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12. Ornithology

12.1. Summary of Conclusions

2012 ES (24 Turbine Layout – tip heights 126m and 139m)	2016 ES (24 Turbine Layout – tip heights 126m and 139m)	2017 SI (21 Turbine Layout – tip heights 126m and 139m)	2021 Section 36C Application (21 Turbine layout with 149.9 m tip heights, plus amended tracks)
<p>Concluded that there were no significant adverse effects on birds under the terms of the EIA Regulations.</p> <p>A Habitats Regulations Appraisal (HRA) under the Habitats Regulations concluded that the proposed development will not have an adverse impact on the integrity of designated sites.</p>	<p>Concluded that there were no significant adverse effects on birds under the terms of the EIA Regulations.</p> <p>An HRA under the Habitats Regulations concluded that the proposed development will not have an adverse impact on the integrity of designated sites.</p>	<p>Concluded that there was no change to the conclusions of the 2016 EIA Report, with all effects concluded to be ‘not significant’ under the terms of the EIA Regulations.</p> <p>The information and advice provided to the competent authority to inform an HRA concluded that the proposed development will not have an adverse impact on the integrity of designated sites.</p>	<p>Concluded that there was no change to the conclusions of the 2016 EIA Report, with all effects concluded to be ‘not significant’ under the terms of the EIA Regulations.</p> <p>The information and advice provided to the competent authority to inform an HRA concluded that the proposed development will not have an adverse impact on the integrity of designated sites.</p>

12.2. Introduction

12.2.1. This chapter assesses the potential effects of the Section 36C Application for Limekiln Wind Farm (hereafter “the Revised Consented Development”), including the additional ‘worst case’ turbine model (Nordex N133), on birds. It supplements Chapter 12: Ornithology of the Environmental Statement (ES) (Infinergy, June 2016, see **Appendix 12.A**) and Chapter 7: Ornithology of the Supplementary Information (SI) Report (Infinergy, September 2017, see **Appendix 12.B**) and should be read in conjunction with these.

12.2.2. In response to the 2016 Environmental Statement and 2017 SI Report for the Consented Development, no objections were raised by NatureScot (formerly

Scottish Natural Heritage) or RSPB Scotland in relation to ornithology, subject to conditions.

- 12.2.3. The reporters, appointed by Scottish Ministers to hold an inquiry into the application under section 36 of the Electricity Act 1989, stated that *"In reaching our conclusions on ornithology, we attach weight to the positions of SNH and the RSPB, neither of which object to the proposed development on ornithological grounds, subject to conditions. We are further reassured in this regard by the statement of agreed matters between the applicant, council and SNH, where it is stated that subject to the application of appropriately worded conditions, the proposal is acceptable in relation to ornithology including impacts on designated sites. We have no evidence before us which would lead us to challenge that agreed position"*. The Scottish Ministers agreed with the reporters' recommendations and consent of the Limekiln Wind Farm was granted subject to conditions in 2019.
- 12.2.4. The principles of the 2016 ES and 2017 SI Report remain valid and appropriate and therefore have not been reassessed for this assessment, unless otherwise stated.

12.3. Consultation

- 12.3.1. Scoping opinions for the Revised Consented Development were solicited in a scoping report from the applicant (see **Appendix 3.A** and **3.B**). These opinions are summarised in Table 12.1.

Table 12.1 – Consultation responses			
Consultee	Date of response	Issue raised	Response
NatureScot	8 April 2021	We are satisfied that updated ornithology surveys will not be required to assess the impacts of the proposed variation on ornithological interests.	Opinions noted.
		We understand that updated collision risk modelling and cumulative impact assessment will be undertaken for greylag geese, a qualifying feature of the Caithness Lochs Special Protection Area which is welcomed.	Collision risk modelling and cumulative impact assessment for greylag goose are presented in the Chapter text and Annex 1.
		We further welcome the proposal to reassess the potential impacts on ornithological interests in relation to construction and operational disturbance.	All potential effects on ornithological interests are considered within the Chapter text
The Highland Council	23 April 2021	The EIAR should provide a baseline survey of the bird interest on site.	The baseline remains as described within the 2016 ES and 2017 SI Report.
		The presence of protected species such as Schedule	All species of conservation concern

