Chapter 12: Ornithology

Non-technical Summary

Chapter 12: 'Ornithology' of the Proposed Development Environmental Impact Assessment Report has been prepared by Avian Ecology Ltd. and provides an assessment of potential impacts of the Proposed Development upon ornithological features in accordance with the Chartered Institute for Ecology and Environmental Management (CIEEM) guidelines (2018). The assessment has been informed through desk study, ornithological field surveys and consultation with relevant stakeholders. Where relevant, information from the operational Lochluichart Wind Farm, Lochluichart Wind Farm Extension I and Corriemoillie Wind Farm has been referred.

The scope of field surveys undertaken was informed through desk study, the suitability of habitats to support sensitive species and consultation responses obtained from SNH and RSPB. Field surveys were undertaken in accordance with SNH guidance applicable at the time (SNH, 2014) and included:

- Vantage Point (VP) Surveys;
- Moorland Breeding Bird Surveys;
- Woodland Grouse Surveys; and,
- Breeding Raptor and Diver Surveys.

Important ornithological features identified through field survey and desk study included:

- Red-throated diver;
- Greylag goose;
- Red Kite
- Hen Harrier
- Golden eagle;
- Osprey;
- Merlin;
- Black grouse;
- Golden plover; and,
- Greenshank.

Activity for all of the above species was extremely low. A single lekking black grouse was identified within the study area and the presence of a nesting pair of red-throated diver has also been established outside of the Proposed Development. Other species were recorded in flight only.

The assessment presented within Chapter 12 assesses the potential effects upon important ornithological features during the construction, operational and decommissioning phase of the proposed development. Key impacts include habitat loss, disturbance and displacement and collision mortality risk.

The Proposed Development does not form part of any statutory or non-statutory designated site for nature conservation with ornithological features of interest. Internationally designated sites located within 20km of the Site comprise the Glen Affric to Stranconon SPA Special Protection Area (SPA) (5.8km), Beinn Daerg SPA (4.2km), Achnalt Marshes SPA (7.8km) and Ben Wyvis (9.7km).

Potentially significant effects on black grouse and breeding divers have been avoided and mitigated through project design, i.e. the turbines and associated infrastructure have been located so as to minimise any effects.

Habitat losses as a result of the Proposed Development, in the context of their remaining availability within the Proposed Development and surrounding wider area, are not considered to be significant upon ornithological features. Given the temporary and restricted nature of works associated with the construction and decommission phases of the development, no significant effects upon ornithological features is predicted. Flight activity of important species within the 'Collision Risk Window' was very low and provided too small a sample to enable a Collision Risk Assessment, which was acknowledged by Scottish Natural Heritage. On this basis, effects from collision mortality for any species will be inconsequential at any population level.

No potentially significant effects upon widespread bird these species as a result of the Proposed Development are anticipated.

Mitigation is proposed in relation to the potential for offences to occur under the provision of the Wildlife and Countryside Act 1981 (as amended) during the construction and decommissioning phases. A Breeding Bird Protection Plan (BBPP) will be included in the Construction Environmental Management Plan (CEMP) to ensure breeding birds and their nest sites are protected from disturbance.

The assessment has also considered the potential effects of the Proposed Development upon important ornithological features in combination with other operational, consented and proposed wind farm developments. No potentially significant cumulative effects are identified.

Introduction

12.1. This Chapter of the Environmental Impact Assessment Report (EIA Report) has been prepared by Avian Ecology Ltd. and provides an assessment of potential effects on ornithological features in relation to the construction, operation and decommissioning of the proposed Lochluichart Wind Farm Extension II (hereafter referred to as the 'Proposed Development').

12.2. The objectives of this Chapter are to:

- establish and describe the baseline ornithology conditions;
- identify key ornithological features and any potentially significant effects upon them; and
- identify and describe any mitigation measures required to address any potentially significant effects.

12.3. The Chapter is supported by the following technical appendices presented in Volume Three and **Figures 12.0 to 12.5**:

- **Appendix 12.A**: Ornithology
- **Appendix 12.B**: Confidential Ornithology

- **Figure 12.0**: Statutory Designated Sites for Ornithology
- **Figure 12.1**: Vantage Point Survey Area
- **Figure 12.2**: Vantage Point Survey Results
- **Figure 12.3**: Breeding Bird Survey Plan
- **Figure 12.4**: Woodland Grouse Survey and Results
- **Figure 12.5**: Breeding Raptor Survey and Results

12.4. **Appendix 12.B** contains detailed information pertaining to the locations of breeding divers, which is considered sensitive. As such, they will not be made publicly available but will be provided to The Highland Council (THC) and Scottish Natural Heritage (SNH).

12.5. Only common bird species names are referred to within this Chapter. A summary of species referred to including species names and relevant conservation status is provided in **Appendix 12.A**.

Project Description

12.6. A detailed description of the Proposed Development is provided in Chapter 3, 'Project Description'.

12.7. In summary the Proposed Development will comprise the installation of nine wind turbines with a proposed maximum tip height of 133m, maximum hub height of 79m and a maximum rotor diameter of 114m together with associated hardstanding substation, borrow pit, permanent meteorological mast and additional wind farm infrastructure.

12.8. The candidate turbine specification is based upon a Senvion 3.6M 114 NES.

Site Overview

12.9. The Proposed Development comprises all land within the red line application site boundary as shown in **Figure 12.0**.

12.10. The Proposed Development is located on land between Loch Glascarnoch and the A835 road to the north, and Loch Luichart and the A832 to the south.

12.11. Lochluichart Wind Farm and Lochluichart Wind Farm Extension (hereafter referred to as the 'Operational Schemes') are located directly to the south of the Proposed Development, and the Corriemoillie Wind Farm (hereafter known as 'Corriemoillie') is located directly to the east.

12.12. The Proposed Development covers an area of approximately 596ha and predominantly comprises open moorland habitats including mire, heath, still and running water and mixed forestry plantation.

Key Legislation, Policy and Guidance

12.13. In the preparation of this Chapter, reference has been made to the following key pieced of planning policy, legislation and guidance:

European

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive); and
- Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (codified version of Directive 79/409/EEC as amended) (the Birds Directive).

National

- Environmental Statements and Annexes of Environmentally Sensitive Bird Information. Guidance for Developments, Consultants and Consultees (2016)[i];
- The Conservation of Habitats and Species Regulations 2010, as amended in Scotland (the Habitat Regulations);
- The Wildlife and Countryside Act 1981 (as amended);
- The Wildlife and Natural Environment (Scotland) Act 2011;
- The Nature Conservation (Scotland) Act 2004;
- The National Planning Policy Framework (2018);
- Scottish Planning Policy (2014);
- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater and Coastal (CIEEM, 2018ii);
- Recommended bird survey methods to inform impact assessment of onshore wind farms (SNH, 2010, updated 2014iii);
- Assessing Connectivity with Special Protection Areas (SPAs) (SNH, 2016iv);
- Assessing Significance of Impact from Onshore Windfarms on Birds Outwith Designated Areas (SNH, 2018v);

- Assessing the Cumulative Impact of Onshore Wind Energy Developments (SNH, 2012vi);
- Windfarms and Birds – Calculating a theoretical collision risk assuming no avoiding action (SNH, 2000vii);
- Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model (SNH, 2017viii);
- Natural Heritage Zones Bird Population Estimates (Wilson *et al*., 2015ix);
- 'Birds of Conservation Concern 4' (BoCC) (Eaton *et al*., 2009x, updated 2015xi);
- Scottish Biodiversity List (SBL) 2013; and
- The United Kingdom Biodiversity Action Plan (UK BAP) Priority Species and Habitats (2007).

Local

- The Highland Council (THC) Onshore Wind Energy Supplementary Guidance (2016 and addendum 2017);
- The Ross and Cromarty (East) Biodiversity Action Plan; and
- The Ross and Cromarty East Local Plan 2007.

Scope of the Assessment

12.14. The assessment presented within this Chapter considers the following three main potential effects upon ornithological features associated with wind farm developments, which includes:

- Habitat Loss – the loss of nesting, foraging or roosting areas by birds resulting from the construction of the Proposed Development;
- Disturbance/Displacement - the displacement of birds from the wind farm and surrounding area as a result of the construction, operation and decommissioning of the Proposed Development; and
- Collision – mortality resulting from collision or interaction with the turbines.

12.15. The potential for effects are considered as a result of the Proposed Development alone and cumulatively, in-combination with the Operational Schemes and Corriemoillie.

Consultation

12.16. **Table 12.0** below details a summary of consultation undertaken as part of the scoping for the assessment. A summary of response is provided along with how these have been addressed.

12.17. Copies of consultation documentation are provided in **Appendix 11.C**.

Table 12.0 Consultation summary.

