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# Kirkan Wind Farm

## Environmental Impact Assessment Report

### Appendix 7.1: Technical Ornithological Appendix



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# 1 INTRODUCTION

- 1.1.1 This appendix has been prepared to accompany Chapter 7: 'Ornithology' of the Kirkan Wind Farm (the proposed development) Environmental Impact Assessment (EIA) Report (EIAR).
- 1.1.2 It presents detailed methodologies and results of ornithology desk studies and field surveys completed between 2016 and 2018 to inform the design and assessment of the proposed development.
- 1.1.3 It should be read with reference to **Figures 7.1 to 7.15** presented in Volume 3 of the EIAR and **Appendices 7.2 and 7.3**.
- 1.1.4 Only common bird species names are referred to within the main text of this Appendix. **Annex 1** provides a summary of all bird species referred to herein, within Chapter 7 of the Kirkan Wind Farm EIAR and all other associated appendices and figures. Both common and species names together with a summary of their conservation status as relevant is provided.
- 1.1.5 Information pertaining to the locations of sensitive breeding bird species and which are considered confidential is provided in confidential **Appendix 7.3** and associated figures. Such information will not be made publicly available, but will be provided to the Scottish Government and Scottish Natural Heritage (SNH).

## 1.2 Project Area Overview

- 1.2.1 The project area, illustrated by the red-line boundary as shown in **Figure 7.1**, is located on land within the Stathvaich Estate, Garve, Highlands to the south east of Loch Glascarnoch.
- 1.2.2 The project area comprises an extensive expanse of undulating open moorland, intersected by a number of watercourses, minor issues and burns together with a small pocket of mixed plantation woodland which is generally stunted and relatively poorly established. The habitats surrounding the project area comprise similar expanses of open moorland, coniferous and mixed native plantation woodland. To the west of the project area are the operational Corriemoillie and Lochluichart wind farms.

# 2 DESK STUDY

## 2.1 Methodology

- 2.1.1 In accordance with SNH guidance (2014, updated 2017), a desk study was undertaken prior to the commencement of field surveys to ascertain a coarse 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 robust to inform the design and assessment of the proposed scheme.
- 2.1.3 The desk study has included a review of the following key sources summarised in **Table 2.1**.
- 2.1.4 EIA documentation for the operational Corriemoillie, Lochluichart and Lochluichart Extension wind farms, as publicly available, has also been reviewed together with additional peer reviewed literature and industry guidance, referred to where relevant.

**Table 2.1: Desk study key sources and information sought.**

Key Source	Information Sought	Study Area
SNH Sitelink	Proximity to statutory designated sites	Within 10km of the project area, extended to 20km for internationally designated sites with migratory geese qualifying interests.
RSPB	Existing ornithological records	Within at least 6km of the project area.
Highland Raptor Study Group (HRSB)	Existing ornithological records	Within at least 6km of the project area.
Highland Biological Recording Group (HBRG)	Existing biological records Proximity to non-statutory designated sites	Within 500m of the project area.

## 2.2 Results

### ***Statutory Designated Sites for Nature Conservation***

- 2.2.1 This section should be read with reference to **Figure 7.1**.
- 2.2.2 A review of SNH Sitelink identifies that the project area does not form part of any statutory designated site for nature conservation with ornithological qualifying interests.
- 2.2.3 **Table 2.2** summarises statutory designated sites with ornithological features of interest located within 10 km of the Site boundary, extended to 20 km for internationally designated sites with migratory goose interests.
- 2.2.4 Distances specified within **Table 2.2** are taken from the project area boundary to the designation boundary at its nearest point.
- 2.2.5 There are no internationally designated sites with migratory goose interests located within 20 km of the project area.

**Table 2.2: Designated sites for nature conservation.**

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

Designated Site	Distance	Ornithological Qualifying Interests
Glen Affric to Strathconon SPA	4.7 km S	Golden eagle (breeding)
Beinn Dearg SPA	6 km NW	Dotterel (breeding)
Beinn Dearg SSSI	6 km NW	Breeding bird assemblage, including golden eagle, dotterel, snow bunting, ptarmigan, ring ouzel, raven, golden plover and peregrine.
Ben Wyvis SPA	6.9 km E	Dotterel (breeding)
Ben Wyvis SSSI	6.9 km E	Dotterel (breeding)
Ben Wyvis NNR	6.9 km E	Upland habitats, geology and associated flora and fauna.
Achanalt Marshes SPA	9.8 km SW	Wood sandpiper (breeding).
Achanalt Marshes SSSI	9.8 km SW	Breeding bird assemblage, including golden plover, common sandpiper, wood sandpiper, dunlin, curlew, snipe,

Designated Site	Distance	Ornithological Qualifying Interests
		redshank, oystercatcher, lapwing, goosander, red-breasted merganser, mute swan, wigeon, tufted duck, teal and mallard.

***Non-statutory Designated Sites for Nature Conservation***

- 2.2.6 The data request submitted to the HBRG identifies that the project area does not form part of any non-statutory designated sites for nature conservation with ornithological interests.
- 2.2.7 In further review of non-statutory designated sites through SNH Sitelink, the project area is also not located within 5 km of any such site with ornithological interests.

***Existing Ornithological Records***

HBRG

- 2.2.8 The data request submitted to the HBRG also sought existing ornithological records within the project area and immediate vicinity.
- 2.2.9 No ornithological records were returned for the study area.

RSPB

2.2.10 The data request submitted to the RSPB returned records of 18 species for the study area, including:

- Whooper swan;
- Red kite\*;
- Hen harrier\*;
- Golden eagle\*;
- White-tailed eagle\*;
- Black grouse\*;
- Ptarmigan;
- Capercaillie;
- Golden plover;
- Dunlin;
- Greenshank;
- Waxwing;
- Ring ouzel;
- Wheatear;
- Common crossbill; and,
- Scottish crossbill.

2.2.11 Further record details are provided in **Annex 2**. Information pertaining to records of sensitive breeding species (\*) from the wider area, which is considered confidential, is provided in **Appendix 7.3**.

HRSRG

- 2.2.12 The data request submitted to the HRSRG returned records of two species for the study area, including:
- Red kite\* (breeding); and,
  - Osprey\* (breeding).
- 2.2.13 Records of protected breeding raptors (\*) are considered confidential and as such are detailed within **Appendix 7.3**.

2.2.14 No nest or roost records for any species were returned from within 2km of the project area.

### 3 FIELD SURVEYS

- 3.1.1 Detailed knowledge of bird populations, distributions and flight activity in order to predict the potential effects of the proposed scheme upon ornithological features, has been derived from field surveys undertaken between 2016 and 2018.
- 3.1.2 The identification of target species and scope of surveys undertaken was informed through consultation with RSPB and SNH, proximity to designated sites and existing knowledge of sensitive species as derived from desk study.
- 3.1.3 Field surveyor knowledge and experience in bird habitat associations has also informed and guided survey effort over the course of surveys.
- 3.1.4 It should be noted that field survey areas were based on a preliminary development boundary, much larger than the project area illustrated in **Figure 7.1**. It is common for project areas to change shape and size over the course of its evolution. As such, the field surveys undertaken for the proposed development comprise coverage of surveys areas required in accordance with SNH guidance (2014, updated 2017) and the surrounding wider area.

#### 3.2 Target Species

- 3.2.1 Target species for survey were identified through desk study and consultation with RSPB and SNH, on the basis of their known or likely presence, their likely sensitivity to the proposed scheme and those which are afforded a higher level of legislative protection, which is in accordance with current SNH guidance (2017).
- Primarily, target species included those species listed on/as:
  - Annex 1 of the Birds Directive;
  - Schedule 1 of the Wildlife and Countryside Act (1981); and,
  - Red-listed Birds of Conservation Concern (BoCCs).
- 3.2.2 This has ensured inclusion of qualifying interests of designated sites for nature conservation (**Table 2.2**) and “Priority bird species for assessment when considering the development of onshore wind farms in Scotland” as per SNH guidance (2018).

#### 3.3 Field Survey Personnel

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

#### 3.4 Methodologies

- 3.4.1 The following field surveys were completed between 2016 and 2018:
- Vantage Point (VP) flight activity surveys;
  - Moorland breeding bird surveys;
  - Breeding raptor and owl searches;
  - Breeding black grouse surveys; and,

- Winter walkover surveys.

3.4.2 All surveys were undertaken in accordance with recommendations outlined within SNH guidance (SNH, 2014 updated 2017).

### ***VP Flight Activity Surveys***

3.4.3 VP flight activity surveys were undertaken between September 2016 and concluded in August 2018 and provide coverage of two breeding and non-breeding seasons.

### VP Locations and Viewsheds

3.4.4 Four VP locations have been used during survey as shown in **Figure 7.2** and detailed within **Table 3.1**.

3.4.5 VP locations and areas of visibility have provided a comprehensive visual coverage of the VP study area required for the proposed scheme in accordance with current SNH guidance (2017a); defined as a 500m buffer around outermost proposed turbine locations as illustrated in **Figure 7.2**.

3.4.6 Modelled areas of visibility within the 2 km viewsheds from each VP location are further detailed in **Appendix 7.2** and illustrated in **Figure 7.2**.

**Table 3.1: VP locations**

VP	X	Y
1	237248	867615
2	238329	870554
3	235611	867192
4	235796	870603

### Survey Effort

3.4.7 The total survey effort (hours) completed at each VP location between September 2016 and March 2018 is summarised in **Table 3.2**. Each VP survey session was up to three-hours in duration.

3.4.8 Full details of all survey times, field surveyors used and weather conditions are presented in **Annex 3**.

3.4.9 The total VP survey effort completed at each VP was 228 hours and has included survey of at least two breeding seasons (March to August) and two non-breeding seasons (September to March), within the most recently available five-year survey window prior to assessment.

3.4.10 Survey effort in each year has exceeded the minimum of 72 hours per VP location divided between breeding and non-breeding seasons i.e. 36 hours breeding and 36 hours non-breeding, as per SNH current SNH guidance (2017).

3.4.11 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.

3.4.12 In accordance with SNH guidance (2014, updated 2017), flight lines were mapped for all target species passing through the VP survey. 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.

**Table 3.2: VP flight activity survey effort summary.**

VP	2016				2017								Year 1 Total
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	
1	3	21	12	6	6	6	18	12	6	9	6	9	114
2	9	15	12	6	6	12	12	12	6	9	6	9	114
3	9	15	12	6	6	12	12	12	6	9	6	9	114
4	3	21	12	6	6	6	18	12	6	9	6	9	114
VP	2017				2018								Year 2 Total
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	
1	12	12	12	6	6	6	18	12	6	12	6	6	114
2	12	12	12	6	6	12	12	12	6	9	9	6	114
3	12	12	12	6	6	12	12	12	6	6	6	12	114
4	12	12	12	6	6	6	18	12	6	9	9	6	114

#### Target Species

3.4.13 Target species for recording included all Annex 1/Schedule 1 raptors, waders, swans, geese, ducks (excl. mallard and feral species) as observed during VP watches.

3.4.14 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 northwest 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). The local passage and non-breeding populations between October and April are therefore considered to possibly comprise part of the Icelandic migratory population.

#### Secondary Species

3.4.15 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.

3.4.16 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

3.4.17 Where sufficient “at collision risk” flight activity data has allowed, collision risk mortality as a result of birds colliding with rotor blades has been assessed using the SNH Collision Risk Models (CRMs) as detailed in Band *et al.* (2007).

3.4.18 Full details are provided in **Appendix 7.2**.

#### ***Moorland Breeding Bird Surveys***

3.4.19 Moorland breeding bird surveys to inform the design and assessment of the proposed scheme have been undertaken in 2017 and 2018.

- 3.4.20 The survey area has comprised coverage of the project area, extended to include accessible areas of open habitats within 500m as shown in **Figure 7.3** and in accordance with current SNH guidance (2014, updated 2017).
- 3.4.21 The methodology employed has followed the Brown and Shepherd (1993) method for censusing upland breeding waders, based upon the recommendations set out in Calladine *et al.* (2009) as recommended in SNH guidance applicable at the time of survey (2014, updated 2017). The methodology is suitable for moorland and open country species including, waders, skuas, gulls, red grouse 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.
- 3.4.22 A series of four staggered visits were completed during each survey year, between April and July.
- 3.4.23 During each survey visit a pre-determined route was walked through the survey area, with all birds seen or heard, and their behaviours (e.g. displaying, carrying food etc.) were mapped in the field. Given the extent of survey areas and terrain, survey visits were generally completed by a small team of surveyors and/or over consecutive days as weather allowed.
- 3.4.24 All surveys were undertaken during daylight hours and in fine conditions conducive to survey. Survey effort is summarised in **Table 3.3**. Full details of all survey times, field surveyors used and weather conditions are presented in **Annex 3**.

