CONFIDENTIAL

Technical Appendix 8.4

Clune Wind Farm

Ornithological Modelling

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RES Group

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1 Introduction and background

1.1 Terms of Reference

In September 2020, Atmos Consulting Ltd. was commissioned by Clune and Corrybrough Estate, and then latterly RES Group, to undertake ornithological surveys in relation to a proposed wind farm development on land south of the village of Tomatin, Highland.

The proposed Clune Wind Farm (hereafter referred to as the "Proposed Development") has been subject to avian surveys from September 2020 through to August 2022, sufficient to provide an initial impact assessment on avian receptors at the Site. Following subsequent design iterations, land on the southern boundary was then the subject of avian surveys from January 2023 through to December 2023.

These surveys indicated relatively high activity from Golden eagle *Aquila chrysaetos,* White-tailed eagle *Haliaeetus albicilla* and Red kite *Milvus milvus* such that when collision risk modelling was carried out, estimates of collision risk were also relatively high such that it was felt further assessment was required to determine the impact of the additional mortality on the populations of those species.

This Technical Appendix describes the modelling undertaken and the outcomes of the modelling. It presents the methodology and results of two different forms of modelling:

- Golden Eagle Territory (GET) modelling for Golden eagle usage of the area; and
- Population Viability Analysis (PVA) for all three species.

1.2 Objectives

The objectives of this Technical Appendix are to:

- Describe the methodology employed in carrying out the modelling; and
- Present the results of the modelling.

2 Methodology

2.1 Golden Eagle Territory Modelling

The requirement for GET modelling is set out in guidance (NatureScot, 2021); the model uses topography and land covering to predict the usage by Golden eagle, using thousands of GPS telemetry records gathered from an on-going programme of satellite tagging young Golden eagle (Fielding A. , et al., 2019).

Essentially this allows three different topographical measures; elevation, distance from ridge and slope to identify areas used preferentially by Golden eagle. Ridges were identified using methodology described in Fielding & Haworth (Fielding & Haworth, 2014).

The suitability of habitat for Golden eagle dispersal was modelled as a combined weighted classification of the three parameters (elevation, distance from ridge and slope). Weightings were derived from Fielding *et al* (2019). Each of the three parameters was categorised into a ten point scale and then those three parameters were summed together and the total value was then scaled onto a 1-10 scale; this prevented any point which scored highly on only one parameter from being scored as highly suitable for eagle use.

2.2 Population Viability Modelling

Population Viability Analysis (PVA) is a quantitative technique used to determine the probability that a population will persist for a given number of years under particular environmental conditions (Beissinger & McCulloch, 2002).

To investigate the effects of the additional collision risk on the populations of Golden and White-tailed eagle and Red kite, a dual approach was used. Two models were produced; a deterministic age-structured female-only matrix model, and a model using population modelling software (VORTEX (Lacy, Borbat, & Pollack, 2005)) which will enable the effects of stochasticity to be investigated.

PVA modelling was based on the results of the surveys carried out between September 2020 and August 2022. Table 1 shows the flight activity for this period and Table 2 shows the outcome of collision risk modelling for these three species over this period. Full details on the methodology to collect this data and the collision risk modelling are provided in Technical Appendix 8.1 Ornithology Surveys

Table 1: Results of flight activity surveys (September 2020 – December 2023)

Species	Minimum No. of Birds	Maximum No. of Birds	No. of Flights	Total Bird Seconds	At Risk Bird Seconds
Golden eagle	1	2	41	6,739	5,861
Red kite	1	5	139	16,838	14,183
White-tailed eagle	1	1	19	3,597	3,227

Table 2: Results of collision risk modelling

Species	Annual collision risk	Years per collision	Collisions over 40 years
Golden eagle	0.277	3.6	11.08

Species	Annual collision risk	Years per collision	Collisions over 40 years
Red kite	0.681	1.5	27.24
White-tailed eagle	0.97	1.0	38.8

The parameters used for the two versions of the modelling, stochastic and deterministic are shown in Appendix A.

The model was run for each species for two scenarios; with no collision risk and with collision risk to allow a review of the effects of collision risk to be seen. Cumulative collision risk was also considered. The model was run for a period of 40 years, to enable life time effects of the Proposed Development to be considered.

For the deterministic model, a female only model was used, which means certain parameters - such as population size and breeding output - were halved to ensure that only females were included in the model. Results are as such, presented for a population which accounts only for females. Collision risk was applied to adults only, this representing the most severe test of the model.

For the stochastic model, the model was run 100 times for each model version.

Table 3 provides a summary of the key parameter sources used. Full details are provided in Appendix A.

Table 3: Summary of population parameters

Species	Parameter	Value	Comments	Reference
Golden eagle	Population basis (total)[1]	64	Based upon NHZ10/Badenoch & Strathspey Scottish Raptor Study Group; five year mean (2018 – 2022) (17.2)	Scottish Raptor Monitoring Scheme (SRMS) reports (e.g. (Challis, et al., 2023)
	Survival	0.795 for 0 – 4 years and 0.9512 for 4+ years	Scottish population estimate	(Whitfield, Fielding, McLeod, & Haworth, 2008)
	Productivity[2]	0.78	Based upon SRMS data from Badenoch & Strathspey area; five year mean 2018-2022	(Challis, et al., 2023)
White-tailed eagle	Population basis (total)	548	Derived from population estimate 2021 (150 pairs)	(Eaton, 2023)
	Survival	0-1 years: 0.819 1-2 years: 0.821	Scottish population	(Evans, Wilson, & Amar, 2009)

