Appendix 7.9

BAT SURVEYS

Bat Survey Report

Broadwater Lake HWSFAC

On behalf of London Borough of Hillingdon

Issue: FV01

Issue date: 15 August 2025

Version Control

Date	Issue	Description
15/08/2025	01	Final issue

Issue to:

London Borough of Hillingdon

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Contents

1 Introduction

1.1 Background

London Borough of Hillingdon (LBH or 'the Client') instructed Harper Environmental Ltd to carry out bat surveys in support of a proposed development at Broadwater Lake, Moorhall Road, Hillingdon (hereafter called 'the Site').

The proposed works involve the redevelopment of Hillingdon Water Sports Facility and Activity Centre (HWSFAC), including ancillary amenities (such as parking and camping areas) and biodiversity enhancements. The site is located on a former mineral works and concrete batching plant where buddleia and birch have self-seeded, within Broadwater Lake. The Broadwater Sailing Club operates from the north-east corner of the lake. The central Ordnance grid reference for the Site is TQ 04678 89186. The Site boundary and zone of influence of proposed development with regard to bats (activity and roosting) is shown in Figure 1 below.

Figure 1: Site boundary showing zone of influence of development works for bat assessment purposes

1.2 Requirement for activity surveys

The Site was identified to have moderate potential to support foraging and commuting bats, since the Site is well-connected to a wider landscape including aquatic and terrestrial environments that are likely to support populations of invertebrates (as food resource for bats), with areas that

currently lack artificial lighting at night, making it likely that bats commute across the Site. In addition, a low to moderate level of activity from up to 10 species is known from previous surveys dating between 2019 and 2023[1].

The local bat assemblage is assessed as having Borough level value for foraging and commuting bats with up to 10 species of bat:

"The most commonly occurring species as reported during surveys undertaken for the Site and for HS2 was soprano pipistrelle (Pipistrellus pygmaeus), along with common pipistrelle (P. pipistrellus), Nathusius's pipistrelle (P. nathusii), brown long-eared (Plecotus auritus), Daubenton's (Myotis daubentonii) and Natterer's (M. nattereri). Serotine (Eptesicus serotinus), noctule (Nyctalus noctula), Leisler's bat (N. leisleri) and barbastelle (Barbastella barbastellus) occur occasionally.
The following additional species may also be present: whiskered bat (M. mystacinus) and Brandt's bat (M. brandtii). This is a moderately diverse bat assemblage and given the occasional presence of barbastelle, the bat assemblage is valued at the Borough level."[1]

Any of the bat species within the assemblage may pass across the Site and red line boundary area. The proposed development therefore has the potential to have a negative impact upon the local bat assemblage and the habitats within Site upon which bats are dependent.

To properly confirm and update the assessment of the local bat assemblage and the potential impacts of the proposed development, repeat bat activity surveys were recommended by Harper Environmental and were commissioned by the client for the appropriate seasonal period in 2024. The results are reported in Section 3 - Results along with a brief assessment of potential impacts in Section 6.

1.3 Requirement for roost surveys

The Site was identified to have potential to support roosting bats, based on a desk study of previous reports[1], aerial imagery and site plans which showed trees and structures within the Site. Surveys were completed in 2023, as detailed below.

Following the Ground-Level Tree Assessment (GLTA) and aerial tree inspections or endoscope surveys of trees in May 2023, no trees with moderate or high potential roost features (PRFs) were located within the zone of direct impacts of the proposed development; i.e. all trees within the zone of impact were assessed as having low, negligible or none PRFs. Under current guidance best practice guidance[2] (updated since 2023) these can now be considered 'PRF-I' or 'PRF-NONE', for which no further surveys are required.

Outside the direct impact area but within 20m of development, there were four trees with moderate potential to support roosting bats on the peninsula (south-east area of the Site). Endoscopic inspections and emergence surveys were undertaken in July, August and September 2023 on the four trees with moderate potential PRFs ('PRF-M' under new guidance) and no roosts were identified.

Three small breezeblock flat-roofed buildings and one single-storey Broadwater Sailing Club (BSC) building within the zone of impact of the proposed development were assessed as having low potential to support roosting bats in May 2023. A further building (pumphouse) was assessed as having negligible potential. As a result, one emergence survey was carried out on each low potential

1. Greengage Environmental Limited (2023) Broadwater Lake 2023 Bat Survey Report.

2 Collins, J. (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edition). The Bat Conservation Trust, London.

building between May 2023 and July 2023. No roosts were discovered and as such no further surveys were required on these buildings.

To properly confirm and update the assessment of potential bat roosts within the Site and the potential impacts of the proposed development, update bat roost assessment surveys of trees and buildings were recommended by Harper Environmental and were commissioned by the client for the appropriate seasonal period in 2025. The results are reported in Sections 3-5 along with an assessment of potential impacts.

2 Methodology

2.1 Bat activity

2.1.1 Static detector surveys

Existing bat activity data (surveys undertaken in 2021 and 2022) was noted, and habitats were assessed as having moderate suitability for bat activity (foraging and commuting).

In accordance with best practice[2] for sites with moderate suitability habitat, static detector surveys were undertaken each month from April to October 2024. Eight static detectors (Song Meter Mini Bat/Mini Bat 2) were deployed at the Site. Placements were predetermined based on a desktop study of the higher-quality foraging and commuting habitats present, as identified in aerial imagery. As a result, detectors were placed within all well-vegetated areas that could host insect populations as a food resource for bats (see Figure 2). The detectors were deployed for five nights each month. The dates and weather are shown in Table 1.

Table 1: Static detector deployment periods with weather and sunset times

Dates monitored overnight	Time of sunset (BST)	Temp at sunset (°C)	Lowest overnight temp (°C)	Rain during survey	Cloud (oktas) / Wind (mph)
26/04/2024-27/04/2024	20:16	10.8	5.9	0-2 (showers 02:00-05:00)	0-8/ 3
27/04/2024-28/04/2024	20:18	8.8	7.7	1-2 (light rain throughout)	6-8/ 3-4
28/04/2024-29/04/2024	20:20	10.2	5.7	0-1 (light showers at 01:00)	6-8/ 1-3
29/04/2024-30/04/2024	20:21	13.0	7.1	0-1 (light showers at 20:00)	0-6/ 2-3
30/04/2024-01/05/2024	20:23	15.7	10.5	0	0-2/ 1-4
21/05/2024-22/05/2024	20:56	13.9	13.0	0-2 (light showers throughout)	6-8/ 2-3
22/05/2024-23/05/2024	20:57	13.8	11.9	0-1 (light showers 21:00-22:00 only)	2-8/ 2-4
23/05/2024-24/05/2024	20:59	13.5	9.3	0	0-8/ 1-3
24/05/2024-25/05/2024	21:00	16.0	10.0	0	0-8/ 1-2
25/05/2024-26/05/2024	21:01	16.9	12.2	0-3 (rain at 02:00, light rain 03:00-05:00)	0-8/ 1-3
17/06/2024-18/06/2024	21:22	19.0	12.3	0	0-8/ 1-4
18/06/2024-19/06/2024	21:22	17.5	12.0	0	2-8/ 2-4

Dates monitored overnight	Time of sunset (BST)	Temp at sunset (°C)	Lowest overnight temp (°C)	Rain during survey	Cloud (oktas) / Wind (mph)
19/06/2024-20/06/2024	21:22	16.0	8.5	0	0-2/ 1-4
20/06/2024-21/06/2024	21:23	19.2	10.4	0	0 1-3
21/06/2024-22/06/2024	21:23	17.2	14.2	0-1 (light showers 02:00-05:00)	0-8/ 2-5
16/07/2024-17/07/2024	21:12	18.5	12.5	0-1 (very sporadic light showers)	0-8/ 1-2
17/07/2024-18/07/2024	21:11	20.1	13.2	0	0-8/ 1-3
18/07/2024-19/07/2024	21:10	23.2	14.6	0	0-2/ 0-3
19/07/2024-20/07/2024	21:08	25.0	16.9	0	0-5/ 2-4
20/07/2024-21/07/2024	21:07	20.4	17.3	0-1 (light showers at 23:00)	6-8/ 2-4
13/08/2024-14/08/2024	20:29	22.2	17.0	0-1 (showers from 04:00-05:00)	0-8/ 1-4
14/08/2024-15/08/2024	20:27	20.9	13.8	0	2-8/ 2-3
15/08/2024-16/08/2024	20:25	19.8	15.4	0-1 (light showers at 00:00, 04:00)	6-8/ 3-4
16/08/2024-17/08/2024	20:23	22.0	12.4	0	0-2/ 1-3
17/08/2024-18/08/2024	20:21	19.5	12.7	0	2-8/ 2-3
13/09/2024-14/09/2024	19:21	12.4	4.2	0	0-5/ 0-1
14/09/2024-15/09/2024	19:19	15.1	8.0	0	0/ 1-3
15/09/2024-16/09/2024	19:17	16.5	13.4	0	3-8/ 1-3
16/09/2024-17/09/2024	19:14	16.0	9.5	0	0-8/ 2-3
17/09/2024-18/09/2024	19:12	17.4	15.4	0	6-8/ 3-4
15/10/2024-16/10/2024	18:08	14.4	14.1	0-1 (light showers at 23:00-03:00)	0-8/ 3-4
16/10/2024-17/10/2024	18:06	19.0	15.8	0-1 (light showers 20:00-01:00)	6-8/ 2-4

Dates monitored overnight	Time of sunset (BST)	Temp at sunset (°C)	Lowest overnight temp (°C)	Rain during survey	Cloud (oktas) / Wind (mph)
17/10/2024-18/10/2024	18:04	13.2	8.7	0	0-8/ 1-3
18/10/2024-19/10/2024	18:02	12.3	12.0	0-1 (light showers 22:00-05:00)	5-8/ 1-3
19/10/2024-20/10/2024	18:00	10.8	10.4	0	0-8/ 1-3

The static deployment locations are shown on Figure 2 below.

