

## Appendix 7.1 Ornithology

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## Appendix 7.1 Ornithology

### Introduction

This Technical Appendix has been prepared to accompany Chapter 7 in Volume 1 of the Knockcronal Wind Farm (hereafter the Proposed Development) EIA Report.

It presents detailed methodologies and results of desk studies and field surveys completed to establish baseline conditions with regards to ornithology, in order to inform the design and assessment of the Proposed Development.

It should be read with reference to the following specific figures, presented in Volume 2 of the EIA Report:

- Figure 7.1: Ornithological Statutory Designated Sites.
- Figure 7.2: Desk Study.
- Figure 7.3: Vantage Point (VP) Survey Plan.
- Figure 7.4: Breeding Bird Survey Plan.
- Figure 7.5: VP Flight Activity Target Species Results.
- Figure 7.6: Moorland Breeding Bird Survey Results.
- Confidential Figure 7.7: Confidential Ornithology – Desk Study.
- Confidential Figure 7.8: Confidential Ornithology – Breeding Raptor Survey Results.

Only common bird species names are referred to within the main text of this Technical Appendix. Annex 1 provides a summary of all bird species referred to herein, within Chapter 7 in Volume 1 of the EIA Report and the Appendix 7.2, and associated Figures. Common and species names, together with a summary of their conservation status as relevant, are provided.

Information pertaining to the locations of sensitive breeding bird species, which is considered confidential, is provided in Confidential Figures 7.7 and 7.8 in Volume 5 of the EIA Report. Such information will not be made publicly available, but will be provided to NatureScot and South Ayrshire Council (SAC).

### **Site Overview**

Land within the site is shown in Figures 7.1 - 7.6 in Volume 2 of the EIA Report. The site is located approximately 4.8 km south of Straiton, 17.5 km east of Girvan, in South Ayrshire. There are no designated sites with ornithology interest within 2 km of the site, with the nearest such site greater than 8.5 km from the site (Bogton Lochs Site of Special Scientific Interest [SSSI] which is partly designated for its breeding bird assemblage of passerines and black-headed gull colony).

The habitats within the site comprise a mosaic of rough pasture, including acid and marshy grassland, with areas of blanket mire and wet modified bog. Commercial conifer plantations border the site to the west, south and east. There is also a small, isolated stand of mature conifers located on-site.

The lower lying northern extent of the site consists of gently sloping, to flat, farmland with improved and semi-improved grasslands. The southern extent of the site, on higher elevation, rises to an undulating plateau with prominent small hills, and which supports a more complex association of upland plant communities.

Habitat along the two proposed access routes is principally commercial conifer plantation, both routes include sections of existing forestry track but only one route will be progressed and utilised.

## Methodology

### ***Desk Study and Consultation***

In accordance with NatureScot guidance (Scottish Natural Heritage (SNH), 2017), a desk study was undertaken to provide an overview of likely bird populations and designated sites for nature conservation in proximity to the Proposed Development, in order to identify possible target species to inform the requirements for survey.

The desk study comprised a review of the sources summarised in Table 7.1.

Additional peer reviewed literature and industry guidance has also been reviewed and is referred to where relevant. Only those records within the last ten years (since 2010) are considered, given this provides the most up to date baseline information.

**Table 7.1 - Desk Study Sources**

<b>Key Source</b>	<b>Information Sought</b>	<b>Search Area</b>
Sitelink	Statutory designated sites for nature conservation with qualifying ornithological interests.	Within 10 km of the site, extended to 20 km for internationally designated sites with migratory geese qualifying interests.
Royal Society for Protection of Birds (RSPB)	Existing ornithological records.	6 km from the site, extended to 10 km for eagles.
South Strathclyde Raptor Study Group (SSRSG)	Existing records of scarce breeding and roosting raptors and owls.	2 km from the site, extended to 10 km for eagles.
South West Scotland Environmental Information Centre (SWSEIC)	Existing ornithological records and non-statutory designated sites with ornithological interest.	2 km from the site.
Linfairst Wind Farm Environmental Statement (ES) Chapter 8	Existing ornithological records from baseline surveys.	Study Areas are shown on Figures A8.1 and A8.2 of the Linfairst ES.

### ***Field Surveys***

Field survey effort and methodologies were agreed with NatureScot prior to commencement (see Chapter 7 in Volume 1 of the EIA Report, Table 7.1). In order to assess the potential effects of the Proposed Development upon ornithological features, detailed information about bird populations, distributions and flight activity has been derived from field surveys undertaken between 2019 and 2020.

Field surveyor knowledge and experience of bird habitat associations at comparable sites has also informed and guided survey effort over the course of surveys.

The following ornithology field surveys were completed:

- Reconnaissance survey visit.
- VP flight activity surveys (April 2019 to March 2020).
- Moorland breeding bird survey (MBBS) (April to July 2019).
- Breeding Annex 1/Schedule 1 raptor and owl searches (April to July 2019).
- Breeding woodland grouse searches (May 2019).

All surveys were undertaken in accordance with recommendations outlined within current NatureScot guidance (SNH, 2017), and as agreed through consultation with NatureScot. Full details of consultations are provided within Chapter 7 in Volume 1 of the EIA Report.