Consultee	Date		Summary of Response	How Response has been addressed
SNH	24/02/2016	Establishing baseline studies	Advised that whilst the previous survey work for the Operational Schemes and Corriemoillie does provide useful background information on bird populations and activity on the Proposed Development, it is greater than 5 years old and therefore falls outside their limit of acceptability to inform an of the Proposed Development General acceptance of baseline survey effort. Recommend complete first year and re-consult with SNH.	One year of ornithological field surveys were completed in between 2015 and 2016 line with SNH guidelines to update the existing baseline ornithological information for the Proposed Development.
	10/02/2016	Establishing baseline studies	Stated no connection between Proposed Development and Glen Affric to Stranconon SPA population of golden eagle. No need to undertake a second year of bird surveys due to construction of nearby wind farms. Recommended use of pre-application service with Highland Council.	Pre-application service request completed in 2016. Golden eagle recorded during surveys not considered to be associated with the Glen Affric to Stranconon SPA.
	13/12/2016	Pre-application	See Appendix 12.B	
	11/05/2017	Scoping Response	General agreement with bird surveys	All methodologies and results are

Consultee	Date		Summary of Response	How Response has been addressed
			undertaken. Flights recorded are likely to be too low to inform a Collision Risk Model.	summarised within the chapter and full details provided within Appendix 12.A. Flight activity recorded was very low and not sufficient to inform robust collision risk model analysis. No collision risk modelling undertaken.
THC	05/06/2017	Scoping	No relevant matters to Ornithology.	Not applicable.
Royal Society for Protection of Birds (RSPB)	Undated, received through scoping.	Scoping	Identified potential for effect on golden eagle and subsequently the Glen Affric SPA and recommended inclusion within the assessment. The ES should consider impacts on the Natural Heritage Zone (NHZ) populations and mitigation for golden eagle. Also identified the potential for impacts on hen harrier, merlin, red throated diver, dotterel, golden plover and black grouse	Impacts on designated sites and species are considered within the following assessment.
Scottish Wildlife Trust	No response received.			

Baseline Methodology

12.18. Ornithological studies have been undertaken on the Proposed Development and surrounding local area since 2009 to inform the Operational Schemes and Corriemoillie. As such, the occurrence and general distribution of bird species at the Proposed Development, and how likely they are to be adversely impacted by the Proposed Development, is well established.

12.19. Therefore, following the completion of one year of field surveys (2015-2016) SNH were re-consulted on the suitability of the updated data set and advised that a second year of surveys was not required (Table 12.1).

Desk Study

12.20. A desk study was undertaken to collate existing information on the presence of designated sites for nature conservation with ornithological interests and existing records of protected and notable bird species, within the Proposed Development and surrounding area.

12.21. The following key sources were consulted:

- Scottish Natural Heritage (SNH) Sitelink (http://gateway.snh.gov.ul/sitelink/);
- Natural Heritage Zones Bird Population Estimates (Wilson *et al.*, 2015)[xii]; and,
- Highland Biological Recording Group (HBRG).

12.22. The following EIA documents in relation to the adjacent Lochluichart Wind Farm Extension and Corriemoillie were also reviewed to:

12.23. Corriemoillie Wind Farm Environmental Statement (ES) Chapter 7 'Ornithology' (2010) and associated appendices which include the following ornithology baseline surveys:

- Flight Activity Surveys September 2009 – August 2009;
- Breeding Bird Surveys (BBS) 2009 and 2010[xiii];
- Breeding Raptor Surveys 2009;
- Raptor Walkover Surveys April – July 2009;
- Breeding Red-throated Diver Survey 2009;
- Red Throated Diver Vantage Point Surveys April – August 2009;
- Breeding Black Grouse Survey 2009;
- Winter Walkover Surveys 2008; and
- Revised Corriemoillie Wind Farm Proposal (2016).

12.24. Lochluichart Wind Farm Extension I ES 2011 and appendices which include the following baseline surveys:

- Breeding Bird Survey (BBS) April – July 2010;
- Diver Surveys April – August 2010;
- Breeding Raptor Surveys March – July 2010;
- Black Grouse Surveys March / April 2010; and
- Flight Activity Surveys November 2009 – October 2010.

12.25. Lochluichart Wind Farm Extension I post construction monitoring reports, as made available by Eneco:

- Natural Research Projects (2015) Loch Luichart Wind Farm- Comparison of Ornithological Survey Data 2011-2015;
- Natural Research Projects (2015) Loch Luichart Wind Farm- Report on Ornithological Surveys;

- Natural Research Projects (2016) Loch Luichart Wind Farm- Report on Ornithological Surveys; and,
- Natural Research Projects (2017) Loch Luichart Wind Farm- Report on Ornithological Surveys.

12.26. In addition, a review of the following operational monitoring report for the Corriemoillie, as made available by EDF, has also been undertaken:

- Corriemoillie Wind Farm Breeding Bird Summary (2016).

12.27. A detailed account of previous survey findings is not provided as part of the ES however, reference is made to comparable findings where appropriate to support the baseline assessment presented.

Field Surveys

12.28. The following ornithology field surveys were completed between April 2015 and March 2016:

- Flight Activity Surveys (April 2015 to March 2016 inclusive);
- Breeding Bird Survey (2015);
- Breeding Black Grouse Survey (2015); and
- Breeding Raptor and Diver Searches (2015).

12.29. All surveys were undertaken in accordance with SNH guidance 'Recommended bird survey methods to inform impact assessment of onshore wind farms' (SNH, 2014), and by experienced and professional ornithologists.

12.30. Detailed survey methodologies are provided in **Appendix 12.A**.

Target Species

12.31. Target species for surveys were identified on the basis of their sensitivity to the Proposed Development and those which are afforded a higher level of legislative protection.

12.32. Primarily, target species included those species identified as "Priority" bird species within SNH guidance (2018) and listed on/as:

- Qualifying interests of nearby designated sites for nature conservation
- Annex 1 of the European Union Directive 2009/147/EC (the 'Birds Directive'); and
- Schedule 1 of the Wildlife & Countryside Act 1981 (as amended for Scotland).

12.33. In addition, Red-listed Birds of Conservation Concern (BoCC) (Eaton et al., 2009, updated 2015) have also comprised target species where it was considered likely that such species may be adversely affected by the Proposed Development.

Flight Activity Surveys

12.34. Flight activity surveys have been undertaken utilising two Vantage Points (VPs), which provided complete visual coverage of the Proposed Development and rotor swept areas of the proposed turbine locations (Figure 12.1).

12.35. Survey effort (hours) completed is summarised in **Table 12.1**.

12.36. SNH guidance (2014) stipulates a minimum of 36 hours of survey is to be undertaken from each VP during the respective breeding and non-breeding season of relevant target species.

12.37. A minimum of 94 hours of survey effort has been completed and as such, is considered to be in excess of the overall minimum effort specified within SNH guidance (2014).

Table 12.1: VP Survey Effort 2015-2016.

VP	2015									2016			Total
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
VP1	5.5	15	12	15	6	6	6	0	12	5	6	6	94.5
VP2	12.5	12	12	15	6	6	6	6	6	6	6	6	99.5

12.38. Survey times were dispersed throughout the day, and completed in a range of weather conditions. Detailed survey timings and conditions are provided in **Appendix 12.A**.

12.39. During surveys flight lines were mapped for all target species passing through the survey area defined as the Proposed Development and a 500m buffer.

12.40. Details of species, number of birds, flight height (in bands), duration and direction were noted on standardised recording forms.

12.41. The activity levels of secondary species were also noted at summary intervals, noting the number of birds present and general behaviour in order to build an overall picture of activity.

12.42. Secondary species were defined as commoner raptors (incl. buzzard, sparrowhawk and kestrel), all gulls (excluding herring gull), and feral species, along with any large concentrations of commoner passerines.

Breeding Bird Survey

12.43. A breeding bird survey was undertaken in the spring and early summer of 2015. The methodology employed was based upon an adapted Brown and Shepherd (1993) methodology as per SNH (2014) guidance.

12.44. The survey comprised four staggered visits between April and July. The survey area comprised the Proposed Development, as well as suitable habitats within 500m as access allowed (Figure 12.4).

Breeding Black Grouse Survey

12.45. A survey for black grouse lek sites was undertaken in May 2015 with reference to species-specific survey methodologies outlined in Gilbert *et al.* (1998).

12.46. The survey area included all areas of suitable habitat (e.g. open moorland, woodland edges and tracks) within the Proposed Development and within 1.5km as access allowed (Figure 12.5).

Breeding Raptor and Diver Searches

12.47. Searches for breeding raptors and divers were undertaken between May and July 2015 with reference to species-specific survey methodologies outlined in Hardey *et al*., (2013) and Gilbert *et al.* (1998).

12.48. The survey area comprised a combination of walkover surveys and scaled-down VP watches over areas of suitable habitat features within a 2km radius of the Proposed Development (Figure 12.6).

12.49. Survey effort is presented in **Table 12.2**.

Table 12.2: Breeding Raptor and Diver Search Effort 2015.

Date	Start Time	End Time
11/05/2015	11.30	17.30
09/06/2015	12.00	18.00
22/07/2015	09.40	16.00

Assessment Methodology and Significance Criteria

12.50. Impact assessment has been undertaken in accordance with CIEEM guidelines (2018).

12.51. Ecological Impact Assessment (EcIA) as defined within the Guidelines is 'a process of identifying, quantifying and evaluating the potential effects of development-related or other proposed actions on habitats, species and ecosystems'.

12.52. The process includes the following stages:

- determination and evaluation of important ecological features;
- identification and characterisation of impacts;
- identify significant effects of impacts in the absence of mitigation;
- outline of mitigating measures to avoid and reduce significant effects;
- assessment of the significance of any residual effects after such measures; and
- identification of appropriate compensation measures to offset significant residual effects.