Figure 2: Static detector placement (BW1 – BW8)

2.1.2 Walked transect surveys

Three night-time bat walkovers (NBW or transect surveys) were undertaken on 11th July 2024, 12th September 2024 and 22nd May 2025. The weather for the transect surveys is presented in Table 2 below.

Date	Start time	Sunset time	End time	Rain	Temperature (start / end)	Cloud / wind
11th July 2024	21:16	21:16	23:16	0	17.5 / 15.5	8 oktas / 3km/h
12th September 2024	19:24	19:24	21:24	0	10.5 / 7.5	3 oktas / 2km/h
22nd May 2025	20:57	20:57	22:57	0	12.5 / 9	2 oktas / 2km/h

The walked transect surveys commenced at sunset and continued until 2 hours after sunset. Bat echolocation calls were recorded using a handheld Batlogger S2 bat detector, which allows the surveyor to identify the bat species in the field. Three walked transects were conducted, denoted as Transect 1 (blue), Transect 2 (green) and Transect 3 (orange). The routes of each transect are shown in Figure 3 below.

Figure 3: walked transect routes, T1 (blue), T2 (green) and T3 (orange).

2.2 Tree assessments

Ground level tree assessments (GLTA) are where a suitably trained licenced or accredited ecologist undertakes a detailed inspection of a tree, using binoculars and/or a high-powered torch, to identify potential roost features (PRFs) for bats. The purpose for this is to determine the presence of bat roosting habitat and the need for further survey, namely climbed tree bat surveys or emergence surveys.

Trees that require further aerial survey following a GLTA are those with visible potential roost features likely to support multiple bats (PRF-m), or where further assessment is required (FAR) as the full area of the tree cannot be seen or assessed from the ground. Potential roost features that can only support individual or very small numbers of bats (PRF-i) do not require further survey, in line with the BCT Bat Survey Guidelines 4th Edition (2024)[3]. As such, this categorisation is used sparingly and only when certain during GLTAs.

Aerial or climbed tree bat surveys are where a tree is climbed either using ropes or a ladder, and is fully inspected at height by a suitably trained licenced or accredited ecologist, using an endoscope and torch to search for bats. Trees may also be endoscoped from the ground, where features are fully accessible without climbing.

The GLTA surveys were undertaken on 14th July 2025, and the tree climbs on 15th July 2025. Island #7 was accessed via canoe, and trees were safely climbed. Weather was fine and suitable for survey. The development zone at the peninsula plus a 20m buffer (the zone of influence or ZoI) was subject to GLTA. Every tree was assessed, however, trees assessed to have negligible potential for roosting bats were not recorded due to the density of woodland within the red line boundary. The assessment area is shown in Figure 4 below.

[3] https://www.bats.org.uk/resources/guidance-for-professionals/bat-surveys-for-professional-ecologists-good-practice-guidelines-4th-edition

Figure 4. Tree assessment area – direct impact area plus a 20m buffer

2.3 Preliminary Roost Appraisal of Buildings

The survey methodology followed the recommendations by the Bat Conservation Trust best practice guidelines[4].

Update preliminary roost appraisals (PRA) were undertaken to confirm that the status of the buildings onsite had not materially changed in terms of offering bat roosting potential. Buildings were visually inspected externally and internally using a high-powered torch for potential roost features and for signs of bats (droppings, smear marks, feeding remains) or presence of bats. Subsequently bat emergence surveys were undertaken of buildings identified to have potential to support bat roosts.

2.4 Emergence Surveys

The survey methodology followed the recommendations by the Bat Conservation Trust best practice guidelines.

Surveys commenced 15 mins before sunset and continued for 1.5h after sunset. Common pipistrelles typically emerge 20 minutes after sunset, while brown long-eared bats typically emerge 1hr 10mins after sunset. Weather conditions were suitable for surveying (calm, dry and warm) during all the surveys (see Table 2.1 below for details).

Night vision aids (NVA) were used on all surveys, including Nightfox Whisker infrared binoculars, Guide TK612 thermal scopes and a DJI Matrice 4T thermal drone. Each surveyor had an NVA to use to view the building once light levels had dropped after dusk. All footage was recorded. The equipment was monitored by the lead ecologist at intervals during the survey. Bat detectors to record bat echolocation calls included Batloggers and Echometer Touch 2. Any bat signs were noted during the surveys. Where bats were seen and an emergence was suspected, footage was reviewed subsequently.

The location of buildings surveyed is shown in Figures 5 and 6 below.

[4] Collins, J. (ed.) (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edition). The Bat Conservation Trust, London.

Figure 5. Location of Broadwater Sailing club building

Figure 6. Location of buildings at the peninsula

The weather conditions for the emergence surveys are detailed below in Table 2.1.

Date	Start time	Sunset time	End time	Rain start / end	Temperature (start / end)	Cloud / wind
6th August 2025	20:26	20:41	22:11	0 / 0	19 / 17	4oktas / 13km/h

2.5 Bat sound analysis

Following all emergence and activity surveys, recorded bat sound data was analysed to determine the level of bat activity at each location at the Site, and the species composition.

Bat sound recordings in 2024 and those for bat activity transects were analysed by an experienced bat sound specialist using Kaleidoscope software.

Bat sound recordings for 2025 emergence surveys were analysed using the BTO Pipeline[5].

2.6 Surveyors

Dr Stephanie Harper who designed and managed the surveys has been working in ecological consultancy since 2007 and holds a Natural England Level 1 Class licence for bats.

Livvy Memarzia wrote this report on behalf of Dr Stephanie Harper. She has 10 years of bat survey experience and holds a Natural England Level 2 Class licence for bats.

2.6.1 Activity and Emergence surveys

Activity and emergence surveys were undertaken by Dr Harper along with the following assistants:

- Oliver Huxley is a consultant ecologist and holds a Master's degree from the University of Leeds in Environmental Science. He has three seasons of experience in bat surveys and ecological consultancy. He holds a pilot's licence for operating the thermal drone used on the emergence survey of island #7.
- Suzanne Thompson is a consultant ecologist and has two seasons of bat survey experience. She has a BSc in Biological Sciences from Birmingham University.
- Jon Baker is a consultant ecologist with one season of experience in bat surveys. Jon has received training in bat surveys and use of equipment, and was supervised during the surveys.
- Scarlett Thompson is a trainee ecologist and has two seasons of bat survey experience.
- Ricky Hibbert is a trainee ecologist and has two seasons of experience in bat surveys.
- Mathew O'Connell and Lorelei Norman have one season of experience in bat surveys. They received training in bat surveys and use of equipment by Stephanie Harper, and were supervised during the surveys.

[5] https://www.bto.org/our-work/science/research-areas/acoustic-monitoring

2.6.2 Bat sound analysis

Gemma Abela analysed the bat activity sound recordings. She has 10 years of bat survey experience and has specialised in bat sound analysis for the last 6 years.

2.6.3 Aerial Tree Inspections

Aaron McTernan led the GLTA and tree climbing surveys. He has 5 years of professional ecological consultancy experience and holds a Level 2 class licence for bats. He has undertaken numerous tree assessments and climbs to assess for bat roost potential and identify bat roosts. Tom Harris assisted Aaron as an accredited assistant. He has 5 years of professional experience and has undertaken numerous tree assessments and climbs to assess for bat roost potential and identify bat roosts.

3 Activity Survey Results

3.1 Walked transect surveys

A minimum of five bat species were recorded along all routes (T1, T2 and T3): common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, noctule and at least one *Myotis* species. A sixth species, brown long-eared bat, was infrequently recorded along route T2.

Along route T1, soprano pipistrelle was the most frequently recorded species (62.41% of bat passes), followed by common pipistrelle (28.91% of bat passes), *Myotis* species (4.59% of bat passes), noctule (3.57% of bat passes), and Nathusius' pipistrelle (0.51% of bat passes).

Along route T2, soprano pipistrelle was the most frequently recorded species (50.58% of bat passes), followed by common pipistrelle (25.67% of bat passes), noctule (14.63% of bat passes), Nathusius' pipistrelle (6.29% of bat passes), *Myotis* species (2.18% of bat passes), and brown long-eared bat (0.64% of bat passes).

Along route T3, soprano pipistrelle was the most frequently recorded species (62.39% of bat passes), followed by common pipistrelle (22.87% of bat passes), noctule (10.34% of bat passes), *Myotis* species (2.49% of bat passes), and Nathusius' pipistrelle (1.91% of bat passes).

Overall, the level of bat activity along both routes was moderate, but activity levels were lower on route T2 (779 recorded bat passes, 23.47% of all activity) when compared with route T1 (1177 recorded bat passes, 35.43% of all activity) and T3 (1364 bat passes, 41.10%). Activity levels were similar between July, September and May (31.82%, 28.47% and 39.71% of all activity, respectively) with small seasonal variance as would be expected based on typical bat ecology.

Tables 2 to 4 below show the number of bat passes per species for the routes T1, T2 and T3 respectively, conducted in July and September 2024.

Table 2: Transect 1

T1		May Transect	July Transect	Sep Transect	Total
Species	Common pipistrelle	180	102	58	**326**
	Soprano pipistrelle	239	298	197	**743**
	Nathusius pipistrelle	0	0	6	**6**
	Noctule	22	4	16	**122**
	Brown long-eared bat	0	0	0	**0**
	Myotis spp.	20	28	6	**40**
	Total	**522**	**432**	**283**	**1176**

Table 3: Transect 2

	T2	May Transect	July Transect	Sep Transect	Total
Species	Common pipistrelle	133	45	22	**247**
	Soprano pipistrelle	96	162	136	**537**
	Nathusius pipistrelle	10	1	38	**39**
	Noctule	92	7	15	**44**
	Brown long-eared bat	0	5	0	**5**
	Myotis spp.	4	6	7	**33**
	Total	**461**	**226**	**218**	**779**

Table 4: Transect 3

T3		May Transect	July Transect	Sep Transect	Total
Species	Common pipistrelle	166	74	72	**279**
	Soprano pipistrelle	248	280	323	**699**
	Nathusius pipistrelle	0	0	26	**36**
	Noctule	102	26	13	**131**
	Brown long-eared bat	0	0	0	**0**
	Myotis spp.	6	18	10	**32**
	Total	**335**	**398**	**444**	**1364**

Charts 1 - 3 below show the spatial distribution of species recorded along route T1 in July, September and May (respectively). Charts 4 - 6 below show the spatial distribution of species recorded along route T2 in July, September and May (respectively). Charts 7 - 9 below show the spatial distribution of species recorded along route T3 in July, September and May (respectively).

