	1	2010	Non-breeding record.
Common sandpiper	3	2016-2017	Including probable breeding record.
Greenshank	3	2016-2017	Including probable breeding record.
Common gull	2	2016-2017	Including breeding colony of 20+ pairs.

ANNEX 3 – ORNITHOLOGY FIELD SURVEY EFFORT

The following codes are used to record weather conditions within **Tables A3-1 to A3-5**:

Wind Speed		Rain		Cloud Cover	
Calm	0	None	0	Out of 8	
Light air	1	Drizzle/mist	1		
Light breeze	2	Light showers	2	Frost	
Gentle breeze	3	Heavy showers	3	None	0
Moderate breeze	4	Heavy rain	4	Ground	1
Fresh breeze	5			All day	2
Strong breeze	6	Visibility			
Moderate gale	7	Poor	0	Snow	
Fresh gale	8	<1 km	1	None	0
Strong gale	9	>1 km	2	On site	1
Whole gale	10			High ground	2
Storm	11	Cloud Height			
		<150 m	0		
Wind Direction		150-500 m	1		
16 point compass		>500 m	2		

Field surveys were undertaken by the following named surveyors:

M. Wood (MW), P. Carroll (PC), A. MacNab (AJM), A. Hutt (AH), A. Little (AL), K. Little (KL), D. Grundy (DG), N. Voaden (NV), G. Dunbar (GD), J. Sykes (JS) and S. MacDonald (SM).

Table A3.1: VP Flight Activity Survey Effort – September 2019 to August 2021.

Date	VP	Surveyor	Start Time	Finish Time	VP Hours	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
23/09/2019	1	AJM	13:15	16:15	3	3/3/4	ESE/ESE/SE	0/0/0	1/1/2	2/2/2	2/2/2	0/0/0	0/0/0
23/09/2019	1	AJM	16:45	19:45	3	4/3/3	SE/SE/SE	0/0/0	2/1/1	2/2/2	2/2/2	0/0/0	0/0/0
24/09/2019	2	AJM	06:20	09:20	3	4/4/4	SE/SE/SE	0/0/0	7/7/6	1/1/2	2/2/2	0/0/0	0/0/0
24/09/2019	2	AJM	09:50	12:50	3	4/3/3	SE/SE/SE	0/2/0	6/7/7	2/2/2	2/2/2	0/0/0	0/0/0
15/10/2019	1	AJM	10:00	13:00	3	2/3/2	SE/SE/SE	0/0/0	2/1/1	2/2/2	2/2/2	0/0/0	0/0/0
15/10/2019	1	AJM	13:30	16:30	3	3/3/3	SE/ESE/ESE	0/0/0	1/3/4	2/2/2	2/2/2	0/0/0	0/0/0
16/10/2019	1	AJM	14:15	17:15	3	2/2/2	SSW/SW/SW	2/0/0	7/6/4	2/2/2	2/2/2	0/0/0	0/0/0
14/10/2019	2	AJM	11:45	14:45	3	1/1/1	SE/NW/NW	0/0/0	6/6/6	2/2/2	2/2/2	0/0/0	0/0/0
14/10/2019	2	AJM	15:15	18:15	3	1/2/2	SSE/SE/SE	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
16/10/2019	2	AJM	10:20	13:20	3	1/2/2	SSE/SSW/SSW	0/2/3	7/8/8	2/2/1	2/2/2	0/0/0	0/0/0
25/11/2019	1	AJM	09:50	12:50	3	2/2/2	E/E/ESE	0/0/0	7/7/6	1/1/2	2/2/2	0/0/0	0/0/0
25/11/2019	1	AJM	13:20	16:20	3	2/1/1	ESE/ESE/ESE	0/0/0	4/3/2	2/2/2	2/2/2	0/0/0	0/0/0
27/11/2019	1	AJM	08:40	11:40	3	4/4/4	NE/NE/NE	2/2/2	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
26/11/2019	2	AJM	09:40	12:40	3	3/3/4	ENE/E/E	1/1/2	8/8/8	1/1/2	2/2/2	0/0/0	0/0/0
26/11/2019	2	AJM	13:10	16:10	3	4/3/4	ESE/ESE/ESE	2/2/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
27/11/2019	2	AJM	12:40	15:40	3	4/5/5	NE/NE/NE	2/2/2	8/7/8	2/2/2	2/2/2	0/0/0	0/0/0
18/12/2019	1	MW	09:00	12:00	3	0/1/0	-/SE/-	0/0/0	0/0/1	-/-/2	2/2/2	2/2/2	1/1/1
18/12/2019	1	MW	12:30	15:30	3	0/1/0	-/SE/-	0/0/0	3/6/5	2/2/2	2/2/2	2/2/2	1/1/1
19/12/2019	1	MW	12:45	15:45	3	1/0/0	SE/-/-	0/0/0	2/2/1	2/2/2	2/2/2	0/0/0	0/0/0
19/12/2019	2	MW	08:55	11:55	3	0/1/0	-/SE/-	0/0/0	6/4/2	2/2/2	2/2/2	0/0/0	0/0/0
20/12/2019	2	MW	09:00	12:00	3	1/2/2	SE/SE/SE	0/0/0	7/7/6	2/2/2	2/2/2	0/0/0	0/0/0
20/12/2019	2	MW	12:30	15:30	3	3/3/1	SE/SE/SE	0/0/0	4/3/3	2/2/2	2/2/2	0/0/0	0/0/0
07/01/2020	1	MW	09:50	12:50	3	0/2/2	-/SW/SW	0/2/2	7/7/8	2/2/2	2/2/2	0/0/0	0/0/0
07/01/2020	1	MW	13:20	16:20	3	2/2/2	SW/SW/SW	0/1/1	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
08/01/2020	1	MW	08:30	11:30	3	3/3/4	W/W/W	0/3/2	5/4/4	2/2/2	2/2/2	0/0/0	0/0/0
08/01/2020	2	MW	12:20	15:20	3	4/4/4	W/W/W	3/2/2	4/4/4	2/2/2	2/2/2	0/0/0	0/0/0
09/01/2020	2	MW	08:30	11:30	3	0/0/0	-/-/-	0/0/0	8/7/7	2/2/2	2/2/2	2/2/2	0/0/0
09/01/2020	2	MW	12:00	15:00	3	0/0/0	-/-/-	0/0/0	6/6/6	2/2/2	2/2/2	2/2/2	0/0/0

