

Appendix 7.3

Bat Surveys

Introduction

Survey design, data analysis and interpretation set out herein has been undertaken with due consideration for the Bat Conservation Trust (BCT) guidelines 3rd Edition (BCT, 2016).

Legislation

All species of British bats are legally protected under part 3 (Section 41) of the Conservation of Habitats and Species Regulations 2010. These Regulations make it an offence to:

- Deliberately capture, injure, or kill a bat;
- Deliberately disturb bats, impairing their ability to survive, breed, reproduce or rear/nurture their young;
- Damage or destroy a breeding site or resting place used by bats; or
- Be in possession of, transport, sell, exchange or offer to sell/exchange a bat (dead or alive) or any part of a bat.

All bats and their roosts in England, Scotland and Wales were originally protected under the Wildlife & Countryside Act 1981. Subsequent amendments to the legislation for England and Wales has removed bats from most of the provisions of the Act, however it remains an offence to:

- Intentionally or recklessly disturb a bat while it is occupying a structure or place which it uses for shelter or protection; or
- Intentionally or recklessly obstruct access to any structure or place that a bat uses for shelter or protection.

Disturbance of bats is covered by both the 2010 Regulations and the 1981 Act, with the magnitude of disturbance critical. Disturbance that impairs survival or successful reproduction would be covered by the Regulations with no legal defence existing. Less significant acts of disturbance may only be covered by the Wildlife & Countryside Act 1981, which includes some legal defences that may be applied in certain circumstances.

It is important to note that bat roosts are protected throughout the year, regardless of whether or not bats are present at the time. Under the Conservation of Habitats and Species Regulations the offence of damaging or destroying a breeding site or resting place of bats is not subject to any legal defence, i.e. an offence will have been committed even if the damage or destruction occurs accidentally.

Licensing

Where development is proposed that would result in an offence under the Habitats and Species Regulations a European Protected Species (EPS) licence needs to be granted by Natural England to permit an act that would otherwise be unlawful. This provides for a specific derogation from the legislation, to prevent a legal infringement occurring. To obtain an EPS

licence for development it must be demonstrated that the purpose of the act to be licensed is for:

- *“preserving public health or public safety or other imperative reasons of overriding public interest including those of social or economic nature and beneficial consequences of primary importance for the environment” (Regulation 53(2)(e)).*

In addition Natural England will not grant an EPS licence unless they are satisfied that:

- *“There is no satisfactory alternative” (Regulation 53(9)(a)); and*
- *“The action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range” (Regulation 53(9)(b)).*

Methods

Preliminary Ground-level Roost Assessment and Potential Roost Feature Inspection Survey

All trees on-site were inspected from ground level on 16 August 2016 by Michelle Bullock MCIEEM, using binoculars as appropriate, to search for features that bats might use for roosting (e.g. woodpecker holes, limb splits, lifting bark, mature ivy stems) and any associated bat roosting evidence (e.g. bat droppings, grease staining around holes). Three trees on-site (9, 10 and 12) were subjected to elevated assessment in the form of Potential Roost Feature (PRF) Inspection Surveys on 25 August by Jamie Woollam MCIEEM and Tom Clemence GradCIEEM, using ladders and an endoscope to inspect PRF identified during the initial Preliminary Ground-level Roost Assessment.

Trees were assigned to one of the following four categories, in line with the BCT guidelines:

- *High* – A tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat
- *Moderate* – A tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only, assessments at this stage are made irrespective of species conservation status)
- *Low* – A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential
- *Negligible* – Negligible habitat features on site likely to be used by roosting bats

The category to which each tree is assigned determines the need for further targeted surveys to confirm the presence/likely absence of roosting bats.

Remote Monitoring

Four Wildlife Acoustics Songmeter (SM4) static detectors were deployed on three occasions during July-September 2016 inclusive to record the relative level of bat activity at the Site and the number of species present. The location of each Monitoring Point (MP) is shown in Plate 7.4.1 below.



Plate 7.4.1. Locations of each Monitoring Point (MP)

The detectors were installed on-site and programmed to record ultrasonic audio data from half an hour before sunset until half an hour after sunrise each night, for a period of at least seven consecutive nights.

Weather conditions during recordings were obtained using historic weather data from the World Weather Online website, with observations taken from the nearest weather station. All data compiled was analysed, regardless of weather conditions.