Chart 1: Spatial distribution of species recorded along route T1 in July

Chart 2: Spatial distribution of species recorded along route T1 in September

Chart 3: Spatial distribution of species recorded along route T1 in May

Chart 4: Spatial distribution of species recorded along route T2 in July

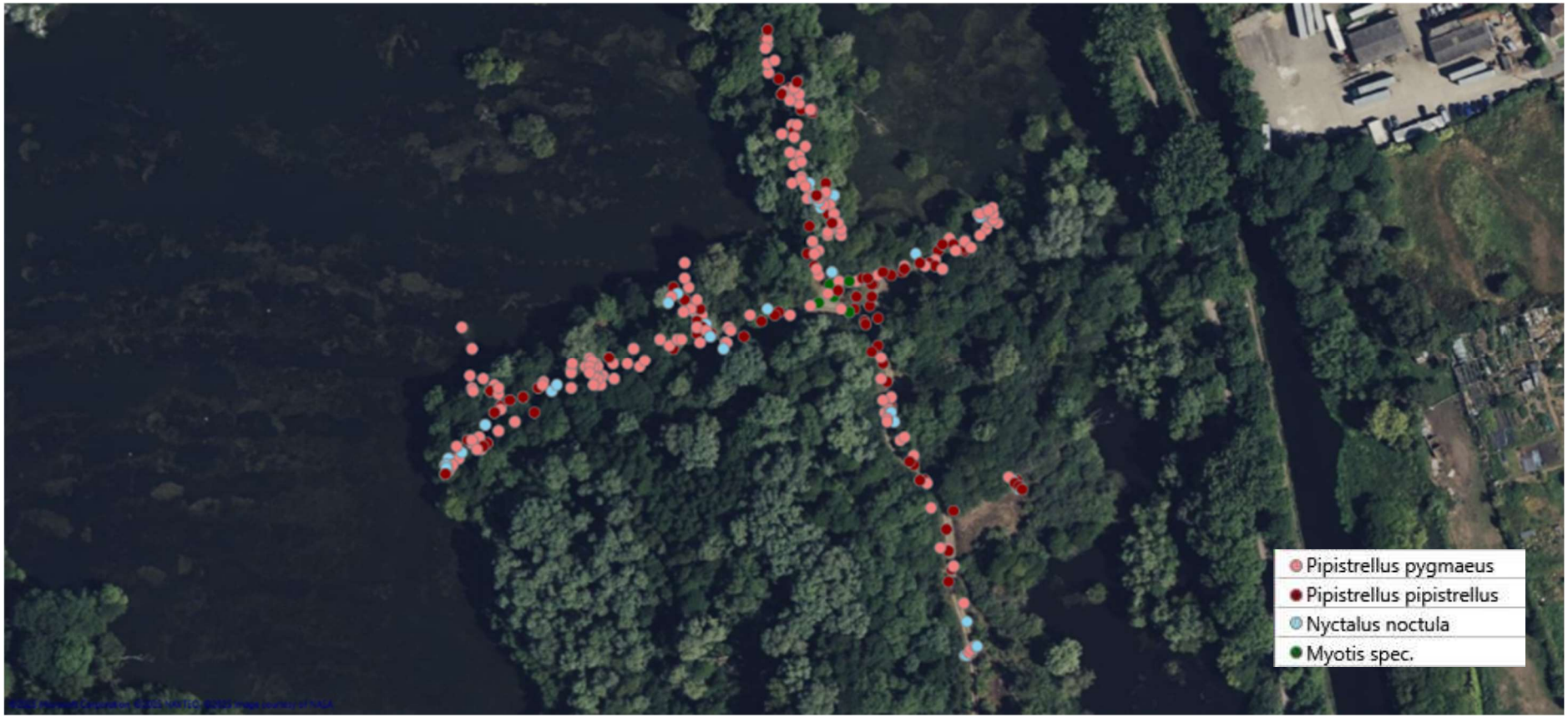
Chart 5: Spatial distribution of species recorded along route T2 in September

Chart 6: Spatial distribution of species recorded along route T2 in May

Chart 7: Spatial distribution of species recorded along route T3 in July

Chart 8: Spatial distribution of species recorded along route T3 in September

Chart 9: Spatial distribution of species recorded along route T3 in September



3.2 Static detector surveys

3.2.1 Species recorded

A minimum of seven bat species were recorded during the static detector surveys: common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, *Myotis* species, brown long-eared bat, noctule and barbastelle. Activity levels recorded are moderate. In accordance with Table 3.3 of the Bat Mitigation Guidelines 2023[6] the assemblage scores are shown in Table 4 below:

Table 2: Species assemblage scores

Species	Score	Comment
Common pipistrelle	1	
Soprano pipistrelle	1	
Nathusius' pipistrelle	3	
Myotis species	6	Assumed to be widespread species. Three species assumed present on a precautionary basis. Desk study and review of previous surveys identified Daubenton's bat and Natterer's bat.
Brown long-eared	1	
Noctule	2	
Barbastelle	4	
Total	**18**	**Local importance**

This finding is as expected and aligns with the assessment made in 2023 that the site assemblage is of Borough importance[1].

3.2.2 Timing of bat use of the site by month

The timing of the bat passes provides perspective on the habitats onsite and how different species are using them. The pivot tables in Appendix A show a breakdown of bat passes per species by time.

It should be noted that high levels of activity would be in the region of >1000 passes recorded per hour, so none of the static recording locations show high levels of activity. The data for all locations appear consistent with either sustained foraging by bats during the peak periods, or during periods of less activity the data are consistent with a small number of bats commuting or foraging for brief periods.

Numbers of bats cannot be drawn out from activity data, and activity levels are used as a proxy for the Site's importance or significance to overall bat populations, not for individual bats.

A written summary of the results is given by month below, with summary tables of the data provided in Appendix A.

6 Reason, P.F. and Wray, S. (2023). UK Bat Mitigation Guidelines: a guide to impact assessment, mitigation and compensation for developments affecting bats. Chartered Institute of Ecology and Environmental Management, Ampfield.

The tables in Appendix A show that in April, static detectors recorded a minimum of five species: soprano pipistrelle and common pipistrelle had a moderate level of activity within the site, whereas Myotis species, Nathusius' pipistrelle and noctule had a low level of activity within the site. Brown long-eared bat and barbastelle were not recorded. All bat species were recorded within 36 minutes of sunset, indicating nearby roosts for all species, which supports survey findings from previous years that bat roosts are present within the site and there are various features (trees and structures) with suitability to support roosting bats. Notably, soprano pipistrelle were recorded just one minute after sunset.

In May, static detectors again recorded a minimum of five species: soprano pipistrelle and common pipistrelle had a moderate level of activity within the site, whereas Myotis species, Nathusius' pipistrelle and noctule again had a low level of activity within the site. Brown long-eared bat and barbastelle were not recorded. All bat species were recorded within 52 minutes of sunset, with common pipistrelle, soprano pipistrelle and noctule recorded within 30 minutes of sunset. The earliest soprano pipistrelle registration was just two minutes after sunset.

A similar trend of activity was seen in June as in the two previous months. A minimum of seven species were recorded within the site: soprano pipistrelle and common pipistrelle had a moderate level of activity within the site, whereas Myotis species, Nathusius' pipistrelle and noctule had a low level of activity within the site. In June, brown long-eared bat and barbastelle were also recorded. One brown long-eared bat pass was recorded at BW4 and 25 passes were recorded at BW7. One barbastelle bat pass was recorded at BW1; this remained the only record of barbastelle at all locations and in all months, i.e. it was only recorded once during the full suite of surveys and therefore was likely commuting briefly through the site and is not reliant upon the habitats there. This is consistent with known barbastelle ecology, since this species prefers mature to ancient woodland and is very light sensitive. The barbastelle bat pass occurred at 04:50 on the 21st June 2024, 447 minutes after sunset, so nearby roosts are not indicated by this record. All other bat species were recorded within 78 minutes of sunset, with common pipistrelle, soprano pipistrelle and noctule recorded within 30 minutes of sunset. The earliest soprano pipistrelle registration was just seven minutes after sunset.

July activity levels were overall slightly lower than those observed in June. Static detectors recorded a minimum of six species: soprano pipistrelle had a lower but still moderate level of activity within the site, whereas common pipistrelle, Myotis species, Nathusius' pipistrelle and noctule again had a low level of activity within the site. Brown long-eared bat had a very low level of activity within the site (only 2 passes at BW6). Barbastelle was not recorded. All bat species recorded were first registered within 60 minutes of sunset, with common pipistrelle, soprano pipistrelle and noctule recorded within 30 minutes of sunset. Again, soprano pipistrelle was recorded one minute after sunset.

In August, static detectors recorded a minimum of five species: soprano pipistrelle had a moderate level of activity within the site, whereas common pipistrelle, Myotis species and Nathusius' pipistrelle and had a low level of activity within the site. Brown long-eared bat had a very low level of activity within the site (only 1 pass at BW8). Barbastelle was not recorded. All bat species recorded were first registered within 32 minutes of sunset, apart from brown long-eared bat (386 minutes after sunset). An interesting trend was seen in August for noctule; there was a significant increase in activity within this month compared to all others (52.23% of all noctule passes occurred in August, with the remaining 47.77% of noctule passes spread across the six other months). Activity peaked on the evening of 14th August 2024, which is also when the earliest recording of noctule was made at 20:57 (30 minutes after sunset) at the following locations: BW2, BW3, BW7 and BW8. Since these recordings were made concurrently, it is unlikely that one or two bats were able to traverse such a large portion of the site within this time, and it is possible that a group of bats may have been

swarming within the site or travelling to a swarming site nearby. This social behaviour is generally limited to August and September which aligns well with the sudden peak of activity in August for this species.

