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Introduction

4.1 This Chapter provides the ornithological impact assessment for the Proposed Development. The specific objectives of the chapter are to:

- describe the current baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address the likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation measures.

4.2 This Chapter is supported by the following Technical Appendices:

- Technical Appendix 4.1: Ornithology Surveys 2023;
- Technical Appendix 4.2: Confidential Ornithology Report;
- Technical Appendix 4.3: Collision Risk Assessment; and
- Technical Appendix 4.4: White-tailed Eagle Population Viability Analysis.

4.3 The ornithological assessment has been undertaken with reference to the following legislation:

- The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland) (the Habitats Regulations);
- The Wildlife and Countryside Act 1981 (as amended in Scotland);
- The Nature Conservation (Scotland) Act 2004;
- The Wildlife and Natural Environment (Scotland) Act 2011; and
- Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017.

4.4 Planning policies relevant to ornithology are listed below. Further information regarding planning policy is provided in **Chapter 2: Policy Context.**

- National Planning Framework 4 (NPF4) (2023) (e.g. biodiversity);
- The Highland Council Policy 57: Natural, Built and Cultural Heritage;
- The Highland Council Policy 58: Protected Species; and
- The Highland Council Policy 59: Other important Species.

4.5 Other documents and guidance reviewed and applied in the ornithological assessment are outlined as follows (see also References Section at the end of this Chapter):

- Band, Madders and Whitfield (2007). Developing Field and analytical Methods to Assess Avian Collision Risk at Wind Farms;
- Chartered Institute of Ecology and Environmental Management (CIEEM) (2022). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine;

- Goodship and Furness (2022). Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species;
- Scottish Government (2013). Scottish Biodiversity List (SBL);
- Scottish Renewables *et al*. (2019). Good Practice during Wind Farm Construction, Version 4;
- Scottish Natural Heritage (SNH) (now NatureScot) (2016a). Assessing Connectivity with Special Protection Areas (SPAs);
- SNH (2016b). Environmental Statements and Annexes of Environmentally Sensitive Bird Information;
- SNH (2017). Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms, Version 2;
- SNH (2018a). Assessing Significance of Impacts from Onshore Wind Farms on Birds Outwith Designated Areas, Version 2;
- SNH (2018b). Assessing the Cumulative Impact of Onshore Wind Energy Developments; and
- Stanbury *et al*. (2021). The Status of our Bird Populations: the Fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and Second IUCN Red List Assessment of Extinction Risk for Great Britain.

Scope and Consultation

Consultation

4.6 A Scoping Report (SLR, 2023) was submitted to the to the Highland Council (THC) in September 2023.

4.7 **Table 4-1** includes a summary of the ornithology specific points raised by consultees during scoping and subsequent consultation process, and where these are addressed in this Chapter.

Table 4-1: Summary of Stakeholder Consultation

Consultee, form of consultation and date	Key Issue	Response/Action Taken
THC, by letter, 17 November 2023	The presence of protected species such as Schedule 1 Birds or European Protected Species must be included and considered as part of the planning application process, not as an issue which can be considered at a later stage.	A full additional year of ornithological surveys was undertaken in 2023 which has informed this assessment which considers impacts on birds. Survey data collected in 2018/19 provides additional information and detail which supports this assessment.
	An assessment of the impacts to birds through collision, disturbance and displacement from foraging / breeding / roosting habitat will be	Undertaken within this Chapter - Assessment of Effects.

Consultee, form of consultation and date	Key Issue	Response/Action Taken
	required for both the Proposed Development and cumulatively with other proposals.	
	It is understood that the applicant is in discussions with NatureScot to confirm the scope of survey works to be undertaken and proposed at the site in order to inform the ornithology assessments for the new application and EIA Report.	See NatureScot response below.
NatureScot, by Microsoft teams call with Alex Turner, 23 January 2024	Ornithology data: Confirmed that NatureScot are happy with the survey scope. Golden eagle and white-tailed eagle are the main concerns for this site.	Update surveys in 2023 covered one year worth of vantage point surveys as well as breeding raptor and wader surveys.
	Collision Risk Modelling (CRM): Present a robust assessment by running the collision risk model for both the consented development and Proposed Development using the 2023 data.	The CRM was run twice against the 2023 survey data, once using the consented development layout and turbine parameters, and once using the Proposed Development layout and turbine parameters. Results shown in **TA4.3: Collision Risk Modelling.**

Effects Scoped Out

4.8 As set out in the Environmental Impact Assessment (EIA) Screening and Scoping Report (SLR, 2023), the following have been scoped out if the ornithology assessment:

- impacts on Cuillins Special Protection Area (SPA). This SPA is located 15.4km from the site boundary which is beyond the typical maximum foraging range of its qualifying species; golden eagle, estimated at approximately 9km (SNH 2016a). Although studies have shown significant differences in eagle ranging distances depending on season and breeding status (Haworth *et al*. 2006), there is unlikely to be any connectivity or impacts on golden eagle from the Cuillins SPA. For this reason, impacts on the Cuillins SPA were scoped out from detailed assessment in agreement with NatureScot (SNH) as part of the scoping process for the consented development.
- In addition, impacts on species/groups not susceptible to significant effects from wind farms (such as woodland passerines) have been scoped out, as specified in current NatureScot (SNH, 2017) guidance. No Schedule 1 woodland passerine species were present within the site.

Approach and Methods

4.9 This Chapter takes an appropriate and topic-specific approach to assessment of the Proposed Development. It provides a worst-case assessment for ornithology and aims to describe any likely significant effects of the Proposed Development and present enough information for the consultees and the decision makers to comment on and determine the application within the parameters do the Proposed Development.

Study Area

4.10 The study area is defined, which includes the proposed turbine footprint plus any additional buffer over which desk based or field assessment have been extended. Assessment differs according to receptor as recommended by relevant good practice survey guidance, as defined by NatureScot (formerly SNH) guidelines (SNH, 2017), and include the following distances:

- 500m (for breeding wader surveys);
- 2km (for breeding raptor surveys); and
- 10km (for data request on breeding status of golden and white-tailed eagle).

4.11 These are summaries in the Survey Methodology Section and are described in detail in **Technical Appendix 4.1.**

4.12 For the assessment of impacts on bird species a variety of buffer distances have been applied to each turbine location and around all other infrastructure where appropriate. These buffers are in accordance with current guidance and evidence-based research. Further details are provided in the Assessment of Potential Effects Section.

Information and Data Sources

4.13 A desk study was undertaken to collate existing information on bird populations in and around the site, and to identify target species for baseline surveys. This included survey data collected in 2018 and 2019 for the site and used to assess the ornithological effects of the consented development:

- The site was fully covered by just over one full year of ornithological surveys from January 2018 to March 2019 to inform the EIA for the consented Ben Sca Wind Farm. Surveys included flight activity vantage point surveys, breeding wader surveys, breeding raptor surveys and lochan surveys for breeding divers.
- Further ornithological survey work was undertaken from January to May 2021 from a new vantage point, and two update breeding wader and breeding raptor surveys were carried out in April and May 2021.

4.14 This information, combined with baseline survey results, was utilised to put each target bird species recorded within the study area into context in terms of its national, regional, and local importance.

4.15 A desk search desk search was carried out via the NatureScot SiteLink website (NatureScot, 2021) to identify statutorily designated sites within 20km of the site which are designated for their avian interest (including SPAs and Sites of Special Scientific Interest (SSSIs)). Beyond 20km, connectivity between SPAs and development proposals is unlikely. Further information on the interest features of sites was obtained through the JNCC and NatureScot websites.

4.16 The following sources of contextual data were consulted:

- Scottish Raptor Monitoring Scheme Reports;
- Ben Sca Wind Farm EIA Report (SLR, 2020a);
- Ben Sca Wind Farm Supplementary Information (SI) Report (SLR, 2020b);
- Ben Sca Wind Farm Extension EIA Report (SLR, 2021);
- Environmental Statement ES / EIA Reports from adjacent consented and application wind farm schemes including Balmeanach Wind Farm EIA and post consent monitoring from nearby operational Ben Aketil and Edinbane Wind Farms;
- data for breeding eagles within at least 10km of the site boundary, from the Highland Raptor Study Group (HRSG).

Field Survey Methodology

4.17 Baseline ornithology surveys were conducted during the period January and December 2023. Full details are presented in **Technical Appendix 4.1** and **Confidential Technical Appendix 4.2** with a summary provided below.

Flight Activity Surveys

4.18 Flight activity surveys were conducted from three vantage point (VP) location between January and December 2023. Survey effort consisted of six hours per VP per month, resulting in a total of 72 hours of survey per VP location. The survey hours met the current NatureScot guidance of 36 hours per VP per season.

4.19 Height bands were as follows:

- 1 = <20m
- 2 = 20-150m
- 3 = 150 -200m
- 4 = >200m

4.20 Target species for the flight activity surveys were chosen considering the location of the site and were defined by legal/or conservation status and vulnerability to impacts potentially caused by wind turbines, as defined in SNH (2017).

4.21 The following species were considered as primary target species:

- annex I raptor and owl species, including:
  - white-tailed eagle (*Haliaeetus albicilla*);
  - golden eagle (*Aquilia chrysaetos*);
  - hen harrier (*Circus cyaneus*);
  - goshawk (*Accipiter gentilis*); and
  - merlin (*Falco columbarius*).
- breeding and migratory wildfowl; and
- breeding and migratory waders.

4.22 Secondary target species included:

- non-annex I raptor and owl species, including:
  - sparrowhawk (*Accipter nisus*);
  - buzzard (*Buteo buteo*);
  - kestrel (*Falco tinnunculus*).
- grey heron (*Ardea cinerea*), gulls, raven (*Corvus corax*) and any other non-passerine species of conservation concern which are considered to be potentially vulnerable to impacts from wind farm developments.

Breeding Wader Surveys

4.23 Surveys for breeding waders were undertaken on open ground within a 500m buffer (where accessible) of the turbine locations (following SNH (2017) which includes recommendations set out in Calladine *et al.* (2009), requiring an adapted Brown & Shepherd (1993) method with four survey visits at least seven days apart between mid-April and the end of July.

Breeding Raptor Surveys

4.24 Species-specific surveys were undertaken for all raptors likely to occur, following methods outlined within Hardey *et al.* (2013), within 2km buffer of the turbine locations.

Collision Risk Modelling

4.25 The standard Band CRM (Band *et. al*. 2007) was used to estimate collision risk based on recorded target species activity levels and flight behaviour, proposed turbine numbers and specifications, and the relevant species biometrics and flight characteristics. Modelling collision risk under the Band CRM is a two-stage process. Stage 1 estimates the number of birds that fly through the rotor swept disc. Stage 2 predicts the proportion of these birds that have the potential to be hit by a rotor blade. Combining both stages produces an estimate of collision mortality in the absence of any avoidance action/behaviour by birds.

4.26 Avoidance rates are then applied to generate predicted rates of collision mortality. Full details are provided in **Technical Appendix 4.3.**

4.27 In order to select flights liable to incur a potential risk of collision, i.e. within the areas occupied by proposed turbines, the CRM used only observations collected within the wind farm polygon (WP) – defined by a 500m buffer around the proposed outermost turbine locations and occurring within the Potential Collision Height (PCH).

4.28 In the interest of proportionality, species rarely present, for which significant collision impacts due to the Proposed Development are highly unlikely, were excluded. Sufficient flight activity to qualify for CRM (minimum of five flights per season and/or minimum of 10 birds) was recorded for: white-tailed eagle, golden eagle, and golden plover.

Population Viability Analysis

4.29 Reference was made to Population Viability Analyses (PVAs) undertaken for white-tailed eagle in relation to the proposed Balmeanach Wind Farm (included as **Technical Appendix 4.4**) and for white-tailed eagle and golden eagle in relation to the proposed Glen Ullinish II Wind Farm. These are relevant to the populations of both species on Skye.

Assessment Methods

4.30 The CIEEM Guidelines for Ecological Impact Assessment in the UK (CIEEM 2022) form the basis of the impact assessment with other relevant guidance, as listed in paragraph 4.5 referred to as appropriate. In accordance with the CIEEM guidelines, only ornithological receptors which are considered to be important, (including those required to be considered by the EIA Regulations and other relevant policies) and potentially affected by the project (i.e., the Important Ornithological Features or IOFs) should be subject to detailed assessment. It is not necessary to carry out detailed assessment of receptors that are not subject to legal or policy protection and are sufficiently widespread, unthreatened and resilient to project impacts and would remain viable and sustainable.

Sensitivity Criteria

4.31 Ornithological receptors should be considered within a defined geographical context, so for this project the following geographic frame of reference is used:

- international;
  - species that form part of the cited interest within an internationally protected site or candidate site (for example SPA, or Ramsar site).
  - a species which is either unique or sufficiently unusual (in terms of distribution and/or abundance) to be considered as being a population of the highest quality example in an international/national context that the site is likely to be designated as an SPA.
- national (i.e., Scotland);
  - species that form part of the cited interest within a nationally designated site (for example, a SSSI or a National Nature Reserve (NNR).
  - a population of a species which is either unique or sufficiently unusual (in terms of distribution and/or abundance) to be considered as being of nature conservation value at up to a country context. This includes Wildlife and Countryside Act Schedule 1 (as amended in Scotland) species, a red- or amber-listed species (as in Birds of Conservation Concern) and a priority Scottish species.
- regional (i.e., Western Seaboard Natural Heritage Zone (NHZ 6));
  - sites supporting a regularly occurring, regionally significant number of internationally or nationally important species in the context of NHZ 6 Western Scotland.
- local (i.e., the site plus circa 10km);
  - populations of any species of conservation importance in the context of the local area within an approximate radius of 10km from the site.
- negligible
  - commonplace species with little or no significance, the loss of which would not be seen as detrimental to the ecology of the area.

