Kirkan Wind Farm

Environmental Impact Assessment Report

Appendix 6.3: Bat Activity Surveys

avian ecology

CONTENTS

1 INTRODUCTION

1.1.1 This appendix has been prepared to accompany Chapter 6: Ecology of the Kirkan Wind Farm Environmental Impact Assessment Report (EIA-R).

1.1.2 It presents detailed methodologies and results of bat activity surveys undertaken in 2018 to establish baseline bat activity conditions. It should be read with reference to the **Figure 6.11** (presented in Volume 3 of the EIAR):.

2 METHODOLOGY

2.1 Key Guidance

2.1.1 Bat survey methodology and subsequent interpretation of results made reference to the following key guidance documents:

- Hundt, L. (2012) *Bat Surveys: Good Practice Guidelines (2nd edition)*. The Bat Conservation Trust, London.
- Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd Edition). The Bat Conservation Trust, London.
- Natural England (2014) Technical Information Note TIN051: Bats and onshore wind turbines interim guidance. Natural England, Peterborough.
- Russ, J. (2012). *British Bat Calls: A Guide to Species Identification*. Pelagic Publishing, Exeter.

2.1.2 New guidance has just been produced: SNH (2019) *Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation*. Version: January 2019. Regard is also given to this new guidance, although the bat survey scope, baseline reporting and assessment was carried out prior to this guidance, so follows the key guidance documents stated above.

2.2 Bat Activity Surveys

2.2.1 Prior to the commencement of bat activity surveys, the habitats present within the project area were appraised for their potential to support bats in terms of potential roost locations, foraging and commuting opportunities in accordance with Bat Conservation Trust (BCT) guidance (Hundt, 2012; Collins, 2016).

Habitat Appraisal

2.2.2 The habitat appraisal was undertaken through a review of aerial imagery, OS mapping, together with ground thruthing during the Phase 1 habitat survey in 2017.

2.2.3 The habitats within the project area are dominated by open heathland, with some pockets of stunted woodland. A number of watercourses intersect the project area, but are largely rocky and unvegetated.

2.2.4 In terms of interest for bats, the majority of the project area comprised open habitats of relatively low interest for bats. Coniferous plantation woodland bordering the project area, particularly to the east, together with the Glascarnoch River and Blackwater to the north provide more favourable foraging and commuting opportunities for bats.

2.2.5 Woodland pockets within the project area comprise stunted, poorly establishing trees supporting no potential roosting features and are not considered to offer any potential roosting opportunities for bats.

2.2.6 Based on the suitability of habitats present within the project area, its geographical location, absence of desk study records and the known distributions of bat species (Russ, 2012), the project area is considered to most closely fit the following descriptions in accordance with '*Factors to consider when determining survey effort and site risk*' (Hundt, 2012):

Quality of habitat and number of habitat features likely to affect bat mortality rates if altered by development -

- *No potential habitat for roosting.*
- *Low quality foraging habitat that could be used by small numbers of foraging bats.*

Species likely to use the site -

- *Low number, single low risk species.*

2.2.7 The project area was also assessed as having a 'Negligible/Low' suitability for bats in accordance with '*Guidance for assessing the potential suitability of proposed development sites for bats, based on the presence of habitat features within the landscape'* (Collins, 2016):

Description roosting habitats -

- *Negligible habitat features on site likely to be used by roosting bats.*

Commuting and foraging habitats -

- *Habitats that could be used by small numbers of commuting bats such as gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat.*
- *Suitable, but isolated habitat that could be used by small numbers of foraging bats, such as a lone tree, or a patch of scrub.*

2.2.8 Bat activity surveys were subsequently commenced adopting seasonal effort applicable to a 'Low' risk site' and comprised:

- Manual Activity Transect Surveys; and,
- Automated Activity Surveys.

2.2.9 The study area comprised those habitats assessed as optimal for bats within the area of the proposed turbine locations extended to include a sample of habitat features out to approximately 200 m as permitted access allowed. The summer and autumn bat transect extended >200 m to the north-west of the study area, to provide baseline bat activity data of the adjacent land to put the bat activity within the study area into context.

Activity Surveys – Ground Level Transects

2.2.10 Ground level transect surveys were undertaken once per season (Spring, Summer and Autumn) within the study area. A single transect with eight listening points (LPs) was used to provide a representative coverage of habitats within (or adjacent to) the study area as illustrated in **Figure 6.11** and detailed in **Table 2.1**.