12.53. The assessment has also been undertaken with reference to SNH guidance (2016 and 2018) on the assessment of wind farm developments in relation to designated sites and those located within the wider countryside.

12.54. In accordance with SNH guidance (2018) the assessment of impacts has been undertaken at a Regional scale for their impacts on a species population, unless an alternative geographical scale is considered appropriate. The Natural Heritage Zone (NHZ) is considered to be the most appropriate default regional scale.

12.55. In line with CIEEM (2018) an 'Impact' is defined as an action resulting in changes to an ecological feature and 'Effect' is defined as an outcome to an ecological feature from an impact.

Determining Importance

12.56. CIEEM guidelines (2018) stipulate that an EcIA is only required to assess in detail impacts upon important ecological (or ornithological) features i.e. those that are considered important and potentially significantly affected by the project. It is not necessary to carry out a detailed assessment of impacts upon those features that are sufficiently widespread, unthreatened and resilient to project impacts. Where such features are not considered important enough to warrant further consideration, or where they will not be significantly affected, these are 'scoped out' of the assessment with justification for exclusion provided.

12.57. Mitigation measures may however still be outlined as appropriate to reduce and/or avoid any potentially adverse effects or to ensure legislative compliance.

12.58. Relevant European, national and local guidance from governments and specialist organisations has been referred to in order to determine the importance of ornithological features. Particular reference has been made to SNH guidance on "Priority" bird species for assessment in relation to wind farms (SNH, 2018).

12.59. In addition, importance has also been determined using professional judgement and taking account of the results of baseline surveys and the importance of features within the context of the geographic area.

12.60. Importance does not necessarily relate solely to the level of legal protection that a feature receives and ecological features may be important for a variety of reasons, such as their connectivity to a designated site, rarity of species or the geographical location of species relative to their known range.

12.61. For the purposes of this assessment the importance of an ecological feature is considered within a defined geographical context from Local to International, as outlined in **Table 12.4**.

Table 12.4: Geographic scale of ecological feature importance.

Importance	Definition
International	An internationally designated site e.g. a Special Protection Area (SPA) and/or Ramsar site or proposed / candidate site (pSPA). A regularly occurring species present in internationally important numbers (>1% of biogeographic populations) listed under Annex I of the Birds Directive, or regularly occurring migratory species listed under Annex II of the Birds Directive connected to an internationally designated for this species.
National	A nationally designated site e.g. a Site of Special Scientific Interest (SSSI). A regularly occurring species present in nationally important numbers (> 1 % of Scottish population) and listed as a UK BAP, SBL priority species Red-listed birds of Conservation Concern (Eaton *et al*., 2015) or listed under Schedule 1 of the Wildlife & Countryside Act or Annex 1 of the Birds Directive.
Regional	A regularly occurring species present in regionally important numbers i.e. >1 % of the relevant Natural Heritage Zone (NHZ) population (Wilson et al., 2015xiv) or appropriate alternative and listed as a UK BAP, SBL priority species Red-listed birds of Conservation Concern (Eaton *et al*., 2015) or listed on Schedule 1 of the Wildlife & Countryside Act or Annex 1 of the Birds Directive.
Local	All other species that are widespread and common and which are not present in regionally or nationally important numbers, but which do contribute to the local breeding/wintering bird assemblage.

Characterising Impacts

12.62. Once identified, the potential impacts arising from the proposed scheme are described making reference to the following characteristics as appropriate:

- positive or negative;
- extent;
- magnitude;
- duration;
- timing;
- frequency; and
- reversibility.

12.63. The assessment only makes reference to those characteristics relevant to understanding the nature of an effect and determining its significance.

12.64. The likelihood or probability that an impact will occur is also described as far as possible based on available information. The likelihood of an impact occurring is referred to throughout this Chapter using the following terms: certain, likely, unlikely or highly unlikely.

12.65. The criteria used to determine the magnitude of impact are set out in **Table 12.5** below.

12.66. It is important to note that where reference is made to population level effects to assess magnitude (e.g. at the Regional NHZ population level), population estimates used are considered to be guides.

12.67. In addition, it will often be impossible to equate an impact to an actual population loss. For example, where birds, may be displaced from a wind farm site as a result of construction or operational activities. This loss may be temporary or may reasonably result in the relocation of birds to suitable habitats elsewhere within the wind farm site or wider area.

12.68. As such, professional judgement, on the basis of best available evidence, has been used to inform the assessment of impacts presented within.

Table 12.5 Impact magnitude.

Importance	Definition
High	The impact (either on its own or in-combination with other proposals) may adversely or positively affect the conservation status of a site/population, in terms of the coherence of its ecological structure and function (integrity), across its whole area, that enables it to sustain the habitat, complex of habitats and/or the population levels of species of interest. e.g. Affecting >5% of the relevant Regional NHZ population.
Medium	Biodiversity conservation status of a site or population would not be adversely or positively affected, but some element of the functioning might be affected and the effect on the site/population is likely to be significant in terms of its ability to sustain some part of itself in the long term. e.g. Affecting >1-5% of the relevant Regional NHZ population.
Low	Neither of the above applies, but some minor adverse or beneficial effect is evident on a temporary basis or affects extent of habitat/species abundance in the local area. e.g. Affecting <1% of the relevant Regional NHZ population.
Negligible	No observable effect in either direction.

Determining Significance

12.69. For the purposes of EIA a 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general.

12.70. The 2018 CIEEM guidelines note that "*A significant effect does not necessarily equate to an effect so severe that consent for the project should be refused planning permission. For example, many projects with significant negative ecological effects can be lawfully permitted following EIA procedures.*

12.71. In broad terms, significant effects encompass impacts on the structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution).

12.72. Significant effects are expressed with reference to an appropriate geographic scale. For example, a significant effect on a nationally designated site is likely to be of national significance. However, the scale of significance does not necessarily always relate to the importance of an ecological feature. For example, an effect on a species which is considered of national importance may not have a significant effect upon its national population.

12.73. For the purposes of this assessment, the significance of effects are primarily expressed with reference to the regional (NHZ), national or international scale

(as relevant) in line with SNH's interests of species status at wider spatial levels. The significance of effects at a local scale is also assessed where sufficient information allows a meaningful assessment.

12.74. In cases of reasonable doubt, where it is not possible to robustly justify a conclusion of no significant effect, a significant effect has been assumed as a precautionary approach. Where uncertainty exists, this is acknowledged.

12.75. Where the ecological assessment proposes measures to mitigate adverse effects on ecological features, a further assessment of residual ecological effects, taking into account any ecological mitigation recommended, has been undertaken.

12.76. CIEEM (2018) guidelines discourage the use a matrix table as commonly set out in ES Chapters to determine 'significant' and 'non-significant' effects. For the purposes of the assessment presented herein, **Table 12.6** below sets out adapted CIEEM terminology, which also shows the equivalent EIA terms. The following assessment will summarise impacts in accordance with EIA significance terminology to allow consistency with other chapters.

Table 12.6: Significance.

Effect (EIA Significance)		**Geographical scale at which residual effect is significant following CIEEM guidelines**
Neutral	Negligible	No Significant Effect on ecological integrity or conservation status.
Non-significant	Minor Adverse	Local
Significant	Moderate Adverse	Regional or other local authority area
	Major Adverse	National or International

Assessment of Cumulative Effects

12.77. Potentially significant cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location.

12.78. Cumulative effects have therefore been assessed with reference to SNH guidance (2012) for ornithological features subject to a detailed assessment. The assessment is based on the consideration of residual effects i.e. assuming that proposed mitigation measures (where relevant) are implemented.

12.79. For the purposes of this assessment the potential for significant cumulative effects includes consideration of the Operational Schemes and Corriemoillie only.

12.80. This is considered to provide the most appropriate and informed approach to assessment for development at this locale.

Baseline Conditions

Designated Sites for Nature Conservation

12.81. This section should be read with reference to **Figures 12.1** to **12.6**.

12.82. Table 12.7 provides a summary of statutory designated sites for nature conservation with cited ornithological features of interest located within 10km of the Proposed Development boundary.

12.83. Sites designated for other ecological features are addressed separately in Chapter 11 'Ecology'.

Table 12.7 Designated sites for nature conservation – 10km.

SPA: Special Protection Area, SSSI: Site of Species Scientific Interest

Site Name	Distance	Qualifying Interests
Glen Affric to Stranconon SPA	5.8 km South	Golden eagle (breeding)
Beinn Dearg SPA	4.2 km North	Dotterel (breeding)
Beinn Dearg SSSI	4.2 km North	Breeding Bird Assemblage
Achanalt Marshes SPA	7.8 km South	Wood sandpiper (breeding)
Achanalt Marshes SSSI	7.8 km South	Breeding Bird Assemblage
Ben Wyvis SPA	9.7 km East	Dotterel (breeding)
Ben Wyvis SSSI	8.8 km East	Dotterel (breeding)

Natural Heritage Zone

1.1.1 The Proposed Development is located in Natural Heritage Zone 7 'Northern Highlands'.

1.1.2 A summary of species population estimates is presented in **Appendix 12.A**.

Field Surveys

12.84. Detailed field survey results are presented in **Appendix 12.A**. results pertaining to red throated diver are presented in Confidential **Appendix 12.B**.

Flight Activity VP Surveys

12.85. A summary of target species flight activity which occurred within the Collision Risk Window (CRW) between September 2012 and August 2014 is presented within Table 12.8.