Table 12.1 – Consultation responses			
Consultee	Date of response	Issue raised	Response
		1 Birds must be included and considered as part of the planning application process, not as an issue which can be considered at a later stage	are considered within the Chapter text.
		The EIAR should address the likely impacts on the nature conservation interests of all the designated sites in the vicinity of the proposed development.	Information to inform an appropriate assessment on effects on designated sites is presented in the Chapter text and Annex 1.
		Further advice has been provided by NatureScot on ecology and ornithology in relation to the surveys required and the adequacy of the work already undertaken. RSPB have also provided a response highlighting matters related to ornithology.	Opinions noted.
RSPB Scotland	23 April 2021	NatureScot guidance states that survey data from previous EIAs can be used providing that “the data are reliable and not too dated (collected within the last 5 years or within 3 years if the populations of key species are known to be changing rapidly).” However, the report does not specify what surveys for what species have been undertaken and when, and therefore it is not clear whether the data meets these criteria. Any data collected prior to 2016 should now be considered expired but could be used for contextual purposes. If there is not two full years of data available to inform a new impact assessment on birds from 2016 or after, new bird surveys should be commissioned in order to inform an updated assessment, and should include Vantage	Consultation with NatureScot was undertaken and NatureScot confirmed that it was satisfied that updated ornithology surveys would not be required to assess the impacts of the proposed variation on ornithological interests.

Table 12.1 – Consultation responses			
Consultee	Date of response	Issue raised	Response
		Points and Breeding Bird Surveys, as well as specific monitoring of divers, raptors and eagles, as per NatureScot guidance.	
		It is appreciated that the proposal is to vary an existing consent and it is noted that the EIA report is required to include the main respects in which the likely significant effects of the proposed varied development would differ from those described in the environmental statement prepared in connection with the Section 36 consent for Limekiln. However, Scottish Government Guidance ² also makes it clear that in determining whether there would be significant adverse effects, consideration needs to be given both to the effects of the change itself, and to the overall or cumulative impact of the proposed variation. It is also noted that Scottish Ministers expect that identification of the significant effects on the environment of the proposed varied development would be carried out taking into account current knowledge and methods of assessment. Therefore, the assessment of impacts should include the effects of the proposed varied development and the difference in impact between the consented scheme and the proposed varied development. For example, in relation to ornithological impacts, due to the proposed increase in turbine height there will be changes to	All potential effects on ornithological interests are considered within the Chapter text and information to inform an appropriate assessment on effects on designated sites is presented in the Chapter text and Annex 1.

Table 12.1 – Consultation responses			
Consultee	Date of response	Issue raised	Response
		<p>the rotor swept area therefore the collision risk will need to be re-calculated. This should be undertaken following the standard NatureScot methodology and incorporating any new data that the Applicant will have collected by that time. Significant effects on disturbance, displacement, loss of suitable habitat (breeding, wintering and foraging), and barrier effects should also be assessed for all relevant species, both during construction and operation. This should not only include impacts from the wind turbines but also new tracks and infrastructure as well as any existing road widening or upgrades.</p>	
		<p>As stated in RSPB Scotland’s previous letters in relation to Limekiln wind farm, we raised concerns that predicted impacts on golden eagles were underestimated. Impacts on the SPA population should be quantified in order to fully appraise the scheme in combination with other developments. Particularly, the EIAR should examine the impacts from risk of disturbance and displacement from the eastern part of the eagles’ territory and the reduction of regular foraging areas, as well as the risk of increased collisions due to tree felling temporarily providing open areas for foraging. We recommend undertaking a “no forestry” Predicting Aquila Territory (PAT) model in</p>	<p>All species of conservation concern are considered within the Chapter text.</p>

Table 12.1 – Consultation responses			
Consultee	Date of response	Issue raised	Response
		<p>order to assist with the assessment of the effect of likely changes in forestry cover and habitat on golden eagle behaviour, and the implications in relation to the impacts of the proposed wind farm.</p>	
		<p>Since the original scheme was consented, we have increasingly become concerned regarding the potential impacts on common scoter, particularly the potential of collision with turbines during the hours of darkness when scoter migrate to breeding lochs on the SPA south of the site boundary. This was our remaining objection point for the Limekiln extension wind farm. Wildfowl often migrate at night and therefore the Vantage Point surveys undertaken to date are unlikely to have recorded them, which could result in an unreliable collision risk assessment. There is very little understanding about movements of, and routes used by, the Flows scoter population. Scoter have been known to feed at sea during the breeding season and it is possible that birds breeding in the Caithness and Sutherland Peatlands SPA could commute through the proposal site, increasing the likelihood of collision risk. Therefore, we advise that scoter records from across the Flow Country are requested from RSPB Scotland to help assess this risk. The species should also be included in the surveys of lochs within 2km. We would strongly recommend undertaking nocturnal</p>	<p>All species of conservation concern are considered within the Chapter text.</p>