4.32 In assigning a level of value to the population of a species, it is necessary to consider its distribution and status, including a consideration of trends based on available historical records. Reference has therefore been made to published lists and criteria where available.

4.33 Examples of relevant lists include:

- species of European conservation importance (as listed on Annex I of the Birds Directive);
- species with enhanced legal protection (as listed on Schedule 1 of the Wildlife and Countryside Act (as amended in Scotland); and
- species considered to be of principal importance for biodiversity in Scotland, as listed on the SBL.

4.34 Criteria for the evaluation include the SPA and SSSI selection guidelines published by the JNCC. Reference has also been made in particular to published bird population estimates such as Wilson *et al.* (2015b) for NHZs within Scotland and Woodward *et al.* (2020) for Great Britain.

4.35 Where appropriate, the value of species populations has been determined using the standard '1% criterion' method (e.g. Holt *et al.,* 2012). Using this, the presence of >1% of the international population of a species is considered internationally important; >1% of the national population is considered nationally important; etc.

Assessing Impacts and the Significance of an Effect

4.36 Both direct and indirect impacts are considered. Direct impacts are changes that are directly attributable to a defined action, e.g., the physical loss of habitat occupied by a bird species during the construction process. Indirect ecological impacts are attributable to an action, but which affect ecological resources through effects on an intermediary ecosystem, process or feature, e.g., the creation of roads which cause hydrological changes, which, in the absence of mitigation, could lead to the drying out of wetland habitats used by important bird species.

4.37 For the purposes of this ornithology assessment, in accordance with CIEEM guidelines, under the EIA Regulations, a 'significant effect' is 'one that is sufficiently important to require assessment and reporting so that the decision-maker is adequately informed as to the environmental consequences of permitting the project'.

4.38 Effects can be considered significant at a wide range of scales from international to local. For example, a significant effect on a regionally important population of a species is likely to be of regional significance. They are also significant if they do not comply with legal and policy protection.

4.39 Consideration of conservation status is important for evaluating the effects of impacts on bird species and assessing their significance. Conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area (which for the purposes of the Birds Directive is the EU).

Avoidance, Mitigation, Compensation and Enhancement

4.40 A sequential process has been adopted to avoid, mitigate and compensate for ornithological impacts. This is referred to as the 'mitigation hierarchy'.

4.41 The differences between avoidance, mitigation, compensation and enhancement are defined here as follows:

- avoidance is used where an impact such as disturbance or displacement of breeding IOFs e.g., through changes in scheme design;

- mitigation is used to refer to measures to reduce or remedy a specific negative impact in situ i.e., direct habitat loss which may reduce a breeding or foraging range;
- compensation describes measures taken to offset residual effects, i.e., where mitigation in situ is not possible; and
- enhancement is the provision of new benefits for biodiversity that are additional to those provided as part of mitigation or compensation measures, although they can be complementary. Such measures can be set out in species specific biodiversity action plans.

Potential Cumulative Effects

4.42 Cumulative effects result from effects arising from two or more developments.

4.43 Cumulative effects have been assessed for all species for which detailed assessment has been undertaken in this EIA Report, for which potentially significant negative effects are likely. The potential for cumulative effects due to collision mortality has been assessed. The cumulative assessment is based on consideration of residual effects, i.e. assuming that proposed mitigation and compensation measures for other projects are implemented.

4.44 With regard to the spatial extent of the cumulative assessment, as set out in the scoping report, current NatureScot (2018c) guidance indicates that the default approach should be to assess cumulative effects at the Natural Heritage Zone (NHZ) scale, unless there is a reasonable alternative. The site is located within NHZ 6 (Western Seaboard). In this case, consideration would entail assessment of operational projects, projects under construction, consented projects which are not yet under construction, and projects for which planning applications have been submitted, all on Skye.

4.45 The significance of potential cumulative effects has been determined using the same method adopted in the assessment of effects for the Proposed Development considered on its own. Cumulative effects are therefore considered significant if they undermine conservation objectives for important ornithological features. Cumulative effects can be considered significant at a wide range of scales from international to local. For example, a significant cumulative effect on a regional population of a species is likely to be of regional significance.

Assumptions, Limitations and Confidence

4.46 The validity of ornithological survey data requires that they were obtained using accepted methodologies and that surveys were carried out in suitable conditions. The field survey methodologies outlined above and described in greater detail in **Technical Appendix 4.1** were all carried out using survey standards recommended by NatureScot and were carried out during suitable times of the year.

4.47 With regard to VP survey coverage, there is a small gap apparent in the VP1 viewshed due to the terrain (**Figure 4.1**). However, it is considered that the vantage point data are representative of the site as a whole and sufficient to inform a robust impact assessment of the Proposed Development.

4.48 Winds were recorded gusting (Beaufort Scale 6) during two hours of the December flight activity survey visit. This is not considered a significant limitation on survey results due to small number of hours affected by adverse weather.

4.49 Desk records of breeding eagle territories were obtained from the proposed Balmeanach Wind Farm development which were requested for in 2023 and covered a 10km buffer. As

Balmeanach Wind Farm is adjacent to the Proposed Development this data was deemed sufficient to use to inform this assessment.

Baseline Conditions

Current Baseline

Designated Sites

4.50 There are no statutory sites designated for their bird interest within 10km of the site boundary. The closest site is the Cullins SPA approximately 15.4km south of the Proposed Development. The Cullins SPA is designated for its golden eagle breeding population which is considered to be of European importance. The SPA supports eight pairs, representing approximately 1.9% of the GB population.

Flight Activity Surveys

4.51 Full details of flight activity (standard VP) surveys in 2023 (including Figures showing flight lines) are provided in **Technical Appendix 4.1.**

4.52 Flight activity was recorded by seven target species, with a summary of the target species flight activity provided in **Table 4-2**.

4.53 Nine secondary species were recorded during the 2023 and consisted of the following:

- red grouse (*Lagopus scotica)*;
- grey heron;
- sparrowhawk;
- buzzard;
- kestrel;
- lesser black-backed gull (*Larus fuscus*);
- herring gull (*Larus argentatus*);
- great-blacked back gull (*Larus marinus*); and
- raven.

Table 4-2: Summary of 'At Risk' Flights of Target Species

Species	Number of flights per month (number of separate individuals)												
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
White-tailed eagle	4 (1)	7 (2)	3 (3)	2 (2)	5 (4)	2 (2)	1 (1)	10 (11)	11 (2)	2 (1)	3(2)	1(1)	51
Golden eagle	1 (1)	3 (1)	-	4 (2)	1 (1)	-	-	-	-	5 (3)	-	-	14
Hen harrier	-	-	-	-	-	-	-	-	1 (1)	-	-	-	1
Goshawk	-	-	1 (1)	-	-	-	-	-	-	-	-	-	1
Merlin	-	-	-	1 (1)	-	-	-	-	-	-	-	-	1
Golden plover	-	1 (21)	2 (13)	-	-	1 (1)	-	-	-	-	-	-	4
Snipe	-	-	-	-	-	-	2 (1)	-	-	-	-	-	2

Breeding Wader Survey

4.54 One wader species, golden plover, was recorded breeding during the breeding wader surveys. Two confirmed territories were recorded, one within the study area (approximate location: National Grid Reference (NGR) 33526 47659) and another just outwith of the study area close to the summit of Ben Sca (NGR 33811 47105).

Breeding Raptor Survey

4.55 No breeding raptor locations were identified within the study area. Three target species were recorded during the breeding raptor surveys which consisted of white-tailed eagle, golden eagle and hen harrier. One record of a hunting female golden eagle was made in June and two records of a displaying male hen harrier were made along the northern boundary of the study area were observed in April. No subsequent observation of hen harrier was made during the 2023 surveys, and it is considered that they did not breed in 2023 within the study area.

4.56 The breeding raptor surveys identified the location of two white-tailed eagle roosts within the study area, details of which are provided in **Confidential Technical Appendix 4.2.** Though no nesting locations were located within the study area breeding behaviours were observed over the course of the breeding raptor surveys of two separate pairs, indicating that there are breeding territories nearby.

Collision Risk Modelling

4.57 A summary of flight activity within the WP (within 500m of the proposed turbines) is provided in **Table 4-3** for the three target species which were taken forward for CRM assessment. The table shows the occupancy rate within each height band, and the total at-risk occupancy data used in the CRM. These data were used to model the Proposed Development in comparison with the consented development.

Table 4-3: Number of primary target species flights and individuals observed passing through the WP during VP surveys (2023)

Species	No. of flights	No. of birds	Total flying time (s)	Time in height category (s)				
				<20m	20-150m	150-200m	>200m	At risk
White-tailed eagle	31	49	7538	1325	4485	1000	729	5810
Golden eagle	9	9	1513	469	449	65	531	918
Golden plover	2	16	1605	406	1199	0	0	1605

4.58 CRM was conducted for three target species: white-tailed eagle, golden eagle and golden plover using the 2023 survey data set. The results of the CRM modelling are shown in **Table 4-4**. A comparison with the results of a CRM for the consented development using the 2023 survey data set is also provided.

Table 4-4: Comparison of CRM results between the Consented and Proposed Development using the 2023 Data (Modelled Collisions per year)

Species	Avoidance Rate	Modelled Collisions per Year		Years per Collision	
		Consented Development	Proposed Development	Consented Development	Proposed Development
White-tailed eagle[1]	95%	2.03	3.47	0.49	0.29
	98%	0.81	1.39	1.23	0.72
Golden eagle	99%	0.04	0.10	23.03	9.88
Golden plover	98%	0.25	0.39	3.96	2.57

Evaluation of Ornithological Receptors

4.59 Applying the criteria outlined in paragraphs 4.31 to 4.35, an evaluation of the importance of the relevant study areas for each of the primary target species recorded during the baseline surveys.

4.60 Species which are considered to be of local value and above are taken further in the assessment.

[1] The population of white-tailed eagle has increased in the locality since the original 2018/19 surveys. An additional 14 comparable flightlines were recorded in the 2023 surveys, along with larger groups of birds. These elevated activity levels have resulted in an increased risk of collision for white-tailed eagles when comparing the 2018/19 and 2023 data.

Table 4-5: Evaluation of Important Ornithological Feature Populations within the study area

Species	Value	Species Information, Status and Baseline	Justification
White-tailed eagle	Regional	• Schedule 1 (including 1A & A1). • Annex I. • SBL priority species • UK BoCC Amber • Scottish breeding population estimated between 98 and 122 breeding pairs (2014 - 2017) (Sansom *et al.,* 2016a and Woodward *et al,* 2020). • Estimated population within NHZ 6 is 34 breeding pairs (Wilson *et al.,* 2015b). • 22 home ranges occupied on Skye in 2020 (Challis *et al.,* 2022). • Recent desk records indicate that there are five breeding territories within 10km of the site, four of which were active during 2022. • Survey results from 2018/19 noted 24 flightlines with at least four different birds, including an adult pair, sub-adult and a juvenile bird. • White-tailed eagle were not confirmed breeding in the 2018 / 2019 surveys, however, one breeding territory was located within 2-6km of the site. • During the 2023 flight activity surveys a total of 52 flightlines of white-tailed eagle were made, along with six static records, with a peak of six individuals observed at one time, consisting of three adult pairs. • Three adult pairs, two Year 2 birds, two Year 3 birds, one Year 4 bird, one juvenile male, one sub-adult, and at least one immature bird were recorded during the surveys, giving at least 14 separate individuals over the year.	This species is not a qualifying feature of any statutory sites within 10km of the site but is of conservation concern (Annex I, SBL, Amber-List) and is afforded special protection (Schedule 1). Three breeding territories are within 6km of the site. Three adult pairs were noted together on site in August. Territorial interactions between two breeding pairs were noted on site during the 2023 surveys. The presence of two territorial pairs (as part of an increasing population) is considered important in the regional context. At least 14 separate individuals were recorded on site during the flight activity surveys, and three roosting sites within the plantation forestry adjacent to the site. Roosting can sometimes be a precursor to establishment of a breeding territory and new forest plantations provide suitable breeding habitat (Forrester *et al.,* 2007). Due to the presence of the two territorial pairs (but no breeding within 2km), the use of the site by multiple individuals, along with roosting sites within the vicinity, the site population is considered to be of Regional value for white-tailed eagle.

Species	Value	Species Information, Status and Baseline	Justification
		• A roost site was established within 2km, which was occasionally used throughout the year by an adult pair. Further details are provided in **Confidential Technical Appendix 4.2**. • During the breeding raptor surveys at least four individual birds were recorded including 2 adult females, an adult male and a sub adult. Territorial display involving two pairs of failed breeders from nearby established breeding sites resulted in an increase in activity in the Ben Sca area, with birds also foraging and commuting over the Proposed Development.	
Hen harrier	Regional	• Schedule 1 (including 1A). • Annex I. • SBL priority species. • UK BoCC Red. • The Scottish population was estimated as 460 (359-573) breeding pairs in the latest national survey in 2016 (Wotton et al., 2018). • Estimated population within NHZ 6 is 38 breeding pairs (Wilson *et al.,* 2015b). • Previous surveys in 2018 and 2019, recorded high levels of activity (48 flightlines, majority during the breeding period), and three breeding pairs were recorded within 2km of the consented development boundary. Details are provided in **Confidential Technical Appendix 4.2**. • During the 2023 flight activity surveys a single hen harrier flightline was recorded, consisting of a hunting male bird. • Hen harrier was observed during the first visit of the 2023 breeding raptor surveys, where two records of a	This species is of conservation concern (Annex I, SBL, Red-List) and is afforded special protection (Schedule 1). During the 2023 the low levels of hen harrier activity were noted indicating that either no breeding attempt was made or that breeding failed early, with birds then dispersing. However, as this species has historically bred on / close to site with three separate pairs noted in 2018 (7.8% of NHZ 6 breeding population). Therefore, the site population is considered to be of regional value for hen harrier.