Table 12.8: Summary target species flight activity within the CRW.

Species	Occupancy	No. of Flights	No. of Birds	Time (s)
Greylag goose	Spring migration	1	2	46
Merlin	Breeding	1	1	40
Osprey	Breeding	2	2	583
Hen harrier	Non-breeding	1	1	215
Red kite	Non-breeding	1	1	80
Golden plover	Breeding	4	6	259

12.86. Flight activity recorded was very low and with recognition of SNH scoping response, was considered insufficient to inform robust collision risk modelling and was therefore not undertaken.

Breeding Bird Survey

12.87. The study area was found to support an assemblage of upland and lowland moorland and woodland passerines considered typical of the locale and habitats present.

12.88. A summary of key species, included Red-listed BoCCs, recorded within a 500m radius of the Proposed Development is provided in Table 12.10.

12.89. A detailed summary is presented in **Appendix 12.A**.

Table 12.9: Key breeding bird territory summary 2015.

Species	No. of Territories
Golden plover	3
Greenshank	2
Cuckoo	1
Skylark	11
Song thrush	1
Grey wagtail	2
Tree pipit	2

Breeding Raptor Searches

12.90. Observations of golden eagle, buzzard, osprey, red kite and merlin were made over the course of survey visits in 2015. No evidence of breeding for any raptor species was recorded within a 2km radius of the Proposed Development.

Breeding Black Grouse Survey

12.91. A single black grouse lek site was recorded within the Proposed Development, which supported a maximum count of two lekking males during a survey visit on the 8th May 2015.

12.92. Incidental observations during a breeding bird survey on the 24th April and breeding raptor survey visit on the 11th May also recorded single males at the lek site.

12.93. The location of the lek site is shown in **Figure 12.5**.

Embedded Mitigation and Scheme Design Evolution

12.94. Full details of the scheme design evolution and embedded mitigation measures are detailed in Chapter 3 'Project Description'.

12.95. During the design stage, existing knowledge of the Proposed Development from Operational Schemes and Corriemoillie, and through consultations, ornithological constraints have been a key consideration in the layout of the

Proposed Development. As such, the development infrastructure has undergone numerous iterations to reduce the potential for impacts to occur (for example, in respect of red throated diver) or minimise the significance of effect.

12.96. It is considered that the principle embedded mitigation measure adopted, to avoid or minimise impacts resulting from the proposed scheme upon ornithological features, has been an integral part of the iterative design process. Use has been made of ecological constraints plans, and available baseline information and ecological issues have been taken into account throughout the design process in consultation with SNH as appropriate. This means that most mitigation measures are embedded within the overall scheme design.

12.97. In summary design consideration and embedded mitigation measures to avoid and minimise impacts upon ornithological features have included:

Species specific

12.98. Embedded mitigation has been included for breeding divers and is detailed in **Appendix 12.B**.

12.99. Turbines have been located as far as possible from known black grouse leks on consideration with other site developments.

Land-take

12.100. Turbine locations, proposed access tracks and infrastructure have been sited to minimise the requirement for land-take and loss of semi-natural habitats.

Cabling

12.101. Cable connections on the Proposed Development and between turbines have been grounded, to avoid increased risks of bird collisions, and routed alongside access tracks to minimise any further habitat losses.

Construction Methods and Pollution Prevention Control

12.102. A Construction Environmental Management Plan (CEMP) will be in place during the construction, operational and decommissioning phases of the development. The CEMP will include all good practice construction measures, habitat reinstatement methods, pollution prevention controls and monitoring to be implemented over the course of the development in line with current guidance and as detailed within Chapter 13 "Hydrology and Hydrogeology" of the ES.

12.103. The CEMP will be submitted to THC for approval prior to the commencement of construction works, in consultation with the Scottish Environmental Protection Agency (SEPA) and other agencies such as SNH.

Important Ornithological Features

12.104. A summary of important ornithological features is provided in **Table 12.11** below. The level of importance assigned to each species is based upon baseline survey results and, for the purpose of consistency for wind farm development

at this locale with reference to EIA documentation for the Operational Schemes and Corriemoillie.

12.105. Golden eagle are a qualifying species of the nearby Glen Affric to Stranconon SPA, which is located c6km south of the Proposed Development. Core foraging range for the species during the breeding season is 6km (SNH, 2016) therefore the Proposed Development is located on the edge of the range for this species. The Operational Schemes and Corriemoillie also are located between the Proposed Development and the SPA, and SNH acknowledge any records are unlikely to be associated with the SPA (scoping response, see Table 12.1). As such, the species is recognised to be separate from the SPA within this assessment.

Table 12.11: Summary of important ornithological features.

Ecological Feature	Importance
International	N/A
National	N/A
Regional	Golden eagle Red-throated diver Red kite Hen harrier Osprey Merlin Greenshank
Local	Greylag goose Golden plover Black grouse All other Red-listed BoCC species. All other commoner raptors, passerines and waders.

Ornithological Features Scoped out of Detailed Assessment

12.106. With the exception of greylag goose, golden plover and black grouse features of 'Local' importance are not considered in detail within this assessment. Such features are considered to be generally common and widespread species and/or were recorded very infrequently or in numbers of very low significance during the baseline studies (as presented in Appendix 12.A).

Potential Effects on Ornithological Features

12.107. The proposed wind farm development may give rise to potentially significant effects upon ornithological features as a result of:

- Habitat loss; and,
- Disturbance and displacement.

12.108. An overview of each potential effect is discussed below.

Habitat Loss

12.109. Direct and permanent habitat losses resulting from the construction of the proposed scheme will be approximately 8.37ha (including footprint of turbines, on-site tracks, crane hardstanding's, construction compounds and borrow pit), which equates to approximately 1.4% of the total Proposed Development area. These habitats are not expected to be reinstated following the decommissioning of the proposed scheme, with turbine foundations and access tracks remaining in place permanently.

12.110. During the construction phase additional habitat losses of approximately 15.8ha are also estimated as a result of construction working areas. These habitats will be reinstated following the completion of construction works (expected to be approximately nine months) and as such losses are considered temporary and reversible.

12.111. Overall habitat losses are considered to represent a potentially significant adverse effect upon ornithological features at a Local level only, resulting in small losses in available open moorland habitats, which will remain abundant within the Proposed Development, the immediate and wider surrounding area. Effects of potential nesting habitats will be restricted to a small number of breeding waders and passerine species as recorded during baseline surveys. With the exception of black grouse, which is discussed further.

12.112. The nest sites of some species listed on Schedule A1 of the Wildlife and Countryside Act 1981 (as amended) are protected at any time. No nest sites of such species (i.e. white-tailed eagle, golden eagle, hen harrier and red kite) were recorded during baseline field surveys, or, are known to be present within the immediate surrounding area.

Disturbance / Displacement

Construction and Decommissioning

12.113. Disturbance to ornithological features is most likely to occur during the construction phase, anticipated to last for approximately nine months.

12.114. Construction activities are predicted to result in a temporary increase in noise, vibration and human presence within construction areas. This has the potential to displace birds from the vicinity of construction areas for the duration of construction works.

12.115. Effects are likely to be greatest during the breeding season (generally between March and August, depending upon the species), but are considerably variable between sites and species.

12.116. The development will require the removal of 0.91ha of plantation forestry which includes an 80m buffer of turbine locations. Chapter 16 provides further details of removal. Due to the presence of blanket bog and minimal removal proposed, it is not proposed that areas will be re-stocked within the Proposed Development.

12.117. Overall construction disturbance is considered temporary and will occur only when construction activities are taking place. Furthermore, construction is not

expected to take place over the whole area of the Proposed Development, but within defined working areas, phased over small areas.

12.118. Some species, through their listing on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) (1981 Act), are afforded additional protection, which makes it an offence to intentionally or recklessly disturb the species whilst it is building a nest or is in, on, or near a nest containing eggs or young; and/or disturb its dependent young.

12.119. Should site clearance activities and subsequent construction works be undertaken during the breeding seasons for such species, there is potential for a disturbance offence under the 1981 Countryside Act.

12.120. Some species as listed on Schedule 1A of the Wildlife and Countryside Act 1981 (as amended) are also afforded further protection from harassment at any time of year. This is relevant to roosting white-tailed eagle, golden eagle, hen harrier and red kite. Roost sites of such species were not recorded during baseline field surveys and are not known to be present within the immediate surrounding area.

12.121. Decommissioning effects are anticipated to be similar to potential disturbance effects identified for the construction phase, being localised and temporary in nature.

Operation

12.122. The operation of turbines and maintenance activities has the potential to cause disturbance and displacement of birds throughout the Proposed Development's operational lifetime.

12.123. In general, most breeding bird populations recover at wind farm sites post-construction, however, there is evidence to suggest that some bird species may be displaced by the presence of operational wind turbines, with the extent of displacement highly variable between species and species-groups (e.g. Pearce-Higgins *et al.,* 2012[xv]).

12.124. Larger birds, often those associated with wide, open spaces with relatively little human activity, are generally more susceptible to displacement effects from operational turbines (e.g. Hötker *et al.,* 2006[xvi]). There is little evidence to suggest that passerines (i.e. smaller, perching birds) are displaced by operational wind turbines. Similarly, a review of the effects of wind farms on upland raptors, primarily involving foraging birds, concluded that in the majority of studies, operational displacement appeared to negligible (Madders & Whitfield 2006[xvii]).

