2021

Tom na Clach Wind Farm Extension

Appendix 12.B: Report on Ornithological Surveys April 2018 to March 2019

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December 2021

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Report Quality Assurance Log

Date	Version	Created by	Checked by
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14/12/2021	Issue	Blair Urquhart	

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Introduction

1.1. This report details the results of ornithological survey work undertaken by Natural Research (Projects) Ltd (NRP) on and around the site of the proposed Tom na Clach Wind Farm Extension ("the Proposed Development") during the period April 2018 to March 2019.

1.2. The objectives of the study were to:

- Map the distributions of breeding birds, including scarce species listed in Annex 1 of the EU Birds Directive (2009/147/EC) on the Conservation of Wild Birds (the Birds Directive) or Schedule 1 of the Wildlife and Countryside Act 1981 (WCA).
- Quantify the level of bird flight activity by breeding, wintering and foraging birds of potential conservation importance.
- Record the presence and abundance of other birds of conservation importance (those listed in Biodiversity Action Plans (BAPs), on the Red List of Birds of Conservation Concern (BoCC) (Eaton *et al*., 2015)[1] or the IUCN Red list of Threatened Species (IUCN, 2019)[2] throughout the study period.

1.3. This report supplements Appendix 8.1: Ornithology Technical Report of the Tom na Clach Repowering Environmental Statement (Infinergy, August 2015) and should be read in conjunction with it.

Designated sites

1.4. The Site is not covered by any statutory nature conservation designations. The nearest designated areas for birds are Kinveachy Forest Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI) (approximately 11 km south). Kinveachy Forest SPA is designated for breeding capercaillie (*Tetrao urogallus*) and Scottish crossbill (*Loxia scotica*). Kinveachy Forest SSSI is designated for the pine wood breeding bird assemblage (**Figure 1**).

Field survey methods

1.5. The baseline surveys detailed here commenced in April 2018 and continued until end of March 2019.

1.6. The Study Area was defined with reference to the Proposed Development boundary and encompasses a series of buffers of up to 6 km radius; with buffer size dependent on the sensitivity of key species to potential effects associated with the Proposed

[1] Eaton, M.A., Aebischer, N.J., Brown, A.F., Hearn, R.D., Lock, L., Musgrove, A.J., Noble, D.G., Stroud, D.A. & Gregory, R.D. (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom,, Channel Islands and Isle of Man. *British Birds* 108, 708-746.
[2] IUCN. (2019). IUCN Red List of Threatened Species (ver. 2019-2). Available at: http://www.iucnredlist.org. (Accessed: August 2019).

Development (**Figure 2**). The various survey areas, which make up the Study Area, are defined as follows:

- 'Site' refers to the area enclosed by the Proposed Development's red-line boundary;
- 'breeding bird survey area', 'winter walkover survey area' or 'core survey area' refers to the Site plus an additional 500 m wide strip around the Site;
- 'flight activity survey area' refers to a polygon drawn round the outermost turbine locations and an additional 500 m wide strip around this polygon;
- 'black grouse survey area' refers to the Site plus an additional 1.5 km wide strip;
- 'raptor survey area' refers to the Site plus an additional 2-6 km wide strip depending on the focal species and presence of contiguous suitable habitat outside of the core survey area.

1.7. The field surveyor was Sean Reed, who is a trained ornithologists with extensive experience in surveying birds. Sean also received training prior to and during survey work to maintain professional standards.

Flight Activity Survey

1.8. Information on bird flight activity was collected during timed watches from strategic Generic Vantage Points (GVPs) using the methods described by Band *et al.* (2007)[3]. GVPs were selected through a mix of GIS analysis and field trials, with the aim of maximising ground visibility within the Site using the minimum number of points. A total of two VPs were used providing coverage of the Site and associated 500 m buffer. Viewsheds from each VP are derived using a 20 m vertical cut-off and truncated horizontally at 2 km (**Figure 3**).

1.9. Observers at VPs positioned themselves to minimise their effects on bird behaviour. A viewing arc not exceeding 180 degrees was scanned. Watches were undertaken during daylight hours by a single observer in a wide range of weather conditions, mainly in conditions of good ground visibility (> 2km). Full weather details are available on request.

1.10. Between April 2018 and March 2019, a total of 144 hours of Vantage Point watches were undertaken (**Table 1**).

Table 1. Summary of monthly GVP observations. Data are hours of observation.

GVP No.	2018									2019			Total
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
GVP1	8.00	8.00	5.33	6.00	8.67	6.00	6.00	7.00	2.00	4.00	5.00	6.00	**72.00**
GVP4	8.00	8.00	8.00	6.00	6.00	6.00	6.00	7.00	2.00	4.00	5.00	6.00	**72.00**
Total	**16.00**	**16.00**	**13.33**	**12.00**	**14.67**	**12.00**	**12.00**	**14.00**	**4.00**	**8.00**	**10.00**	**12.00**	**144.00**

1.11. During each watch, hierarchical recording methods were used, as follows:

Focal bird sampling - timed. The viewing arc was scanned constantly until a *Target A Species*[4] was detected in flight. Once detected, the bird was followed until it ceased flying or was lost to view. The time the bird was initially detected and the time it spent flying (to the nearest second) were recorded. The route followed by the bird was plotted in the field onto an enlarged 1:25,000 scale map, with the direction of flight indicated. The bird's flying elevation above the ground was estimated at the point of detection and at 15 second intervals thereafter, using a countdown timer with an audible alarm. Flying elevation was classified as <10 m, 10-30 m, 30-50 m, 50-100 m, 100-150 m or >150 m.