### **Target Species**

Target species for survey and recording were identified through desk study and consultation with NatureScot (See Chapter 7 in Volume 1 of the EIA Report), on the basis of their known or likely presence, their likely sensitivity to the proposed development and whether they are afforded a higher level of legislative protection, which is in accordance with current NatureScot guidance (SNH, 2017 and 2018).

Primarily, target species included those species listed on/as:

- Annex 1 of the EC Birds Directive (2009/147/EC).
- Schedule 1 of the Wildlife and Countryside Act 1981 (Amendment) (Scotland) Regulations 2001.
- Wetland birds, including geese, duck, waders and waterfowl (but excluding mallard and feral species).

This has ensured inclusion of qualifying interests of designated sites for nature conservation (Table 7.7) and target species that should be considered in the development of onshore wind farms in Scotland, as per NatureScot guidance (SNH, 2017).

### ***Field Survey Methodology***

#### **Reconnaissance Survey Visit**

A reconnaissance survey visit was undertaken in March 2019 by two competent ornithologists with a comprehensive understanding of bird-habitat associations in Scotland.

The reconnaissance survey sought to:

- provide an overview of features/habitats within the site, and surrounding area, which may be of potential ornithological interest;
- make any preliminary observations of signs indicative of potential target species;
- identify any access constraints; and
- establish the number of VP locations required to provide visual coverage of the required VP flight activity survey area in accordance with NatureScot guidance (SNH, 2017), on the basis of a maximum developable turbine envelope.

Broadly, the habitats on, and adjacent to, the site are considered to offer low ornithological interest. Livestock grazing onsite is considered likely to limit the potential for ground-nesting birds, although modest numbers of waders are possible. The trees on-site and woodland habitats adjacent to the

site are considered sub-optimal for nesting goshawk, but movements of goshawk through the site cannot be discounted.

The habitats on, and adjacent to, the site were appraised as sub-optimal for breeding black grouse; however breeding black grouse searches were undertaken as a precaution, particularly given the black grouse records returned from the wider area from the desk study.

### **VP Flight Activity Surveys**

VP flight activity surveys were undertaken between April 2019 and March 2020, providing coverage of one breeding season (April to August inclusive) and one non-breeding season (September to March).

#### VP Locations and Viewsheds

Two VPs were used between April 2019 and March 2020 to provide maximum coverage of the VP Flight Activity Study Area required in accordance with current NatureScot guidance (SNH, 2017); defined as a 500 m buffer around outermost Proposed Development turbine locations as illustrated in Figure 7.3 in Volume 2 of the EIA Report.

VP locations are presented within Table 7.2 and illustrated in Figure 7.3 in Volume 2 of the EIA Report.

Ground-truthed modelled areas of visibility within the 2 km viewsheds from each VP location are also illustrated in Figure 7.3 in Volume 2 of the EIA Report.

**Table 7.2 - VP Locations**

<b>VP</b>	<b>Grid Reference</b>	<b>Radius (m)</b>
1	NS 36721 00054	2000
2	NS 38680 00234	2000

#### VP Survey Effort

The total survey effort (hours) completed at each VP between April 2019 and March 2020 is summarised in Table 7.3. Full details of all survey times, field surveyors used and weather conditions are presented in Annex 3.

The total VP survey effort completed at each VP was 72 hours, and covered a full breeding season and non-breeding season (in accordance with NatureScot guidance [SNH, 2017]). This level of survey effort was discussed and agreed with NatureScot through letter correspondence on 30 May 2019 (see Table 7.1 of Chapter 7 of the EIA Report).

Survey times were dispersed throughout the day and were also completed in a range of weather conditions, but always in conditions conducive to survey and safe access.

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.

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 150 m which has subsequently been increased to 180 m and 200 m. Therefore, height bands HT2 to HT4 incorporate the rotor sweep:

- HT1 <10 m;
- HT2 10 to 25 m;
- HT3 25 to 50 m; and
- HT4 >150 m.

**Table 7.3 - VP Flight Activity Survey Effort Summary (Hours)**

VP	2019									2020			Total
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
1	6	6	6	6	6	6	6	6	6	6	6	6	72
2	6	6	6	6	6	6	6	6	6	6	6	6	72

Secondary Species

Secondary species were also noted in approximately 15 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.

Secondary species are defined here as commoner raptors (e.g. buzzard, kestrel and sparrowhawk), all gulls, raven, feral species and mallard, along with any large concentrations of Schedule 1 or Red-listed passerines as recorded during survey.

**Moorland Breeding Bird Survey (MBBS)**

MBBSs was undertaken in 2019.

The MBBS Study Area comprised coverage of the site, extended to include accessible areas of open habitats within 500 m as shown in Figure 7.4 in Volume 2 of the EIA Report and in accordance with current NatureScot guidance (SNH, 2017).

The methodology employed followed the Brown and Shepherd (1993) method for censusing upland breeding waders, based upon the recommendations set out in Calladine *et al.* (2009) as per current NatureScot guidance (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) may also be recorded.

A series of four staggered visits were completed between April and July 2019.

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.