**Table 3.3: Moorland breeding bird survey effort**

Year	Visit	Date	Start Time	End Time
2017	1	13/04/2017	08.10	15.40
	2	17/05/2017	08.00	14.40
	3	14/06/2017	08.05	14.00
	4	21/07/2017	07.00	15.40
2018	1	05/04/2018	09.30	15.40
	2	24/05/2018	10.30	16.45
	3	22/06/2018	08.20	16.10
	4	19/07/2018	10.10	18.00
		29/07/2018 <sup>1</sup>	12.30	18.00

### **Breeding Raptor and Owl Searches**

- 3.4.25 Breeding raptor and owl searches to inform the design and assessment of the proposed scheme were undertaken in 2017 and 2018 with reference to species-specific methodologies outlined in Hardey *et al.* (2013), as per SNH guidance (2014 updated 2017).
- 3.4.26 A minimum of eight search visits were made during each survey year, staggered across the core breeding season. Given the extent of the survey area and terrain, searches were sometimes completed by a team of surveyors and/or over consecutive days.
- 3.4.27 Survey effort is summarised in **Table 3.4**. Full details of all survey times, field surveyors used and weather conditions are presented in **Annex 3**.

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<sup>1</sup> A period of poor weather and project area ground conditions prolonged the completion of the final survey visit in 2018.

- 3.4.28 The breeding raptor and owl search area has comprised coverage of the project area and areas out to at least 2 km for all raptor species, extended out to 6km for breeding eagle species as shown in **Figure 7.4** and in accordance with current SNH guidance (2014, updated 2017).
- 3.4.29 Search effort and areas have been informed through desk study records obtained from RSPB and the HRSB and through consultation with SNH.

**Table 3.4: Breeding raptor and owl search effort summary**

Year	Visit	Date	Start Time	End Time
2017	1	03/03/2017	10.00	17.00
	2	22/02/2017	12.20	18.00
	3	19/04/2017	10.45	16.45
		20/04/2017	08.45	15.30
	4	10/05/2017	09.20	18.00
	5	28/06/2017	07.10	13.50
	6	21/07/2017	07.15	13.15
	7	28/07/2017	12.30	15.55
		28/07/2017	15.35	18.35
8	31/08/2017	12.40	19.00	
2018	1	26/01/2018	08.30	11.30
		26/01/2018	12.00	15.00
	2	16/02/2018	10.45	13.45
	3	16/02/2018	14.15	17.15
		16/02/2018	10.30	16.30
	4	20/03/2018	11.00	17.00
	5	07/04/2018	10.30	16.30
	6	16/04/2018	11.30	18.00
	7	23/06/2018	08.10	14.10
8	18/07/2018	13.35	16.35	

### **Breeding Black Grouse Surveys**

- 3.4.30 Searches for black grouse leks to inform the design and assessment of the proposed scheme were undertaken in 2017 and 2018, with reference to species-specific methodologies outlined in Gilbert *et al.* (1998), as per SNH guidance applicable (2014 updated 2017).
- 3.4.31 In each survey year, at least one search visit, following a number of preparatory visits, was undertaken between the last week in March and mid-May to record peak numbers of lekking males within the survey area.
- 3.4.32 During searches all areas of suitable habitat (e.g. open moorland, woodland edges and tracks) within the survey area were visited at dawn. All black grouse observed were recorded, with leks more than 200m apart treated as separate leks.
- 3.4.33 Survey effort is summarised in **Table 3.5**. Full details of all survey times, field surveyors used and weather conditions are presented in **Annex 3**.

- 3.4.34 The breeding black grouse search area has comprised the project area and accessible areas out to 1.5 km as shown in **Figure 7.5** and in accordance with SNH guidance (2014, updated 2017).
- 3.4.35 Given the extent of the survey area and timing, searches were generally undertaken by small teams of surveyors to ensure safety.

**Table 3.5: Breeding black grouse search effort summary**

Year	Visit	Date	Start Time	End Time
2017	1	24/03/2017	05.20	08.30
	2	20/04/2017	05.05	08.05
	3	01/05/2017	04.35	07.55
	4	18/05/2017	03.50	07.10
2018	1	14/03/2018	05.35	08.40
	2	21/03/2018	05.15	08.20
	3	06/04/2018	05.40	08.40

### **Winter Walkovers**

- 3.4.36 The predominantly moorland nature of the habitats present within the project area and immediate vicinity are unlikely to be of any importance to aggregations of foraging wintering or roosting wildfowl.
- 3.4.37 In addition, the proposed scheme is also not located within any known feeding areas for migratory swans and geese (i.e. Mitchell, 2012 and Patterson, 2013) and desk study records do not identify the importance of the project area or immediate area for such.
- 3.4.38 A series of winter walkover surveys were however carried out for clarity over the 2016/17 overwintering period to confirm this and to provide initial observations of black grouse prior to the 2017 breeding season.
- 3.4.39 The study area (as defined in Table 2.1) provided coverage of the project area and out to at least 1km as access allowed, within which observations of notable flocks of waders and waterfowl were recorded, together with any observations of raptors and owls.
- 3.4.40 Given the extent of the survey area and difficulties traversing the study area in winter conditions, survey visits were generally undertaken by small teams of surveyors.
- 3.4.41 Survey effort is summarised in **Table 3.6**. Detailed survey effort including survey conditions are presented in **Annex 3**.
- 3.4.42 Further winter walkover surveys were not considered necessary over the 2017/18 wintering period, as agreed in consultation with SNH, given the absence of notable observations made during 2016/17 surveys.

**Table 3.6: Winter walkover survey summary**

Year	Visit	Date	Start Time	End Time
2016/2016	1	16/09/2016	08.55	14.30
	2	24/11/2016	09.30	15.30
		24/11/2016	09.20	15.50
	3	23/01/2017	08.45	15.15

		24/01/2017	09.00	15.30
	4	28/03/2017	08.30	14.00
		28/03/2017	08.30	14.30

### ***Additional Surveys***

- 3.4.43 SNH guidance (2014 updated 2017) recommends surveys for breeding diver species are undertaken out to 1km of proposed wind farm developments, following species-specific methods outlined in Gilbert *et al.* (1999).
- 3.4.44 In review of aerial imagery and OS mapping, two small waterbodies Loch Bad Leabraidh and Lochan Dub Mor are located within 1km of the project area as shown on **Figure 7.2**. The lochans lie to the south and south west of the project area, within the neighbouring Corriemoillie Estate and beyond the extent of permitted access for survey to inform the proposed scheme.
- 3.4.45 The occupancy of breeding divers within the wider surrounds of the project area, including Loch Bad Leabraidh and Lochan Dub Mor are, however, understood to be monitored through operational monitoring surveys undertaken for the adjacent operational Corriemoillie and Lochluichart Wind Farm developments.
- 3.4.46 As such, and as agreed in consultation with SNH, breeding diver surveys were not specifically undertaken to inform the design and assessment of the proposed scheme, on the basis of existing monitoring data being available for the species and the avoidance any unnecessary potential disturbance at established breeding lochans.
- 3.4.47 Details of consultations undertaken are presented in Chapter 7: ‘Ornithology’ of the Kirkan Wind Farm EIAR.
- 3.4.48 Flight activity of breeding divers over the project area, where it occurred, was however recorded during VP flight activity surveys.

## **3.5 Results**

### ***VP Flight Activity Surveys***

#### Target Species

- 3.5.1 Target species flight activity recorded during the entire VP survey effort (September 2016 to August 2018) from all VPs combined (VPs 1 to 4) is summarised in **Table 3.7**. The total number of flights, total number of birds and total flight time recorded is presented.
- 3.5.2 Detailed flight records are presented in **Annex 4**, which also indicates the total flight time for each species below, at and above the turbine rotor swept path. Flight lines for each species over the entire survey period are illustrated in **Figures 7.6 to 7.14**.

***Table 3.7: Target species flight activity summary***

<b>Species</b>	<b>Total No. of Flights</b>	<b>Total No. of Birds</b>	<b>Total Flight Time (s)</b>
Red-throated diver	1	1	188
Grey heron	9	11	699
Whooper swan	4	10	545

Pink-footed goose	13	481	1,962
Pink-footed goose / Greylag goose mixed flock	1	47	120
Greylag goose	7	357	1,133
Goosander	4	6	395
Red kite	17	17	4,571
Hen harrier	2	2	136
Goshawk	2	2	71
Golden eagle	32	24	8,751
White-tailed eagle	3	3	1,087
Osprey	1	1	193
Peregrine	5	6	596
Black grouse	10	14	268
Oystercatcher	1	1	74
Golden plover	7	8	365
Snipe	1	1	420
Greenshank	2	2	83
Common sandpiper	1	1	30

### Secondary Species

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

- Mallard
- Raven
- Buzzard
- Sparrowhawk
- Kestrel
- Lesser black-backed gull
- Great black-backed gull
- Common gull
- Herring gull

### ***Moorland Breeding Bird Surveys***

3.5.4 Confirmed, probable or possible breeding evidence was obtained for a total of 52 species within the study area, over the course of surveys.

3.5.5 In summary, the study area supports an assemblage of upland and lowland breeding species considered typical of the locale and habitats present and including a number of both common and notable passerines, associated with woodland, scrub and moorland habitats where present and waders.

- 3.5.6 Notable passerines (i.e. Schedule 1 and red-listed species) included crossbill, grey wagtail, house sparrow, lesser redpoll, mistle thrush, skylark spotted-flycatcher, song thrush, tree pipit and whinchat. Only a small number of territories were recorded.
- 3.5.7 Open moorland passerines including skylark and meadow pipit, were distributed throughout the study area, at relatively low densities.
- 3.5.8 An observation of a single crested tit was also recorded during a survey visit in July 2017, within open moorland habitats. No breeding evidence for the species was recorded over the course of surveys. Desk study records do also not identify the species' local presence.
- 3.5.9 Only a small number of breeding wader territories (including golden plover, greenshank, common sandpiper, snipe and woodcock) were recorded. Approximate locations of breeding wader territories are illustrated in **Figure 7.15**. A summary of breeding wader territory numbers recorded within with 500m of proposed turbine locations is summarised in **Table 3.8**.
- 3.5.10 Breeding red grouse and black grouse are also present within the study area in relatively low numbers. Given additional species-specific surveys for black grouse were also undertaken, detailed information is not provided.

**Table 3.8: Breeding wader territories – within 500 m of proposed turbine locations**

Species	No. of Territories	
	2017	2018
Greenshank	1	0
Golden plover	3	0
Snipe	2	4
Common sandpiper	0	0

### ***Breeding Raptor and Owl Searches***

- 3.5.11 Seven species of raptor and a single species of owl were recorded during breeding raptor and owl searches undertaken in 2017 and 2018 including golden eagle, osprey, red kite, buzzard, kestrel and sparrowhawk. A single observation of short-eared owl, flushed from habitats to the north of the project area was also made during moorland breeding bird surveys however, no breeding evidence was obtained and the observation is considered to be of a passage bird.
- 3.5.12 Similarly, an observation of a single barn owl roosting on the wall of the Glascarnoch Dam was made during Fish Habitat Surveys completed to inform the design and assessment of the proposed scheme in July 2018. No breeding evidence was however, obtained from within the study but the species may breed within wider surrounding area and there are no suitable nesting opportunities for the species within the project area.
- 3.5.13 No raptor or owl species bred within the project area over the course of surveys. Wooded habitats, being limited in growth provide no suitable tree nesting opportunities and open moorland habitats generally comprise low heather swards (general absence of mature stands), provide poor ground nesting opportunities. The absence of breeding raptor and owl species within the project area is supported through desk study records.
- 3.5.14 Three species were confirmed as breeding within 2 km of the project area, limited to buzzard, kestrel and sparrowhawk.

- 3.5.15 In 2018, a single golden eagle territory located within 6km of the Site, and identified in consultation with the RSPB, was monitored (under licence), and was successful. Use of the project area by the adult pair, recording during searches and VP flight activity surveys was overall very low.
- 3.5.16 Information pertaining to the specific locations of breeding raptors is considered confidential. As such, further detailed information is provided in **Appendix 7.3**.

#### ***Breeding Black Grouse Surveys***

- 3.5.17 Searches for black grouse leks in 2017 and 2018 recorded a total of 15 lek sites within the study area, supporting a peak combined total of 20 males.
- 3.5.18 The locations of black grouse lek sites are considered confidential. As such, detailed information is provided in **Appendix 7.3**.

#### ***Winter Walkover Surveys***

- 3.5.19 Winter walkover surveys did not record any notable aggregations of wintering waders or waterfowl. Habitats within the project area are unsuitable for such species.
- 3.5.20 A single observation of whooper swan was made during a survey visit in November 2011, comprising a flock of 14 birds in flight over the study area. Single observations of teal, jack snipe, greenshank, snipe and golden plover, all comprising one or two birds were also made over the course of survey visits.
- 3.5.21 Observations of birds during survey largely comprised passerines, typical of the habitats present together with red and black grouse and observations of commoner raptors including buzzard and sparrowhawk.