In some circumstances, instead of mapping a flight line, a 'flight area' denoting the area in which a bout of flight activity occurred was plotted on the field map. Recording the spatial extent of a flight bout with a flight area was preferable in circumstance where;

- simultaneous flight activity by a number of birds was observed;
- an individual flight bout is observed over a long period of time;
- an individual flight bout is too complicated, i.e. a display flight, or
- any combination of the above.

Focal bird sampling – untimed. The same scanning procedure as described above was used. However, flights of *Target B Species* were not timed, instead the flight path was mapped and flying elevation was recorded at the start and when it changed during the recorded bout. Where a flock was observed a central flight line representative of the route was estimated.

Activity summaries. At the end of each 5-min period, flight activity within the survey area by species of lesser conservation importance (*Secondary Species)* was summarised. Each VP watch was sub-divided into 5-minute periods and at the end of each 5-minute period the total number of individuals of each secondary target

[3] Band, W., Madders, M. & Whitfield, D.P. (2007) Developing field and analytical methods to assess avian collision risk at wind farms. In de Lucas, M, Janss, G.F.E. and Ferrer, M. (Eds.) Birds and Wind Farms: Risk assessment and Mitigation, pp. 259 - 275. Quercus, Madrid.

[4] Target species were drawn from those listed in Annex 1 of the Birds Directive and Schedule 1 of the WCA. Other species considered important in a regional or local context may also be included. These are listed in Appendix 1.

species seen flying in the study area was recorded. The height, direction and number of individuals involved in notable bird movements were recorded.

1.12. Data were entered in the field onto recording sheets and later transferred to Excel spreadsheets. Maps of flight activity by *Target Species* were compiled for each watch. Each flying bout was numbered consecutively and cross-referenced to the relevant flightpath on the map.

Scarce Breeding Bird Survey

1.13. Priority was given to detecting the species considered most likely to occur; golden eagle (*Aquila chrysaetos*), red kite (*Milvus milvus*), osprey (*Pandion haliaetus*), peregrine (*Falco peregrinus*), hen harrier (*Circus cynaeus*), goshawk (*Accipiter gentilis*) and merlin (*Falco columbarius*).

1.14. Surveys for golden eagle focused on areas suitable for nesting and foraging within the 6 km buffer of the Site. Surveys for red kite, osprey, peregrine, hen harrier, goshawk and merlin focused on areas or sites suitable for nesting and foraging within the 2 km buffer of the Site (**Figure 2**). Nineteen separate searches or watches were conducted during the survey period, totalling 78 hours, to search for scarce breeding species (**Table 2**). These visits complemented search effort accrued during VP watches. Methods used for individual species are summarised below;

- Golden eagle (EA). Survey methods based on Hardey *et al.* (2013)[5] were followed.
- Red kite (KT). Survey methods based on Hardey *et al.* (2013) were followed. Suitable habitat was checked during April and May for evidence of hunting males, territorial activity and other signs of presence.
- Osprey (OP). Survey methods based on Hardey *et al.* (2013) were followed. Potential nest sites were searched for in spring to look for the evidence of occupancy (presence of birds, faeces, fresh prey remains).
- Hen harrier (HH). Survey methods based on Hardey *et al.* (2013) were followed. Emphasis was given to searching habitats considered potentially suitable for nesting, in this case limited to areas of heath/bog with stands > 0.4m tall and areas of re-stock plantation.
- Goshawk (GI). Survey methods devised by Dr M. Marquiss (NRP, unpublished) were followed. These methods consisted of observing potential nesting habitat (woods > 3 ha with numerous large and well-spaced mature trees, providing good canopy cover). Observers listened for calling birds and watched for display flights. Areas were also searched for evidence of goshawk occupation (such as faeces, prey remains, moulted feathers and nests). Particular emphasis was given to stream sides, where tree growth is faster and whorls of branches are further apart.
- Peregrine (PE). Survey methods given in Hardey *et al*. (20013) were followed. Potential nest sites were searched for in spring to look for the evidence of occupancy (presence of birds, faeces, fresh prey remains).
- Merlin (ML). Survey methods based on Hardey *et al*. (2013) were followed. Within suitable habitats, old crow nests (which could be re-used by merlin), fenceposts, hummocks, bushes and trees were checked for signs of occupation (e.g. plucked prey, moulted feathers, pellets and faeces). Emphasis was given to heath bog habitats with stands of heather >0.4m tall and edges of closed canopy forestry plantations.

Table 2. Details of Scarce Breeding Bird surveys, 2018.

Date	Start time	End time	Duration (hrs)	Obs.	Cloud (10^{ths})	Cloud base (m)	Wind direction	Wind force	Precip*	Visibility (km)	Target species
18/04/2018	0820	1520	7.00	SR	5	500	W	3	nil	10	EA
25/04/2018	0915	1545	6.50	SR	4	500	W	3	nil	10	ML PE HH
27/04/2018	1050	1120	0.50	SR	7	500	W	3	nil	10	PE ML (Nil result)
27/04/2018	1450	1515	0.42	SR	5	500	W	2	nil	10	ML (Nil result)
04/05/2018	0730	1330	6.00	SR	4	500	W	3	nil	10	ML EA PE HH OP
10/05/2018	0745	1345	6.00	SR	4	500	WSW	4	nil	10	ML EA PE HH OP
15/06/2018	0915	1655	7.67	SR	5	1000	W	3	ILR	20	PE EA ML OP
19/06/2018	0940	1210	2.50	SR	6	1000	SW	5	nil	20	KT (Nil result)
19/06/2018	1245	1630	3.75	SR	5	1000	SW	3	nil	20	ML PE
20/06/2018	0930	1640	7.17	SR	8	1000	N	2	IHR	20	ML
22/06/2018	1015	1550	5.58	SR	10	1000	W	2	nil	20	EA ML PE (Nil result)
25/06/2018	1515	1745	2.50	SR	1	1000	W	2	nil	20	GI KT
25/06/2018	1820	1850	0.50	SR	1	1000	W	2	nil	20	PE ML (Nil result)
27/06/2018	1415	2020	6.08	SR	0	-	NE	1	nil	20	HH
10/07/2018	1245	1345	1.00	SR	10	500	N	1	ILR	1	HH (Nil result)
12/07/2018	1630	1705	0.58	SR	10	500	E	1	ILR	3	ML (Nil result)

[5] Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. and Thompson, D. (2013). Raptors, a field guide to survey and monitoring. The Stationery Office, Edinburgh.