Table 12.1 – Consultation responses			
Consultee	Date of response	Issue raised	Response
		<p>surveys where possible, using vertical radar coupled with acoustic recorders, remote camera and surveyor observations during the breeding and migration seasons to make a more accurate assessment of the risk that birds breeding in the Caithness and Sutherland Peatlands SPA could commute/migrate through or around the proposal site, increasing the likelihood of collision risk and barrier effects. We understand the cost implications of this and believe that a strategic approach is needed. Potentially, developers of wind farms across the Flow Country could collaborate as this issue has also been raised a number of times in RSPB Scotland responses.</p>	
		<p>We recommend that information is provided within the EIA report to demonstrate that the survey data are adequate, robust and accurate including:</p> <ul style="list-style-type: none"> • Full information on the VP work undertaken, including dates, times and weather conditions • Maps showing VP locations that also denote viewsheds (we note Figure 9 of the scoping report does not include these). • Maps showing raptor foraging areas • Worked example(s) of collision risk calculations • Provision of raw data in order independent verification of collision risk calculations 	<p>This Chapter supplements Chapter 12: Ornithology of the Environmental Statement (ES) (Infinergy, June 2016, see Appendix 12.A) and Chapter 7: Ornithology of the Supplementary Information (SI) Report (Infinergy, September 2017, see Appendix 12.B) and should be read in conjunction with these.</p> <p>Revised collision risk calculations are presented in Annex 1 of this Chapter.</p>
		We are increasingly concerned about the	Cumulative effects upon NHZ and SPA

Table 12.1 – Consultation responses			
Consultee	Date of response	Issue raised	Response
		<p>cumulative effects on birds as a result of the high number of operational, consented and planned wind farm developments across the Flow Country. A robust cumulative assessment of collision risk, disturbance, displacement and barrier effects should take account of all operational, consented and proposed wind energy schemes that could impact on bird populations of the relevant NHZ (The Peatlands of Caithness and Sutherland), the adjacent Caithness and Sutherland Peatlands SPA and nearby Caithness Lochs SPA.</p> <p>The in-combination effect of other relevant plans or projects, such as the Sutherland spaceport and overhead line grid connections at Limekiln, Strathy Wood and Creag Riabhach, should also be considered.</p>	<p>bird populations have been considered within the Chapter text.</p>

12.4. Methodology

12.4.1. This section takes into account the legislation, policy and guidance referred to in the 2016 ES. The baseline information relied upon in order to make an assessment of the effects of the Revised Consented Development is that information which has been provided in the 2016 ES (**Appendix 12.A**) and 2017 SI Report (**Appendix 12.B**). To ensure consistency of approach, the same significance criteria and assessment methodology as referred to in the 2016 ES has been followed. Taking into account the relevant policy and guidance, baseline information, and assessment criteria, an assessment is presented below which details the effects of the s36c Application.

12.5. Baseline Conditions

12.5.1. With no further fieldwork carried out, the baseline remains as described within the 2016 ES (**Appendix 12.A**) and 2017 SI Report (**Appendix 12.B**).

12.6. Change in Effects

Construction

12.6.1. Construction effects would be similar to those described within the 2016 ES. Despite changes to the track layout, the removal of one borrow pit and the relocation of the temporary construction compound, the extent of the wind farm and associated infrastructure remains the same, which in turn maintains the scale and magnitude of spatial effects. As such, the effects identified within the 2016 ES remain unchanged.

Operation

12.6.2. The operational effects identified within the 2016 ES would also remain unchanged. The 2016 ES demonstrated that there is no requirement for any further assessment, including collision risk assessment, due to so few records and so little flight activity for any species recorded.

Decommissioning

12.6.3. Decommissioning effects would be similar to those described within the 2016 ES. The extent of the wind farm and associated infrastructure remains the same, which in turn maintains the scale and magnitude of spatial effects. As such, the effects identified within the 2016 ES remain unchanged.

Cumulative Effects

12.6.4. The cumulative effects identified within the 2016 ES would remain unchanged; the predicted in-isolation effects are considered to have no potential to contribute to cumulative effects and therefore the cumulative effects assessment from the 2016 ES remains unchanged which identified cumulative effects as being non-significant.

Mitigation

12.6.5. No significant effects were identified; therefore, no mitigation is proposed.

12.7. Summary of residual effects

12.7.1. Residual effects are summarised in **Table 12.2**. The revisions to the Consented Development will result in no change to the magnitude of effects on ornithological receptors overall, including cumulative effects. The assessment of significance of effects remains unchanged from that outlined within the 2016 ES.