2.2.11 Survey effort is detailed in **Table 2.1.** Surveys were conducted when weather conditions were generally conductive to bat activity surveys i.e. relatively mild and dry, with low wind speeds.

2.2.12 In Spring (May), the transect route differed from that used in Summer (July) and Autumn (October) to account for fog conditions over higher ground, at the time of the bat surveys.

2.2.13 Transect routes were chosen to provide a representative coverage of the range of habitats present within the study area including habitats of potentially higher interest (e.g. woodland edge and watercourses) and lower interest to bats (open moorland). A description of each LP is provided in **Table 2.2.**

2.2.14 During each survey, transects were walked and activity recorded onto an 'Anabat SD2' bat detector. Five minutes of static monitoring was undertaken at each listening point. All activity either observed or heard via audio output from the bat detector was noted and cross-referenced on to a field map, along with observations relating to the number of bats and their activity type (i.e. foraging or commuting).

Table 2.1: Ground level transect survey effort.

Survey Season	Date	Sunset	Start	Finish	Total Time	Weather
Spring	26/05/2018	21:53	21:35	23:00	1 hr 25 mins	Wind: F1 (SW); Rain: Nil; Cloud Cover: 8/8; Visibility: Moderate (1-2km).
Summer	27/07/2018	21:43	21:25	23:15	1 hr 32 mins	Wind: F1-2 (SW); Rain: Nil; Cloud Cover: 3-4/8; Visibility: Good (>2km).
Autumn	18/10/2018	18:06	17:55	19:45	1 hr 50 mins	Wind: F3 (E); Rain: Nil-Drizzle; Cloud Cover: 8/8; Visibility: Moderate (1-2km).

Table 2.2: Ground level transect – LP descriptions.

Spring			Summer and Autumn		
LP	**Grid Reference**	**Habitat Description**	**LP**	**Grid Reference**	**Habitat Description**
1	NH 37391 67902	Mature Forestry in ride	1	NH 38895 67996	At edge of river/burn
2	NH 37063 68560	Edge of mature forestry at end of ride	2	NH 37704 67609	Between 2 areas of small trees on the track
3	NH 36779 68720	Corner of mature forestry looking onto open ground	3	NH 37557 67786	At edge of forestry plantation on edge of river/burn
4	NH 36546 69016	Edge of river/burn	4	NH 37391 67902	Open hill ground
5	NH 36182 69238	Clearing among small trees	5	NH 37238 68256	Open hill ground
6	NH 35655 67750	On track between 2 areas of small trees	6	NH 37063 68560	Open hill ground
7	NH 35338 70023	At edge of forestry belt on river/burn edge	7	NH 36779 68720	Wet flush/mire
8	NH 35541 70233	At Met mast in clearing amongst small trees	8	NH 36905 68289	Small disused quarry

Activity Surveys – Automated Monitoring

2.2.15 Ten automated monitoring stations were deployed within the study area during each survey period as illustrated in **Figure 6.11** and detailed in **Table 2.3**.

2.2.16 The locations of monitoring stations were chosen to sample activity from a representative range of habitats present within the study area, including habitats of potentially higher interest (e.g. woodland edge and watercourses) and lower interest to bats (open moorland).

2.2.17 In August, an additional two "control" stations (C1 and C2) were deployed beyond the study area, to provide a comparison of activity between the study area and within habitats of higher interest to bats in wider surrounding local area.

2.2.18 Each monitoring station comprised a single Songmeter (SM2) bat detector fitted with a single omnidirectional microphone attached to a 1m high wooden stake.

2.2.19 Monitoring was undertaken between the time period spanning approximately 30 minutes before sunset and half an hour after sunrise, with equipment set up to record simultaneously, to allow comparison of activity recorded at monitoring stations located within different habitats.

2.2.20 Recording periods for each monitoring station are detailed within **Table 2.4**.

Table 2.3: Automated monitoring station locations.

