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Lesser Horseshoe Bat Activity Monitoring Survey

Northern United

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1 Introduction

1.1 AEWC Ltd. was commissioned by the Forest of Dean District Council to conduct activity surveys on the Northern Quarter site during May to September 2017, to monitor bat activity in two specific adjacent mitigation areas.

1.2 Extensive bat surveys have been undertaken in 2011-2015 to support the planning application at the Northern Quarter to provide baseline information on bats present using the Northern Quarter.

1.3 An area of conifer woodland has been felled to facilitate the biodiversity enhancement works that form part of the Northern Quarter development. Static detector surveys were carried out in 2015, prior to felling the woodland, to obtain baseline bat activity data for the area.

1.4 The objective of the 2017 static detector surveys was to monitor the level of use of the mitigation area following the felling of conifer woodland, specifically by lesser horseshoe bats (*Rhinolophus hipposideros*).

1.5 This report provides the results of the static detector surveys carried out from May to September 2017.

2 Method

2.1 In order to provide information on lesser horseshoe bat activity across the mitigation area, automated ultrasound detectors were deployed across the site. For consistency, all surveys used Wildlife Acoustics Song Meter 2 (SM2) detectors as different detectors have different detectability, both in sensitivity and directionality of microphone. The SM2 detector is a self-triggering bat detector with internal storage, to collect and store all recordings taken over the survey period.

2.2 Twelve SM2 detectors were mounted on suitable trees at a height of approximately 3-4m, with the microphone facing along an obvious linear feature where present. The location of the static detectors was consistent with the same tree used for mounting each detector each month (Figure 1). Detectors 1-6 were positioned as close as possible to the original locations of the six detectors used in the 2015 surveys.

2.3 The detectors were left in situ for a minimum of five full nights during each month, in order to maximise the detection of lesser horseshoe bats as a quieter calling species. The recorders were programmed to begin recording bat activity from shortly before sunset until shortly after sunrise. Table A1 (Annex A) gives the location of each detector, and the start and end times for each survey month. Figure A1 (Annex A) gives the settings used for each detector.

2.4 The recorded data was downloaded to a computer and analysed using Wildlife Acoustics' Kaleidoscope analysis software, which facilitates species identification. Due to the unique nature of the lesser horseshoe bat's call (a constant frequency call

of 110kHz), this species should be easily identified in recorded data. All calls identified as Lesser Horseshoe were manually cheeked for identification accuracy.

2.5 Weather data for each survey event has been provided in Table A2 in Annex A. This weather data has been sourced from the weather station at Littledean Hill, Cinderford, approximately 3km southwest of the Northern Quarter Site.

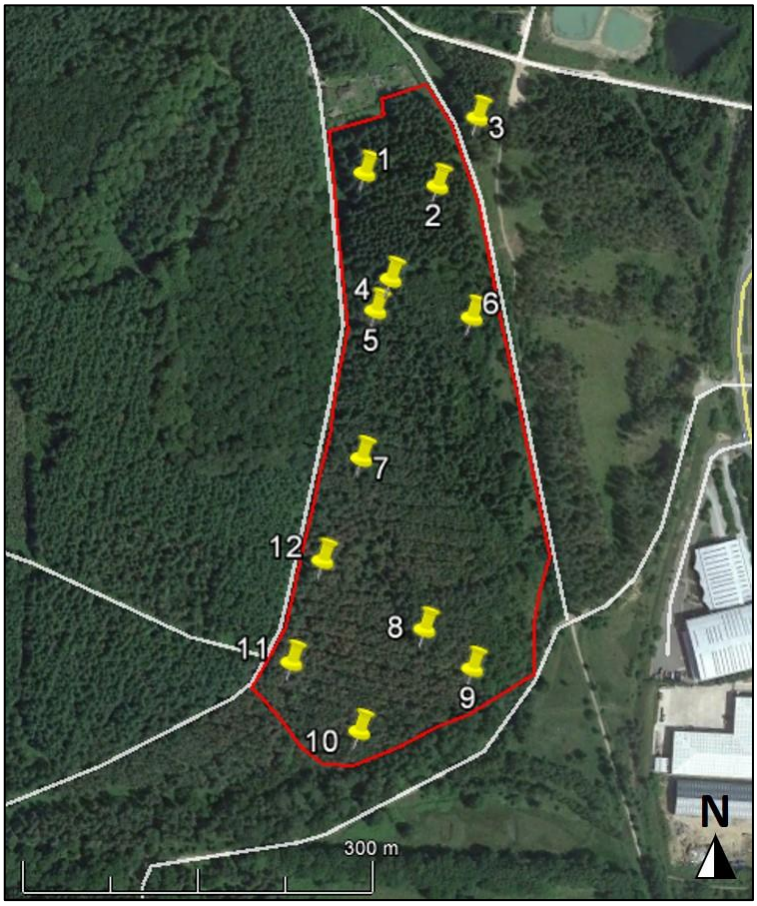

Figure 1: Showing the locations of the SM2 detectors (yellow) within the mitigation area (red).