Table 12.2 – Summary of residual effects			
Potential effect	Receptor	Mitigation	Residual effect
Construction: disturbance	All species	None required	Negligible
Operation: land take	All species	None required	Negligible

Table 12.2 – Summary of residual effects			
Potential effect	Receptor	Mitigation	Residual effect
Operation: habitat modification	All species	None required	Negligible
Operation: disturbance	All species	None required	Negligible
Operation: collision	All species	None required	Negligible
Decommissioning	All species	None required	Negligible
Cumulative	All species	None required	Negligible

12.8. Statement of Significance

12.8.1. Effects on ornithology associated with the s36c Application for the Revised Consented Development are considered to be not significant. This represents no change to the conclusions outlined in the 2016 ES.

12.9. Potential Effects on Special Protection Areas (SPAs)

12.9.1. Most of the effects identified within the Habitats Regulations Appraisal (Infinergy, June 2016) would remain unchanged; the exception to this is collision risk which would be altered due to the increase in rotor diameter. As a result, collision risk modelling (CRM), using the same methodology as laid out in the 2016 ES, has been re-run.

12.9.2. The Predictable Flight Method (PFM)¹ of the Collision Risk Model (CRM) (Band et al., 2007) was used to estimate predicted collision mortality for greylag goose during the non-breeding season. The width of the Risk Window presented by the Revised Consented Development was measured, as the maximum extent of the 21-turbine layout plus a 500 m buffer, at 3,605 m. This was multiplied by the risk window height (140 m) to give an estimated Risk Window of 504,700 m². The area of the Risk Window occupied by the proposed rotors was $21 * (\pi * 66.5^2) = 291,751 \text{ m}^2$ or about 0.58 of the Risk Window. Flights considered at risk of collision involved those recorded at height bands 10 - 30m, 30 - 50m, 50 - 100m and 100-150m.

12.9.3. Other parameters and values in the modelling process are shown in **Annex 1** and included a precautionary provision that 25% of flights were not observed because they occurred in the hours of darkness (estimates of daylight hours according to latitude followed the algorithm of Forsythe et al., 1995), a turbine operation rate of 85%, and a precautionary avoidance rate of 99.8% for geese (SNH, 2010

¹ The Band CRM involves two methods to predict estimated collision fatalities, depending on the pattern of flight of the species involved: 'predictable' and 'unpredictable' flight methods. The predictable flight method (PFM) is appropriate when birds tend to move through an area in a relatively consistent direction, such as when on migration or when moving between localised feeding and roosting sites. The unpredictable flight method (UFM) is more appropriate when flights are not in any particular direction and assumes that they are random.

updated 2018). Detailed calculations are presented in Annex 1: Revised Collision Risk Modelling to Inform a Habitats Regulations Appraisal.

12.9.4. **Table 12.3** shows the results of the re-run CRM. Estimated collision risk has decreased from the estimates provided in the 2016 ES due to the fact that the avoidance rate for geese increased from 99 % to 99.8 % in 2018 and the number of turbines has decreased from 24 to 21.

Table 12.3 – Collision risk estimates				
Species	Revised Consented Development		Original scheme (Infinergy June 2016, for comparison)	
	Estimated collision per year based on 99.8 % avoidance	Number of years per collision	Estimated collision per year based on 99 % avoidance	Number of years per collision
Greylag goose	0.3	3.2	1.4	0.7

12.9.5. A decrease in the collision rate is predicted for greylag goose; as a result, the Habitats Regulations Appraisal from the 2016 ES which identified that collision risk would not compromise the Conservation Objectives of the Caithness Lochs SPA remains unchanged.

12.10. References

- Band, W., Madders, M., & Whitfield, D.P. (2007). Developing field and analytical methods to assess avian collision risk at wind farms. In: de Lucas, M., Janss, G.F.E. & Ferrer, M. (Eds.) *Birds and Wind Farms: Risk Assessment and Mitigation*, pp. 259-275. Quercus, Madrid.
- Forsythe, W.C., Rykiel, E.J., Stahl, R.S., Wu, H. & Schoolfield, R.M. (1995). A model comparison for day length as a function of latitude and day of year. *Ecological Modelling*. 80: 87 – 95.
- SNH. (2010, updated 2018). *Avoidance rates for the onshore SNH Wind Farm Collision Risk Model*. SNH, Battleby, UK.