Table 2. Details of Scarce Breeding Bird surveys, 2018.

Date	Start time	End time	Duration (hrs)	Obs.	Cloud (10^{ths})	Cloud base (m)	Wind direction	Wind force	Precip*	Visibility (km)	Target species
13/07/2018	1545	1615	0.50	SR	7	1500	W	1	nil	20	ML (Nil result)
18/07/2018	0615	1400	7.75	SR	8	1000	W	1	nil	20	HH ML
30/07/2018	1400	2000	6.00	SR	7	2000	SSW	3	nil	20	HH
Total			**78.00**								

*Precipitation codes: Continuous/Intermittent + Light/Heavy + Rain/Snow/Hail/Fog

Moorland Bird Survey

1.15. Breeding bird territories were surveyed April to July 2018, within the 500 m survey area shown in **Figure 2**. The Brown & Shepherd (1993)[6] method for upland waders was modified to also provide reliable breeding estimates for moorland passerines by undertaking some surveys during the first few hours of daylight. All target bird species were surveyed. Surveyors conducted four separate "visits" during the survey period, totalling over 93 hours, to search for moorland breeding species (**Table 3**).

1.16. Fieldwork was not undertaken in conditions considered likely to affect bird detection, for example strong winds (greater than Beaufort Scale Force 4), persistent precipitation, poor visibility (less than 300 m), or in unusually hot or cold temperatures.

Table 3. Details of Moorland Bird surveys, 2018.

Date	Start time	End time	Duration (hrs)	Obs.	Cloud (10^{ths})	Cloud base (m)	Wind direction	Wind force	Precip*	Visibility (km)	Comments
16/04/2018	0935	1535	6.00	SR	5	500	S	4	nil	10	Visit 1
17/04/2018	1035	1555	5.33	SR	5	400	S	4	ILR	10	Visit 1
24/04/2018	0930	1505	5.58	SR	4	500	WSW	3	nil	10	Visit 1
27/04/2018	0920	1040	1.33	SR	7	500	W	3	nil	10	Visit 1
27/04/2018	1150	1445	2.92	SR	5	500	W	2	nil	10	Visit 1
08/05/2018	0915	1545	6.50	SR	8	500	WSW	3	ILR	10	Visit 2
14/05/2018	0945	1530	5.75	SR	3	500	SW	2	nil	10	Visit 2
17/05/2018	0945	1500	5.25	SR	2	500	E	2	nil	20	Visit 2
22/05/2018	0945	1330	3.75	SR	10	600	E	3	ILR	2	Visit 2
22/05/2018	1400	1550	1.83	SR	10	600	E	3	nil	5	Visit 2
29/05/2018	0945	1535	5.83	SR	3	1000	W	2	nil	20	Visit 3
30/05/2018	0945	1545	6.00	SR	3	1000	NE	2	nil	20	Visit 3
05/06/2018	0950	1540	5.83	SR	0	-	E	2	nil	20	Visit 3
12/06/2018	0930	1210	2.67	SR	10	1000	N	1	nil	20	Visit 3
12/06/2018	1300	1600	3.00	SR	9	1000	NE	2	nil	20	Visit 3
10/07/2018	0945	1645	7.00	SR	10	500	N	1	ILR	1	Visit 4
11/07/2018	0935	1555	6.33	SR	10	500	N	1	ILR	2	Visit 4
12/07/2018	0935	1625	6.83	SR	10	500	E	1	ILR	3	Visit 4
13/07/2018	0930	1130	2.00	SR	10	1000	W	1	nil	10	Visit 4
13/07/2018	1215	1545	3.50	SR	7	1500	W	1	nil	20	Visit 4
Total (hrs)			**93.25**								

*Precipitation codes: Continuous/Intermittent + Light/Heavy + Rain/Snow/Hail/Fog

1.17. The survey aimed to cover the ground systematically with a constant search effort. All suitable ground within the Site plus the 500 m survey boundary (**Figure 2**) was approached closely, typically to within 100 m. Water bodies, patches of scrub, and isolated trees were examined carefully. Ditches, streams and the edges of water bodies were followed. Surveyors paused at regular intervals to scan and listen for calling and singing birds.

1.18. Careful attention was given to recording behaviour indicative of breeding and care was taken to avoid counting the same individual more than once. Where necessary, surveyors retraced their steps in order to check the continued presence of previously recorded birds.

1.19. The location and activity of birds were mapped onto enlarged 1:25,000 scale OS maps using standard BTO codes (Marchant, 1983)[7]. The position of each bird was mapped at the point it was first detected. The flight lines of birds seen flying over the Proposed Development were recorded.

Winter Walked Transects

1.20. Walk-over surveys were undertaken between September 2018 and February 2019 and occurred within the 500 m buffer of the Site (**Figure 2**).

1.21. Walk routes meandered to closely examine as much ground as practical, in particular features of potential ornithological importance such as woodland edges, rocky outcrops, mires and streams. Where practicable, observers used a different route on each visit to maximise the eventual spatial coverage of the Site. Observers frequently paused to scan for birds.

[6] Brown, A.F. & Shepherd, K.B. (1993). A method for censusing upland breeding waders. Bird study 40: 3 pp189-195.