Date	VP	Surveyor	Start Time	Finish Time	VP Hours	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
19/02/2020	1	AJM	08:55	11:55	3	1/1/2	WSW/WSW/SW	0/0/0	1/1/2	2/2/2	2/2/2	0/0/0	2/2/2
19/02/2020	1	AJM	12:25	15:25	3	3/3/4	SW/SSW/SW	0/0/2	6/6/8	2/2/2	2/2/2	0/0/0	2/2/2
18/02/2020	2	AJM	11:10	14:10	3	4/4/4	W/WSW/WSW	2/2/0	5/4/4	2/2/2	2/2/2	0/0/0	2/2/2
18/02/2020	2	AJM	14:40	17:40	3	4/4/4	WSW/WSW/WSW	0/0/0	5/5/4	2/2/2	2/2/2	0/0/0	2/2/2
04/03/2020	1	AJM	11:35	14:35	3	1/2/2	SSW/SSW/S	0/0/0	1/1/3	2/2/2	2/2/2	0/0/0	2/2/2
04/03/2020	1	AJM	15:05	18:05	3	2/2/3	S/SSW/SW	0/0/2	4/5/6	2/2/2	2/2/2	0/0/0	2/2/2
23/03/2020	1	SM	13:25	16:25	3	3/3/3	S/S/SSW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
06/03/2020	2	AJM	06:25	09:25	3	1/1/1	NE/NE/SW	0/0/0	2/2/4	2/2/2	2/2/2	1/1/1	0/0/0
06/03/2020	2	AJM	09:55	12:55	3	1/2/2	SW/SW/SW	0/0/0	5/6/6	2/2/2	2/2/2	0/0/0	0/0/0
25/03/2020	2	SM	08:35	11:35	3	1/1/1	NW/NW/NW	1/1/1	8/8/8	1/2/2	2/2/2	0/0/0	2/2/2
17/06/2020	1	SM	10:50	13:50	3	0/1/0	-/SE/-	0/1/0	8/8/8	1/2/2	1/2/2	0/0/0	0/0/0
17/06/2020	1	SM	14:20	17:20	2	1/2/2	SSE/S/WNW	0/0/0	8/6/5	2/2/2	2/2/2	0/0/0	0/0/0
29/06/2020	1	SM	17:05	20:05	3	4/3/3	N/N/N	0/3/1	6/8/8	2/2/1	2/2/2	0/0/0	0/0/0
24/06/2020	2	SM	08:55	11:55	3	1/2/1	WSW/WSW/W	0/2/2	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
24/06/2020	2	SM	12:25	15:25	3	2/2/2	W/W/S	0/0/0	8/8/5	2/2/2	2/2/2	0/0/0	0/0/0
29/06/2020	2	SM	13:10	16:10	3	3/3/3	NNW/N/N	2/0/2	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
01/07/2020	1	SM	10:40	13:40	3	4/4/4	NE/NNE/NNE	0/0/2	7/6/6	2/2/2	2/2/2	0/0/0	0/0/0
01/07/2020	1	SM	14:10	17:10	3	3/3/4	N/NE/NE	0/0/0	7/6/6	2/2/2	2/2/2	0/0/0	0/0/0
16/07/2020	1	SM	13:30	16:30	3	4/3/2	WSW/SW/NW	0/3/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
02/07/2020	2	SM	04:35	07:35	3	1/1/1	N/NNW/NW	0/0/0	2/6/8	2/2/2	2/2/2	0/0/0	0/0/0
02/07/2020	2	SM	08:05	11:05	3	1/2/3	NW/WNW/W	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
21/07/2020	2	SM	16:20	19:20	3	3/3/2	W/WNW/NW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
13/08/2020	1	SM	13:50	16:50	3	2/2/1	SE/ESE/ESE	0/0/0	8/8/7	2/2/2	2/2/2	0/0/0	0/0/0
28/08/2020	1	MW	05:40	08:40	3	2/2/2	N/N/N	0/0/1	8/8/8	1/1/1	2/2/2	0/0/0	0/0/0
13/08/2020	2	SM	09:55	12:55	3	1/1/1	NNE/NE/SW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
24/08/2020	2	MW	18:10	21:10	3	1/2/2	NE/NE/NE	0/0/0	5/6/6	2/2/2	2/2/2	0/0/0	0/0/0
04/09/2020	1	PC	09:05	12:05	3	4/3/3	SW/SW/SW	2/2/2	6/6/6	2/2/2	2/2/2	0/0/0	0/0/0
07/09/2020	1	SM	13:55	16:55	3	5/3/4	W/WNW/W	2/3/0	8/8/7	1/1/2	2/2/2	0/0/0	0/0/0
07/09/2020	1	SM	17:25	20:25	3	4/4/3	W/W/W	2/0/0	8/6/8	2/2/2	2/2/2	0/0/0	0/0/0