3 Results

3.1 The detectors ran for a minimum of five nights, lasting longer than the minimum in August and September, collecting additional data from the site.

3.2 The twelve detectors collected a total of 274Gb of data, equating to over 250 000 files, with a very high number of these being analysed as noise files, with a high number of crickets. The remaining files totalled 74 785, this included all species identified calls and calls not identified.

3.3 A total of 171 lesser horseshoe bat calls were recorded over the five month survey period, comprising 0.23% of the total bat calls recorded. Table B1 in Annex B gives the total number of lesser horseshoe calls, other species calls and unidentified calls recorded on each detector in each month.

4 Constraints/Limitations

4.1 The bat numbers on the site fluctuate notably, not only throughout the seasons but can change notably from one month to the next, each survey only acts as a snapshot in time and gives an indication of the numbers of bats using the site, however, numbers present may fluctuate daily with changes in weather, roost location and bats moving to other sites/foraging areas.

4.2 On one month one logger failed, August SM2 10, and did not records any activity. Additionally, in July one logger, SM2 no 2, recorded very low activity, and was conserved a partial failure. However, these two loggers are not considered to have notably affected the results.

5 Discussion

5.1 The surveys were carried out over five months across the length of the bat activity season, from May when maternity colonies are forming, to September when juveniles are volant and active as much as adults, although colder autumn temperatures commonly reduce bat activity during this period.

5.2 The static detectors recorded a very high level of noise files (more than two thirds of all files recorded). This is largely due to the detectors being set at a very sensitive level and the ease with which the detectors can pick up ambient noise from weather conditions such as rain and rustling by wind, as well as other no target species including birds and crickets. In addition, a proportion of the calls recorded came back as Unidentified, where the software identified the recording as likely to be a bat but could not identify the species, for reasons such as quietness or poor quality of the recording, making it difficult to separate out certain species. The Unidentified recordings may be a mix of species, but are considered to be much less likely to include lesser horseshoe calls, due to the very distinctive echolocation produced by this species.

5.3 In 2015, only six detectors were deployed, covering the northern half of the mitigation area. Following the conifer woodland clearance, it was not possible to install detectors in the same locations in 2017, as most of the original trees have been felled. There is also no baseline data for the southern half of the mitigation area from 2015. It is therefore difficult to draw direct comparisons between individual detectors from the 2015 and 2017 results, but instead to assess the general lesser horseshoe activity in the site as a whole.

5.4 With a total of 171 recordings, lesser horseshoe bats accounted for only 0.23% of all recorded bats. this is considered to be very low, especially given the proximity to a notable colony and high number of Lesser Horseshoe bats known to be using the site. However, this is not unexpected given the known difficulty and inaccuracy in recording and identifying this species present on detector being a quiet and difficult to record species.

5.5 Overall, the results of the 2017 static detector surveys are consistent with those of the 2015 surveys in the same area, and the 2013 surveys carried out across the whole Northern Quarter site, in that the level of lesser horseshoe bat activity recorded was very low, with lesser horseshoe calls comprising 0.11% of all recorded bat calls in 2015. The 2017 surveys are approximately double the proportion of lesser horseshoe bat recordings to the 2015 surveys.

5.6 Bat detector recording techniques present a bias in that quieter bats (such as long-eared and Myotis bats) and bats with very directional echolocation calls (such as horseshoe bats) are harder to detect. As a result, lesser horseshoes have likely been under-recorded during the 2013, 2015 and 2017 detector surveys.

Annex A:

Table A1: Showing the location of each SM2, the start and end dates for each survey, and the start and end times for each recording night

SM2 No.	Grid Ref.	16th-21st May		6th-12th June		14th-20th July		9th-18th August		14th-22nd September	
		Start	End	Start	End	Start	End	Start	End	Start	End
1	SO6423115120	20:45	05:30	21:10	05:00	21:00	05:20	20:45	06:00	19:00	07:00
2	SO6429415109	20:45	05:30	21:10	05:00	21:00	05:20	20:45	06:00	19:00	07:00
3	SO6432915170	20:45	05:30	21:10	05:00	21:00	05:20	20:45	06:00	19:00	07:00
4	SO6425415026	20:45	05:30	21:10	05:00	21:00	05:20	20:45	06:00	19:00	07:00
5	SO6424114998	20:45	05:30	21:10	05:00	21:00	05:20	20:45	06:00	19:00	07:00
6	SO6432414992	20:45	05:30	21:10	05:00	21:00	05:20	20:45	06:00	19:00	07:00
7	SO6422714868	20:45	05:30	21:10	05:00	21:00	05:20	20:45	06:00	19:00	07:00
8	SO6428014716	20:45	05:30	21:10	05:00	21:00	05:20	20:45	06:00	19:00	07:00
9	SO6432114680	20:45	05:30	21:10	05:00	21:00	05:20	20:45	06:00	19:00	07:00
10	SO6422014625	20:45	05:30	21:10	05:00	21:00	05:20	20:45	06:00	19:00	07:00
11	SO6416314688	20:45	05:30	21:10	05:00	21:00	05:20	20:45	06:00	19:00	07:00
12	SO6419214778	20:45	05:30	21:10	05:00	21:00	05:20	20:45	06:00	19:00	07:00

Figure A1: Showing the settings used for each detector.