All surveys were undertaken during daylight hours and in fine conditions conducive to surveying. Survey effort is summarised in Table 7.4. Full details of all survey times, field surveyors used and weather conditions are presented in Annex 3. Given the size of the MBBS Study Area, survey visits were typically undertaken by a small team of surveyors and/or over consecutive days.

**Table 7.4 - MBBS Effort**

Visit	Date	Start Time (24hrs)	Finish Time (24hrs)
1	11/4/19	09:00	14:35
	12/4/19	09:20	14:35
2	13/5/19	08:45	14:45
	14/5/19	08:30	13:35
3	27/6/19	09:00	14:10
4	22/7/19	09:30	14:45

**Breeding Annex 1/Schedule 1 Raptor and Owl Searches**

Searches for Annex 1/Schedule 1 breeding raptor and owls were undertaken between April and July 2019 (inclusive), with reference to species-specific methodologies outlined in Hardey *et al.* (2013).

A series of search visits were made, staggered across the core breeding season.

Survey effort is summarised in Table 7.5. Full details of all survey times, field surveyors used and weather conditions are presented in Annex 3. It typically took two surveyors one day to cover the Study Area, or a single surveyor two days.

The Study Area comprised coverage of the site and, where access allowed, areas out to 2 km as shown Figure 7.4 in Volume 2 of the EIA Report, in accordance with current NatureScot guidance (SNH, 2017).

Search effort and Study Areas were also informed through a review of desk study records, and through consultation with NatureScot.

**Table 7.5 - Breeding Raptor and Owl Search Effort Summary**

Visit	Date	Start Time (24hrs)	Finish Time (24hrs)
1	2/4/19	08:05	11:05
2	3/4/19	08:40	11:40
3	22/4/19	13:00	16:00
4	23/4/19	13:10	16:10
5	21/5/19	13:05	16:15
6	22/5/19	13:10	16:10
7	3/6/19	13:25	16:25
8	6/6/19	14:00	17:00
9	26/6/19	10:15	16:25
10	30/7/19	08:20	14:20

**Breeding Black Grouse Searches**

In accordance with current NatureScot guidance (SNH, 2017), searches for lekking black grouse were undertaken in 2019, and consisted of a preparatory visit to check for habitat suitability (which was done during the first MBBS survey), followed by three surveys to search for lekking breeding black grouse in May, following the methodology within Gilbert *et al.* (1998).



The Study Area comprised all suitable habitats (e.g. open moorland, woodland edges and tracks) within, and out to 1.5 km of the site where access allowed, as shown in Figure 7.4 in Volume 2 of the EIA Report, in accordance with current NatureScot guidance (SNH, 2017).

Survey effort is summarised in Table 7.6. Full details of all survey times, field surveyors used and weather conditions are presented in Annex 3.

Search effort and survey areas have been informed by desk study records and through consultation with NatureScot.

**Table 7.6 - Black Grouse Search Effort Summary**

Visit	Date	Start Time (24hrs)	Finish Time (24hrs)
1	14/5/19	04:20	07:20
2	20/5/19	04:10	07:10
3	21/5/19	04:05	07:05

#### **Study Area**

The Study Area used was specific to the survey type, and are stated in the respective sections above.

#### **Personnel**

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.

#### **Limitations**

All habitats within the site were accessible. The wider Study Areas used for the MBBS (500 m), Annex 1/ Schedule 1 Breeding Raptor and Owl Searches (2 km) and Breeding Black Grouse Searches (1.5 km) were surveyed from suitable locations within the site or public rights of way (PRoW), scanning the Study Areas with the use of optics (telescope and binoculars).

Given the good visibility across the Study Areas from PRoW this is not considered a limitation to the results obtained.

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

VP flight activity surveys 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 traverse to each VP location.

Surveyors were stationary until the completion of watches at the VP locations to ensure they did not influence bird behaviour.

No disturbance activities were noted during any of the surveys which could have affected bird behaviour.

Overall, the data are considered to provide an accurate reflection of the levels of target species activity within the Site and wider area, and no material limitations to the survey data are identified.

## Results

### **Desk Study**

This section provides details of existing ornithological information, including existing records of protected and notable bird species identified within and in proximity to the site from desk study sources listed in Table 7.1.

### **Statutory Designated Sites**

This section should be read with reference to Figure 7.1 in Volume 2 of the EIA Report.

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

Table 7.7 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.

Distances specified within Table 7.7 are taken from the site boundary to the designation boundary at its nearest point.

**Table 7.7 - Designated Sites for Nature Conservation**

*SSSI – Site of Special Scientific Interest*

<b>Designated Site</b>	<b>Distance / Orientation</b>	<b>Ornithological Qualifying Interests</b>
Bogton Lochs SSSI	8.6 km, north-east of the site.	Breeding bird assemblage of passerines and black-headed gull colony.
Merrick Kells SSSI	9.4 km, south-east of the site.	Breeding bird assemblage.

