THE ENVIRONMENT PARTNERSHIP

Brislington Meadows, Bristol

ECOLOGICAL TECHNICAL APPENDIX J

Bat Surveys

7507.20.021

March 2022

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THE ENVIRONMENT PARTNERSHIP

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Drawings

1.0 Introduction

Background

1.1 The Environment Partnership (TEP) was commissioned in July 2020, by Campbell Reith on behalf of Homes England, to complete an Ecological Impact Assessment (EcIA) for the site known as Brislington Meadows (hereafter referred to as 'the site').

1.2 Prior to TEP's appointment, WSP completed a Preliminary Ecological Appraisal (PEA) in September 2019 for the site on behalf of Homes England to inform a pre-planning application (ref 9/05220/PREAPP).

1.3 WSP was subsequently commissioned to commence bat activity surveys, comprising a combination of manual transect surveys and automated static surveys, for the months of May and June 2020. WSP was also commissioned to complete further bat roost survey of the former police station located off Broomhill Road, Sinnott House, prior to its demolition in 2020.

1.4 TEP's instruction, commencing in July 2020, included updating the preliminary bat roost appraisal and undertaking any further bat roost surveys as required to inform the EcIA. TEP's instruction also included completion of bat activity surveys for the remaining activity season, including the months July to October 2020.

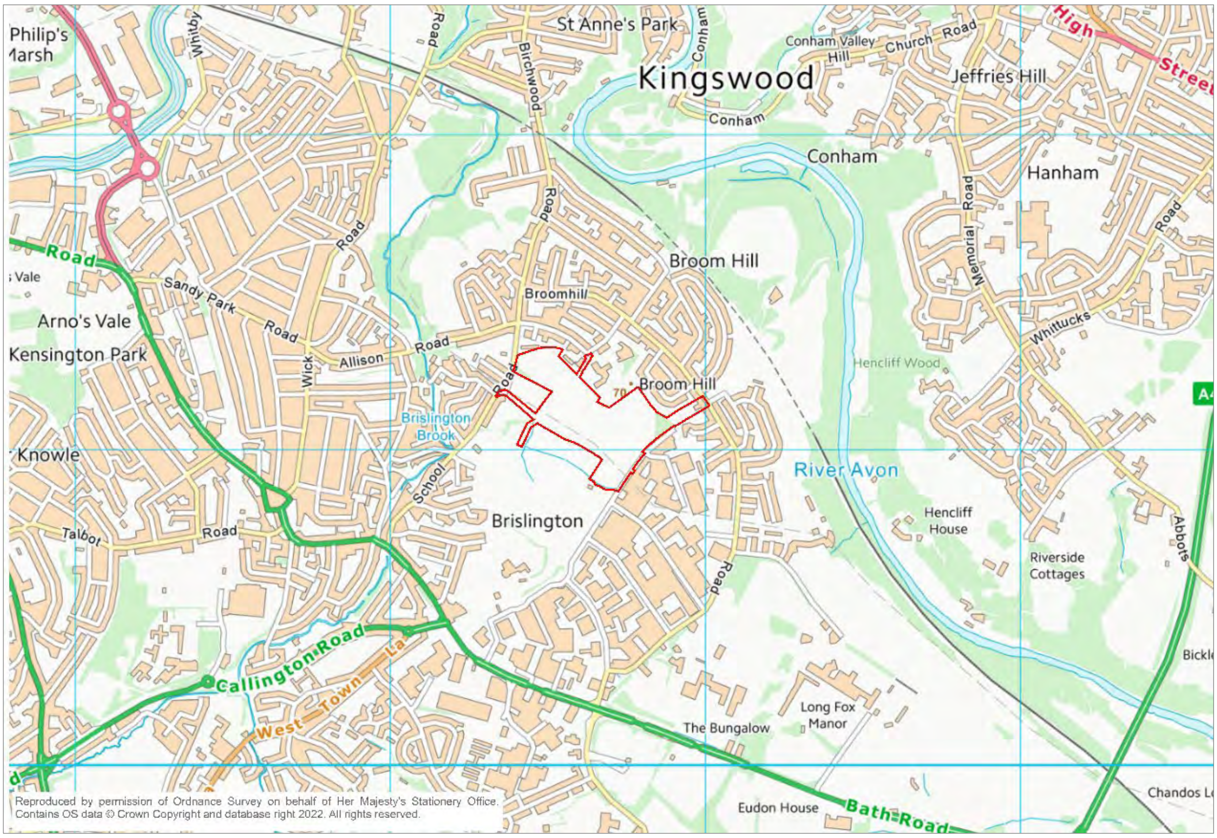
Site Description

1.5 The central grid reference of the site is approximately ST 626 711 and the location of the site is shown in Figure 1.

1.6 The site is situated within an area surrounded by residential, industrial buildings and parkland within Brislington, a suburb located southeast of the City of Bristol. The River Avon circumnavigates the northern and eastern outskirts of the site.

1.7 The site comprises mainly grassland fields with relic hedgerows outgrown with scrub forming field boundaries.

Figure 1: Site Location



Guidance

1.8 The following guidance has been applied during scoping, implementation and interpretation of the bat surveys:

- Bat Conservation Trust Bat Surveys for Professional Ecologists Good Practice Guidelines 3rd edition (BCT, 2016)
- British Standards BS 8596:2015 Surveying for bats in trees and woodland – Guide (BS 8596:2015)
- Wray *et. al.* (2010) Valuing bats in Ecological Impact Assessment. In Practice, December 2010, 23-25.

2.0 Method

Desk Study

2.1 Pre-existing records of bats from within a 2km radius provided by Bristol Regional Environmental Records Centre (BRERC) were reviewed to inform the bat surveys. Further detail of these records, including a map, are presented within the Desk Study (Ecological Technical Appendix G, TEP Ref 7507.20.039).

Roost Surveys

Buildings and Other Structures

2.2 Sinnott House, a former police station, was located in the eastern thin rectangular section of the site at the start of TEP's commission in July 2020. It is understood from Homes England that Sinnott House was surveyed for bats by WSP in 2020, prior to its demolition in October 2020 (Ref No. 20/02571/N). Survey is understood to have comprised a daytime inspection and one emergence survey.

2.3 There are now no buildings situated within the site boundary, but there are a number of built structures present. These include:

- a horse shelter and small shed which are located within in the horse paddock in the northern most parcel of the site (F6).
- a mobile phone mast is located on the north edge of the southern woodland near Bonville Road (W2); and
- a large metal pylon is located within the south-eastern field F3.

2.4 Buildings and structures were initially subject to a preliminary roost appraisal (PRA) by WSP in September 2019. TEP repeated the PRA for buildings or structures remaining on site in August 2020, excluding Sinnott House which had undergone further survey by WSP.

2.5 The repeat PRA was completed by licensed bat ecologist Graham Roberts MCIEEM (Level 2 Ref 2015-11841-CLS-CLS) assisted by experienced ecologist Dr Rachel Roberts CEnv MCIEEM.

2.6 The repeat PRA included searching for bats and residual evidence of bats, such as droppings, feeding remains and staining, in addition to the presence of any potential roost features (PRF). The PRA included a search of all accessible floor spaces, walls and exteriors of the structures.

2.7 Any PRFs were then also closely inspected using an endoscope and high-powered torch fitted with a red filter. Binoculars and a ladder were employed as aids to ensure survey effectiveness.

2.8 The mast and pylon were assessed using binoculars from the ground.

2.9 Following the PRA and, where found to be present, PRF inspections, the structures present were categorised according to their bat roost suitability as determined by the characteristics and PRF detailed in Table 1.

Table 1: Categorisation of buildings for bat roost suitability

<table>
<tr><th>Roost Suitability</th><th colspan="2">Characteristics</th><th>Potential Roost Features (PRF)</th></tr>
<tr><td>High</td><td>Several of the following features:</td><td rowspan="2">Pre – 20th century buildings. Agricultural buildings of traditional brick, stone or timber construction. Large unobstructed flying spaces. Roof warmed by sun, in particular south facing roofs without shade. Large roof timbers with gaps at joints (e.g. mortise joints), cracks and holes. Numerous access points for bats to fly into. Buildings near woodland and/or water. Low levels of disturbance. Buildings may be poorly maintained or aged, providing access points for bats into roof structures or crevices in bridges, but at the same time not too draughty, wet or cool.</td><td>PRF that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time (e.g. maternity/hibernation) due to their size, shelter, protection, conditions and surrounding habitat.</td></tr>
<tr><td>Moderate</td><td>Some of the following features:</td><td>One or more PRF 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 (maternity/hibernation).</td></tr>
<tr><td>Low</td><td colspan="2">Modern/intact buildings with few potential access points for bats. Brick buildings often with pitched slate or tile roofs but may have small or cluttered roof space. Flat roofed buildings with weatherboards or similar feature at the eaves with potential bat access behind or into building. Cooler, shaded, light or draughty voids. Buildings often lacking connectivity to woodland or areas of water.</td><td>One or more PRF that could be used by individual bats opportunistically, however, these PRFs do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats.</td></tr>
<tr><td>Negligible</td><td colspan="2">Flat roof structures lacking weatherboards, hanging slates or cladding. Modern/intact buildings with no bat access points. Lacking connectivity to any woodland or areas of water. High levels of regular disturbance. High levels of internal/external lighting. Buildings in very poor condition such that internal spaces are not weatherproof, being exposed to high levels of light, wind and/or rain.</td><td>Negligible habitat features on site likely to be used by roosting bats.</td></tr>
</table>

Trees

2.10 All trees within the site were subject to a daytime ground based preliminary roost appraisal (PRA) for their suitability to support roosting bats. The PRA of the trees was completed by licenced bat ecologist Graham Roberts MCIEEM (Level 2 Ref 2015-11841-CLS-CLS) on 14th July 2020.

2.11 Trees were viewed from the ground with the aid of binoculars and a high-powered torch (fitted with a red filter) where necessary. Where accessible from the ground, potential roost features (PRF) were closely inspected utilising an endoscope and torch as aids. Based on the PRF characteristics, trees were categorised for their roost suitability according to the criteria summarised in Table 2.

2.12 Trees with PRFs that are at height and couldn't be fully surveyed from the ground were subject to an aerial inspection. The aerial inspection survey was completed by Graham Roberts and Angus Blankenstein on the 6th October 2020.

2.13 Aerial inspections were undertaken where appropriate using a ladder or by rope access according to the location of the PRFs. All PRFs identified on the tree were closely inspected utilising an endoscope and torch.

2.14 Tree suitability was re-categorised as appropriate to the findings of the aerial inspections.

Table 2: Categorisation of trees for bat roost suitability

<table>
<tr><th>Roost Suitability</th><th>Characteristics</th><th>Potential Roost Features (PRF)</th><th>Risk of Bat Roost Presence (as per BS 8596:2015)</th></tr>
<tr><td>High</td><td rowspan="2">Large / mature trees with one of more features such as woodpecker holes, sheltered rot holes, vertical or horizontal cracks in stems or branches, other hollows or cavities, partially detached platey bark, partially detached or overlapping mature ivy (>50mm stem diameters) or other suitable cavity or cavity forming feature.</td><td>A tree with one of more PRF that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time (e.g. maternity/hibernation) due to their size, shelter, protection, conditions and surrounding habitat.</td><td rowspan="3">High/moderate</td></tr>
<tr><td>Moderate</td><td>A tree with one or more PRF that could be used by bats but which are unlikely to support a roost of high conservation status (i.e. not suitable for maternity or hibernation use).</td></tr>
<tr><td>Low</td><td>PRF with only very limited roosting potential</td><td>One or more PRF that could be used by individual bats opportunistically, but which is not suitable to be used on a regular basis or by larger numbers of bats.</td></tr>
<tr><td rowspan="2">Negligible</td><td colspan="2">A tree of sufficient size and age to contain PRFs but with none seen from the ground.</td><td>Low</td></tr>
<tr><td colspan="2">Typically small / young trees which have not developed any potential features described above.</td><td>Negligible</td></tr>
</table>

2.15 At the time of the PRA and aerial PRF inspection surveys the weather conditions were both sunny with a slight breeze.

2.16 Trees confirmed with roost suitability were reassessed in May 2021 and January 2022 to identify any change to PRF suitability. Only one tree, W2.2, was recategorised (from low to moderate suitability) following a change in PRF character. No additional trees were noted to have developed PRF in this time.

Activity Surveys

Manual Transects

2.17 Six walked dusk transects, performed by WSP (May & June) and by TEP (July, August, September & October), were completed across the site during 2020. Drawing G7507.20.021 illustrates the pre-defined transect routes walked on each survey visit.

2.18 Dusk surveys commenced no more than 15 minutes before sunset and no later than sunset and continued for approximately two hours. Dates, times and start and end conditions for each of the transects completed are summarised in Table 3.

Table 3: Transect survey conditions

Date	Start time	End time	Time of sunset	Weather at start				Weather at end			
				Temp °C	Rain	Wind	Cloud	Temp °C	Rain	Wind	Cloud
29/5/20	21:03	22:54	21:15	20	0	1	0-1	16	0	1	0-1
22/6/20	21:19	23:15	21:31	17	0	1	1	15	0	0	1
14/7/20	21:10	23:15	21:10	20	0	1	8	15	0	1	8
9/8/20	20:35	22:25	20:35	24	0	1	7	22	0	1	7
6/9/20	19:40	21:29	19:40	16	0	0	7	16	0	0	2
14/10/20	18:10	20:10	18:10	13	Slight	1	7	14.5	0	6	1

2.19 WSP surveys (May and June) comprised a single loop of the transect route with 12 'listening stops' lasting five minutes.

2.20 TEP adapted the transect method (July to October) to enable kernel density mapping without spatial bias from 'listening stops'. The transect route was walked continually at a slow steady pace. Two repeat loops of the transect route were completed on each survey visit (July to October).

2.21 Although start and stop positions remained the same on each visit, the route was reversed between surveys for all survey visits (May to October inclusive) to reduce sampling bias.

2.22 May and Junes transects were led by a WSP licensed surveyor (Ref 2015:15116-CLS-CLS) using Elekon Batlogger M detectors. The July to October transects were led by TEP licensed surveyor Graham Roberts MCIEEM (Level 2 Ref 2015-11841-CLS-CLS) assisted by Dr Rachel Roberts CEnv MCIEEM, using Anabat SD2 with Bat Mapper and heterodyne detectors.

2.23 Bat calls were recorded automatically by the detectors for later analysis using specialist computer software. Bat passes were recorded manually during the transect by surveyors in addition to the maximum number(s) of bats observed at any one time, the species and any other contextual data observed such as flight direction, social calling or feeding buzzes.

2.24 Raw data files from the WSP May and June transect surveys were provided to TEP for analysis. Sonograms recorded from all transect surveys were analysed using Kaleidoscope V5.3 software by Graham Roberts MCIEEM.