Table A2: Showing weather conditions for each date SM2 detectors were installed.

Date	Sunset	Sunrise	Temperature (°C)		Rain total (mm)	Wind Max (km/h)
			At sunset	Min during night		
16th May	20:58	05:13	13.0	11.0	1.2	7.4
17th May	21:00	05:12	10.0	7.0	0.0	14.8
18th May	21:01	05:11	11.0	6.0	0.0	18.5
19th May	21:03	05:09	10.0	8.0	0.1	14.8
20th May	21:04	05:08	12.0	10.0	0.0	20.4
6th June	21:24	04:52	12.0	11.0	0.3	35.2
7th June	21:25	04:52	14.0	14.0	1.6	18.5
8th June	21:26	04:51	14.0	12.0	0.4	22.2
9th June	21:27	04:51	13.0	13.0	0.2	18.5
10th June	21:27	04:51	16.0	13.0	1.8	18.5
11th June	21:28	04:50	14.0	13.0	0.3	37.0
14th July	21:23	05:08	15.0	14.0	0.0	20.4
15th July	21:22	05:09	17.0	16.0	0.2	29.6
16th July	21:21	05:11	16.0	10.0	0.0	14.8
17th July	21:20	05:12	19.0	17.0	0.0	16.7
18th July	21:18	05:13	23.0	17.0	7.5	31.5
19th July	21:17	05:15	17.0	13.0	3.6	31.5
9th Aug	20:44	05:46	15.0	11.0	0.1	18.5
10th Aug	20:42	05:47	15.0	9.0	0.1	20.4
11th Aug	20:40	05:49	16.0	14.0	1.1	27.8
12th Aug	20:38	05:51	15.0	10.0	0.1	14.8
13th Aug	20:36	05:52	15.0	12.0	0.1	14.8
14th Aug	20:34	05:54	16.0	14.0	3.3	20.4
15th Aug	20:32	05:55	15.0	13.0	0.0	13.0
16th Aug	20:30	05:57	17.0	17.0	4.8	24.1
17th Aug	20:28	05:59	17.0	13.0	0.3	33.3
14th Sep	19:26	06:44	12.0	8.0	0.0	25.9
15th Sep	19:24	06:45	12.0	7.0	0.0	16.7
16th Sep	19:21	06:47	11.0	8.0	9.9	20.4
17th Sep	19:19	06:49	12.0	9.0	0.0	13.0
18th Sep	19:17	06:50	14.0	8.0	0.1	16.7
19th Sep	19:14	06:52	14.0	13.0	0.0	18.5
20th Sep	19:12	06:54	14.0	14.0	0.0	24.1
21st Sep	19:10	06:55	13.0	10.0	0.0	18.5

Annex B

Table B1: Showing the total number of files per detector per month, monthly totals and percentage of total bat calls recorded, for lesser horseshoes, other bat species and unidentified calls.

	May			June			July			August			September		
SM2 No.	**LHB**	**Other Bat Spp**	**No ID**	**LHB**	**Other Bat Spp**	**No ID**	**LHB**	**Other Bat Spp**	**No ID**	**LHB**	**Other Bat Spp**	**No ID**	**LHB**	**Other Bat Spp**	**No ID**
1	11	2007	259	3	1773	240	1	904	167	3	1604	408	25	849	105
2	0	2690	166	13	2853	608	0	1	9	2	3012	61	29	601	110
3	0	473	187	0	53	8	2	1940	44	6	311	1065	4	115	23
4	1	1556	183	0	600	44	0	1315	184	0	3335	222	6	1860	97
5	0	832	105	0	391	88	0	1878	130	0	962	83	0	3936	191
6	0	1775	159	0	1753	17	4	1075	114	0	1204	73	2	175	10
7	0	47	23	0	201	30	0	386	74	0	89	25	1	49	17
8	0	92	11	0	113	138	0	1974	261	3	459	223	3	58	15
9	0	421	58	1	665	130	2	819	71	0	333	29	0	178	34
10	2	669	117	4	2899	365	0	1985	228	0	0	0	3	112	19
11	16	221	928	0	1831	782	0	3090	895	3	589	302	1	442	47
12	0	268	80	2	1237	170	6	1617	246	1	888	106	11	392	73
Totals	30	11051	2276	23	14369	2620	15	16984	2423	18	12786	2597	85	8767	741
%	0.22	82.74	17.04	0.14	84.46	15.40	0.08	87.45	12.48	0.12	83.02	16.86	0.89	91.39	7.72