### **Non-Statutory Designated Sites**

SWSEIC shows that the site does not form part of any non-statutory designated site for nature conservation and no such sites are located within 2 km of the Proposed Development. However, there are two Provisional Local Wildlife Sites (pLWS) within 2 km, with the Straiton Hills pLWS located partially within the Site boundary to the in north-east, and the River Stinchar (Milton to Black Hill) pLWS located 625 m to the south of the site. Straiton Hills pLWS is described as a large and highly rated area of diverse upland and wetland habitats, including moorgrass grassland, blanket bog and rushy pasture, with several lochs and wooded glens; all of botanical and ornithological interest. River Stinchar (Milton to Black Hill) pLWS is described as a rich stretch of upland habitats which contains a number of scarce plants and breeding birds, with Linfern Loch being important for wildlife, including birds.

### **Existing Records of Protected and Notable Bird Species - SWSEIC**

Consultation with SWSEIC returned records of three species within 2 km of the site, comprising golden eagle, teal and common crossbill. None of these records were indicative of breeding.

Further details returned from SWSEIC are provided in Annex 2 and illustrated on Figure 7.2 in Volume 2 of the EIA Report.

### **Existing Records of Protected and Notable Bird Species - RSPB**

The only records returned by the RSPB were 80 records of black grouse, with 66 of these records indicative of breeding behaviour. The nearest breeding record was located approximately 2.5 km south-east of the site.

Further details of black grouse records returned from RSPB are provided in Annex 2 and illustrated on Figure 7.2 and breeding records are included on Confidential Figure 7.7 in Volume 2 of the EIA Report.

#### Existing Records of Protected and Notable Bird Species - SSRSG

The SSRSG returned no records from within 2 km of the site (extended to 10 km for eagles).

#### Existing Records of Protected and Notable Bird Species - Linfairn Wind Farm ES

A summary of the surveys undertaken to support the Linfairn Wind Farm ES Chapter are presented in Table 7.8.

**Table 7.8 - Summary of surveys which supported the Linfairn Wind Farm application**

Survey Type	Dates	Results
MBBS	Apr-Jun 2012	Lapwing (1 territory) and snipe (4 territories).
Breeding Annex 1/Schedule 1 raptor and owl searches	Mar-Jun 2012	No breeding species.
VP flight activity surveys	Oct 2011-Sep 2012	Pink-footed goose (3 flights), peregrine falcon (3 flights), osprey (2 flights) and hen harrier (1 flight). No collision risk modelling was undertaken.
Black Grouse Surveys	Mar-May 2012	No black grouse leks.
Winter Walkover Surveys	Oct 2011-Mar 2012	No wintering geese or swans.

### Field Surveys

This section presents the results of baseline field surveys, including an overview of birds present within the Study Areas and their distribution.

#### VP Flight Activity Surveys

##### Target Species

Target Species flight activity recorded during the VP survey period (April 2019 to March 2020) from both VPs combined is summarised in Table 7.9. The total number of all flights, total number of birds recorded and the total time spent in each height band (HT) (in seconds). This includes some flights which were detected outside of the VP study area (500 m turbine buffer) and which are not 'at-risk' in terms of collision.

Flights recorded within the 'at risk' window (within the collision risk zone at height bands HT3 and HT4) are presented in Table 7.10.

Detailed flight records are presented in Annex 4, which also indicates the total flight-time for each species below, at and above the indicative turbine rotor swept path. Flight lines for each target species over the entire survey period are illustrated in Figure 7.5 in Volume 2 of the EIA Report.

**Table 7.9 - Target Species Flight Activity Summary (All Flights)**

Species	Total no. of Flights	Total no. of Birds	Total Flight Time (secs) <sup>1</sup>
Mute swan	1	1	100
Pink-footed goose	3	620	43,700
Black grouse	2	2	29

Species	Total no. of Flights	Total no. of Birds	Total Flight Time (secs) <sup>1</sup>
Grey heron	1	1	40
Hen harrier	3	3	105
Goshawk	2	2	590
Golden plover	4	62	21,990
Curlew	4	4	295
Snipe	1	1	22

<sup>1</sup> Time multiplied by the number of birds.

**Table 7.10 - 'At Risk' Target Species Flight Activity Summary**

Species	Total no. of Flights	Total no. of Birds	Total Time Spent at Collision Risk (Secs) <sup>1</sup>
Mute swan	1	1	55
Pink-footed goose	3	620	43,700
Goshawk	2	2	590
Golden plover	4	62	16,000
Curlew	2	2	135

<sup>1</sup> Time multiplied by the number of birds.

#### Secondary Species

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

- mallard;
- sparrowhawk;
- buzzard;
- lesser black-backed gull;
- kestrel; and
- raven.

#### Collision Risk Mortality

Flight activity within the 'at risk' window was not at a sufficient level to allow collision risk mortality as a result of birds colliding with rotor blades to be assessed. The risk of collision mortality is considered to be inconsequential given the limited number of 'at risk' flights for all target species.

#### **Moorland Breeding Bird Surveys (MBBS)**

MBBS in 2019 recorded low numbers of breeding wader territories, consisting of curlew and snipe as summarised in Table 7.11 and illustrated in Figure 7.6 in Volume 2 of the EIA Report. Territories were recorded in areas of open habitat in the centre of the site, which is the characteristic habitat type on-site.

One common crossbill breeding territory was also recorded in woodland habitat on the western site boundary. The plantation woodland adjoining the western, southern and eastern site boundaries is suitable breeding habitat for this species.