12.125. The extent of displacement from wind turbines on waterbirds and breeding waders are likely to vary, depending on a range of factors including the specification of the development; the topography of the surrounding land; existing sources of disturbance, the habitats affected and the availability of alternative habitats and the species of bird in question (e.g. Drewitt and Langston, 2006[xviii]). Studies have shown that, in general, bird species are not disturbed beyond 500 to 800m from turbines (e.g. Pearce-Higgins *et al*., 2009[xix]) and some species do show a high degree of 'habituation' to operational turbines (Hötker *et al*., 2006).

12.126. It is therefore not possible to provide a single, standardised 'displacement distance' for all birds or even species groups as evidence is confounding. It is also important to note that a displacement distance, where adopted, should not be interpreted as a 'total sterilisation zone'; rather that it is the distance where no discernible effects can be observed. It is therefore highly likely that some individual birds will be more tolerant than others and at least some birds will continue to utilise habitats within a closer proximity to operational turbines.

Collision Mortality Risk

12.127. Collision or interaction of a bird with operational turbine rotors is certain to result in the death or long-term impairment of that bird to survive.

12.128. In addition, the significance of a single collision mortality, will be dependent on relevant population densities, whereby species which typically occur at low densities (e.g. raptors) are more likely to suffer adverse population level effects than species which naturally occur at higher density populations.

12.129. Flight activity recorded within the CRW was low over the course of the survey period. Of species considered sensitive collision impacts (SNH, 2017) only one flight was recorded of greylag goose, merlin, hen harrier and red kite, two flights of osprey and four of golden plover. Flights all comprised single or two birds.

12.130. Flight duration data within the CRW was therefore very low and provided a limited sample to undertake a robust Collision Risk Assessment, acknowledged by SNH (Table 12.1).

12.131. On this basis, effects from collision mortality for any species are considered to be inconsequential and highly unlikely, Negligible and Not Significant at any population level and not considered further.

Decommissioning

12.132. Impacts associated with the decommissioning phase of the proposed scheme are considered to be broadly the same as construction phase impacts, requiring the temporary creation of construction compounds to house equipment and machinery and temporary increases in noise and visual disturbance through the presence of vehicular traffic and site staff.

12.133. Subsequently, decommissioning effects are considered alongside construction effects and not exclusively.

Potential Effects in the Absence of Mitigation

12.134. This section identifies the potential effects in the absence of non-embedded design mitigation of the construction, operational and decommissioning phases of the Proposed Development on important ornithological features (as summarised in Table 12.12).

Red-throated Diver

12.135. Red-throated diver is listed on Annex 1 of the EU Birds Directive, Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) and is an Amber-listed BoCC.

12.136. In 2006, the national species survey estimated a total of 1,268 breeding pairs of red-throated diver across the 21 regional NHZ areas. The estimated population for NHZ 7 'Northern Highlands' was 39 pairs (Wilson et al., 2015).

12.137. The assessment presented within **Appendix 12.B**, providing the implementation of precautionary mitigation measures concludes No Significant Effects upon red-throated diver as a result of the Proposed Development and in combination with the Operational Schemes and Corriemoillie.

Greylag Goose

12.138. Two populations of greylag goose occur in Britain, comprising a migratory population which breeds in Iceland and winters predominantly in northern Scotland, with a further sedentary breeding British population.

12.139. Whilst the British greylag goose population has undergone notable increases in numbers and distribution during recent decades, the Greylag geese recorded at the Proposed Development are most likely to belong to the Icelandic greylag goose population.

12.140. Greylag goose is an Amber-listed BoCC and a priority species of the Ross and Cromarty (East) LBAP. There are no internationally designated sites for the species located within 20km of the Proposed Development, with the nearest comprising the Cromarty Firth SPA located 22.6km to the west.

12.141. Regional NHZ population estimates for the species are not available (Wilson *et al.*, 2015). In the absence of this the most recent North Scotland population estimate 63,544 birds (as per Mitchell and Brides, 2017[xx]).

12.142. Observations of greylag geese during 2015-2016 field surveys were limited to two flights totalling 502 birds. A single flight of 500 birds was recorded in early May 2015, with a further flight of two birds recorded in mid-June.

12.143. No further observations of the species were made and there are no known regular roosting or foraging sites for the species located within 1km of the Proposed Development. The single flight of 500 birds represents <1% of the most applicable Regional population estimate for the species.

12.144. Greylag goose activity during field surveys undertaken for the consented Lochluichart Wind Farm Extension between 2009 and 2010 and the Corriemoillie was similarly of a low level within only single flight of three birds recorded during flight activity surveys for Corriemoillie.

12.145. Overall, the Proposed Development is not considered to lie beneath a regularly used flight route for the greylag geese, and the habitats present within the Proposed Development are of no importance for foraging or roosting birds. As such the species is assigned a value of Local importance but is subject to a

detailed assessment given its inclusion as a "Priority" species within SNH guidance (2018)

Construction and Decommissioning Phase Impacts

12.146. There will be no construction or decommissioning phase impacts upon greylag goose as a result of habitat loss or disturbance.

12.147. Impacts will therefore be Negligible and Not Significant at any geographical scale.

Red Kite

12.148. Red kite is listed on Annex 1 of the EU Birds Directive, Schedule 1 and 1A of the Wildlife and Countryside Act 1981 (as amended), is an Amber-listed BoCC and is a priority species for the Ross and Cromarty (East) LBAP.

12.149. Scottish red kite populations have undergone rapid population expansions over recent decades, facilitated by species re-introduction programmes in North Scotland, Aberdeenshire, Central Scotland and Dumfries and Galloway.

12.150. North Scotland populations do however remain relatively low, with a total of 10 occupied home ranges by pairs recorded across Inverness-shire, Ross-shire and Sutherland in 2016 (Challis *et al.*, 2018[xxi]). The most recently published NHZ 7 'Northern Highlands' population is nine pairs (18 birds) and is therefore likely to remain an accurate reflection of the current regional breeding population (Wilson *et al*., 2015). This is however, considered to be an underestimate of the actual species population size due to the exclusion of unpaired and immature birds but is sufficiently precautionary in the absence of further evidence.

12.151. Two observations of red kite were recorded during field surveys undertaken between 2015 and 2016. This comprised a brief flight (80 seconds) of a single bird during a flight activity survey in December 2015 and a sighting of a single bird to the west of the Proposed Development during a raptor search in June 2015.

12.152. There are no known nest sites located within 2km of the Proposed Development.

12.153. Field studies to inform Corriemoillie between 2009 and 2010 recorded a total of 12 red kite flights, with no breeding pairs identified locally.

12.154. No observations of the species were reported from during baseline surveys to inform the Lochluichart Wind Farm Extension.

12.155. Adopting a precautionary approach, the observations of two birds during baseline surveys in 2015 and 2016 represents 11% of the Regional NHZ population and the species is therefore assigned a value of Regional importance for the purposes of this assessment.

Construction and Decommissioning Phase Impacts

12.156. The Proposed Development is not established to be of importance for nesting and foraging red kite however, low levels of species activity do occur within the immediate area.

12.157. Potential effects upon the species as a result of construction phase habitat loss and disturbance are therefore considered to be no more than Negligible impact and Not Significant at the Regional NHZ population level.

12.158. Red kite are listed on Schedule 1, A1 and Schedule 1A of the Wildlife and Countryside Act 1981 (as amended) and as such are afforded additional protection against disturbance at any time of year. Precautionary mitigation to ensure legislative compliance during the construction phase is outlined in Mitigation below.

Hen Harrier

12.159. Hen harrier is listed on Annex 1 of the EU Birds Directive and Schedule 1 and 1A of the Wildlife and Countryside Act 1981 (as amended), is a Red-listed BoCC, an SBL species and a priority species on the Ross and Cromarty (East) LBAP.

12.160. The Scottish population has undergone historical declines, attributable to habitat loss, predation and illegal persecution. In 2016, the fifth UK and Isle of Man species population survey took place, which recorded an estimate of 460 territorial pairs in Scotland, a 9% decline since the previous survey in 2010.

12.161. The most recently published NHZ 7 'Northern Highlands' population is 18 pairs (36 birds), which whilst may be outdated may be taken as a reasonably precautionary population size including unpaired and non-breeding birds.

12.162. Only a single flight of a single hen harrier was recorded during baseline surveys in October 2015. No further observations of the species were made and there are no known nesting sites within 2km of the Proposed Development.

12.163. Similarly, low levels of species activity were recorded during baseline surveys for Corriemoillie between 2009 and 2010, with a total of four and species flights recorded and no nest sites recorded locally.

12.164. No observations of the species were reported from during baseline surveys to inform the Lochluichart Wind Farm Extension.

12.165. Adopting a precautionary approach, the single bird recorded during baseline surveys in 2015 comprises 3% of the Regional NHZ population and for the purposes of this assessment is assigned a value of Regional importance.

Construction and Decommissioning Phase Impacts

12.166. The Proposed Development is not established to be of importance for nesting or foraging hen harrier.

12.167. Potential effects upon the species as a result of construction phase habitat loss and disturbance are therefore considered to be Negligible and Not Significant at the Regional NHZ population level.