Ultrasonic recordings were analysed using the Anlook (version 4.1t) software where audio data is presented sonographic format and can be reviewed through zero-crossings frequency analysis. This software was used

to filter bat calls to species (e.g. noctule *Nyctalus noctula*), genus (e.g. *Nyctalus* sp.) or group (e.g. 'big bat') level based on known parameters (e.g. peak frequency of call, call duration, inter-pulse interval etc). Non-bat 'noise' files were removed from the data set.

Each recorded file was considered to represent a single bat 'pass', although it is acknowledged that each 'pass' varies in the number of bat call 'pulses'.

Bat activity levels were then determined by calculating the mean number of bat passes per hour for each species / genus / group.

Bat Activity Transect Survey

Transect surveys were undertaken between July and August 2016 to sample the distribution of bat activity across the Site, and the number of species present. Two transect routes were walked on each survey across the Site, with the aim of sampling all accessible parts of the Site on multiple occasions throughout each survey. Repeated transects were undertaken to increase the survey coverage of the Site both spatially and temporally.

Each transect was walked at a moderate and consistent speed with detection and observation of bat behaviour recorded during the survey. Each transect survey commenced at sunset, for at least two hours, and were undertaken during suitable weather conditions as summarised in Table 7.4.5.

Hand-held Elekon Batlogger M detectors were used to aid detection and observation of bat activity (with heterodyne automatically-tuned audio output). In addition, all ultrasonic audio data was recorded by the Batlogger, with a one second delay between recordings. At the point of contact, each sound file is assigned a GPS location and temperature reading. Surveyor location was continually recorded by the Batlogger to create a 'track' of the walked transect (See **Figure 7.2**).

Ultrasonic recordings were subsequently analysed using BatExplorer software, where audio data is presented in sonographic format and can be reviewed in real time and at full spectrum. Sonograms were reviewed to identify any bat call 'pulses' and/or the presence of non-bat audio data. Non-bat 'noise' files were removed from the data set. Where possible, confirmed bat calls were assigned a bat species (noctule *Nyctalus noctula*), genus (e.g. *Nyctalus* sp.) or group (e.g. 'big bat') label based on known parameters (e.g. peak frequency of call, call duration, inter-pulse interval etc).

Bat call location data is presented graphically including as a Utilisation Distribution (UD) of all bat activity using R software (authoring format R Markdown through R-Studio) and/or Batexplorer software (see **Figure 7.3**).

Limitations

It should be noted that the findings described herein for remote monitoring surveys are based on the bat activity recorded at the location immediate to

each static detector, and therefore only describe localised activity at the Site.

The SM4 bat detector represents the latest technology from Wildlife Acoustics. Unfortunately it would appear that there are some technical issues with certain SM4 units, as on some nights these detectors failed to record bat calls. As a result bat call data is missing from these nights and could not be included in the analysis. CSA Environmental is taking this issue up with Wildlife Acoustics and will be making a decision as to whether or not to continue to use this technology in the future. Nonetheless, the data collected are considered sufficient to allow reliable conclusions to be drawn.

Batlogger M detectors automatically assign a GPS location to each bat contact, allowing distribution maps to be plotted (see Results section of this report). The accuracy of the GPS locations provided for each contact is variable and may depend on the number of satellites available and the strength of the signal received. This in turn is affected by environmental conditions such as cloud or tree canopy cover. The accuracy of GPS coordinates may vary between 5-15m during a transect survey and, as a result, this must be taken into account when viewing the distribution maps within this report.

Assessment method

- 1.1 Any bats identified during the surveys have been evaluated with consideration for Wray *et al.* (2010), which provides guidance on defining the relative rarity of species. This guidance has been adapted and is summarised in the following table.

Table 7.4.1 Categorising Bats by Distribution and Rarity (adapted from Wray *et al.*, 2010)

Rarity within range	Species
Rarest (under 10,000)	Greater mouse-eared bat Greater horseshoe Grey long-eared bat Bechstein's bat Barbastelle Alcathoe
Rarer (10,000 – 100,000)	Lesser horseshoe Whiskered/Brandt's bat Nathusius' pipistrelle Serotine Leisler's bat
Common (over 100,000)	Common pipistrelle Soprano pipistrelle Brown long-eared bat Noctule Natterer's bat Daubenton's bat

Results

Preliminary Ground-level Roost Assessment and PRF Inspection Survey

Results of the preliminary ground level roost assessment and PRF inspection survey are provided in Table 7.4.2 below and presented on **Figure 7.4**.