[7] Marchant, J.H. (1983). BTO Common Birds Census Instructions. British Trust for Ornithology, Thetford

1.22. Eighteen walked transects, totalling 22 hours, were undertaken. A range of meteorological conditions were sampled, although wind speeds above Beaufort F6 were avoided to improve aural detection of species (**Table 4**).

1.23. The walked transects were effectively mobile VP watches. The procedure employed was as follows:

- For *Target Species* the time each individual was first detected was recorded along with details of age, sex and behaviour. These details were cross-referenced to a 1:25,000 scale map where the location and flight route (if applicable) were plotted.
- For all other species, the number of individuals was recorded and locations they were first detected were plotted on the map.

Table 4. Details of Winter Walked Transect surveys, 2018/19.

Date	Start time	End time	Duration (hrs)	Obs.	Cloud (10^{ths})	Cloud base (m)	Wind direction	Wind force	Precip*	Visibility (km)
04/09/2018	0915	1035	1.33	SR	7	2000	W	1	nil	20
11/09/2018	1035	1155	1.33	SR	3	2000	W	4	nil	20
18/09/2018	1035	1155	1.33	SR	10	500	SE	1	ILR	1
03/10/2018	1335	1450	1.25	SR	9	1000	W	3	IHR	15
16/10/2018	1305	1410	1.08	SR	6	2000	SSW	5	nil	20
25/10/2018	1250	1350	1.00	SR	9	1000	W	2	nil	20
01/11/2018	1035	1155	1.33	SR	1	2000	W	1	nil	20
08/11/2018	1035	1155	1.33	SR	4	2000	S	3	nil	20
16/11/2018	1035	1155	1.33	SR	4	2000	S	2	nil	20
23/11/2018	1200	1320	1.33	SR	8	600	E	2	nil	10
04/12/2018	1155	1305	1.17	SR	1	2000	SW	3	nil	20
11/12/2018	1145	1250	1.08	SR	8	2000	W	2	nil	20
10/01/2019	1035	1150	1.25	SR	10	1500	W	2	nil	20
17/01/2019	1035	1155	1.33	SR	3	2000	W	2	nil	15
22/01/2019	1040	1150	1.17	SR	1	1000	W	2	nil	15
05/02/2019	1310	1420	1.17	SR	9	2000	S	3	nil	20
14/02/2019	1240	1340	1.00	SR	8	2000	SW	3	nil	20
26/02/2019	1335	1445	1.17	SR	6	2000	W	1	nil	20
Total			**22.00**							
*Precipitation codes: Continuous/Intermittent + Light/Heavy + Rain/Snow/Hail/Fog										

Black Grouse

1.24. Searches for black grouse (*Tetrao tetrix*) were undertaken within suitable habitat in the 1.5 km survey buffer (**Figure 2**) during the peak period for display activity (lekking) by males between April and May. The methods employed were based on those described in Gilbert *et al.* (1998)[8]. Surveys were undertaken during the early morning in calm, dry weather with good visibility. Observers listened and scanned the areas considered suitable for lekking. In total, 5.5 hours was spent searching for black grouse (**Table 5**).

Table 5. Details of black grouse lek surveys, 2018.

Date	Start time	End time	Duration (hrs)	Obs.	Cloud (10^{ths})	Cloud base (m)	Wind direction	Wind force	Precip*	Visibility (km)
19/04/2018	0530	0800	2.50	SR	4	500	SSW	3	nil	10
03/05/2018	0500	0800	3.00	SR	8	900	SW	3	nil	10
Total			**5.50**							
*Precipitation codes: Continuous/Intermittent + Light/Heavy + Rain/Snow/Hail/Fog										

Field Survey Results

1.25. Observed flight activity, timings and heights refer to all flights observed in the field from GVPs. It should be noted that flight activity and timings could reduce, due to clipping flights to the 500 m flight activity buffer and viewshed, from that recorded in the field when it comes to analysing these data in a Collision Risk Model (CRM).

Wildfowl

Occurrence and status

1.26. No species of conservation concern was recorded during the study period. Other wildfowl species recorded of lesser conservation concern included greylag goose (*Anser anser*) (**Figure 4**; **Tables 6** and **14**).

1.27. One flight involving a single greylag goose was recorded on 15 May 2018.

Flight activity

1.28. One flight by a single greylag goose was recorded during GVP watches. The flight was recorded as being between 50 m and 100 m in height (**Table 6**).

Table 6. Details of greylag goose flights recorded from GVPs.

Period	GVP No.	No of flights	No of birds	Presence in height category					
				<10m	10-30m	30-50m	50-100m	100-150m	>150m
Apr-Aug	GVP1	1	1			*			
Total		**1**	**1**			*****			

[8] Gilbert, G., Gibbons, D.W. & Evans, J. (1998) Bird monitoring methods. RSPB Sandy, Bedfordshire.

Waders

Occurrence and status

1.29. Three species of wader of conservation concern were recorded during the study period: **golden plover** (*Pluvialis apricaria*), **dunlin** (*Calidris alpina*) and **curlew** (*Numenius arquata*). Species of lesser conservation concern that were recorded included redshank (*Tringa totanus*) (**Figures 5**, **9** and **11**; **Tables 7**, **8**, **14**, **15** and **18**).

1.30. **Golden plover** (Annex 1) was recorded regularly during the breeding season but only on two occasions during the non-breeding season. All records made were of one or two individuals. In 2018, five breeding territories were confirmed within the 500 m buffer of the Site (**Figure 11**; **Table 15**).

1.31. **Dunlin** (Annex 1) was recorded on one occasion during the study period. On 8 May 2018 a pair were located and were probably breeding (**Figure 11**; **Table 15**).