Species	Value	Species Information, Status and Baseline	Justification
		displaying male were noted. The majority of the behaviour was noted just outwith of the northern 2km survey buffer.	
Golden eagle	Local	• Schedule 1 (including 1A & A1) • Annex I • SBL priority species • UK BoCC Green • Scottish breeding population estimated at 508 breeding pairs (Hayhow *et al,* 2017). • Estimated population within NHZ 6 is 74 breeding pairs (Wilson *et al.,* 2015b). • 30 home ranges occupied on Skye in 2016, but a reduction in numbers from 2016 onwards, attributed to a drop in the monitoring effort as well as local population declines (Challis *et al.,* 2018, 2022). • No golden eagle monitoring has been undertaken by HRSG on Skye since 2019. Three territories were identified within 10km of Balmeanach Wind Farm in 2019. Details are provided in **Confidential Technical Appendix 4.2**. • Data collected during the 2018/19 surveys noted 23 flightlines, with at least four different individuals recorded. • During the flight activity surveys a total of 14 flightlines were recorded. Behaviours noted included hunting and commuting. • At least five separate individuals identified including an adult male and female, one juvenile female, one immature female and one Year 2 male. • Only one record of golden eagle was made during the breeding raptor surveys where a female adult was noted hunting over the site.	This species is not a qualifying feature of any statutory sites within 10km of the site but is of conservation concern (Annex I, SBL, Amber-List) and is afforded special protection (Schedule 1). The Proposed Development is not part of a territorial range but is used occasionally by foraging non-breeding golden eagles (less frequently than by white-tailed eagle). With no breeding confirmed within 2km of the site, it is considered that the site population is considered to be of no more than local importance to golden eagles.

Species	Value	Species Information, Status and Baseline	Justification
Golden plover	Local	• Annex I. • SBL. • UK BoCC Green • UK breeding populations is estimated at 37,480 breeding pairs (Wilson *et al.,* 2015b), with approximately 15,000 breeding pairs in Scotland (Forrester *et al.,* 2007). • Scottish wintering population estimated at 25,000-35,000 individuals (Forrester *et al.,* 2007). • Estimated population within NHZ 6 is 1,606 breeding pairs. • Previous breeding wader surveys identified one possible territory in 2018, and two probable/confirmed territories in 2019. • Flight activity surveys in 2018 identified a maximum of 10 birds in March 2018 and seven birds in September 2018. • Two confirmed breeding pairs were identified during the 2023 breeding wader surveys. • Four flightlines were noted during the flight activity surveys, with a maximum of 21 individuals recorded.	This species is of conservation concern (Annex I, SBL). Previous surveys in 2018 and 2019 identified a maximum of two breeding pairs, and a maximum of 10 birds during winter. Two confirmed territories were identified in 2023, a maximum count of 21 individuals were noted in February 2023. The site population is considered to be of no more than local value for golden plover.
Goshawk	Negligible	• Schedule 1 species. • UK BoCC Green. • Scottish breeding population is estimated as 130-140 breeding pairs (Forrester *et al.,* 2007 and Wilson *et al.,* 2015b), and more recently 281 pairs (Challis *et al*. 2022.). • Estimated population within NHZ 6 is 0 breeding pairs. • Goshawk was not recorded during the 2018 and the 2019 surveys.	This species is not of conservation concern but is afforded special protection (Schedule 1). As no breeding evidence was recorded during the surveys, they are not thought to breed within the study area. As goshawk was only recorded once during the surveys, the site population is considered to be of negligible value for goshawk.

Species	Value	Species Information, Status and Baseline	Justification
		• Not recorded during the 2023 breeding raptor survey, and only recorded once during flight activity surveys where it was observed low in flight in the south of site.	
Merlin	Negligible	• Schedule 1. • Annex I. • SBL priority species. • UK BoCC Red • Estimated population within NHZ 6 is 26 breeding pairs. • Two flightlines recorded during 2018, considered to be on passage, no flightlines noted in 2019. • Merlin was observed once during the flight activity surveys, and no records were made during the breeding raptor survey. It is not considered that merlin breed within the survey area.	This species is of conservation concern (Annex I, SBL, Red-List) and is afforded special protection (Schedule 1). This species has been infrequently recorded on site, and it is thought that individuals were on passage. No evidence of breeding noted. Therefore, the site population is considered to be of negligible value for merlin.
Snipe	Negligible	• UK BoCC Amber • Estimated population within NHZ 6 is 2,025 breeding pairs. • Scottish population estimated at 34,000-40,000 pairs. • Breeding wader surveys carried out in 2018 identified 2-3 possible territories and 1 probable/confirmed territory. • Breeding wader surveys carried out in 2019 identified 2 probable/confirmed territories. • No breeding territories were recorded in 2023 and only two flight lines were noted during the flight activity surveys.	This species is of conservation concern (Amber-list). Previous surveys in 2018 and 2019 identified a maximum of four pairs which represents 0.06-0.07% of the Scottish population, and 0.2% of the NHZ 6 population. Two snipe flightlines were recorded during the 2023 surveys, however, no breeding territories were noted. Snipe is a cryptic species which may lead to it being under-recorded. Given the lack of data collected during the 2023 surveys and the amount of habitat available for snipe in the locality, the site population is assessed as being of negligible value for snipe.

Species	Value	Species Information, Status and Baseline	Justification
All other species	Negligible	• See **Technical Appendix 4.1** for full survey results.	All other species noted during the surveys were either relatively common species, or recorded infrequently, and therefore the site is considered to be of negligible value for all other species.

Future Baseline

4.61 In the absence of the Proposed Development, changes on site, in terms of human usage, will occur due to the construction of the consented development (See **Chapter 1: Introduction and Project Description** for details). However, the consented development will include measures to protect sensitive bird species within the site and no significant impact on bird species was identified as part of the assessment.

4.62 Habitat on site will remain largely the same, therefore, it is anticipated that in the short-medium term the bird community will remain largely the same in regard to abundance and distributions. However, due to the expanding white-tailed eagle population in the locality and due to behaviours noted during the 2023 surveys, it is possible that white-tailed eagle may establish a territory in close proximity to the Proposed Development.

4.63 It is more difficult to predict changes that may occur in the long-term, especially in the wake of climate change, which is thought to cause range shifts in some bird species (Huntley *et al.*, 2007). Climate change may alter habitat types by impacting the composition and health of the plant communities present, thereby affecting the habitat suitability for some of the bird species which currently occupy the site.

Assessment of Effects

Effects Assessed in Full

4.64 This assessment concentrates on the effects of construction, operation and decommissioning of the Proposed Development upon important ornithological features. The following potential effects have been assessed:

- habitat loss or damage (permanent and temporary) due to construction of wind farm infrastructure;
- inadvertent destruction of nests during construction;
- disturbance to birds during construction due to vehicular traffic, operating plant and the presence of construction workers;
- disturbance to birds due to the operation of the wind turbines, vehicular traffic and the presence of people during operation;
- barrier effect due to the operation of the wind turbines; and
- mortality of birds caused by collisions with turbine blades and other infrastructure.

4.65 Effects have been assessed in detail for the following ornithological features (see **Table 4-5** for justification):

- white-tailed eagle;
- golden eagle;
- hen harrier; and
- golden plover.

4.66 All species which are potentially vulnerable to significant effects from the Proposed Development are considered, which are also:

- species for which the study area is considered to be important at a local level or above;
- species listed on Annex I of the Birds Directive;
- breeding species listed on 1 of The Wildlife and Countryside Act 1981 (as amended in Scotland); and/or
- priority species listed on the Scottish Biodiversity List.

Embedded Mitigation and Good Practice Measures

4.67 The assessment of effects is based on the information outlined in **Chapter 1.** The Proposed Development is an amendment to the consented development, the reasoning behind which is to maximise energy yield of the site. With respect to ornithology, there were no onsite constraints and no significant effects identified as part of the EIA process for the consented development, therefore, during the design phase of the Proposed Development there were no specific design criteria applied in relation to ornithology.

4.68 Good practice measures in relation to pollution risk, sediment management and watercourse crossings to be adopted during the construction and operation phases are also set out in **Chapter 6: Hydrology, Hydrogeology and Soils**. Full details of construction mitigation measures will be provided in a Construction Environmental Management Plan (CEMP), which will further outline on mitigating for pollution risks in relation to watercourses. An outline CEMP is included as **Technical Appendix 1.1: Outline CEMP.**

4.69 Good practice measures, as outlined below, would be employed to reduce the possibility of damage and destruction (and disturbance in the case of sensitive species such as breeding raptors), to occupied bird nests during the construction phase.

4.70 Under the Wildlife and Countryside Act 1981, it is an offence, with only limited exceptions, to:

- intentionally or recklessly take, interfere with, damage or destroy the nest of any wild bird whilst it is in use or being built (applies year-round for nests of birds included in Schedule A1);
- obstruct or prevent any wild bird from using its nest;
- intentionally or recklessly take, interfere with or destroy the egg of any wild bird;
- intentionally or recklessly disturb any wild bird listed in Schedule 1 while it is nest building, or at (or near) a nest containing eggs or young, or disturb the dependent young of such a bird;
- intentionally or recklessly harass any wild bird included in Schedule 1A; or
- knowingly cause or permit any of the above acts.

4.71 Avoidance of damage to, or destruction of nests, or disturbance to sensitive species whilst nesting can be achieved through careful timing of construction activities; for example restricting activities in sensitive areas as far as practicable in the early part of the breeding season until the location and breeding status of nesting birds has been established. If site clearance and construction activities are required to take place during the main breeding bird season, from mid-March to August inclusive (January/ February onwards for white-tailed eagle), pre-commencement survey work would be undertaken to ensure that nest destruction and disturbance to sensitive species (i.e., breeding raptors and waders) are

avoided. Where applicable, construction would not take place within specified disturbance-free buffer zones for certain sensitive species during the breeding season.

4.72 Disturbance-free buffer zones around nest sites of sensitive species would be applied and monitored closely. For breeding waders, disturbance-free buffer zones are only required until chicks have hatched and are capable of walking away from any sources of disturbance.

4.73 Based on the 2023 survey data, with the 2018/19 survey data providing additional background information, and the relevant literature (e.g., Goodship and Furness 2022), the following disturbance-free buffer zone is considered likely to be required to help prevent nest failure due to disturbance during construction. It should be noted that this represents a guide only and may vary according to topography and other factors at each nest site.

- white-tailed eagle (500m-1000m);
- hen harrier (300m -750m); and
- golden plover (200m -500m).

4.74 White-tailed eagle roosts were identified during the survey works and disturbance-free buffers should be maintained around these roosting sites, along with any other-white-tailed eagle roosts during construction works. A buffer of 250-500m is recommended during the non-breeding season (Goodship and Furness, 2022).

4.75 A Bird Protection Plan (BPP) would be developed by a suitably experienced ornithologist, and agreed in consultation with NatureScot, in advance of works commencing on the site. The BPP would set out in sufficient detail the measures and procedures that would be followed to ensure the protection of sensitive species as well as legally protected species during construction.

4.76 The BPP would detail the pre-works survey methods for breeding and wintering species (breeding raptor and winter roost surveys). To ensure that the baseline information for all potentially affected protected species is up-to-date, surveys would be undertaken not more than 8-12 months (timing will in effect be seasonally dependent) prior to the commencement of works. The pre-works surveys would be completed in all areas of suitable habitat up to 2km around proposed construction footprint.

4.77 A suitably qualified Environmental Clerk of Works (EnvCoW) would be employed to oversee activity at key points for the duration of the construction and reinstatement periods (at a frequency to be agreed with Highland Council and NatureScot), to ensure natural heritage interests are safeguarded (See **Chapter 5: Ecology** for further details). The role of the EnvCoW would include the following specific roles with regard to the ornithology interest of the site:

- prior to the start of construction and/or the breeding bird season, the EnvCoW would make contractors aware of the ornithological sensitivities within the site (particularly with regard to the potential presence of sensitive breeding species, i.e. breeding waders and raptors);
- the EnvCoW would undertake surveys for nesting birds throughout the construction period that falls within the nesting season and set up and monitor appropriate exclusion areas whilst nests of relevant species are in use.
- the EnvCoW would undertake roost surveys during construction period that falls within the non-breeding season, to help ensure that no roosting birds are disturbed

during construction. Appropriate buffers would be set up around any roost site identified and closely monitored to reduce disturbance.

Construction Effects

4.78 Potential effects, assuming that the good practice mitigation outlined in paragraphs 4.68 to 4.77 are implemented, are addressed for each important feature in turn.

Habitat Loss

4.79 Construction of turbine bases, access tracks and other structures would lead to habitat loss (see **Chapter 5**). Considering both direct and indirect habitat loss there would be a loss of 11.16ha of blanket bog habitat, and 2.46ha of conifer plantation. A further 2.5ha of habitat would be lost which consists of a mix of acid grassland, dry heath, wet heath and rushy grassland.