#### ***Field Survey Limitations***

- 3.5.22 Field surveys have been undertaken to provide a detailed baseline of bird populations, distributions and flight activity in order to inform the design and assessment of the proposed scheme and enable an informed planning decision to be made.
- 3.5.23 A minimum of two years of data has been collected from within the most recently available five-year survey window, prior to the undertaking of assessment, which is in accordance with current SNH guidance (2017).
- 3.5.24 Consultation with SNH and RSPB was also undertaken to identify key sensitivities and the scope of field surveys necessary to inform an assessment of a possible wind farm development at the locale.
- 3.5.25 Desk study and consultation with specialist recording groups has also been undertaken prior to and over the course of field surveys and assessment process to supplement and provide further context for survey findings; identify any potential discrepancies; and establish the requirement for further surveys e.g. in response to additional target species and potentially changing populations of sensitive species.
- 3.5.26 The extent and physical nature of the terrain and habitats within the project area, comprising steep slopes and bogs in parts, have represented some safety constraints to some walkover type surveys and access to VP locations for VP flight activity surveys. Survey visits for some surveys were also generally undertaken using small teams of surveyors and/or over consecutive days in order to capture survey data within the shortest possible survey window and minimise surveyor presence within the required study areas. Such limitations are not considered to hinder results obtained, which are considered to be representative of bird assemblages and their distribution within the project area and relative survey areas.

- 3.5.27 The undertaking of VP watches during the hours of dawn and dusk during the non-breeding season has been undertaken but has been constrained, due to safety concerns traversing the terrain and habitats within the project area during the wintering period in the hours of darkness. Given the proposed scheme is not known to be located within an area of known importance for wintering waterfowl this is not considered to represent a limitation to the dataset in establishing reasonable levels of at risk flight activity for such species.
- 3.5.28 The undertaking of VP flight activity surveys from VP locations simultaneously, where this occurred, is also not considered to have influenced key target species flight activity within the project area. All VP locations were located outside of the project area, with respective viewsheds considered to be adequately independent of one another.
- 3.5.29 Vantage point flight activity surveys were also commenced after a short period of “settling in”, to ensure any potential disturbance to target species present within each viewshed had reasonably passed and surveyors were alert to survey following a strenuous traverse to each VP location. It is also noted that neither VP was located in close proximity to any identified sensitive site for target species i.e. nest, roost or lek site. Surveyors were also seated and stationary until the completion of watches at both locations and were in contact to ensure flight lines of target species where they were recorded, were not duplicated.
- 3.5.30 Viewshed analysis presented within **Appendix 7.2** and **Figure 7.2** does suggest that the lower altitudes of the Collision Risk Windows (CRWs) surrounding a small number of turbines are not visible in their entirety from the established VP locations. Such “blind spots” are however considered to be very minor and flight activity of target species around these turbines would still have been recorded due to coverage surrounding the turbine locations and visibility of the CRWs at higher altitudes.
- 3.5.31 Overall no limitations to the data set in establishing an accurate reflection of the levels of target species activity within the project area and surrounding area are identified.

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## ANNEX 1 – BIRD SPECIES SUMMARY

**Table A1-1** provides a list of bird species referred to within Chapter 7: ‘Ornithology’ and associated appendices of the Kirkan Wind Farm EIA Report. Both common and species names are presented along with a summary of each species relevant conservation status using the following abbreviations:

- Annex 1 - species listed on Annex 1 of the Birds Directive;
- Schedule 1, 1A, A1 - species listed on Schedule 1, Schedule 1A or Schedule A1 of the 1981 Act;
- UK BAP - priority species listed of the UK Biodiversity Action Plan (UK BAP);
- BoCC - BoCCs as listed by leading bird conservation organisations in the UK, including the RSPB and BTO. Red and amber categories are given (Eaton et al., 2015);
- SBL - species listed on the Scottish Biodiversity List; and,
- LBAP – species listed as a priority species for the Ross and Cromarty Local Biodiversity Action Plan.

**Table A1-1: Summary of bird species.**

Common Name	Species Name	Conservation Status
Grey heron	<i>Ardea cinerea</i>	-
Whooper swan		Annex 1, LBAP
Mute swan	<i>Cygnus olor</i>	-
Pink-footed goose	<i>Anser brachyrhynchus</i>	BoCC – Amber, LBAP
Greylag goose	<i>Anser anser</i>	S1, BoCC – Amber, LBAP
Wigeon	<i>Anas penelope</i>	BoCC – Amber, LBAP
Teal	<i>Anas crecca</i>	BoCC – Amber
Mallard	<i>Anas platyrhynchos</i>	BoCC – Amber
Goosander	<i>Mergus merganser</i>	-
Red kite	<i>Milvus milvus</i>	Annex 1, S1, BoCC – Amber, SBL, LBAP
Hen harrier	<i>Circus cyaneus</i>	Annex 1, S1, S1A, BoCC – Red, SBL, LBAP
Goshawk	<i>Accipiter gentilis</i>	S1
Sparrowhawk	<i>Accipiter nisus</i>	-
Buzzard	<i>Buteo buteo</i>	-
Golden eagle	<i>Aquila chrysaetos</i>	Annex 1, S1, S1A, SA1, BoCC – Amber, SBL, LBAP
White-tailed eagle	<i>Haliaeetus albicilla</i>	Annex 1, S1, S1A, SA1, BoCC – Red, SBL
Osprey	<i>Pandion haliaetus</i>	Annex 1, S1, BoCC – Amber, SBL, LBAP
Kestrel	<i>Falco tinnunculus</i>	BoCC – Amber, SBL
Rough-legged buzzard	<i>Buteo lagopus</i>	-
Merlin	<i>Falco columbarius</i>	Annex 1, S1, BoCC – Amber, SBL
Peregrine	<i>Falco peregrinus</i>	Annex 1, S1, SBL

Common Name	Species Name	Conservation Status
Red grouse	<i>Lagopus lagopus</i>	UK BAP, BoCC – Amber, SBL
Black grouse	<i>Tetrao tetrix</i>	UKBAP, BoCC – Red, SBL, LBAP
Capercaillie	<i>Tetrao urogallus</i>	Annex 1, S1, BoCC – Red, SBL, LBAP
Ptarmigan	<i>Lagopus muta</i>	-
Oystercatcher	<i>Haematopus ostralegus</i>	-
Dotterel	<i>Charadrius morinellus</i>	Annex 1, S1, BoCC – Red, SBL, LBAP
Golden plover	<i>Pluvialis apricaria</i>	Annex 1, BoCC – Amber, SBL
Lapwing	<i>Vanellus vanellus</i>	UKBAP, BoCC – Red, LBAP
Dunlin	<i>Calidris alpina</i>	BoCC – Amber, SBL
Snipe	<i>Gallinago gallinago</i>	BoCC – Amber, LBAP
Woodcock	<i>Scolopax rusticola</i>	BoCC – Amber, SBL, LBAP
Curlew	<i>Numenius arquata</i>	UKBAP, BoCC – Amber, SBL, LBAP
Redshank	<i>Tringa totanus</i>	BoCC – Amber
Common sandpiper	<i>Actitis hypoleucos</i>	BoCC – Amber
Common gull	<i>Larus canus</i>	BoCC – Amber
Lesser black-backed gull	<i>Larus fuscus</i>	BoCC – Amber
Herring gull	<i>Larus argentatus</i>	UKBAP, BoCC – Red, SBL
Cuckoo	<i>Cuculus canorus</i>	UKBAP, BoCC – Red, SBL
Barn owl	<i>Tyto alba</i>	LBAP
Short-eared owl	<i>Asio flammeus</i>	Annex 1, BoCC – Amber, SBL
Skylark	<i>Alauda arvensis</i>	UKBAP, BoCC – Red, SBL, LBAP
Meadow pipit	<i>Anthus pratensis</i>	BoCC – Amber
Whinchat	<i>Saxicola rubetra</i>	BoCC – Amber
Wheatear	<i>Oenanthe oenanthe</i>	BoCC – Amber
Ring ouzel	<i>Turdus torquatus</i>	BoCC – Red, SBL
Song thrush	<i>Turdus philomelos</i>	UKBAP, BoCC – Red, SBL, LBAP
Crested tit	<i>Lophophanes cristatus</i>	LBAP
Raven	<i>Corvus corax</i>	-
Starling	<i>Sturnus vulgaris</i>	UKBAP, BoCC – Red, SBL
House sparrow	<i>Passer domesticus</i>	BoCC – Red, SBL, LBAP
Scottish crossbill	<i>Loxia scotica</i>	S1, BoCC – Amber, SBL, LBAP

## ANNEX 2 – EXISTING ORNITHOLOGICAL RECORDS (RSPB)

**Table A2-1** provides a summary of existing ornithological records returned by RSPB within at least a 6km radius from the project area. Further details of records pertaining to sensitive species are provided in **Appendix 7.3**. Records returned by the RSPB include those originating from:

- 2007 National Common Scoter survey;
- 2008 National Scottish Crossbill survey;
- 1975 onwards White-tailed Eagle Reintroduction – Sightings data and Sat-tag data;
- 2010 National Hen Harrier survey;
- 1992 – 2016 Red Kite Breeding Records;
- 2011 Black Grouse Lek Survey – Ross-shire;
- North Scotland region incidental records;
- 2011 Montane Survey;
- 1955 – 2016 Capercaillie casual records; and,
- 2015 National Golden Eagle Survey.

**Table A2-1: Summary of existing ornithological records (RSPB).**

Species	No. of Records	Date Range	Summary
Common scoter	6	2007	Non-breeding records.
Crossbill	9	2008	Breeding season and non-breeding season records
Scottish crossbill	1	2008	Sighting record.
White-tailed eagle	2	2008-2010	Sighting record and satellite fix of individual birds.
Hen harrier	1	2010	Non-breeding season record.
Red kite	9	2009-2015	Confirmed and possible breeding records.
Black grouse	41	2011	Probable breeding records including displaying males and female observations.
Whooper swan	1	2012	Observation of six individuals on Loch Glascarnoch.
Greenshank	1	2012	Breeding season record.
Cuckoo	1	2012	Breeding season record.
Waxwing	2	2012	Non-breeding season records.
Ring ouzel	2	2012	Breeding season records.
Rock ptarmigan	3	2011	Probable breeding records.
Dunlin	1	2011	Possible breeding record.
Wheatear	1	2011	Possible breeding record.
Golden plover	2	2011	Possible breeding records.
Capercaillie	1	2013	Sighting record of a single female.

## ANNEX 3 – ORNITHOLOGY FIELD SURVEY EFFORT

The following codes are used to record weather conditions within **Tables A3-1 to A3-8**:

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

The following field surveyors are named: Mr A. Carroll (AC), Mr A. McNab (AM), Mr. R. Whytock, Mr R. Shand, Mr. C. Scott (CS), Mr G. Palmer (GP), Mr G. Riddoch (GR), Mr M. Wood (MW) and Mr P. Carroll (PC).