**Table 7.11 - Target Species Breeding Territories**

Species	No. of Territories within the MBBS Study Area
Curlew	1
Snipe	1

**Breeding Annex 1/ Schedule 1 Raptor and Owl Searches**

During the searches in 2019 an osprey nest site was located in the Study Area (Confidential Figure 7.8 in Volume 2 of the EIA Report).

**Breeding Black Grouse Searches**

During the searches in 2019 (like in the searches in 2012 which informed the Linfairn application) no black grouse were recorded in the Study Area, and the species is considered likely to be absent.

## References

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## Annex 1 – Bird Species Summary

Table A1.1 provides a list of bird species referred to within Chapter 7 in Volume 1 of the EIA Report. Both common and species names are presented along with a summary of each species conservation status using the following abbreviations:

- Annex 1 - species listed on Annex 1 of the Birds Directive (2009/147/EC);
- 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 (Eaton *et al.*, 2015);
- SBL - species listed on the Scottish Biodiversity List; and
- LBAP - species listed as a priority species for Ayrshire Local Biodiversity Action Plan.

**Table A1.1 - Summary of Bird Species**

Common Name	Species Name	Conservation Status
Mute swan	<i>Cygnus olor</i>	BoCC – Amber
Pink-footed goose	<i>Anser brachyrhynchus</i>	BoCC – Amber
Teal	<i>Anas crecca</i>	BoCC – Amber
Mallard	<i>Anas platyrhynchos</i>	BoCC – Amber
Black grouse	<i>Tetrao tetrix</i>	SBL, BoCC – Red, LBAP
Grey heron	<i>Ardea cinerea</i>	-
Hen harrier	<i>Circus cyaneus</i>	Annex 1, Schedule 1, Schedule 1A, SBL, BoCC – Red, LBAP
Goshawk	<i>Accipiter gentilis</i>	Schedule 1
Sparrowhawk	<i>Accipiter nisus</i>	-
Buzzard	<i>Buteo</i>	-
Golden eagle	<i>Aquila chrysaetos</i>	Annex 1, Schedule 1, Schedule 1A, Schedule A1, SBL
Osprey	<i>Pandion haliaetus</i>	Annex 1, Schedule 1, SBL, BoCC – Amber
Golden plover	<i>Pluvialis apricaria</i>	Annex 1, SBL
Lapwing	<i>Vanellus</i>	SBL, BoCC – Red
Curlew	<i>Numenius arquata</i>	SBL, BoCC – Red
Snipe	<i>Gallinago</i>	BoCC – Amber
Black-headed gull	<i>Larus ridibundus</i>	SBL, BoCC – Amber
Lesser black-backed gull	<i>Larus fuscus</i>	BoCC – Amber
Kestrel	<i>Falco tinnunculus</i>	SBL, BoCC – Amber
Peregrine falcon	<i>Falco peregrinus</i>	Annex 1, Schedule 1, SBL
Raven	<i>Corvus corax</i>	-
Common crossbill	<i>Loxia curvirostra</i>	Schedule 1

## Annex 2 – Existing Ornithological Records

Table A2.1 provides a summary of existing ornithological records returned by RSPB within at least a 6 km radius from a centre grid reference within the site. Only post-2010 records are regarded, and only species regarded as target species are included within Table A2.1.

**Table A2.1 - Summary of Existing Ornithological Records (RSPB)**

Species	No. of Records	Date Range	Summary
Black grouse	80	2010 to 2017	Mostly likely breeding birds (66), but also non-breeding birds (14).

Table A2.2 provides a summary of existing ornithological records returned by SWSEIC within at least a 2 km from a centre grid reference within the Site. Only post-2010 records are regarded, and only species regarded as target species are included within Table A2.2.

**Table A2.2 - Summary of Existing Ornithological Records (SWSEIC)**

Species	No. of Records	Date Range	Summary
Teal	1	2010	1 record in May (no further information).
Golden eagle	1	2018	1 bird at Galloway Forest Park in April (non-breeding).
Common crossbill	3	2010	3 records in January and June (no further information).



## Annex 3 – Ornithology Field Survey Effort

The following codes are used to record weather conditions within Tables A3.1 to A3.4:

<b>Wind Speed</b>		<b>Rain</b>		<b>Cloud Cover</b>	
Calm	0	None	0	Out of 8	
Light air	1	Drizzle/mist	1		
Light breeze	2	Light showers	2	<b>Frost</b>	
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	<b>Visibility</b>			
Moderate gale	7	Poor	0	<b>Snow</b>	
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	<b>Cloud Height</b>			
		<150 m	0		
<b>Wind Direction</b>		150-500 m	1		
16 point compass		>500 m	2		

The following field surveyors carried out the ornithology surveys: Mr G. Palmer (GP), Mr T. Bowman (TB), Mr N. Bostock (NB), Mr R.T. Whytock (RTW) and Mr A. Russell (AR).