Table 7.4.2 Preliminary ground-level roost assessment and PRF inspection survey results

Tree Ref*	Species	Age	Identified PRFs	Bat roost suitability #
1	Ash	Semi-mature	<ul style="list-style-type: none"> • Dead limb • Trunk cavity (exposed from above) • Woodpecker hole 	Moderate
6 (a – see Figure 7.4)	Oak	Mature	<ul style="list-style-type: none"> • Lifted bark 	Low
7	Ash (twin-stemmed)	Mature	<ul style="list-style-type: none"> • Large knot hole on southern elevation of northern-most stem. 	Moderate
9	Ash	Mature	<ul style="list-style-type: none"> • Lifted bark • Split on northern elevation • Crevice on northern elevation • Torn off limb on northern elevation • Deadwood in crown 	Negligible (PRF Inspection survey found identified PRFs to be unsuitable)
10	Ash	Mature	<ul style="list-style-type: none"> • Limb on northern elevation has crevice on eastern aspect • Deadwood in crown 	Negligible (PRF Inspection survey found identified PRFs to be unsuitable)
12	Ash	Mature	<ul style="list-style-type: none"> • Two woodpecker holes on eastern elevation of main trunk • Large swelling on southern elevation with associated crevice (however, points upwards and therefore likely to fill with rain water) • Single woodpecker hole on southern elevation of main trunk • Deadwood in canopy 	Negligible (PRF Inspection survey found identified PRFs to be unsuitable)
20	Ash	Semi-mature	<ul style="list-style-type: none"> • Knot hole on southern elevation (however, faces upwards so likely to fill with rain water) 	Low

Tree Ref*	Species	Age	Identified PRFs	Bat roost suitability #
24	Oak	Semi-mature	<ul style="list-style-type: none"> • Large torn off limb • Limb protruding from southern elevation of trunk has split on eastern and western aspect • Torn branch at top of tree • Deadwood in canopy 	Moderate
32	Ash	Mature	<ul style="list-style-type: none"> • Woodpecker holes • Broken off limb 	Moderate
41	Oak	Mature	<ul style="list-style-type: none"> • Appears to have broken off limbs on eastern elevation (however, couldn't view tree from that side due to no access). 	At least Low
45 (a – see Figure 7.4)	Oak	Mature	<ul style="list-style-type: none"> • Two woodpecker holes on eastern elevation 	Moderate
45 (b – see Figure 7.4)	Oak	Mature	<ul style="list-style-type: none"> • Large split limb • Lifted bark • Several small broken off limbs 	Moderate
45 (c – see Figure 7.4)	Oak	Mature	<ul style="list-style-type: none"> • Lifted bark 	Low
45 (d - see Figure 7.4)	Oak	Mature	<ul style="list-style-type: none"> • Lifted bark • Dead limb 	Low
47	Oak	Mature	<ul style="list-style-type: none"> • Lifted bark • Woodpecker hole 	Low

*Tree reference accord with Tree Constraints Plan (Ian Keen Limited. (August 2016) "Tree Constraints Plan: Land at Newport Pagnell Road, Wootton, Northamptonshire". Drawing No: 9273/01)

Suitability assessed in accordance with BCT (2016)

Remote Monitoring

The weather conditions experienced during the nights where data was analysed are provided in Table 7.4.3 below.

Table 7.4.3 Overnight weather conditions during static monitoring periods

Survey month	Dates sampled	Overnight temperature (°C)		Cloud/rain	Wind (mph)
		Min	Max		
July	26/07/16	16	16	Partly cloudy, becoming overcast, light rain	8-9
July	27/07/16	13	16	Partly cloudy, dry	1-6
July	28/07/16	10	16	Cloudy, light rain at 21.00 then dry	7-8
July	29/07/16	12	16	Cloudy, very light rain at 21:00 then dry	5-7