[1] For deterministic model, population basis was halved to account for a female only model

[2] For deterministic model, productivity was halved

Species	Parameter	Value		Comments	Reference
		2-3 years	0.857		
		4+ years	0.951		
		Adult	0.966		
	Productivity[2]	0.8		Scottish population estimate; the current 5 year mean from national raptor monitoring is 0.84 but the more conservative value has been used	(Samson, Evans, & Roos, 2016)
Red kite	Population basis (total)	142		Highland population based on mean of occupied territories 2018 – 2022 (45.6 pairs)	The Red kite re-introduction populations are still relatively discrete; this locale, will form part of the reintroduced Highland population. Data from SRMS reports e.g. (Challis, et al., 2023)
	Survival	1yst yr survival	0.41	Highland population	(Samson, Etheridge, Smart, & Roos, 2016)
		2nd yr survival	0.71		
		adult	0.86		
	Productivity[2]	1.52		Calculated from reported productivity for the Highland population (2018 – 2022)	SRMS reports e.g (Challis, et al., 2023)

3 Results

3.1 GET modelling

Figure 8.4.1 shows the results of the GET modelling. The area within the Site as categorised onto the predicted usage scale is shown in Table 4, as a per cent of the area. This shows that the majority of the Site is of moderate to high predicted use.

Table 4: Results of GET modelling; extent of site classed by suitability for Golden eagle

Predicted use index value	Percentage of site
3	0.09%
4	4.30%
5	14.93%
6	21.18%
7	21.30%
8	21.82%
9	13.67%
10	2.70%

3.2 PVA modelling

3.2.1 Deterministic model results

Golden eagle

An age-structured, relatively simplistic matrix model was developed with the parameters as outlined in Appendix A. The population was based on the Badenoch and Strathspey SRSG monitoring population.

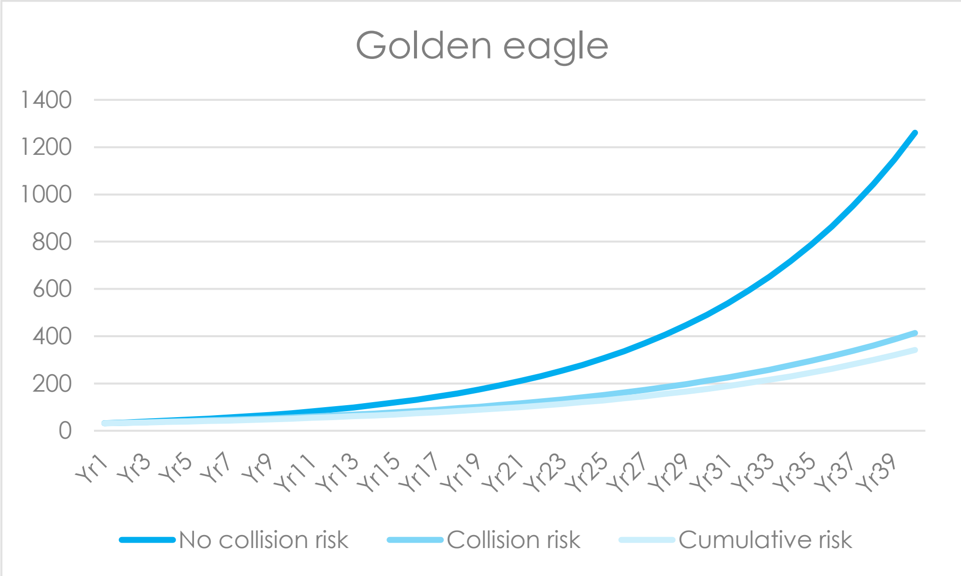
Table 5 shows the outcome from the deterministic modelling.

Table 5: Deterministic model outcomes Golden eagle

Model	Starting population (female birds only)	Final population (at 40 years; female birds only)	Approximate annual growth rate
No collision risk	32	1260	9.88%
Collision risk	32	413	6.8%
Cumulative risk	32	341	6.3%

Chart 1 shows the graph from these results.

Chart 1 Golden eagle deterministic model results



The rate of growth was considerably slower for the population experiencing collision risk, although it should be noted that these levels of growth are very high for an established population, although the 2015 national eagle survey did show an expanding population in this area (Hayhow D.B., Benn, Stevenson, Stirling-Aird, & Eaton, 2017) .