**Table A3-1: VP flight activity survey effort (September 2016 – August 2018).**

Date	VP	Surveyor	Start Time	Finish Time	Effort (Hours)	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
28/09/2016	1	AM	13.45	16.45	3	2/3/5	SW/SW/W	0/3/3	8	2/1/2	2	0	0
28/09/2016	2	AC	10.05	13.05	3	1	SW	1/2/0	8	2	2	0	0
28/09/2016	3	AM	10.10	13.10	3	2/2/3	SW	2/0/3	8	1	2	0	0
28/09/2016	4	AC	14.15	17.15	3	1/2/3/4	SW	3	8	2	2/2/1	0	0
30/09/2016	2	PC	10.35	13.35	3	2	SW/SW/W	2/0/0	6/6/5	2	2	0	0
30/09/2016	2	PC	14.05	17.05	3	3/3/2	W	0/2/2	5/4/4	2	2	0	0
30/09/2016	3	GR	10.35	13.35	3	3	SW	2/2/0	6/3/4	2	2	0	0
30/09/2016	3	GR	14.05	17.05	3	2/3/3	SW/W/W	0/2/2	3/6/5	2	2	0	0
01/10/2016	1	GR	12.45	15.45	3	0/0/1	-/-/E	0/0/2	3/3/5	2	2	0	0
01/10/2016	3	GR	09.15	12.15	3	0	-	0	1/1/2	2	2	0	0
02/10/2016	2	GR	07.00	10.00	3	0	-	0	0	0	2	1/1/0	0
02/10/2016	4	GR	10.30	13.30	3	2	E/E/ESE	0	0	0	2	0	0
03/10/2016	1	AM	11.15	14.15	3	3/3/2	SE/SSE/SE	0	3	2	2	0	0
03/10/2016	1	AM	14.45	17.45	3	3/3/4	SE/SSE/SE	0	4/4/5	2	2	0	0
03/10/2016	4	AC	11.45	14.45	3	2	E	0	5/4/4	2	2	0	0
03/10/2016	4	AC	15.15	18.15	3	2/1/1	E	0	4/6/6	2	2	0	0
06/10/2016	1	GR	07.15	10.15	3	0/1/2	-/E/E	0	0	0	2	0	0
06/10/2016	3	GR	10.45	13.45	3	2/3/3	ESE	0	0/0/3	0/0/2	2	0	0
10/10/2016	4	MW	14.00	17.00	3	1/2/1	E	0	3/2/2	2	2	0	0
11/10/2016	2	MW	08.30	11.30	3	0/1/1	-/E/E	0	0/1/1	0/2/2	2	0	0
11/10/2016	2	MW	12.00	15.00	3	1	E	0	3/5/7	2	2	0	0
17/10/2016	1	AM	11.10	14.10	3	2/2/3	S/SSW/WSW	0/0/3	7/7/6	2	2	0	0
17/10/2016	4	MW	11.40	14.40	3	1/2/2	S/WSW/SW	3/2/0	4/5/7	2	2	0	0
18/10/2016	3	GR	09.25	12.25	3	2	SW	0	3/6/8	2	2	0	0
18/10/2016	3	GR	12.55	15.55	3	3	W/W/WNW	2	8/8/7	2	2	0	0
20/10/2016	2	GR	08.30	11.30	3	0	-	0	8	2	2	0	0
20/10/2016	2	GR	12.00	15.00	3	0/0/1	-/-/S	0	8/7/7	2	2	0	0
26/10/2016	4	GR	08.00	11.00	3	2/3/3	SW/WSW/WSW	2	7	1/2/2	2	0	0

Date	VP	Surveyor	Start Time	Finish Time	Effort (Hours)	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
26/10/2016	4	GR	11.30	14.30	3	4/5/5	WSW	0/2/0	7	2	2	0	0
27/10/2016	1	GR	12.15	15.15	3	5	SW	2/0/0	7/6/6	2	2	0	0
27/10/2016	3	GR	08.45	11.45	3	3/4/4	SW	2/0/2	8/6/8	1/1/2	2	0	0
28/10/2016	1	GR	08.05	11.05	3	2/2/4	WSW/WSW/W	1/1/0	7/6/5	1/2/2	2	0	0
11/11/2016	1	GR	12.05	14.05	2	2/2	SSW	0	8	2	2	0	0
11/11/2016	1	GR	14.35	16.35	2	3/3	SSW	0	8	2	2	0	0
12/11/2016	1	GR	07.40	09.40	2	1	SSW	1	8	1	2	0	0
15/11/2016	3	GR	09.35	12.35	3	3/3/3	WSW/WSW/WSW	0/0/0	7/4/4	2/2/2	2/2/2	0/0/0	0/0/0
15/11/2016	3	GR	13.05	16.05	3	3/2/3	WSW/WSW/WSW	2/0/0	6/5/6	2/2/2	2/2/2	0/0/0	0/0/0
16/11/2016	2	GR	12.45	15.45	3	3/2/2	W	3/3/3	6/6/7	2	2	0	2
16/11/2016	4	GR	09.15	12.15	3	3/4/3	W/W/W	3/3/2	7/7/6	1/2/2	2/2/2	0/0/0	2/2/2
22/11/2016	1	MW	09.40	12.40	3	2	N	0	4/5/5	2	2	2	1
22/11/2016	1	MW	13.10	16.10	3	3/3/2	N	0	6/4/4	2	2	2	1
22/11/2016	4	GR	10.00	13.00	3	0/1/1	-/N/N	0/0/0	5/6/5	2/2/1	2/2/2	0/0/0	1/1/1
22/11/2016	4	GR	13.30	16.30	3	1/1/1	N/N/N	0/0/0	7/5/5	2/2/2	2/2/2	0/0/0	1/1/1
23/11/2016	2	MW	08.55	11.55	3	0/0/1	NW	0	0/0/1	2/2/2	2/2/2	2/2/2	1
23/11/2016	4	MW	12.25	15.25	3	1/1/1	NW/NW/NW	0/0/0	1/2/2	2/2/2	2/2/2	2/2/2	1/1/1
25/11/2016	2	GR	09.15	12.15	3	0/1/1	-/NE/ENE	0/0/0	5/5/6	2/2/2	2/2/2	1/1/1	1/1/1
25/11/2016	2	GR	12.45	15.45	3	1/1/1	ENE/ENE/ENE	0/0/0	5/5/4	2/2/2	2/2/2	1/1/1	1/1/1
25/11/2016	3	MW	08.45	11.45	3	2/2/2	W/W/W	0/0/0	2/2/3	2/2/2	2/2/2	2/2/2	1/1/1
25/11/2016	3	MW	12.15	15.15	3	2	W	0	5/6/6	2	2	2	1
12/12/2016	2	GR	08.30	11.30	3	0/0/1	-/-/E	0/0/0	6/7/8	2/2/2	2/2/2	0/0/0	0/0/0
12/12/2016	2	GR	12.00	15.00	3	1/1/1	E/E/ESE	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
13/12/2016	3	GR	12.10	15.10	3	2/2/2	SE/SE/SE	0/0/0	6/6/5	2/2/2	2/2/2	0/0/0	0/0/0
13/12/2016	3	GR	08.40	11.40	3	3/3/2	ESE/ESE/SE	0	8/8/7	1/2/2	2/2/2	0	0
15/12/2016	1	GR	09.00	12.00	3	4/4/3	SW/SW/SW	0/0/0	7/6/6	2/2/2	2/2/2	0/0/0	0/0/0
15/12/2016	1	GR	13.00	16.00	3	3/3/3	WSW/WSW/WSW	0/0/0	8/8/7	2/2/2	2/2/2	0/0/0	0/0/0
19/12/2016	4	GR	09.20	12.20	3	2/2/2	WSW/WSW/WSW	1/0/0	8/7/7	1/2/2	1/2/2	0	0
19/12/2016	4	GR	13.20	16.20	3	2/3/3	WSW/WSW/WSW	0	6/5/5	2/2/2	2/2/2	0/0/0	0/0/0

Date	VP	Surveyor	Start Time	Finish Time	Effort (Hours)	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
13/01/2017	2	GR	08.15	11.15	3	5/5/4	NW/NW/NW	2/0/2	5/5/6	1/1/1	2/2/2	1/0/0	1/1/1
13/01/2017	2	GR	12.00	15.00	3	5/4/4	NW/W/W	0/2/0	7/6/6	1/2/2	2/2/2	0/0/0	1/1/1
16/01/2017	3	GR	08.50	11.50	3	3/3/3	W/W/W	0/0/0	7/7/7	1/1/1	2/2/2	0/0/0	1/1/1
16/01/2017	3	GR	12.20	15.20	3	2/2/1	W/W/W	0/0/0	8/8/8	1/1/1	2/2/2	0/0/0	1/1/1
30/01/2017	4	GR	07.50	10.50	3	0/0/1	-/-/SSE	0/0/0	0/0/0	-/-/-	2/2/2	1/1/0	2/2/2
30/01/2017	4	GR	11.20	14.20	3	1/1/1	SSE/SSE/SSE	0/0/0	1/2/2	2/2/2	2/2/2	0/0/0	2/2/2
31/01/2017	1	GR	08.00	11.00	3	2/2/3	SSE/SSE/SSE	2/2/2	8/8/8	1/1/2	2/2/2	0/0/0	2/2/2
31/01/2017	1	GR	11.30	14.30	3	3/3/2	SSE/SE/SE	2/0/0	8/8/7	2/2/2	2/2/2	0/0/0	2/2/2
06/02/2017	2	GR	10.40	13.40	3	4/4/5	SE/SE/SE	0/0/0	5/6/6	2/2/2	2/2/2	0/0/0	2/2/2
06/02/2017	2	GR	14.10	17.10	3	5/6/5	SE/SE/SE	0/0/2	7/8/8	2/2/2	2/2/2	0/0/0	2/2/2
07/02/2017	3	GR	07.45	10.45	3	1/1/2	E/E/E	2/2/2	8/8/8	1/1/1	2/2/2	0/0/0	0/0/0
07/02/2017	3	GR	11.15	14.15	3	2/1/1	E/ESE/ESE	0/2/2	7/7/8	2/2/2	2/2/2	0/0/0	0/0/0
10/02/2017	4	GR	07.50	10.50	3	0/1/1	-/E/E	0/0/0	1/1/2	2/2/2	2/2/2	0/0/0	2/2/2
10/02/2017	4	GR	11.45	14.45	3	1/1/1	E/E/E	0/0/0	2/2/2	2/2/2	2/2/2	0/0/0	2/2/2
14/02/2017	1	GR	07.35	10.35	3	4/4/5	SE/SE/SE	0/0/0	3/5/4	2/2/2	2/2/2	0/0/0	0/0/0
14/02/2017	1	GR	11.05	14.05	3	5/5/5	SE/SE/SE	0/0/0	2/2/3	2/2/2	2/2/2	0/0/0	0/0/0
15/02/2017	2	GR	07.20	10.20	3	0/1/1	-/ESE/ESE	0/0/0	4/5/6	2/2/2	2/2/2	0/0/0	0/0/0
15/02/2017	2	GR	10.50	13.50	3	0/0/1	-/-/ESE	0/0/0	0/0/0	-/-/-	2/2/2	1/1/0	0/0/0
17/02/2017	3	GR	09.35	12.35	3	1/1/2	S/S/SSE	0/0/0	5/2/1	2/2/2	2/2/2	0/0/0	0/0/0
17/02/2017	3	GR	13.05	16.05	3	1/1/1	S/S/S	0/0/0	6/8/6	2/2/2	2/2/2	0/0/0	0/0/0
03/03/2017	1	AM	09.55	12.55	3	1/1/1	W/S/SW	0/0/0	1/1/2	2/2/2	2/2/2	0/0/0	1/1/1
03/03/2017	1	AM	13.25	16.25	3	1/1/1	SW/SE/S	0/0/0	3/2/4	2/2/2	2/2/2	0/0/0	1/1/1
03/03/2017	4	GP	10.35	13.35	3	0/1/1	-/NW/E	0/0/0	1/1/3	2/2/2	2/2/2	0/0/0	1/1/1
03/03/2017	4	GP	14.05	17.05	3	2/2/2	E/SE/ENE	0/0/0	3/4/3	2/2/2	2/2/2	0/0/0	1/1/1
22/03/2017	1	AM	12.15	15.15	3	2/3/2	E/ENE/ENE	0/0/0	5/6/7	2/2/2	2/2/2	0/0/0	2/2/2
22/03/2017	1	AM	15.45	18.45	3	2/2/2	ENE/NE/NE	0/0/0	6/6/6	2/2/2	2/1/2	0/0/1	1/1/1
22/03/2017	4	PC	12.40	15.40	3	2/3/2	NE/NE/ENE	0/2/2	7/7/7	2/2/2	2/2/2	0/0/0	2/2/2
22/03/2017	4	PC	16.10	19.10	3	2/2/2	NE/NNE/N	0/0/0	7/7/6	2/1/2	2/2/2	0/0/0	1/1/1
23/03/2017	3	AM	08.05	11.05	3	2/2/2	SE/SE/SE	0/0/0	1/1/1	2/2/2	2/2/2	1/0/0	2/2/2