2.25 To generate a kernel density plot, using Arc Map GIS software to 'smooth' the spatial distribution of bat activity contacts, bat contacts recorded during the 'listening stops' completed during the WSP transect surveys in May and June were discounted. The data from the 'listening stops' were also discounted when determining standard bat activity indices for the transects, again to avoid sampling bias. This data was, however, included in the general sonogram analysis process to inform overall species assemblage and to provide additional contextual information (e.g. general species distribution and social calling behaviours).

Limitations

2.26 A mobile telephone mast situated in the eastern woodland edge of the site caused some interference with the bat detectors used, most notably the heterodyne detectors. Nevertheless, this distortion did not cause such sufficient interference with the bats' calls that the calls could not be recorded and confidently identified.

2.27 Weather conditions were optimal throughout all transect surveys.

Static Remote Monitoring

2.28 Static remote monitoring was undertaken by WSP at two fixed locations (B and C) within the site, during the months May and June 2020. The detectors used were SM4 full spectrum recorders. Static remote monitoring was continued by TEP with the addition of two further fixed locations (A and D), during the months July to October 2020, inclusive. Anabat Express detectors were used in all locations A-D for these surveys.

2.29 Static locations are illustrated in Drawing G7507.20.021 and the locations are described in Table 3. Static locations were non-random. Micro-siting was used to discretely hide the detector unit from public view but best site the microphone to avoid significant obstruction or noise from canopy foliage rustling. General locations were determined by habitat type, informed by preliminary development proposals, and were designed to:

- confirm the species assemblage using the habitats within the site;
- determine the relative activity and spatial distribution of bats across the site to enable evaluation of habitat use; and
- identify potential commuting / dispersal corridors.

2.30 Each detector was deployed once per month for a minimum of five consecutive nights. Detectors were deployed with standardised sensitivity settings. Both SM4s (May and June) and Anabat Expresses (July to October) automatically commenced recording each night of deployment from 30 minutes before sunset to 30 minutes after sunrise. Further information regarding deployment locations, survey dates and survey conditions is provided in Table 4 and

2.31 Table 5.

Table 4: Static locations and recording periods

Location	Visit number and survey dates	Nr. nights deployed	Nr. nights with activity recorded	Description of location and orientation
A	V1: N/A	Location not included for WSP surveys		Detector (Anabat Express) placed within small broadleaved woodland facing southeast towards woodland glade with connecting canopy. * Located within a woodland, expected low levels of contacts.
	V2: N/A			
	V3: 13-19/07/20	7	5	
	V4: 09-17/08/20	9	2	
	V5: 07-15/09/20	9	5	
	V6: 12-19/10/20	8	8	
B	V1: 20-27/05/20	8	8	SM4 used for visits 1-2 (WSP) with Anabat Express used for visits 3-6 (TEP). Detector placed within intact hedgerow with trees facing eastward into open grassland F1.
	V2: 22-27/06/20	6	6	
	V3: 13-19/07/20	7	5	
	V4: 09-17/08/20	9	7	
	V5: 07-15/09/20	9	9	
	V6: 12-19/10/20	8	8	
C	V1: 20-27/05/20	8	5	SM4 used for visits 1-2 (WSP) with Anabat Express used for visits 3-6 (TEP). Detector placed within intact hedgerow with trees and scrub facing eastward into open grassland F2.
	V2: 22-27/06/20	6	6	
	V3: 13-19/07/20	7	7	
	V4: 09-17/08/20	9	9	
	V5: 07-15/09/20	9	9	
	V6: 12-19/10/20	8	8	
D	V1: N/A	Location not included for WSP surveys		Detector (Anabat Express) placed within intact hedgerow with dense scrub facing southeast into upward sloping grassland F4.
	V2: N/A			
	V3: 13-19/07/20	7	7	
	V4: 09-17/08/20	9	9	
	V5: 07-15/09/20	9	9	
	V6: 12-19/10/20	8	8	

Table 5: Summary of weather conditions during static recording periods

Visit number and survey dates	Locations	Temperature ranges[1] ºC at start[2]	Temperature ranges ºC at end[3]	Nr. nights with >2hr rainfall	Maximum wind speed (km/h) & nr. Nights with windspeed >12km/hr	Moon illuminance range
V1: 20-27/05/20	B-C only[4]	9.0 - 22.0	8.0 – 18.0	0	18 [3]	5-0-22%
V2: 22-27/06/20	B-C only[4]	14.0 – 27.0	10.0 – 20.0	2	13 [2]	2-40%
V3: 13-19/07/20	A-D	15.0 – 19.5	8.7 – 16.5	2	14[1]	45-2%
V4: 09-17/08/20	A-D	16.5 – 26.7	14.0 – 20.00	3	16[1]	61-1%
V5: 07-15/09/20	A-D	14.5 – 23.2	8.0 – 16.7	0	17[2]	76-5%
V6: 12-19/10/20	A-D	10.0 – 13.2	3.7 – 14.5	0	14[3]	25-0-11%

<u>Limitations</u>

2.32 Every detector worked within its operating parameters with no detector or microphone failure logged (microphone failure can occur with large amounts of distorted data such as wind, running water, machinery or rustling leaves etc.).

2.33 There was no theft or interference with detectors at any of the locations during any of the survey periods.

2.34 Temperatures were within acceptable parameters for each survey period, with every night of each survey period recording sunset temperatures exceeding 10°C. Although sunrise temperatures dropped below 10°C during survey periods earlier and later on in the season, this does not affect compliance with survey guidelines, nor did the lower morning temperatures appear to appreciably influence the activity periods recorded each night.

2.35 Bat activity periods have not been substantially influenced by rainfall or fog on the nights when more than two hours rainfall was recorded.

2.36 Strong wind speeds (>12km/h i.e. Beaufort 3 or above) did not substantially influence activity periods or the activity levels recorded during each survey period.

2.37 Data which may be affected as a consequence of the above identified weather conditions represents a small proportion of the overall survey data. There remains a sufficiently robust data baseline to ensure confidence in the data interpretation.

Data Analysis and Species Identification

2.38 Raw data files from the WSP May and June transect and static recording periods were provided to TEP for analysis.

1 Temperature ranges present the minimum and maximum temperatures recorded at each location on each night of each recording period

2 Start of recording period was automatically set (applying GPS location) to 30 minutes before sunset

3 End of recording period was automatically set (applying GPS location) to 30 minutes after sunrise

4 Temperatures recorded by Anabat express detector specific to location for visits 3-6 (July to August) only, with temperature records for visits 1-2 (May and June, completed by WSP) were determined retrospectively using historic weather data

2.39 Sonogram analysis for all data (May to October transects and static recording periods, inclusive) was undertaken using Kaleidoscope V5.3 software at TEP by Graham Roberts MCIEEM.

2.40 Analysing bat sonograms using Kaleidoscope can automatically identify some sonograms to a 100% accuracy depending on the quality and signal parameters recorded of the sonogram. Kaleidoscope was set to an 80% auto identification threshold maintaining a standard high end of certainty for bat species identification. Any sonograms with parameters below the 80% auto identification were manually identified, where sufficient call characteristics were available. If insufficient call characteristics were available, the bat contact was recorded as an unidentified bat. Unidentified bats totalled just 19 registrations during the course of the static monitoring survey, representing just under 0.5% of the data set.

2.41 For the purposes of presentation and interrogation, data was transformed to calculate bat activity indices (BAI). For the majority of datasets and statistical analysis the BAI represents bat registrations per hour (brh), to account for different night lengths throughout the recording period.

2.42 BAIs quantify the amount of use bats make of an area i.e. activity levels, not abundance. Consistency has been achieved throughout the monitoring period in regard to detector model, sensitivity and calibration, position and orientation and in the software used in subsequent sonogram analysis. High confidence can therefore be placed in the relative bat activity levels presented.

Limitations

2.43 Although different detectors were used by the different surveyors between the first two surveys (May and June) and remaining four surveys (July to October), this is not considered to materially influence survey effectiveness. All types of detector employed for transect and static monitoring surveys worked completely within their operating parameters and all data were analysed using the same software and applying the same identification parameters. Furthermore, transformation of data to a standardised bat activity index based on bat registrations per hour, rather than 'passes' or 'pulses' removes potential bias that could be introduced by any differences in sonogram file recording techniques of different models of bat detector.

2.44 Transect survey data were standardised to a bat activity index comprising bat registrations per hour, based on the precise survey length for each individual transect survey.

2.45 Data derived from 'listening stops' completed on the first two transect surveys were removed from the data set before the kernel density plot was undertaken to remove spatial bias.

2.46 The adaptation of transect survey methods, from one loop of the transect route with 'listening stops' applied during May and June surveys to two continual loops of the transect route during July to October surveys, is therefore not considered to materially influence survey findings or interpretation.

2.47 The inclusion of two further static locations during the July to October recording periods provided additional spatial context. Standardisation of data to BAIs for static all recording periods, based on bat registrations per hour, removed potential sampling bias.

2.48 Some genus groups (such as Myotis species) can be difficult to determine the specific species due to similar styles of calls. In addition it can be difficult to determine species or even genus in some circumstances due to partial calls or other noises such as passing cars or rain or wind distorting the data. In these cases when it not possible to identify a bat call even to genus, it is labelled as an unknown bat. If the genus can be identified but not the species, the call is labelled only by the genus group.

2.49 Myotis species have overlapping call characteristics and it is therefore not possible to identify these bats to species level with good confidence (at least 80%). Myotis data represent a small proportion of the activity recorded and therefore for the purposes of meaningful data interrogation, Myotis species have generally been grouped. Where possible, individual Myotis species are identified.

2.50 Detectability of some bat species e.g. *Plecotus* and *Barbastella* is lower than others, e.g. *Nyctalus* and *Pipistrellus*, as a consequence of their less detectable echolocation calls and hunting strategies that take them into less open habitats. Careful interpretation has been applied when comparing across species.

Evaluation Method

2.51 For the purposes of this assessment and of assigning value to bats, the guidance set out in Wray *et. al.* (2010) has been followed. This guidance includes a framework for identifying the importance of bats in the landscape through the evaluation of bat roosts and habitats. Applying this framework, bat roosts can be valued according to species rarity (Table 6) and roost type (Table 7).

Table 6: Species rarity in England (adapted from Wray et al 2010)

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

Table 7: Valuation of roosts

Geographic Scale Of Importance	Roost Type
Negligible	-
Site	-
Local	Feeding perches (common species) Individual bats (common species) Small numbers of non-breeding bats (common species) Mating sites (common species)
County	Maternity sites (common species) Small numbers of hibernating bats (common and rarer species) Feeding perches (rarer/rarest species) Individual bats (rarer/rarest species) Small numbers of non-breeding bats (rarer/rarest species)
Regional	Mating sites (rarer/rarest species) including well used swarming sites Maternity sites (rarer species) Hibernation sites (rarest species) Significant hibernation sites for rare/rarest species or all species assemblages
National	Maternity sites (rarest species) Sites meeting Sites of Special Scientific Interest (SSSI) guidelines based on bats
International	Special Area of Conservation (SAC) sites with bats as qualifying species

2.52 Wray *et. al.* (2010) identifies a numerical scoring system which can be applied to commuting habitat (Table 8) and foraging habitat (Table 9). The score derived from these evaluations is then applied to the geographical scale proposed by the CIEEM EcIA guidelines (Table 10).

Table 8: Valuing commuting habitat for bats

Species (Score)	Number Of Bats (Score)	Roosts/Potential Roosts Nearby (Score)	Type And Complexity Of Linear Features (Score)
Common (2)	Individual bats (5)	None (1)	Absence of (other) linear features (1)
Rarer (5)	Small number of bats (10)	Small number (3)	Un-vegetated fences and large field sizes (2)
Rarer (5)	Small number of bats (10)	Moderate number/not known (4)	Walls, gappy or flailed hedgerows, isolated well-grown hedgerows, and moderate field sizes (3)
		Large number of roosts, or close to a SSSI for the species (5)	Well-grown and well connected hedgerows, small field size (4)
		Close to or within a SAC for the species (20)	Complex network of mature well established hedgerows, small fields and rivers/streams (5)

Table 9: Valuing foraging habitat for bats

Species (Score)	Number Of Bats (Score)	Roosts/Potential Roosts Nearby (Score)	Type And Complexity Of Linear Features (Score)
Common (2)	Individual bats (5)	None (1)	Industrial or other site without established vegetation (1)
Rarer (5)	Small number of bats (10)	Small number (3)	Suburban areas or intensive arable land (2)
Rarer (5)	Small number of bats (10)	Moderate number/not known (4)	Isolated woodland patches, less intensive arable and/or small towns and villages (3)
		Large number of roosts, or close to a SSSI for the species (5)	Larger or connected woodland blocks, mixed agriculture, and small villages/hamlets (4)
		Close to or within a SAC for the species (20)	Mosaic of pasture, woodlands and wetland areas (5)

Table 10: Scoring system for commuting and foraging habitats

Score	Value
1 – 10	Not important
11 – 20	Local
21 – 30	County
31 – 40	Regional
41 – 50	National

3.0 Results

Desk-Based Assessment

3.1 There are no statutory wildlife sites identified within the desk study search radii that area specifically designated for bats.

3.2 Records of at least eleven bat species records were collated within a 2km search area of site boundary and starting from the year 2000:

- 2 records common pipistrelle (notable BERC as protected, nationally vulnerable and declining);
- 34 records of soprano pipistrelle (notable BERC as protected, nationally vulnerable and declining);
- 13 records of long-eared bat (rare BERC, nationally vulnerable and declining);
- 1 Bechstein's bat, 1 whiskered bat, 3 Natterer's bat and 1 *Myotis* species records were recorded (all myotis species are considered rare within BERC, nationally vulnerable and declining);
- 15 records of noctule (important within BERC, vulnerable and declining nationally);
- 2 records of serotine (rare BERC species, vulnerable and declining nationally);
- 1 record of Leisler's bat (rare BERC and Bristol is considered a national stronghold for this species, rare and vulnerable nationally);
- 2 greater horseshoe bat records were returned (local BERC Avon is a national stronghold for this species, endangered and declining nationally); and
- 30 lesser horseshoe bat records were returned (local BERC Avon is a national stronghold for this species, endangered and declining nationally).

Buildings and Other Structures

3.3 Daytime inspections and an emergence survey completed by WSP Ltd prior to demolition of the former police station in October 2020 did not identify the presence of bats or evidence of roosting bats in the building. A pre-start inspection of the building was completed by licensed ecologist Paul Gregory (Level 2 Ref 2015-10235-CLS-CLS) and demolition was then also supervised by the same licensed ecologist in accordance with recommendation by WSP Ltd following completion of their bat surveys of the building. No bats were encountered during the demolition.