4.80 Habitat loss is only likely to affect important species breeding within the study area, which are likely to use these habitats for nesting and foraging. Given the small scale of habitat loss it is expected that this would not significantly impact white-tailed eagle, golden eagle, or hen harrier due to the large size of their territories (core range of 5km, 6km and 2km respectively (SNH 2016a)).

4.81 Golden plover nest locations were confirmed within 500m of the construction footprint (one of which was within 30m). Blanket bog, along with dry and wet heath provide suitable nesting habitat for this species, with an approximate loss of 13ha of these habitats. This would reduce habitat suitability for golden plover on site, nevertheless, there is ample habitat for this species in the locality, and no significant impact on golden plover is expected due to the Proposed Development in terms of habitat loss.

Nest Damage or Destruction

4.82 Damage or destruction to active nests could contravene the Wildlife and Countryside Act 1981 (as amended in Scotland). However, the good practice measures would avoid the likelihood of damage, destruction or disturbance to occupied bird nests during the construction phase. As such, no significant effects are predicted for any species due to nest damage or destruction.

Disturbance/Displacement

4.83 During the construction stage of the Proposed Development, the potential effects of associated noise and visual disturbance could lead to the temporary displacement or disruption of breeding, roosting and foraging birds. The level of impact would depend on the timing of potentially disturbing activities, the extent of displacement (both spatially and temporally) and the availability of suitable habitats in the surrounding area for displaced birds to occupy.

4.84 Disturbance of birds due to construction activities of this type has not been sufficiently quantified in the literature and the available information is often contradictory. However, it is likely that construction impacts would be greater on species that are intolerant of noise and other sources of disturbance. Larger bird species, those higher up the food chain or those that feed in flocks in the open tend to be more vulnerable to disturbance than small birds living in structurally complex or closed habitats such as woodland (Hill et al., 1997).

4.85 The potential effects associated with construction activities are only likely to occur for as long as the construction phase continues and are thus generally short-term in nature. The exception to this would be if a negative effect on the breeding success of a feature were such that the local population becomes extinct and replacement through recruitment or re-colonisation does not occur. For example, a study by Pearce-Higgins *et al.* (2012) found that snipe and curlew densities declined significantly on wind farms during construction and had not recovered by the first-year post-construction.

4.86 Disturbance/displacement effects during construction could affect species potentially breeding within the relevant parts of the study area (i.e. golden plover, hen harrier and snipe). Furthermore, it could also affect species using the site as a potential roosting during both the breeding and non-breeding season. Disturbance/displacement of roosting birds, especially during the more weather adverse non-breeding season can negatively impact body condition, through an increase in energy expenditure and a reduction in rest time.

4.87 Construction disturbance can be readily mitigated by avoiding sensitive areas through the implementation of appropriately defined buffer zones and by timing construction activities to avoid periods where sensitive species are present (if and where possible), such as the breeding season. A range of good practice measures have therefore been proposed to mitigate for potential construction disturbance effects including working under an EnvCoW, and the use of appropriate buffers as necessary (see Sections 4.67-4.77).

White-tailed eagle

4.88 No breeding white-tailed eagle territories were located within 2km of the Proposed Development during the 2023 surveys. This was also the case during previous surveys on site in 2018/19. However, territorial activity has increased since the previous baseline surveys, including the use of day roosts by a pair exhibiting territorial behaviour. The closest roost is within 750m of the footprint of the Proposed Development. It is known that roosts are established as a precursor to breeding.

4.89 A 250m buffer around an active roost within forestry should be maintained during the non-breeding season (Kortland et al., 2011).

4.90 Disturbance buffers of between 250m and 500m are recommended during the breeding season (Goodship and Furness 2022). Though, as the upper disturbance for breeding can be up to 1000m this would have to considered by the EnvCoW and appropriate measures would be implemented. Following these procedures, no significant effect on white-tailed eagle is predicted during the construction phase.

Golden eagle

4.91 No golden eagle territories were identified within 2km of the Proposed Development during the 2023 surveys, providing similar results to the 2018/19 surveys. As the study area is not part of a territorial home range, the Proposed Development does not have the potential to cause disturbance to breeding golden eagle. It is, therefore, expected that no significant effect will be experienced by golden eagle during the construction phase.

Hen harrier

4.92 Although no breeding hen harrier were identified in the 2023 surveys, they are known to breed regularly in the area. Nests identified during the 2018/19 are located between 0.6km and 2km from the construction footprint which is within the disturbance buffer for breeding hen harrier (300-750m). Furthermore, during wind farm construction

displacement has been suggested potentially to occur up to 500m around nest sites with some disruption up to 1km, depending on the line of visibility (Bright *et al.,* 2006).

4.93 Hen harrier nests will be identified as part of the BPP prior to construction works and good practice measures will be implemented to minimise risk of short-term impacts relating to construction works. Disturbance to foraging birds is possible though the area affected is likely to be very small in relation to the pair's foraging range.

4.94 The impact of disturbance/displacement of hen harriers during construction would be negligible and not significant.

Golden plover

4.95 Sansom *et al.,* (2016b) found no evidence of disturbance to breeding golden plover during the construction phase of a large wind farm in northern Scotland. Two breeding golden plover territories were recorded in the 2023 surveys and are located between 30m and 425m from the construction footprint. This is within the disturbance buffer of golden plover (200-500m), however, following good practice measures outlined above the impact on golden plover will be negligible with no significant effect predicted.

Operational Effects

Disturbance/Displacement

4.96 The operation of wind turbines and associated human activities for maintenance purposes also has the potential to cause disturbance and displace birds from the site. This in effect can lead to habitat loss, as previously used habitat may no longer be utilised by birds due to displacement effects from a wind farm development.

4.97 Studies have shown that, in general, species are not disturbed beyond 500m to 800m from wind turbines (e.g. Drewitt and Langston, 2006 and references therein; Hötker et al., 2006; Pearce-Higgins et al., 2009) and, in some cases, birds do not appear to have been disturbed at all (e.g. Devereux et al., 2008; Whitfield et al., 2010; Douglas et al., 2011; Fielding and Haworth, 2013).

4.98 There is less consensus of opinion about disturbance effects closer to wind farm infrastructure. Pearce-Higgins et al., (2009) found evidence of lower frequencies of occurrence of some species within the vicinity of wind turbines during the breeding season, with a significant reduction in frequency of occurrence, compared to control sites, in seven of the 12 species studied. Other studies of curlew (Whitfield et al., 2010), involving long-term monitoring found no evidence of displacement due to wind farm infrastructure.

White-tailed eagle

4.99 Studies at Smola wind farm in Norway, found that white-tailed eagle territories within 500m of turbines experienced significantly lower breeding success, in large part due to displacement of birds from their territories (Dahl *et al*., 2011). While May *et al*., (2013) showed that sub-adult white-tailed eagles were partially displaced from habitats around the same wind farm.

4.100 Atmos (2018) concluded that there was no evidence of avoidance of Ben Aketil during post consent surveys. Monitoring at Edinbane Wind Farm between 2007-2014 found little evidence of displacement of white-tailed eagle over both Edinbane and Ben Aketil wind farms. Furthermore, a large increase in activity was noted to the south of Edinbane (Haworth Conservation 2015). This increase in white-tailed eagle activity in the locality

has also been reflected between surveys for the consented and Proposed Development. As white-tailed eagles do not disperse far from their natal site, the increase in white-tailed eagle activity on Skye, likely reflects good breeding success in recent years.

4.101 No breeding white-tailed eagle nest locations were identified within 2km of the Proposed Development with desk records indicating that the closet nest site is approximately 2.6km away. At least six adults were recorded during surveys and territorial behaviour of two different pairs were noted during the surveys.

4.102 As monitoring has shown that operational wind farms currently on Skye do not appear to be displacing white-tailed eagles, it is considered likely that this will also be true for the Proposed Development. Furthermore, the population of white-tailed eagle has been increasing within the locality despite the presence of these two operational wind farms, which suggests that displacement is not impacting white-tailed eagle populations, however, it is important to bear in mind that white-tailed eagle populations are currently increasing across the country (Sansom *et al,* 2016a). As there are no breeding sites within 500m of the Proposed Development it is not thought that displacement will impact on breeding success. No significant effect is predicted on the white-tailed eagle population due to disturbance/displacement.

Golden eagle

4.103 Displacement of golden eagles around wind farm developments is estimated to occur at 300m from turbine hub; based off recent satellite tag data received from golden eagles on operational wind farms (Fielding *et al.,* 2021, Fielding *et al.,* 2022). A more conservative estimation of a 500m displacement radius around the turbines, is widely accepted (Walker *et al*., 2005, Haworth 2010) and has been used as the assessment criteria on other wind farms on the isle of Skye. Both displacement buffers are therefore considered.

4.104 Monitoring works at Ben Aketil Wind Farm in 2017 (Atmos 2018) indicated that golden eagles were displaced from around the present turbine locations. Elsewhere, at Edinbane Wind Farm, golden eagle activity declined during construction works between 2008 and 2010. Though since operational, activity levels have returned to pre-construction levels Haworth Conservation 2015).

4.105 As part of the proposed Balmeanach Wind Farm EIA a Golden Eagle Topography (GET) model was created to analyse potential habitat loss for golden eagles in relation to wind farm developments on Skye, including for the consented development (NRP, 2023). As the boundary for the consented development is broadly similar to the Proposed Development, this gives a good indication of golden eagle habitat within the Proposed Development boundary. A 300m buffer of the turbine layout for the consented development (referred to as the potential development boundary (PDA)) was assessed for its golden eagle habitat suitability (174ha), which ranked habitat within this buffer for its suitability for golden eagle. The most suitable habitat is class 6+ within the GET model, of which, 37.5ha was identified within the 300m buffer. A further 88.5ha of lower quality habitat (GET score 3-5) also falls within the 300m buffer. Therefore, 21% of the PDA had high habitat suitability for golden eagle and 51% had sub-optimal habitat suitability. Eagles would be displaced from a total of 126ha (1.26km^2) of suitable habitat.

4.106 Using the 500m displacement buffer, a loss of 320ha of potential eagle habitat, consisting of approximately of 100ha of forestry and 220ha of open habitat, will occur. Golden eagles prefer open habitat (Forrester *et al.,* 2007, Unwin 2016) with the forestry within the 500m buffer considered to be too dense to provide suitable habitat. Therefore, golden eagles would be displaced from approximately 220ha (2.2km^2) of suitable habitat.

4.107 Golden eagles could be displaced from between 1.26 – 2.2 km^2 of suitable habitat due to the Proposed Development. Eight flight lines were recorded within both the 300m and 500m buffer during the 2023 flight activity surveys, suggesting relatively low levels of foraging activity and the absence of a territorial breeding pair in the vicinity. Observations largely consisted of sub-adult birds, with adults noted on three separate survey days in May and October.

4.108 Given the low levels of activity noted during the 2023 surveys, the lack of evidence of a breeding territory, along with the large amount of suitable habitat within the locality, no significant effect on golden eagle in regard to displacement is anticipated.

Hen harrier

4.109 Upon review of a number of studies examining the relationship between hen harriers and displacement from wind farms, Madders & Whitfield (2006), concluded that, by and large, there is little evidence of displacement and ranked the species as being of low-medium risk of displacement. Little evidence of hen harrier displacement was identified within wind farm sites across Europe and evidence for breeding displacement is rare (Wilson *et al.,* 2015a), with hen harrier found to nest within 200-300m of turbines (Whitfield and Madders, 2005).

4.110 No breeding attempts were recorded during the 2023 survey season, though hen harrier is known to nest within the area, with the closest nest, noted in the 2018/19 surveys, approximately 1km from the construction footprint. Breeding success has been varied in recent years, with three nearby nests (within 2.3km) successful in 2018, however, breeding attempts failed in 2019 and 2023. Breeding hen harrier show high site fidelity and it is more likely that inter-year variation in breeding success is the result of the availability of prey (field voles), which fluctuate on a four-year cycle and can create favourable conditions for hen harrier to breed, rather than the effect of operational wind farms. This may also be reflected in post consent monitoring at Ben Aketil Wind Farm (Atmos 2018) which found that the number of active hen harrier territories in the vicinity of the wind farm has remained stable since 2013. The population is, however, less than half what it was in 2010-11. There is no obvious link between the decline and the Ben Aketil Wind Farm (McMillan, 2017). It is apparent that hen harrier breeding productivity varies markedly between years, with a high degree of nest failure in some seasons.

4.111 Given the above evidence it is considered that displacement/disturbance of hen harrier from the Proposed Development is negligible, and no significant impact is expected.

Golden plover

4.112 Pearce-Higgins *et al*., (2009) noted a significant avoidance of wind farms by golden plover within a 200m buffer. Sansom *et al.,* (2016b) also found that during the operational phase abundance at one wind farm in northern Scotland reduced by 79% with displacement occurring up to 400m from turbines.

4.113 Other studies have shown that golden plover is more tolerant of wind farms with nesting birds identified between 100-200m from the nearest turbine (Fielding and Haworth, 2010). Pearce-Higgins *et al.,*(2012) found little evidence for consistent population declines in golden plover due to the displacement effect of wind farms. Other studies involving long-term monitoring at wind farm sites found no evidence of displacement due to wind farm infrastructure in golden plover (Douglas *et al.,* 2011; Fielding and Haworth, 2013).

