2.0 Survey Methodology

2.1 Survey Personnel

The ornithological field surveys were undertaken as described by SLR field surveyors. All surveyors involved either held or were agents on appropriate Schedule 1 licences issued by NatureScot.

Full details of survey visits, including survey dates, start and finish times, observers and weather conditions are provided in **Annexes A** and **B**. The ornithology survey areas are shown on **Figure 9.1.2**.

2.2 Flight Activity Surveys

Standard flight activity surveys were conducted initially from two VP locations, one of which was relocated to an alternative location in October 2021. Initially surveys were undertaken from VP1 and VP2, however VP2 was moved to VP3 in October 2021, due to land access issues. Monthly survey effort is summarised in **Table 2-1**. VP locations along with the associated areas of visibility at 20m above ground level, (the viewsheds) are shown on **Figure 9.1.3a** and **Figure 9.1.3b**.

Activity patterns and time spent flying within the area viewable from each VP were recorded and the flight activity of primary and secondary target species (as defined in Section 1.5) was quantified. This information will enable an assessment to be made of potential collision and displacement impacts prior to the commencement of construction.

The main purpose of VP watches is to collect data on primary target species that will enable estimates to be made of:

- The time spent flying over the site;
- The relative use by birds of different parts of the site;
- The proportion of flying time spent within the provisional upper and lower risk height limits as determined by the rotor diameter and rotor hub height; and
- An index of flight activity for secondary target species within the site. A summary of observations of secondary target species was recorded at the end of each five-minute period during VP watches, in accordance with current SNH guidance.

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

- Time of observation;
- Duration of flight line (seconds);
- Species, age and sex (where determinable); and
- Time spent within each height band.

To incorporate the potential dimensions of the turbines likely to be used, the height bands used were as follows:

- 1: 0-30m;
- 2: 30-150m; and
- 3: >150m.

In addition, a summary of observations of secondary target species was recorded at the end of each five-minute period during VP watches to provide an index of flight activity for secondary target species within the site.

Table 2-1: VP Surveys undertaken at Windburn (Apr 2021 – Mar 2023)

VP Number	Grid Coordinates (x,y)	Hours of Survey Completed (hrs:mins)			
		Apr – Sep 2021	Oct 2021 – Mar 2022	Apr – Aug 2022*	Sep 2022 – Mar 2023
VP1	289226, 701449	36:00	36:00	30:00	42:00
VP2	287465, 702953	36:00	00:00	00:00	00:00
VP3	287008, 701812	00:00	39:20	24:00	33:00*
				* survey hours during this period are less than 36 hours due to prolonged periods of low cloud	

2.3 Moorland Breeding Wader Surveys

Surveys for breeding waders were carried out within the site boundary and a 500 m buffer (where accessible) around it (following SNH (2017)[1] which includes recommendations set out in Calladine *et al.* (2009)[7], requiring an adapted Brown & Shepherd (1993)[3] method with four survey visits at least seven days apart between mid-April and mid-July. Due to the scale of the site, the surveys were phased over a period of two days.

The four survey visits were carried out as follows:

2021 Breeding Season

- Visit 1: 15th and 26th April;
- Visit 2: 17th and 20th May;
- Visit 3: 17th and 24th June; and
- Visit 4: 6th and 7th July.

2022 Breeding Season

- Visit 1: 25th and 28th April;
- Visit 2: 19th and 20th May;
- Visit 3 (delayed until July due to poor weather): 7th and 20th July; and
- Visit 4: 27th and 28th July.

While waders were the main focus of the survey all bird species encountered were recorded during each visit. Registrations were marked onto 1:25,000 scale survey maps using standard British Trust for Ornithology (BTO) species and activity codes for use in post-survey analysis.

2.4 Breeding Raptor Surveys

Species-specific surveys were undertaken for all raptors likely to occur, following methods outlined within Hardey *et al*. (2013)[4], within 2km of the site (where accessible).

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

During the surveys all accessible suitable raptor breeding habitat within this area, including open moorland/ rough grassland, moorland/ forest edge, rock crags and outcrops, was covered. Data collected during VP surveys and moorland breeding bird surveys were also used to define territories within the survey buffer.

The surveys were carried out as follows:

2021 Breeding Season

- April: 22nd and 28th;
- May: 19th, 26th and 27th;
- June: 29th; and
- July: 1st and 13th.

2022 Breeding Season

- April: 22nd and 28th;
- May: 24th and 26th; and
- July (June visit delayed by poor weather): 7th and 8th.