White-tailed Eagle

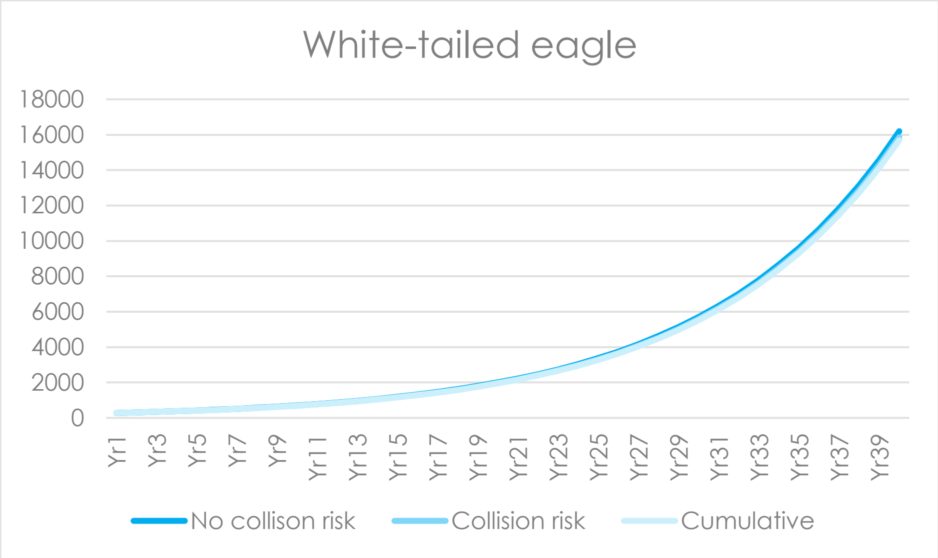
An age-structured, relatively simplistic matrix model was developed with the parameters as outlined in Appendix A. This was based on national Scottish population; the eastern population is still very small and its unclear if this location would be part of the eastern more recently introduced population or expansion of the western population.

Table 6: Deterministic model outcomes White-tailed eagle

Model	Starting population (female birds only)	Final population (at 30 years; female birds only)	Approximate annual growth rate
No collision risk	274	16,200	11.026%
Collision risk	274	15,858	10.967.%
Cumulative risk	274	15,688	10.936%

Chart 2 shows the graph from these results.

Chart 2 White-tailed eagle deterministic model results



The national population while relatively small, is currently growing very strongly and this is reflected in the outcomes of the modelling. As with the Golden eagle modelling, the outcomes are unlikely to ever happen, as it is a simplistic model which does not apply any effects – such as habitat constraints or density dependency – which would reduce the productivity as the population grows.

Red Kite

An age-structured, relatively simplistic matrix model was developed with the parameters as outlined in Appendix A. The population was based on the Highland re-introduced population.

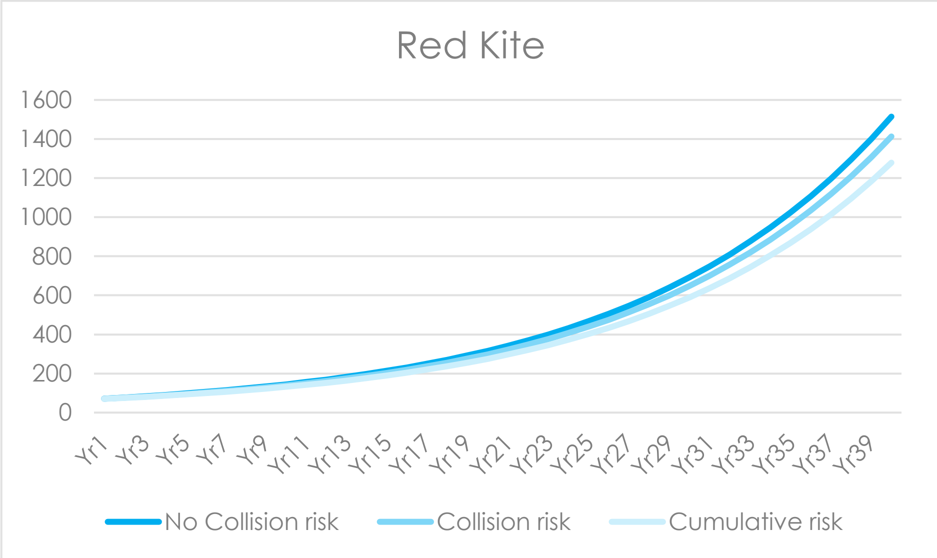
Table 7 shows the outcome from the deterministic modelling.

Table 7: Deterministic model outcomes Red kite

Model	Starting population (female birds only)	Final population (at 30 years; female birds only)	Annual growth rate
No collision risk	71	1514	8.15%
Collision risk	71	1412	7.97%
Cumulative risk	71	1278	7.72%

Chart 3 shows the graph from these results.

Chart 3 Red Kite deterministic model results



The addition of collision risk had very little effect on the population.

3.2.2 Stochastic model results

Using Vortex 10.0, a stochastic model was developed. This takes account of observed population parameters, as well as variation around the measured values. Doing this introduces an element of randomness into the model which is more similar to what occurs in the wild, where population parameters will fluctuate in response to external stimuli.