Overall bat activity levels dropped in September when compared to the previous month. Static detectors recorded a minimum of six species: soprano pipistrelle, common pipistrelle, Nathusius' pipistrelle and noctule all had a low level of activity within the site. Myotis species and Brown long-eared bat had very low levels of activity within the site (21 passes and 2 passes, respectively). Barbastelle was not recorded. All bat species recorded were first registered within 51 minutes of sunset (apart from brown long-eared bat at 397 minutes after sunset), with common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle and noctule recorded within 30 minutes of sunset. Again, soprano pipistrelle was recorded less than one minute after sunset.

October activity levels were low to very low across all species, reflecting a reduced usage of the site as bats move towards hibernation sites. Static detectors recorded a minimum of five species: soprano pipistrelle, common pipistrelle, Myotis species, Nathusius' pipistrelle, noctule and Myotis species. Brown long-eared bat and barbastelle were not recorded. All bat species recorded were first registered within 44 minutes of sunset. Noctule was first recorded 30 minutes prior to sunset, indicating a roost within very close proximity to BW1.

3.2.3 Limitations

Unfortunately, the detector at BW7 failed to record during the survey period in September due to a microphone fault, which was remedied before October. Despite this, when averaged across all months, activity levels were generally highest at BW7 when compared to all other locations.

Initially 9 statics were placed onsite in April and May however from June locations were consolidated into 8 locations. The consolidated static locations were very close together so the data were considered together as representative of the same location.

3.3 Species accounts

The activity levels for each species during both static detector and transect surveys are discussed below, along with their use of the Site.

3.3.1 Common pipistrelle

Common pipistrelle was the second-most frequently recorded species across all transect surveys, and this species was recorded along the majority of the transect routes (i.e. consistently across the Site).

This species was second-most frequently recorded species overall during static detector surveys, and this species was recorded at all detector locations during all months (total 62305 passes), with the highest level of overall activity recorded at BW7 (average 2519.5 bat passes per month).

Both static detector and transect surveys recorded common pipistrelle during all months of the survey period.

The earliest common pipistrelle pass was recorded 10 minutes after sunset (21:32, 17th June) at BW1. Based on expected roost emergence times compared with the survey results, this common pipistrelle record likely aligns with a bat roosting within the site or within close proximity to the site.

3.3.2 Soprano pipistrelle

Soprano pipistrelle was the most frequently recorded species on all transect surveys, and this species was recorded along the majority of the transect routes (i.e. consistently across the Site).

This species was also the most frequently recorded species overall during static detector surveys, and this species was recorded at all detector locations during all months (total 118764 passes), with the highest level of overall activity recorded at BW7 (average 4250.8 bat passes per month).

Both static detector and transect surveys recorded soprano pipistrelle during all months of the survey period.

The earliest soprano pipistrelle pass was recorded less than one minute after sunset (19:17, 15th September) at BW8. Based on expected roost emergence times compared with the survey results, this soprano pipistrelle record likely aligns with a bat roosting within the site.

3.3.3 Noctule

Noctule was recorded on all transects in all months (between four and 26 passes per survey, average 13.5 passes per survey). Noctule records from the transect surveys are spread along the majority of the transect routes.

This species was frequently recorded during static detector surveys, and this species was recorded at all detector locations during all months (total 5909 passes), with the highest level of overall activity recorded at BW7 (average 300.2 bat passes per month) followed by BW1 (average 219.0 bat passes per month).

Both static detector and transect surveys recorded noctule during all months of the survey period.

The earliest noctule pass was recorded 30 minutes before sunset (17:38, 15th October 2024) at BW1. Based on expected roost emergence times compared with the survey results, this noctule record likely aligns with a bat roosting within the site.

In addition, the significant increase in noctule records in August (including multiple concurrent records at 20:57 which continue in increased frequency throughout the night, when compared to other months) may indicate social swarming of noctules within the site or in close proximity to the site.

3.3.4 Myotis sp.

Myotis bats were recorded on all transects in all months (between six and 28 passes per survey, average 12.5 passes per survey). Myotis records from the transect surveys are spread along the majority of the transect routes.

This genus (species group) was frequently recorded during static detector surveys; with recordings at most detector locations during most months (total 5896 passes), with the highest level of overall activity recorded at BW8 (average 413.9 bat passes per month) followed by BW7 (average 386.5 bat passes per month).

The earliest Myotis sp. pass was recorded 30 minutes after sunset (20:53, 4th April) at BW5. Based on expected roost emergence times compared with the survey results, this Myotis sp. record likely aligns with a bat roosting within the site or within close proximity to the site.

3.3.5 Nathusius' pipistrelle

Nathusius' pipistrelle was recorded on all transects September (between six and 38 passes on each transect). Nathusius' pipistrelle call was only recorded along route T2 (July and May transects).

This species was recorded during all months of static detector surveys, at most locations (total 5940 passes), with the highest level of overall activity recorded at BW3 (average 200.3 bat passes per month) followed by BW7 (average 185.2 bat passes per month).

The earliest Nathusius' pipistrelle pass was recorded 16 minutes after sunset (18:24, 15th October 2024) at BW8. Based on expected roost emergence times compared with the survey results, this record likely aligns with a bat roosting within the site or in close proximity to the site.

3.3.6 Brown long-eared bat

Brown long-eared bat was recorded sporadically and in low numbers. Only one walked transect survey recorded brown long-eared bat – 5 passes on T2 in July. This species was not recorded on T2 in September or May and was not recorded in any month on T1 or T3.

Brown long-eared bat was recorded by static detectors in very low numbers (one to 25 passes per month, average 7.75 passes per month) at BW4, BW5, BW6, BW7 and BW8 between June and September. However, it should be noted that brown long-eared bat has a very quiet call and is usually under-represented using acoustic monitoring methods.

The earliest record of brown long-eared bat was at 60 minutes after sunset, which does not strongly indicate a roost within the site (although it does not rule out the possibility, due to brown long-eared bat's ability to emerge from roosts silently or without echolocating).

3.3.7 Barbastelle

The walked transects did not identify barbastelle. Static monitoring recorded barbastelle only once, at 04:50 on the 21st June 2024 (at BW1, 447 minutes after sunset). Barbastelle populations are unlikely to be reliant upon this site for roosting, commuting, foraging or socialising, however their presence should be acknowledged even as a rare visitor to the site since they are a conservation priority on a local and national scale, due to their vulnerability to habitat loss and high sensitivity to artificial lighting at night[7].

3.4 Activity summary

Overall, there was low to moderate bat activity across the survey area recorded from both activity survey types, across the breadth of the site. The highest level of activity was observed at BW7, but activity was reasonably consistent across all locations. The most frequently recorded species were soprano pipistrelle and common pipistrelle, with frequent use of the site by noctule, Myotis sp. and Nathusius' pipistrelle. Brown long-eared bat infrequently uses the site but may be under recorded due to the limitations of acoustic monitoring. Barbastelle was only recorded once throughout the entire survey period, making it a rare visitor to the site, but this species should be noted as vulnerable to habitat loss and severance, including by artificial lighting at night, which will also have at least some detrimental effects on all species when foraging, commuting and socialising.

7 Bat Conservation Trust, *Barbastelle*, https://www.bats.org.uk/about-bats/what-are-bats/uk-bats/barbastelle

4 Building Survey Results

4.1 Preliminary Roost Appraisal

The photos of the buildings are presented below along with descriptions of potential roost features.

4.1.1 Substation

The building was set within an area cluttered by vegetation, with buddleia branches on the roof and growing close to the sides. Careful part-clearance by hand was undertaken by an ecologist to better assess and view the building. The building was not insulated and with corrugated metal roof. These factors reducing likelihood of use of PRFs by bats. No signs of bats were found. Overall the building was assessed to have low potential to support bat roosts.

Gaps in masonry

Gap between fascia and wall

Gaps above doors – audible hum of equipment.

Gaps between brick and roof

	
Large crack in masonry	*Gaps between brick and roof*

4.1.2 Fisherman's buildings

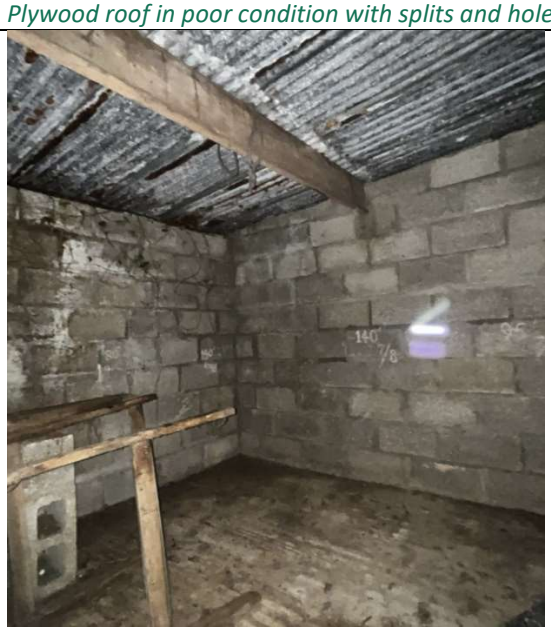
These two buildings had leaking roofs, one with a large hole in the plywood liner which was hanging down. At different times of the year are very damp depending on rainfall. On the exterior, roofs were laden with branches and vegetation growing all over. One smelled strongly of diesel. No signs of bats were found. Overall the building was assessed to have low potential to support bat roosts.

	
Gaps between roof and brickwork	*Crevices within roof materials visible, accessible from exterior*

Branches on roof concealing possible access points

Plywood roof in poor condition with splits and holes

Ivy covering over potential roost features



Gaps between roof and brickwork

Holes in roof and gaps between roof and bricks allowing bats access

Ivy and tree branches covering over potential roost features

4.1.3 Pumphouse

The building was fully covered with vegetation which had to be carefully part-cleared by hand to inspect the building. Despite this it was in good condition structurally. No features suitable for bats were identified on the interior or exterior. The building lacked thermal stability and was fully open to the elements. An inspection found no bats present, or signs of use by bats. Overall the building was assessed to have negligible potential to support bat roosts.