Date	VP	Surveyor	Start Time	Finish Time	Effort (Hours)	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
23/03/2017	3	AM	11.35	14.35	3	1/1/1	SSE/S/S	0/0/0	2/2/2	2/2/2	2/2/2	0/0/0	0/0/0
24/03/2017	1	PC	09.15	12.15	3	2/3/3	SW/SW/SW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
24/03/2017	1	PC	12.45	15.45	3	3/3/3	SW/SW/SW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
24/03/2017	2	AM	08.50	11.50	3	2/2/2	SW/W/W	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
24/03/2017	2	AM	12.20	15.20	3	2/2/2	W/W/W	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
24/03/2017	4	AC	08.35	11.35	3	2/2/2	SW/SW/SW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
24/03/2017	4	AC	12.05	15.05	3	2/2/3	SW/SW/SW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
27/03/2017	2	PC	11.45	14.45	3	1/2/2	S/S/SSE	0/0/0	4/4/4	2/2/2	2/2/2	0/0/0	0/0/0
27/03/2017	2	PC	15.15	18.15	3	2/2/2	SSE/SSE/SSE	0/0/0	4/3/1	2/2/2	2/2/2	0/0/0	0/0/0
27/03/2017	3	RW	12.00	15.00	3	2/2/2	SW/SW/SW	0/0/0	3/2/1	2/2/2	2/2/2	0/0/0	0/0/0
27/03/2017	3	RW	15.30	18.30	3	2/2/2	SW/SW/SW	0/0/0	2/1/0	2/2/2	2/2/2	0/0/0	0/0/0
12/04/2017	1	AM	11.40	14.40	3	4/4/4	NW/NW/WNW	3/3/3	5/6/7	2/2/2	2/2/2	0/0/0	0/0/0
12/04/2017	1	AM	15.10	18.10	3	4/4/4	WNW/W/W	3/3/3	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
12/04/2017	2	CS	12.15	15.15	3	4/4/4	NW/NW/NW	3/3/3	6/6/6	2/2/2	2/2/2	0/0/0	0/0/0
12/04/2017	2	CS	15.45	18.45	3	4/3/3	NW/NW/NW	3/3/3	7/6/7	2/2/2	2/2/2	0/0/0	0/0/0
12/04/2017	4	PC	12.10	15.10	3	4/4/4	WNW/WNW/WNW	3/3/3	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
12/04/2017	4	PC	15.40	18.40	3	4/4/4	W/W/WNW	3/3/3	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
20/04/2017	2	GP	09.05	12.05	3	3/3/3	W/WSW/W	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
20/04/2017	2	GP	12.35	15.35	3	3-4/3-4/3-4	WSW/WSW/WSW	0/0/0	8/8/7	1/2/2	2/2/2	0/0/0	0/0/0
20/04/2017	3	PC	08.50	11.50	3	3/3/3	W/W/W	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
20/04/2017	3	PC	12.20	15.20	3	3/3/3	W/W/W	1/1/2	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
30/04/2017	1	AM	14.10	17.10	3	4/3/3	SE/SE/SE	0/0/0	6/6/6	2/2/2	2/2/2	0/0/0	0/0/0
30/04/2017	1	AM	17.40	20.40	3	3/2/1	SE/SE/SE	0/0/0	6/5/4	2/2/2	2/2/2	0/0/0	0/0/0
30/04/2017	3	GR	05.30	08.30	3	4/3/4	SE/SE/E	0/0/0	8/7/7	0/1/1	2/2/2	0/0/0	0/0/0
30/04/2017	4	PC	14.30	17.30	3	3/3/3	SE/E/E	0/0/0	7/7/8	2/2/2	2/2/2	0/0/0	0/0/0
30/04/2017	4	PC	18.00	21.00	3	3/2/1	E/ESE/ESE	0/0/0	7/7/8	2/2/2	2/2/2	0/0/0	0/0/0
30/04/2017	3	GR	09.30	12.30	3	4/4/4	E/E/E	0/0/0	7/6/6	2/2/2	2/2/2	0/0/0	0/0/0
10/05/2017	3	AM	10.40	13.40	3	3/3/3	W/W/W	0/0/0	8/7/8	2/2/2	2/2/2	0/0/0	0/0/0
10/05/2017	3	AM	14.10	17.10	3	3/3/2	W/W/W	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
16/05/2017	1	GP	12.00	15.00	3	3/4-5/4-5	SSW/SW/SW	2/3/0	8/7/7	1/1/2	2/1/2	0/0/0	0/0/0

Date	VP	Surveyor	Start Time	Finish Time	Effort (Hours)	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
16/05/2017	1	GP	15.30	18.30	3	4-5/4-5/4-5	SW/SW/SW	0/0/0	4/2/1	2/2/2	2/2/2	0/0/0	0/0/0
16/05/2017	2	AM	12.05	15.05	3	3/4/3	SSW/WSW/WSW	2/3/0	7/8/5	2/2/2	2/2/2	0/0/0	0/0/0
16/05/2017	2	AM	15.35	18.35	3	3/3/3	WSW/WSW/WSW	0/0/0	3/2/1/	2/2/2	2/2/2	0/0/0	0/0/0
16/05/2017	4	PC	12.15	15.15	3	2/4/4	SSW/SW/W	3/0/0	7/6/4	2/2/2	2/2/2	0/0/0	0/0/0
16/05/2017	4	PC	15.45	18.45	3	4/4/4	W/W/W	0/0/0	4/3/1	2/2/2	2/2/2	0/0/0	0/0/0
14/06/2017	4	PC	15.30	18.30	3	3	S	0	7/7/8	2	2	0	0
14/06/2017	2	CS	15.35	18.35	3	3	SSE	0	7/8/8	2	2	0	0
14/06/2017	1	AM	15.05	18.05	3	3	SW	2/0/0	7	2	2	0	0
15/06/2017	4	PC	04.15	07.15	3	2/2/3	S/SW/SW	0/1/2	6/7/7	2	2	0	0
15/06/2017	1	AM	04.05	07.05	3	2/2/3	SSW/WSW/WSW	0/0/3	7/7/6	2	2	0	0
15/06/2017	2	CS	04.20	07.20	3	3/2/1	SW	0/2/2	7/8/5	2	2	0	0
27/06/2017	4	PC	14.45	17.45	3	3	E/E/ENE	0	8	2	2	0	0
27/06/2017	2	AM	14.45	17.45	3	3	SE	0	8	1	2	0	0
28/06/2017	3	AM	08.05	11.05	3	2/2/1	NE/NE/ENE	0/0/2	7	1	2	0	0
28/06/2017	3	AM	11.35	14.35	3	2/1/3	E	0	7/7/5	2	2	0	0
30/06/2017	1	GR	15.30	18.30	3	3	W/NW/NW	2	8	1	2	0	0
30/06/2017	3	GR	19.30	22.30	3	2	NW	2/2/0	8	1	2	0	0
05/07/2017	1	AM	19.40	22.40	3	1/1/1	SSE/SSW/SE	0/0/0	7/7/8	2/2/2	2/2/2	0/0/0	0/0/0
05/07/2017	4	PC	19.55	22.55	3	2/1/1	SE/SW/SW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
06/07/2017	2	PC	09.35	12.35	3	2/2/2	SE/SSE/SSW	0/1/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
06/07/2017	2	PC	13.05	16.05	3	2/3/3	SSW/SW/SW	2/2/3	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
06/07/2017	3	AM	09.35	12.35	3	1/1/1	SW/SW/SW	1/1/0	8/8/8	1/1/1	2/1/2	0/0/0	0/0/0
06/07/2017	3	AM	13.05	16.05	3	1/1/1	SW/SW/SW	0/2/3	8/7/7	1/1/1	2/2/2	0/0/0	0/0/0
28/07/2017	1	AM	12.40	15.40	3	2/2/2	SW/SW/SW	0/0/0	7/5/4	2/2/2	2/2/2	0/0/0	0/0/0
28/07/2017	4	GP	12.05	15.05	3	3/3/4	WSW/SW/SW	3/1/2	8/8/8	1/2/2	2/2/2	0/0/0	0/0/0
09/08/2017	2	PC	07.20	10.20	3	2/2/2	NW/NW/NW	0/0/1	7/8/8	2/2/2	2/2/2	0/0/0	0/0/0
09/08/2017	2	PC	10.50	13.50	3	2/3/3	NW/NW/NW	0/0/0	8/7/7	2/2/2	2/2/2	0/0/0	0/0/0
09/08/2017	3	AM	07.05	10.05	3	2/2/3	NW/NW/NW	0/0/1	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
09/08/2017	3	AM	10.35	13.35	3	3/4/4	NW/NW/NW	1/0/0	7/6/6	2/2/2	2/2/2	0/0/0	0/0/0

Date	VP	Surveyor	Start Time	Finish Time	Effort (Hours)	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
23/08/2017	1	AM	16.10	19.10	3	1/2/1	WSW/WSW/SW	0/0/2	5/6/6	2/2/2	2/2/2	0/0/0	0/0/0
23/08/2017	4	PC	16.30	19.30	3	2/2/1	SW/SW/SW	0/0/2	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
24/08/2017	1	AM	09.50	12.50	3	1/1/1	SW/SW/SW	0/0/2	6/5/6	2/2/2	2/2/2	0/0/0	0/0/0
24/08/2017	2	PC	13.45	16.45	3	2/2/2	WSW/WSW/WSW	2/2/2	5/7/7	2/2/2	2/2/2	0/0/0	0/0/0
24/08/2017	4	PC	10.15	13.15	3	1/1/1	SW/SSW/SW	0/3/0	6/7/7	2/2/2	2/2/2	0/0/0	0/0/0
24/08/2017	3	AM	13.25	16.25	3	2/2/1	SW/SW/SW	0/2/2	5/6/7	2/2/2	2/2/2	0/0/0	0/0/0
31/08/2017	1	AM	13.25	16.25	3	2/2/2	NW/NW/NW	0/0/0	7/7/5	2/2/2	2/2/2	0/0/0	0/0/0
31/08/2017	4	AM	17.30	20.30	3	3/2/1	NW/NW/NW	0/0/0	5/4/3	2/2/2	2/2/2	0/0/0	0/0/0
01/09/2017	3	AM	09.25	12.25	3	1/1/1	W/W/W	0/0/0	5/4/5	2/2/2	2/2/2	0/0/0	0/0/0
01/09/2017	3	AM	12.55	15.55	3	1/2/1	W/W/W	0/0/0	4/6/6	2/2/2	2/2/2	0/0/0	0/0/0
11/09/2017	1	AM	12.55	15.55	3	4/4/4	NW/NW/NW	2/2/2	7/6/6	2/2/2	2/2/2	0/0/0	0/0/0
11/09/2017	1	AM	16.25	19.25	3	4/4/4	NW/NW/NW	0/2/3	5/6/6	2/2/2	2/2/2	0/0/0	0/0/0
11/09/2017	4	PC	13.00	16.00	3	3/3/3	NW/NW/NW	2/2/2	7/6/6	2/2/2	2/2/2	0/0/0	0/0/0
11/09/2017	4	PC	16.30	19.30	3	3/3/3	NW/NW/NW	2/2/2	6/7/7	2/2/2	2/2/2	0/0/0	0/0/0
12/09/2017	2	PC	08.00	11.00	3	3/3/3	W/W/W	2/2/2	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
12/09/2017	2	PC	11.30	14.30	3	3/3/3	W/W/W	0/0/0	7/8/8	2/2/2	2/2/2	0/0/0	0/0/0
12/09/2017	3	AM	07.45	10.45	3	2/1/2	SW/SW/SW	0/0/2	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
12/09/2017	3	AM	11.15	14.15	3	2/2/2	SW/SW/SW	2/0/0	7/6/6	2/2/2	2/2/2	0/0/0	0/0/0
29/09/2017	2	AM	11.00	14.00	3	4/4/4	SW/SW/SW	0/0/2	4/5/5	2/2/2	2/2/2	0/0/0	0/0/0
29/09/2017	2	AM	14.30	17.30	3	4/4/4	SW/SW/SW	0/0/2	6/7/7	2/2/2	2/2/2	0/0/0	0/0/0
29/09/2017	4	PC	11.00	14.00	3	4/4/4	SW/SW/SW	0/0/2	6/7/7	2/2/2	2/2/2	0/0/0	0/0/0
29/09/2017	4	PC	14.30	17.30	3	4/4/4	SW/SW/SW	0/0/2	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
30/09/2017	1	GR	06.50	09.50	3	2/3/4	SW/SW/SW	0/0/0	3/3/4	2/2/2	2/2/2	0/0/0	0/0/0
30/09/2017	1	GR	10.20	13.20	3	1/3/3	SW/SW/SW	0/1/0	5/6/7	2/2/2	2/2/2	0/0/0	0/0/0
18/10/2017	2	PC	12.00	15.00	3	3/2/1	E/E/E	0/0/0	6/7/8	2/2/2	2/2/2	0/0/0	0/0/0
18/10/2017	2	PC	15.30	18.30	3	2/2/2	NE/NE/NE	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
18/10/2017	4	PC	08.20	11.20	3	1/2/3	E/SE/SE	0/0/0	6/6/5	2/2/2	2/2/2	0/0/0	0/0/0
19/10/2017	3	PC	12.00	15.00	3	4/3/3	SE/SE/SE	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
19/10/2017	4	PC	07.30	10.30	3	2/2/2	SE/SE/SE	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0