12.168. Hen harrier is listed on Schedule 1 and Schedule 1A of the Wildlife and Countryside Act 1981 (as amended) and as such are afforded additional protection against disturbance at any time of year. Precautionary mitigation to ensure legislative compliance during the construction phase is outlined in Mitigation below.

Golden Eagle

12.169. Golden eagle is listed on Annex 1 of the EU Birds Directive and Schedule 1 and 1A of the Wildlife and Countryside Act 1981 (as amended), is an Amber-listed BoCC, an SBL species and a priority species on the Ross and Cromarty (East) LBAP.

12.170. The most recently published Northern Highlands NHZ golden eagle population comprised 43 occupied breeding territories (in 2003). In 2015, an updated national golden eagle survey took place, which overall identified the national population had increased by 15%, rising from 442 pairs recorded during the previous national survey in 2003, to 508 territorial pairs in 2015.

12.171. Golden eagle observations recorded during 2015-2016 field surveys comprised three flights all of single birds during the 2015 breeding season. An additional sighting of a single golden eagle was also recorded to the south east of Corriemoillie Forest during a breeding raptor search in June 2015 however, no breeding evidence for the species was recorded within the study area.

12.172. Species activity during field surveys undertaken for the consented Lochluichart Wind Farm Extension between 2009 and 2010, was similarly recorded at a low level, with a total of six flights reported, all of single birds.

12.173. Observations of golden eagles during field surveys undertaken for Corriemoillie included a total of 22 flights, primarily of single birds.

12.174. Post construction monitoring surveys undertaken for Lochluichart Wind Farm Extension I did not identify any golden eagle territories within close proximity to the Proposed Development.

12.175. Overall, whilst higher levels of species activity were recorded previously at Corriemoillie, historical survey findings for the Operational Schemes together with updated survey findings for the Proposed Development between 2015-2016, the Proposed Development is little used by breeding and non-breeding eagles.

12.176. No eyries were identified within 2km of the Proposed Development during breeding raptor surveys and there are no known eyries within 6km. The open moorland habitats within the Proposed Development, in theory offer suitable foraging habitats for the species. Studies and assessment for Corriemoillie concluded that the land within the Proposed Development was of low importance.

12.177. The species is the sole qualifying interest of the Glen Affric to Strathconon SPA (10 active territories), located 5.8km to the South of the Proposed Development, and listed as a breeding bird assemblage feature of the Beinn Dearg SSSI.

12.178. Consultation with SNH through scoping stated that: '*there is no connectivity between the eagle seen and the SPA and the already operational Lochluichart WF is between it and the SPA'.* In addition, the Lochluichart Wind Farm Extension ES concluded no connection between the site and the SPA. On this basis any impacts on golden eagle are highly unlikely to affect the Glen Affric to Strathconon SPA.

12.179. The species is assigned a value of regional importance for the purposes of this assessment.

Construction and Decommissioning Phase Impacts

12.180. Construction works will occur at distances in excess of 2km from any known golden eagle nest site. As such, the magnitude and significance of any impacts arising from construction is considered to be Negligible.

12.181. In line with current research, suggesting construction phase displacement of golden eagles from wind farm sites (Haworth Conservation, 2015), there may be some level of disturbance to individual birds which choose to utilise habitats in the vicinity of working areas over the course of construction works. Such impacts would however be temporary, of no more than Low magnitude at the Regional NHZ population level and Not Significant.

12.182. Decommissioning phase activities, which would be anticipated to occur over a relatively similar timescale to construction works. As such, on the basis of current baseline conditions, would be temporary of Low magnitude and the Regional NHZ population and Not Significant.

12.183. No adverse impact upon the Glen Affric to Strathconon SPA golden eagle population is predicted to occur.

Operational Phase Impacts

12.184. The construction of the Proposed Development will result in a direct and permanent loss of approximately 8.37ha of open moorland habitats representing 1.4% of the total Proposed Development area. In addition, construction works are also anticipated to result in the temporary loss of an additional 15.8ha of habitats to facilitate construction working areas.

12.185. Collectively, current research suggests little clear evidence for long-term displacement effects upon golden eagles as a result of operational wind farms (as reviewed by Humphreys *et al*., 2017).

12.186. A single long-term study of potential displacement effects upon the species at the adjacent wind farms of Edinbane and Ben Aketil on the Isle of Skye, did suggest the occurrence of displacement on the basis of decrease in spatial use habitats within 500m of operational turbines during initial years of operational monitoring (Haworth Conservation, 2015). Overall flight activity was however found to be highly variable between years, with potential confounding influences of differences in habitat features between wind farm sites (e.g. typography), which have not yet been tested.

12.187. A further study carried out at the Beinn an Tuirc wind farm, did also identify a decrease in spatial use of the wind farm site during initial years of operational monitoring (Walker *et al*., 2005). Activity through the turbine clusters was recorded and the potential confounding influence of habitat enhancement measures undertaken on adjacent moorland areas as mitigation for the development do not currently allow clear conclusions of wind farm avoidance by the species.

12.188. Displacement and loss of habitats for foraging golden eagle could include all land up to 500m from proposed turbines. This would equate to 293ha of habitats, which do not already bear displacement effects from turbines associated with the Operational Schemes and Corriemoillie. On review of baseline information, these habitats are not important to the species at this location and should any displacement occur, it would be low magnitude on the Regional NHZ population level and Not Significant.

12.189. No adverse impact upon the Glen Affric to Strathconon SPA golden eagle population is predicted to occur.

Osprey

12.190. Osprey is listed on Annex 1 of the EU Birds Directive and Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), BoCC Amber and is a priority species on the Highland Ross and Cromarty LBAP.

12.191. The most recently published NHZ 7 'Northern Highlands' population is 8 pairs (16 birds). This is however likely to be an underestimate with the most recently published SRMS results from 2016 for Inverness-shire alone comprising 14 breeding pairs (28 birds).

12.192. Observation of osprey during baseline surveys comprised two species flights, each of single birds June 2015. In addition, a single bird was recorded in flight over Loch Glascarnoch during a raptor search visit also in June 2015.

12.193. No known nest sites are located within 2km of the Proposed Development.

12.194. During baseline surveys for Corriemoillie a total of five species flights were recorded. A nest site was also identified within a 2km radius of Corriemoillie.

12.195. No observations of the species were made during baseline surveys to inform the Lochluichart Wind Farm Extension I. occasional observations of birds in flight were noted during the 2011-2017 monitoring surveys.

12.196. On the basis of very low levels of species activity recorded, it is considered that the Proposed Development does not fall within an established foraging route for breeding pairs present within the surrounding wider area. Adopting a precautionary approach, observations of two birds during baseline surveys in 2015 comprises 13% of the Regional NHZ population and is assigned a value of Regional importance for the purposes of this assessment.

Construction and Decommissioning Phase Impacts

12.197. The Proposed Development is not established to be of importance for nesting or foraging osprey.

12.198. Potential impacts upon the species as a result of construction phase habitat loss and disturbance is therefore considered to be Negligible and Not Significant at the Regional NHZ population level.

12.199. Osprey is listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) and as such are afforded additional protection against disturbance at

their nest sites. Precautionary mitigation to ensure legislative compliance during the construction phase is outlined in Mitigation below.

Operational Phase Impacts

12.200. Two species flights were recorded during baseline surveys in June 2015, each of two birds interacting with each other.

12.201. Operational phase displacement impacts in the absence of established foraging and nesting interest locally, is not expected to occur and would be considered Negligible and Not Significant at a Regional NHZ population level.

Merlin

12.202. Merlin is listed on Annex 1 of the EU Birds Directive and Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), is an Amber-listed BoCC, an SBL species.

12.203. The most recently published NHZ 7 'Northern Highlands' population is 30 pairs (60 birds). This is taken as a highly precautionary estimate in view unpaired and immature birds also attributable to the Regional population.

12.204. Observations of merlin during baseline surveys between 2015 and 2016 comprised a single flight of a single bird in June 2015 and a brief sighting of two birds in flight over Corriemoillie Forest during a raptor search also in June 2015.

12.205. No known nest sites are identified within 2km of the Proposed Development.

12.206. During baseline surveys for Corriemoillie no species flights were recorded however, observations of the species were made during breeding raptor searches. No breeding evidence within 2km of the wind farm site boundary was confirmed.

12.207. No observations of the species were made during baseline surveys to inform the Lochluichart Wind Farm Extension.

12.208. The three birds recorded during baseline surveys in 2015 comprises 5% of the Regional NHZ population. Adopting a precautionary approach merlin is therefore assigned a value of Regional importance for the purposes of this assessment.

Construction and Decommissioning Phase Impacts

12.209. The Proposed Development is not established to be of importance for nesting or foraging merlin.

12.210. Potential impacts upon the species as a result of construction phase habitat loss and disturbance is therefore considered to be Negligible and Not Significant at the Regional NHZ population level.

12.211. Merlin is listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) and as such birds are afforded additional protection against disturbance at their nest site. Precautionary mitigation to ensure legislative compliance during the construction phase is outlined in Mitigation below

Operational Phase Impacts

12.212. Operational impacts upon merlin as a result of potential displacement would be considered Negligible and Not Significant at the Regional NHZ population level.