Monitoring Station	Grid Reference	Habitat
MS1	NH 35691 68151	Open moor next to ditch/burn
MS2	NH 35556 68017	Open moor next to fence and ditch/burn
MS3	NH 36063 68490	Open moor
MS4	NH 36194 68104	Open moor next to a burn
MS5	NH 36408 67301	Scattered rocks in open moor
MS6	NH 36541 67425	In bowl surrounded by small trees
MS7	NH 36735 67659	At edge of pool/mire amongst small trees
MS8	NH 37058 68111	On meteorological mast within immature woodland plantation
MS9	NH 37519 68399	Edge of small birch plantation
MS10	NH 37001 68597	Edge of small trees next to drovers track
C1	NH4086567956	Clearing of mature plantation forestry next to track.
C2	NH3809670558	On side of river amongst stunted birch trees

Table 2.4: Automated monitoring survey effort.

Monitoring Station	Survey Season	Start and End Dates	Number of Nights Recording Attained	Total Recording Time (hours)
MS1	Spring	26th – 31st May	6	45
		1st – 11th June	11	165
	Summer	27th – 31st July	5	42.5
		1st – 7th August	7	63
	Autumn	19th – 30th September	12	150

Monitoring Station	Survey Season	Start and End Dates	Number of Nights Recording Attained	Total Recording Time (hours)
MS2	Spring	26th – 31st May	*Equipment failure*	0
		1st – 11th June	*Equipment failure*	0
	Summer	27th – 31st July	5	42.5
		1st – 7th August	7	63
	Autumn	18th – 30th September	13	162.5
		1st – 3rd October	3	40.5
MS3	Spring	26th – 31st May	6	45
		1st – 11th June	11	82.5
	Summer	27th – 31st July	5	42.5
		1st – 2nd August	2	18
	Autumn	18th September	1	12.5
MS4	Spring	26th – 31st May	6	45
		1st – 10th June	10	75
	Summer	27th – 31st July	*Equipment failure*	0
		Redeployed - August (19th – 28th)	*Equipment failure*	0
	Autumn	September	*Equipment failure*	0
MS5	Spring	26th – 31st May	6	45
		1st – 10th June	10	75
	Summer	27th – 31st July	*Equipment failure*	0
		Redeployed – August (19th – 28th)	*Equipment failure*	0
	Autumn	19th – 30th September	12	150
MS6	Spring	26th – 29th May	4	30
	Summer	27th – 31st July	5	42.5
		1st – 7th August	7	63
	Autumn	19th – 30th September	*Equipment failure*	0
MS7	Spring	26th – 31st May	*Equipment failure*	0
		Redeployed – June	*Equipment failure*	0
	Summer	27th – 31st July	*Equipment failure*	0
		Redeployed – August (19th – 27th)	*Equipment failure*	0
	Autumn	19th – 30th September	12	150
		1st- 5th October	5	67.5
MS8	Spring	26th – 31st May	6	45
		1st – 11th June	11	75

Monitoring Station	Survey Season	Start and End Dates	Number of Nights Recording Attained	Total Recording Time (hours)
	Summer	27th – 31st July	*Equipment failure*	0
		Redeployed – August (19th – 27th)	9	81
	Autumn	19th – 24th September	6	75
MS9	Spring	26th – 31st May	6	45
		1st – 8th June	8	60
	Summer	27th – 31st July	5	42.5
		1st – 7th August	7	63
	Autumn	19th – 30th September	12	125
		1st – 6th October	5.5	74.25
MS10	Spring	26th – 31st May	6	45
		1st – 11th June	11	82.5
	Summer	27th – 31st July	5	42.5
		1st – 7th August	7	63
	Autumn	19th – 29th September	10	125
C1	Summer	7th – 20th August	14	126
C2	Summer	7th – 24th August	18	162

Personnel

2.2.21 All field surveys were completed by Mr A Carroll, Mr L. Carroll and Mr A. McNab, all highly experienced and competent field surveyors.

2.2.22 Bat sound analysis has been undertaken by Ms S. Whiteley BSc MCIEEM who has completed specific training on bat sound analysis (training by Dr S. Sowler MCIEEM) and has over 6 years' experience conducting sound analysis for sites across the UK and 7 years' experience completing bat surveys.

Data Analysis and Assumptions of Bat Activity

2.2.23 Data analysis and interpretation of results followed the principles presented in the BCT guidance *Bat Surveys for Professional Ecologists 3rd Edition* (Collins, 2016).