External wall in good condition

Roof in good condition, no crevices

As above

Vegetation cover of the building, very cluttered reducing access to bats

4.1.4 Broadwater Sailing Club Building

Briadwater Sailing Club building (BSC) – at each end, wooden cladding over prefabricated concrete panels providing shallow cavity however very drafty with large access gaps and no visible crevices features or features that bats may roost upon. Low potential on a precautionary basis.

At each end, the building had wooden cladding over prefabricated concrete panels providing a shallow cavity however this was very drafty with large access gaps and no visible crevices features or features that bats may roost upon. Despite its age the building was in good condition with no rot or gaps around windows or on the roof. The building was assessed as having low potential to support bat roosts.

4.1.5 Summary

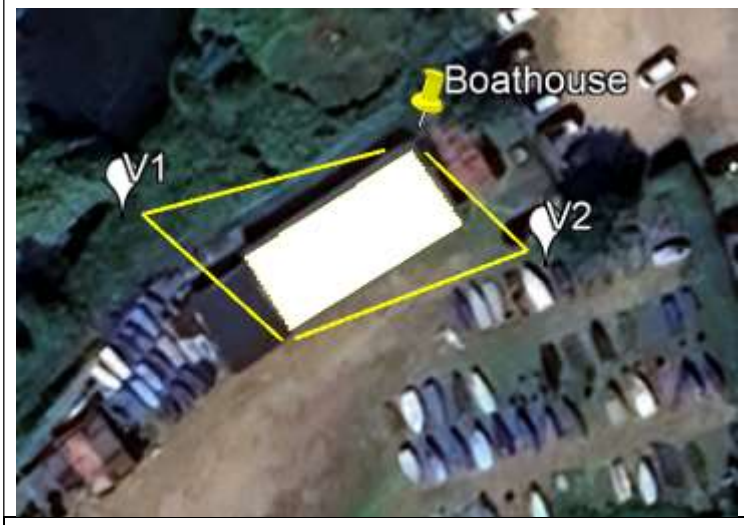
All buildings except the pumphouse were assessed to have low potential. The pumphouse was identified to have negligible potential as there were no potential roost features. In accordance with best practice guidance, a single emergence survey is required for low potential buildings. No further surveys are required for buildings with negligible potential.

4.2 Emergence surveys

Emergence surveys of the buildings were undertaken on 6th August 2025. Vantage points for the emergence surveys of the low potential buildings are shown below, along with the end of survey vantage points. No bat emergences were recorded during any of the surveys. Observations of bats during the surveys were made:

- Boathouse: low levels of commuting and foraging throughout the survey by common pipistrelle.
- Substation: only one common pipistrelle pass over the building for the whole survey.
- Fisherman's buildings: low levels of commuting and foraging by common pipistrelle and noctule.

Vantage points for substation and fishermen's buildings



BSC vantage points

Fisherman's workshop and storage shed – west aspect

Fisherman's workshop – east aspect

Fisherman's storage shed – east aspect

Substation – north aspect

Substation – south and west aspect

Boathouse – front and east aspect

Boathouse- rear and west vantage point

5 Tree Survey Results

5.1 Ground level tree assessments

Appendix B Table B.1 provides the detailed GLTA tree data. 55 trees were recorded during the GLTA survey after being assessed to have potential to support roosting bats or requiring further assessment to determine their potential. A summary of the survey results is provided in Table 5.1.

Table 5.1 Summary of tree suitability to support bat roosts after GLTA

Total	Confirmed	PRF-m	FAR	PRF-i	Negligible
55	0	13	6	30	6

Confirmed: a confirmed bat roost.

PRF-m: PRFs with suitability as bat roosts for multiple bats - further assessment required.

PRF-i: PRFs with limited suitability for single bats only - no further assessment required (low potential under the previous survey categorisation system).

FAR: Further Assessment Required (could not be climbed or fully inspected).

Negligible: no features present that may comprise PRFs.

5.2 Aerial tree inspection

Following the GLTA, 13 trees (PRF-M) and six trees (FAR) were climbed and inspected. A summary of the survey results is provided in Table 5.2 below. Appendix B Table B.2 provides the detailed tree data. Appendix B Table B.3 provides the individual PRF inspection details.

Table 5.2 Summary of tree suitability to support bat roosts after climbed tree inspection

Total	Confirmed	PRF-m	PRF-i	Negligible
19	0	9	8	2

5.3 Impact Assessment informing further survey requirement

Following the tree climbs, nine trees within the ZoI were classified as PRF-M meaning that these trees had features that could support bat roosts. The trees are shown in Figure 5.1 below with direct and indirect impact areas indicated. All the trees are located within areas where no tree felling will occur, and retained trees will be protected in accordance with BS5837:2012. Embedded mitigation for the proposed development ensures no light spill onto natural habitats in accordance with best practice guidance, through preparation of a lighting scheme that uses bespoke measures to reduce light spill to zero. Therefore as there is no potential for impacts or significant effects, no further surveys are required. Tree 632 was previously subject to emergence surveys in 2023 by Greengage (referenced as T3) and no roosts were identified from this assessment. This tree now falls within an area where planting will be strengthened with no tree removals.

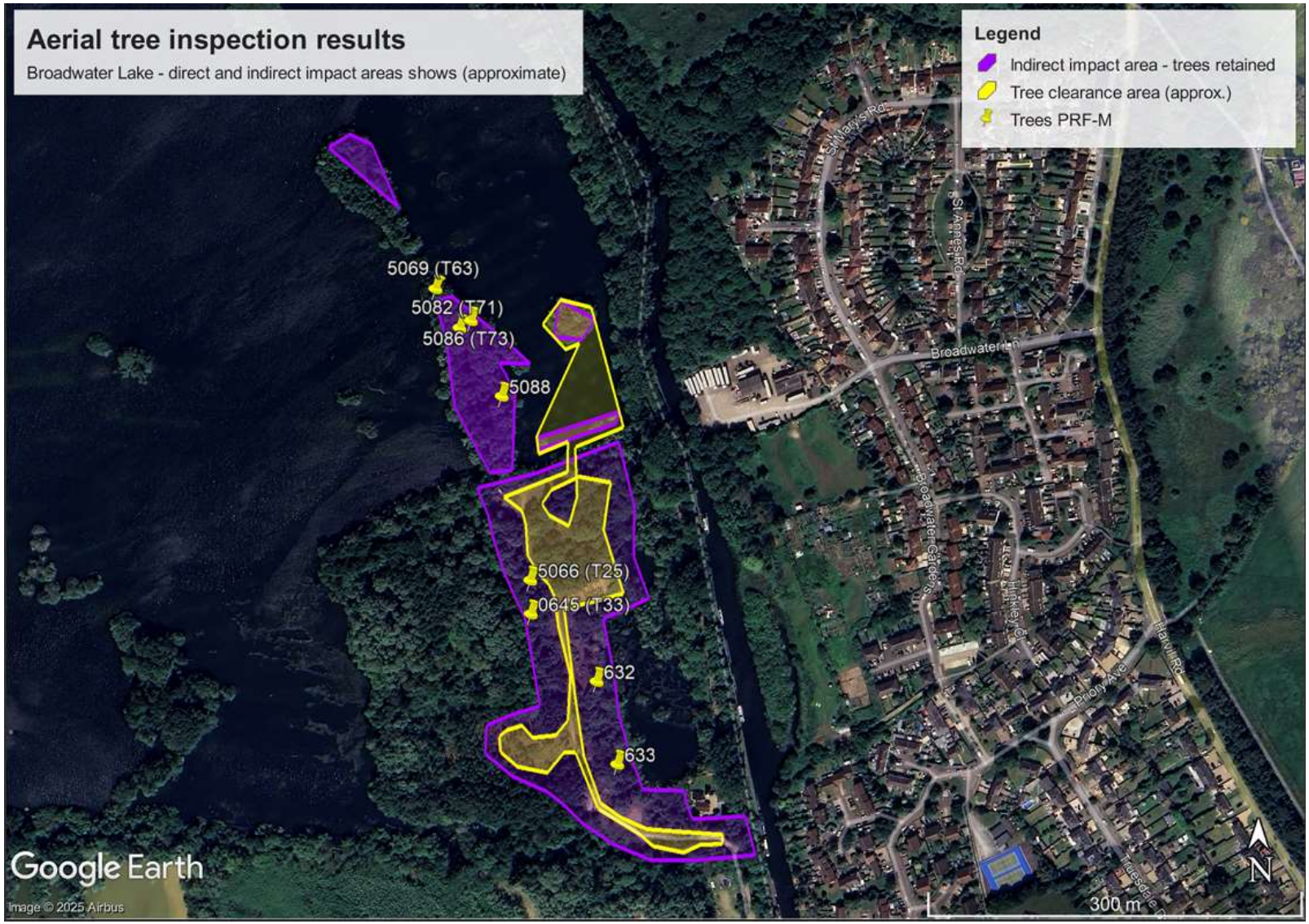


Figure 5.1 Aerial tree inspection results

6 Conclusion and Recommendations

6.1 Summary of results

No roosts have been identified within buildings at the site, and nine trees with potential roost features were all located 10m or more outside the direct impact area of development proposals.

Bat activity levels were low to moderate with a Borough important assemblage using the site and surrounds.

The proposed development has been designed to avoid, mitigate and enhance for all species recorded as important ecological features for the site, including bats. A summary is provided below.

6.2 Embedded (designed-in) mitigation

Designed-in mitigation measures for the proposed development include the following:

- minimal clearance of trees from the peninsula in the south-eastern area of the Site, and no clearance of any trees with potential roost features (i.e. suitability for roosting bats), with a protected woodland zone which will have no tree clearance at all;
- retained habitats and trees will be protected by barriers prior to construction works occurring as detailed within a CEMP, and trees will be protected in accordance with BS5837:2012 Trees in relation to construction.
- measures set out within a CEMP ensure that protected species checks will be made prior to any works occurring. An Ecological Clerk of Works (ECoW) by a suitably qualified ecologist will be deployed during the construction stage on a precautionary basis, to ensure that trees are felled and buildings are demolished in a sensitive manner which would allow works to immediately pause in the unlikely event that bats are encountered. If this were to occur, a mitigation licence would need to be sought from Natural England in order to allow works to proceed lawfully;
- The lighting scheme for the Site has been designed in accordance with best practice to minimise impacts to foraging bats.[8]

Following implementation of the above designed-in mitigation, no impacts to trees suporting potential roost features or bat roosts are predicted.