1.32. **Curlew** (Red list, IUCN near threatened) was recorded regularly during the breeding season. In 2018, one pair of curlew were holding territory within the 500 m buffer of the Site but no nest site was found. A second pair of curlew were holding territory beyond the 500 m buffer of the Site (**Figure 11**; **Table 15**).

Flight activity

1.33. A single **golden plover** flight was recorded from GVPs during the study period involving two individuals. The flight was recorded as being between 50 m and 100 m in height (**Figure 5**; **Table 7**).

Table 7. Details of golden plover flights recorded from GVPs.

Period	GVP No.	No of flights	No of birds	Presence in height category					
				<10m	10-30m	30-50m	50-100m	100-150m	>150m
Sep-Mar	GVP1	1	2				*		
Total		**1**	**2**				*****		

1.34. No **dunlin** flights were recorded from GVPs during the study period.

1.35. Eight flights by 11 **curlews** were recorded from GVPs during the study period. Flight height varied between less than 10 m and 100 m in height (**Figure 5**; **Table 8**).

Table 8. Details of curlew flights recorded from GVPs.

Period	GVP No.	No of flights	No of birds	Presence in height category					
				<10m	10-30m	30-50m	50-100m	100-150m	>150m
Apr-Aug	GVP1	3	4	*	*	*	*		
	GVP4	5	7	*	*	*			
Total		**8**	**11**	*****	*****	*****	*****		

Scarce raptors and owls

Occurrence and status

1.36. Eight species of scarce raptor were recorded during surveys: **golden eagle**, **white-tailed eagle** (*Haliaeetus albicilla*), **red kite**, **osprey**, **peregrine**, **hen harrier**, **goshawk** and **merlin**. Two species of scarce owl were recorded during surveys: **short-eared owl** (*Asio flammeus*) and **barn owl** (*Tyto alba*). Other raptor species of lesser conservation concern were also recorded, including buzzard (*Buteo buteo*), sparrowhawk (*Accipiter nisus*) and common kestrel (*Falco tinnunculus*) (**Confidential Figure**; **Figures 6-8** and **10**; **Tables 9-18**).

1.37. **Golden eagle** (Annex 1 and Schedule 1) was present throughout the study period and was recorded regularly in flight in and around the Site. An historic breeding site is located adjacent to the Site boundary. In 2018 the territory was occupied by an immature pair and nest building was recorded in April. The eyrie was built up and the female appeared to be incubating in May 2018. By June 2018 it was clear that if a breeding attempt had been made it had failed (**Confidential Figure**; **Figures 6** and **10**; **Tables 9**, **14-18**).

1.38. **White-tailed eagle** (Annex 1 and Schedule 1) was recorded on one occasion during the survey period. The record involved an immature bird, seen on 12 July 2018, and was presumed to be a transient individual (**Figure 10**; **Table 15**).

1.39. **Red kite (**Annex 1 and Schedule 1) was observed regularly during the study period with the majority of observations being made in the breeding season. No evidence of breeding by red kite was obtained during baseline surveys, despite extensive searches in potential breeding habitat (**Figures 7** and **10**; **Tables 10**, **14-18**).

1.40. **Osprey** (Annex 1 and Schedule 1) was recorded on two occasions during the study period. An adult was seen on 4 May and 15 June. No evidence of breeding by osprey was obtained during baseline surveys (**Figure 10**; **Table 17**).

1.41. **Peregrine** (Annex 1 and Schedule 1) was recorded on eleven occasions during the study period with the majority of observations being made in the breeding season. A possible breeding site was located; however due to its location it was not possible to confirm (**Confidential Figure**; **Figures 8** and **10**; **Tables 11**, **14-18**).

1.42. **Hen harrier** (Annex 1 and Schedule 1) was observed regularly during the study period with the majority of observations being made in the breeding season. Evidence of breeding was recorded at three locations in 2018. A juvenile was recorded on several occasions at one location indicating a successful breeding attempt had occurred (**Confidential Figure**; **Figures 8** and **10**; **Tables 12**, **14-18**).

1.43. **Goshawk** (Schedule 1) was recorded on two occasions during the study period. An adult female was observed on 13 July 2018 and an adult male was observed on 17 January 2019 (**Figure 10**; **Tables 15** and **16**).

1.44. **Merlin** (Annex 1 and Schedule 1) was recorded occasionally during the study period with the majority of observations being made in the breeding season. Evidence of breeding by merlin was obtained at one location during baseline surveys and two recently fledged juveniles were recorded on 18 July 2018 (**Confidential Figure**; **Figures 8** and **10**; **Tables 13-15**, **17** and **18**).

1.45. **Short-eared owl** (Annex 1) was recorded on two occasions during the study period. No evidence of breeding by short-eared owl was obtained within the 2 km buffer during baseline surveys; however, breeding was suspected at one location beyond the 2 km buffer (**Confidential Figure**; **Figure 10**; **Table 17**).

1.46. **Barn owl** (Schedule 1) a successful breeding attempt was recorded during the study period. An adult and three juveniles were observed on 22 June 2018 (**Confidential Figure**; **Figure 10**; **Table 17**).

Flight activity

1.47. Four flights by **golden eagle** were recorded from GVPs during the study period. A total duration of 337 seconds of flight activity was recorded, of which 192 seconds (57 %) was spent at potential collision risk height, i.e., between 10 m and 150 m above ground level (**Table 9**).

Table 9. Details of golden eagle flights recorded from GVPs.