Golden eagle

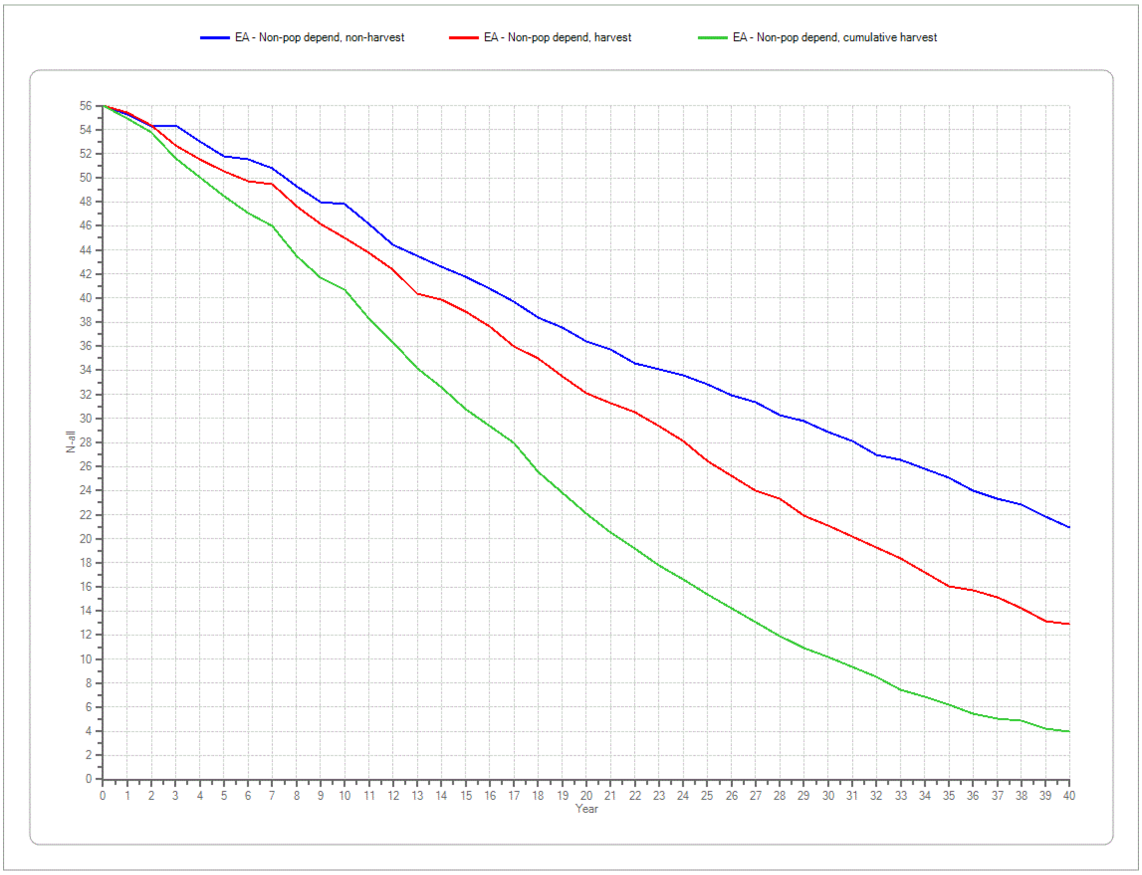
The population was capped at 1800 birds, based upon likely estimates of maximum carrying capacity for Scotland (Whitfield, Fielding, McLeod, & Haworth, 2008). While it is unlikely all 1800 would be in Badenoch and Strathspey area, it provides a bound for the population.

The results of the model are summarised in Chart 4 below, with key population parameter outcomes presented in Table 8, which shows the mean results for each scenario.

Table 8: Results of stochastic model

PVA model	No. iterations	Population growth rate	Mean end population size	Extinction probability
No collision risk	100	-3.06%	20.91	5%
Collision risk	100	-4.46%	12.89	22%
Collision risk (cumulative)	100	-7.36%	3.93	69%

Chart 4 Golden eagle stochastic model result comparison



Both populations declined, albeit the decline was faster for the population undergoing collision risk and the likelihood of extinction was higher; including cumulative risk into the model increased the likelihood of extinction even more.

White-tailed eagle

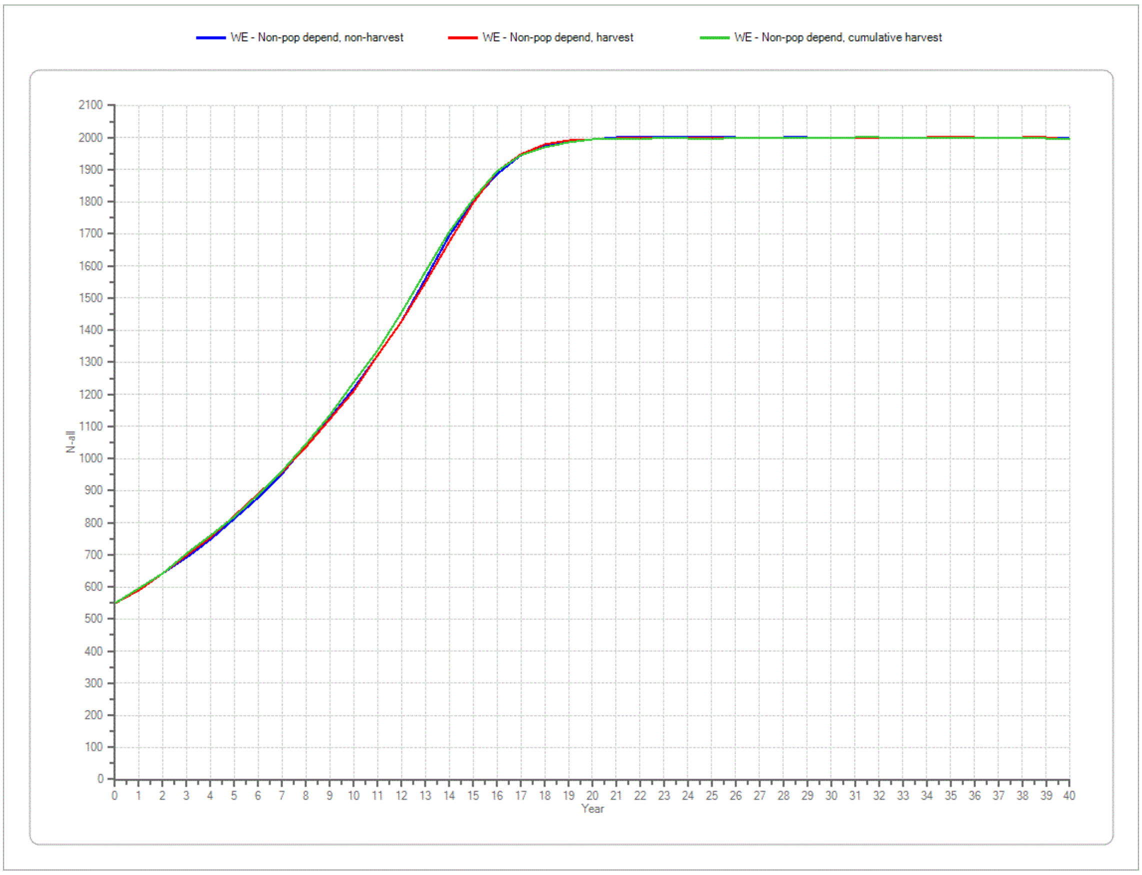
The population was capped at 2,000 birds. The model is based on a Scottish population; a stochastic model using the starting population used in the deterministic model will nearly always fail.