6.3 Enhancement measures benefitting bats

It is noted that proposed enhancements within the Site include, but are not limited to:

- additional tree, shrub and grassland planting along the northern perimeter of the Site to make general ecological enhancements for bats but also for invertebrates, nesting birds, hedgehog and other species;
- native planting and habitat management which encourages invertebrate populations (particularly flies, moths and beetles) to increase the provision of foraging resource within the site for bats;

[8] Bats and Artificial Lighting at Night Guidance Note, Institution of Lighting Professionals, 2023.

- planting of submerged willow trees in the south-western area, primarily to provide screening and shelter for bird species but also likely to improve habitat connectivity for foraging bats and to improve suitability for invertebrates and therefore provide additional feeding provision for bats;
- improved management plan with some additional habitat planting on the peninsula so that the overall condition (density, canopy cover, understorey) of the woodland is not degraded in the short-term and is improved in the long-term;
- bat boxes on trees within the peninsula and along the access road to the BSC;
- change in human usage of the Site (sailing areas, angling areas) to concentrate activities within certain zones and ensure others are left undisturbed as much as possible, to alleviate the pressure of human disturbance upon wildlife within the Site.

These enhancements are likely to improve the quality and connectivity of habitats within the Site for foraging and commuting bats, and provide additional roosting opportunities for bats. The enhancements are set out within an Outline Mitigation and Ecological Management Plan (MEMP) and within detailed landscaping proposals for the proposed development.

6.4 Additional measures

Additional enhancement measures, such as integrated bat bricks or bespoke bat roost provision could be considered to increase the availability of roosting locations for bats within the site.

6.5 Conclusion

It is concluded that there is limited potential for the proposed development to impact upon roosting, commuting, foraging and socialising bats.

This is due to the lack of roosts within the direct impact zone of the Site, meaning roosts will not be lost as a result of the proposed development, the embedded mitigation measures that will ensure no potential roost features identified within trees are damaged or lost, and the development proposals which allow for general maintenance and enhancement of suitable habitats for foraging, commuting and socialising bat populations.

6.6 Presence of edible dormouse

Edible dormouse *Glis glis* was recorded within basal tree cavities and within a bat box (tree 5088). This is classified as an invasive non-native species and listed on Schedule 9 of the Wildlife and Countryside Act 1981.

Appendix A Summary Tables (Statics)

Species:	CPIP								
	April	May	June	July	August	September	October	Total	Avg
BW1	644	2611	122	18	93	379	176	4043	577.6
BW2	3251	1144	344	161	816	1204	57	6977	996.7
BW3	1329	332	176	144	459	414	60	2914	416.3
BW4	2256	1714	266	31	468	220	12	4967	709.6
BW5	1805	433	375	163	520	400	144	3840	548.6
BW6	3423	1790	346	85	106	632	168	6550	935.7
BW7	4284	1116	2001	3406	4223	N/A	87	15117	2519.5
BW8	867	3952	779	989	1334	428	23	8372	1196.0
BW9	3137	2551	-	-	1409	1641	787	9525	1905.0
Total	20996	15643	4409	4997	9428	5318	1514	**62305**	

Species:	SPIP								
	April	May	June	July	August	September	October	Total	Avg
BW1	542	2482	1648	82	147	481	283	5665	809.3
BW2	6085	3342	578	483	3040	2588	642	16758	2394.0
BW3	3655	1926	680	1295	996	676	227	9455	1350.7
BW4	3443	453	339	155	1221	1224	95	6930	990.0
BW5	5606	427	796	691	1156	1270	52	9998	1428.3
BW6	3778	1532	434	490	726	746	194	7900	1128.6
BW7	4862	2423	2284	6837	8619	N/A	480	25505	4250.8
BW8	2823	3362	2131	6603	3660	2143	113	20835	2976.4
BW9	5586	1643	-	-	4962	2210	1317	15718	3143.6
Total	36380	17590	8890	16636	24527	11338	3403	**118764**	

Species:	NNOC								
	April	May	June	July	August	September	October	Total	Avg
BW1	84	56	245	339	747	41	21	1533	219.0
BW2	356	76	251	167	430	48	30	1358	194.0
BW3	146	31	54	357	385	18	13	1004	143.4
BW4	28	133	377	102	330	47	20	1037	148.1
BW5	181	72	213	143	252	48	68	977	139.6
BW6	162	31	94	85	255	10	10	647	92.4
BW7	795	45	435	100	418	N/A	8	1801	300.2
BW8	104	34	151	134	268	21	7	719	102.7
BW9	220	111	-	-	1	89	37	458	91.6
Total	2076	589	1820	1427	3086	322	214	**5909**	

Species:	NPIP								
	April	May	June	July	August	September	October	Total	Avg
BW1	60	1	19	8	19	215	9	331	47.3
BW2	444	5	16	14	36	121	2	638	91.1
BW3	45	3	17	100	60	1173	4	1402	200.3
BW4	676	21	17	2	106	75	5	902	128.9
BW5	128	13	18	13	37	64	5	278	39.7
BW6	75	8	0	0	52	61	0	196	28.0
BW7	962	5	40	42	40	N/A	22	1111	185.2
BW8	228	39	34	8	27	17	14	367	52.4
BW9	24	9	-	-	97	254	331	715	143.0
Total	2642	104	161	187	474	1980	392	**5940**	

Species:	PAUR								
	April	May	June	July	August	Septembe	October	Total	Avg
BW1	0	0	0	0	0	0	0	0	0.0
BW2	0	0	0	0	0	0	0	0	0.0
BW3	0	0	0	0	0	0	0	0	0.0
BW4	0	0	1	0	0	0	0	1	0.1
BW5	0	0	0	0	0	2	0	2	0.3
BW6	0	0	0	2	0	0	0	2	0.3
BW7	0	0	25	0	0	N/A	0	25	4.2
BW8	0	0	0	0	1	0	0	1	0.1
BW9	0	0	-	-	0	0	0	0	0.0
Total	0	0	26	2	1	2	0	**31**	

Species:	MYOSP								
	April	May	June	July	August	Septembe	October	Total	Avg
BW1	19	20	9	0	0	0	0	48	6.9
BW2	5	20	28	45	36	0	1	135	19.3
BW3	10	2	16	23	31	5	6	93	13.3
BW4	4	8	49	19	11	2	5	98	14.0
BW5	8	9	20	10	11	0	0	58	8.3
BW6	28	3	1	3	9	0	0	44	6.3
BW7	19	664	25	837	679	N/A	95	2319	386.5
BW8	2641	9	70	84	91	2	0	2897	413.9
BW9	14	9	-	-	49	12	120	204	40.8
Total	2748	744	218	1021	917	21	227	**5896**	

Species:	BBAR								
	April	May	June	July	August	Septembe	October	Total	Avg
BW1	0	0	1	0	0	0	0	1	0.1
BW2	0	0	0	0	0	0	0	0	0.0
BW3	0	0	0	0	0	0	0	0	0.0
BW4	0	0	0	0	0	0	0	0	0.0
BW5	0	0	0	0	0	0	0	0	0.0
BW6	0	0	0	0	0	0	0	0	0.0
BW7	0	0	0	0	0	N/A	0	0	0.0
BW8	0	0	0	0	0	0	0	0	0.0
BW9	0	0	-	-	0	0	0	0	0.0
Total	0	0	1	0	0	0	0	**1**	

Grand totals by month	**64842**	**34670**	**15525**	**24270**	**38433**	**18981**	**5750**	**198846**

A.1: Summary of all bat records, arranged by species, across all months and locations

Species key
-CPIP: Common pipistrelle
-SPIP: Soprano pipistrelle
-NNOC: Noctule
-NPIP: Nathusius' pipistrelle
-PAUR: Brown long-eared bat
-MYOSP: Myotis sp.
-BBAR: Barbastelle

Dark orange: greatest activity
Light orange: second-greatest activity
Light blue: least activity