3.4 B1 is constructed of single skin corrugated metal sheets, while B2 appears to be a converted metal container (Figure 2: Horse shelters (B1 left and B2 right) present in paddocks (F6a)Figure 2). These were both were assessed to have negligible suitability for roosting bats. B3 and B4 are relic structures constructed of single skin plyboard type panels (Figure 3). B3 had the appearance of an old cabin/container and had some gaps present where corner or roof joins had burst due to warping. Although these provide potential bat access, there was no evidence of staining or scratch marks on the exterior of these gaps and from what could be seen internally, no evidence of bats or droppings.

B4 is open and extremely dilapidated and was assessed to have negligible suitability for bats. The phone mast and pylon also have negligible suitability for bats.

Figure 2: Horse shelters (B1 left and B2 right) present in paddocks (F6a)

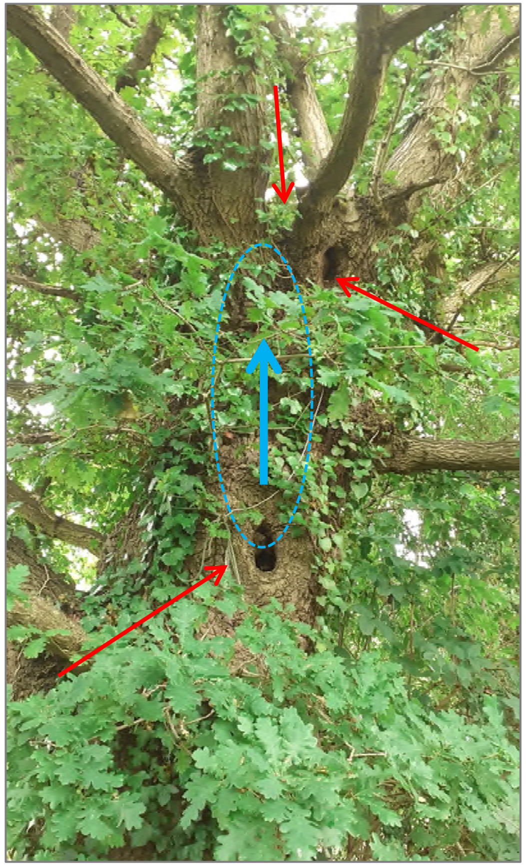
Figure 3: Other relic structures (B3 left and B4 right) present in paddocks (F6)

Trees

3.5 Table 11 describes the trees within the site boundary that have bat roosting potential. Drawing G7507.20.006 illustrates the locations of these trees within the site.

Table 11: PRA and aerial inspections of trees

Tree ID	Location	Description	Ground-based PRA findings	PRF inspection findings	Photographic record	Roost Suitability
T4	362626.21, 171003.79	English oak	A rot hole is present on a protruding eastward branch.	The tree was aerially assessed with the use of ropes and an endoscope. Upon closer inspection the rot hole did not extend into the branch very far and was damp. The rot hole did not extend to a suitable depth where a bat could roost however the rot hole over time could become a suitable PRF		Low

Tree ID	Location	Description	Ground-based PRA findings	PRF inspection findings	Photographic record	Roost Suitability
T5	362501.35, 171073.15	A very old and large English oak located within an old hedgerow with trees with dense scrub on either side.	Dead wood and cavities are present and there is light ivy growth on the trunk.	At 4m from the ground the trunk has a large, vertical cavity chamber present (highlighted in blue). Bat access into this cavity chamber is via two holes, one east and one west facing both at 4m and a third north-west facing hole at approx. 5m. In addition, a downward facing hole is present within the crown. The cavity chamber is dry and free from excessive rot and damage. No bats or evident of bats was recorded, however there is potential for a large number of bats for roosting, maternity and hibernation is possible. In addition this cavity chamber could support owls, as at least one of access holes is of a suitable size. No nest evidence was found.		High Also has suitability for nesting / roosting owls

Tree ID	Location	Description	Ground-based PRA findings	PRF inspection findings	Photographic record	Roost Suitability
T6	362484.01, 171078.36	A veteran English oak located within an old hedgerow with trees with dense scrub on either side.	A large basal cavity is present to the south, a major cavity on of a limb. Trunk at crown appears to be hollow and the main leader is lost past this point.	Within the crown of the tree at approx. 4m three large branches at the base of the crown are split. There is also evidence of an historical lightning strike at this point. Two of these branches have cavities (highlighted in blue) are present at the base of these branches where the crown begins. These two branch cavities were investigated using an endoscope. No bats or evidence of bats were recorded. However both these cavities have the potential to support a small number of bats as they continue up within the branch to approx. 30cm. Both cavities are dry.		Moderate

Tree ID	Location	Description	Ground-based PRA findings	PRF inspection findings	Photographic record	Roost Suitability
T8	362487.48, 171147.72	An ash tree with three stems located within blackthorn dominant scrub belt south of the allotments	The ground-based inspection using binoculars revealed a weld at 3m between two trunks.	The weld is between stems currently has no gaps or cavities created. PRF may develop in time.		Low
T19	362718.12, 171119.11	Mature English oak located within a defunct hedgerow with trees.	A very old tree with some minimally lifted bark.	No PRF identified. Due to age and complex structure, low suitability assigned as a precautionary approach.		Low

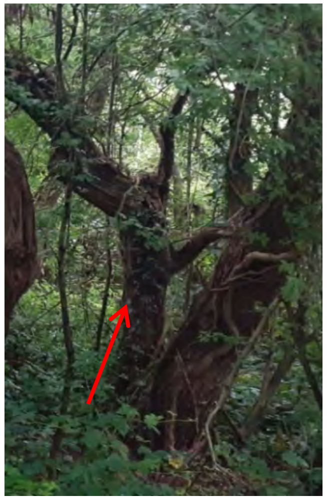
Tree ID	Location	Description	Ground-based PRA findings	PRF inspection findings	Photographic record	Roost Suitability
T20	362772.74, 171101.77	Mature ash tree situated within a defunct hedgerow with trees. This tree is close to T21.	A rot hole at height is present at 6m on a southward facing branch.	The rot hole did not extend to a suitable depth where a bat could roost and was damp. The rot hole over time could become a suitable PRF. Due to age and evidence of ash dieback, which may expedite formation of PRF, low suitability assigned as a precautionary approach.		Low
T21	362781.41, 171097.43	Mature ash tree situated within a defunct hedgerow with trees. This tree is close to T20.	A rot hole at height is present at 10m on a northward facing branch.	The rot hole did not extend to a depth that a bat could roost. The rot hole over time could become a suitable PRF. Due to age and evidence of ash dieback, which may expedite formation of PRF, low suitability assigned as a precautionary approach.		Low

Tree ID	Location	Description	Ground-based PRA findings	PRF inspection findings	Photographic record	Roost Suitability
T25	362501.35, 171196.28	A mature English oak with two trunks located in a defunct hedgerow with trees. The hedgerow borders the eastern boundary of the allotments and has a solid metal fence present.	The ground based inspection revealed a large area of stripped bark on the trunk at 1 to 2m and a rotten split on the other trunk.	There are no areas where a bat could access in either the stripped bark or the rotten split. Due to age and evidence of bark damage, low suitability assigned as a precautionary approach.		Low
T26	362524.76, 171205.81	A mature English oak located in an intact hedgerow with trees. It is cluttered with debris of metal corrugated sheets and cut scrub to make a makeshift boundary.	The ground-based inspection revealed a large area of stripped bark on the trunk at 1-2m.	There are no areas where a bat could access. However in time with weathering this could become a PRF. Due to age and evidence of bark damage, low suitability assigned as a precautionary approach.	 	Low

Tree ID	Location	Description	Ground-based PRA findings	PRF inspection findings	Photographic record	Roost Suitability
T27	362531.70, 171230.09	Mature English oak located within a hedgerow with trees	Some minimal plate bark seen but no evidence of lifting plates to create potential cavity.	No PRF identified. Due to age and evidence of bark damage, low suitability assigned as a precautionary approach.		Low
G7.1	362661.76, 170892.81	A mature crack willow situated next to a brook and a dense scrub bank. This tree was discovered in September 2020 during some scrub removal.	A large hazard split is present in one of the trunks. This hazard split could support a small number of bats.	No bats observed in split during inspection. A sample of suspected old bat droppings was sent for DNA analysis, but results came back as 'PCR amplification unsuccessful'. The sample was likely to be too old or degraded for successful identification.		Moderate (potential historic roost, but no recent evidence at time of inspection)

Tree ID	Location	Description	Ground-based PRA findings	PRF inspection findings	Photographic record	Roost Suitability
G14.1	362472.74, 171086.16	A multi-stemmed mature hazel located in an old hedgerow, growing in closely with a mature hawthorn. Dense scrub is present on either side of this hedgerow.	A single PRF located in a larger branch in the form of a rot-hole at 1.5m facing south.	The rot-hole was damp at the time of inspection, but could support individual bats, or a small number of roosting bats when/if suitably dry.		Moderate
G24.1	362644.42, 171137.32	Dead tree of unknown species (thought likely to be elm).	Lifting bark plates predominantly on the trunk are present in all directions.	Inaccessible to bramble, surveyed at distance with binoculars.		Low

Tree ID	Location	Description	Ground-based PRA findings	PRF inspection findings	Photographic record	Roost Suitability
G33.1	362837.77, 17111.91	A mature holly located off the public footpath within broadleaved woodland situated in the western section of the site.	PRF features are present in the form of rotten bark and cavities (cankers) which have developed at varying stages of height on the trunk, the branches are currently unaffected by disease. It is likely this disease will spread to the branches in time.	Cankers are present mainly on the trunk and occasionally on limbs. Those which appeared to have associated rot holes or hollows were all investigated and found to be very small or shallow and/or waterlogged.		Low
G40.1	362460.60, 171217.95	A mature sycamore located within a defunct hedgerow with trees adjacent to the allotments.	Ivy cover is present on the trunk no higher than 2.5m. The ivy cover could obscure a hidden PRF (rot-hole, trunk cavity etc.)	On closer inspection using a torch and endoscope, no PRF was recorded on the trunk. Due to age and complex form, low suitability assigned as a precautionary approach.		Low

Tree ID	Location	Description	Ground-based PRA findings	PRF inspection findings	Photographic record	Roost Suitability
W2.1	362862.05, 171059.28	A mature multi stemmed crack willow located within the western broadleaved woodland block within the site. This tree is in poor condition with cracks and splits due to wind damage.	The majority of these splits and cracks are unsuitable for roosting bats as they are too small, however could become suitable for roosting bat in time. A slight split in the larger trunk has PRFs approx. 1.5m from the ground could potentially support individual bats.	The inspection using an endoscope revealed no evidence of bats. The split is very slight, only 5mm at its widest point.	 	Low
W2.2	362869.85, 171066.22	A crack willow in poor condition located in the western broadleaved woodland area of the Site. This is a double stemmed tree and has a single PRF.	The PRF is a split in the trunk at approx. 1.5m high and facing northward. The damage has created a small cavity within the trunk.	The PRF was inspected using an endoscope and revealed no bats and no evidence of bats. On first inspection in 2020, the cavity was very small, not extensive and damp. By inspection in 2022 the cavity had enlarged and extended into the leaning main stem and the suitability for roosting bats had increased.	 	Moderate

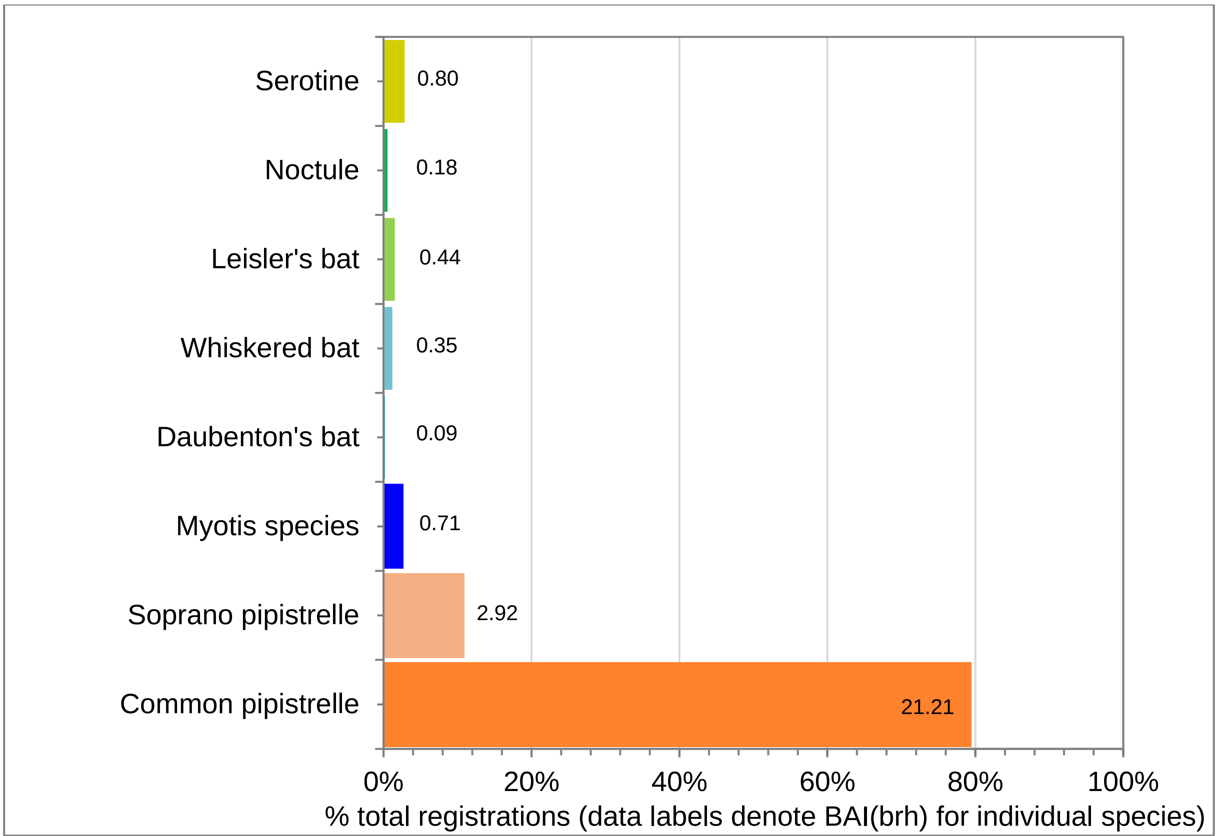
Activity Transects

3.6 Results of the six transect surveys are illustrated in Drawings G7507.10.022 through to G7507.10.027 inclusive. Drawing G7507.20.028 presents a kernel density plot compiled from all bat activity recorded to illustrate activity 'hot spots'.