2.5 Black Grouse Surveys

Dedicated black grouse surveys were carried out following based on the methodology written for the 1995-96 national black grouse survey by Etheridge and Baines (1995)[5], and described by Gilbert *et al*. (1998)[8]. This methodology is recommended for surveys for onshore wind farm projects in Scotland (SNH 2017)[1].

All habitats considered suitable for lekking birds (e.g., tracks, old quarries, heavily grazed upland pasture, heather clearings within forest and heather moorland), within the site were surveyed within two to three hours of sunrise. Surveys were conducted on foot, with frequent stops to listen for the 'bubbling' calls of displaying birds, which are audible up to 1km away.

The lek surveys were carried out in 2021 as follows:

Three survey visits were undertaken and can be summarised as follows:

- Visit 1: – to determine areas of suitable habitat for lekking birds. This is usually done in March, however fieldwork was not started until April so a site visit was undertaken on April 14th and 15th;
- Visit 2: April 16th and 26th – survey starting at sunrise, to determine presence of black grouse; and
- Visit 3: May 13th and 20th – a repeat of visit 2, survey starting at sunrise, to determine presence of black grouse as no black grouse were observed on visit 2.

After the first two visits it was determined that black grouse were not present within the survey area, the third visit was used to assess all suitable black grouse habitat again for lekking black grouse.

Due to the absence of black grouse in 2021 no black grouse surveys were undertaken in 2022.

[8] Gilbert, G., Gibbons, D.W. and Evans, J. (1998). *Bird Monitoring Methods*. RSPB, Sandy.

2.6 Survey Limitations

Surveys were carried out within the parameters of current guidelines (both in terms of timings and weather conditions).

After six months of survey (in October 2021), VP 2 had to be moved to a new location (VP3) due to land access issues. The VP was moved from a south facing hill to an east facing hill. The overall coverage from VP 1 in combination with VP 2 and then VP 1 in combination with VP 3 was roughly the same, i.e., the majority of the site was visible. However, with VPs 1 and 2 there were two turbine locations (Wind Turbine No's 12 and 13) that were not covered in the viewshed. The change to VPs 1 and 3 ensured that all turbine positions were covered by the viewsheds. The only gaps in the visibility apparent (at 20m above ground level) are around Fin Glen and Birken Glen, where the topography is very steep. Therefore, it is considered that the vantage point data will be representative of the site as a whole and sufficient to inform a robust assessment of the proposed development.

The site boundary and proposed turbine locations have changed over time. Initially the site boundary did not include land within the Blackford Estate in Perth & Kinross. Therefore there were no breeding wader, breeding raptor or black grouse surveys within this area in 2021 and 2022. This additional area was covered by surveys in 2023 (see **Technical Appendix 9.2: Additional Bird Surveys 2023**).

During surveys in 2022/23, VP surveys were occasionally delayed until the following months due to unsuitable weather conditions, low cloud and/or health and safety concerns (e.g. impassable access track due to ice, difficult conditions under foot). VP survey hours are provided in **Table 2-1.** Due to issues with persistent low cloud, the breeding season of 2022 is missing six hours of survey time at VP1 and twelve hours of survey time at VP3. In the winter season of 2022/23 an additional six hours were undertaken at VP1 but VP3 is missing three hours of survey time.

Due to the poor weather conditions in June 2022 the third visit of breeding raptor surveys and BBS was completed in the first week of July. Due to poor weather and access issues, the third visit of BBS had a 13 day gap between the two halves of the site being surveyed.

The final visit of breeding raptor surveys was not conducted in 2022 due to poor weather later in July, and the prioritising of completion of VP survey hours which had been missed. Due to the low number of previous raptor records it was considered that there was no benefit to continuing raptor surveys into August, which is the end of the breeding season.

3.0 Survey Results

3.1 Flight Activity Surveys

The following section provides summaries of the VP survey results for each season between April 2021 and March 2023.

Due to the dimensions of the turbines, survey PCH was assumed to be height band 2 (30-150m). Flights were considered at risk where they were at PCH and within the WP (i.e., not those outside the WP).

Full CRM has been undertaken for three species: red kite, kestrel and golden plover (bold in the tables below) and is presented in the **Technical Appendix 9.4: Avian Collision Risk Assessment.**

Full details of primary target species flights are provided in **Annex C.**

3.1.1 Year 1 Breeding Season: April – August 2021

During the first breeding season five target species were recorded across the site with red kite been the most abundant species, with a total of 17 flights accounting for 20 birds and kestrel with 14 flights accounting for 14 birds.

Full flight activity for the first year of breeding season surveys (April - August 2021) is summarised in **Table 3-1.**

Maps showing flightline data are provided in **Figure 9.1.4 (a to d)**.