Earliest recording for each species each month									
Location	Kit ID	Month	Date	Night	Sunset	Time	Minutes After S	Species	Passes
7	484	June	21/06/24	4	09:23:00 PM	04:50:00 AM	447	**Barb**	1
7	484	July	19/07/24	4	09:08:00 PM	10:08:00 PM	60	**BLE**	1
7	484	June	21/06/24	5	09:23:00 PM	10:41:00 PM	78	BLE	2
8	670	August	15/08/24	2	08:27:00 PM	02:53:00 AM	386	BLE	1
5	474	September	17/09/24	4	07:14:00 PM	01:51:00 AM	397	BLE	1
5	474	April	4/30/2024	5	08:23:00 PM	08:53:00 PM	30	**Myo**	1
2	475	August	15/08/24	3	08:25:00 PM	08:57:00 PM	32	Myo	1
1	852	June	17/06/24	1	09:22:00 PM	10:03:00 PM	41	Myo	1
9	2278	October	19/10/24	5	06:00:00 PM	06:44:00 PM	44	Myo	1
2	475	May	25/05/24	5	09:01:00 PM	09:51:00 PM	50	Myo	1
1	852	July	20/07/24	5	09:07:00 PM	09:58:00 PM	51	Myo	1
9	2278	September	13/09/24	1	07:21:00 PM	08:12:00 PM	51	Myo	1
1	852	October	15/10/24	1	06:08:00 PM	05:38:00 PM	-30	**Noct**	1
1	852	July	18/07/24	3	09:10:00 PM	09:12:00 PM	2	Noct	1
4	483	September	15/09/24	3	07:17:00 PM	07:23:00 PM	6	Noct	1
5	474	September	15/09/24	3	07:17:00 PM	07:23:00 PM	6	Noct	1
4	483	April	4/28/2024	3	08:20:00 PM	08:37:00 PM	17	Noct	1
1	852	June	17/06/24	1	09:22:00 PM	09:51:00 PM	29	Noct	1
5	474	May	24/05/24	4	09:01:00 PM	09:30:00 PM	29	Noct	1
2	475	August	14/08/24	2	08:27:00 PM	08:57:00 PM	30	Noct	2
3	537	August	14/08/24	2	08:27:00 PM	08:57:00 PM	30	Noct	1
7	484	August	14/08/24	2	08:27:00 PM	08:57:00 PM	30	Noct	1
8	670	August	14/08/24	2	08:27:00 PM	08:57:00 PM	30	Noct	1
8	670	August	14/08/24	2	08:27:00 PM	08:57:00 PM	30	Noct	1
8	670	October	15/10/24	1	06:08:00 PM	06:24:00 PM	16	**Npip**	1
9	2278	September	15/09/24	3	07:17:00 PM	07:35:00 PM	18	Npip	1
2	475	August	14/08/24	2	08:27:00 PM	08:50:00 PM	23	Npip	1
8	670	August	17/08/24	5	08:21:00 PM	08:44:00 PM	23	Npip	1
7	484	April	4/26/2024	1	08:16:00 PM	08:52:00 PM	36	Npip	1
1	852	June	18/06/24	2	09:22:00 PM	10:10:00 PM	48	Npip	3
8	670	May	25/05/24	5	09:01:00 PM	09:53:00 PM	52	Npip	1
1	852	July	20/07/24	5	09:07:00 PM	10:03:00 PM	56	Npip	1
1	852	June	17/06/24	1	09:22:00 PM	09:32:00 PM	10	**P45**	1
4	483	April	4/29/2024	4	08:21:00 PM	08:33:00 PM	12	P45	1
8	670	May	21/05/24	1	08:56:00 PM	09:09:00 PM	13	P45	1
4	483	September	15/09/24	3	07:17:00 PM	07:34:00 PM	17	P45	1
1	852	July	20/07/24	5	09:07:00 PM	09:24:00 PM	17	P45	1
6	2281	August	15/08/24	3	08:25:00 PM	08:44:00 PM	19	P45	1
9	2278	October	15/10/24	1	06:08:00 PM	06:28:00 PM	20	P45	1
8	670	September	15/09/24	3	07:17:00 PM	07:17:00 PM	0	**P55**	2
1	852	July	20/07/24	5	09:07:00 PM	09:08:00 PM	1	P55	1
7	484	April	4/30/2024	5	08:23:00 PM	08:24:00 PM	1	P55	1
8	670	May	23/05/24	3	08:59:00 PM	09:01:00 PM	2	P55	1
1	852	June	17/06/24	1	09:22:00 PM	09:29:00 PM	7	P55	1
8	670	October	15/10/24	1	06:08:00 PM	06:17:00 PM	9	P55	3
8	670	August	13/08/24	1	08:29:00 PM	08:44:00 PM	15	P55	1

A.2: Earliest bat record for each species within each recording period

A.2: Overall earliest bat record for each species

Earliest recording per species across all locations and across all months									
Location	Kit ID	Month	Date	Night	Sunset	Time	Minutes After SS	Species	Passes
7	484	June	21/06/2024	4	09:23:00 PM	04:50:00 AM	447	Barb	1
7	484	July	19/07/2024	4	09:08:00 PM	10:08:00 PM	60	BLE	1
5	474	April	4/30/2024	5	08:23:00 PM	08:53:00 PM	30	Myo	1
1	852	October	15/10/2024	1	06:08:00 PM	05:38:00 PM	-30	Noct	1
8	670	October	15/10/2024	1	06:08:00 PM	06:24:00 PM	16	Npip	1
1	852	June	17/06/2024	1	09:22:00 PM	09:32:00 PM	10	P45	1
8	670	September	15/09/2024	3	07:17:00 PM	07:17:00 PM	0	P55	2

Appendix B Tree survey data

Table B.1 Full results of ground level tree inspections.

Table B.2 Tree climb results.

Table B.3 PRF inspection results.

Table B.1 Full results of ground level tree inspections

Tree ID/Tag	Overall categorisation	Tree species	Latitude	Longitude	GR Accuracy	DBH	Tree height (m)	Tree life stage	Other comments
T81	PRF-i	Willow sp.	51.59395	-0.490349	13	60	14	Mature	1) 3m S Snapped out stem with fissures
0662 (T79)	FAR	Willow sp.	51.59373	-0.490423	5	50	14	Mature	1) FAR: snapped out stem, able to identify cavity on top side
T77	PRF-i	Willow sp.	51.593728	-0.490559	11	35	8	Mature	1) PRF-I: 2.5m E, cavity within open vertical split offers limited cover
5100 (T75)	PRF-m	Willow sp.	51.593819	-0.490507	9	55	12	Mature	1) PRF-M: 2.5m W, decayed heartwood in callus wound, cavity leads vertically
T16	PRF-i	Crack willow	51.593899	-0.490241	3	50	14	Mature	Fresh transerverse snap offers exposed fibrous cracks for individual bats
T14	PRF-i	Crack willow	51.593897	-0.490273	4	35	12	Mature	Transerverse snap offers some small and shallow crack for individual bats
5088	PRF-m	White willow	51.593594	-0.490074	3	45	13	Mature	Bat box on stem at 4m E PRF-m
5086 (T73)	PRF-m	Willow sp.	51.594144	-0.490431	9	55	18	Mature	1) PRF-M: 7m, W, knothole/woodpecker hole
5096	FAR	Willow	51.593442	-0.490033	3	30	10	Mature	Wound on limb at 3.5m W FAR
5082 (T71)	PRF-m	Willow sp.	51.59409	-0.490569	9	40	12	Mature	1) PRF-M: 3m W, callus roll leads up from base, cavity extends vertically
T69	PRF-i	Willow sp.	51.59431	-0.49049	5	70	20	Mature	1) PRF-I: 5m, E, wound on limb over water
T67	Negligible	Willow sp.	51.594266	-0.490679	9	20	10	Mature	
T65	PRF-i	Willow sp.	51.594404	-0.490567	5	30	8	Mature	1) PRF-I: 4m NE, small crevices at end of snapped out limb
5069 (T63)	PRF-m	Willow sp.	51.594373	-0.490844	5	40	8	Mature	1) PRF-M: 1.75m E, callus roll offers cavity leading upwards
T61	Negligible	Willow sp.	51.594292	-0.489181	8	70	18	Mature	
T59	PRF-i	Alder	51.594222	-0.48918	8	30	12	Mature	1) PRF-I: 1.5m SE cavity amongst callus roll and dead wood
0639 (T57)	FAR	Willow sp.	51.594213	-0.489281	9	65	18	Mature	1) FAR: 8m N, woodpecker hole
T55	PRF-i	Willow sp.	51.594294	-0.489249	8	25	10	Mature	1) PRF-I: 5.5m N, shallow woodpecker holes x2
T53	PRF-i	Alder	51.594183	-0.489445	7	25	8	Mature	1) PRF-I: 1m, SW, knothole leads to downwards cavity
T51	PRF-i	Willow sp.	51.59419	-0.489311	6	20	5	Mature	1) PRF-I: 1m, N, low level hazard beam
633	PRF-m	Crack willow	51.590942	-0.488741	3	30	8	Mature	Butt rot PRF-m
T47	Negligible	Horse chestnut	51.590441	-0.488189	11	75	10	Mature	
T45	PRF-i	Alder	51.590884	-0.489227	6	30	7	Mature	1) PRF-I: 7m at top of snap offers small crevices
T43	PRF-i	Alder	51.590952	-0.489884	5	45	14	Mature	1) PRF-I: 6m N, wound in stem
T12	PRF-i	Willow	51.591141	-0.488916	4	30	10	Mature	Hazard beam at 1.5m offers small pockets for individual bats PRF-i
T41	Negligible	Silver birch	51.591183	-0.490053	10	10	8	Immature	
T39	PRF-i	Willow sp.	51.591742	-0.489512	9	45	12	Mature	1) PRF-I: 2m NE, cavity up limb wound 12cm deep
624	PRF-m	Willow (dead)	51.591285	-0.488911	3	40	3	Dead	Large cavity developed along fallen dead stem PRF-m
T37	PRF-i	Willow sp.	51.591867	-0.489531	5	70	10	Mature	1) PRF-I: 2.5m E, split hazard beam in fallen tree
0696 (T35)	PRF-m	Willow sp.	51.591971	-0.48971	5	60	12	Mature	1) PRF-M: 5.5m NE snapped out stem creating complexity of fissures. 2) PRF-M: 5m S, cavity under snap out
632	FAR	Crack willow	51.591543	-0.488979	3	55	10	Mature	Knot hole in limb at 6m W FAR; knot hole on stem at 3m W FAR
0645 (T33)	FAR	Willow sp.	51.592026	-0.489738	8	60	18	Mature	1) FAR 5m N, snapped stem with cavities in splintered wound. 2) PRF-I 4m NE another snapped stem. 3) PRF-I within fallen stem, 1.5m, SE
T31	PRF-i	Dead willow sp.	51.591947	-0.489864	8	40	16	Mature	1) PRF-I: 2m, E, snapped stem with fissures offering limited cover
T29	PRF-i	Willow sp.	51.59227	-0.489662	6	60	12	Mature	1) PRF-I: 2.5m W snapped off limb with fissures
T27	PRF-i	Ash	51.592223	-0.489833	7	35	12	Mature	1) PRF-I 4m W, snapped out limb with loose bark and fissures
5066 (T25)	PRF-m	Willow sp.	51.59228	-0.489704	5	55	12	Mature	1) PRF-M 2m NE split on top of horizontal limb. 2) PRF-I large split in limb close to base, mostly open and fiberous
T10	PRF-i	Crack willow	51.59256	-0.489526	3	45	10	Mature	Knot hole in limb at 1.5m NW leads to smalltube cavity. PRF-i