Assemblage

3.7 Figure 4 summarises the composition of the species assemblage recorded over the six transect surveys.

Figure 4: Species assemblage and average relative abundance recorded during transect surveys

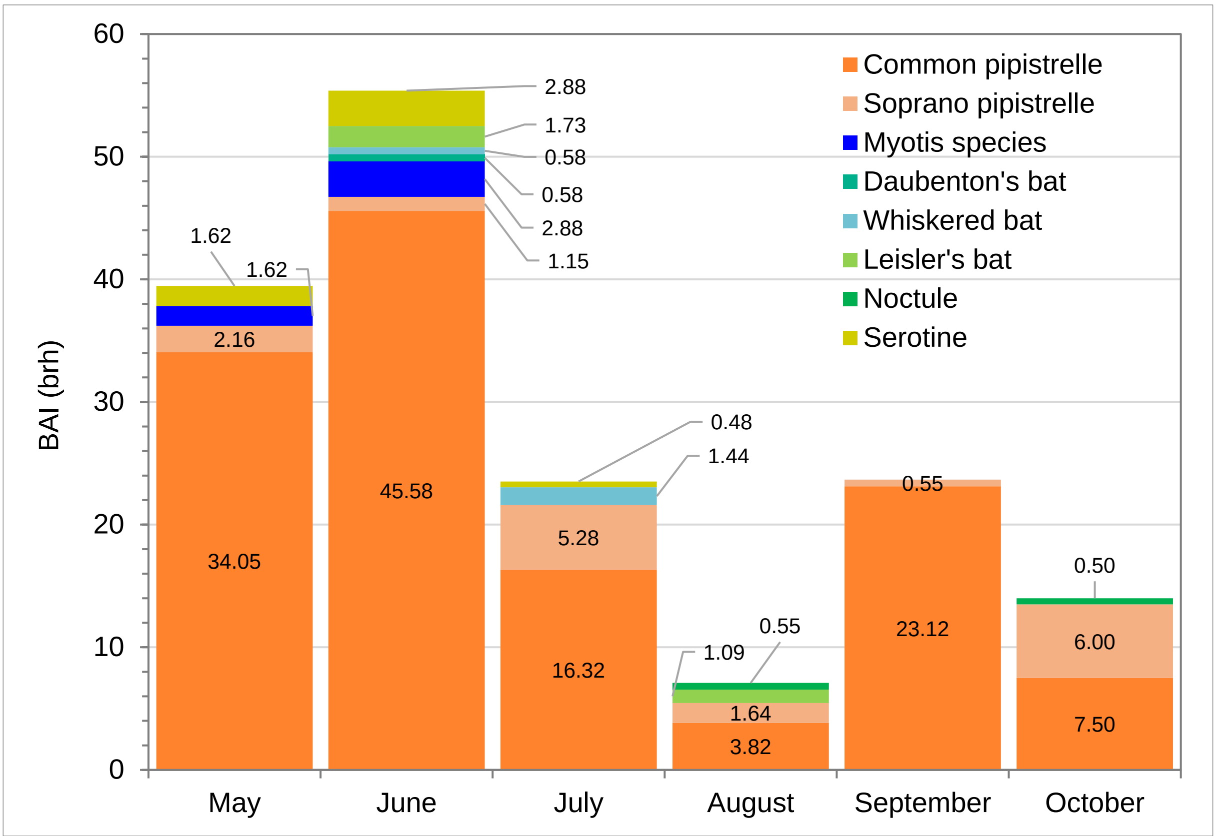


3.8 An assemblage of at least seven species was recorded during the transect surveys. Pipistrelles combined produced 90.4% (totalling 273 registrations) of the overall contacts recorded during transects. Common pipistrelle was the most frequently recorded with 240 registrations (79.5%) followed by soprano pipistrelle with 33 registrations (10.9%). Large bat species (serotine, Leisler's bat and noctule) totalled 16 registrations (5.4%), with the remaining 13 registrations comprising Myotis species (including Daubenton's and whiskered bats) (4.2%). The overall site BAI recorded during the transects was 26.69brh.

3.9 The relative abundance of pipistrelle species recorded during each of the transect surveys (Figure 5) varied between visits, with late spring and early summer recording highest levels of activity in common pipistrelles, but mid-summer and late autumn visits recording highest activity in soprano pipistrelles.

3.10 Relative abundance of other species also varied between transect visits. Serotine was only recorded during transects in May, June and July. Leisler's was only recorded during transects in June and August, while noctule was only recorded in August and October. Myotis species were only recorded during May, June and July, with confirmed Daubenton's only identified from June transects and confirmed whiskered bat only identified from transects in June and July. June recorded highest activity levels overall for Myotis species.

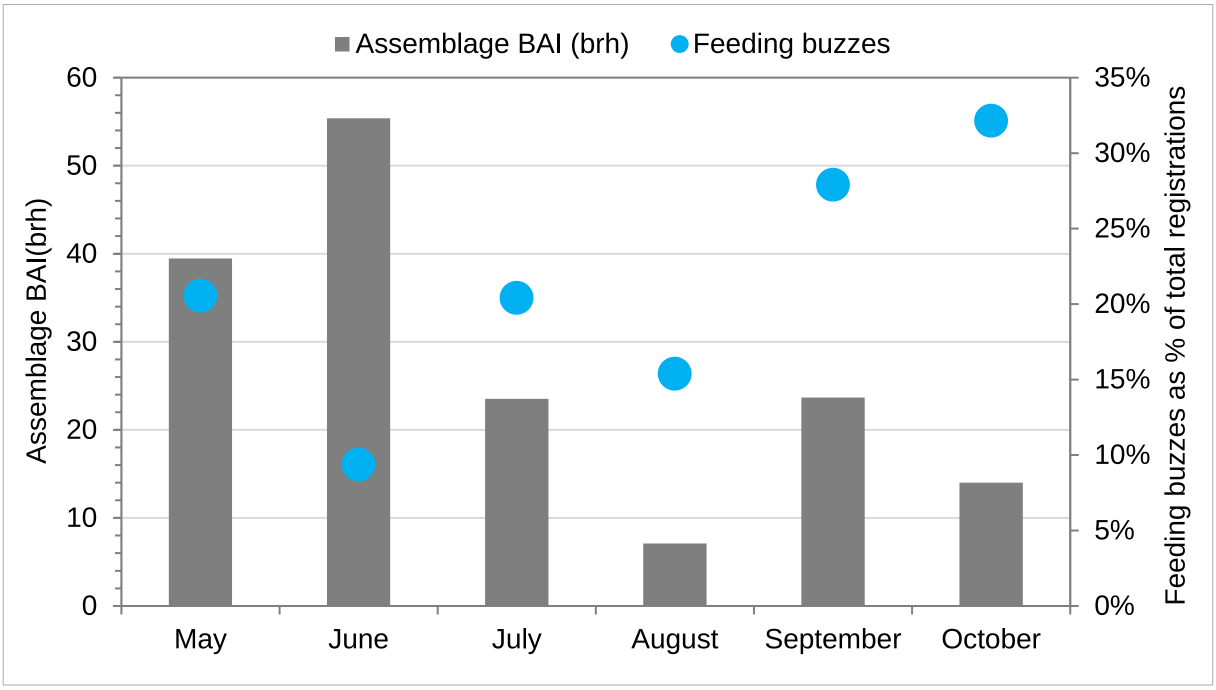
Figure 5: Relative activity levels of bat species recorded during transect surveys (data labels denote BAI (brh) for individual species recorded)



Foraging and Social Behaviours

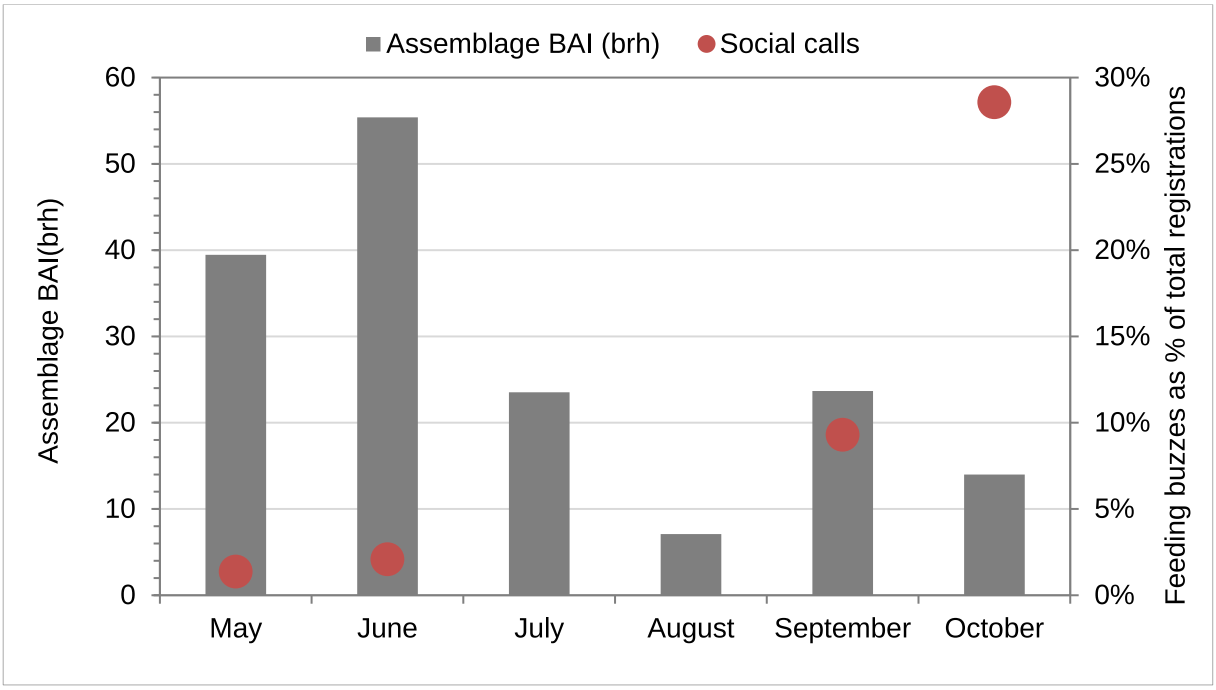
3.11 Foraging was recorded infrequently along the transects during each survey. All feeding buzzes recorded during the transects were by pipistrelle species. Figure 6 summarises the foraging activity for all transect survey visits. Foraging activity, represented by the proportion of recorded contacts including feeding buzzes, increased over autumn months, peaking in October when approximately one third of recorded contacts included feeding buzzes.

Figure 6: Foraging activity levels of bat species recorded during transect visits



3.12 Low levels of social calls were recorded in May and June (Figure 7). Social calls are a distinct form of vocalisation by bats thought to represent communication, as opposed to echolocation. No social calls were recorded in July or August but social calling increased in September and peaked in October, when nearly 30% of recorded contacts included social calls.

Figure 7: Social calling activity levels of bat species recorded during transects



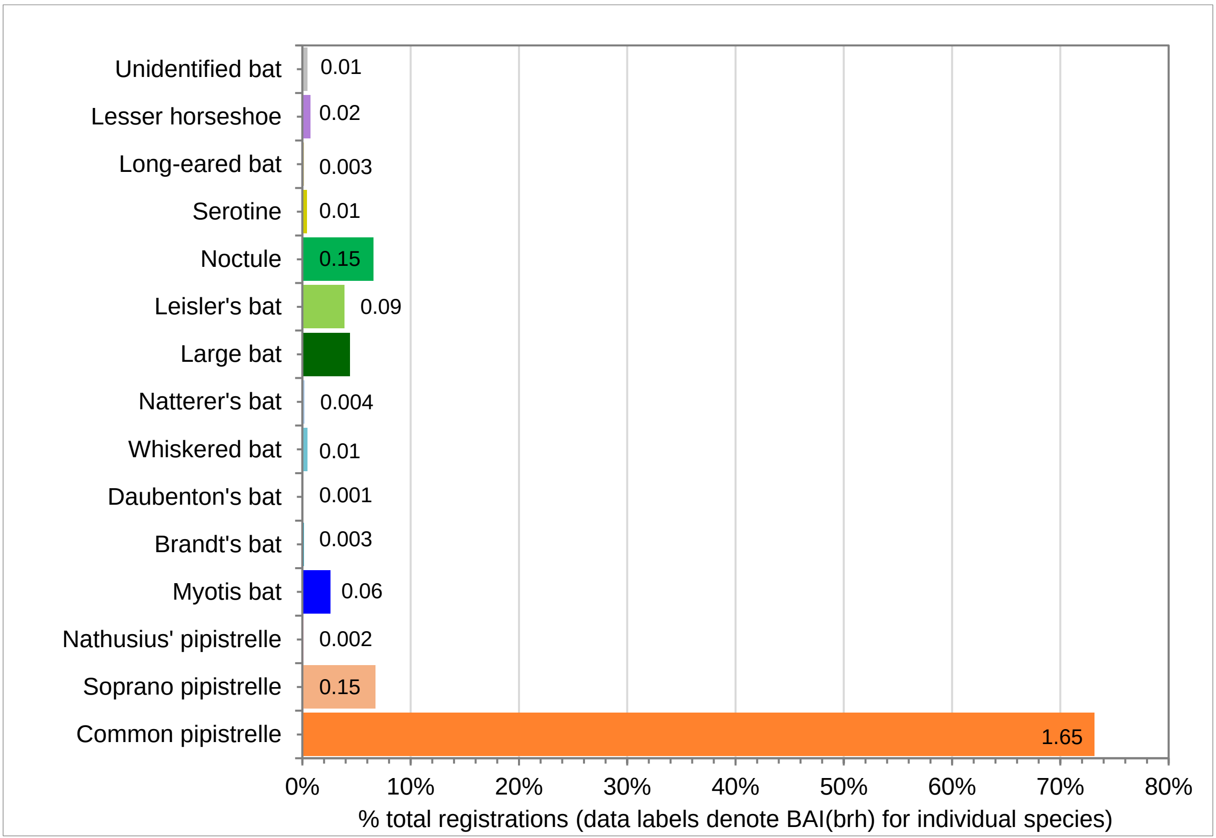
3.13 This late autumn peak in social calling is comparable to the static remote monitoring results. Although there are different types of social calls among different bat species, the increase of social calling towards the end of the year is attributed to the presence of young born earlier in the season with a resulting increase in communication between the young bats and adults of a colony.

Static Remote Monitoring

Assemblage

3.14 Figure 8 illustrates the overall bat assemblage recorded from data analysed from all static recording periods and all monitoring locations. An assemblage of at least twelve species was recorded, expanding on that recorded during the transect surveys. This increase in assemblage is not unexpected, considering the substantially greater recording periods encompassed by the static monitoring survey.

Figure 8: Species assemblage recorded during static remote monitoring



3.15 A total of 3,968 registrations were recorded during the course of the static remote monitoring surveys, all locations combined. Common pipistrelle generated 2,903 of these registrations (73.2%). The relative abundance of common pipistrelles is similar to that recorded from the transect surveys. Soprano pipistrelle generated 267 registrations (6.7%). Noctule generated 260 registrations (6.6%), with unidentified large bats generating 174 registrations (4.4%) and Leisler's bats 154 registrations (3.9%). Only 17 registrations were recorded for serotine (0.4%). In combination, large bats (noctule, Leisler's bat and serotine) generated approximately 15.3% of all registrations.