Period	GVP No.	No of flights	No of birds	Total fly time (s)	Time in height category (s)					
					<10m	10-30m	30-50m	50-100m	100-150m	>150m
Apr-Aug	GVP1	1	1	40	20	20				
	GVP4	3	3	297	125	172				
Total		**4**	**4**	**337**	**145**	**192**				

1.48. No flights by **white-tailed eagle** were recorded from GVPs during the study period.

1.49. Twenty-seven flights by **red kite** were recorded from GVPs during the study period. A total duration of 4,333 seconds of flight activity was recorded, of which 3,559 seconds (82 %) was spent at potential collision risk height (**Table 10**).

Table 10. Details of red kite flights recorded from GVPs.

Period	GVP No.	No of flights	No of birds	Total fly time (s)	Time in height category (s)					
					<10m	10-30m	30-50m	50-100m	100-150m	>150m
Apr-Aug	GVP1	3	3	691		60	228	135	82	186
	GVP4	9	9	1842	588	513	554	171	16	
Sep-Mar	GVP1	2	2	262			93	169		
	GVP4	13	13	1538		369	969	200		
Total		**27**	**27**	**4333**	**588**	**942**	**1844**	**675**	**98**	**186**

1.50. No flights by **osprey** were recorded from GVPs during the study period.

1.51. One flight by two **peregrines** was recorded from GVPs during the study period. A total duration of 4 seconds of flight activity was recorded, all of which was spent below potential collision risk height (**Table 11**).

Table 11. Details of peregrine flights recorded from GVPs.

Period	GVP No.	No of flights	No of birds	Total fly time (s)	Time in height category (s)					
					<10m	10-30m	30-50m	50-100m	100-150m	>150m
Apr-Aug	GVP4	1	2	4	4					
Total		**1**	**2**	**4**	**4**					

1.52. Seven flights by **hen harrier** were recorded from GVPs during the study period. A total duration of 346 seconds of flight activity was recorded. The majority of the flight duration, 311 seconds (90 %), was spent below 10 m in height and not at potential collision risk height (**Table 12**).

Table 12. Details of hen harrier flights recorded from GVPs.

Period	GVP No.	No of flights	No of birds	Total fly time (s)	Time in height category (s)					
					<10m	10-30m	30-50m	50-100m	100-150m	>150m
Apr-Aug	GVP4	1	1	55	55					
Sep-Mar	GVP1	2	2	150	135	15				
	GVP4	4	4	141	121	20				
Total		**7**	**7**	**346**	**311**	**35**				

1.53. No flights by **goshawk** were recorded from GVPs during the study period.

1.54. Three flights by **merlin** were recorded from GVPs during the study period. A total duration of 118 seconds of flight activity was recorded, of which 108 seconds (92 %) was at potential collision risk height (**Table 13**).

Table 13. Details of merlin flights recorded from GVPs.

Period	GVP No.	No of flights	No of birds	Total fly time (s)	Time in height category (s)					
					<10m	10-30m	30-50m	50-100m	100-150m	>150m
Apr-Aug	GVP1	1	1	63				16	47	
Sep-Mar	GVP1	1	1	45		45				
	GVP4	1	1	10	10					
Total		**3**	**3**	**118**	**10**	**45**		**16**	**47**	

1.55. No flights by **short-eared owl** or **barn owl** were recorded from GVPs during the study period.

Black grouse

Occurrence and status

1.56. No **black grouse** (Red list) were recorded within the Site or study area (i.e. within 1.5 km of the Site) during the study period.

1.57. Targeted surveys for 'lekking' (displaying) birds in April and May 2018, did not locate any lekking birds.

Flight activity

1.58. No flights by **black grouse** were recorded from GVPs during the study period.

Other species

1.59. Other species recorded during flight activity surveys included raven (*Corvus corax*), buzzard, common kestrel, sparrowhawk, herring gull (*Larus argentatus*) and red grouse (*Lagopus lagopus scotica*). All these species are common and distributed throughout Scotland (**Table 14**).

Tables 14 - 18

Table 14. The percentage of five-minute recording periods in which each species was encountered during watches from all GVPs during the study period.

Species	No. of 5-minute periods recorded	Occurrence (%)*
Raven	78	4.51
Red grouse	56	3.24
Buzzard	41	2.37
Red kite	26	1.50
Kestrel	22	1.27
Curlew	7	0.41
Hen harrier	7	0.41
Golden eagle	4	0.23
Herring gull	4	0.23
Merlin	3	0.17
Greylag goose	2	0.12
Golden plover	1	0.06
Peregrine	1	0.06
Sparrowhawk	1	0.06

Birds listed in Annex 1 of the Birds Directive or Schedule 1 of the WCA are shown in bold.

* The percentage of 5-min recording periods in which each species was encountered during watches from the GVPs (n = 144) is shown (144 x 12 = 1,728).

Table 15. Moorland Bird Survey results, 2018.