Date	VP	Surveyor	Start Time	Finish Time	VP Hours	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
04/09/2020	2	PC	13:10	16:10	3	4/4/4	SW/SW/SW	2/2/2	6/6/6	2/2/2	2/2/2	0/0/0	0/0/0
23/09/2020	2	KL	09:30	12:30	3	0/1/1	-/W/S	0/0/0	1/1/1	2/2/2	2/2/2	0/0/0	0/0/0
23/09/2020	2	KL	13:00	16:00	3	1/2/1	SSW/SSW/WSW	0/0/0	1/1/1	2/2/2	2/2/2	0/0/0	0/0/0
12/10/2020	1	SM	12:20	15:20	3	4/4/4	WNW/NW/NW	2/0/2	8/7/8	1/2/2	1/2/2	0/0/0	0/0/0
12/10/2020	1	SM	15:50	18:50	3	3/3/2	NW/NNW/NNW	3/0/0	8/6/7	2/2/2	2/2/2	0/0/0	0/0/0
22/10/2020	1	SM	09:50	12:50	3	1/2/2	WNW/NE/NNE	0/0/0	1/4/7	2/2/2	2/2/2	0/0/0	0/0/0
08/10/2020	2	SM	07:10	10:10	3	0/1/1	-/NNW/NW	0/0/0	4/6/7	2/2/2	2/2/2	1/1/0	0/0/0
08/10/2020	2	SM	10:40	13:40	3	1/2/3	W/WSW/WSW	0/0/2	2/5/6	2/2/2	2/2/2	1/1/0	0/0/0
22/10/2020	2	SM	13:55	16:55	3	1/2/1	NW/NE/ENE	0/0/0	5/6/6	2/2/2	2/2/2	1/1/0	0/0/0
12/11/2020	1	SM	09:30	12:30	3	2/1/1	WNW/SSE/SE	0/0/0	7/6/6	2/2/2	2/2/2	0/0/0	0/0/0
12/11/2020	1	SM	13:00	16:00	3	2/2/3	ESE/ESE/SSW	0/0/0	7/7/8	2/2/2	2/2/2	0/0/0	0/0/0
04/11/2020	2	SM	09:35	12:35	3	2/2/3	W/WNW/WNW	0/0/0	7/8/7	2/2/2	2/2/2	0/0/0	0/0/0
04/11/2020	2	SM	13:05	16:05	3	3/3/3	WNW/WNW/NW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
17/12/2020	1	SM	08:50	11:50	3	1/1/2	SSE/SSE/S	0/0/0	4/4/2	2/2/2	2/2/2	0/0/0	0/0/0
17/12/2020	1	SM	12:20	15:20	3	2/2/2	SSW/WSW/SSE	0/0/0	5/4/6	2/2/2	2/2/2	0/0/0	0/0/0
01/12/2020	2	SM	08:50	11:50	3	1/1/2	SSW/SSE/S	0/0/0	8/8/8	2/2/2	2/2/2	1/0/0	0/0/0
01/12/2020	2	SM	12:20	15:20	3	2/1/1	SSE/SE/WNW	0/0/0	7/4/6	2/2/2	2/2/2	0/0/0	0/0/0
22/01/2021	1	SM	08:40	11:40	3	4/2/3	NNW/NW/NW	3/0/0	7/2/5	2/2/2	2/2/2	1/0/0	1/1/1
22/01/2021	1	SM	12:10	15:10	3	2/1/3	W/WNW/WNW	0/2/2	7/8/7	1/1/2	2/2/2	0/0/0	1/1/1
06/01/2021	2	SM	09:10	12:10	3	1/1/1	N/NE/SE	0/0/0	0/1/1	-/2/2	2/2/2	2/2/2	1/1/1
06/01/2021	2	SM	12:40	15:40	3	1/1/1	SSE/S/SSW	0/0/0	2/6/7	2/2/2	2/2/2	2/2/2	1/1/1
16/02/2021	1	SM	09:55	12:55	3	4/4/3	S/SSW/SW	0/0/0	4/5/6	2/2/2	2/2/2	0/0/0	1/1/1
16/02/2021	1	SM	13:25	16:25	3	3/3/2	SW/SW/SW	2/0/0	8/6/4	2/2/2	2/2/2	0/0/0	1/1/1
02/02/2021	2	SM	10:05	13:05	3	3/4/4	E/ESE/ESE	0/0/0	7/8/8	2/2/2	2/2/2	0/0/0	1/1/1
02/02/2021	2	SM	13:35	16:35	3	4/4/4	E/ESE/ESE	2/0/0	6/6/4	2/2/2	2/2/2	0/0/0	1/1/1
01/03/2021	1	AJM	12:10	15:10	3	2/2/2	SSW/SSW/SSW	0/0/0	4/5/3	2/2/2	2/2/2	0/0/0	2/2/2
16/03/2021	1	SM	08:40	11:40	3	4/5/5	NW/WNW/WNW	0/0/0	6/5/2	2/2/2	2/2/2	0/0/0	2/2/2
16/03/2021	1	SM	12:10	15:10	3	5/5/4	W/W/W	0/0/0	3/3/3	2/2/2	2/2/2	0/0/0	2/2/2
01/03/2021	2	AJM	08:10	11:10	3	1/1/1	SW/SW/SW	0/0/0	7/6/6	2/2/2	2/2/2	0/0/0	2/2/2