The results of the model are summarised in Chart 5 below, with key population parameter outcomes presented in Table 5, which shows the mean results for each scenario.

Table 9:   Results of stochastic model

PVA model	No. iterations	Population growth rate	Mean end population size	Extinction probability
No collision risk	100	8.10%	1999.18	0%
Collision risk	100	8.00%	1995.67	0%
Collision risk cumulative	100	8.06%	1994.97	0%

Chart 5 White-tailed eagle stochastic model result comparison



All populations effectively reached carrying capacity, with little difference between the growth; the additional mortality had no impact on the national population.

Red kite

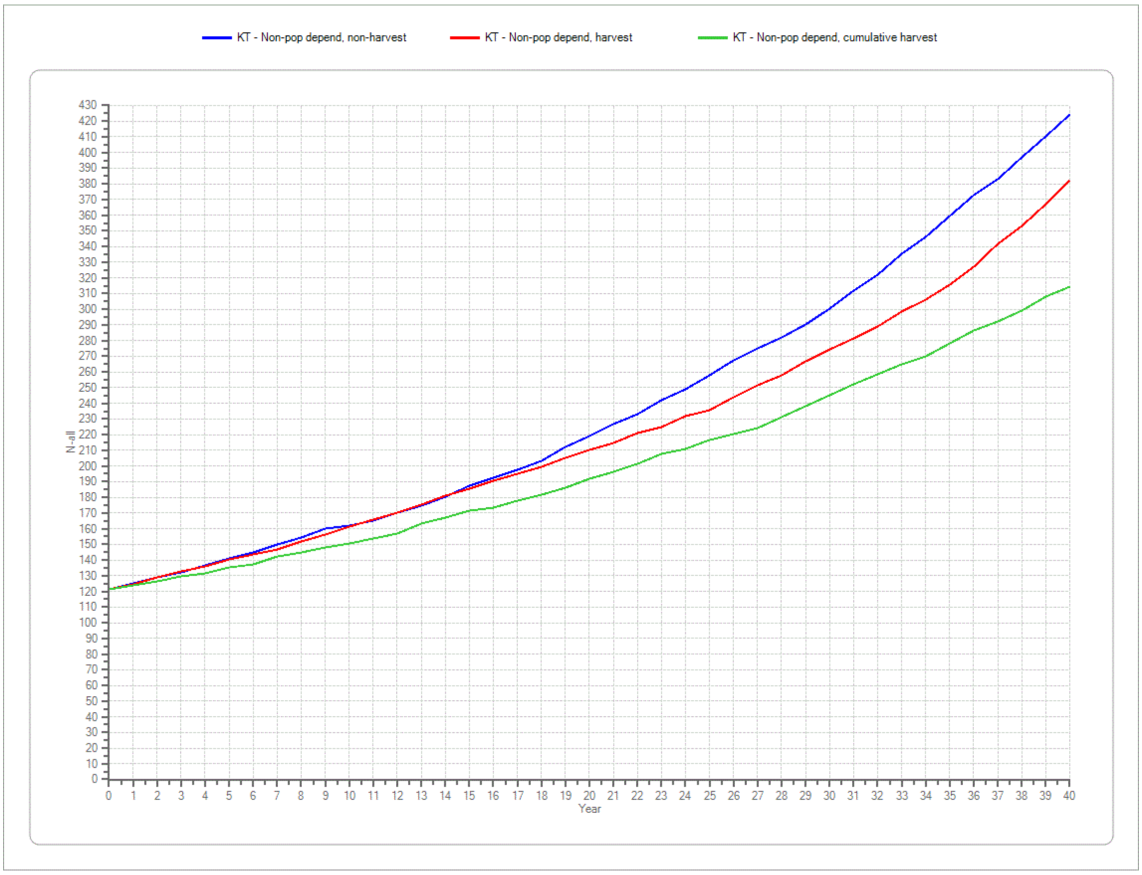
The population was capped at 3,000 birds. It is unlikely the Highland population would reach this level but including a max population provides some measure of realism for populations which are growing quickly.

The results of the model are summarised in Chart 6 below, with key population parameter outcomes presented in table 10, which shows the mean results for each scenario.