4.114 The 2023 surveys confirmed two golden plover territories, roughly in the same location as the two confirmed territories in 2019. The outermost territory is located near the summit of Ben Sca, approximately 415m from the footprint of the Proposed Development. Given the

disturbance distances outlined above this territory is considered to be outwith of the displacement effect of the operational phase. However, the other territory is located approximately 30m from the footprint and is at risk of being displaced. Given that the Proposed Development site is surrounded by suitable breeding habitat, worst case scenario would likely be the displacement of one territory to nearby suitable habitat. One territory represents 0.06% of the regional NHZ6 population. Therefore, the potential impact of displacement during wind farm operation is considered not significant for golden plover.

Barrier Effect

4.115 Individual turbines, or a wind farm as a whole, may present a barrier to the movement of birds, restricting or displacing birds from much larger areas. The effect this would have on a population is subtle and difficult to predict with any degree of certainty. If birds regularly have to fly over or around obstacles or are forced into suboptimal habitats, this may result in reduced feeding efficiency and greater energy expenditure. By implication, this will reduce the efficiency with which they accumulate reserves, potentially affecting breeding success or survival.

4.116 Migratory birds are less likely to be impacted by barrier effects as the energetic costs for diverting around a wind farm would be quite low when compared to the overall distance travelled (Masden *et al.* 2009). Barrier effects are more likely to cause issue for locally occurring birds which wish to move between breeding and foraging areas, or to roost sites (Madsen *et al.* 2010).

White-tailed eagle

4.117 White-tailed eagles have increased in the locality since the 2018/19 surveys, with activity noted throughout the survey area and movements of eagles across the Proposed Development. White-tailed eagles were noted flying along the ridgeline where the turbines are proposed to be, particularly in the south beside Ben Sca. The study area was used for roosting and territorial breeding behaviours was also noted indicating that the study area is well-used by local birds. There are a lack of studies investigating barrier effect and it is ill-understood how birds react. Though, some studies have shown that white-tailed eagles do not significantly alter their flight behaviour due to the presence of wind farms (Dahl, 2014), monitoring works at Edinbane and Ben Aketil Wind Farms have seen increases in white-tailed eagle over the operational wind farms (Haworth Conservation 2015). This puts white-tailed eagle at a higher risk of collision with turbines, though suggests that there is a negligible impact on white-tailed eagle from barrier effect and that the effect will not be significant.

Golden eagle

4.118 The low level of golden eagle activity recorded during the 2023 surveys suggests that the Proposed Development does not lie on a regular commuting route for this species. This is also supported by the 2018/19 survey data where a similar level of flight activity was recorded. Therefore, no significant effect is anticipated for golden eagle due to barrier effects.

Hen harrier

4.119 Only one hen harrier flight line was collected during the 2023 survey, which is likely due to the failure of hen harrier to breed in the locality in 2023. During the 2018 surveys, when three active breeding territories were noted within the vicinity of the Proposed Development, a total of 47 flight lines were observed. Hen harriers are classed as

showing 'small or non-significant risk or impact' from barrier effects according to EU guidance (European Commission, 2011). The Proposed Development is relatively small in scale, with six turbines within open habitat and three within a forestry area, and any impacts are thought to be negligible. Therefore, it is anticipated that the Proposed Development would not have a significant effect on hen harrier due to barrier effects.

Golden plover

4.120 Only four golden plover flightlines were recorded during the 2023 flight activity survey with little evidence indicating that golden plover frequently commutes over the Proposed Development. Two flights of breeding birds to and from breeding sites were noted though these flights lines were located to the south-east of the Proposed Development, between 450m and 2.1km away. Fifteen flight lines were noted during the 2018/19 surveys, the majority of which were noted in the breeding season and were located proposed turbine BS-01 and BS-02.

4.121 It is thought outwith the breeding season there is very low potential for the Proposed Development to act as a barrier to golden plover due to the low level of activity noted during the non-breeding period.

4.122 During the breeding season golden plover travel up to 2.3km from their nest location (Forrester *et al.,* 2007), therefore the Proposed Development has the potential to act as a barrier on two breeding pairs. Barrier effect is ill-understood and there is contrasting evidence on the avoidance of wind farms by golden plover, however, worst case scenario would be that the wind farm acts as a barrier to two breeding pairs, which represents 0.12% of the NHZ6 population. Given the small scale of potential impact, it considered that any impact would be negligible, and no significant effect is predicted.

Collision with Wind Turbines

4.123 Collision of a bird with turbine rotors is almost certain to result in the death of the bird. In low density populations (e.g., raptors) this could have a greater negative effect on the local population than in higher density populations (e.g., passerines) because a higher proportion of the local population would be affected in a low-density population. Larger birds such as raptors also live longer and have much slower reproductive rates than passerines, which can also increase the significance of the impact of collisions on the relevant population. The frequency and likelihood of a collision occurring depends on a number of factors which include aspects of the size and behaviour of the bird (including their use of a site), the nature of the surrounding environment, and the structure and layout of the wind turbines.

4.124 Collision risk is perceived to be higher for birds that spend much of the time in the air, such as foraging raptors and those that have regular flight paths between feeding and breeding/roosting grounds (e.g. geese). The risk of bird collisions at wind farms is greatest in areas where large concentrations of birds are present (such as on major migration routes), and in poor flying conditions, such as rain, fog, strong winds that affect birds' ability to control flight manoeuvres, or on dark nights when visibility is reduced (Langston and Pullan, 2003; Drewitt and Langston, 2006 and references therein). Birds may also be more susceptible if the wind farm is located in an area of high prey density. For diurnal foraging raptors, the proximity of structures on which to perch can increase the likelihood of collision with wind turbines (e.g. Percival, 2005 and references therein).

4.125 It should be noted that operational disturbance and collision risk effects are mutually exclusive in a spatial sense, i.e. a bird that avoids the wind farm area due to disturbance cannot be at risk of collision with the turbine rotors at the same time. However, they are

not mutually exclusive in a temporal sense, i.e. a bird may initially avoid the wind farm but habituate to it, and would then be at risk of collision.

4.126 Passerines nesting within a wind farm site would be expected to be regularly flying between wind turbines and could therefore be expected to be most at risk of collision. However, passerines tend to fly below PCH and evidence suggests that passerines collide with wind turbines infrequently. Moreover, most of the species concerned are of low or negligible conservation value. Collision is therefore mainly considered in relation to species of high sensitivity, e.g., target raptor species and species not particularly manoeuvrable in flight, such as geese and swans.

4.127 Species with sufficient data (minimum of five flights per season and/or minimum of 10 birds) to undertake CRM are considered at risk of collision with the proposed wind turbines at the site. The species that met this criterion and were subject to CRM are as follows:

- white-tailed eagle;
- golden eagle; and
- golden plover.

4.128 For all other species, the number of flights within the CRZ, i.e. flights through the WP at PCH, was so low that CRM was not warranted, and collision risk is considered negligible, therefore not significant.

White-tailed eagle

4.129 White-tailed eagles are particularly vulnerable to increased mortality rates due to their low reproductive rates, long life span and high annual survival rates (Dahl, 2014).

4.130 The 2023 white-tailed eagle flight activity data is shown on **Figure 4.3.1.** In 2023, white-tailed eagle was noted across the study area, with high levels of activity noted particularly around the submit of Ben Sca near to proposed turbine 1. A total of 31 white-tailed eagle flights were recorded at PCH within the CRZ. Assuming a 95% avoidance rate, 3.47 collisions per year (approximately one collision every 0.29 years) were predicted.

4.131 Flight activity by white-tailed eagle has clearly increased since the surveys for the consented development in 2018/19, due to an increase in the local population, with three active territories within 6km in 2022, based on local Raptor Study Group data sourced for the proposed Balmeanach Wind Farm assessment. For the consented development this increase in activity has resulted in an increase in predicted mortality from 0.51 based on 2018/19 data to 0.81-2.03 based on 2023 data. For the Proposed Development collisions risk is between 1.39 – 3.47 individuals a year using the 2023 data.

4.132 Assuming worst case scenario that the mortality would involve breeding adults, the annual predicted collision mortality rate of 3.47 represents 1.4% of the national breeding population (244 adults in 2017), 5.4% of the NHZ 6 population (68 adults in 2013), and 7.8% of the local Skye population (44 adults in 2022). Background annual mortality is 6.4% for adults (>3 years old) (Green *et al.,* 1996) (which amounts to 2.82 birds on Skye), the loss of an extra 3.47 individuals yields annual mortality of 6.29, representing a 123% increase in adult mortality. However, the background annual mortality for birds younger than three years of age is high (60.5%), therefore it is reasonable to suggest that the additional mortality of birds <3 years old would not be significant.

4.133 Based on 2023 data, for the consented development the re-modelled 2023 data yielded a result of 2.03, based on the default avoidance rate of 95%. This demonstrates the extent

to which white-tailed eagle activity has increased since baseline surveys for the consented development took place, which resulted in a predicted figure of 0.51.

4.134 There is a body of evidence based on empirical data suggesting that an avoidance rate of 98% is more realistic for this species. Anecdotal evidence in support of this is that of the five known white-tailed eagle collision incidents recorded in Scotland, only one of these was recorded on Skye (an adult bird killed by a collision with a turbine at the adjacent Edinbane Wind Farm in 2016), and this is in the context of extensive monitoring at wind farms in the area.

4.135 Population modelling in Sansom *et al.* (2016a) shows a potential modelled population size of approximately 220 pairs by 2025. Extrapolation forwards, that model (Vortex) predicted an estimated possible population size of between 889 and 1,005 pairs by 2040. Non-natural mortality of up to 14 birds per year was considered and when modelling the impact of additional mortality, potentially caused by illegal killing and collisions with wind turbines, population growth rate was reduced, but not to the extent of causing a population decline in the following 25 years. The modelled scenario that included the deaths of an additional 14 birds per annum across Scotland predicted a mean population size of 489 (± 10) pairs in 2040 which is 400 pairs lower than the modelled population with no extra mortality. However, an annual loss of only two white-tailed eagles would result in around 794 (±10) breeding pairs (Sansom *et al.* 2016).

4.136 To further investigate the potential impacts of collision risk resulting from the adjacent proposed Balmeanach Wind Farm on the local and regional populations of white-tailed eagle, future population trajectories were also investigated using population modelling (**Technical Appendix 4.4**). The potential impacts of an additional mortality of 3.4 birds (which was assessed as the cumulative impact in the Balmeanach EIA) were modelled at two scales: Skye and NHZ 6. The following points were concluded relation to this model within the Balmeanach EIA:

- "The assumed NHZ 6 starting population in the models is 120 sub-adults and 78 adults. Depending on the ages of the birds killed the cumulative collision mortality of 3.4 birds per year represents 2.8% of the sub-adults, 4.4% of the adults or 1.7% of all birds. This scale of mortality is not predicted to have a significant impact although there would be a delay in reaching the carrying capacity.
- The assumed Skye starting population in the models is 50 sub-adults and 50 adults. Depending on the ages of the birds killed the cumulative collision mortality of 3.4 birds per year represents 6.8% of the sub-adults, 6.8% of the adults or 3.4% of all birds.
- The worst-case scenario is that all collisions would be adults and the population is not predicted to reach its carrying capacity within 30 years. However, the prediction of between 34 and 37 pairs (range 26 - 38 pairs) is still a significant increase from the present and well above the maximum predicted Skye population in Sansom et al. (2016). There is no prediction of a population decline.
- A more realistic scenario is that the collision mortality will be split between sub-adults and adults. If an equal split is assumed, the prediction of between 36 and 37 pairs (range 29 - 40 pairs) to be present in Year 30 is made.
- The overall effect of the levels of additional wind farm mortality modelled in this case is to reduce the year at which the population reach their carrying capacities. There is no threat to the integrity of the white-tailed eagle populations at even the highest rate of modelled mortality. As such, the additional cumulative predicted collision mortality for white-tailed eagle is not considered to be significant."

4.137 This is also supported by the PVA prepared for Glen Ullinish II Wind Farm (Muirhall Energy, 2023) where collision risk was predicted to be 3.3 individuals a year. The effects of this additional mortality also resulted in an increase in time needed to reach carrying capacity of the white-tailed eagle population, but no significant effect was predicted.

4.138 In terms of collision risk, whilst the Proposed Development will have an impact on a regional scale on the white-tailed eagle population, in the context of an increasing population this will be at a low level. The PVA model shows that the white-tailed eagle population will still reach its carrying capacity within the region, and the effect is considered to be not significant.

Golden eagle

4.139 The 2023 golden eagle flight activity data is shown in **Figure 4.3.2.** Flight activity by golden eagle were at similar levels as what was recorded for the consented development. Flightlines were scattered throughout the site, with the highest concentration around the southern edge of the site boundary. A total of nine golden eagle flights were recorded at PCH within the CRZ. Assuming a 99% avoidance rate, 0.10 collisions per year (approximately one collision every 9.9 years) were predicted.

4.140 Flight activity by golden eagle remains at a similar level to those recorded during surveys for the consented development in 2018/19 where no significant effect on the golden eagle population was considered likely as reported within the Ben Sca Wind Farm EIA Report (SLR, 2020a). The predicted mortality for the Proposed Development (0.10) remains similar to what was predicted for the consented development in 2018/19 (0.08).