Date	VP	Surveyor	Start Time	Finish Time	VP Hours	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
10/03/2021	2	SM	09:10	12:10	3	3/3/3	S/SSW/SSW	0/0/0	6/7/7	2/2/2	2/2/2	0/0/0	2/2/2
10/03/2021	2	SM	12:40	15:40	3	3/3/4	SSW/SSE/SSE	0/0/2	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
16/04/2021	1	SM	05:35	08:35	3	2/2/2	ENE/E/E	0/0/0	0/1/1	NA/2/2	2/2/2	1/1/0	2/2/2
16/04/2021	1	SM	09:05	12:05	3	2/2/3	SE/SSE/SSE	0/0/0	2/2/3	2/2/2	2/2/2	0/0/0	2/2/2
12/04/2021	1	SM	14:45	17:45	3	2/3/3	WNW/WNW/NW	0/0/0	6/7/7	2/2/2	2/2/2	0/0/0	2/2/2
05/04/2021	2	SM	13:45	16:45	3	4/4/4	NNW/NNW/NNW	0/2/0	5/7/4	2/2/2	2/2/2	0/0/0	1/1/1
27/04/2021	2	AH	10:00	13:00	3	5/5/4	NE/NE/NE	1/1/1	7/7/8	2/2/2	2/2/2	0/0/0	0/0/0
27/04/2021	2	AH	13:30	16:30	3	5/5/5	NE/NE/NE	0/1/1	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
21/05/2021	1	SM	05:55	08:55	3	5/4/4	E/NE/NE	1/2/3	8/8/8	1/2/2	2/2/2	0/0/0	0/0/0
24/05/2021	1	GD	19:10	22:10	3	3/3/4	N/N/N	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
16/05/2021	2	KL	09:00	12:00	3	1/2/2	W/SSE/W	0/0/0	4/4/5	2/2/2	2/2/2	0/0/0	0/0/0
16/05/2021	2	KL	12:30	15:30	3	2/2/2	SW/SW/SW	0/0/0	3/3/7	2/2/2	2/2/2	0/0/0	0/0/0
16/06/2021	1	NV	07:00	10:00	3	4/5/5	SW/SW/SSW	0/0/0	4/6/5	2/2/2	2/2/2	0/0/0	0/0/0
20/06/2021	1	AH	10:30	13:30	3	3/3/3	NW/NW/NW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
20/06/2021	1	AH	14:00	17:00	3	2/3/4	NW/NW/NW	0/0/0	7/6/7	2/2/2	2/2/2	0/0/0	0/0/0
08/06/2021	2	SM	12:20	15:20	3	2/3/3	WSW/SW/SW	0/0/0	8/8/7	2/2/2	2/2/2	0/0/0	0/0/0
08/06/2021	2	SM	15:50	18:50	3	3/3/3	W/WSW/WSW	0/0/0	6/7/7	2/2/2	2/2/2	0/0/0	0/0/0
25/06/2021	2	AH	09:00	12:00	3	3/4/4	N/N/N	2/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
06/07/2021	1	MW	09:05	12:05	3	1/1/2	S/S/S	0/0/0	4/3/3	2/2/2	2/2/2	0/0/0	0/0/0
06/07/2021	1	MW	12:35	15:35	3	2/2/2	S/S/S	0/0/0	3/4/4	2/2/2	2/2/2	0/0/0	0/0/0
28/07/2021	1	GD	07:35	10:35	3	3/3/3	SE/SE/SE	0/0/3	8/8/8	1/2/1	2/2/2	0/0/0	0/0/0
20/07/2021	2	JS	09:45	12:45	3	1/1/1	NW/NW/NW	0/0/0	7/8/7	2/2/2	2/2/2	0/0/0	0/0/0
20/07/2021	2	JS	13:15	16:15	3	1/1/2	NNW/NNW/NNW	0/0/0	6/3/1	2/2/2	2/2/2	0/0/0	0/0/0
28/07/2021	2	SM	11:05	13:25	3	4/3/3	E/E/E	2/3/0	8/8/8	1/1/2	2/2/2	0/0/0	0/0/0
26/08/2021	1	AJM	06:35	09:35	3	1/1/2	E/ENE/E	0/0/0	6/5/4	2/2/2	2/2/2	0/0/0	0/0/0
26/08/2021	1	AJM	10:05	13:05	3	2/2/2	E/ESE/SE	0/0/0	4/4/3	2/2/2	2/2/2	0/0/0	0/0/0
05/08/2021	2	SM	09:45	12:45	3	3/3/3	SE/SE/SE	0/0/0	8/8/7	2/2/2	2/2/2	0/0/0	0/0/0
05/08/2021	2	SM	13:15	16:15	3	4/4/4	SSE/S/S	0/0/0	5/4/4	2/2/2	2/2/2	0/0/0	0/0/0

Table A3.2: Moorland breeding bird survey effort – 2020 and 2021.

Where only one value is presented, this was the weather condition for the whole survey.

Date	Surveyor	Start Time	Finish Time	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost /Snow
18/06/2020	SM	10:30	17:30	2/3/3/3/3/3	S/SE/SE/SE/SE/SE	0/0/0/0/0/0	1/1/1/1/1/1	2/2/2/2/2/2	2	0
14/07/2020	SM	10:00	17:25	3/3/3/2/2/3	W/W/WNW/WNW/WNW/WNW	1/0/0/0/0/0	8/7/8/8/7/8	1/2/2/2/2/2	2	0
16/07/2020	SM	09:55	13:15	3/3/3	WNW/W/WSW	0/0/0	8/8/8	1/2/2	2	0
28/04/2021	AH	08:30	15:45	3/3/3/3/3	NE/NE/NE/NE/NE	0/0/0/0/0	4/4/3/5/5/4	2/2/2/2/2	2	0
28/04/2021	JS	08:30	15:00	3/3/4/3/3/3	NNE/NNE/N/N/NNW	0/0/0/2/0/0	3/5/3/6/5/5	2/2/2/2/2	2	0
15/05/2021	AL & KL	09:00	15:00	1/1/0/1/1/2	NW/SE/-/ESE/N/S	0/0/0/0/0/0	8/7/7/5/6/6	2/2/2/2/2	2	0
09/06/2021	NV	10:30	16:30	2/2/2/3/3/3	SW/SW/SW/SW/SSW/SSW	0/0/2/2/0/0	8/8/8/8/8/8	2/2/2/2/2	2	0
10/06/2021	SM	09:10	15:25	2/3/4/4/3/3	WSW/SW/SW/SSW/S/S	0/0/0/0/0/0	7/7/7/7/8/8	2/2/2/2/2	2	0
08/07/2021	AJM	08:50	16:55	2/2/2/2/2/2/2	WNW/WNW/WNW/WNW/NW/NW/NW/NW	0/0/0/0/0/0/0	8/8/7/8/8/8/8/8	2/2/2/2/2/2/2	2	0
08/07/2021	MW	08:55	15:15	1/1/2/2/2/2	NW/NW/NW/NW/NW/NW	0/0/0/0/0/0	8/8/8/8/8/8	2/2/2/2/2/2	2	0

Table A3.3: Breeding Schedule 1/Annex 1 raptor and owl search effort – 2020 and 2021.

Where only one value is presented, this was the weather condition for the whole survey.