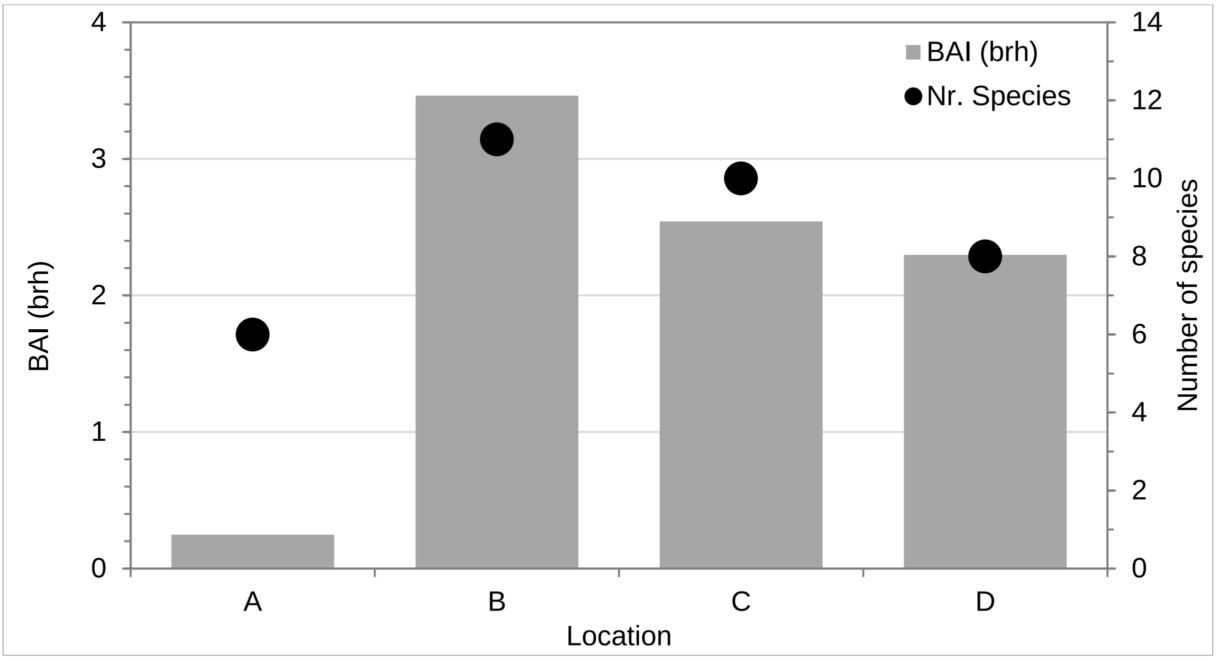
3.16 Myotis bats were next most frequently recorded bats with 134 registrations (3.4%) and which included Brandt's bat, Daubenton's bat, whiskered bat and Natterer's bat. It should be noted that the accuracy of call diagnostics for individual Myotis species is variable within the data, with only 32 registrations identified to species level. Therefore, for the purposes of interrogating activity data beyond this stage of confirming assemblage composition, Myotis species have been grouped.

3.17 Remaining bat species recorded included lesser horseshoe with 30 registrations (0.8%), long-eared bat with 6 registrations (0.2%) and Nathusius' pipistrelle with 4 registrations. Both these latter species may be under-recorded due to the quiet echolocation of long-eared bats and considerable overlap in call diagnostics between Nathusius' and common pipistrelles. Unidentified bats totalled just 19 registrations, less than 0.5% of the data.

3.18 The site-wide BAI is just 2.26brh. Although the general order of abundance of species recorded is similar between the transect surveys and the static monitoring surveys, the site-wide BAI determined from the static data is markedly lower than the site-wide BAI. This is not unexpected, as survey objectives differ and the transect surveys targeted dusk periods, when bat activity is generally highest (when transect surveys are most effective). As the static remote monitoring surveys recorded bat activity through the whole night over multiple consecutive nights during each month, the BAIs generated by the static remote monitoring surveys are considered to be more truly representative of bat activity levels within the site than those generated by the transect surveys.

3.19 Figure 9 illustrates the species assemblage BAI and species diversity by detector location.

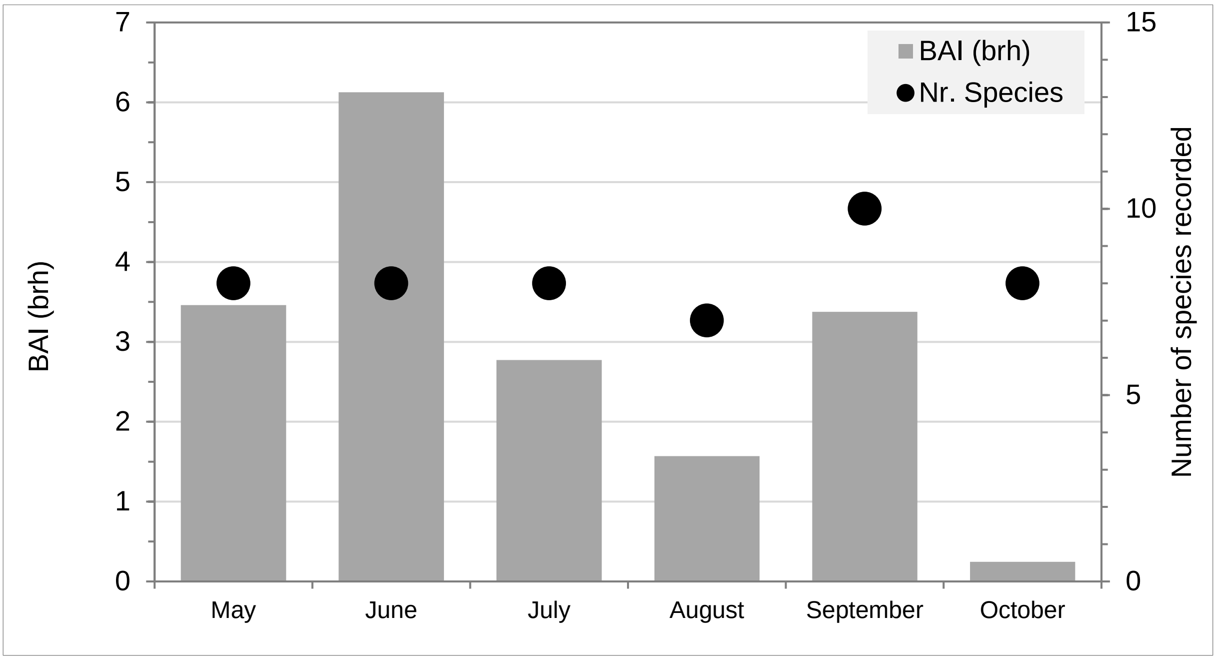
Figure 9: Species assemblage by static monitoring location



3.20 Bat assemblage diversity and BAI appear generally similar at survey locations B, C and D, all of which were located in similar habitat types (outgrown hedgerows facing into grassland). Survey location A was placed within woodland W1 where a lower level of activity and fewer species were recorded. The placement of static A in this location was purposeful and this finding was not wholly unexpected, considering the cluttered environment of the small woodland. Analysis did not determine the assemblage variation in activity levels between locations to be significant however (K_3=5.6, P>0.05). This indicates that there would appear to be no discernible habitat selection for the bat assemblage.

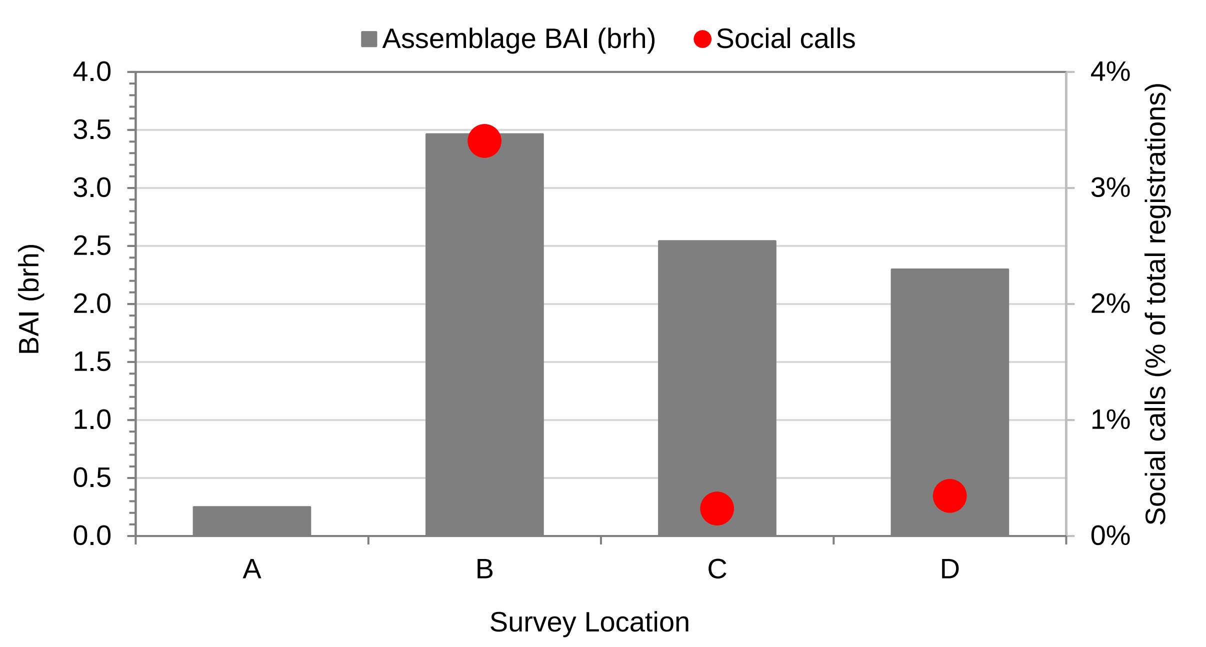
3.21 Figure 10 illustrates the variation in the species assemblage BAI and species diversity by between each survey month, with all survey locations combined. The variation in the assemblage BAI was found to be significant (K_5=9.5, P<0.05). This suggests that there is seasonal variation in use of the site by the assemblage. Overall, highest activity was generated in spring with a BAI of 3.46brh, dropped in summer with an average BAI of 2.63brh and was lowest in autumn with an average BAI of 1.77brh. Assemblage diversity was lower in spring, with 8 species recorded, and higher in summer and autumn with 11 species recorded during each of these seasons.

Figure 10: Species assemblage by survey visit



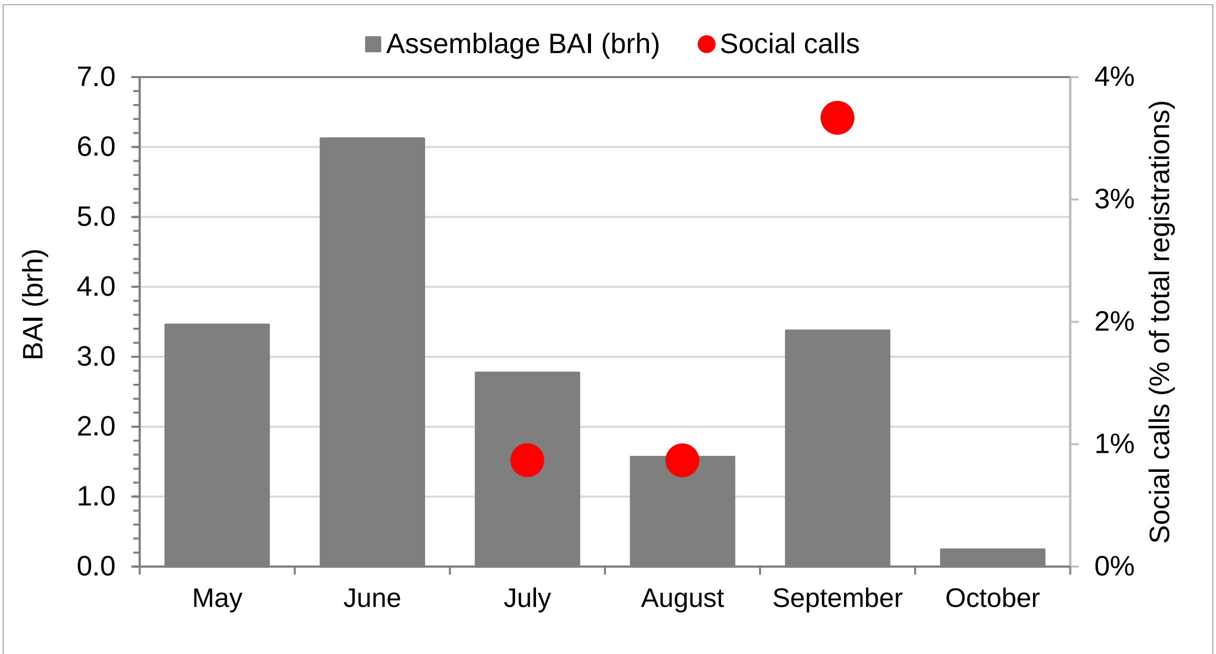
3.22 Figure 11 illustrates social calling as a proportion of the total registrations by the assemblage each month, overlaid with the assemblage BAI. Location A was anticipated to have low registrations due to woodland habitat. Location B had the highest level of BAI with comparable social call levels. Locations C and D had slightly less bat registrations than B, however there is a distinct decrease in social calls.