**Table A3.1 - VP Flight Activity Survey Effort (April 2019 – March 2020)**

Date	VP	Surveyor	Start Time (24h)	Finish Time (24h)	VP Hours	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
02/04/2019	1	RTW	11:30	14:30	3	3/3/3	SW/SW/SW	0/3/0	5/4/3	2/2/2	2/2/2	0/0/0	0/0/0
02/04/2019	1	RTW	15:00	18:00	3	3/2/3	SW/SW/SW	3/0/0	6/3/5	2/2/2	2/2/2	0/0/0	0/0/0
03/04/2019	2	RTW	12:30	15:30	3	3/2/2	W/NW/NW	0/2/0	8/8/8	2/2/1	2/2/2	0/0/0	0/0/0
03/04/2019	2	RTW	16:00	19:00	3	2/2/2	N/N/N	0/2/1	8/8/8	1/1/1	2/2/2	0/0/0	0/0/0
20/05/2019	2	GP	07:10	10:10	3	1/1/2	NW/WNW/WNW	0/0/0	8/8/8	1/1/1	2/2/2	0/0/0	0/0/0
20/05/2019	2	GP	10:40	13:40	3	2/2/2	W/WNW/W	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
21/05/2019	1	GP	07:05	10:05	3	2/1/1	WSW/WSW/WSW	0/0/0	6/7/8	2/2/2	2/2/2	0/0/0	0/0/0
21/05/2019	1	GP	10:35	13:35	3	2/2/2	WNW/WSW/WSW	0/0/0	7/6/7	2/2/2	2/2/2	0/0/0	0/0/0
19/06/2019	2	GP	14:00	17:00	3	3/3/3	SSW/SSW/SSW	0/0/0	8/7/7	2/2/2	2/2/2	0/0/0	0/0/0
19/06/2019	2	GP	10:30	13:30	3	2/2/3	S/SSW/SSW	0/0/0	5/7/8	2/2/2	2/2/2	0/0/0	0/0/0
21/06/2019	1	GP	13:30	16:30	3	2/2/2	SW/NW/SW	0/0/0	6/3/2	2/2/2	2/2/2	0/0/0	0/0/0
21/06/2019	1	GP	10:00	13:00	3	3/2/2	SW/W/W	2/0/2	7/6/7	2/2/2	2/2/2	0/0/0	0/0/0
18/07/2019	1	NB	08:30	11:30	3	2/2/3	SSW/SSW/SSW	0/0/2	8/8/7	1/1/1	2/2/2	0/0/0	0/0/0
18/07/2019	1	NB	12:00	15:00	3	2/2/3	SSW/SSW/SSW	0/2/2	7/7/7	1/1/1	2/2/2	0/0/0	0/0/0
30/07/2019	2	AR	08:40	11:40	3	1/2/2	N/N/N	0/0/0	5/5/7	2/2/2	2/2/2	0/0/0	0/0/0
30/07/2019	2	AR	12:10	15:10	3	2/2/2	N/N/N	0/1/0	7/8/8	2/2/2	2/2/2	0/0/0	0/0/0
21/08/2019	2	RTW	09:15	12:15	3	3/3/2	SW/SW/SW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
21/08/2019	2	RTW	12:45	15:45	3	3/3/3	SSW/SSW/SW	0/0/0	8/8/8	2/2/2	2/2/2	0/0/0	0/0/0
29/08/2019	1	RTW	07:20	10:20	3	3/4/3	SSW/SW/SSW	0/2/0	6/6/6	2/2/2	2/2/2	0/0/0	0/0/0
29/08/2019	1	RTW	10:50	13:50	3	3/3/3	SSW/SW/SW	0/3/0	7/6/7	2/2/2	2/2/2	0/0/0	0/0/0
06/09/2019	1	TB	09:40	12:40	3	2/2/2	W/W/W	2/3/2	6/7/8	1/1/1	2/2/2	0/0/0	0/0/0