Visit No.	Date	Time	Species	Number	Sex	Age	Behaviour
Visit 1	16/04/18	0910	Merlin	1			Flying
	16/04/18	1345	Golden eagle	1			Flying, Territorial
	16/04/18	1438	Golden plover	1			Territorial
	24/04/18	1530	Peregrine	1			Territorial
	27/04/18	1220	Golden plover	1			Territorial
	27/04/18	1255	Merlin	1	F		Hunt/feed
Visit 2	08/05/18	1230	Dunlin	2			Sing
	08/05/18	1505	Golden plover	2	MF		Agitated/alarm
	14/05/18	1422	Red kite	1			Hunt/feed
	17/05/18	1045	Golden plover	1	M	A	Agitated/alarm
	22/05/18	1230	Golden plover	1			Vocalise
Visit 3	30/05/18	1030	Golden plover	1			Agitated/alarm
	30/05/18	1315	Golden plover	2		2A	Agitated/alarm
	05/06/18	1010	Curlew	1			Vocalise
	05/06/18	1220	Golden plover	1		A	Agitated/alarm
	05/06/18	1240	Curlew	2	MF	2A	Agitated/alarm
	05/06/18	1450	Golden plover	1	F	A	Agitated/alarm, Sing
	05/06/18	1450	Golden plover	1	F	A	Agitated/alarm, Sing
	05/06/18	1530	Curlew	1		A	
	12/06/18	1000	Curlew	1			Agitated/alarm
	12/06/18	1100	Curlew	1			Agitated/alarm
	12/06/18	1200	Golden plover	1			Vocalise, Sing
	12/06/18	1210	Golden plover	2	MF		Agitated/alarm
	12/06/18	1500	Golden plover	1			Agitated/alarm
Visit 4	10/07/18	0945	Hen harrier	1	F	A	
	10/07/18	1545	Golden plover	1			Agitated/alarm
	12/07/18	1215	White-tailed eagle	1		IMM	Flying
	12/07/18	1352	Golden plover	2	M F	A	Agitated/alarm
	12/07/18	1458	Red kite	1			Flying
	13/07/18	1352	Golden plover	2	M F	A	Agitated/alarm, Chick tend
	13/07/18	1358	Red kite	1	F	A	Hunt/feed
	13/07/18	1436	Goshawk	1	F	A	Hunt/feed

Table 16. Results of winter walked transects, September 2018 to February 2019.

Species	Month						Grand Total
	September	October	November	December	January	February	
Golden eagle						1	**1**
Goshawk					1		**1**
Hen harrier				1			**1**
Peregrine				1			**1**
Red grouse	8					14	**22**
Red kite		1	4				**5**

Table 17. Results of Scarce Breeding Bird surveys, 2018.

Date	Time	Species	Number	Sex	Age	Behaviour	Signs	Comments
18/04/2018	1038	Golden eagle	2	MF	IMM	Display		
18/04/2018	1050	Golden eagle	2	MF	IMM	Display		Land in gully
18/04/2018	1100	Merlin	1			Agitated/alarm		Mobbing EA pair
18/04/2018	1124	Golden eagle	2	MF	IMM	Display		Land 100m apart
18/04/2018	1131	Golden eagle	2	MF	IMM	Display		Male lands Female flies
18/04/2018	1143	Golden eagle	1	F	IMM	Nest build		Carrying nest material
18/04/2018	1134	Merlin	1			Agitated/alarm		Mobbing EA female
18/04/2018	1240	Merlin	1			Flying		At fence line
18/04/2018	1415	Golden eagle	0				Nest	Well-built nest
25/04/2018	0920	Peregrine	1	F	A	Flying		Female flies towards cliffs - poss nest
25/04/2018	0920	Peregrine	1	M	A	Flying		
25/04/2018	1032	Peregrine	2	MF	2A	Display		
25/04/2018	1210	Peregrine	1	M	A	Flying		Flying S up valley
25/04/2018	1320	Golden eagle	1	F	IMM	Flying		Flying to possible nest
25/04/2018	1400	Merlin	1	F		Perch		Flushed from roadside
25/04/2018	1445	Red kite	1			Hunt/feed		
04/05/2018	0745	Merlin	1	F		Hunt/feed		V brief
04/05/2018	0800	Merlin	1	F		Hunt/feed		V brief
04/05/2018	0915	Merlin	1	F		Nest build?		From good nesting heather Poss nest
04/05/2018	1003	Golden eagle	1			Incubate		Brief
04/05/2018	1023	Golden eagle	2	MF		Flying, Incubate		Interacting with BZ Soaring F to old nest not seen again
04/05/2018	1214	Merlin	1	F		Flying		V brief flushed from stream
04/05/2018	1226	Osprey	1			Flying		Direct flight
04/05/2018	1320	Peregrine	1			Incubate? Chick tend?		Flushed from good looking nest site by 3 kestrels. Circled & returned to prob nest
10/05/2018	1155	Merlin	1	M	A	Incubate		Briefly dropping into good heather
15/06/2018	1220	Golden eagle	2	MF	IMM	Flying		
15/06/2018	1655	Osprey	1			Hunt/feed		Just outside 2km buffer
19/06/2018	1610	Barn owl	1		A	Flying		Landed in trees next to derelict farmstead
20/06/2018	1255	Hen harrier	1	M	A	Flying		
22/06/2018	1620	Barn owl	4		1A+3J	Chick tend	Nest with young	
25/06/2018	1526	Peregrine	1			Flying		Soaring high
25/06/2018	1540	Red kite	1			Flying		
25/06/2018	1634	Red kite	1		IMM	Hunt/feed		Probable immature
27/06/2018	1445	Golden eagle	2	MF	IMM	Flying		Soaring 4km WNW of VP
27/06/2018	1505	Hen harrier	1	M	A	Hunt/feed, Territorial		Probable mating near prob nest (1)
27/06/2018	1551	Hen harrier	1	M	A	Hunt/feed	Kill/prey	With prey Flying to prob nest (2)
27/06/2018	1620	Red kite	1			Flying		Soaring high
27/06/2018	1636	Hen harrier	1	M	A	Hunt/feed		
27/06/2018	1802	Hen harrier	1	F	A	Territorial, Incubate		Soaring Possible incubation break. Mobbed by ravens
27/06/2018	1804	Red kite	1		IMM	Hunt/feed		

Table 17. Results of Scarce Breeding Bird surveys, 2018.