2.2.24 Bat detectors recorded data onto digital media for subsequent analysis using 'Analook' (Titley Electronics) and Kaleidoscope Pro (Wildlife Acoustics) software. All data was processed through Kaleidoscope Pro to separate out noise files. The remaining sonograms are then automatically identified by the software. A selection of sonograms from each species or species group was manually checked with particular attention given to non-pipistrelle species.

2.2.25 Bat species were identified using characteristic features associated with species echolocation calls. Diagnostic features used in this analysis include characteristic frequency, slope, call duration, time between calls, minimum length of the body of the call and smoothness.

2.2.26 Bat detectors record the passage of echolocating bats during surveys, enabling an estimation of relative bat activity levels for assessment. It is recognised, however, that there are limitations to the use of this method for determining bat activity levels.

2.2.27 An individual bat can pass a particular feature on several occasions while foraging and therefore it was not possible to estimate the number of individual bats or draw a fair comparison where survey time differs. As such, bat activity was recorded as an index; the Bat Activity Index (BAI), based on BCT (Collins, 2016) guidance, is defined as follows:

BAI (per night/hour) = Total number of bat 'registered calls' / number of nights of recording

2.2.28 For analysis purposes, bat activity was recorded as the number of 'bat registered calls' (a sequence of echolocation calls consisting of two or more call notes (pulse of frequency) from one bat, not separated by more than one second (White and Gehrt, 2001[1], Gannon *et al*., 2003[2]) with a minimum call note length of >= two milliseconds (Weller *et al*., 2009[3]) from which the activity index is calculated.

2.2.29 In the absence of any recognised criteria to define levels of bat activity (e.g. what quantifies low, medium or high activity) professional judgement has been used, taking into consideration geographical location and knowledge and experience gained through conducting similar surveys at other sites.

Survey Limitations

2.2.30 A number of equipment failures occurred during automated surveys, however recording of bat activity was undertaken for an extensive duration over the 2018 bat activity season using multiple monitoring stations, which provided representative coverage of all habitat types within the study area, including repetitions.

2.2.31 Foggy weather conditions during the spring bat transects meant that a different transect route was taken compared to the summer and autumn transect route. This change in route is not considered a notable limitation because the spring transect covered optimal bat habitats within the project area (and thus those habitats most sensitive to the proposed development), and those habitats that it missed are largely outside of the project area.

2.2.32 Overall survey effort are considered sufficient to provide a representative sample of bat activity within the study area, in view of the low suitability of habitats for bats present and the project area locale.

3 RESULTS

Activity Surveys – Ground Level Transects

3.1.1 No bats were recorded during the ground level transect surveys.

Activity Surveys – Automated Monitoring

3.1.2 A total of 468 bat call registrations were recorded from all monitoring stations combined, over the entire survey effort.

3.1.3 The majority of activity concerned common and soprano pipistrelle bats, representing up to 47% and 51% of calls registered respectively. Activity in August was highest overall, representing up to 62.5% of activity recorded.

[1] White, E. & Gehrt, S. (2001). *Effects of recording media on echolocation data from broadband bat detectors*. Wildlife Society Bulletin 29: 974-978

[2] Gannon, W., Sherwin, R. & Haymond, S. (2003). *On the importance of articulating assumptions when conducting acoustic studies of habitat use by bats*. Wildlife Society Bulletin 31: 45-61

[3] Weller, T., Cryan, P. & O'Shea, T. (2009). *Broadening the focus of bat conservation and research in the USA for the 21st century. Endangered Species Research*. 8: 129-145

3.1.4 Other species call registrations recorded included those attributable to *Myotis* species.

3.1.5 Activity was highest at the control location C1, with activity at all other monitoring stations being very low. October was only sampled on monitoring stations MS2, MS7 and MS9 but no bats were recorded, as would reasonably be expected for a Scottish highland site of this nature.

3.1.6 Overall, activity for all species at all monitoring stations is determined to be low to very low.

3.1.7 Survey results are discussed for each species separately, below.

Common Pipistrelle

3.1.8 **Table 3.1** presents the common pipistrelle BAI for each monitoring station and survey period. A total of 221 common pipistrelle registered calls were recorded over the entire survey period.

3.1.9 Activity levels were broadly consistent across the monitoring stations in Spring and Summer, with no activity recorded during the Autumn survey period.