Annex 1 – Revised Collision Risk Modelling to Inform a Habitats Regulations Appraisal

Greylag goose

Greylag goose

	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	
Dawn/dusk observations	7.35	12.43	18.72	13.15	21.89	11.13	6.67	6.13	
Daytime observations	17.65	42.07	31.28	15.85	23.11	26.87	48.33	63.37	
No. birds observed in risk window at dawn/dusk	0	0	37	0	0	0	0	32	
No. birds observed in risk window at daytime	0	267	99	0	0	0	0	1	
No. birds per hour of observation at dawn/dusk	0.00	0.00	1.98	0.00	0.00	0.00	0.00	5.22	
No. birds per hour of observation at daytime	0.00	6.35	3.16	0.00	0.00	0.00	0.00	0.02	
Available hours for flight activity at dawn/dusk	64	124	120	124	124	116	124	120	
Available hours for flight activity at daytime/25% night	203.73	348.53	282.97	258.91	274.73	292.51	382.03	428.35	Predicted total flights
Potential no. birds in risk window during month	0.00	2211.94	1132.77	0.00	0.00	0.00	0.00	633.19	3977.90

Calculation of available hours

Days in month	16	31	30	31	31	29	31	30
Daylight hrs	12.31	10.32	7.91	6.47	7.15	9.26	11.76	14.37
Nighttime hrs	11.69	13.68	16.09	17.53	16.85	14.74	12.24	9.63
Day minus dawn/dusk	10.31	8.32	5.91	4.47	5.15	7.26	9.76	12.37
Night minus dawn/dusk	9.69	11.68	14.09	15.53	14.85	12.74	10.24	7.63
Total Dawn/dusk hrs	64	124	120	124	124	116	124	120
Total Day + 25% night hrs	203.73	348.53	282.97	258.91	274.73	292.51	382.03	428.35

Potential no. of birds thru risk window	Area of risk window	Area of rotors	Proportion of risk window taken up by rotors	Potential no. of birds thru rotors	% collision risk	No. of birds killed per year	No. of birds killed per year
3977.90	504,700	291,751	0.58	2299.497	6.8%	155.6	0.3

K: [1D or [3D] (0 or 1) **1**

NoBlades **3**

MaxChord **3.5 m**

Pitch (degrees) **6**

BirdLength **0.83 m**

Wingspan **1.64 m**

F: Flapping (0) or gliding (+1) **0**

Bird speed **15 m/sec**

RotorDiam **133 m**

RotationPeriod **5.10638 sec**

integration interval **0.05**

Bird aspect ratio: β **0.51**

Calculation of alpha and p(collision) as a function of radius

	r/R	c/C	α	Upwind:			Downwind:		
				collide length	p(collision)	y(x)	collide length	p(collision)	y(x)
	0				1.00		0	1.00	0
	0.05	0.575	3.67	13.56	0.53	0.05311	13.14	0.51	0.05147
	0.1	0.622	1.83	7.20	0.28	0.05643	6.75	0.26	0.05287
	0.15	0.781	1.22	5.61	0.22	0.06593	5.04	0.20	0.05922
	0.2	0.939	0.92	4.84	0.19	0.07589	4.16	0.16	0.06512
	0.25	0.971	0.73	4.03	0.16	0.07901	3.32	0.13	0.06511
	0.3	0.923	0.61	3.30	0.13	0.07761	2.63	0.10	0.06174
	0.35	0.875	0.52	2.77	0.11	0.07607	2.13	0.08	0.05851
	0.4	0.827	0.46	2.45	0.10	0.07685	1.85	0.07	0.05788
	0.45	0.780	0.41	2.22	0.09	0.07829	1.65	0.06	0.05817
	0.5	0.732	0.37	2.03	0.08	0.07959	1.50	0.06	0.05861
	0.55	0.684	0.33	1.87	0.07	0.08075	1.37	0.05	0.05918
	0.6	0.637	0.31	1.74	0.07	0.08178	1.27	0.05	0.05988
	0.65	0.589	0.28	1.62	0.06	0.08267	1.19	0.05	0.06073
	0.7	0.541	0.26	1.52	0.06	0.08342	1.13	0.04	0.06171
	0.75	0.494	0.24	1.43	0.06	0.08404	1.07	0.04	0.06282
	0.8	0.446	0.23	1.35	0.05	0.08452	1.02	0.04	0.06408
	0.85	0.398	0.22	1.27	0.05	0.08486	0.98	0.04	0.06547
	0.9	0.350	0.20	1.21	0.05	0.08507	0.95	0.04	0.06699
	0.95	0.303	0.19	1.14	0.04	0.08514	0.92	0.04	0.06865
	1	0.255	0.18	1.09	0.04	0.08507	0.90	0.04	0.07045
Overall p(collision) =				Upwind	7.6%	Downwind	6.0%		
				Average	6.8%				