4.141 Over the operational period of the Proposed Development, assuming worst case scenario, four adult golden eagles will be lost over the 40-year period. Annual adult survival rate is estimated to be between 95.85 to 97.5% in Western Scotland (giving a background mortality rate of 2.5 - 4.15%) and for sub-adults it is speculated that survival rates are much lower, though this is supported by little data (Watson, 2010). Pre-adult survival in eagles probably varies considerably, both between populations and between different time periods in the same population. In the absence of immigration/emigration, the maintenance of a stable population over time will be achieved through the combined effects of adult mortality and pre-adult mortality. The length of the pre-adult period will also vary between populations (Watson 2010). For populations with high productivity and high adult survival, then a pre-adult survival of c.10% may be sufficient to maintain a stable population (e.g. on Skye, Watson 2010). Elsewhere in western Scotland, where breeding productivity is lower, pre-adult survival may be c.15% in order to maintain the population.

4.142 Background mortality rates are estimated to be between 2.5 – 4.15%, using the higher background mortality rate of 4.15% within NHZ6 population (148 adults), 6.14 birds die a year. With the predicted yearly collision mortality to be 0.04 birds a year, this is a 0.65% increase above the 4.15% background mortality rate. Using the lower value of a 2.5% background mortality rate within the NHZ 6 population, 3.18 birds die a year. With the predicted collision mortality at 0.04 birds a year this is a 1.26% increase above the 2.5% rate. Therefore, the Proposed Development may cause an increase in background mortality of 0.65-1.26%, though this should be caveated by the following assumptions to the above calculations.

- the NHZ 6 population estimate (Wilson *et al.,* 2015) is based on 2003 survey data and is likely to have increased (based on the trend recorded in the Hebridean Islands area between 2003 and 2015, Hayhow *et al.* (2017)); and

- collision events are possibly more likely to affect less experienced sub-adult birds which are not part of the breeding population, and which have a naturally higher mortality rate.

4.143 Extensive analysis of satellite tracking records suggests that golden eagles rarely approach turbines (Fielding *et al.,* 2022, 2021). A study conducted at two wind farms in the central Highlands of Scotland showed that although golden eagles were closer to turbine locations in preferred habitat, they were at greater distances after turbines became operational (Fielding *et al.,* 2022). At higher wind speeds golden eagles flew closer to operational turbines; particularly those turbines in more preferred habitat (higher GET score). After turbines became operational, golden eagles effectively abandoned inner turbine locations, and flights close to rotor blades appeared to be rare (Fielding *et al.,* 2021). The authors of the study (who are the leading experts on golden eagle ecology and behaviour in Scotland) suggested that it is habitat loss and not probability of collision that constitutes the main impact of wind farms in Scotland for golden eagle.

4.144 According to the ongoing German (Brandenburg state) review of bird collisions with turbines in Europe, there have been 27 recorded golden eagle fatalities (Dürr, 2023). These collisions have been in Spain (8 collisions), Norway (2 collisions) and Sweden (12 collisions), although collisions are most likely underreported as not all countries monitor and share their collision fatalities data. Currently, it seems there have been between three and five golden eagle collision deaths at Scottish wind farms spread over more than 20 years (Fielding et al., 2022).

4.145 Operational displacement may occur, which could lower the number of birds killed over the operational period. Though on the basis of four golden eagle collisions over the 40-year operational period, represent a yearly loss of 0.02% of the current NHZ 6 population. Therefore, a negligible impact is predicted, leading to a non-significant effect.

Golden plover

4.146 The 2023 golden plover flight activity is shown on **Figure 4.3.3,** with two flight lines within the CRZ. Flight activity occurs in the southern end of the site, close to the summit of Ben Sca. Assuming a 98% avoidance rate, 0.3889 collisions per year (2.57 years per collision) were predicted. Both flights lines recorded in the CRM were recorded outwith of the breeding season.

4.147 Flight activity by golden plover remains at a similar level to those recorded during surveys for the consented development in 2018/19 which had a predicted mortality rate of 0.33.

4.148 The wintering population of golden plover is 25,000 – 35,000 individuals in Scotland, the predicted yearly collision rate of 0.3889 represents between 0.002 to 0.001 of the national wintering population. If considering the regional breeding population within NHZ 6 (3,212 individuals) the predicted collision rate of 0.3889, represents 0.01% of this population. The potential small scale loss of either population estimate is considered negligible, especially when viewed in light of the background mortality rate of 27% for this species (BTO Birdfacts). Therefore, no significant effect on the golden plover population is predicted.

Decommissioning Effects

4.149 Potential effects associated with decommissioning of the Proposed Development are assumed to be similar to those identified for construction phase (i.e., habitat loss and disturbance/ displacement). Decommissioning effects are therefore not considered separately for each species.

4.150 Due to the length of the operational period (40 years) the future composition of the bird community at the site is not known and the confidence in any prediction would be uncertain. In the absence of mitigation, decommissioning could cause short term effects through disturbance. Positive effects however, might also occur through the removal of turbines and the reinstatement of topsoil. Good practice measures, similar to those employed during the construction phase, including surveys prior to decommissioning, to inform an up-to-date assessment of potential effects on important bird species, would be implemented during decommissioning. Following the implementation of these measures, no significant effects would be anticipated.

Summary of Predicted Effects

4.151 Following the implementation of a range of good practice measures as detailed throughout this Chapter, no significant negative effects on any of IOFs (i.e. white-tailed eagle, golden eagle, hen harrier, and golden plover) are predicted during the construction phase of the Proposed Development.

4.152 During the operational phase no significant effects were identified in regards to disturbance/displacement or with barrier effects. A low-level impact for white-tailed eagle in terms of collision risk was identified, however, this impact is not considered to be significant. No significant effects were identified for golden eagle and golden plover in terms of collision mortality. Hen harrier was not considered in regard to collision risk due to their very low levels of flight activity in 2023.

4.153 During decommissioning, as during construction, potential displacement effects are possible, but a basic monitoring programme for breeding waders and raptors will inform any potential impacts here and following the implementation of a range of accepted good practice measures no significant negative effects on IOFs are predicted.

Cumulative Effects Assessment

4.154 The following section assesses the potential cumulative effects on IOFs from the Proposed Development along with all other operational, consented and submitted plans or projects within an appropriate zone of influence and against the relevant NHZ population estimates, following NatureScot guidance (SNH, 2018c).

4.155 In line with this guidance, any wind farm developments of fewer than three turbines (small scale wind energy proposals (SNH, 2016c)) were excluded from the cumulative impact assessment, due to the problems associated with finding appropriate data for developments of this size. Only IOFs for which a greater than negligible residual impact is predicted are considered in the cumulative impact assessment, as unquantified negligible impacts will not result in a detectable increase in cumulative impacts.

4.156 All existing, consented and submitted wind farm developments (of three or more turbines) and other projects identified within NHZ 6 are considered as part of the assessment of cumulative impacts (these are shown in **Table 4-6**).

Table 4-6: Projects Considered for Cumulative Effects Assessment

Project	Status	Distance from Proposed Development (km)	No. of Turbines	Information Available	Species Assessed
Balmeanach	Submitted	0.7km	10	EIA chapter	White-tailed eagle, golden eagle, hen harrier, golden plover.
Ben Aketil and Extension	Operational	1.1km	12	EIA chapter and post consent monitoring reports available	White-tailed eagle, golden eagle, hen harrier, merlin, peregrine, golden plover, short-eared owl.
Ben Aketil Repowered & Extended	Submitted	1.1km	9	EIA chapter	White-tailed eagle, golden eagle.
Edinbane	Operational	1.5km	18	EIA chapter (section 42 variation) and post consent monitoring available	White-tailed eagle, golden eagle, hen harrier.
Edinbane Repower and Extension	Scoping	Adjacent	19	Scoping Report	N/A
Skye Reinforcement Project	Applications	1.7km	Overhead transmission line	ES available (Ornithology confidential)	White-tailed eagle, golden eagle, red-throated diver, short-eared owl.
Waternish Wind Farm	Scoping	2.5km	15	Scoping	N/A
Glen Ullinish	Approved	5.5km	11	EIA chapter	White-tailed eagle, golden eagle, hen harrier.
Glen Ullinish II	Submitted	3.2km	47	EIA chapter	White-tailed eagle, golden eagle, hen harrier, greenshank, red-throated diver.
Beinn Mheadhonach	Approved	11.8km	4	EIA chapter	White-tailed eagle, golden eagle, red-throated diver, short-eared owl.

Project	Status	Distance from Proposed Development (km)	No. of Turbines	Information Available	Species Assessed
Beinn Mheadhonach Redesign	Scoping	11.8km	5	Scoping Report	N/A

4.157 Potential cumulative effects from the Proposed Development include potential habitat loss (by means of disturbance/displacement) for golden eagle, and collision mortality for white-tailed eagle, golden eagle, hen harrier, and golden plover. Hen harrier is included in the cumulative analysis using the flight data from previous surveys in 2018/19, as this provides flight data for a successful breeding year which is a likely scenario moving forward.

Construction and Decommissioning Effects

4.158 It is assumed, that during the construction and decommissioning phases of nearby wind farm developments, best practice guidelines will be adhered to, therefore, no significant cumulative effects during these phases are considered likely.

Operational Effects

Habitat Loss (Disturbance/displacement)

Golden eagle

4.159 Golden eagles are often displaced from wind farms during the operational period, and it has been suggested that habitat loss as a result of disturbance, is the main impact of wind farms in Scotland for golden eagle (Fielding *et al.,* 2021).

4.160 The Edinbane Section 42 variation ES (Vattenfall 2009) calculated that the cumulative loss of sub-adult golden eagle habitat due to the construction of Ben Aketil and Edinbane Wind Farms was 10.26km² (2.3% of the total for Skye). As these wind farms are on the edge of the largest block of potential sub-adult habitat on Skye (143.75km^2) it was concluded that it was unlikely that the cumulative loss of sub-adult habitat, resulting from the construction of the two wind farms, would have a significant impact on the local or regional golden eagle population. A lack of any significant impact was concluded as a result of the location of the wind farms on the edge of the largest patch and the small footprint area of the development.

4.161 For proposed Balmeanach Wind Farm, the area of potential habitat loss was assumed to be that within a 500m disturbance/displacement buffer of the proposed turbines, which amounts to approximately 4.2km². Furthermore, this includes some overlap of existing habitat loss from Ben Aketil and Edinbane Wind Farms, plus the consented Ben Sca Wind Farm along with an area of forestry. Between the Proposed Development and the proposed Balmeanach Wind Farm there is a small overlap in site area (0.1km^2).

4.162 Using the same approach, within a 500m buffer of the Proposed Development there is an area of 3.2km^2, consisting of approximately of 1km^2 of forestry and 2.2km^2 of open habitat.

4.163 Golden eagle disturbance/displacement and the resulting habitat loss was not quantified for other projects considered in the cumulative assessment.

4.164 Habitat loss arising from the construction of the Skye Reinforcement Project is unlikely to result in adverse impacts upon any bird species. Any impacts are likely to be negligible and not significant.

4.165 Considering the areas of overlap, and in the context of the location of the wind farm projects which are on the edge of a large area of sub-adult golden eagle habitat, the additional potential area of habitat loss, by means of disturbance and displacement, is therefore, unlikely to have a significant cumulative impact on the local or regional golden eagle population.

Other Species

4.166 No significant cumulative impacts from habitat loss (disturbance/displacement) are considered likely for white-tailed eagle, hen harrier or golden plover following the rationale that only IOFs for which a greater than negligible residual impact is predicted are considered in the cumulative impact assessment.

Collision Mortality

4.167 Collison rates for white-tailed eagle, golden eagle, hen harrier, and golden plover from the cumulative wind farm projects and the Proposed Development are presented in **Table 4-**7.

Table 4-7: Cumulative Effect – Collision Mortality (Collisions per Year)

Project	White-tailed eagle	Golden eagle	Hen harrier	Golden plover
Proposed Development	3.47	0.1012	Not assessed in CRM	0.3889
Consented Development 2018/19 data	0.51	0.08	0.096	0.33
Balmeanach	1.38	0.155	0.035	1.75
Ben Aketil and Extension	0.05	0.04	0.11	0
Ben Aketil Repowered & Extended	0.512	0.129	Not assessed in CRM	Not assessed in CRM
Edinbane	0.06	0.277	0.049	Not assessed in CRM
Glen Ullinish	1.12	0.195	0	Not assessed in CRM
Glen Ullinish II	3.3	0.39	0.11	Not assessed in CRM
Beinn Mheadhonach	0.29	0.032	0	Not assessed in CRM
Total	**10.132**	**1.2492**	**0.29**	**2.1389**

(Outdated data faded in grey – newest data used if available)

White-tailed eagle

4.168 Heuck *et al.,* (2019) found that white-tailed eagle habitat suitability and turbine density were found to have synergistic effects on increased collision mortality, leading to the recommendation that wind turbines should not be placed in core population areas of

species vulnerable to collision risk (Heuck *et al.,* 2019). NHZ 6 is a stronghold for breeding white-tailed eagle with 34 breeding pairs (Wilson et al, 2015b). More recent work on Skye has identified 22 territories (Challis *et al.,* 2022), identifying it as providing high suitability in terms of habitat.

4.169 PVA analysis produced for the proposed Balmeanach Wind Farm (2023) (**Technical Appendix 4.4**) and the proposed Glen Ullinish II Wind Farm (Muirhall, 2023) modelled the potential impacts of additional mortality modelled at two scales: NHZ 6 and Skye. Models were run with and without density dependence and with three age class mortality scenarios. Each model (combination of region, mortality rate and presence or absence of density dependence) is simulated 1,000 times with a 30-year projection (Balmeanach) and 40-year projection (Glen Ullinish II).

4.170 The assumed NHZ 6 starting population in year 0 of the model simulation is 120 sub-adults and 78 adults. The cumulative predicted mortality of 10.132 represents 8.4% of the sub adult population, 12.9% of the adult population, and 5.1% of the entire population.