Date	VP	Surveyor	Start Time	Finish Time	Effort (Hours)	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
19/10/2017	3	PC	15.30	18.30	3	2/3/3	SE/SE/SE	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
20/10/2017	1	PC	07.30	10.30	3	0/0/1	-/-/W	0/0/0	7/7/7	1/2/2	2/2/2	0/0/0	0/0/0
20/10/2017	1	PC	11.00	14.00	3	1/2/2	W/NW/NW	1/0/0	7/7/8	2/2/2	2/2/2	0/0/0	0/0/0
25/10/2017	1	AM	11.45	14.45	3	4/4/4	W/W/W	3/0/3	6/5/7	2/2/2	2/2/2	0/0/0	0/0/0
25/10/2017	1	AM	15.15	18.15	3	4/4/4	W/W/W	2/2/3	6/7/6	2/2/2	2/2/2	0/0/0	0/0/0
25/10/2017	4	PC	11.50	14.50	3	4/4/4	SW/SW/SW	3/0/3	7/6/4	1/2/2	2/2/2	0/0/0	0/0/0
25/10/2017	4	PC	15.20	18.20	3	4/4/4	SW/SW/SW	2/2/3	5/4/8	2/2/2	2/2/2	0/0/0	0/0/0
26/10/2017	2	PC	07.45	10.45	3	3/2/3	W/W/W	0/1/1	4/6/7	2/2/2	2/2/2	0/0/0	0/0/0
26/10/2017	2	PC	11.15	14.15	3	3/0/0	NW/NW/NW	3/0/0	7/6/5	2/2/2	2/2/2	0/0/0	0/0/0
27/10/2017	3	GR	07.45	10.45	3	1/2/3	E/NW/NW	1/0/0	8/8/7	2/2/2	2/2/2	0/0/0	0/0/0
27/10/2017	3	GR	11.15	14.15	3	3/3/3	NW/NW/NW	0/0/0	6/7/6	2/2/2	2/2/2	0/0/0	0/0/0
08/11/2017	2	PC	10.00	13.00	3	2/2/3	SW/SW/SW	2/2/2	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
08/11/2017	4	PC	13.50	16.50	3	2/3/4	SW/SW/SW	2/2/2	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
09/11/2017	2	PC	07.15	10.15	3	4/4/4	W/W/W	3/3/3	7/6/6	2/2/2	2/2/2	0/0/0	0/0/0
09/11/2017	4	PC	10.45	13.45	3	4/4/4	W/W/W	3/3/3	4/6/6	2/2/2	2/2/2	0/0/0	0/0/0
18/11/2017	3	GR	08.10	11.10	3	4/3/3	NW/NW/W	0/0/0	2/2/4	2/2/2	2/2/2	0/0/0	0/0/0
18/11/2017	3	GR	11.40	14.40	3	3/3/3	W/NW/NW	0/0/0	5/5/5	2/2/2	2/2/2	0/0/0	0/0/0
19/11/2017	1	GR	08.50	11.50	3	2/2/2	W/W/W	0/1/0	7/7/6	2/2/2	2/2/2	0/0/0	0/0/0
19/11/2017	1	GR	12.20	15.20	3	-/1/1	-/E/E	0/0/1	7/6/6	2/2/2	2/2/2	0/0/0	0/0/0
22/11/2017	2	PC	09.30	12.30	3	1/1/0	SW/SW/-	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	2/2/2
22/11/2017	2	PC	13.00	16.00	3	0/0/0	N/A	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	2/2/2
22/11/2017	3	AM	09.25	12.25	3	1/1/1	W/W/W	0/0/0	6/7/7	2/2/2	2/2/2	0/0/0	2/2/2
22/11/2017	3	AM	12.55	15.55	3	1/1/1	N/N/N	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	2/2/2
29/11/2017	1	AM	09.25	12.25	3	1/1/1	NW/NW/W	0/0/0	5/6/7	2/2/2	2/2/2	0/0/0	0/0/0
29/11/2017	1	AM	12.55	15.55	3	1/2/2	N/N/N	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	1/1/1
29/11/2017	4	PC	09.30	12.30	3	2/2/2	NW/NW/NW	0/0/0	4/4/6	2/2/2	2/2/2	1/1/0	1/1/1
29/11/2017	4	PC	13.00	16.00	3	2/3/3	NW/NW/NW	0/0/0	7/6/6	2/2/2	2/2/2	0/0/0	1/1/1
19/12/2017	3	GR	08.45	11.45	3	5/6/5	W/W/SW	0/0/1	8/8/8	1/1/1	2/2/2	0/0/0	2/2/2
19/12/2017	3	GR	12.15	15.15	3	4/4/5	WSW/W/W	1/0/1	8/8/8	1/1/1	2/2/2	0/0/0	2/2/2

Date	VP	Surveyor	Start Time	Finish Time	Effort (Hours)	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
22/12/2017	2	AM	08.40	11.40	3	2/2/3	W/W/WNW	0/0/1	7/7/7	1/1/1	2/2/2	0/0/0	0/0/0
22/12/2017	2	AM	12.10	15.10	3	2/2/2	WNW/W/W	2/2/0	7/7/7	1/1/1	2/2/2	0/0/0	0/0/0
22/12/2017	4	PC	08.40	11.40	3	2/3/4	W/W/W	0/0/0	7/8/8	1/1/1	2/2/2	0/0/0	0/0/0
22/12/2017	4	PC	12.10	15.10	3	4/4/4	W/W/W	1/1/0	7/7/7	1/1/1	2/2/2	0/0/0	0/0/0
28/12/2017	1	GR	08.50	11.50	3	1/1/1	WNW/WNW/WNW	0/0/0	5/4/5	2/2/2	2/2/2	2/2/2	1/1/1
28/12/2017	1	GR	12.20	15.20	3	1/1/1	WNW/W/W	2/0/0	6/4/4	2/2/2	2/2/2	2/2/2	1/1/1
25/01/2018	2	AM	10.20	13.20	3	1/1/1	SW/W/N	3/3/2	7/7/8	1/2/2	2/2/2	0/0/0	1/1/1
25/01/2018	2	AM	13.50	16.50	3	1/1/1	N/N/N	2/2/2	8/8/8	2/2/2	2/2/2	0/0/0	1/1/1
25/01/2018	4	PC	10.30	13.30	3	0/0/1	-/-/NW	2/2/1	8/8/8	1/1/2	2/2/2	0/0/0	2/2/2
25/01/2018	4	PC	14.00	17.00	3	1/1/1	NW/NW/NW	1/1/1	8/8/8	1/1/1	2/2/2	0/0/0	2/2/2
26/01/2018	1	AM	07.40	10.40	3	1/1/1	SW/E/E	0/0/0	3/2/2	2/2/2	2/2/2	1/1/0	1/1/1
26/01/2018	1	AM	11.10	14.10	3	1/1/2	E/S/S	0/0/0	2/3/4	2/2/2	2/2/2	0/0/0	1/1/1
29/01/2018	3	GR	09.05	12.05	3	3/4/4	WNW/NW/WNW	2/0/0	7/6/5	2/2/2	2/2/2	0/0/0	1/1/1
29/01/2018	3	GR	12.35	15.35	3	4/4/4	NW/NW/NW	2/2/2	6/5/6	2/1/1	2/2/2	0/0/0	1/1/1
16/02/2018	1	AM	10.35	13.35	3	3/3/2	SW/SW/SW	0/0/0	6/4/3	1/2/2	2/2/2	0/0/0	1/1/1
16/02/2018	1	AM	14.05	17.05	3	2/2/3	SW/SW/SW	0/0/0	3/6/7	2/2/2	2/2/2	0/0/0	1/1/1
17/02/2018	2	AM	07.25	10.25	3	1/2/1	W/W/W	0/2/0	7/7/5	1/2/2	2/2/2	0/0/0	1/1/1
17/02/2018	2	AM	10.55	13.55	3	2/1/2	W/W/W	0/0/3	3/4/4	2/2/2	2/2/2	0/0/0	1/1/1
17/02/2018	4	PC	07.30	10.30	3	2/3/3	SW/SW/SW	2/2/0	6/7/6	2/2/2	2/2/2	1/0/0	1/1/1
17/02/2018	4	PC	11.00	14.00	3	3/3/3	WSW/WSW/WSW	0/0/3	3/3/4	2/2/2	2/2/2	0/0/0	1/1/1
25/02/2018	3	GR	10.45	13.45	3	1/1/2	S/S/S	0/0/0	4/5/6	1/1/2	2/2/2	0/0/0	1/1/1
25/02/2018	3	GR	14.15	17.15	3	2/2/2	S/S/S	0/0/0	6/6/6	2/2/2	2/2/2	0/0/0	1/1/1
26/02/2018	3	PC	10.30	13.30	3	3/4/4	SE/SE/SE	0/0/0	7/7/7	2/2/2	2/2/2	2/2/2	1/1/1
26/02/2018	3	PC	14.00	17.00	3	2/2/1	SE/SE/SE	0/0/0	6/4/1	2/2/2	2/2/2	2/2/2	1/1/1
27/02/2018	2	PC	08.30	11.30	3	2/2/2	NNE/NNE/NE	0/0/0	4/7/7	2/2/2	2/2/2	1/1/0	1/1/1
27/02/2018	2	PC	12.00	15.00	3	3/3/3	E/E/E	0/0/0	5/5/6	2/2/2	2/2/2	0/0/0	1/1/1
06/03/2018	1	GR	08.40	11.40	3	2/2/1	NE/NE/NE	2/2/2	8/8/8	0/1/1	1/2/2	0/0/0	1/1/1
06/03/2018	1	GR	12.10	15.10	3	2/1/1	NE/NE/NE	2/2/2	8/8/8	1/1/1	2/2/1	0/0/0	1/1/1
11/03/2018	4	GR	12.00	15.00	3	2/3/3	SE/SE/SE	0/0/0	6/4/6	2/2/2	2/2/2	0/0/0	2/2/2

Date	VP	Surveyor	Start Time	Finish Time	Effort (Hours)	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
12/03/2018	4	GR	07.35	10.35	3	0/1/2	-/E/E	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
13/03/2018	1	AM	10.35	13.35	3	1/1/2	S/S/SW	0/0/0	6/5/5	2/2/2	2/2/2	0/0/0	1/1/1
13/03/2018	1	AM	14.25	17.25	3	1/2/1	S/S/S	0/0/0	6/6/7	2/2/2	2/2/2	0/0/0	1/1/1
13/03/2018	4	PC	11.00	14.00	3	2/2/2	SE/SE/SE	0/0/0	7/5/6	1/2/2	2/2/2	0/0/0	1/1/1
13/03/2018	4	PC	14.30	17.30	3	2/2/2	SE/SE/SE	2/0/0	7/6/6	2/2/2	2/2/2	0/0/0	1/1/1
14/03/2018	2	AM	09.10	12.10	3	4/3/3	SSE/SSE/S	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	1/1/1
14/03/2018	2	AM	12.40	15.40	3	3/4/4	SSE/SE/SE	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	1/1/1
14/03/2018	3	PC	09.30	12.30	3	4/4/4	SE/SE/SE	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	1/1/1
14/03/2018	3	PC	13.00	16.00	3	4/4/4	SE/SE/SE	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	1/1/1
20/03/2018	1	AM	11.10	14.10	3	2/2/2	WNW/WNW/WNW	0/0/0	4/3/2	2/2/2	2/2/2	0/0/0	2/2/2
20/03/2018	1	AM	14.40	17.40	3	3/2/2	WNW/NW/NW	0/0/0	2/2/2	2/2/2	2/2/2	0/0/0	2/2/2
21/03/2018	2	AM	09.00	12.00	3	3/3/4	W/W/WSW	2/2/2	7/7/7	2/2/2	2/2/2	0/0/0	2/2/2
21/03/2018	2	AM	12.30	15.30	3	4/3/3	WSW/WSW/WSW	2/2/2	7/7/7	2/2/2	2/2/2	0/0/0	2/2/2
21/03/2018	3	AM	08.45	11.45	3	4/4/4	W/W/W	2/2/2	8/8/7	1/2/1	2/2/2	0/0/0	1/1/1
21/03/2018	3	AM	12.15	15.15	3	4/4/4	W/W/W	2/2/2	7/7/8	1/1/2	2/2/2	0/0/0	1/1/1
25/03/2018	4	GR	06.45	09.45	3	2/3/3	WNW/WNW/WNW	1/1/2	8/8/7	1/1/2	2/2/2	0/0/0	0/0/0
25/03/2018	4	GR	10.15	13.15	3	4/3/3	WNW/WNW/WNW	2/2/0	7/6/6	2/2/2	2/2/2	0/0/0	0/0/0
06/04/2018	1	CS	09.10	12.10	3	3/3/2	E/E/E	2/2/2	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
06/04/2018	1	CS	12.40	15.40	3	2/2/2	E/E/E	2/2/2	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
06/04/2018	2	AM	09.05	12.05	3	3/3/3	SE/SSE/SSE	2/2/2	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
06/04/2018	2	AM	12.35	15.35	3	3/3/2	SSE/SE/SE	2/2/2	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
06/04/2018	4	PC	09.10	12.10	3	3/3/3	SE/ESE/ESE	2/2/2	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
06/04/2018	4	PC	12.40	15.40	3	3/3/3	ESE/SE/SE	2/2/2	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
09/04/2018	3	GR	10.15	13.15	3	1/1/1	E/E/E	0/0/0	6/5/4	2/2/2	2/2/2	0/0/0	2/2/2
09/04/2018	3	GR	13.45	16.45	3	2/2/2	E/E/E	0/0/0	4/5/6	2/2/2	2/2/2	0/0/0	2/2/2
10/04/2018	2	AM	13.55	16.55	3	2/3/3	NE/NE/NE	0/0/2	7/8/8	1/1/1	2/2/2	0/0/0	2/2/2
10/04/2018	2	AM	10.25	13.25	3	3/2/2	ENE/NE/NE	0/0/0	6/7/8	1/1/1	2/2/2	0/0/0	2/2/2
10/04/2018	4	PC	10.30	13.30	3	3/3/3	NNE/NNE/NNE	0/0/0	8/8/8	1/1/1	2/2/2	0/0/0	2/2/2
10/04/2018	4	PC	14.00	17.00	3	3/3/3	NNE/NNE/NNE	0/0/2	8/8/8	1/1/1	2/2/2	0/0/0	2/2/2