Date	Time	Species	Number	Sex	Age	Behaviour	Signs	Comments
27/06/2018	1815	Hen harrier	1	M	A	Territorial		Soaring over prob nest 1 Away S
27/06/2018	1815	Red kite	1		IMM	Flying, Hunt/feed		Soaring with HH
27/06/2018	1835	Hen harrier	1	F	A	Territorial, Incubate		Soaring Incubation break? Young chicks?
27/06/2018	1902	Red kite	1			Flying		High
27/06/2018	1914	Hen harrier	1	M	A	Hunt/feed	Kill/prey	With prey Heading for prob nest 2
27/06/2018	1920	Hen harrier	1	M	A	Incubate	Nest w young, Kill/prey	Lands 10m from nest 1. Takes prey to prob nest - Juniper bush. Stays within 50m of nest until end of survey at 2020 Prob roosting
18/07/2018	0845	Hen harrier	1	F	A	Territorial, Perch		HH perched on post
18/07/2018	1015	Hen harrier	1	F	A	Territorial, Perch		HH perched on rock
18/07/2018	1305	Merlin					Faeces	Fresh splash by track
18/07/2018	1310	Merlin	2		JUV		Recent fledglings	
18/07/2018	1335	Hen harrier	1	F	A	Territorial, Perch		Perched on turves. Only available good nesting heather 100m east.
18/07/2018	1345	Hen harrier	1	F	A	Flying	Nest failed?	Poss reacting to vehicle. NB no male. Nest failed?
30/07/2018	1430	Hen harrier	1	F	A	Flying		From nest area lands
30/07/2018	1531	Hen harrier	1	F	A	Flying		From perch to SE
30/07/2018	1558	Hen harrier	2	F M	A, JUV		Used nest (this yr)	Female to nest area, Juv M lands on turves. Both away to west
30/07/2018	1813	Hen harrier	1	F	A	Flying		Female from W, returns to W out of view
30/07/2018	1905	Short-eared owl	1		A	Hunt/feed, Chick tend		From good heather, swooping x3
30/07/2018	1908	Hen harrier	2	F M	A JUV	Flying		Female lands in view
30/07/2018	1910	Hen harrier	2	F M	A JUV	Flying		Juv lands, move, lands. Gone at 1917. Female away south. Both roosting at nest?
30/07/2018	1935	Short-eared owl	1		A	Chick tend	Nest	Direct flight away from good heather at 5. Missed food delivery? Poss nest.

Table 18. Incidental records, April 2018 to March 2019.

Date	Time	Species	Number	Sex	Age	Behaviour	Comments
12/04/2018	1117	Golden eagle	2	MF		Display	High display
12/04/2018	1259	Golden eagle	1			Flying	
12/04/2018	1344	Golden eagle	1			Hunt/feed	
12/04/2018	1631	Golden eagle	1			Flying	
19/04/2018	1036	Golden eagle	1			Display	
23/04/2018	1315	Peregrine	1	M		Territorial	Interacting with RN away NW towards cliffs
23/04/2018	1911	Golden eagle	1			Territorial	Soaring away towards (old) nest
15/05/2018	0955	Golden eagle	1			Territorial	60sec @ 100-150m
15/05/2018	1205	Golden eagle	1			Territorial	130s 10-30 50-100 & 30-50m towards old nest
24/05/2018	1005	Golden eagle	1			Hunt/feed	6km SE of VP
28/05/2018	1047	Golden eagle	2	MF	2A	Display, Hunt/feed	1km NE of poss nest
28/05/2018	1418	Golden eagle	2	MF		Hunt/feed	High soaring & climbing
29/05/2018	1555	Red kite	1			Hunt/feed	
25/06/2018	1308	Golden eagle	2	MF		Flying	2.5km NNW of VP

Table 18. Incidental records, April 2018 to March 2019.

Date	Time	Species	Number	Sex	Age	Behaviour	Comments
25/06/2018	1328	Golden eagle	2			Flying	Soaring 4km WNW of VP
24/07/2018	1308	Hen harrier	2			Territorial	Poss pair HH interacting. 1 landed c 3.8km away from VP
07/08/2018	1235	Red kite	1			Hunt/feed	On way to VP5.
28/08/2018	1833	Golden eagle	1			Flying	
04/09/2018	1152	Red kite	1		IMM	Perch	
03/10/2018	1554	Hen harrier	1	F		Flying, Perch	landed just before heavy shower. Not seen leaving
25/10/2018	1150	Golden eagle	2	MF		Territorial	Soaring and grappling
25/10/2018	1236	Golden eagle	1	F		Flying	Direct flight
08/11/2018	1210	Golden eagle	2	MF	IMM	Hunt/feed, Territorial	hunting at <10m Brief interaction with 2nd EA which dropped out of view.
08/11/2018	1443	Golden eagle	2			Territorial	from VP5 >5km soaring.
08/11/2018	1515	Hen harrier	1	F	A	Hunt/feed	flying NE on way to roost?
16/11/2018	0830	Golden eagle	1			Hunt/feed, Flying	
16/11/2018	1330	Golden eagle	2			Flying, Territorial	2.4km WSW of VP1
11/12/2018	1013	Golden eagle	1			Flying	during VP5 c 3km WNW of VP
05/02/2019		Golden eagle	1			Flying	c4.5 km east of VP1
05/02/2019		Golden eagle	2			Flying	c4.5 km east of VP1
14/02/2019	1526	Golden eagle	1	F		Territorial	
14/02/2019	1540	Golden eagle	2	MF		Territorial	Display
14/02/2019	1555	Golden eagle	1			Flying	
14/02/2019	1653	Golden eagle	2	MF		Territorial	Display
14/02/2019	1720	Golden plover	2			Flying	
14/02/2019	1150	Golden eagle	1			Flying	
14/02/2019	1230	Golden eagle	1			Flying	
21/02/2019	1425	Golden eagle	2	MF		Territorial	Soaring
21/02/2019	1515	Golden eagle	2			Territorial	Soaring 4km to West
26/02/2019	1110	Merlin	1	F		Territorial, Perch	
21/03/2019	1210	Golden eagle	1	F		Flying	>150m Soaring probably female