4.171 The assumed Skye population in year 0 of the model is 50 sub-adults and 50 adults. The cumulative predicted mortality of 10.132 represents 20.3% of both the sub-adult and adult population, and 10.1% of the entire population. Note that the PVA results indicate that "the most extreme, and ecologically unrealistic, modelled scenario was 10% adult mortality, equivalent to killing approximately 17 adults (both sexes) per year. Even this extreme scenario predicts a median year 30 population of 38 pairs, which is considerably larger than the maximum population of 30 pairs for Skye estimated by Sansom *et al*. (2016). The minimum modelled year 30 population was 25 pairs, which is the same as the current population."

4.172 The most realistic scenario is that any mortality will affect both adults and sub-adults. The modelling presented in Appendix 1 of the white-tailed eagle PVA provided with the Balmeanach EIA Report (and also appended here as **Technical Appendix 4.4**) gave the following results:

- For NHZ 6, with a carrying capacity of 80 pairs, the predicted impact on the white-tailed eagle population of 5% mortality, with density dependence, results in a population of 73.3 pairs after 30 years, compared with 81.4 pairs with 0% mortality. This is not considered significant, as the population will be at 91.25% of carrying capacity.
- For Skye, with a carrying capacity of 40 pairs, the predicted impact on the white-tailed eagle population of 10% mortality, with density dependence, this results in a population of 36.2 pairs after 30 years, compared with 40.5 pairs with 0% mortality. This is not considered significant, as the population will be at 90.5% of carrying capacity.

4.173 In terms of collision risk, whilst the cumulative situation will have an impact on a regional scale on the white-tailed eagle population, in the context of an increasing population this will be at a low level. The PVA model shows that the white-tailed eagle population will still reach carrying capacity within the region, and the effect is considered to be not significant.

Golden eagle

4.174 PVA analysis of golden eagle produced for the proposed Glen Ullinish II Wind Farm (Muirhall 2023) modelled the potential impacts of additional mortality modelled at two scales: NHZ 6 and Skye. Models were run with and without density dependence and with three age class mortality scenarios. Each model (combination of region, mortality rate and

presence or absence of density dependence) is simulated 1,000 times with a 40-year projection.

4.175 The assumed NHZ 6 starting population in year 0 of the model simulation is 222 birds of all ages (74 breeding pairs). The cumulative predicted mortality of 1.1 represents 0.5% of the entire population.

4.176 The assumed Skye population in year 0 of the model is 88 birds of all ages. The cumulative predicted mortality of 1.1 represents 1.25% of the entire population.

4.177 The most realistic scenario is that any mortality will affect both adults and sub-adults. The modelling presented in Muirhall (2023) gave the following results:

- For NHZ 6, with a carrying capacity of 118 pairs, the predicted impact on the golden eagle population of 0.5% mortality, with density dependence, results in a population of 116 pairs after 40 years, compared with 117.1 pairs with 0% mortality. This is not considered a significant, as the population will be at 99.1% of carrying capacity.
- For Skye, with a carrying capacity of 48 pairs, the predicted impact on the golden eagle population of 1.5% mortality, with density dependence, this results in a population of 47.6 pairs after 40 years, compared with 48.5 pairs with 0% mortality. This is not considered significant, as the population will be at 98.1% of carrying capacity.

4.178 Predicted mortality of 1.1 individuals is similar to the cumulative situation considered in this report. As the effect on the carrying capacity of the population is negligible, no significant effect is considered likely for golden eagle in regard to collision impact.

Hen harrier

4.179 Though not assessed for the project alone due to the lack of 2023 flight activity, hen harriers are considered cumulatively as they are known breeders in the area. The 2018/19 flight data gives an indication of flight activity by hen harrier during a successful breeding year and is used here to present a worst-case scenario for collision risk. Flight activity by hen harrier amounted to a single flight in late September 2023. This low activity is assumed to be as a result of the absence of any breeding territories (or early breeding failure) this year. Therefore, the predicted mortality rate for both the consented and the Proposed Development is negligible based on 2023 data. The rate in 2018, using the data collected that year, was 0.096 when there were three breeding territories within 2km of the consented development. Collision rate was calculated to be 0.096 (approximately one collision every 15 years) which was not considered significant for hen harrier on the consented development.

4.180 Twenty-seven hen harrier collisions have been reported at European wind farms, six of which were in the UK (Dürr, 2023). Whilst it is acknowledged that there may be other, unpublished collisions of this species, hen harrier collisions nevertheless appear to be an uncommon event.

4.181 The predicted mortality for the consented scheme was 0.096 individuals per year, and considered cumulatively the total predicted mortality is 0.29 birds per year. If predicted annual mortality of 0.29 individuals per year relates to individuals from the breeding population, this equates to 0.38% of the estimated breeding population of NHZ 6 (76 individuals, Wilson *et al.,* 2015) and represents less than 0.03% of the Scottish breeding population (920 breeding individuals; Wotton *et al.,* 2018).

4.182 In the context of background annual adult mortality of 19% (BTO Birdfacts), which amounts to 14.4 birds in the context of the NHZ 6 population of 76, the additional annual

mortality of 0.096 birds is not considered to impact the hen harrier population (0.6% increase in annual mortality). Therefore, no significant cumulative effect is considered likely.

Golden plover

4.183 Golden plover collision risk was only considered for two wind farms, the Proposed Development and the adjacent proposed Balmeanach Wind Farm. A predicted cumulative collision rate of 2.1389 birds per year was calculated. Both wind farms would have a project life of 40 years, which results in a total of 85.5 predicted collisions over the operational phases of the projects. This represents a total of between 0.342 – 0.244% of the national wintering population, and 0.285% of the national breeding population, which given the time frame of the developments is considered to be negligible.

4.184 If considering the regional breeding population within NHZ 6 (3,212 individuals) a total of 85.5 predicted collisions represents 2.6% of the regional population.

4.185 Collision risk for waders is generally deemed to be low, due to a relatively low cursory flight path, coupled with high flight manoeuvrability (Mc Guinness e*t al.,* 2015). A review of pan-European collision assessments revealed much lower golden plover collision records than other species, though this was not controlled for survey effort or corpse recovery rates (Hötker et al., 2006). Golden plover collisions with turbines are relatively rare (47 golden plover collisions have been reported at European wind farms, none of which were in the UK (Dürr 2023)). The relatively high mortality rates predicted for golden plover derive from a very low number of flights comprising a high number of individuals. Given that the 85.5 predicted collisions are over a 40-year period, it is not considered that this will have a significant impact on the local golden plover population, and therefore, no significant effect is predicted.

Summary of Predicted Cumulative Effects

4.186 During construction no significant cumulative effects were considered likely to occur.

4.187 During the operational phase no significant effect was identified for golden eagles in terms of habitat loss (by means of disturbance/displacement). Collision risk was considered not significant for golden eagle, hen harrier, and golden plover. Collision risk was considered to have a low-level impact at the regional level for white-tailed eagles, however, this was considered to be non-significant.

Further Survey Requirements and Monitoring

4.188 The key issues for consideration are raptor flight activity, the potential for displacement from the Proposed Development to other adjacent areas and the potential for collision as it is important that any monitoring programme addresses the species that may be affected by the Proposed Development. It should be recognised however that ‘such monitoring should only be required where there is a gap in understanding or where the scale and extent of impact is uncertain’ (SNH, 2009).

4.189 The post consent ornithological monitoring programmes for the adjacent operational Edinbane Wind Farm and Ben Aketil Wind Farm have produced a vast amount of information over a long period of time, and it is broadly understood how raptors respond to operational wind farms in this part of Skye. The operational monitoring data show that there is some displacement of flight activity away from the turbines although this has not apparently affected the long-term population trends for golden eagle which remain stable

and white-tailed eagle which have increased. What is not fully understood, however, is the change in potential cumulative effect on the populations of both eagle species on the Isle of Skye as an increasing number of renewable energy developments are brought forward.

4.190 Post consent monitoring requirements (as included in **Technical Appendix 5.3: Outline Habitat Management Plan, OHMP**) should be coordinated with the adjacent consented Glen Ullinish Wind Farm and the proposed Balmeanach, Ben Aketil Repowering and Glen Ullinish II Wind Farms if consented in due course. The exact scope of works would be confirmed after consultation but is likely to include collision monitoring, flight activity surveys and breeding raptor surveys. It is important that any monitoring is designed to assess the actual versus predicted impacts on birds and to allow for a flexible monitoring plan to be undertaken during the post consent period.

4.191 It is proposed that ornithological monitoring should take place during and post-construction, in line with NatureScot guidance (SNH, 2009). This is in line with what was recommended for the proposed Balmeanach Wind Farm and the approach is outlined as follows:

- year-round collision monitoring: carcass searches, carcass persistence trials and observer efficiency trials should be completed at least once per month throughout the year, to determine whether actual bird collisions are in line with predicted values. Carcasses of all species found on site should be recorded;
- flight activity surveys should be undertaken from the same VP locations used during baseline surveys to monitor the flight activity of target species. These surveys should be undertaken in Year 0, 1, 2, 3, 5, and 10, with a minimum of 3 hours of survey effort per VP location per month. Upon completion of surveys in Year 10, the need for further monitoring should be accessed. These surveys would help establish any disturbance/displacement effects of the operational turbines on the resident bird species; and
- targeted raptor surveys should also be undertaken to monitor the status of nesting raptor species within the vicinity of the Proposed Development, in order to further determine the displacement effect. These surveys should be undertaken in Year 0, 1, 2, 3, 5, and 10. Upon completion of surveys in Year 10, the need for further monitoring should be accessed.

4.192 Given the broad range of existing data, a flexible monitoring programme is recommended and should be undertaken at reasonable intervals throughout the lifespan of the Proposed Development. For example, the above monitoring can take place annually during construction, and after the Proposed Development becomes operational, during years 1-3, 5, 10 and 15, with the requirement for further surveys to be determined based on previous survey results.

4.193 Availability of carrion is a key aspect influencing eagle flight activity in a particular area. It is recommended that fallen stock/deer removal within 500m of each turbine is carried out. It is recommended that a plan for compliance with this proposal is secured via planning condition.

4.194 It is proposed that a close collaboration with the HRSG is established in order to facilitate a research programme aimed at furthering understanding of white-tailed eagle and golden eagle population prospects in the light of an increasing number of renewable energy projects on the Isle of Skye. The overarching objective of this research programme would be the monitoring of the breeding populations of the two eagle species, and the effects of the wind farm developments in the northern part of Skye on these species. It is envisaged

that GPS technology would be used to understand eagle movement patterns and use of breeding and non-breeding areas. This approach would allow the exploration of their habitat use and home ranges across the annual cycle, and also to monitor any collisions and displacement effects that might occur as a result of operational and proposed wind farm developments.

4.195 This research initiative would work best as a collaborative effort between a number of wind farm developers whose renewable energy assets are located in the northern part of Skye and the Applicant is committed to pursuing these discussions through the Skye Developer Forum. It is proposed that the Proposed Development would investigate contributing to the funding for an eagle research programme. This proposal could form a planning condition for the Proposed Development.

Mitigation, Compensation and Enhancement

4.196 As part of the Proposed Development approximately 64.73ha of blanket bog will be restored through the felling of trees currently planted on areas of deep peat (See **Technical Appendix 5.3 OHMP** for details). The restoration of bog habitat should increase habitat suitability for waders, with an increase in both nesting and foraging habitat, and may reduce predator pressure by reducing cover for them. Tree removal both in terms of habitat change and disturbance for birds during the construction works will be further considered in the final HMP and BPP once final construction phasing is known.

Statement of Significance

Proposed Development

4.197 No significant effects on ornithological features were considered for the construction, operational, and decommissioning phases.

Cumulative Effects

4.198 No significant cumulative effects on ornithological features were considered for the construction or operational phase.

Comparison to Consented Development

4.199 No significant effects on ornithological features were considered for the consented development in isolation or cumulatively and, therefore, the conclusions of this assessment and the previous assessment undertaken for the consented development are in accordance with one another.

References

Atmos Consulting (2017). Ben Aketil Wind Farm, Skye. *Post Construction Monitoring Report 2017*. Ben Aketil Wind Energy Ltd.

Balmeanach Wind Farm EIA (2023). Technical Appendix 9.6: Modelling the Impacts of Wind Farm Mortality on White-tailed Eagles.

Band, W., Madders, M. and Whitfield, D.P. (2007) Developing Field and Analytical Methods to Assess Avian Collision Risk at Wind Farms. In: De Lucas, M., Janss, G. and Ferrer, M., Eds., *Birds and Wind Power*, Quercus Editions, Madrid, 259-275.

Bevanger, K., Berntsen, F., Clause, S., Dahl, E.L, Flagstad, O., Follestad, A., Halley, D., Hanssen, F., Johnsen, L., Kvaloy, P., Lund-Hoel, P., May, R., Nygard, T., Pedersen, H.C., Reitan, O., Roskaft, E., Steinheim, Y., Stokke, B. & Vang, R. 2010: Pre – And Post construction studies of conflicts between birds and wind turbinesin coastal Norway (birdwind) report on findings 2007-2010 – Nina report 620. Norwegian Institute for Nature Research, Trondheim.

Bright J. A. Langston, R.H.W., Bullman, R., Evans, R.J., Gardner, S. Pearce-Higgins, J. and Wilson, E. (2006). Map of bird sensitivities to wind farms in Scotland: A tool to aid planning and conservation. *Biological Conservation* **141**: 2342-2356.