Black Grouse

12.213. Black grouse are a Red-listed BoCC, an SBL species and a priority species on the Ross and Cromarty (East) LBAP.

12.214. The most recently published NHZ 7 'Northern Highlands' population is 473 displaying males.

12.215. A single black grouse lek site was recorded within the Proposed Development during targeted species surveys in 2015. The lek site supported a maximum count of two lekking males during a survey visit on the 8th May, with incidental observations of single males also recorded at the lek site during other breeding season survey visits. No flight activity of black grouse was recorded.

12.216. Species activity recorded during baseline surveys to inform Corriemoillie was also of a similarly low level, with only a small number of single lekking males recorded within 1.5km of the wind farm site in 2009 and 2010.

12.217. No observations of the species were made during surveys to inform the Lochluichart Wind Farm Extension.

12.218. Black grouse are considered to be present at the Proposed Development and immediate surrounding area in very low numbers (<1% of regional NHZ population). As such are considered to be of Local importance. A detailed assessment is however carried out on the basis for their inclusion as a "Priority" species within SHH guidance (2018).

Construction and Decommissioning Phase Impacts

12.219. In the context of remaining suitable moorland and woodland habitat within the immediate and surrounding area, habitat loss for black grouse as a result of the Proposed Development will be Negligible and Not Significant at the Regional NHZ population level.

12.220. The black grouse lek recorded during 2015 surveys is located approximately <100m from the Proposed Development infrastructure at its nearest point. As such there is potential for black grouse to be disturbed during the construction phase where works are undertaken during the species respective breeding season. Given the species presence locally in established low densities, works would only impact on a very small number of birds i.e. up to two lekking birds.

12.221. Impacts are therefore assessed as Negligible at the Regional NHZ population.

Operational Phase Impacts

12.222. Research into the displacement of black grouse from wind farm site remains limited. There have been several studies into the abundance and distribution of lekking birds at operational wind farm sites however, confounding factors such

as habitat management and the lack of pre-construction data place limitations on evidence suggesting displacement effects for the species (Zwart *et al.* 2015).

12.223. The species, particularly within the Proposed Development is subjected to moderate levels of disturbance as they are present within close proximity to an access track which has been used during the construction of Corriemoillie.

12.224. Whilst displacement effects are therefore difficult to predict with any high degree of certainty, adopting a precautionary approach and assuming the displacement of two lekking males from the Proposed Development, this would be equate to a Negligible Adverse impact and Not Significant at the Regional NHZ population level.

Golden Plover

12.225. Golden plover, listed on Annex I of the EU Birds Directive (migratory), is a Red-listed BoCC, and an SBL species.

12.226. The most recently published NHZ 7 'Northern Highlands' regional population estimate is 3,009 pairs (or 6,018 birds).

12.227. Observations of golden plover during baseline surveys between 2015 and 2016 included eight species flights totalling 11 birds. All flights were recorded during the species respective breeding season in 2015 (March to August). Breeding bird surveys recorded the presence of three golden plover territories within 500m of the Proposed Development. This included a single territory to the southern boundary of the Proposed Development to the south of Loch na Salach, with the further two territories recorded in excess of 300m to the west of the Proposed Development.

12.228. Golden plover activity recorded during baseline surveys to inform Corriemoillie included 11 species flights during the 2009 breeding season and two territories located within 500m of the Proposed Development. Three territories were recorded during breeding bird surveys undertaken in 2009 and 2010, and the ES concluded that there were likely to be five territories located within 500m of Corriemoillie.

12.229. Baseline surveys to inform the Lochluichart Wind Farm Extension recorded two golden plover territories within 500m of the Proposed Development.

12.230. Post construction monitoring surveys undertaken for Lochluichart Wind Farm Extension I recognised a territory within the Proposed Development in 2015, 2016 and 2017 south of Meallan Caoruinn.

12.231. Golden plover are considered to be present at the Proposed Development and immediate surrounding area in very low numbers (<0.1% of Regional NHZ population). As such are considered to be of Local importance. A detailed assessment is however carried out on the basis for their inclusion as a "Priority" species within SNH guidance (2018).

Construction and Decommissioning Phase Impacts

12.232. Golden plover are established to be present locally at low breeding densities locally. Three territories were recorded within 500m of the Proposed

Development during baseline surveys in 2015 with no territories located within the Proposed Development. Direct habitat loss impacts for the species is therefore considered to be Negligible and Not Significant at the Regional NHZ population level.

12.233. Precautionary mitigation to ensure legislative compliance during the construction phase is outlined in Mitigation below.

12.234. There is a growing literature on research into the impacts of construction and operational phase disturbance upon breeding golden plover within the UK.

12.235. Some studies (e.g. Pearce-Higgins *et al*., 2008 and 2009; Sansom and Douglas, 2014) suggest observable fine scale displacement effects of up to a 40% reduction in breeding densities within 500m of operational turbine location. Whilst others (e.g. Douglas *et al*., 2011; Fielding and Hawroth, 2013; Pearce-Higgins *et al*., 2012), suggest the population densities of golden plover are not affected by the presence of wind farms. Collectively the conclusions of such studies are hindered by confounding variables such as habitat, typography and differences in other as yet untested environmental variables between sites.

12.236. In the absence of specific evidence directly applicable to the Proposed Development, a precautionary approach is adopted and it is therefore possible that golden plovers may be disturbed and displaced by construction activities that would be undertaken during the breeding season, however the numbers of pairs that would be impacted is very small. Any impact would be of Low magnitude and Not Significant at the Regional NHZ population level.

Operational Phase Impacts

12.237. Habitat loss as a result of displacement during the operational phase is considered to be a Low magnitude impact and Not Significant at the Regional NHZ population level.

Greenshank

12.238. Greenshank is listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) and is an Amber-listed BoCC.

12.239. Currently published NHZ population estimates for breeding greenshank include 148 pairs (296 birds) within NHZ 7 'Northern Highlands', with 1,297 pairs across the 21 NHZs. As a breeding species, greenshank is typically present within low breeding densities, with rarely more than one pair per km^2 (e.g. Forester *et al*., 2007).

12.240. During baseline surveys in 2015, two greenshank territories were recorded within the survey area, including a single territory along the Allt Giubhais Mor within the Proposed Development and a further territory adjacent to Loch a Mheallain Chaeorainn located within the Corriemoillie site.

12.241. No flight activity for the species was recorded.

12.242. During breeding bird surveys undertaken in 2010 to inform the Lochluichart Wind Farm Extension, three pairs of greenshank were recorded, which also included single pairs along the Socach Allt Giubhais and adjacent to Loch a

Mheallain Chaeorainn, with an additional territory to the southeast of the Lochluichart Wind Farm Extension.

12.243. Breeding bird surveys in 2009 and 2010 to inform Corriemoillie recorded at least five greenshank territories. In addition a feeding area for the species was also identified in 2009. Baseline surveys to inform Corriemoillie also recorded a total of 28 species flights during flight activity surveys in 2009. The level of flight activity is likely attributable to the location of territories within Corriemoillie and the commuting of birds to identified foraging areas.

12.244. Post construction monitoring surveys undertaken for Lochluichart Wind Farm Extension I recognised the territory outside the Proposed Development adjacent to Loch a Mheallain Chaeorainn in 2015, 2016 and 2017. No territories were identified within the Proposed Development.

12.245. The two greenshank territories (assumed 4 birds) recorded during breeding bird surveys in 2015 equates to >1% of the Regional NHZ population. For the purposes of this assessment the species is therefore assigned a value of Regional importance.

Construction and Decommissioning Phase Impacts

12.246. A single greenshank territory was recorded within the Proposed Development in 2015, to the east of Allt Giubhais Mor and the existing access track.

12.247. A further greenshank territory was recorded within the Corriemoillie site and beyond 720m from the Proposed Development infrastructure. No impacts upon this territory are anticipated.

12.248. Direct breeding habitat loss for breeding greenshank within the Proposed Development, on the basis of the existing known territory location is not anticipated to occur. The development will result in a small and permanent loss of suitable mire and heath habitats available for future nesting opportunities. Proposed felling of existing coniferous plantation woodland will however, result in an overall increase in open habitat availability similar to that present the surrounding area for foraging and nesting greenshank and other species of open ground. As such, on the basis of the species historical presence only in low breeding densities, habitat losses are considered to be Negligible and Not Significant at the Regional NHZ population level.

12.249. There is a limited literature base on the effects of disturbance to Greenshank. Distances of 200-300m from disturbance sources have however, been cited as the extent at which the species will tolerate disturbances during the breeding season (e.g. Ruddock and Whitfield, 2009), with distances of 300-400m also implemented on major infrastructure projects e.g. SSE Beauly – Denny OHL reinforcement project (SSE, 2013). A precautionary disturbance distance of 300m from development infrastructure has therefore been adopted for the purposes of this assessment.

12.250. The single greenshank territory identified within the Proposed Development is located more than 300m from the nearest piece of development infrastructure (turbine T6). As such disturbance of breeding greenshank, where works are undertaken during the species' breeding season (broadly April to July), is

considered highly unlikely. This equates to a Low magnitude impact, which is Not Significant at a Regional NHZ population level.

12.251. Greenshank are listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) and as such are afforded additional protection against disturbance at their nest sites. Precautionary mitigation to ensure legislative compliance during the construction phase is outlined in Mitigation below.