Table 10: Results of stochastic model

PVA model	No. iterations	Population growth rate	Mean end population size	Extinction probability
No collision risk	100	2.95%	423.97	0%
Collision risk	100	2.69%	382.17	0%
Collision risk cumulative	100	2.16%	314.63	0%

Chart 6 Red kite stochastic model result comparison



The Red kite population continued to increase, albeit more slowly with both collision risk and cumulative collision risk added to the model

4 Discussion

4.1 Golden eagle

The results of the GET model shows an area with moderate to high suitability for Golden eagle. However within this, there is variability, with the ridge around Cam Dubh'Ic an Deoir having the highest suitability. Much of the area around this, which contains a majority of the turbines, is of lower suitability, but suitability is greater through the south-east of the Proposed Development. In terms of displacement effect, the largest area of loss would be in that south-east area of the Proposed Development, which encompasses an area of approximately 2.35 km^2 of moderate – highly suitable eagle habitat. However much of the central area of the Proposed Development is of lower suitability for eagles, so the displacement from this area would have a lower impact.

All stochastic PVA models showed a decline in the eagle population. There appears to have been a recent improvement in the population for this species within the central and southern Highlands with the 2015 population survey showing a large increase (Hayhow D.B., Benn, Stevenson, Stirling-Aird, & Eaton, 2017) which has been reflected in the outturns in the deterministic model, which all show population growth even with increased mortality due to collision risk.

With population modelling, smaller populations with highly variable population parameters are more prone to extinction in stochastic PVAs. Deterministic models, which rely on the mean parameter do not experience this and so it is not unusual to have a difference in the outcomes for deterministic and stochastic models, particularly for long lived, low number of young per year species such as eagles. The value of carrying out both kinds of modelling is that deterministic models allow an understanding of the underlying trends as a result of the current population parameters and so give in effect, a baseline as to the current 'health' of the population. This suggests that the Badenoch and Strathspey eagle population is currently expanding, evidence of which can be seen in the actual eagle surveys. Stochastic models are not as optimistic as the deterministic models are, so they allow for some perturbation and variation within the population; their drawback is the small population issue described above, which means they can be unduly pessimistic. Given the eagle population is expanding in this region, while the model suggests it should be declining, this can be seen in action.

It has been suggested that the recovering population may be linked to increased scrutiny of illegal persecution in this area which may cause a reduction in its occurrence. This may mean survival in this region is being underestimated; however greater productivity was observed which was captured by using SRSG data and more territories present in the Badenoch and Strathspey region even since the 2015 survey. This also tends to suggest that this population could be very sensitive to additional mortality, if a change in mortality levels has increased the population levels relatively quickly, although with the population growing, this should become less sensitive over time.

The fact that all stochastic models show a declining population when actual data shows otherwise suggests that the parameters may be too conservative, or are not reflecting recent changes in this particular population.

While the stochastic model suggest that the level of collision risk estimated would not be sustainable for this population, it is also understood that collision risk is based on flight activity being unchanged over the operational wind farm; at the same time it is known that Golden eagle displace from the area covered by turbines (Fielding, et al., 2021) and that this reduces collision risk such that the larger impact is generally considered to be displacement.

As such, while it would be important not to replace one source of mortality (illegal persecution) with another (collision risk) on this population which is apparently recovering, it is also likely that the impact of collision risk on this population would be overestimated and would not take account of behavioural responses to the presence of turbines. Given the positive outturns with the deterministic model it is clear that the underlying population parameters of the population have improved and are indicative of a population which is growing. As a result, while the stochastic model shows a population likely to go extinct as a result of additional mortality due to collision risk, this model is considered to be unduly pessimistic, in that the collision risk does not take account of behavioural adaptions and as such is over estimated and likely to be by a relatively large degree. In addition, the decline of the population without collision mortality suggests that the population parameters may still be underestimating some parameters of this population, despite the strong growth displayed by the deterministic model.

4.2 White-tailed eagle

In all models, despite the relatively high level of collision risk estimated for this species, the population continued to grow. This reflects the buoyant state of the Scottish White-tailed eagle population, as demonstrated in Samson, Evans & Roos (2016), which indicated that the Scottish White-tailed eagle was in the period of rapid expansion following reintroduction; the population parameters figures are all indicative of a population growing strongly. Over time, the positive parameters will likely reduce as the population matures.

While it would have been preferable to model a more localised population (especially since the cumulative collision risk considered a regional cumulative risk) to investigate the impacts on the regional population, at the same time, the western population is probably supporting the small but increasing eastern population with immigration as the western population becomes saturated and expands. It is unclear the provenance of the birds breeding to the south of the Proposed Development.

4.3 Red kite

The Highland Red kite population is the reintroduced population which has had the slowest growth rates of the Scottish populations; the population has been more affected by illegal persecution and other populations resulting in lower survival rates (Samson, Etheridge, Smart, & Roos, 2016). Despite this, it has continued to grow and expand, as evidenced by the activity observed at the proposed development, some 35 km from the original release location.

The levels of estimated collision risk would slow the growth of this population but it would still grow, even taking into account cumulative collision risk. There have been concerns about cumulative collision risk on Red kite in this area, hence the 2016 Samson study which suggested the population at that time was close to capacity. Since then the population has continued to grow and expand. Cumulative collision risk would have to be significantly higher at this point in time to be able to depress this population's growth.

5 References

Beissinger, S. R., & McCulloch, D. R. (2002). *Population Viability Analsysis.* Chicago: University of Chicago Press.