July	30/07/16	13	16	Partly cloudy, light rain at 21:00, then dry	5-7
August	19/08/16	7	14	Partly cloudy, dry	12-15
August	20/08/16	14	15	Overcast, Mainly dry with very light rain at 21:00 and 03:00	13-19
August	21/08/16	15	17	Overcast, light to moderate rain all night	9-12
August	22/08/16	16	19	Cloudy, dry	3-6
August	23/08/16	16	21	Clear, dry	2-6
September	30/08/16	13	18	Clear, dry	6-8
September	31/08/16	12	16	Partly cloudy, dry	5-6
September	01/09/16	13	15	Cloudy, dry	6-8
September	02/09/16	15	16	Overcast, light to moderate rain all night	7-12
September	03/09/16	9	16	Cloudy, light rain 21:00-00:00 then dry	14-15

The total number of bat passes recorded across all monitoring locations for each bat species are provided in Plate 7.4.2 and Table 7.4.4 below. Markedly higher pass numbers of common pipistrelle *Pipistrellus pipistrellus* were recorded. Lower levels of soprano pipistrelle *Pipistrellus pygmaeus* and Noctule *Nyctalus noctula* bat activity were also recorded alongside very low numbers of unidentified *Myotis* sp., brown long-eared bat *Plecotus auritus* and few barbastelle *Barbastella barbastellus*. Calls by unidentified *Nyctalus* and *Nyctlaus/Eptesicus* bats were also recorded. It should be noted that comparisons drawn of the number of passes by different species can only give an indication of relative species abundance at the Site, as detectability varies between species.

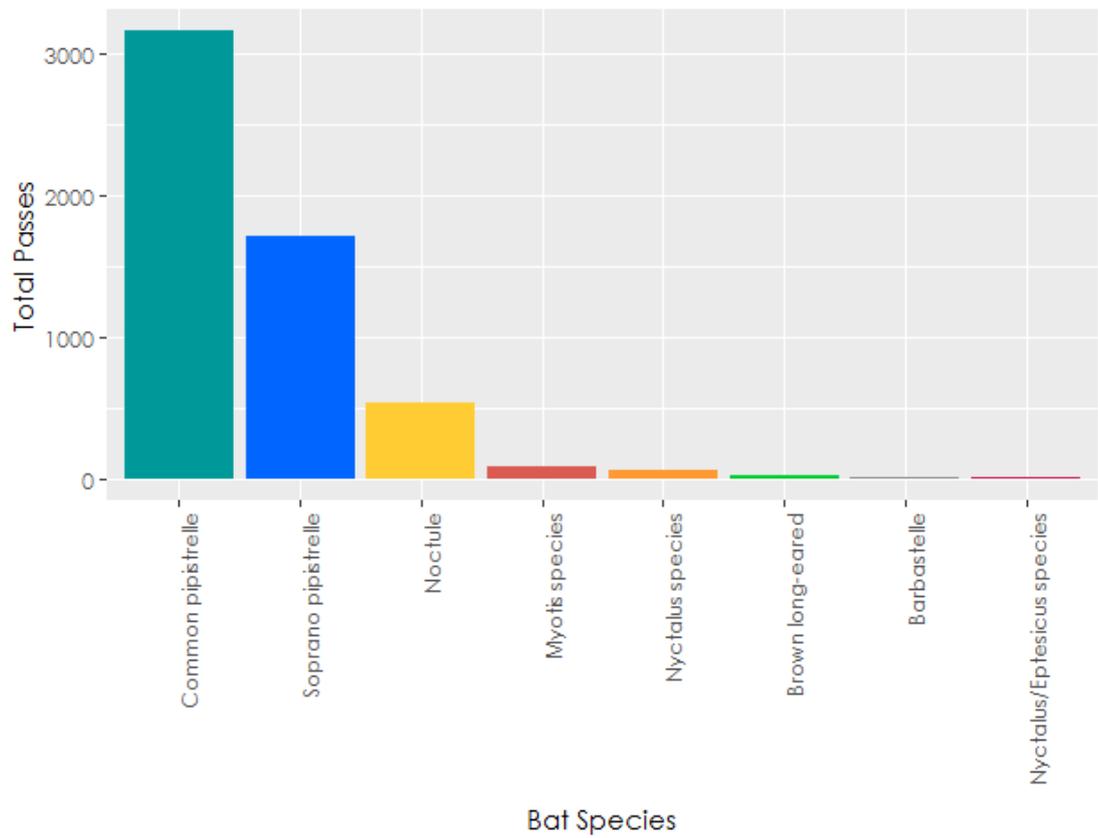


Plate 7.4.2. Bat passes per species/genus/group recorded in total across all monitoring points during the static monitoring surveys.