Table 3-1: Number of Primary Target Species Flights and Total Number of birds recorded, Apr-Aug 21

Species	Number of flights (number of birds recorded) by month					Total number of flights Apr-Aug	Total number of birds in flight Apr-Aug
	Apr	May	Jun	July	Aug		
Red kite	**2 (3)**	**0**	**3 (3)**	**2 (2)**	**10 (12)**	**17**	**20**
Hen harrier	0	0	0	0	2	2	2
Kestrel	**4 (4)**	**2 (2)**	**1 (1)**	**4 (4)**	**3 (3)**	**14**	**14**
Merlin	1 (1)	0	0	0	0	1	1
Snipe	0	0	0	1 (1)	0	1	1

Five secondary species were recorded on site between April and August 2021 with lesser black-backed gull recorded the most with 54 records accounting for 355 birds (**Table 3-2).**

Table 3-2: Number of Secondary Target Species, Apr-Aug 21

Species	Number of 5-minute periods recorded by month						Total sum of birds (maximum counts) by month					
	Apr	May	Jun	Jul	Aug	**Total**	Apr	May	Jun	Jul	Aug	**Total**
Red grouse	1	0	0	0	0	**1**	1	0	0	0	0	**1**
Herring gull	0	7	7	13	0	**23**	0	7	9	19	0	**35**
Lesser black-backed gull	0	20	26	8	0	**54**	0	242	95	18	0	**355**
Buzzard	2	1	2	5	4	**13**	2	1	2	5	4	**14**
Raven	5	6	4	7	9	**31**	6	9	7	10	11	**43**

3.1.2 Year 1 Non-breeding Season: September 2021 – February 2022

During the first non-breeding season four target species were recorded across the Site with red kite been the most active species with a total of 13 flights accounting for 12 birds in addition to a single flight of pink-footed goose accounting for 60 birds.

Full flight activity for the first year of non-breeding season surveys (September 2021 - February 2022) is summarised in **Table 3-3**.

Maps showing flightline data are provided in **Figure 9.1.5 (a to d)**.

Table 3-3: Number of Primary Target Species Flights and Total Number of birds recorded, Sep 21-Feb 22

Species	Number of flights (number of birds recorded) by month						Total number of flights Sep-Feb	Total number of birds in flight Sep-Feb
	Sep	Oct	Nov	Dec	Jan	Feb		
Pink-footed goose	0	1 (60)	0	0	0	0	1	60
Red kite	**4 (4)**	**6 (6)**	**1 (1)**	**1 (1)**	**0**	**1 (1)**	**13**	**13**
Hen harrier	1 (1)	0	0	0	0	0	1	1
Kestrel	**3 (3)**	**0**	**0**	**0**	**0**	**1 (1)**	**4**	**4**
Merlin	0	1 (1)	0	0	0	0	1	1

Four secondary species were recorded on site between September 2021 and Feb 2022 with raven recorded the most with 68 records accounting for 115 birds (**Table 3-4).**

Table 3-4: Number of Secondary Target Species, Sep 21-Feb 22

Species	Number of 5-minute periods recorded by month							Total sum of birds (maximum counts) by month						
	Sep	Oct	Nov	Dec	Jan	Feb	**Total**	Sep	Oct	Nov	Dec	Jan	Feb	**Total**
Red grouse	2	0	1	0	0	0	**3**	2	0	1	0	0	0	**3**
Herring gull	0	0	0	0	0	0	**1**	0	0	0	0	0	0	**1**
Buzzard	0	2	0	0	0	0	**2**	0	2	0	0	0	0	**2**
Raven	10	12	10	9	16	6	**68**	17	19	14	19	24	10	**115**

3.1.3 Year 2 Breeding Season: March – August 2022

During the second breeding season three target species were recorded across the Site with red kite been the most abundant species with a total of 13 flights accounting for 13 birds.

An unidentified wader was observed in April, this was likely to be snipe as they have been observed in the area before.

Full flight activity for the second year of breeding season surveys (March - August 2022) is summarised in **Table 3-5**.

Maps showing flightline data are provided in **Figure 9.1.6 (a to c)**.