Date	VP	Surveyor	Start Time	Finish Time	Effort (Hours)	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
15/04/2018	3	GR	09.30	12.30	3	2/2/3	E/E/SE	0/0/0	3/3/3	2/2/2	2/2/2	0/0/0	0/0/0
15/04/2018	3	GR	13.00	16.00	3	3/4/3	SE/SE/SE	0/0/0	2/3/2	2/2/2	2/2/2	0/0/0	0/0/0
16/04/2018	1	AM	10.45	13.45	3	2/2/2	S/S/S	2/2/2	6/5/6	2/2/2	2/2/2	0/0/0	2/2/2
16/04/2018	1	AM	14.15	17.15	3	3/3/2	S/S/S	0/0/0	6/5/4	2/2/2	2/2/2	0/0/0	2/2/2
20/05/2018	3	GR	12.05	15.05	3	4/4/4	SW/SW/SW	0/1/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
20/05/2018	3	GR	15.35	18.35	3	4/3/3	SW/SW/SW	0/0/0	8/6/7	2/2/2	2/2/2	0/0/0	0/0/0
25/05/2018	1	PC	04.35	07.35	3	2/2/3	NW/NW/NW	0/0/0	6/4/5	2/2/2	2/2/2	0/0/0	0/0/0
25/05/2018	1	PC	08.05	11.05	3	3/3/3	NW/NW/NW	0/0/0	6/6/6	2/2/2	2/2/2	0/0/0	0/0/0
25/05/2018	2	GP	04.00	07.00	3	1/1/0	N/NNW/-	0/0/0	7/4/6	2/2/2	2/2/2	0/0/0	0/0/0
25/05/2018	2	GP	07.30	10.30	3	2/2/2	NNW/NW/NNE	0/0/0	6/4/3	2/2/2	2/2/2	0/0/0	0/0/0
25/05/2018	4	AM	03.40	06.40	3	2/2/2	NW/NNW/NNW	0/0/0	7/6/5	2/2/2	2/2/2	0/0/0	0/0/0
25/05/2018	4	AM	07.10	10.10	3	2/2/2	NW/NW/E	0/0/0	5/4/4	2/2/2	2/2/2	0/0/0	0/0/0
17/06/2018	3	GR	11.45	14.45	3	4/4/4	SSW/SSW/SSW	0/0/0	4/5/5	2/2/2	2/2/2	0/0/0	0/0/0
17/06/2018	3	GR	15.15	18.15	3	4/3/3	SSW/S/S	0/0/0	5/5/5	2/2/2	2/2/2	0/0/0	0/0/0
24/06/2018	2	GR	15.40	18.40	3	3/3/3	SW/SW/SW	0/0/0	4/3/3	2/2/2	2/2/2	0/0/0	0/0/0
24/06/2018	4	GR	19.10	22.10	3	2/2/2	W/W/W	0/0/0	4/4/3	2/2/2	2/2/2	0/0/0	0/0/0
25/06/2018	1	RW	10.25	13.25	3	1/1/1	SW/SW/SW	0/0/0	0/0/0	0/0/0	2/2/2	0/0/0	0/0/0
26/06/2018	1	RW	08.30	11.30	3	1/1/1	SW/SW/SW	0/0/0	0/0/0	0/0/0	2/2/2	0/0/0	0/0/0
28/06/2018	1	GR	13.00	16.00	3	2/2/2	NW/NW/NW	0/0/0	1/0/0	2/0/0	2/2/2	0/0/0	0/0/0
28/06/2018	1	GR	16.30	19.30	3	0/0/0	-	0/0/0	0/0/0	0/0/0	2/2/2	0/0/0	0/0/0
30/06/2018	2	AM	12.30	15.30	3	2/2/2	SSE/S/SSE	0/0/0	1/1/1	2/2/2	2/2/2	0/0/0	0/0/0
30/06/2018	4	RS	12.40	15.40	3	2/2/2	SSE/S/S	0/0/0	1/1/1	2/2/2	2/2/2	0/0/0	0/0/0
30/06/2018	4	RS	16.10	19.10	3	2/2/2	S/SSW/S	0/0/0	1/1/1	2/2/2	2/2/2	0/0/0	0/0/0
30/06/2018	2	AM	16.00	19.00	3	2	SSE/SSE/SE	0	1	2	2	0	0
01/07/2018	1	AM	08.40	11.40	3	1/2/2	SSE/SW/WSW	0/0/0	2/2/2	2/2/2	2/2/2	0/0/0	0/0/0
01/07/2018	1	AM	12.10	15.10	3	2/3/4	W/W/W	0/0/0	3/5/6	2/2/2	2/2/2	0/0/0	0/0/0
01/07/2018	4	RS	09.00	12.00	3	2/2/2	SW/S/SSW	0/0/0	1/2/4	2/2/2	2/2/2	0/0/0	0/0/0
01/07/2018	4	RS	12.30	15.30	3	2/2/2	SW/SW/W	0/0/0	4/6/7	2/2/2	2/2/2	0/0/0	0/0/0
18/07/2018	3	AM	14.25	17.25	3	3/2/2	W/WSW/WSW	0/0/0	8/7/7	2/2/2	2/2/2	0/0/0	0/0/0

Date	VP	Surveyor	Start Time	Finish Time	Effort (Hours)	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
18/07/2018	2	PC	16.55	19.55	3	3/2/1	W/W/W	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
18/07/2018	3	AM	17.55	20.55	3	1/1/1	NW/WSW/WSW	0/0/0	6/6/6	2/2/2	2/2/2	0/0/0	0/0/0
20/07/2018	4	PC	11.00	14.00	3	2/2/2	SSW/SW/SW	2/2/2	7/8/7	2/1/1	2/2/2	0/0/0	0/0/0
20/07/2018	2	AM	10.55	13.55	3	2/2/2	WSW/WSW/WSW	0/1/2	7/7/6	1/1/1	2/2/2	0/0/0	0/0/0
31/07/2018	2	GR	16.00	19.00	3	4/4/4	SSE/S/S	0/0/2	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
20/08/2018	1	PC	14.50	17.50	3	2/2/2	NW/NW/NW	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
20/08/2018	1	PC	18.20	21.20	3	2/2/2	NNW/NNW/NNW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
20/08/2018	4	AM	14.20	17.20	3	2/2/3	NW/NW/NW	0/0/0	8/8/7	2/2/2	2/2/2	0/0/0	0/0/0
20/08/2018	4	AM	17.50	20.50	3	2/1/1	NW/NW/NW	0/0/0	7/8/8	2/2/2	2/2/2	0/0/0	0/0/0
21/08/2018	2	PC	08.20	11.20	3	0/1/1	-/SE/SE	0/0/0	7/8/8	2/2/2	2/2/2	0/0/0	0/0/0
21/08/2018	3	AM	08.50	11.50	3	1/2/3	SE/SSE/S	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
21/08/2018	3	AM	12.20	15.20	3	3/4/4	S/S/S	0/0/0	7/7/8	2/2/2	2/2/2	0/0/0	0/0/0
21/08/2018	2	PC	11.50	14.50	3	2/3/3	SE/E/SE	0/0/0	7/7/7	2/2/2	2/2/2	0/0/0	0/0/0
28/08/2018	3	GR	09.40	12.40	3	2/3/3	SW/SW/SW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
28/08/2018	3	GR	13.10	16.10	3	3/3/2	SW/SW/SSW	0/0/0	8/8/7	2/2/2	2/2/2	0/0/0	0/0/0

**Table A3-2: Moorland breeding bird survey effort (2017).**

Date	Surveyor	Start Time	Finish Time	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
13/04/2017	AM	08.10	14.35	2-3	WNW/W	2	6-7	2/1/1/2/2/2	2	0	0
13/04/2017	CS	08.10	14.10	2-3	WNW/W	2	5-8	2	2	0	0
13/04/2017	PC	08.10	14.10	2-4	WSW	2	7-8	2/1/2/2/2/2	2	0	0
17/05/2017	PC	08.10	14.05	3	SSW	0-2	5-7	2	2	0	0
17/05/2017	GP	08.00	14.00	2-3	S/SSE/SSW	0-2	7-8	2	2	0	0
17/05/2017	AM	08.05	14.40	3	SW	0-1	6	2	2	0	0
14/06/2017	PC	08.05	14.00	1-3	SSE/SSW	0-1	8	2	2	0	0
14/06/2017	AM	08.05	14.00	2-3	S/SE/SW	0-1	8	2	2	0	0
14/06/2017	CS	08.05	14.00	3	WSW	0-2	7-8	2	2	0	0
20/07/2017	PC	09.15	15.05	3	W/WNW/NW	0-2	8	1/2/2/2/2/2	2	0	0
20/07/2017	AM	09.15	15.40	3	W/N	0-2	8	1/2/2/2/2/2	2	0	0

Date	Surveyor	Start Time	Finish Time	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
21/07/2017	AM	07.00	13.05	2-3	E	0	2-6	2	2	0	0

**Table A3-3 Moorland breeding bird survey effort (2018).**

Date	Surveyor	Start Time	Finish Time	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
05/04/2018	CS	09.30	15.30	2	NW	0	3-4	2	0-1	0	0
05/04/2018	AM	09.35	15.40	2-3	WNW/NW	0	3-4	22	2	0-1	2
05/04/2018	PC	09.35	15.20	2-3	WNW	0	3-5	2	2	0-1	2
24/05/2018	AM	10.30	16.45	1-2	S/SSW/SW	0	0-3	0-2	2	0	0
24/05/2018	GP	10.30	16.30	2	SSE/SE/SSW/S	0	0-2	0-2	2	0	0
24/05/2018	PC	10.30	16.30	1-2	SE/SSE/S	0	0-4	2	2	0	0
22/06/2018	PC	10.10	15.05	3	WNW/W/W	0	7	2	2	0	0
22/06/2018	AM	10.10	16.10	2-3	WNW/W/W	0	6-7	2	2	0	0
23/06/2018	AM	08.20	14.15	3	WSW/ W	0	7-8	2	2	0	0
19/07/2018	PC	10.10	16.20	3	SW	0	6-7	2	2	0	0
19/07/2018	AM	10.00	16.05	3	SW	0	3-5	2	2	0	0
29/07/2018	GR	12.30	18.00	1-2	SW	0-2	6-8	1	2	0	0

**Table A3-4 Breeding black grouse search effort (2017).**

Date	Surveyor	Start Time	Finish Time	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
24/03/2017	PC	05.20	08.30	2/2/2	SW/SW/SW	0/0/0	7/8/8	2/2/2	2/2/2	1/0/0	2/2/2
24/03/2017	AC	05.30	08.05	2/2/2	SW/SW/SW	0/0/0	7/8/7	2/2/2	2/2/2	0/0/0	2/2/2
24/03/2017	AM	05.20	08.20	1/1/1	SW/SW/SW	0/0/0	7/8/7	2/2/2	2/2/2	0/0/0	2/2/2
20/04/2017	PC	05.05	08.05	2/3/3	SW/W/SW	0/0/0	8/7/7	2/2/2	2/2/2	0/0/0	0/0/0
01/05/2017	PC	04.35	07.35	3/3/3	NE/NE/NE	0/0/0	2/3/4	2/2/2	2/2/2	0/0/0	0/0/0
01/05/2017	AM	04.35	07.55	2/2/2	SE/SE/SE	0/0/0	3/3/3	2/2/2	2/2/2	0/0/0	0/0/0
18/05/2017	PC	04.05	07.05	0/1/1	-/W/SW	0/0/0	1/2/1	2/2/2	2/2/2	1/0/0	0/0/0
18/05/2017	GP	03.50	06.50	1/0/0	S/-/-	0/0/0	7/0/0	2/2/2	2/2/2	0/0/0	0/0/0
18/05/2017	AM	04.05	07.10	1/1/1	W/W/W	0/0/0	1/1/1	2/2/2	2/2/2	0/0/0	0/0/0

Date	Surveyor	Start Time	Finish Time	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
14/03/2018	PC	05.40	08.49	3	SE	0	6/7/8	2	2	0	1
14/03/2018	AJM	05.35	08.40	3	SSE	0	6/7/8	2	2	0	1
21/03/2018	PC	05.20	08.20	2/3/3	W	2	8	2	2	0	2
21/03/2018	AM	05.15	08.15	3	W	2/0/2	8/7/8	2	2	0	1
06/04/2018	CS	05.40	08.40	2	E	2/0/0	8	2	2	0	0
06/04/2018	AM	05.35	08.35	2/2/3	SE	0/2/2	8	2	2	0	2
06/04/2018	PC	05.40	08.40	2/3/3	SE	01/02/2002	8	2	2	0	2