Challis, A., Beckmann, B. C., Wilson, M. W., Eaton, M. A., Stevenson, A., Stirling-Aird, P., . . . Wilkinson , N. I. (2023). *Scottish Raptor Monitoring Scheme Report 2021 & 2022.* Stirling: BTO Scotland.

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.* Stirling: BTO Scotland.

Eaton, M. &. (2023). Rare breeding birds in the UK in 2021. *British BIrds*, 116 609-684.

Evans, R., Wilson, J. D., & Amar, A. (2009). Growth and demography of a re-introduced population of White-tailed Eagles Haliaeetus albicilla. *Ibis*, 151 244-254.

Fielding, A., & Haworth, P. (2014). *Golden eagles in the south of Scotland: an overview.* Inverness: Scottish Natural Heritage.

Fielding, A., Anderson, D., Benn, S., Dennis, R., Geary, M., Weston, E., & Whitfield, D. (2021). Responses of dispersing GPS-tagged Golden Eagles (Aquila chrysaetos) to multiple wind farms across Scotland. *Ibis*, 1-15.

Fielding, A., Haworth, P., Anderson, D., Benn, S., Dennis, R., Weston, E., & Whitfield, D. (2019). A simple topographical model to predict Golden Eagle Aquila chrysaetos space use during dispersal. *Ibis*, 1-18.

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

Lacy, R. C., Borbat, M., & Pollack, J. P. (2005). *VORTEX: A Stochastic Simulation of the Extinction Process.* Brookfield Il: Chicago Zoological Society.

NatureScot. (2021). *NatureScot statement on modelling to support the assessment of forestry and wind farm impacts on golden eagles.* Inverness: NatureScot.

Samson, A., Etheridge, B., Smart, J., & Roos, S. (2016). *Population modelling of North Scotland red kites in relation to the cumulative impacts of wildlife crime and wind farm mortality.* Battleby: SNH.

Samson, A., Evans, R., & Roos, S. (2016). *Population and future range modelling of reintroduced Scottish white-tailed eagles (Haliaeetus albicilla) SNH Commissioned Report No. 898.* Inverness: NatureScot.

Whitfield, D. P., Fielding, A. H., McLeod, D. R., & Haworth, P. F. (2008). *A conservation framework for golden eagles: implications for their conservation and management in Scotland. Scottish Natural Heritage Commissioned Report No.193 ROAME No. F05AC306).* JNCC.

Appendices

Appendix A. Parameters for model

Table 11: Parameter values used in the Golden eagle PVA

Parameter	Value Stochastic model (deterministic model)	Standard deviation	Source of parameter value	Details/assumptions
Starting population size	64 individuals (32 females)	Not required	SRMS monitoring reports (e.g. (Challis, et al., 2022)	Starting population derived from the breeding population for NHZ10 and the Badenoch and Strathspey area of Scottish Raptor Study Group (SRSG)monitoring which follows it closely. As a result, the most recent population estimate was taken from a five year mean of SRSG data (2018-2022) which gave a mean breeding population of 18.4
Age at first breeding	4	Not required	(Whitfield, Fielding, McLeod, & Haworth, 2008)	
Productivity (fledglings per pair)	0.78	0.152	SRMS reports (e.g. (Challis, et al., 2022)	A five year mean and standard error was calculated using SRMS data for the period 2016 - 2022
Maximum young per year	3	Not required	(Whitfield, Fielding, McLeod, & Haworth, 2008)	
First year survival	0.795	0.0795	(Whitfield, Fielding, McLeod, & Haworth, 2008)	There is uncertainty over the annual survival rates for immature eagles. Whitfield *et al* produced a survival rate of 0.4 for immatures reaching adulthood; 0.4 equated to 0.795 annual across the first four years. In the absence of an estimate of standard deviation, 10% was adopted.
Second year survival	0.795	0.0795		
Third year survival	0.795	0.0795		
Fourth year survival	0.795	0.0795		
Adult survival	0.9512	0.009	(Whitfield, Fielding, McLeod, & Haworth, 2008)	
Maximum population	1000			