06/09/2019	1	TB	13:10	16:10	3	2/2/2	W/W/W	2/3/2	8/8/8	1/1/1	2/2/2	0/0/0	0/0/0
13/09/2019	2	TB	13:20	16:20	3	4/3/3	WSW/W/W	0/0/0	3/5/4	2/2/2	2/2/2	0/0/0	0/0/0
13/09/2019	2	TB	16:50	19:50	3	3/2/1	W/W/W	0/0/0	3/2/2	2/2/2	2/2/2	0/0/0	0/0/0
03/10/2019	1	TB	07:20	10:20	3	0/2/2	-/SE/SE	0/0/0	7/8/8	2/2/2	2/2/2	1/0/0	0/0/0
03/10/2019	1	TB	10:50	13:50	3	3/3/3	SSE/S/SE	0/0/0	7/8/8	2/2/2	2/2/2	0/0/0	0/0/0
18/10/2019	2	TB	07:35	10:35	3	2/2/2	SE/SE/SE	0/0/0	5/3/3	2/2/2	2/2/2	0/0/0	0/0/0
18/10/2019	2	TB	11:05	14:05	3	2/2/1	SE/SE/SE	0/0/0	3/4/5	2/2/2	2/2/2	0/0/0	0/0/0
06/11/2019	1	TB	10:00	13:00	3	1/2/1	ESE/SE/SE	0/0/3	8/8/8	2/2/1	2/2/2	0/0/0	0/0/0
06/11/2019	1	TB	13:30	16:30	3	1/1/1	ESE/SE/SE	2/0/0	8/8/8	1/1/1	2/2/2	0/0/0	0/0/0
29/11/2019	2	TB	09:40	12:40	3	1/1/1	SE/ESE/E	0/0/0	0/0/0	N/A	2/2/2	1/1/1	0/0/0
29/11/2019	2	TB	13:10	16:10	3	0/0/0	N/A	0/0/0	0/0/0	N/A	2/2/2	0/0/0	0/0/0
04/12/2019	1	TB	08:10	11:10	3	2/2/2	SW/SW/SW	1/1/1	8/8/8	0/0/1	2/2/2	0/0/0	0/0/0
04/12/2019	1	TB	11:40	14:40	3	3/2/2	SW/SW/SW	2/0/0	8/8/6	0/0/1	2/2/2	0/0/0	0/0/0
09/12/2019	2	TB	08:10	11:10	3	4/3/3	NW/NNW/NW	0/0/0	3/2/3	2/2/2	2/2/2	0/0/0	0/0/0
09/12/2019	2	TB	11:40	14:40	3	3/3/2	NW/NW/NW	0/0/0	1/1/1	2/2/2	2/2/2	0/0/0	0/0/0
20/01/2020	1	TB	10:20	13:20	3	1/1/1	SW/SW/SW	0/0/0	8/8/8	1/1/1	2/2/2	0/0/0	0/0/0
20/01/2020	1	TB	13:50	16:50	3	1/2/2	SW/SW/SW	0/0/0	8/8/8	1/1/2	2/2/2	0/0/0	0/0/0
27/01/2020	2	TB	08:00	11:00	3	3/3/3	SSW/SSW/SSW	0/0/0	5/8/6	2/2/2	2/2/2	0/0/0	0/0/0
27/01/2020	2	TB	11:30	14:30	3	3/3/3	SSW/SSW/SSW	0/0/0	3/3/3	2/2/2	2/2/2	0/0/0	0/0/0
05/02/2020	1	TB	07:50	10:50	3	0/1/1	-/SW/SW	0/0/0	6/8/8	2/1/1	2/2/2	1/0/0	0/0/0
05/02/2020	1	TB	11:20	14:20	3	1/1/1	SW/SW/SW	0/0/0	8/8/8	1/1/2	2/2/2	0/0/0	0/0/0
18/02/2020	2	TB	11:20	14:20	3	3/4/4	WSW/WSW/WSW	0/2/0	8/8/8	2/2/2	2/2/2	0/0/0	2/2/2
18/02/2020	2	TB	14:50	17:50	3	4/4/4	WSW/W/W	3/2/2	8/7/6	1/1/2	2/2/2	0/0/0	2/2/2

03/03/2020	1	TB	11:50	14:50	3	1/1/1	WNW/WNW/WNW	2/2/2	8/7/7	2/1/2	2/2/2	0/0/0	2/2/2
03/03/2020	1	TB	15:20	18:20	3	1/1/1	WNW/WNW/WNW	0/2/2	5/5/6	2/2/1	2/2/2	0/0/0	2/2/2
09/03/2020	2	TB	06:25	09:25	3	3/3/2	W/W/W	1/0/0	8/8/8	1/1/1	2/2/2	0/0/0	0/0/0
09/03/2020	2	TB	09:55	12:55	3	3/3/3	WSW/WSW/SW	0/0/0	8/8/8	1/1/1	2/2/2	0/0/0	0/0/0

**Table A3.2 - MBBS Effort**

*When only one value is given this was the weather condition for the whole survey period.*

Date	Surveyor	Start Time (24h)	Finish Time (24h)	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost/Snow
11/04/2019	GP	09:00	14:35	3/3/3/4/4/4	S/S/SSE/SSW/SSE/SSE	0	0/0/1/2/6/6	2/2/2/2/2/2	2	0
12/04/2019	GP	09:20	14:35	3/3/3/3/3/3	SSE/SSE/SSE/SSE/SSE/SSE	0	3/2/1/2/1/1	2/2/2/2/2/2	2	0
13/05/2019	GP	08:45	14:45	3/3/2/3/2/3	S/S/SW/SW/SW/SW	0	1/2/3/5/3/2	2/2/2/2/2/2	2	0
14/05/2019	GP	08:30	13:35	2/1/2/2/2/2	SE/E/S/SW/W/W	0	1/2/2/2/2/2	2/2/2/2/2/2	2	0
27/06/2019	AR	09:00	14:05	1/1/2/2/2/2	NE/NE/NE/NE/E/E	0	1/1/1/2/2/2	2/2/2/2/2/2	2	0
27/06/2019	GP	09:00	14:10	1/2/2/2/2/2	NE/NE/NNE/ENE/ENE/ENE	0	0/0/0/0/0/0	-/2/2/2/2/2	2	0
22/07/2019	GP	09:30	14:45	3/3/3/3/3/3	S/S/SSW/S/S/S	0	8/8/8/7/5/4	2/2/2/2/2/2	2	0
22/07/2019	AR	09:30	14:45	3/2/1/2/1	SW/SW/SW/SSW/SSW	0	0/0/0/0/0	2/2/2/2/2	2	0