Date	Surveyor	Start Time	Finish Time	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
05/03/2020	AJM	09:10	15:25	3/3/3/3/3/3	SW/SW/SW/SW/SW/SW	0/0/0/0/0/0	3/4/5/5/5/6	2	2	0	2
24/03/2020	SM	09:00	16:35	3/3/3/4/4/3/3	SSW/SSW/SSW/SSW/SSW/SSW/S/S	0/0/0/0/0/0/0	8/8/7/5/6/8/8/8	2	2	0	2
25/06/2020	SM	08:45	14:45	1/1/1/2/2/2	SE/SE/ESE/E/ESE/SE	0/0/0/0/0/0	7/6/6/4/3/1	2	2	0	0
21/07/2020	SM	09:25	15:30	2/2/3/3/3/3	W/W/WSW/WSW/W/W	0/0/0/0/0/0	5/7/8/7/7/7	2	2	0	0
29/07/2020	AL & KL	10:45	16:45	3/3/4/4/3/2	W/W/W/NW/NW/WSW	2/2/0/0/0/0	8/8/6/7/5/8	2	2	0	0
23/03/2021	KL	11:45	17:45	4/4/4/3/2/3	WSW/WSSW/SSW/WSW/SW/SW	0/0/0/0/0/0	5/4/7/8/6/5	2	2	0	2/2/0/0/0/0
24/03/2021	AL	10:15	16:15	3/3/3/3/4/3	WSW/SW/S/SW/SSE/SW	0/0/0/0/0/2	4/4/6/8/8/8	2	2	0	0
21/04/2021	PC	10:30	16:30	2/2/2/2/2/2	NE/NE/SW/NNW/SW/SW	0/0/0/0/0/0	3/2/1/1/1/1	2	2	0	0
16/05/2021	AL	08:45	14:45	1/2/1/1/2/2	SW/E/N/W/W/SE	0/0/0/0/0/0	3/3/5/4/5/7	2	2	0	0
26/05/2021	AJM	11:15	17:30	3/3/3/3/3/3	N/NNE/NNE/N/NNE/NNE	1/0/0/0/0/2	8/8/8/7/7/7	2	2	0	0

Date	Surveyor	Start Time	Finish Time	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
03/06/2021	SM	11:40	17:40	4/4/4/4/3/3	SE/SE/SE/SE/ESE/ESE	0/0/0/0/0/0	2/1/1/1/2/7	2	2	0	0
16/06/2021	NV	10:15	16:15	5/4/5/5/5/5	SSW/SSW/SW/SSW/SSW/SSW	0/0/0/0/0/0	4/6/6/5/6/7	2	2	0	0
09/07/2021	MW	07:30	13:30	1/1/1/1/1/1	W/W/W/W/W/W/W	0/0/0/0/0/0	8/8/8/8/8/8	2	2	0	0

Table A3.4: Breeding diver search effort – 2020 and 2021¹⁷.

Date	Surveyor	Start Time	Finish Time	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
24/06/2020	SM	15:30	18:30	3/2/2	WSW/WSW/W	0/0/0	5/1/1	2/2/2	2/2/2	0/0/0	0/0/0
02/04/2021	SM	15:30	19:30	3/3/3/2	ENE/ENE/ENE/N	0/0/0/3	6/7/7/8	2/2/2/2	2/2/2/2	0/0/0/0	0/0/0/0
20/05/2021	AJM	12:45	17:50	5/4/5/5/5/5	E/E/ENE/ENE/ENE/ENE	0/0/0/2/0/2	7/8/8/8/7/8	2/2/2/2/2/2	2/2/2/2/2/2	0/0/0/0/0/0	0/0/0/0/0/0

Table A3.5: Breeding black grouse survey effort – 2020 and 2021.

Date	Surveyor	Start Time	Finish Time	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
24/03/2020	SM	05:05	08:05	2/2/2	SSW/SSW/SSW	0/1/1	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
25/03/2020	SM	05:05	08:05	1/1/1	N/NNW/NW	1/1/1	8/8/8	1/2/1	2/2/2	0/0/0	2/2/2
26/03/2020	SM	05:00	08:00	0/1/0	-/N/-	0/0/0	0/0/0	2/2/2	2/2/2	1/1/1	2/2/2
16/03/2021	SM	05:30	08:30	4/4/4	WNW/WNW/NW	2/0/0	8/6/2	2/2/2	2/2/2	0/0/0	2/2/2
26/03/2021	AL & KL	04:59	07:59	1/2/2	SW/SW/SW	2/0/0	8/6/8	2/2/1	2/2/2	0/0/0	0/0/0
09/04/2021	SM	05:25	08:25	3/0/2	NW/NW/WNW	3/0/2	8/7/5	2/2/2	2/2/2	1/1/1	1/1/1

¹⁷ Note, one breeding diver search in 2020 and one in 2021 was included as part of a breeding raptor and owl search (see **Table 9.1.7** and **Table A3.3** for details of these).

ANNEX 4: VP FLIGHT ACTIVITY SURVEY – TARGET SPECIES FLIGHT RECORDS

The follow British Trust for Ornithology (BTO) species codes are used to denote target species within **Table A4.1**:

EA: Golden eagle; **WE:** White-tailed eagle; **HH:** Hen harrier; **ML:** Merlin; **KT:** Red kite; **SHTEA:** Short-toed eagle; **BV:** Black-throated diver; **ML:** Merlin; **GJ:** Greylag goose; **PG:** Pink-footed goose; **WS:** Whooper swan; **CU:** Curlew; **OD:** Wood sandpiper; **GP:** Golden plover; **L.:** Lapwing; **GK:** Greenshank; **DN:** Dunlin; **SN:** Snipe; **H.:** Grey heron.; **GD:** Goosander.

Table A4.1 present target species flight activity data. The date, species, number of birds, flight duration and the duration of time spent within each height band (HT), in seconds, is presented.

Table A4.1: Target species flight records – Year 1 and 2 (September 2019 to August 2021).