Table 7.4.4. Bat passes per species/genus/group recorded across all monitoring points during static monitoring periods.

Common pipistrelle	Soprano pipistrelle	Noctule	Nyctalus species	Nyctalus/Eptesicus species	Myotis species	Brown long-eared	Barbastelle
3154	1714	528	64	7	81	27	9

Plate 7.4.3 and Table 7.4.5 show the bat passes per hour recorded at each monitoring point surveyed.

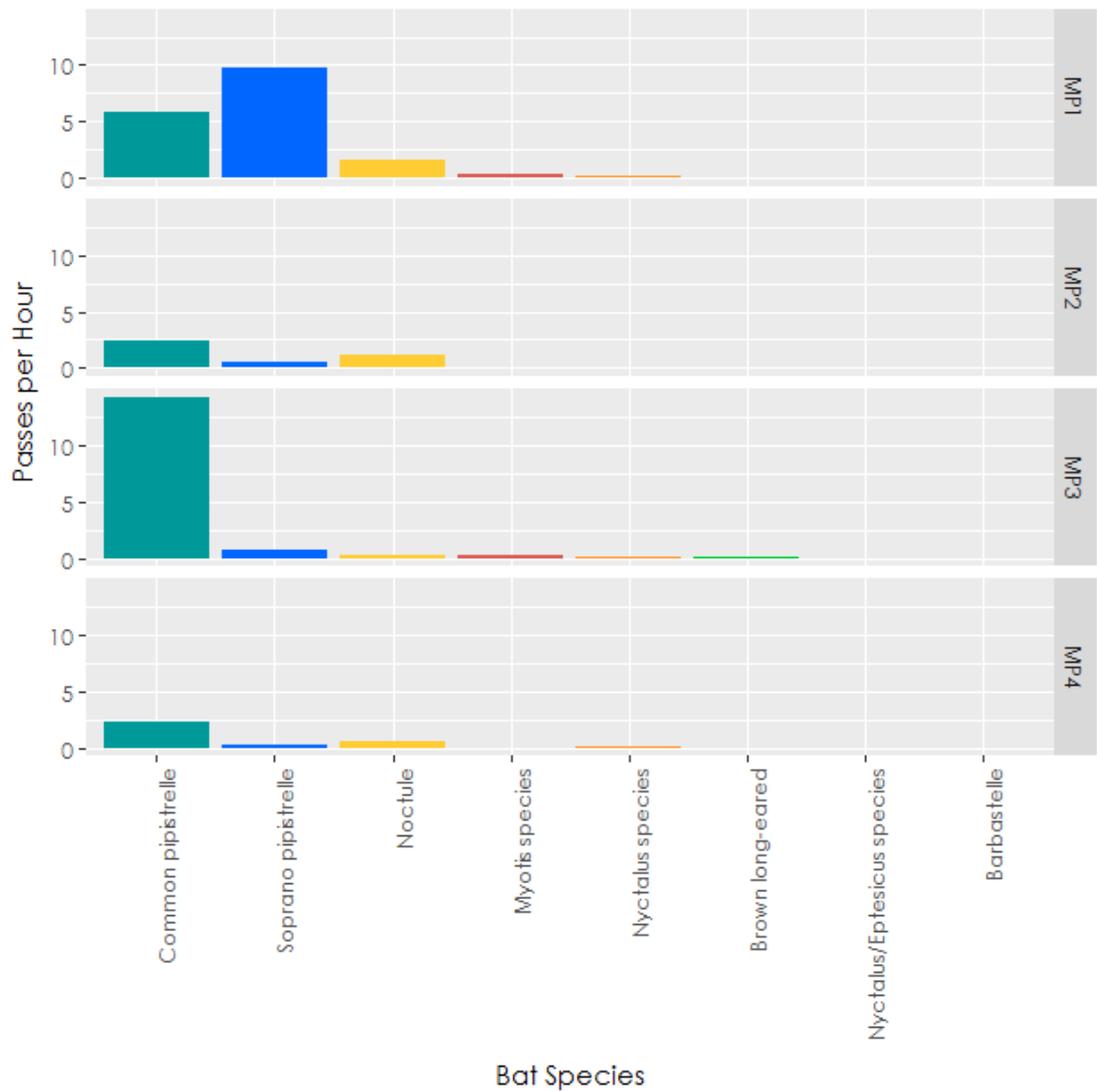


Plate 7.4.3. Bat passes per hour recorded for each bat species at each static monitoring point