Figure 11: Social calling by location



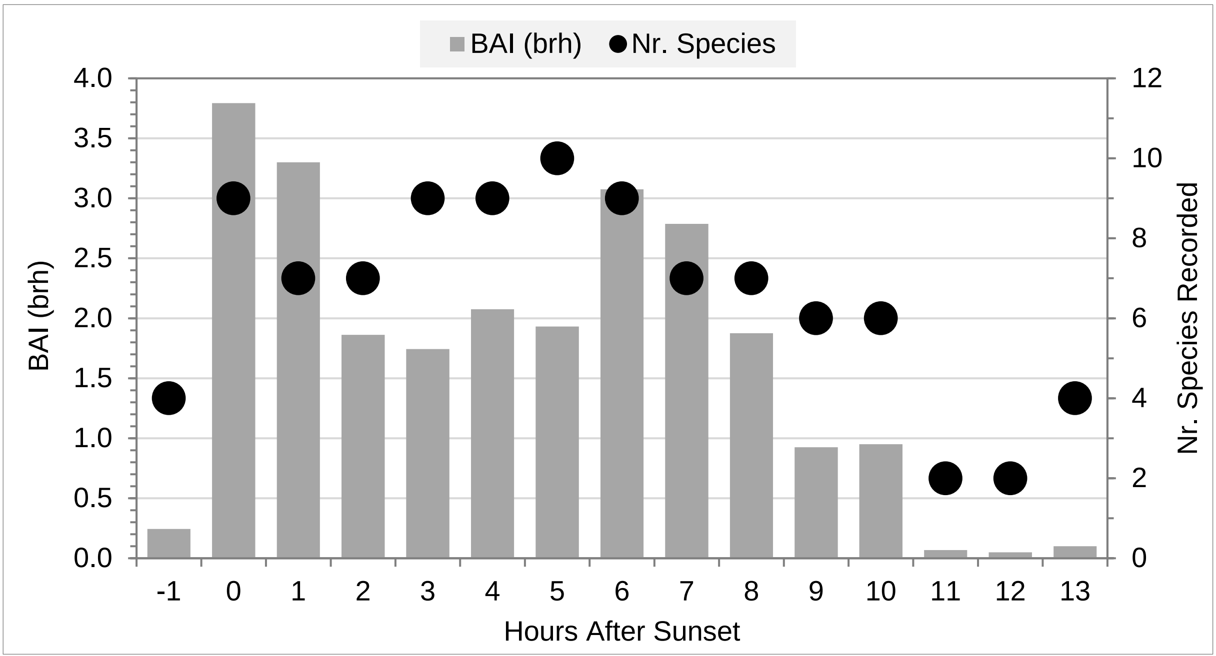
3.23 Figure 12 illustrates social calling as a proportion of the total registrations by the assemblage each month, overlaid with the assemblage BAI. Although the social calling recorded in individual months and the proportions of social calling recorded overall differ between the static survey and the transect surveys, the observed autumnal peak is similar between survey methods and is attributed to the presence of young bats born earlier in the 2020 season.

Figure 12: Social calling by month



3.24 Figure 13 summarises the overall nightly activity patterns of the bat assemblage, combining data from all locations and recording periods. Accounting for changing night length through the season, which would extend the time of dawn in the numbers of ‘hours after sunset’, the figure demonstrates a clear peak in activity around sunset, with a second peak that would correspond to sunrise periods. Activity levels drop during the middle parts of the night. Dusk and dawn periods would correlate with daily roost movements when bat colonies disperse from a roost site to foraging grounds overnight and return again by daybreak. The numbers of species recorded in the site generally show a reverse trend to the assemblage activity levels, with species diversity lower at dusk and dawn and higher in the middle of the night.

Figure 13: Nightly activity of the assemblage (all locations and all recording periods combined)



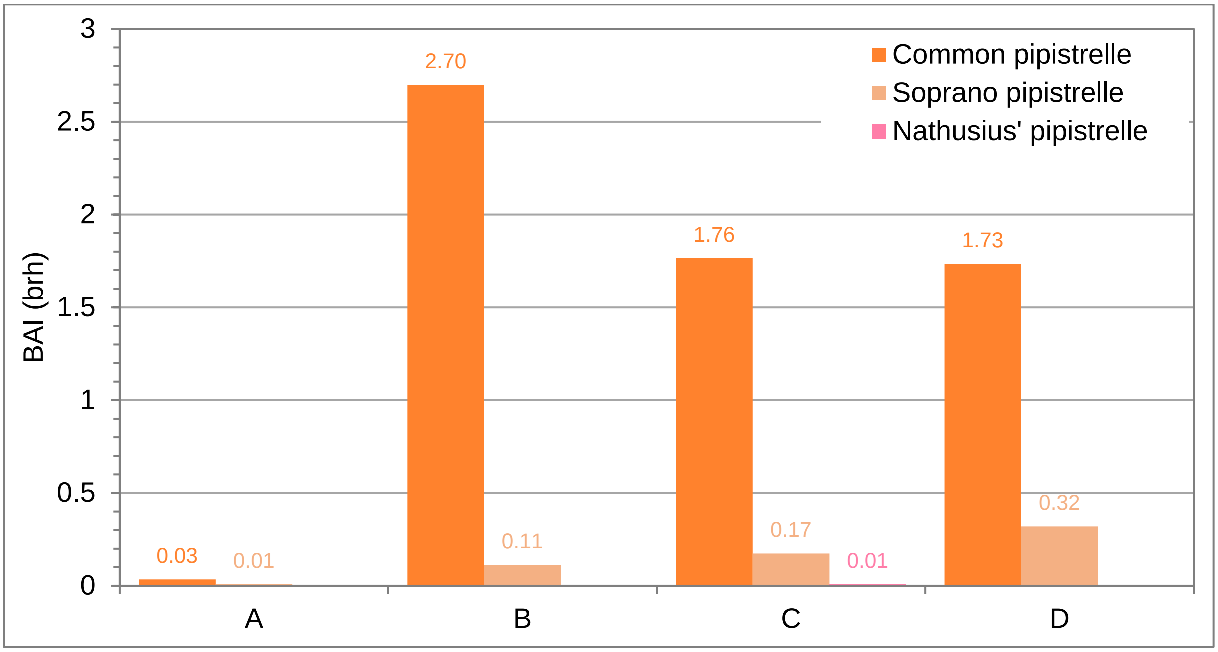
Pipistrelles

Spatial patterns

3.25 Figure 14 displays the relative activity levels for pipistrelles recorded during all survey periods combined at each of the four monitoring locations. The spatial distribution of common pipistrelles mirrors that of the assemblage, which is unsurprising given common pipistrelles generated over 70% of the total registrations recorded.

3.26 Significant variation in the relative activity levels was found between four locations for both common (K_3=6.89, $P<0.05$) and soprano pipistrelle (K_3=6.85, $P<0.05$). This suggests habitat preference may be exhibited within the site by these species, with location B generating the greatest number of registrations by common pipistrelle and location D generating the greatest number of registrations by soprano pipistrelle. Nathusius’ pipistrelle was only recorded at location C.

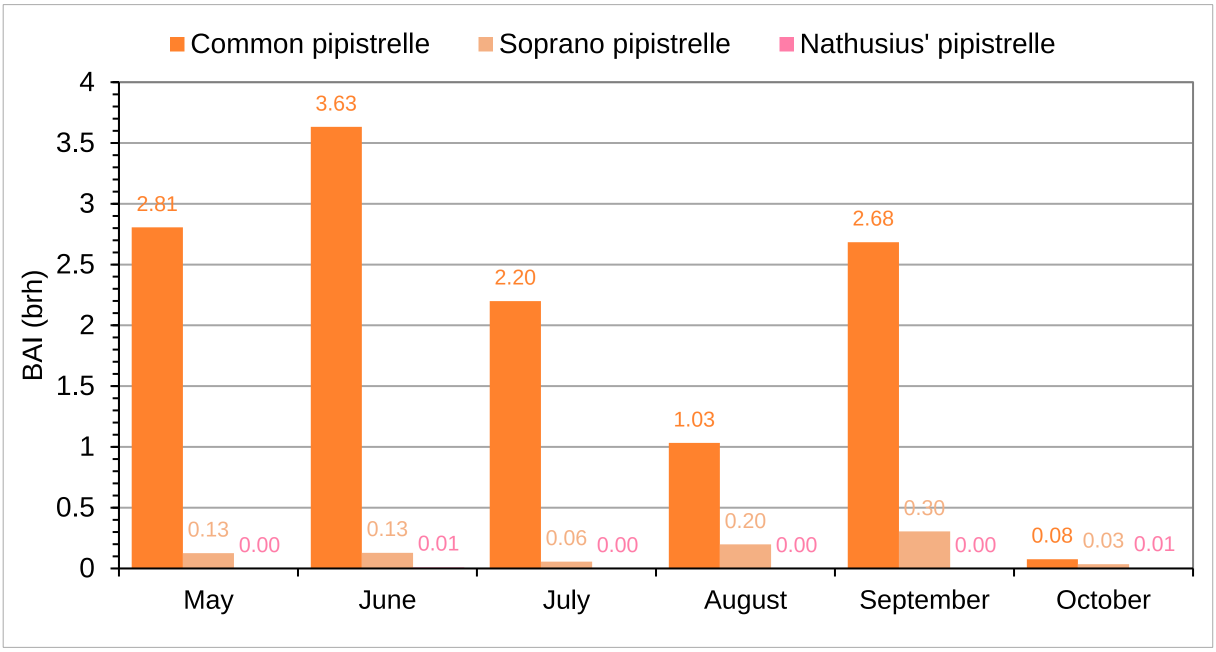
Figure 14: BAIs recorded at each location by pipistrelle bats



Seasonal patterns

3.27 Figure 15 shows common and soprano pipistrelles BAI by monthly visit. There was no significance in the variation in BAI between visits for common pipistrelle (K_5=7.76, P>0.05) or soprano pipistrelles (K_5=5.12, P>0.05). Nathusius' pipistrelle was recorded too infrequently (June and October only) to allow meaningful comparison.

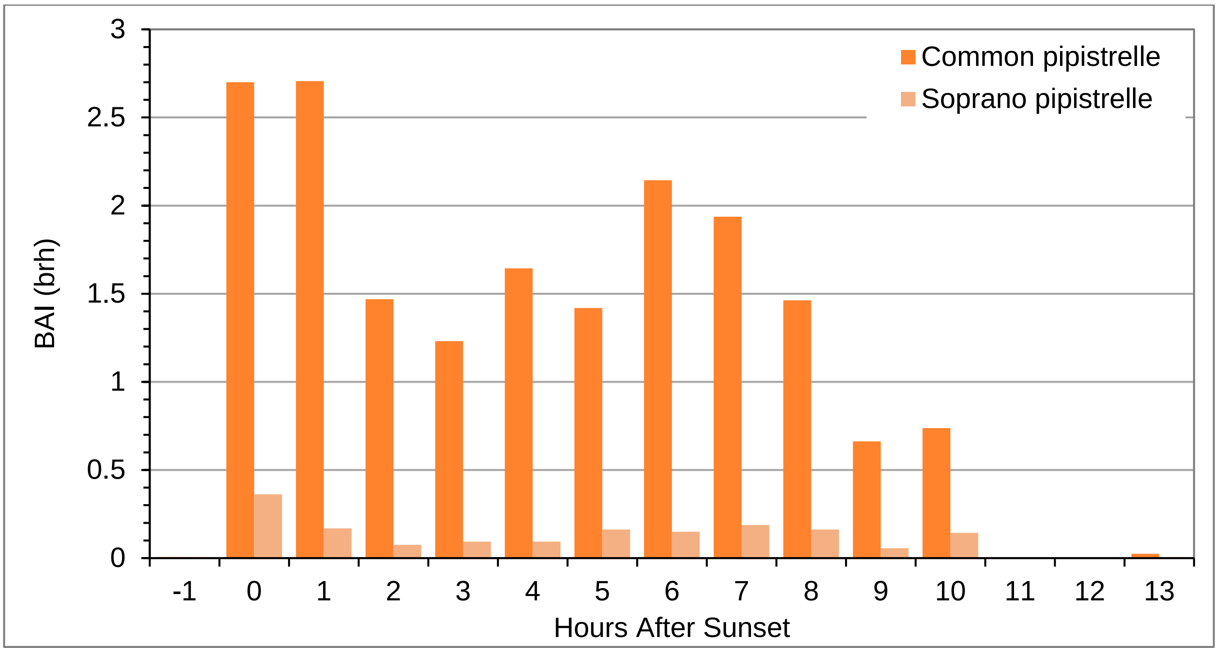
Figure 15: BAIs recorded across the site each month by common and soprano pipistrelles



Nightly patterns

3.28 Figure 16 illustrates nightly activity patterns of common and soprano pipistrelles using the site. Nathusius' pipistrelle was recorded only infrequently. Although soprano pipistrelles exhibit a much lower BAI than common pipistrelles, the nightly activity pattern through the night is generally similar between the two. A distinct peak in hourly activity is observed in pipistrelle species around sunset and the hour following. Activity dips during the middle hours of the night and a second peak is observed around sunrise. This second peak is more drawn out than the sunset peak, due to the changing night length over the season.

Figure 16: Nightly activity patterns of common and soprano pipistrelles



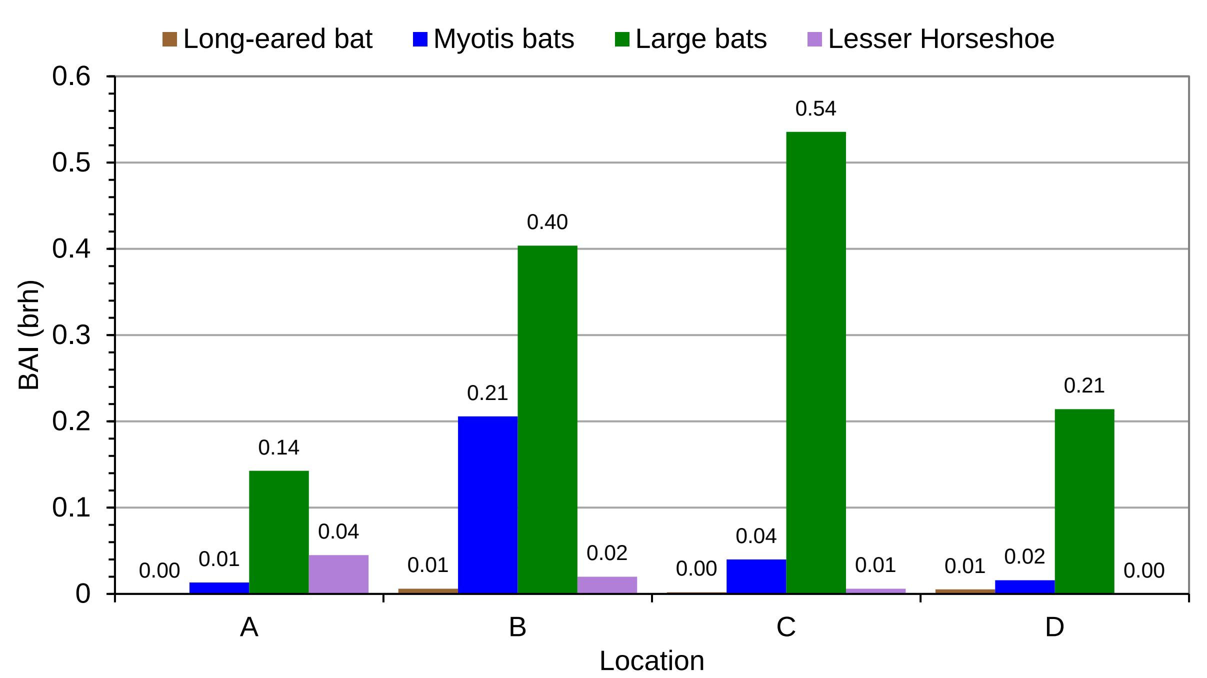
Other Species

Spatial patterns

3.29 Figure 17 displays the relative activity levels for non-pipistrelles recorded during all survey periods combined at each of the four monitoring locations.

3.30 Myotis species were recorded at all four monitoring locations and, while there is an observed peak in activity levels at location B activity levels recorded were low to very low. The variation in activity levels between locations was not found to be significant (K_3=1.03, P>0.05).