Table 3-5: Number of Primary Target Species Flights and Total Number of birds recorded, Mar-Aug 22

Species	Number of flights (number of birds recorded) by month						Total number of flights Mar-Aug	Total number of birds in flight Mar-Aug
	Mar	Apr	May	Jun	July	Aug		
Red kite	**3 (3)**	**5 (5)**	**1 (1)**	**2 (2)**	**2 (2)**	**0**	**13**	**13**
Kestrel	**0**	**0**	**0**	**0**	**2 (2)**	**2 (2)**	**4**	**4**
Snipe	0	0	3 (3)	1 (1)	0	0	4	4
Unidentified wader	0	1 (2)	0	0	0	0	1	2

Seven secondary species were recorded on site between March and August 2022 with lesser black-backed gull recorded the most with 74 records accounting for 146 birds (**Table 3-6).**

Table 3-6: Number of Secondary Target Species, Mar-Aug 22

Species	Number of 5-minute periods recorded by month							Total sum of birds (maximum counts) by month						
	Mar	Apr	May	Jun	Jul	Aug	**Total**	Mar	Apr	May	Jun	Jul	Aug	**Total**
Red grouse	0	2	0	0	0	0	**2**	0	3	0	0	0	0	**3**
Common gull	0	0	1	0	0	0	**1**	0	0	1	0	0	0	**1**
Greater black-backed gull	0	0	1	0	0	0	**1**	0	0	1	0	0	0	**1**
Herring gull	1	0	0	0	0	0	**1**	1	0	0	0	0	0	**1**
Lesser black-backed gull	0	2	27	27	18	0	**74**	0	3	53	43	47	0	**146**
Buzzard	0	0	0	1	2	2	**9**	0	0	0	1	2	3	**12**
Raven	5	9	3	3	2	2	**24**	12	11	3	5	3	3	**37**

3.1.4 Non-Breeding Season 2: September 2022 – March 2023

During the second non-breeding season three target species were recorded across the Site with golden plover been the most abundant species with a total of five flights accounting for 51 birds and red kite with a total of 13 flights accounting for 13 birds.

Full flight activity for the second year of non-breeding season surveys (September 2022 - March 2023) is summarised in **Table 3-7.**

Maps showing flightline data are provided in **Figure 9.1.7 (a to e).**

Table 3-7: Number of Primary Target Species Flights and Total Number of birds recorded, Sep 22-Mar 23

Species	Number of flights (number of birds recorded) by month							Total number of flights Sep-Mar	Total number of birds in flight Sep-Mar
	Sep	Oct	Nov	Dec	Jan	Feb	Mar		
Pink-footed goose	2 (32)	0	0	0	0	0	2 (65)	4	97
Red kite	**3 (4)**	**0**	**2 (2)**	**1 (1)**	**0**	**1 (1)**	**6 (8)**	**13**	**16**
Hen harrier	1 (1)	0	0	0	0	0	0	1	1
Golden eagle	0	0	0	0	0	0	1 (1)	1	1
Kestrel	**3 (3)**	**0**	**5 (5)**	**0**	**0**	**0**	**3 (3)**	**11**	**11**

Species	Number of flights (number of birds recorded) by month							Total number of flights Sep-Mar	Total number of birds in flight Sep-Mar
	Sep	Oct	Nov	Dec	Jan	Feb	Mar		
Merlin	1 (1)	0	0	0	0	0	0	1	1
Golden plover	**1 (3)**	**0**	**4 (48)**	**0**	**0**	**0**	**0**	**5**	**51**
Curlew	1 (1)	0	0	0	0	0	0	1	1

Three secondary species were recorded on site between September 2022 and March 2023 with raven recorded the most with 42 records accounting for 101 birds (**Table 3-8).**

Table 3-8: Number of Secondary Target Species, Sep 22-Mar 23

Species	Number of 5-minute periods recorded by month								Total sum of birds (maximum counts) by month							
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	**Total**	Sep	Oct	Nov	Dec	Jan	Feb	Mar	**Total**
Red grouse	0	0	0	1	1	1	1	**4**	0	0	0	2	2	4	2	**10**
Buzzard	4	0	0	0	0	3	6	**13**	6	0	0	0	0	4	9	**19**
Raven	4	0	6	9	0	10	22	**52**	8	0	18	20	0	13	42	**101**

3.2 Breeding Wader Surveys

3.2.1 2021

Within the Clackmannanshire part of the survey area, two snipe breeding territories were recorded. In addition, curlew was also recorded using the site but there were no confirmed breeding territories. Golden plover were recorded on passage only. Snipe territories are shown on **Figure 9.1.8**.

A full list of birds recorded on site is provided in **Table 4-1** Section 4.0. Non-wader species recorded holding territories include red grouse, meadow pipit and skylark. Other species which are red-listed BoCC such as herring gull, swift and lesser redpoll were recorded as commuting over the site.

3.2.2 2022

Within the Clackmannanshire part of the survey area, two snipe breeding territories were again recorded. In addition, curlew was also recorded using the site there were no confirmed breeding territories. Snipe territories are shown on **Figure 9.1.8**.

A full list of birds recorded on site is provided in **Table 4-1** Section 4.0.