Table 7.4.5. Bat passes per hour recorded for each bat species at each static monitoring point

SM 2	Common pipistrelle	Soprano pipistrelle	Noctule	Nyctalus species	Nyctalus / Eptesicus species	Myotis species	Brown long-eared	Barbastelle
MP1	5.78	9.77	1.66	0.22	0.04	0.34	0.06	0.03
MP2	2.41	0.45	1.09	0.08	0.01	0.04	0.10	0.03
MP3	14.26	0.65	0.30	0.03	0.00	0.17	0.03	0.01
MP4	2.29	0.26	0.54	0.12	0.00	0.01	0.00	0.00

Transect Surveys

The dates and weather conditions for each transect survey are provided in Table 7.4.6 below.

Table 7.4.6. Bat transect survey weather conditions

Survey Date (2016)	Sunset / sunrise time (BST)	Start Time	End Time	Temp (°C)	Precipitation	Cloud Cover (Oktas)	Wind (Beaufort Scale)
21 Jul	21:10:00	21:10:00	23:10:00	19-18	Drizzle	8-6	2-0
09 Aug	20:39:00	20:39:00	22:39:00	16-14	None	2-1	2-2
10 Aug	05:40:00	03:40:00	05:40:00	10-10	None	3-4	2-1
30 Aug	19:54:00	19:54:00	21:54:00	19-15	None	1-0	1-1

At least six species of bat were recorded at the site during transect surveys undertaken in 2016, comprising common pipistrelle, soprano pipistrelle, noctule, Myotis species, brown long-eared and barbastelle. The number of bat contacts recorded for each species are summarised in Table 7.4.7 below. The locations of each bat contact and the overall distribution of activity across the Site are illustrated in Plates 7.4.4 and 7.4.5.

Table 7.4.7. Summary of bat contacts recorded during the transect surveys

Month	Common pipistrelle	Soprano pipistrelle	Noctule	Nyctalus species	Nyctalus / Eptesicus	Myotis species	Barbastelle
21 Jul (dusk)	108	40	32	0	1	0	0
09 Aug (dusk)	41	15	1	0	0	1	0
10 Aug (dawn)	0	8	0	0	0	0	0
30 Aug (dusk)	37	12	32	1	0	2	1