**Table A3.3 Annex 1/Schedule 1 Breeding Raptor and Owl Search Effort**

*When only one value is given this was the weather condition for the whole survey period.*

Date	Surveyor	Start Time (24h)	Finish Time (24h)	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost/Snow
02/04/2019	RTW	08:05	11:05	2/3/3	SW/SW/SW	0/0/0	4/5/4	2/2/2	2	0
03/04/2019	RTW	08:40	11:40	3/3/3	W/W/WNW	2/0/2	8/8/8	2/2/2	2	0
22/04/2019	RTW	13:00	16:00	3/3/3	SW/SW/SW	0/0/0	0/0/0	-/-/-	2	0

23/04/2019	RTW	13:10	16:10	3/3/3	SW/SW/SW	0/0/0	0/0/0	-/-/-	2	0
21/05/2019	RTW	13:05	16:15	3/3/3/2/2	SW/SW/SW/SW/SW	0/0/0/0/0	6/5/5/5/5	2/2/2/2/2	2	0
22/05/2019	RTW	13:10	16:10	3/3/3	W/W/W	0/0/0	6/5/4	2/2/2	2	0
03/06/2019	RTW	13:25	16:25	4/3/3	SW/WSW/WSW	0/0/0	7/6/6	2/2/2	2	0
06/06/2019	RTW	14:00	17:00	2/2/2	SE/SE/SE	0/0/0	2/2/2	2/2/2	2	0
26/06/2019	GP	10:15	16:15	2/1/1/1/1/2	NNW/NW/NNW/WNW/W/WNW	0/0/0/0/0/0	5/2/1/1/1/0	2/2/2/2/2/-	2	0
26/06/2019	AR	10:25	16:25	3/4/4/3/3/3	NW/NW/NW/NW/NW/N	0/0/0/0/0/0	5/4/4/4/4/4	2/2/2/2/2/2	2	0
30/07/2019	GP	08:20	14:20	2/2/2/1/0/1	ENE/ENE/NE/S/-/SW	0/0/0/0/2/3	7/7/7/8/8/8	2/2/2/2/2/2	2	0

**Table A3.4 Black Grouse Search Effort**

Date	Surveyor	Start (24h)	Time	Finish (24h)	Time	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
14/05/2019	GP	04:20		07:20		2/2/2	SE/SE/SE	0/0/0	1/1/1	2/2/2	2/2/2	0/0/0	0/0/0
20/05/2019	GP	04:10		07:10		0/1/0	-/WNW/-	0/0/0	8/8/8	1/1/1	2/2/2	0/0/0	0/0/0
21/05/2019	GP	04:05		07:05		1/1/1	WSW/WSW/WSW	0/0/0	7/7/6	2/2/2	2/2/2	0/0/0	0/0/0

## 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 April 2019 and March 2020. The species, number of birds, total flight duration (no. of birds multiplied by duration) and duration spent at each height band (HT) is presented. Note that the flights in Table A4.1 refer to all target species flights recorded.

**Table A4.1 - Target Species Flights (April 2019 to March 2020)**

Date	VP	Species	No. of Birds	Start Time (24hrs)	Duration (s)	HT1 (s)	HT2 (s)	HT3 (s)	HT4 (s)	Notes
02/04/2019	1	Golden plover	20	11:33	7,380	0	0	7,380	0	-
02/04/2019	1	Goshawk	1	12:12	515	0	0	435	80	Adult male, hunting.
02/04/2019	1	Golden plover	20	13:40	8,880	0	5,700	3,180	0	-
03/04/2019	2	Golden plover	20	17:07	5,660	0	260	5,400	0	-
20/05/2019	2	Curlew	1	07:12	20	20	0	0	0	-
20/05/2019	2	Curlew	1	07:51	35	20	15	0	0	-
20/05/2019	2	Curlew	1	08:30	120	15	30	75	0	-
20/05/2019	2	Mute swan	1	08:41	100	0	45	55	0	-
20/05/2019	2	Curlew	1	10:43	120	15	45	60	0	-
13/09/2019	2	Snipe	1	19:01	22	7	15	0	0	-
18/10/2019	2	Black grouse	1	10:03	12	12	0	0	0	Female.
18/10/2019	2	Black grouse	1	10:16	17	17	0	0	0	Female.
04/12/2019	1	Hen harrier	1	10:49	50	50	0	0	0	Male, hunting.
09/12/2019	2	Hen harrier	1	08:43	10	10	0	0	0	Male.
09/12/2019	2	Golden plover	2	09:11	70	0	30	40	0	Lost to view in sunlight, flushed by raven.
09/12/2019	2	Grey heron	1	12:06	40	10	30	0	0	-

09/03/2020	2	Pink-footed goose	150	08:36	13,500	0	0	0	13,500	-
09/03/2020	2	Pink-footed goose	250	08:59	22,500	0	0	0	22,500	-
09/03/2020	2	Pink-footed goose	220	09:06	7,700	0	0	0	7,700	-
09/03/2020	2	Goshawk	1	11:06	75	0	0	75	0	Male.
09/03/2020	2	Hen harrier	1	11:09	45	30	15	0	0	Ringtail.