**Table A3-5 Breeding black grouse search effort (2018).**

Date	Surveyor	Start Time	Finish Time	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
24/03/2017	PC	05.20	08.30	2	SW	0	7-8	2	2	0-1	2
24/03/2017	AC	05.30	08.05	2	SW	0	7-8	2	2	0	2
24/03/2017	AM	05.20	08.20	1	SW	0	7-8	2	2	0	2
20/04/2017	PC	05.05	08.05	2-3	W/SW	0	7-8	2	2	0	0
01/05/2017	PC	04.35	07.35	3	NE	0	2-4	2	2	0	0
01/05/2017	AM	04.35	07.55	2	SE	0	3	2	2	0	0
18/05/2017	PC	04.05	07.05	0-1	-/W/SW	0	1-2	2	2	0-1	0
18/05/2017	GP	03.50	06.50	0-1	S/-	0	0-7	2	2	0	0
18/05/2017	AM	04.05	07.10	1	W	0	1	2	2	0	0
14/03/2018	PC	05.40	08.49	3	SE	0	6-8	2	2	0	1
14/03/2018	AM	05.35	08.40	3	SSE	0	6-8	2	2	0	1
21/03/2018	PC	05.20	08.20	2-3	W	2	8	2	2	0	2
21/03/2018	AM	05.15	08.15	3	W	0-2	7-8	2	2	0	1
06/04/2018	CS	05.40	08.40	2	E	0-2	8	2	2	0	0
06/04/2018	AM	05.35	08.35	2-3	SE	0-2	8	2	2	0	2
06/04/2018	PC	05.40	08.40	2-3	SE	0-2	8	2	2	0	2

**Table A3-5 Breeding black grouse search effort (2018).**

Date	Surveyor	Start	Finish	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud	Visibility	Frost	Snow
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		Time	Time					Height			
16/09/2016	AC/PC	08.55	14.30	2-3	SW	0	5/6/6/8/8	2	2	0	0
24/11/2016	GR	09.30	15.30	0-1	-/S	0	2/3/2/2/2/2	2	2	1/1/0/0/0/0	1
24/11/2016	MW	09.20	15.50	0-1	-/NW	0	0/0/1/2/2/2/2	2	2	2	1
23/01/2017	GR	08.45	15.15	2	SSW	0	3	2	2	0	0
24/01/2017	GR	09.00	15.30	3	S	0	7	2	2	0	2
28/03/2017	PC	08.30	14.00	1	E	0	8	1/1/2/2/2/2	2	0	0
28/03/2017	RW	08.30	14.30	0	-	0	8/8/8/7/5/6	1/1/2/2/2/2	1/1/2/2/2/2	0	0

## ANNEX 4 – VP FLIGHT ACTIVITY SURVEY: TARGET SPECIES FLIGHTS

Table A4-1 presents details of target species flight lines recorded during VP flight activity surveys between September 2016 and August 2018. The species, number of birds, total flight duration and duration spent below (HT1), at (HT2) and above (HT3) rotor sweep height is presented.

**Table A4-1: Target species flights (September 2016 to August 2018).**

Date	VP	Species	No. of Birds	Start Time	Duration (s)	HT1 (s)	HT2 (s)	HT3 (s)
28/09/2016	2	Pink-footed goose	73	12.03	65	0	65	0
28/09/2016	2	Black grouse	1	12.56	30	30	0	0
28/09/2016	3	Pink-footed goose	52	10.13	135	0	0	135
28/09/2016	3	Pink-footed/greylag goose mixed flock	47	10.22	120	0	120	0
28/09/2016	3	Pink-footed goose	92	10.36	150	0	0	150
28/09/2016	3	Golden plover	1	11.10	35	0	35	0
30/09/2016	2	Golden eagle	1	15.58	240	0	240	0
30/09/2016	3	Red kite	1	13.02	244	0	244	0
30/09/2016	3	Pink-footed goose	22	13.04	130	0	130	0
30/09/2016	3	Greylag goose	70	14.34	249	0	0	249
01/10/2016	3	Greylag goose	50	10.13	121	0	90	31
01/10/2016	3	Black grouse	1	10.46	19	19	0	0
17/10/2016	1	Pink-footed goose	2	12.17	205	0	205	0
17/10/2016	1	Greylag goose	9	12.17	205	0	205	0
18/10/2016	3	Peregrine	1	09.51	257	0	257	0
18/10/2016	3	Greylag goose	64	13.56	138	0	138	0
18/10/2016	3	Greylag goose	56	14.05	100	0	100	0
18/10/2016	3	Greylag goose	72	15.27	140	0	0	140
28/10/2016	1	Peregrine	1	10.16	177	0	177	0
11/11/2016	1	Hen harrier	1	12.27	136	121	15	0
16/11/2016	4	Whooper swan	2	9.24	45	45	0	0
25/11/2016	2	Whooper swan	1	9.17	214	0	214	0
25/11/2016	2	Grey heron	2	9.27	157	0	157	0
25/11/2016	2	Grey heron	1	9.44	63	0	63	0

Date	VP	Species	No. of Birds	Start Time	Duration (s)	HT1 (s)	HT2 (s)	HT3 (s)
25/11/2016	2	Red kite	1	11.2	515	0	515	0
25/11/2016	2	Golden eagle	1	11.55	675	0	675	0
25/11/2016	3	Whooper swan	5	10.14	76	0	76	0
25/11/2016	3	Golden eagle	1	11.23	59	0	59	0
12/12/2016	2	Red kite	1	11.29	232	0	232	0
13/12/2016	3	Hen harrier	1	12.58	60	45	15	0
13/01/2017	2	Goshawk	1	09.54	45	0	45	0
06/02/2017	2	Red kite	1	13.35	161	0	161	0
06/02/2017	2	Peregrine	1	16.14	32	2	30	0
03/03/2017	1	Red kite	1	10.23	60	0	60	0
03/03/2017	1	White-tailed eagle	1	14.01	670	0	0	670
22/03/2017	4	Red kite	1	14.18	877	247	630	0
23/03/2017	3	Golden eagle	1	13.35	645	0	0	645
20/04/2017	2	Goosander	2	11.41	30	30	0	0
20/04/2017	2	Common sandpiper	1	11.49	30	30	0	0
20/04/2017	3	Greenshank	1	10.16	36	0	36	0
20/04/2017	3	Greenshank	1	10.25	47	0	47	0
20/04/2017	3	Golden plover	2	11.46	30	15	15	0
20/04/2017	3	Golden plover	1	13.31	10	0	10	0
30/04/2017	3	Golden plover	1	07.14	78	0	78	0
30/04/2017	3	Osprey	1	08.11	193	0	193	0
30/04/2017	3	Golden plover	1	09.41	67	0	67	0
30/04/2017	4	Black grouse	1	17.16	16	16	0	0
30/04/2017	4	Black grouse	1	20.00	8	8	0	0
06/07/2017	2	Grey heron	1	10:26	10	10	0	0
06/07/2017	2	Oystercatcher	1	13:31	74	44	30	0
28/07/2017	1	Peregrine	2	13:41	55	25	30	0
24/08/2017	1	Red kite	1	10:28	305	45	260	0
24/08/2017	4	Golden eagle	1	12:59	190	0	0	190
31/08/2017	1	Golden eagle	1	16:02	35	0	35	0

Date	VP	Species	No. of Birds	Start Time	Duration (s)	HT1 (s)	HT2 (s)	HT3 (s)
31/08/2017	4	Grey heron	1	18:22	130	95	35	0
11/09/2017	1	Golden eagle	1	16:30	100	0	100	0
11/09/2017	4	Black grouse	1	13:32	60	20	40	0
12/09/2017	2	Goosander	1	10:18	105	0	105	0
12/09/2017	2	White-tailed eagle	1	14:16	170	0	170	0
12/09/2017	3	Red kite	1	12:34	180	0	180	0
29/09/2017	2	Red kite	1	11:37	205	0	205	0
29/09/2017	2	Golden eagle	2	13:44	315	0	315	0
29/09/2017	2	Golden eagle	1	14:31	730	0	730	0
29/09/2017	4	Golden eagle	1	14:33	195	0	195	0
18/10/2017	4	Black grouse	2	08:47	25	25	0	0
18/10/2017	4	Golden eagle	1	10:46	178	0	178	0
19/10/2017	4	Pink-footed goose	26	10:28	440	0	440	0
20/10/2017	1	Black grouse	3	07:43	16	16	0	0
27/10/2017	3	Golden eagle	1	11:34	248	0	248	0
19/11/2017	1	Red kite	1	11:04	54	0	54	0
29/11/2017	4	Golden eagle	1	11:44	439	0	239	200
22/12/2017	2	Red kite	1	12:26	480	0	480	0
22/12/2017	2	Golden eagle	2	13:47	130	0	130	0
22/12/2017	2	Golden eagle	1	14:56	245	0	245	0
28/12/2017	1	Peregrine	1	12:31	75	30	45	0
28/12/2017	1	Red kite	1	12:38	45	0	45	0
29/01/2018	3	Golden eagle	1	10:48	542	0	542	0
29/01/2018	3	Golden eagle	1	10:54	20	0	20	0
17/02/2018	2	Golden eagle	1	09:48	125	0	125	0
17/02/2018	2	Red kite	1	12:32	200	0	200	0
25/02/2018	3	Golden eagle	1	12:24	127	2	125	0
26/02/2018	3	Golden eagle	1	11:58	235	0	210	25
26/02/2018	3	Golden eagle	1	12:06	190	0	100	90
27/02/2018	2	Red kite	1	11:17	443	60	368	15

Date	VP	Species	No. of Birds	Start Time	Duration (s)	HT1 (s)	HT2 (s)	HT3 (s)
27/02/2018	2	Golden eagle	1	14:44	75	0	60	15
27/02/2018	2	Golden eagle	1	14:45	40	0	40	0
11/03/2018	4	Red kite	1	12:09	74	0	74	0
11/03/2018	4	Red kite	1	12:19	121	16	105	0
11/03/2018	4	Goshawk	1	12:21	26	0	26	0
13/03/2018	4	Golden eagle	1	11:16	221	0	0	221
13/03/2018	4	White-tailed eagle	1	11:38	247	0	0	247
13/03/2018	4	Golden eagle	1	15:54	949	0	75	874
14/03/2018	2	Golden eagle	1	11:42	210	0	210	0
14/03/2018	2	Goosander	2	15:34	165	0	165	0
25/03/2018	4	Golden eagle	1	11.34	278	0	278	0
25/03/2018	4	Golden eagle	1	11.34	700	0	700	0
06/04/2018	1	Pink-footed goose	2	10:58	78	0	78	0
06/04/2018	1	Pink-footed goose	35	13:15	122	0	122	0
06/04/2018	1	Pink-footed goose	9	14:09	60	0	0	60
06/04/2018	1	Pink-footed goose	55	15:20	129	0	129	0
06/04/2018	2	Goosander	1	13:02	95	35	60	0
06/04/2018	2	Pink-footed goose	42	13:17	130	0	130	0
06/04/2018	2	Grey heron	2	13:26	75	75	0	0
06/04/2018	2	Greylag goose	36	15:23	180	0	180	0
06/04/2018	2	Pink-footed goose	1	15:23	180	0	180	0
06/04/2018	4	Grey heron	1	12:43	26	26	0	0
09/04/2018	3	Golden plover	1	13:52	67	0	67	0
09/04/2018	3	Golden plover	1	15:46	78	0	78	0
10/04/2018	2	Whooper swan	2	11:09	210	90	120	0
10/04/2018	2	Snipe	1	11:22	420	0	420	0
10/04/2018	2	Grey heron	1	11:31	55	55	0	0
10/04/2018	4	Pink-footed goose	70	10:56	138	0	18	120
15/04/2018	3	Golden eagle	1	12:04	80	0	80	0
16/04/2018	1	Golden eagle	1	13:15	145	0	145	0

Date	VP	Species	No. of Birds	Start Time	Duration (s)	HT1 (s)	HT2 (s)	HT3 (s)
25/05/2018	1	Grey heron	1	05:32	68	0	68	0
25/05/2018	1	Grey heron	1	09:25	115	0	115	0
25/05/2018	4	Black grouse	2	05:24	35	35	0	0
25/05/2018	4	Black grouse	1	06:31	15	15	0	0
17/06/2018	3	Red-throated diver	1	12:41	188	0	188	0
24/06/2018	4	Black grouse	1	20:12	44	15	29	0
01/07/2018	1	Red kite	1	09:49	375	0	375	0
21/08/2018	2	Golden eagle	1	13:09	225	0	225	0
21/08/2018	2	Golden eagle	1	13:41	165	45	120	0