Operational Phase Impacts

12.252. In consultation for the Strathy South Wind Farm development, SNH have previously cited anecdotal evidence from unpublished studies on the species which suggests that overall greenshank do not display a high level of behavioural displacement around operational turbines (SNH, 2015[xxii]). Operational displacement of greenshank at wind farm sites does however, remain to be poorly studied.

12.253. Adopting a similar precautionary approach of a 300m displacement buffer, on the basis that the species is present locally in low population densities, habitat loss as a result of displacement during the operational phase is considered to be a Low magnitude impact and Not Significant at the Regional NHZ population level.

Mitigation

12.254. No potentially significant impacts upon ornithological features are predicted to occur as a result of the construction, operation, or decommissioning of the Proposed Development.

12.255. Notwithstanding mitigation through design, no further specific mitigation measures are therefore proposed.

12.256. Mitigation measures are however, proposed in relation to the potential for offences to occur under the provisions of the Wildlife and Countryside Act 1981 (as amended) and on a precautionary basis in relation to sensitive species.

Breeding Birds

12.257. All wild birds in the UK are protected under Section 1 of the Wildlife and Countryside Act 1981 (as amended), which makes it an offence to intentionally or recklessly kill, injure or take any wild bird or take, damage or destroy the nest (whilst being built or in use) or its eggs. Wild birds listed on Schedule 1 of the Act receive additional legal protection which makes it an offence to intentionally or recklessly disturb these species while building a nest or while they are in, on, or near a nest containing eggs or young; or to disturb their dependent young.

12.258. Where possible site clearance activities will be undertaken outside of the core breeding bird season (1st March to 31st August). Where this is not possible a pre-clearance survey of areas to be cleared will be undertaken by a competent ornithologist in order to identify any active wild bird nests. Should any active nests be found, works will not proceed until the competent ornithologist advises.

12.259. To avoid potential disturbance to breeding Schedule 1 raptor species, all areas within at least 500m of site clearance activities will be surveyed in advance of works being undertaken during the core breeding season (1st March to 31st August, inclusive) to identify any nesting locations for such species.

12.260. Where required, a Breeding Bird Protection Plan (BBPP) (or similar) would be drawn up for with the aim of protecting breeding birds from disturbance during the construction phase. The BBPP would be produced where necessary in consultation with SNH and may include working buffers around identified nest sites and/or habitat features in accordance with best available evidence applicable at the time.

Summary of Residual Effects

12.261. No significant effects have been identified for any important ornithological feature. As such, the significance of residual effects is also Not Significant.

Cumulative Effects

12.262. This section considers the potential for significant effects upon important ornithological features by the Proposed Development in combination with the Operational Schemes and Corriemoillie (Table 12.12).

12.263. The potential for cumulative impacts upon red-throated diver are considered separately in **Appendix 12.B**.

12.264. In summary no adverse impacts are predicted for red-throated divers as a result of the Proposed Development and as such potential in-combination effects with the above listed wind farm developments would be Negligible and Not Significant at the Regional NHZ population level.

12.265. The following cumulative assessment considers the following two main impacts upon ornithological features from wind farm developments:

- Disturbance/Displacement; and,
- Collision Risk Mortality.

12.266. Construction activities at the Operational Schemes and Corriemoillie are considered complete. The potential for significant cumulative construction phase effects is therefore not considered.

12.267. Direct habitat loss impacts for all target species is considered to be Negligible for all developments, in the context of remaining suitable habitats for such species within the wind farm sites and immediate surrounding area. As such, a detailed cumulative assessment of potential impacts at the Regional NHZ population scale is not considered necessary.

Table 12.12 Developments considered for cumulative effects.

Lochluichart Wind Farm	
Planning Ref.	05/01052/S36RC
Status	Constructed
No. of Turbines	17
Corriemoillie Wind Farm	
Planning Ref.	13/01082/S42
Status	Constructed
No. of Turbines	17
Lochluichart Wind Farm Extension	
Planning Ref.	13/01082/S42
Status	Constructed
No. of Turbines	17

Disturbance /Displacement

12.268. The potential for operational disturbance to result in actual population losses is difficult to ascertain and quantify with a high degree of certainty.

12.269. The three currently consented and operational wind farm developments together with the Proposed Development are however, established to be located in a locale known to support low breeding population densities of identified key ornithological features (e.g. black grouse, greenshank and golden plover) or of little interest to foraging species (e.g. migratory geese and golden eagle).

12.270. Collectively all three consented and operational wind farm developments conclude no more than Low magnitude impacts upon ornithological features as a result of long-term operational displacement, which would not be significant at the Regional NHZ population level. Any additive and therefore cumulative effect from the Proposed Development would be highly unlikely and not be significant at the Regional NHZ population level.

Collision Risk Mortality

12.271. Collision risk mortality within EIA Report Chapters of proposed wind farm developments is typically the main impact consistently quantified where flight activity data allows.

12.272. The number of flights recorded within the CRW were insufficient to inform collision risk modelling therefore it is not possible to undertake a additive analysis of predicted collisions with cumulative schemes.

12.273. No significant adverse collision impacts were predicted from the operation schemes and the addition of the Proposed Development is considered highly unlikely to result in any cumulative effects on any species population.

Summary of Effects

12.274. No potentially significant impacts upon ornithological features resulting from the Proposed Development alone or in-combination are identified.

12.275. Mitigation measures to ensure legislative compliance during the construction phase of the development with regards the protection of nesting birds are outlined. Providing implementation, no breach of the provisions of the relevant legislation will occur.

Table 12.13 Summary table of impacts upon the recorded ecological features.

Feature	Proposed Activity	Characterisation of unmitigated impact upon feature	Significance without mitigation and confidence level	Mitigation and Enhancement	Residual significance and confidence level (following mitigation)
Red-throated Diver	Habitat Loss	Highly unlikely	Negligible, not significant.	Not required.	Not significant
	Disturbance and Displacement	Highly unlikely	Negligible, not significant.	Not required.	Not significant
	Collision Mortality	Highly unlikely	Negligible, not significant.	Not required.	Not significant
Greylag goose	Habitat Loss	Highly unlikely	Negligible, not significant.	Not required.	Not significant
	Disturbance and Displacement	Highly unlikely	Negligible, not significant.	Not required.	Not significant
	Collision Mortality	Highly unlikely	Negligible, not significant.	Not required.	Not significant
Red kite	Habitat Loss	Certain, irreversible.	Negligible, not significant.	Not required.	Not significant
	Disturbance and Displacement	Unlikely.	Negligible, not significant.	Legislation compliance only.	Not significant
	Collision Mortality	Unlikely.	Negligible, not significant.	Not required.	Not significant

Feature	Proposed Activity	Characterisation of unmitigated impact upon feature	Significance without mitigation and confidence level	Mitigation and Enhancement	Residual significance and confidence level (following mitigation)
Hen harrier	Habitat Loss	Highly unlikely	Negligible, not significant.	Not required.	Not significant
	Disturbance and Displacement	Highly unlikely	Negligible, not significant.	Legislation compliance only.	Not significant
	Collision Mortality	Unlikely.	Negligible, not significant.	Not required.	Not significant
Golden eagle	Habitat Loss	Unlikely	Negligible, not significant.	Not required.	Not significant
	Construction - Disturbance and Displacement	Temporary, low magnitude.	Negligible / minor adverse, not significant.	Not required.	Not significant
	Operational – displacement	Unlikely.	Negligible, not significant.	Not required.	Not significant
	Collision Mortality	Unlikely.	Negligible, not significant.	Not required.	Not significant
Osprey	Habitat Loss	Highly unlikely	Negligible, not significant.	Not required.	Not significant
	Disturbance and Displacement	Unlikely.	Negligible, not significant.	Legislation compliance only.	Not significant
	Collision Mortality	Unlikely.	Negligible, not significant.	Not required.	Not significant
Merlin	Habitat Loss	Highly unlikely	Negligible, not significant.	Not required.	Not significant
	Disturbance and Displacement	Unlikely.	Negligible, not significant.	Legislation compliance only.	Not significant
	Collision Mortality	Unlikely.	Negligible, not significant.	Not required.	Not significant

Feature	Proposed Activity	Characterisation of unmitigated impact upon feature	Significance without mitigation and confidence level	Mitigation and Enhancement	Residual significance and confidence level (following mitigation)
Black grouse	Habitat Loss	Certain, irreversible.	Negligible, not significant.	Not required.	Not significant
	Disturbance and Displacement	Likely, temporary.	Negligible, not significant.	Not required.	Not significant
	Operational – displacement	Likely	Negligible, not significant.	Not required.	Not significant
Golden plover	Habitat Loss	Unlikely.	Negligible, not significant.	Not required.	Not significant
	Construction - Disturbance and Displacement	Likely, temporary, low magnitude.	Negligible / minor adverse, not significant.	Not required.	Not significant
	Operational - Disturbance and Displacement	Unlikely, permanent, low magnitude	Minor adverse, not significant.	Not required.	Not significant
	Collision Mortality	Unlikely.	Negligible, not significant.	Not required.	Not significant
Greenshank	Habitat Loss	Unlikely.	Negligible, not significant.	Not required.	Not significant
	Disturbance and Displacement	Unlikely, temporary, low magnitude.	Negligible / minor adverse, not significant.	Legislation compliance only.	Not significant
	Operational - Disturbance and Displacement	Unlikely, permanent, low magnitude	Minor adverse, not significant.	Not required.	Not significant

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