Date	VP	Species	No. of Birds	Start Time	Total Flight Duration (s)	HT1	HT2	HT3	HT4	HT5	HT6	Notes
23/09/2019	1	HH	1	18:13	90	90	0	0	0	0	0	Ringtail, likely female.
23/09/2019	1	GJ	23	18:51	135	0	0	0	0	0	135	-
24/09/2019	2	HH	1	09:58	510	510	0	0	0	0	0	Adult male.
15/10/2019	1	EA	2	15:59	80	0	0	80	0	0	0	Adult pair.
14/10/2019	2	EA	1	13:46	315	0	15	135	165	0	0	Juvenile female.
14/10/2019	2	EA	1	13:49	120	0	0	120	0	0	0	Adult male.
07/01/2020	1	GD	1	10:22	33	33	0	0	0	0	0	Male.
04/03/2020	1	WS	13	12:17	145	0	0	0	0	0	145	-
04/03/2020	1	EA	1	15:17	400	0	10	90	75	75	150	Adult male display, approximately 2 km east of turbine area.
23/03/2020	1	EA	1	14:03	232	30	172	30	0	0	0	Hunting approximately 2 km east of turbine area.
06/03/2020	2	EA	2	12:11	240	0	240	0	0	0	0	Adult pair.
25/03/2020	2	HH	1	08:39	312	15	72	225	0	0	0	Female.
17/06/2020	1	SN	1	12:21	131	131	0	0	0	0	0	Drumming.
17/06/2020	1	SN	1	12:34	190	175	15	0	0	0	0	Drumming.
17/06/2020	1	DN	1	13:05	25	25	0	0	0	0	0	Display flight/song.
17/06/2020	1	SN	1	13:30	30	30	0	0	0	0	0	Drumming.

17/06/2020	1	GP	1	13:37	42	12	30	0	0	0	0	May have landed.
17/06/2020	1	SN	1	13:48	309	174	135	0	0	0	0	Drumming.
17/06/2020	1	GP	1	15:36	20	5	15	0	0	0	0	Called, landed.
17/06/2020	1	EA	1	16:02	641	26	45	270	180	120	0	Adult male.
24/06/2020	2	SN	1	09:29	53	23	30	0	0	0	0	Drumming.
24/06/2020	2	SN	1	09:42	130	10	120	0	0	0	0	Drumming.
24/06/2020	2	SN	2	10:37	321	6	180	135	0	0	0	Drumming.
24/06/2020	2	SN	1	10:51	612	12	285	315	0	0	0	Drumming.
24/06/2020	2	SN	1	11:23	213	3	150	60	0	0	0	Drumming.
24/06/2020	2	SN	1	11:33	310	10	120	180	0	0	0	Drumming, same flight path as above.
24/06/2020	2	HH	1	13:49	55	55	0	0	0	0	0	Male, flew into clear-fell area north of loch.
29/06/2020	2	SN	1	15:24	221	11	195	15	0	0	0	Drumming.
29/06/2020	2	SN	1	15:38	522	12	300	210	0	0	0	Drumming.
01/07/2020	1	ML	1	11:18	40	40	0	0	0	0	0	Male hunting very low.
01/07/2020	1	DN	1	11:53	21	21	0	0	0	0	0	Landed.
01/07/2020	1	EA	2	12:01	1522	0	0	225	855	442	0	1 bird joined by a second, talon lock, display.
01/07/2020	1	HH	1	13:29	190	160	30	0	0	0	0	Female/ringtail hunting.
01/07/2020	1	HH	1	14:24	33	33	0	0	0	0	0	Male hunting.
01/07/2020	1	GK	1	14:35	57	0	0	57	0	0	0	Calling.
01/07/2020	1	HH	2	15:23	401	0	0	326	75	0	0	Birds around 150 m apart, 1 bird dropped after recording.
13/08/2020	1	HH	1	16:41	306	306	0	0	0	0	0	Male on ground behind knoll, flushed by kestrel, and started hunting.
28/08/2020	1	HH	1	08:12	78	78	0	0	0	0	0	-
13/08/2020	2	H.	1	12:14	58	13	45	0	0	0	0	Appeared to be going to land.
07/09/2020	1	EA	1	17:47	191	11	15	165	0	0	0	Adult hunting and displaying (undulating flight with dives/rises).
07/09/2020	1	EA	1	18:20	601	0	106	390	105	0	0	Adult, likely same bird as above, hunting.
23/09/2020	2	PG	200	10:01	300	0	0	0	0	0	300	-
23/09/2020	2	WS	2	10:31	120	0	0	0	0	0	120	-
23/09/2020	2	PG	80	11:12	120	0	0	0	0	0	120	-
23/09/2020	2	PG	60	11:39	90	0	0	0	0	0	90	-
23/09/2020	2	EA	3	13:01	300	0	0	0	0	60	240	Pair with juvenile female. Juvenile very vocal. Male display diving.
23/09/2020	2	PG	65	13:31	120	0	0	0	0	0	120	-