Brown, A. F. and Shepherd, K. B. (1993). A Method for Censusing Upland Breeding Waders. Bird Study 40, 189-195.

BTO Birdfacts: http://app.bto.org/birdfacts [Accessed in January 2024].

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.

Challis, A., Wilson, M.W., Eaton, M.A., Stevenson, A., Stirling-Aird, P., Thornton, M. & Wilkinson, N.I. (2022). Scottish Raptor Monitoring Scheme Report 2020. BTO Scotland, Stirling.

CIEEM (2022) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester. Version 1.2.

Dahl, E. (2014). Population dynamics in white-tailed eagle at an on-shore wind farm area in coastal Norway (Doctoral Dissertation). Norwegian University of Science and Technology (NTNU).

Daniel B. Hayhow, Stuart Benn, Andrew Stevenson, Patrick K. Stirling-Aird & Mark A. Eaton (2017) Status of Golden Eagle *Aquila chrysaetos* in Britain in 2015, Bird Study, 64:3, 281-294, DOI: 10.1080/00063657.2017.1366972

Devereux, C.L., Denny, M.J.H. and Whittingham, M.J. (2008). Minimal Effects of Wind Turbines on the Distribution of Wintering Farmland Birds. *Journal of Applied Ecology* **45**, 1689–1694.

Douglas, D.J.T., Bellamy, P.E. and Pearce-Higgins, J.W. (2011). Changes in the Abundance and Distribution of Upland Breeding Birds at an Operational Wind Farm. *Bird Study* **58**, 37-43.

Drewitt, A.L. and Langston, R.H.W. (2006). Assessing the Impacts of Wind Farms on Birds. Ibis 148, 29- 42.

Dürr, T. (2020). Vogelverluste an Windenergieanlagen / bird fatalities at wind turbines in Europe. Daten aus der zentralen Fundkartei der Staatlichen Vogelschutzwarte im Landesamt für Umwelt, Gesundheit und Verbraucherschutz Brandenburg zusammengestellt. Tobias Dürr; Stand vom: 07 January 2020.

Dürr, T. (2023). Auswirkungen von Windenergienanlagen auf Voegel und Fledermaeuse. Daten aus der zentralen Fundkartei der Staatlichen Vogelschutzwarte im Landesamt für Umwelt, Gesundheit und Verbraucherschutz Brandenburg zusammengestellt.

European Commission (2011). Wind energy developments and Natura 2000. Luxemburg: Publications Office of the European Union. 116pp.

Fielding, A. and Haworth, P. 2010. *Farr Wind Farm: A review of displacement disturbance on golden plover arising from operational turbines between 2005-2009.* Haworth Conservation, Isle of Mull, Scotland.

Fielding, A.H. and Haworth, P.F. (2013). *Farr Wind Farm: A Review of Displacement Disturbance on Golden Plover Arising from Operational Turbines 2005-2013*. Haworth Conservation, Isle of Mull, Scotland.

Fielding, A.H., Anderson, D., Benn, S., Dennis, R., Geary, M., Weston, E. & Whitfield, D.P. (2021). Non-territorial GPS-tagged golden eagle (*Aquilla chrysaetos*) at two Scottish wind famrs: Avoidance influenced by preferred habitat distribution, wind speed and blade motion status. PloS ONE 16(8): e0254159.

Fielding, A.H., Anderson, D., Benn, S., Dennis, R., Geary, M., Weston, E, & Whitfield, P (2022). Responses of dispersing GPS tahgged Golden Eagles (*Aquilla chrysaetos*) to multilpe wind farms across Scotlandd. Ibis (164), 102-117.

Forrester, R. W., Andrews, I. J., Mclnerny. C. J., Murray, R. D., McGowan, R. Y., Zonfrillo, B., Betts, M.W., Jardine, D.C. & Grundy, D.S. (eds) (2007). The Birds of Scotland. The Scottish Ornithologists' Club, Aberlady.

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

Goodship, N.M, and Furness, R.W. (MacAruthur Green) (2022) Disturbance Distances Review: An updated literature review of disturbance distances of selected bird Species. NatureScot Research Report 1283.

Hardey, J., Crick, H.Q.P., Wernham, C., Riley, H., Etheridge, B., Thompson, D. (2013). *Raptors: A field guide for surveys and monitoring* (3rd Edition). The Stationery Office Edinburgh.

Haworth Conservation Ltd (2015). Edinbane Windfarm: Ornithological Monitoring 2007-2014. *A review of the spatial use of the area by birds of prey*. Haworth Conservation Ltd, Mull.

Haworth Conservation. 2010. Edinbane Windfarm: Ornithological Monitoring. *A review of the spatial use of the area by birds of prey.* Haworth Conservation Ltd, Mull.

Haworth, P. F., Mcgrady, M. J., Whitfield, D. P., Fielding, A. H. & McLeod. D. R. A. (2006). Ranging distance of resident Golden Eagles *Aquila chrysaetos* in western Scotland according to season and breeding status, Bird Study, **53**:3, 265-273

Hayhow, D. B., Benn, S., Stevenson, A., Stirling-Aird, P. K. & Eaton, M. A. (2017). Status of Golden Eagle *Aquila chrysaetos* in Britain in 2015, *Bird Study*, **64**:3, 281-294.

Heuck, C., Herrmann, C., Levers, C., Leitao, P. J., Krone, O., Brandl, R. & Albrecht, J (2019). Wind turbines in high quality habitat cause disproportionate increases in collision mortality of the whit-tailed eagle. Biological Conservation, 236: 44-51.

Hill, D.A., Hockin, D., Price D., Tucker G., Morris, R. & Treweek, J. (1997). Bird disturbance: improving the quality of disturbance research. Journal of Applied Ecology 34, pp 275-288.

Holt, C., Austin, G., Calbrade, N., Mellan, H., Hearn, R., Stroud, D. Wotton, S. & Musgrove, A. 2012. *Waterbirds in the UK 2010/11 The Wetland Bird Survey*. British Trust for Ornithology, Royal Society for the Protection of Birds and Joint Nature Conservation Committee in association with Wildfowl & Wetlands Trust.

Hötker, H., Thomsen, K.-M. & H. Jeromin (2006): *Impacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats - facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation*. Michael-Otto-Institut im NABU, Bergenhusen.

Kortland, K., Evans, R., Douse, A. & Patterson, G. (2011) Managing forests for white-tailed eagles. Forestry Commission Scotland.

Landerarbeitsgemeinschaft der Vogelschutzwarten LAG VSV (2014). Recommendations for distances of wind turbines to important areas for birds as well as breeding sites of selected bird species. Ber. Vogelschutz 51: 15-42.

Langston, R.H.W. and Pullan, J.D. (2003). Windfarms and Birds: an Analysis of the Effects of Wind Farms on Birds, and Guidance on Environmental Assessment Criteria and Site Selection Issues. Report T-PVS/Inf. 2003. 12, by BirdLife International to the Council of Europe, Bern Convention on the Conservation of European Wildlife and Natural Habitats. RSPB/BirdLife in the UK.

Dahl, E., Bevanger, K., Nygard, T., Roskaft, E. & Stokke, B. G (2011). Reduced breeding success in white-tailed eagles at Smola windfarm, western Norway is caused by mortality and displacement. Biological Conservation.

Douglas, D.J.T., Bellamy, P.E. and Pearce-Higgins, J.W. (2011). Changes in the Abundance and Distribution of Upland Breeding Birds at an Operational Wind Farm. Bird Study 58, 37-43.

Natural Research Projects Limited (2023) Balmeanach Wind Farm: Confidential Report on GET Modelling.

NatureScot. (2021). SiteLink website. https://sitelink.nature.scot/home

May, R., Nyard, T., Dahl, E.L. & Bevanger, K. (2013) Habitat utilization in white-tailed eagles (Haliaeetus albicilla) and the displacement impact of the Smola wind-power plant. Wildlife Society Bulletin 37: 75-83.

Madders, M. & Whitfield, D.P. (2006). Upland raptors and the assessment of wind farm impacts. Ibis 148: 43-56.

Masden, E.A., Haydon, D.T., Fox, A.D. & Furness, R.W. 2010. Barriers to movement: modelling energetic costs of avoiding marine wind farms amongst breeding seabirds. Marine Pollution

Bulletin 60: 1085-1091. Masden, E.A., Haydon, D.T., Fox, A.D., Furness, R.W., Bullman, R. & Desholm, M. 2009. Barriers to movement: impacts of wind farms on migrating birds. ICES Journal of Marine Science 66: 746-753.

Mc Guinness, S., Muldoon, C., Tierney, N., Cummins, S., Murray, A., Egan, S. & Crowe, O. (2015). *Bird Sensitivity Mapping for Wind Energy Developments and Associated Infrastructure in the Republic of Ireland*. BirdWatch Ireland, Kilcoole, Wicklow.

McMillan, R.L. (2017). Hen Harrier Monitoring Study Skye – 2017.

Muirhall Energy (2023) Glen Ullinish II Wind Farm EIA Report Appendix 9.3 – Modelling the impacts of wind farm mortality on White-tailed Eagles.

Pearce-Higgins, J.W., Stephen, L., Langston, R.H.W., Bainbridge, I.P., and Bullman, R. 2009. The distribution of breeding birds around upland wind farms. Journal of Applied Ecology 46: 1323–1331.

Pearce-Higgins, J.W., Stephen, L., Douse, A. and Langston, R. H. W. (2012). Greater Impacts of Wind Farms on Bird Populations During Construction Than Subsequent Operation: Results of a Multi-site and Multi-species Analysis. Journal of Applied Ecology 49, 386–394.

Percival, S. (2005). Birds and Windfarms: What are the Real Issues? British Birds 98, 194-204

Sansom, A., Evans, R. & Roos, S. (2016a). Population and future range modelling of reintroduced Scottish white-tailed eagles (*Haliaeetus albicilla*). Scottish Natural Heritage Commissioned Report No. 898.

Sansom, A., Pearce-Higgins, J.W. & Douglas, D. J. T. (2016b) Negative impact of wind energy development on a breeding shorebird assessed with a BACI study design. Ibis 158, 541-55.

Scottish Natural Heritage (SNH) (2016a). Assessing Connectivity with Special Protection Areas (SPAs). Version 3 – June 2016. Scottish Natural Heritage, Inverness.

Scottish Natural Heritage (SNH) (2016b). Environmental Statements and Annexes of Environmentally Sensitive Bird Information. Scottish Natural Heritage, Inverness.

Scottish Natural Heritage SNH (2016c). Assessing the impact of small-scale wind energy proposals on the natural heritage (Guidance note). Scottish Natural Heritage.

Scottish Natural Heritage (SNH) (2017). Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms. Version 2.

Scottish Natural Heritage (SNH) (2018a) Assessing Significance of Impacts from Onshore Wind Farms on Birds Outwith Designated Areas. Version 2.

Scottish Natural Heritage (SNH) (2018b) Assessing the Cumulative Impact of Onshore Wind Energy Developments.

Scottish Natural Heritage (SNH) (2018c). Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model. Version 2.

Scottish Renewables (2019). Good Practice during Wind Farm Construction. Version 4.

SLR (2020) Ben Sca Wind Farm EIA.

SLR (2023) EIA Screening and Scoping Report – Consented Ben Sca and Extension Wind Farm – Minor adjustments to the associated infrastructure, tip height and rotor diameter increase.

Stanbury A, Eaton MA, Aebischer NJ, Balmer D, Brown A, Douse A, Lindley P, McCulloch N and Win I (2021). The Status of our Bird Populations: the Fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and Second IUCN Red List Assessment of Extinction Risk for Great Britain. *British Birds* 114, 723–747.

Unwin, M (2016) Eagles. Bloomsbury Wildlife.

Vattenfall, (2009). Edinbane Wind Farm, Section 42 Amendment to Planning Consent 02/00089/FULSL 2009.

Walker, D., McGrady, M., McCluskie, A., Madders, M. & McLeod, D.R.A (2005). Resident Golden Eagle ranging behaviour before and after construction of a windfarm in Argyll. *Scottish Birds,* 25, 24-40.

Watson, J. (2010). The Golden Eagle, 2nd edition, T & AD Poyser, London.

Whitfield, D. P. & Madders, M. (2005). *A review of the impacts of wind farms on hen harriers*. Natural Research Information Note 1. Natural Research Ltd., Banchory.

Whitfield, D.P., Green, M. and Fielding, A.H. (2010). *Are Breeding Eurasian Curlew Numenius Arquata Displaced by Wind Energy Developments?* Natural Research Projects Ltd, Banchory, Scotland.

Wilson, M., Fernandez-Bellon, D., Irwin, S. and O'Halloran, J. (2015a) The interactions between hen harriers and wind turbines. WINDHARRIER – Final Project Report, UCC.

Wilson, M. W., Austin, G. E., Gillings S. and Wernham, C. V. (2015b). Natural Heritage Zone Bird Population Estimates. SWBSG Commissioned report number SWBSG_1504. pp72.

Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D.A. & Noble, D. (2020) Population estimates of birds in Great Britain and the United Kingdom. *British Birds* 113: 69-104.

Wotton, S. R., Bladwell, S., Mattingley, W., Morris, N. G., Raw, D., Ruddock, M., Stevenson, A. & Eaton, M. A. (2018). Status of the Hen Harrier Circus cyaneus in the UK and Isle of Man in 2016, Bird Study, 65:2, 145-160, DOI: 10.1080/00063657.2018.1476462

Figures

Appendices