Table B.1 Full results of ground level tree inspections

Tree ID/Tag	Overall categorisation	Tree species	Latitude	Longitude	GR Accuracy	DBH	Tree height (m)	Tree life stage	Other comments
0627 (T23)	PRF-i	Willow sp.	51.592152	-0.48979	7	45	12	Mature	1) PRF-I: 2.5m N, wound in dead wood
5089 (T21)	PRF-m	Willow sp.	51.592272	-0.48986	7	40	10	Mature	1) PRF-M: 4m E, hazard beam on limb
T8	PRF-i	Willow	51.592528	-0.489148	3	25	10	Mature	Wound on stem at 1m N leads to very small cavity, PRF-i. Hazard beam at 2.5m S offers multiple small pockets for individual bats PRF-i
5099 (T19)	PRF-m	Willow sp.	51.592443	-0.490073	7	35	4	Mature	1) PRF-M: 1m, W, base fissured splits
T6	PRF-i	Willow	51.592555	-0.489098	4	25	7	Mature	Wound on stem at 1.5m W leads to small crevice that could support individual bat. PRF-i
T17	PRF-i	Willow sp.	51.592685	-0.490041	6	35	12	Mature	1) PRF-I: 1.5m, E, top of fissure
T15	PRF-i	Willow sp.	51.592742	-0.490168	9	35	10	Mature	1) PRF-I: 4m, NW, top of callus wound
5081 (T13)	PRF-m	Willow sp.	51.592783	-0.490164	5	22	8	Mature	1) PRF-M: 1.5m, N, callus roll 2) PRF-M: 2m, S, callus roll
T4	PRF-i	Willow	51.592865	-0.489182	3	35	7	Mature	Wound on top side of limb leads to very small cavity for individual bat PRF-i
T11	Negligible	Ash	51.593045	-0.490361	6	40	16	Mature	
T9	PRF-i	Willow sp.	51.593052	-0.490257	10	40	7	Mature	1) PRF-I: 1m, SE, hollow limb
T2	PRF-i	Willow	51.592876	-0.489559	3	20	7	Mature	Two wounds present on stems (2m E, 2.5m S). Both lead to small cavities that could support individual bats. PRF-i
5080	FAR	Willow	51.592861	-0.489461	4	20	7	Mature	Multiple hazard beams and subsidence cracks throughout crown, FAR
T7	Negligible	Willow sp.	51.593111	-0.490176	6	40	14	Mature	
0682 (T5)	PRF-m	Willow sp.	51.593173	-0.48995	5	45	10	Mature	1) PRF-M: 1m, SW, low level horizontal hazard beam with cavities on either side
T3	PRF-i	Willow sp.	51.59316	-0.489142	5	30	10	Mature	1) PRF-I: 5m, S, wound
T1	PRF-i	Willow sp.	51.593167	-0.48874	9	100	20	Mature	1) PRF-I: 7m SW snap out upward facing

Table B.2 Tree climb results				
Tree tag / ID number	**No of PRF**	**Overall Category**	**Can all PRFs be inspected**	**Other comments**
639	1	Negligible		
682	1	PRF-i	No	
5082 (T71)	1	PRF-m	Yes	Assessed from ground
5086 (T73)	1	PRF-m	Yes	
5100	1	PRF-m	Yes	Ladder
662	1	Negligible		
5096	2	PRF-i	Yes	Wound visible from ground is superficial
5069 (T63)	1	PRF-m	Yes	Assessed from ground
5081	3	PRF-i	Yes	Ladder
5099 (T19)	1	PRF-i	Yes	Can be assessed from ground
5066 (T25)	2	PRF-m	Yes	Can be assessed from ground
5080	4	PRF-i	Yes	Ladder
5089 (T21)	1	PRF-i	Yes	
0645 (T33)	1	PRF-m	Yes	
624	1	PRF-i	Yes	Ground level inspect with pole cam
0696 (T35)	3	PRF-i	Yes	Downgraded from M to I
632	4	PRF-m	Yes	
5088	1	PRF-m	Yes	Woodcrete bat box. Edible dormouse present
633	2	PRF-m	Yes	Ground level

Table B.3 PRF inspection results

Tree ID	PRF no.	Category	Type	Location	Height	Entrance orientation	Entrance dimensions	Thermal stability	Humidity	Competitors present	Most valuable roost type	Hibernation potential	Notes
682	1	PRF-i	Hazard-beam	Limb	1	W	3x25	Drafty	Dry	Slugs	Transitional	No	Enclose pocket at end away from stem could support two bats
5082 (T71)	1	PRF-m	Callus-roll	Stem	3	SE	12x2.5	Drafty	Slightly damp	Slugs	Day roost/summer	No	Spired apex with attractive entrance and accessibility
5086 (T73)	1	PRF-m	Woodpecker hole	Stem	6	W	12x5	Drafty	Dry	Two Glis Glis present at base	Transitional	No	Feature does not extend upwards but goes down to base 40cm
5100	1	PRF-m	Wound	Stem	2.5	N	5x8	Thermally stable	Dry	Woodlice and slugs	Mating	No	
5096	2	PRF-i	Desiccation-fissures	Limb	2	Upwards facing	4x2	Exposed	Dry	Woodlice	Day roost/summer	No	Exposed crack for individual bat
5069 (T63)	1	PRF-m	Callus-roll	Stem	2	SE	8x2	Drafty	Dry	Woodlouse	Day roost/summer	No	Decay within callus leads to a vertically cavity offering capacity for a few bats, suitable accessibility to feature
5081	3	PRF-i	Wound	Stem	2.5	SE	12x3	Drafty	Dry	Spider at apex	Day roost/summer	No	
5081	1	PRF-i	Wound	Stem	2.5	N	15x3	Drafty	Dry	Slugs and woodlice	Mating	No	
5099 (T19)	1	PRF-i	Shearing-crack	Stem	1.5	NW	10x25	Drafty	Dry	Slug	Day roost/summer	No	Splits within fallen stem offer minimal cover
5066 (T25)	2	PRF-i	Hazard-beam	Limb	2	S	4x30	Drafty	Dry	Spiders	Day roost/summer	No	Crumbly and cluttered internally
5066 (T25)	1	PRF-m	Transverse-snap	Stem	1	W	8x12	Drafty	Dry	Slugs	Transitional	No	Snapped stem of multi-stem tree, wedge shaped feature offers cavity for multiple bats with suitable accessibility
5080	4	PRF-i	Subsidence-crack	Stem	2	NW	45x3	Drafty	Dry	Moth and spider webs	Day roost/summer	No	Crack offers some enclosure that could support small number of bats
5080	3	PRF-i	Hazard-beam	Limb	3	W	10x40	Exposed	Dry	None present	Day roost/summer	No	Small crevices at each end could support individual bats
5080	2	PRF-i	Hazard-beam	Limb	3.5	W	3x50	Exposed	Dry	None present	Day roost/summer	No	Small crevices at each end could support individual bats
5080	1	PRF-i	Hazard-beam	Limb	3	W	4x40	Exposed	Dry	None present	Day roost/summer	No	Small crevices at each end could support individual bats
5089 (T21)	1	PRF-i	Hazard-beam	Limb	4	E	5x30	Drafty	Dry	Spider webs	Day roost/summer	No	Cavity doesn't extend into limb very far, limited cover provided
0645 (T33)	1	PRF-m	Shearing-crack	Stem	5	W	20x5	Drafty	Dry	None	Day roost/summer	No	Fresh snapped out stem from a Multi-stem willow. Additional crevices surrounding main cavity.
624	1	PRF-i	Basal Cavity	Stem	1	SW	35x30	Drafty	Dry	None present	Transitional	No	Large cavity developed laterally along fallen stem. Risk ofpredation likely renders the majority of the cavity unusable, however, a single pocket at the top may be used by 1-2 bays

Tree ID	PRF no.	Category	Type	Location	Height	Entrance orientation	Entrance dimensions	Thermal stability	Humidity	Competitors present	Most valuable roost	Hibernation potential	Notes
0696 (T35)	3	PRF-i	Transverse-snap	Limb	4.5	Upwards facing	12x6	Exposed	Dry	Glis Glis was present	Day roost/summer	No	
0696 (T35)	2	PRF-i	Transverse-snap	Limb	5	NW	4x10	Drafty	Dry	None	Day roost/summer	No	Wedge shaped cavity leading into half snapped out limb
0696 (T35)	1	PRF-i	Transverse-snap	Limb	5.5	Downwards facing	20x6	Drafty	Dry	None	Day roost/summer	No	Complex snap, multiple splits, one cavity leads back up stem offering some roosting potential
632	4	PRF-i	Desiccation-fissures	Limb	4	SW	3x10	Exposed	Dry	Woodlice	Day roost/summer	No	Very exposed crevice for individual bat
632	3	PRF-i	Hollow	Limb	7	NW	4x4	Drafty	Dry	None present	Mating	No	
632	2	PRF-m	Knot-hole	Limb	6	W	4x10	Drafty	Dry	Scratch marks around entrance suggest use by squirrel / edible dormouse	Maternity	No	Cavities developed 20cm away from stem and 10cm towards. Predation risk may reduce likelihood of maternity use
632	1	PRF-m	Knot-hole	Stem	1.5	W	6x6	Within heartwood	Dry	None present	Hibernation	Yes	Knot hole leads to two cavities. Tube developed 100cm up the stem and a more open chamber developed 70cm down. both full of dry rot. Easy access for predators and proximityto the ground reduces likelihood of maternity use. Thermally stable chamber.
5088	1	PRF-m	Bat box	Stem	4m E					Edible dormouse	Maternity	Yes	Bat box could be used in hibernation period
633	2	PRF-i	Wound	Limb	1	Upwards facing	8x4	Thermally stable	Dry	None present	Transitional	No	Upwards facing with high predation risk
633	1	PRF-m	Butt-rot	Stem	1	SW	10x8	Thermally stable	Dry	Woodlice at apex	Hibernation	Yes	Low level with sheltered entrance, could be used for hibernation and transition. Unlikely to be used for maternity use due to proximity to the ground