23/09/2020	2	PG	45	14:19	150	0	0	0	0	0	150	-
12/10/2020	1	WS	2	13:56	74	29	45	0	0	0	0	Landed on loch.
22/10/2020	1	H.	1	10:41	44	44	0	0	0	0	0	-
22/10/2020	1	GJ	2	12:19	117	0	0	57	60	0	0	-
22/10/2020	2	EA	1	14:47	40	0	0	40	0	0	0	Probable adult.
22/10/2020	2	EA	1	14:56	697	0	0	75	60	285	277	Adult.
22/10/2020	2	EA	1	15:09	312	0	0	0	75	60	177	Adult, different bird from flight above.
22/10/2020	2	EA	1	15:38	35	0	35	0	0	0	0	Could not age.
22/10/2020	2	GJ	24	16:36	217	0	0	217	0	0	0	Possibly landed on loch but may have kept going.
12/11/2020	1	EA	1	09:33	386	0	0	131	255	0	0	Adult hunting, drifting into wind.
12/11/2020	1	EA	1	09:58	637	0	7	390	180	60	0	Hunting, probable same bird as above, but could not age this one.
04/11/2020	2	HH	1	11:26	134	44	90	0	0	0	0	Ringtail hunting.
04/11/2020	2	EA	3	12:11	610	25	15	315	60	165	30	All 3 close together, similar action, play.
04/11/2020	2	HH	1	13:09	63	48	15	0	0	0	0	Hunting.
04/11/2020	2	HH	1	13:14	158	83	75	0	0	0	0	Ringtail hunting.
04/11/2020	2	HH	1	13:21	502	180	255	67	0	0	0	Ringtail hunting.
04/11/2020	2	HH	1	15:13	137	77	60	0	0	0	0	Ringtail hunting - likely all flights same bird.
17/12/2020	1	WE	1	15:09	277	82	75	120	0	0	0	Adult, landed on hillside.
17/12/2020	1	EA	1	15:19	112	22	45	45	0	0	0	Adult.
17/12/2020	1	WE	1	15:20	47	47	0	0	0	0	0	Adult from flight above, took off when golden eagle appeared, did not interact.
17/12/2020	1	EA	1	15:23	115	0	115	0	0	0	0	Adult, presumed same bird as flight above.
01/12/2020	2	WS	5	12:29	124	0	0	0	0	124	0	Going west at same height.
22/01/2021	1	EA	1	11:34	264	0	144	120	0	0	0	Adult male, flushes a covey of red grouse.
16/02/2021	1	EA	1	10:42	600	120	150	225	105	0	0	Hunting, juvenile.
16/02/2021	1	EA	1	12:02	34	0	34	0	0	0	0	Un-aged, brief flight.
16/02/2021	1	HH	1	12:02	247	0	142	15	90	0	0	Male, picked up while watching golden eagle.
16/02/2021	1	EA	1	12:08	776	45	105	416	105	30	75	Adult, hunting, probable male.
16/02/2021	1	EA	1	15:08	1073	105	120	323	180	90	255	Adult male hunting, display at end of flight.
16/02/2021	1	EA	1	15:10	941	0	0	416	300	75	150	Female adult, hunting, brief sky dance, presumed pair with male above.
02/02/2021	2	EA	1	10:29	630	0	45	165	225	90	105	Adult hunting, high soaring.
02/02/2021	2	EA	1	15:24	321	0	0	15	180	126	0	Un-aged, displayed briefly.

16/03/2021	1	GP	2	13:14	55	55	0	0	0	0	0	Low, landed.
10/03/2021	2	EA	1	09:59	422	45	75	122	105	75	0	Juvenile.
10/03/2021	2	HH	1	10:00	115	115	0	0	0	0	0	Ringtail - seemed to get up in response to golden eagle.
10/03/2021	2	EA	2	10:29	870	615	255	0	0	0	0	Pair, displaying, courting, dropping items, mirroring, mated.
10/03/2021	2	EA	1	10:46	998	143	195	570	90	0	0	Adult male having mated with female, flew off and landed on Creag Dhubh.
10/03/2021	2	HH	1	10:59	259	109	75	75	0	0	0	Adult male.
10/03/2021	2	WE	1	11:04	343	0	75	268	0	0	0	Juvenile.
10/03/2021	2	EA	1	11:05	292	7	30	90	165	0	0	Adult female soared above white-tailed eagle and landed on Creag Dhubh
10/03/2021	2	EA	1	11:07	1026	6	195	780	45	0	0	Adult male, displaying along ridge.
10/03/2021	2	EA	1	11:25	149	15	30	104	0	0	0	Adult male.
10/03/2021	2	EA	1	11:26	62	15	45	2	0	0	0	Adult female.
10/03/2021	2	EA	1	12:02	394	0	0	394	0	0	0	Adult male.
10/03/2021	2	EA	1	12:47	387	0	45	135	90	60	57	Juvenile, moved away from adult golden eagle when they appeared.
10/03/2021	2	EA	1	12:50	778	0	30	360	148	60	180	1 of adult pair.
10/03/2021	2	EA	1	12:54	95	0	0	5	60	30	0	1 of adult pair.
16/04/2021	1	CU	1	06:12	57	0	57	0	0	0	0	Displaying.
16/04/2021	1	GJ	2	06:46	66	66	0	0	0	0	0	-
16/04/2021	1	GJ	2	06:54	220	0	30	190	0	0	0	-
16/04/2021	1	CU	1	07:34	73	0	0	73	0	0	0	Travelling.
16/04/2021	1	GJ	6	07:41	164	0	0	0	90	74	0	-
16/04/2021	1	PG	17	09:24	83	0	0	0	0	0	83	-
16/04/2021	1	CU	1	10:37	54	9	45	0	0	0	0	Not displaying. Landed.
16/04/2021	1	KT	1	10:56	141	0	141	0	0	0	0	Travelling steady progress south.
16/04/2021	1	KT	2	11:16	100	75	25	0	0	0	0	Came from south of VP then split.
16/04/2021	1	KT	1	11:18	190	0	190	0	0	0	0	1st bird from flight above
16/04/2021	1	KT	1	11:18	336	0	45	180	111	0	0	2nd bird from flight above.
16/04/2021	1	EA	2	11:36	491	0	0	0	0	120	371	Adult pair. Male displayed twice near female. Circled up very high then flew off slowly south-east.
12/04/2021	1	PG	120	15:24	238	0	0	0	0	0	238	Going north.
12/04/2021	1	BV	2	15:35	182	0	0	182	0	0	0	Going south.
12/04/2021	1	WE	1	17:38	618	45	183	225	120	45	0	Immature bird, lost behind hill.