3.1.10 Activity was highest during August at C1 but overall activity across all monitoring stations was consistently very low.

Table 3.1: Common pipistrelle bat activity.
BAI: Bat Activity Index (registered calls per hour). MS: Monitoring Station.

Monitoring Station	Spring		Summer		Autumn		Total
	May	June	July	August	September	October	
MS1	0.04	0.02	0.09	0.03	-	-	0.03
MS2	-	-	0.19	-	-	-	0.03
MS3	-	0.02	-	-	-	-	0.01
MS4	0.11	0.01	-	-	-	-	0.05
MS5	0.07	0.15	-	-	-	-	0.05
MS6	0.10	-	-	-	-	-	0.01
MS7	-	-	-	-	-	-	-
MS8	0.02	0.01	-	-	-	-	0.01
MS9	0.56	0.02	0.07	0.19	-	-	0.09
MS10	0.27	0.02	-	-	-	-	0.04
C1	-	-	-	0.94	-	-	0.94
C2	-	-	-	-	-	-	-
Total	**0.15**	**0.04**	**0.06**	**0.19**	**-**	**-**	**0.01**

Soprano pipistrelle

3.1.11 **Table 3.2** presents the soprano pipistrelle bat activity index (BAI) for each monitoring station and survey period. A total of 239 soprano pipistrelle registered calls were recorded over the entire survey period.

3.1.12 Activity was highest at C1 during August but activity was considered to be very low overall.

Table 3.2: Soprano pipistrelle bat activity.
BAI: Bat Activity Index (registered calls per hour). MS: Monitoring Station.

Monitoring Station	Spring		Summer		Autumn		Total
	May	June	July	August	September	October	
MS1	-	0.01	0.12	0.02	-	-	0.02
MS2	-	-	0.16	0.08	-	-	0.04
MS3	0.04	0.01	-	-	-	-	0.01
MS4	0.07	0.05	-	-	-	-	0.06
MS5	0.16	0.08	-	-	-	-	0.05
MS6	0.03	-	-	-	-	-	0.01
MS7	-	-	-	-	-	-	-
MS8	0.04	-	-	0.01	0.01	-	0.01
MS9	0.16	0.05	0.24	0.08	-	-	0.06
MS10	0.22	0.12	-	-	0.01	-	0.06
C1	-	-	-	1.15	-	-	1.15
C2	-	-	-	-	-	-	-
Total	0.09	0.04	0.09	0.22	0.00	0	0.01

Myotis Species

3.1.13 *Myotis* species refers to bats from the *Myotis* genus. There are five species from this genus occurring in the UK which display similar call characteristics: Natterer's *Myotis nattereri*, Daubenton's *M. daubentonii*, whiskered *M. mystacinus*, Brandt's *M. brandtii*, Bechstein's *M. bechsteinii* and Alcathoe's *M. alcathoe* bat.

3.1.14 Eight calls characteristic of Myotis species were recorded over the survey period: 2 in May (MS10), 4 in June (MS1) and 2 in August 2018 (MS10 and C11).

3.1.15 Activity of this species is concluded as being very low overall, <0.001 call per hour.

4 SUMMARY

4.1.1 Analysis of data recorded during bat activity surveys conducted in 2018 identified calls with the characteristics of the following species (grouped by risk at the population level, in accordance with guidance applicable at the time from Natural England, 2014):

Low risk species

- Common pipistrelle;
- Soprano pipistrelle; and,
- Myotis species.

4.1.2 Overall bat activity recorded was very low, with very little activity recorded during automated surveys and no bats recorded during the walked transect surveys.

4.1.3 No favoured foraging areas or commuting routes were identified within the project area or wider study area and it is considered unlikely that the habitats within the project area are important for local bat populations.

4.1.4 Habitat structure within is considered to be generally poor for bats, with the open nature of the landscape lacking suitable foraging and commuting features. Moorland and heathland habitats are typically poor for bats (JNCC, 2001[4]) but wetter areas and particularly under the shelter of trees can provide some foraging opportunities.

4.1.5 Mature woodland edge habitats and more sheltered valleys within the wider surrounding area are likely to provide higher value habitat features for bats in the local landscape, as suggested through activity recorded at C1.

[4] http://jncc.defra.gov.uk/pdf/Habitat_Management_for_bats.pdf