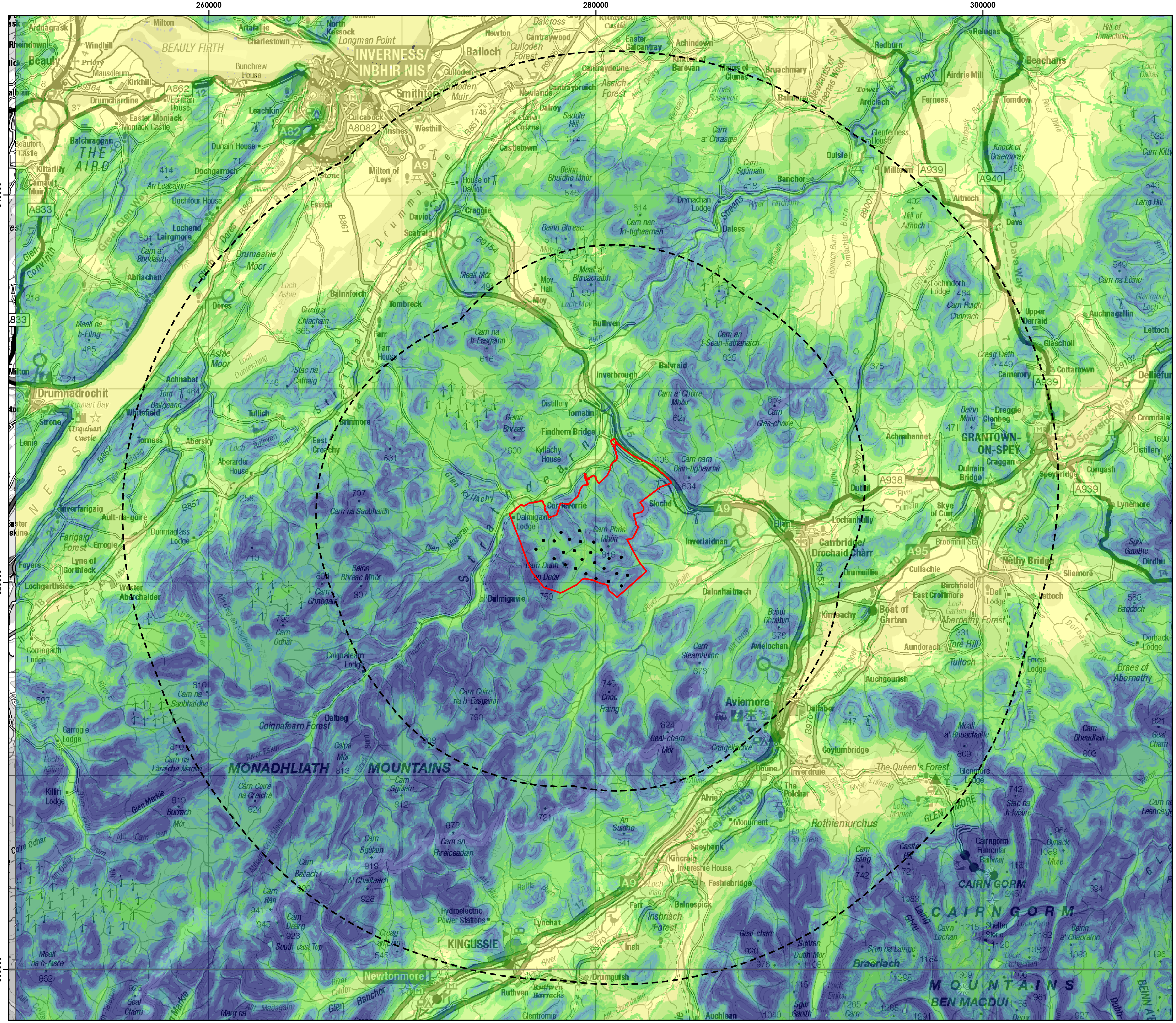
Table 12: Parameter values used in the White-tailed eagle PVA

Parameter	Value Stochastic model (deterministic model)	Standard deviation	Source of parameter value	Details/assumptions
Starting population size	456 individuals (10)	Not required	SRMS (Challis, et al., 2022)	Starting population derived from breeding population estimate (150 occupied territories) (based on (Eaton, 2023). Because the White-tailed eagle is comparatively recently reintroduced to eastern Scotland, and the breeding population is not stable (and no territories are known to be in proximity to the Proposed Development) additional mortality is applied to the Scottish population.
Age at first breeding	5	Not required	(Samson, Evans, & Roos, Population and future range modelling of reintroduced Scottish white-tailed eagles (Haliaeetus albicilla) SNH Commissioned Report No. 898, 2016)	
Productivity (fledglings per pair)	1.382	0.08	(Samson, Evans, & Roos, Population and future range modelling of reintroduced Scottish white-tailed eagles (Haliaeetus albicilla) SNH Commissioned Report No. 898, 2016)	
Maximum young per year	3	Not required	(Samson, Evans, & Roos, Population and future range modelling of reintroduced Scottish white-tailed eagles (Haliaeetus	

Parameter	Value Stochastic model (deterministic model)	Standard deviation	Source of parameter value	Details/assumptions
			albicilla) SNH Commissioned Report No. 898, 2016)	
First year survival	0.93	0.016	(Samson, Evans, & Roos, Population and future range modelling of reintroduced Scottish white-tailed eagles (Haliaeetus albicilla) SNH Commissioned Report No. 898, 2016)	Data was presented as an overall subadult survival rate so was calculated to give annual figures. Year 1/ year 2 derived from a combined estimate in Samson *et al*. (2016).
Second year survival	0.94	0.016		
Third year survival	0.89	0.016		
Fourth year survival	0.855	0.037		
Adult survival	0.961	0.008		
Maximum population	2000			

Table 13: Parameter values used in the Red kite PVA

Parameter	Value Stochastic model (deterministic model)	Standard deviation	Source of parameter value	Details/assumptions
Starting population size	142 individuals (71females)	Not required	SRMS monitoring 2018 – 2022 (Challis, et al., 2023)	May underestimate population size as population is now beyond ability to monitor all territories
Age at first breeding	2			
Productivity (fledglings per pair)	1.78	0.13	SRMS reports (e.g. (Challis, et al., 2023)	Five year mean developed from the five year period 2018 - 2022
Maximum young per year	4			
First year survival	0.41	0	(Samson, Etheridge, Smart, & Roos, 2016)	
Second year survival	0.71	0.04		
Adult survival	0.86	0.004		



Clune Wind Farm

Figure 8.4.1
Ornithological modelling

Key

- Site boundary
- 10 and 20km buffers of site boundary
- Proposed turbine

Predicted space use by golden eagles during dispersal

High

Low

0 2.5 5 10
Kilometres

N

Scale @ A3:
1:185,000

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Drawn by: AF | Checked by: TH | Approved by: JW