27/04/2021	2	L.	1	10:13	60	15	45	0	0	0	0	Flew from loch.
27/04/2021	2	EA	1	10:35	180	90	45	45	0	0	0	Sat on a post maybe hunting, flushed red grouse, landed on a post then gained height then dropped out of view. Not an adult.
27/04/2021	2	EA	1	11:17	75	0	60	15	0	0	0	Hanging in wind above ridge, moved east then dropped from sight.
27/04/2021	2	EA	1	13:38	330	30	60	60	15	165	0	Moved along ridge into wind. Dropping then returning to same height then moved east into distance.
27/04/2021	2	EA	1	13:43	150	5	0	90	45	0	0	Hanging in the wind circling then dropped over the ridge.
27/04/2021	2	EA	1	15:10	120	30	90	0	0	0	0	Likely same bird as above, drifting along ridge.
16/05/2021	2	WE	1	10:58	240	0	0	0	0	0	240	Immature bird.
16/05/2021	2	GJ	4	11:03	120	0	0	0	0	120	0	-
16/05/2021	2	HH	1	12:34	15	15	0	0	0	0	0	-
16/05/2021	2	EA	1	14:11	540	0	0	240	195	45	60	Immature bird hunting then soaring-
16/05/2021	2	EA	1	14:29	480	0	0	0	0	0	480	Adult, display dives (27 dives).
16/06/2021	1	L.	1	07:17	93	93	0	0	0	0	0	-
16/06/2021	1	L.	1	07:19	47	47	0	0	0	0	0	-
16/06/2021	1	SN	1	07:24	125	0	125	0	0	0	0	Male displaying.
16/06/2021	1	L.	2	07:30	48	48	0	0	0	0	0	-
16/06/2021	1	L.	1	07:32	38	15	23	0	0	0	0	-
16/06/2021	1	SN	2	07:37	28	0	28	0	0	0	0	-
16/06/2021	1	SN	1	07:43	133	0	133	0	0	0	0	Male displaying.
16/06/2021	1	KT	1	07:50	94	0	94	0	0	0	0	-
16/06/2021	1	L.	1	08:01	141	141	0	0	0	0	0	-
16/06/2021	1	L.	1	08:25	37	37	0	0	0	0	0	-
16/06/2021	1	L.	1	08:47	42	42	0	0	0	0	0	-
16/06/2021	1	L.	1	09:00	143	143	0	0	0	0	0	-
16/06/2021	1	DN	1	09:07	8	8	0	0	0	0	0	-
16/06/2021	1	SN	1	09:17	141	0	141	0	0	0	0	-
16/06/2021	1	L.	1	09:43	74	74	0	0	0	0	0	-
20/06/2021	1	WE	1	10:32	50	50	0	0	0	0	0	Adult.
20/06/2021	1	SN	1	10:40	5	0	5	0	0	0	0	Displaying, then dropped.
20/06/2021	1	SN	1	10:47	330	0	330	0	0	0	0	Displaying, in full drumming mode.

20/06/2021	1	CU	1	10:54	120	120	0	0	0	0	0	Male singing.
20/06/2021	1	L.	1	11:05	204	204	0	0	0	0	0	Circling and alarming, alarm calling even after landing.
20/06/2021	1	SN	1	11:25	240	0	105	135	0	0	0	Drumming.
20/06/2021	1	L.	2	11:50	188	38	75	75	0	0	0	Landed by river.
20/06/2021	1	L.	1	12:02	190	15	175	0	0	0	0	-
20/06/2021	1	SHTEA	1	12:05	1200	60	120	675	345	0	0	Mobbed by buzzard, followed same routine until 13:30 hrs.
20/06/2021	1	L.	1	13:10	86	86	0	0	0	0	0	-
20/06/2021	1	L.	1	13:21	120	120	0	0	0	0	0	-
20/06/2021	1	L.	1	14:11	75	0	75	0	0	0	0	-
20/06/2021	1	HH	1	14:19	60	45	15	0	0	0	0	Female, mobbed short-toed eagle, lost behind background, may have landed.
20/06/2021	1	SN	1	14:41	81	0	81	0	0	0	0	Displaying.
20/06/2021	1	L.	2	14:58	120	15	105	0	0	0	0	-
20/06/2021	1	DN	1	15:19	10	10	0	0	0	0	0	Calling and singing.
20/06/2021	1	GP	1	15:22	25	0	25	0	0	0	0	-
20/06/2021	1	L.	1	16:26	107	107	0	0	0	0	0	-
20/06/2021	1	L.	1	16:37	104	104	0	0	0	0	0	-
20/06/2021	1	EA	1	16:52	164	0	0	164	0	0	0	Immature bird circling, then flew south-east.
08/06/2021	2	GP	1	12:53	30	30	0	0	0	0	0	Low, calling.
08/06/2021	2	HH	1	14:12	64	64	0	0	0	0	0	Hunting ringtail/female, drifted behind ridge.
08/06/2021	2	EA	1	14:24	1309	4	120	595	320	195	75	Adult, hunting, dropped to ground.
08/06/2021	2	EA	1	15:09	891	0	0	141	165	165	420	Same bird as above, probable male, hunting, then lost behind ridge.
08/06/2021	2	EA	1	16:01	1062	0	0	75	90	135	762	Adult hunting, looked darker than golden eagle recorded before during survey.
25/06/2021	2	HH	1	09:04	81	81	0	0	0	0	0	Female, seemed to be hunting.
25/06/2021	2	OD	1	09:08	192	162	30	0	0	0	0	Alarming calling, landed briefly and then flew to river.
25/06/2021	2	SN	1	10:21	260	0	120	140	0	0	0	-
25/06/2021	2	WE	1	11:37	342	57	105	105	75	0	0	Circled, drifted, mobbed by common gull.
25/06/2021	2	GJ	7	11:39	8	0	0	8	0	0	0	-
06/07/2021	1	L.	1	09:03	127	52	75	0	0	0	0	-
06/07/2021	1	HH	1	10:40	370	0	220	150	0	0	0	Male
06/07/2021	1	EA	1	11:49	423	0	0	78	345	0	0	Male, 3rd year.
06/07/2021	1	SN	1	12:41	11	11	0	0	0	0	0	-

06/07/2021	1	GP	2	13:05	222	0	0	222	0	0	0	-
05/08/2021	2	HH	1	13:59	190	30	70	90	0	0	0	Ringtail, along summit of Creag Duibh.
05/08/2021	2	HH	1	14:02	58	58	0	0	0	0	0	Ringtail appeared as bird in flight above peeled off to the north.
05/08/2021	2	EA	1	14:34	243	0	45	135	63	0	0	Adult.
05/08/2021	2	EA	1	14:35	216	0	0	216	0	0	0	Juvenile, picked up when following adult in flight above.
05/08/2021	2	EA	1	15:14	179	74	105	0	0	0	0	Adult.
05/08/2021	2	EA	1	15:21	426	0	0	90	75	156	105	Adult male.
05/08/2021	2	EA	1	15:25	777	0	60	135	162	270	150	Adult female, picked up when following male in flight above. Lost eventually against far hillside.