Figure 17: BAIs recorded at each location for non-pipistrelle species



3.31 Leisler's bat and noctule were recorded at all four locations at generally low levels (<1brh), while serotine was not recorded at location A (woodland W1) and was recorded only at very low levels (<0.1brh) at each of the other locations. The variation in the combined large bat species activity levels between monitoring locations was not found not to be significant (K_3=3.58, P>0.05).

3.32 Long-eared bats were only recorded at Locations B, C and D (Figure 17) with very low activity levels (<0.1brh) recorded in each location. Lesser horseshoe bats were recorded from locations A-C and activity levels were also very low (<0.1brh) at each of these locations. Long-eared bats and lesser horseshoes were recorded too infrequently to make meaningful comparisons.

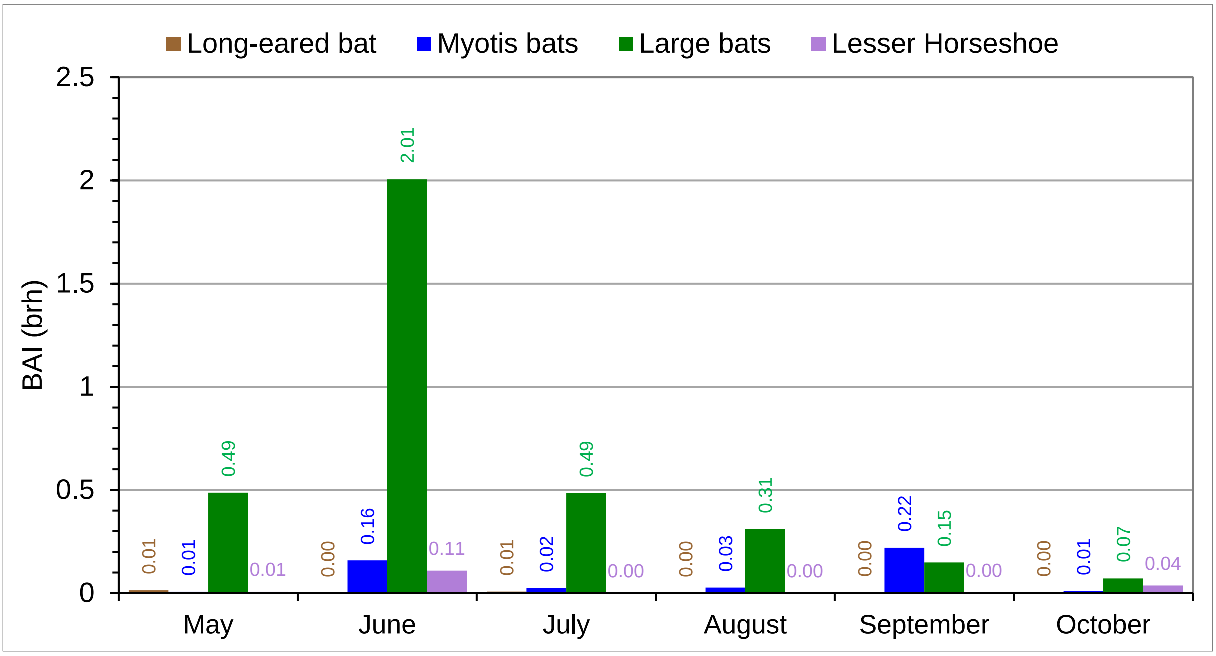
<u>Seasonal patterns</u>

3.33 Figure 18 shows non-pipistrelles BAI by monthly visit. The variation in Myotis species BAI between survey visits was found to not found be significant. Data indicate a peaks of activity levels in June and September.

3.34 The variation in combined large bat species BAI recorded during each survey visit was found to be significant (K5 = 14.83 P<0.01). There is a distinct peak of activity in June.

3.35 Long-eared bats were only recorded during the months of visits May, June, September and October (Figure 18) with very low activity levels (0.1brh or less) recorded in each instance. Lesser horseshoe bats were recorded during May, June, September and October. Activity levels were very low, peaking in June with just 0.1brh and with BAI in other months it was recorded being less than 0.1brh. Long-eared bats and lesser horseshoes were recorded too infrequently to make meaningful comparisons.

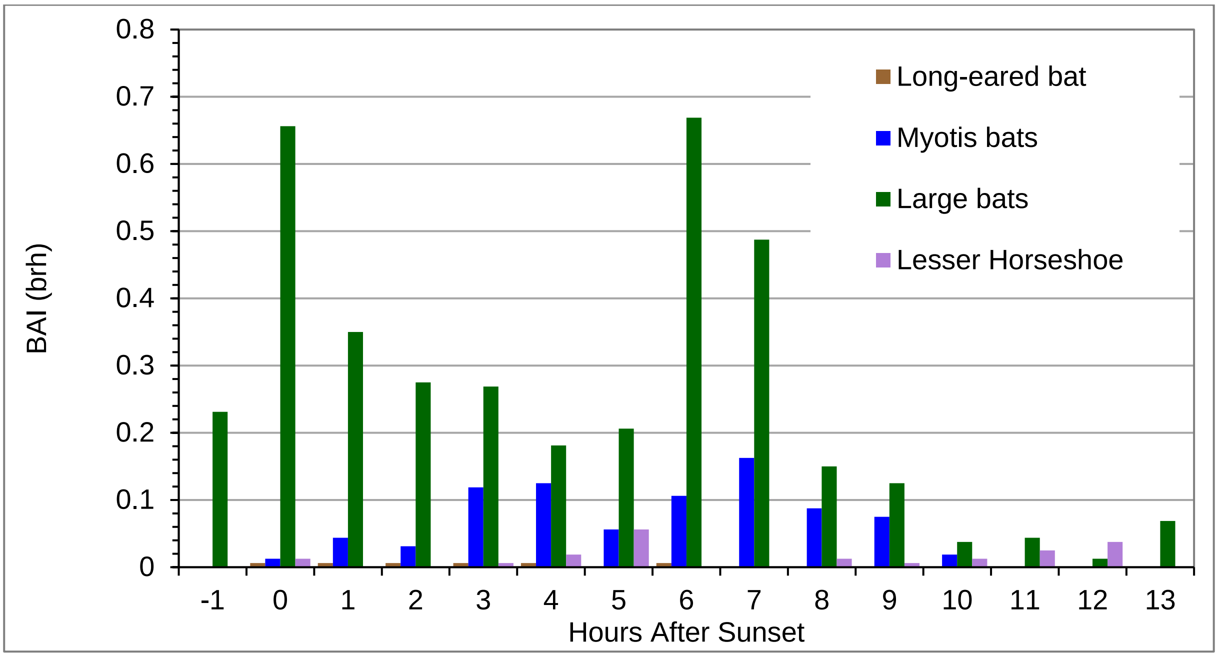
Figure 18: BAIs recorded across the site each month by non-pipistrelle species



Nightly patterns

3.36 The nightly patterns of activity for non-pipistrelle bat species is shown at Figure 19.

Figure 19: Nightly activity patterns of non-pipistrelle species



3.37 The nightly activity pattern is suggestive that Myotis species are utilising the site (albeit at very low levels) through most of the night, commencing around sunrise and leaving around sunset (taking into account changing day lengths and the June and September peak in activity).

3.38 There is a distinct peak of activity in large bat species (combined, but predominantly reflective of noctule activity) starting from sunset with a gradual decline towards sunrise with a peak six hours after sunset. These levels of activity during the night would suggest that large bats species would be passing through the site.

3.39 Long-eared bats and lesser horseshoes were recorded too infrequently to draw meaningful conclusions. However, based on general observations, it is surmised that these species are utilising the site opportunistically during larger landscape movements.

4.0 Evaluation

Desktop

4.1 The desktop search results identified records of eleven species within a 2km search area. The information regarding the exact location of bat roosts is considered sensitive information.

Roost Appraisal

4.2 The only building identified within the site boundary was Sinnott House. This building was surveyed by WSP in 2020 and was evaluated to have negligible suitability for roosting bats. This building has now been demolished.

4.3 The results of the tree suitability for supporting roosting bats is illustrated in drawing G7507.20.006. No bat roosts were confirmed during the ground-based (GBA) or aerial assessments of these trees.

4.4 The GBA and aerial assessment of the seventeen trees identified within or on the site boundary were categorised into their potential suitability for supporting roosting bats. Of these trees one was identified as having high suitability, four identified as moderate suitability and twelve as low suitability for roosting bats.

4.5 The trees with high or moderate suitability could provide roosting suitability for bats and could potentially become active roosts in a short period of time. Trees with low suitability could support a roosting bat if the PRF on these trees changes over time Weather conditions such as strong winds could increase the PRFs making them suitable roosting spaces for bats such as small cracks opening due to extreme weather, rot holes becoming more defined and deeper.

4.6 Tree G7.1 situated within scrub and adjacent to a brook southwest within the site boundary had suspected bat droppings that were collected and sent for DNA analysis at Warwick University. The results returned as “PCR” meaning the sample was unsuccessful. This tree remains high suitability for roosting bats.

4.7 Tree T5, a veteran English oak, located in the north western site boundary has additional suitability for nesting owl species due to its large trunk cavity. This tree remains at high suitability for a roosting and/or hibernating bats.

4.8 All of the defunct and intact hedgerows with trees are considered important for foraging and commuting bats of all recorded species.

Bat Activity

4.9 A general assemblage and BAI of expected bat species was recorded during the transect and static surveys based on the habitat type, site location and the connecting surrounding area.

4.10 Lesser horseshoe bats were recorded on a small number of occasions within the static surveys along with Daubenton's bat, Natterer's bat, Brant's bat and Nathusius' Pipistrelle, Leisler's, noctule and Serotine. These bats are considered to be in the rarer category of bat for the purposes of Wray et al. 2010 evaluation method.

4.11 Social calling was recorded during the transect and static surveys by common pipistrelle and soprano pipistrelle. These were the only species recorded with social calling during the surveys.

4.12 Foraging was recorded during each of the transect surveys from common pipistrelle and soprano pipistrelle.

4.13 Taking all the above elements into account, and based on the data analysis completed, the site is of importance to Bristol for commuting (Table 9) and of Local importance for foraging (Table 10) bats.

Habitat Evaluation

4.14 The dominant habitats within the site boundary consist of open grassland fields, hedgerows with trees, scrub and a small amount of woodland. The contours within the site boundary are varied and provide number of suitable dark areas, avoiding light spillage from the surrounding housing, industrial area and the city of Bristol to the north.

4.15 Drawing G7507.20.28 illustrates focal areas of bat activity. Hotspot areas of bat activity include the eastern boundary corner, an area of dense scrub central to the north boundary and Bonville Road adjacent to the woodland. The eastern boundary corner is at the bottom of a steep decline towards a wooded area with good connectivity via hedgerows connected to the site. This area is sheltered by trees and the steep gradient and prevents light spillage making it dark and optimal for bats. The area of dense scrub situated centrally in the northern boundary supports optimal foraging potential for bats. The area off Bonville Road recorded high levels of foraging, due to the streetlights attracting invertebrates also creating optimal foraging for bats particularly pipistrellus species.

4.16 Bats are utilising the majority of the hedgerows within the site boundary for commuting. The highest levels of activity recorded was the western side of F4 and the hedgerows between F1 and F2.

4.17 Location A was situated within a small woodland copse (W2). Static detectors deployed within woodland habitats may not be as influenced by weather conditions, specifically winds, as those situated within hedgerows overlooking the open grasslands. However, the woodland is small and dense and does not provide optimal flight or forage conditions within the interior.

Table 12: Evaluation of the site for commuting bats

Species (Score)	Number Of Bats (Score)	Roosts Nearby (Score)	Type And Complexity Of Linear Features (Score)	Value (Score)
Rarer (5)	Small number of bats (10)	None (1)	Complex network of mature well established hedgerows, small fields and rivers/streams (5)	County (in this context "Bristol") (21)

Table 13: Evaluation of the site for foraging bats

Species (Score)	Number Of Bats (Score)	Roosts Nearby (Score)	Type And Complexity Of Habitat Features (Score)	Value
Common (2)	Small number of bats (10)	None (1)	Complex network of mature well established hedgerows, small fields and rivers/streams (5)	Local (18)

Drawings

G7507.20.006 Trees with Bat Roost Suitability

G7507.20.021 Bat Transect Route and Static Bat Detector Locations

G7507.20.022 Bat Transect Survey - Visit 1 – 29 May 2020

G7507.20.023 Bat Transect Survey - Visit 2 – 22 June 2020

G7507.20.024 Bat Transect Survey - Visit 3 – 14 July 2020

G7507.20.025 Bat Transect Survey - Visit 4 – 9 August 2020

G7507.20.026 Bat Transect Survey - Visit 5 – 6 September 2020

G7507.20.027 Bat Transect Survey - Visit 6 – 14 October 2020

G7507.20.028 Bat Transect Survey – Hotspot Analysis

KEY

Site boundary

Trees and dense scrub

Built structures

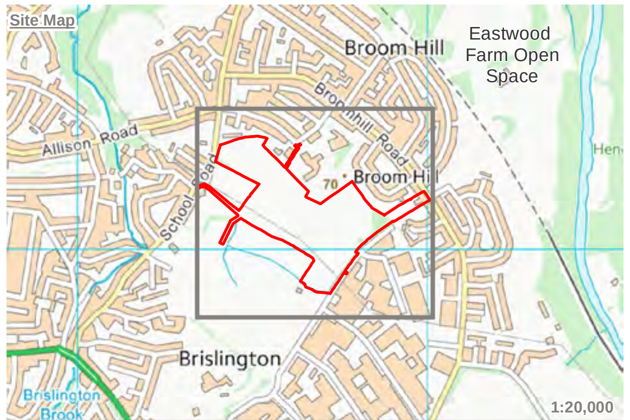
Bat Roost Suitability Category (Trees)

High

Moderate

Low

Note:
The locations of habitats and features are indicative



Rev	Description	Drawn	Approved	Date

THE ENVIRONMENT PARTNERSHIP

Genesis Centre, Birchwood Science Park, Warrington WA3 7BH
Tel 01925 844004 e-mail tep@tep.uk.com www.tep.uk.com

Project
Brislington Meadows - Ecology

Title
Trees with Bat Roost Suitability and Built Structures

Drawing Number
G7507.20.006

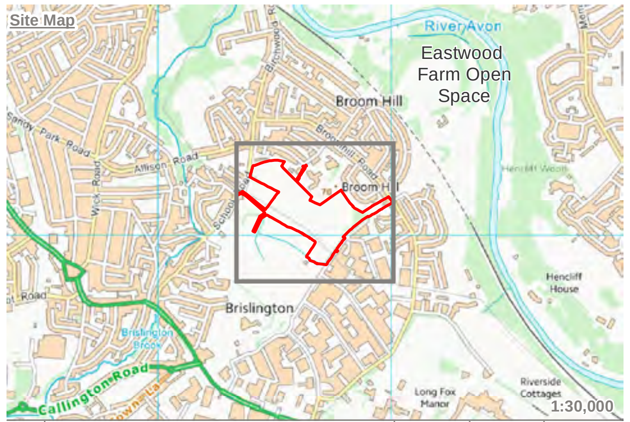
Drawn	Checked	Approved	Scale	Date
GAR	SA	RAR	1:2,250 @ A3	24/02/2022

KEY

- Site boundary
- Trees and dense scrub
- Built structures
- Static detector location (arrow denotes microphone direction)
- Transect route (route reversed on alternate visits)

Note:
The locations of habitats and features are indicative.