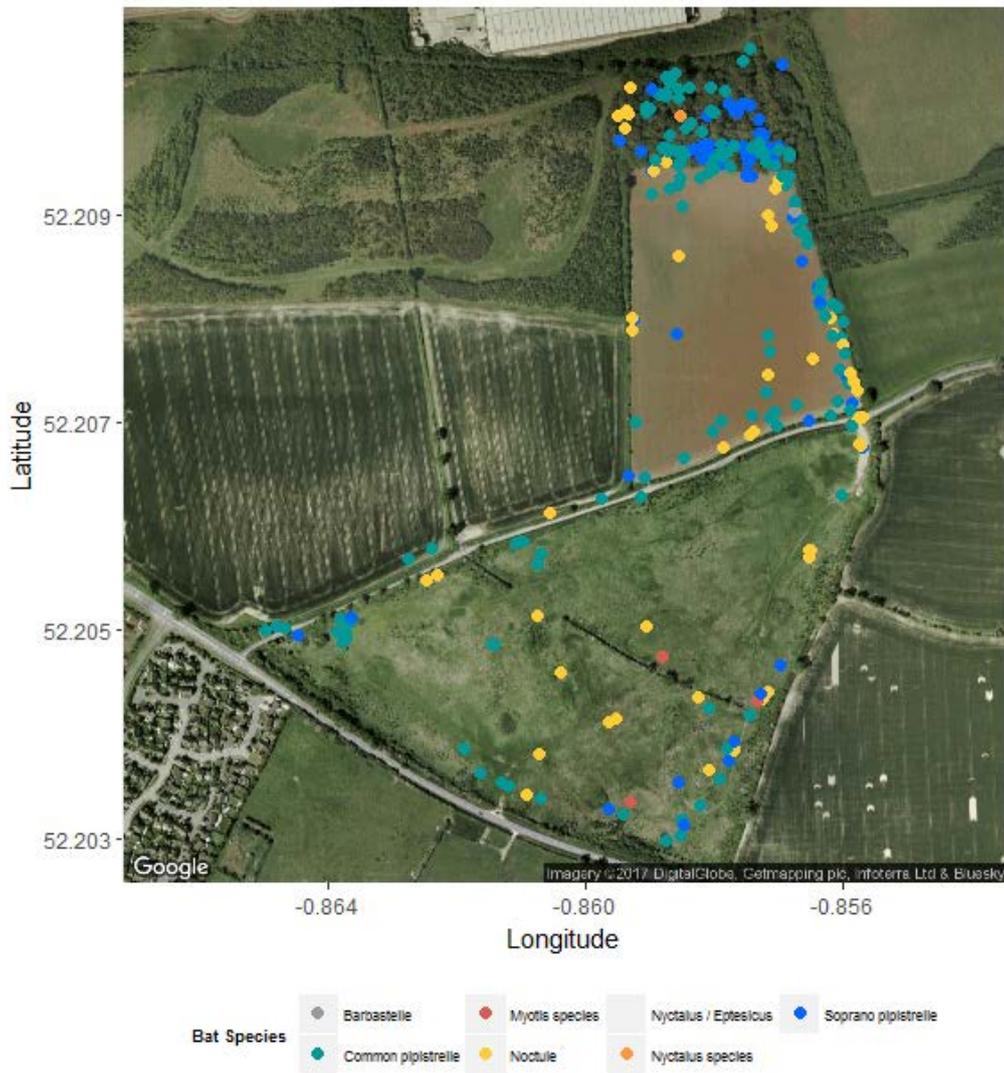


Plate 7.4.4. Map to show the locations of individual bat contacts recorded during transect surveys



Plate 7.4.5. Map to show the location of each bat contact recorded during transect surveys, with contours indicating the density of contacts. Closer contours represent more concentrated bat activity.

Assessment

Data from these further surveys confirms use of the Site by at least six species of bat including common pipistrelle, soprano pipistrelle, noctule, *Myotis* sp., brown long-eared bat and barbastelle; as well as *Nyctalus* sp. and *Nyctalus* sp./*Eptesicus* sp.

Bat activity at the Site was dominated by common bat species. Common pipistrelle was by far the most frequently recorded bat species at the Site as a whole, although at Monitoring Point (MP) 1 greater numbers of Soprano pipistrelle (average of 9.77 passes per hour) than common pipistrelle (average 5.78 passes per hour) were recorded. Soprano pipistrelle was the second most common bat species recorded at the Site, followed by noctule.

Barbastelle was the least recorded species, with only a single contact recorded during the transect surveys (on 30th August along the eastern boundary of Hampton Green North) and nine contacts recorded during the static surveys (four at MP1, four at MP2 and one at MP3).

Bat activity recorded during the transect surveys was generally focused along hedgerows and within the woodland/woodland edge with markedly less activity recorded in open areas. The greatest level of activity was recorded within the woodland in the north of the Site and along the eastern

boundary of Hampton Green North, thereby suggesting that this boundary is an important navigational corridor for bats travelling to/from the woodland. During the static monitoring surveys the highest number of bat passes was recorded at MP1 located on the woodland edge, closely followed by MP3 located along the hedgerow that dissects Hampton Green South. Markedly fewer bat passes were recorded at MP2 located along the southern boundary of the Hampton Green North (adjacent to The Green) and MP4 located along the south-western boundary of the Hampton Green South (adjacent to Newport Pagnell Road (B526)).

In accordance with Wray et al (see above), the vast majority of activity recorded at the Site was by 'common' bat species including common pipistrelle, soprano pipistrelle, noctule and brown long-eared bat. The Myotis bats recorded at the Site were not identified to species level due to the difficulty in differentiating sonograms within this genus. Therefore some of the Myotis bats recorded at the Site could potentially fall within the 'rarer' or 'rarest' category. However, only very low levels of activity by Myotis bats was recorded, with the vast majority associated with the woodland in the north which will be retained and protected under the proposals. Very low numbers of barbastelle were also recorded at the Site and this species is considered one of the 'rarest' species in the county. However, given the very low levels of activity, the Site is not considered to represent a particularly important part of their foraging/navigational habitat.

Given the habitats present and the diversity of bat species recorded at the Site, in combination with the presence of barbastelle (which is considered to be one of the UK's rarest bat species), albeit in very low numbers, the bat foraging/commuting interest at the Site is considered to be of importance at the Local Level.