Site Map



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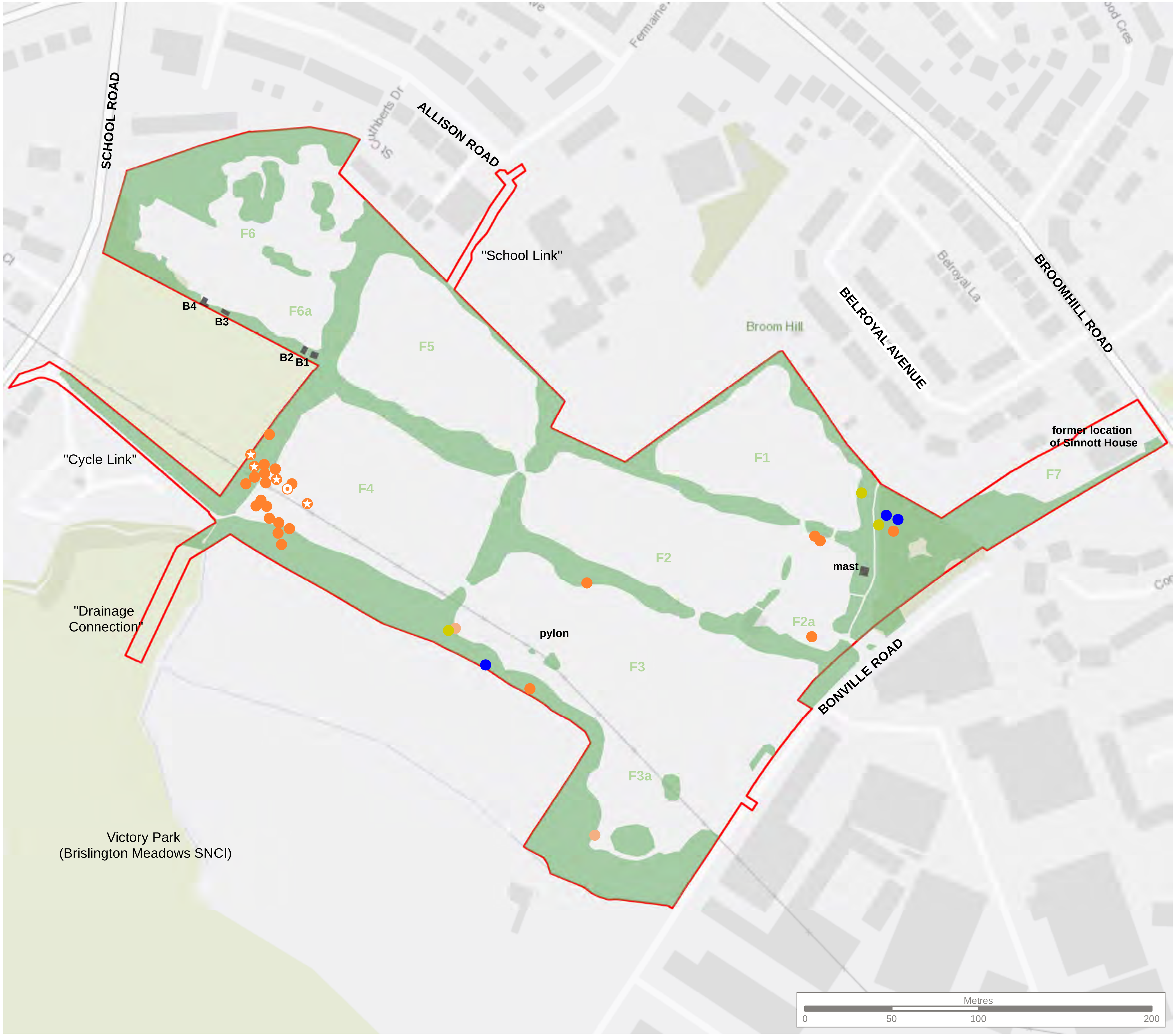
Project
Brislington Meadows Ecology

Title
Bat Transect Route and Static Detector Locations

Drawing Number
G7507.20.021

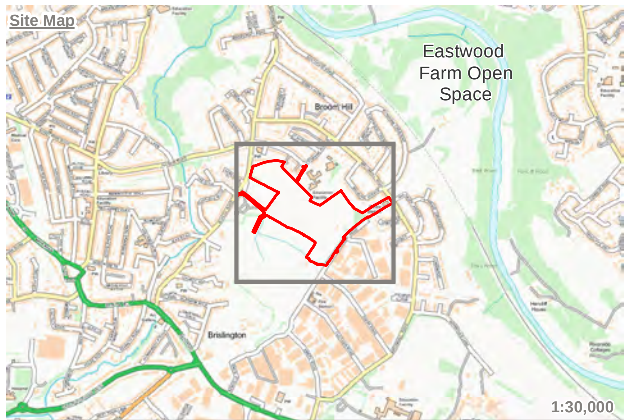
Drawn	Checked	Approved	Scale	Date
JK	CW	GR	1:2,250 @ A3	24/02/2022



KEY

- Site boundary
- Trees and dense scrub
- Built structures
- Myotis species
- Serotine
- Soprano pipistrelle
- Common pipistrelle social call
- Common pipistrelle feeding buzz
- Common pipistrelle

Note:
Raw data provided by WSP, analysed and digitised by TEP
The locations of habitats and features are indicative



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Project
Brislington Meadows Ecology

Title
G7507.20.022

Drawing Number
Bat Transect Survey
Visit 1 - 29th May 2021

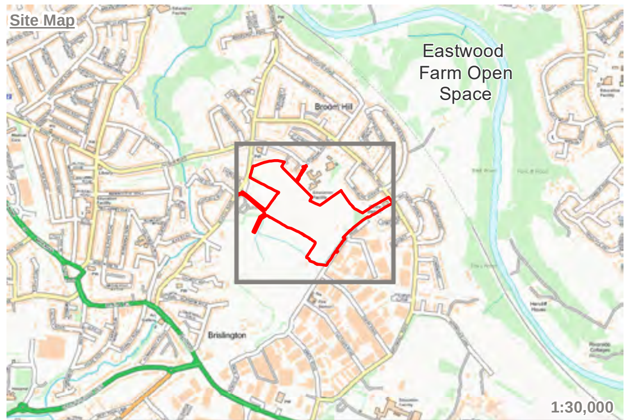
Drawn	Checked	Approved	Scale	Date
JK	CW	GR	1:2,250 @ A3	24/02/2022

KEY

- Site boundary
- Trees and dense scrub
- Built structures
- Myotis species
- Daubenton's bat
- Whiskered bat
- Leisler's bat
- Serotine
- Soprano pipistrelle
- Common pipistrelle social call
- Common pipistrelle feeding buzz
- Common pipistrelle

Note:
Raw data provided by WSP, analysed and digitised by TEP
The locations of habitats and features are indicative

N



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Project
Brislington Meadows Ecology

Title
G7507.20.023

Drawing Number
Bat Transect Survey
Visit 2 - 22nd June 2020

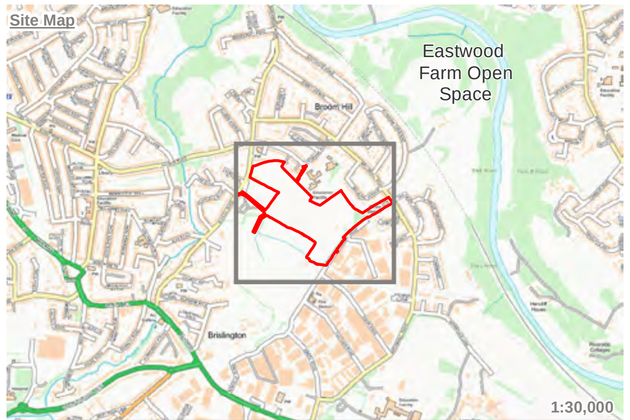
Drawn	Checked	Approved	Scale	Date
JK	CW	GR	1:2,250 @ A3	24/02/2022

KEY

- Site boundary
- Trees and dense scrub
- Built structures
- Whiskered bat
- Serotine
- Soprano pipistrelle feeding buzz
- Soprano pipistrelle
- Common pipistrelle feeding buzz
- Common pipistrelle
- Bat flightline (colour denotes bat species)

Note:
The locations of habitats and features are indicative

Site Map



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Project
Brislington Meadows Ecology

Title
G7507.20.024

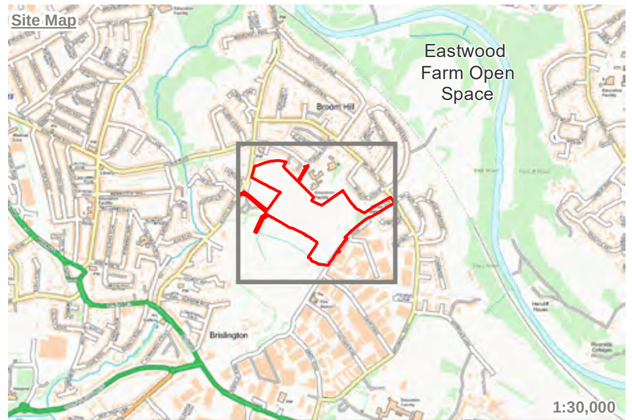
Drawing Number
Bat Transect Survey
Visit 3 - 14th July 2020

Drawn	Checked	Approved	Scale	Date
JK	CW	GR	1:2,250 @ A3	24/02/2022

KEY

- Site boundary
- Trees and dense scrub
- Built structures
- Noctule
- Leisler's bat
- Soprano pipistrelle feeding buzz
- Soprano pipistrelle
- Common pipistrelle
- Bat flightline (colour denotes bat species)

Note:
The locations of habitats and features are indicative



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Project
Brislington Meadows Ecology

Title
G7507.20.025

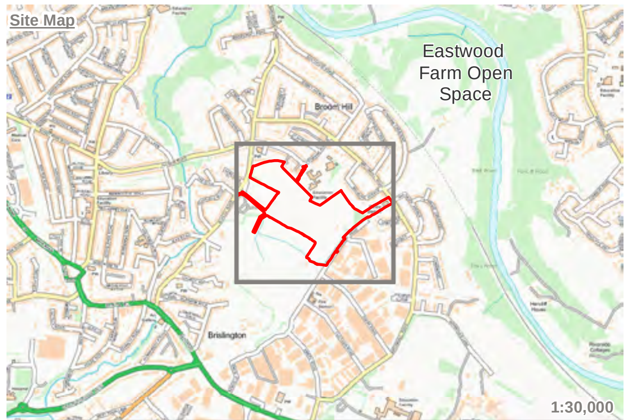
Drawing Number
Bat Transect Survey
Visit 4 - 9th August 2020

Drawn	Checked	Approved	Scale	Date
JK	CW	GR	1:2,250 @ A3	24/02/2022

KEY

- Site boundary
- Trees and dense scrub
- Built structures
- Soprano pipistrelle
- Common pipistrelle social call
- Common pipistrelle feeding buzz
- Common pipistrelle
- Bat flightline (colour denotes bat species)

Note:
The locations of habitats and features are indicative



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Project
Brislington Meadows Ecology

Title
G7507.20.026

Drawing Number
Bat Transect Survey
Visit 5 - 6th September 2020

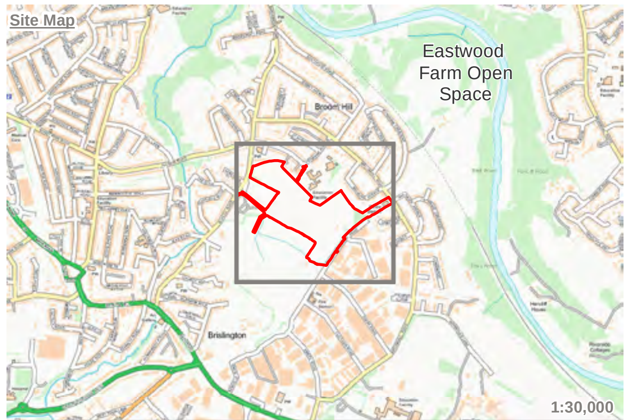
Drawn	Checked	Approved	Scale	Date
JK	CW	GR	1:2,250 @ A3	24/02/2022

KEY

- Site boundary
- Trees and dense scrub
- Built structures
- Noctule
- Soprano pipistrelle social call
- Soprano pipistrelle feeding buzz
- Soprano pipistrelle
- Common pipistrelle social call
- Common pipistrelle feeding buzz
- Common pipistrelle
- Bat flightline (colour denotes bat species)

Note:
The locations of habitats and features are indicative

Site Map



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Project
Brislington Meadows Ecology

Title
G7507.20.027

Drawing Number
Bat Transect Survey
Visit 6 - 14th October 2020

Drawn	Checked	Approved	Scale	Date
JK	CW	GR	1:2,250 @ A3	24/02/2022

KEY

Site boundary

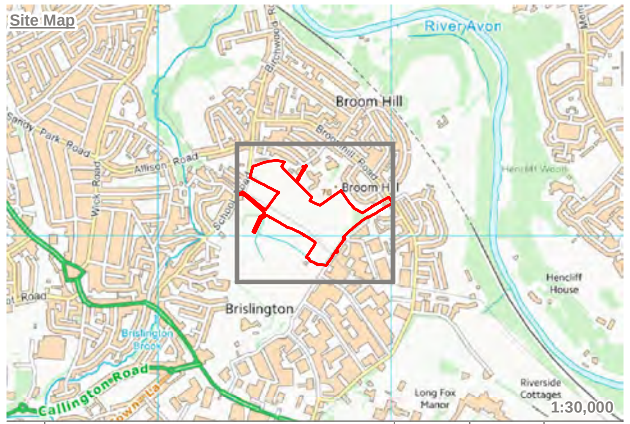
Value

Higher density of passes

Lower density of passes

Note:
Kernel density estimation (KDE) has been employed to estimate the smoothed distribution of bat activity and identify hotspots across the study area.
A search radii of 25m has been employed during such calculation.

Site Map



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Project
Brislington Meadows Ecology

Title
Bat Transect Survey - Hotspot Analysis

Drawing Number
G7507.20.028

Drawn	Checked	Approved	Scale	Date
JK	CW	GR	1:2,250 @ A3	24/02/2022

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