

## Bat Activity Survey

Land to the north of Water Lane  
Angmering

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## Contents

|                                          |           |
|------------------------------------------|-----------|
| <b>1.0 INTRODUCTION.....</b>             | <b>3</b>  |
| BACKGROUND .....                         | 3         |
| SITE CONTEXT AND STATUS.....             | 4         |
| <b>2.0 PREVIOUS SURVEYS (2015).....</b>  | <b>5</b>  |
| BAT TRANSECT ACTIVITY SURVEYS .....      | 5         |
| <b>3.0 UPDATE BAT SURVEYS 2017 .....</b> | <b>12</b> |
| BAT TRANSECT ACTIVITY SURVEYS .....      | 12        |
| <b>4.0 DISCUSSION .....</b>              | <b>17</b> |
| BAT SPECIES AND ACTIVITY .....           | 17        |
| RECOMMENDATIONS AND ENHANCEMENTS .....   | 22        |
| <b>5.0 CONCLUSIONS.....</b>              | <b>27</b> |
| <b>6.0 REFERENCES .....</b>              | <b>28</b> |

### LIABILITIES:

Whilst every effort has been made to guarantee the accuracy of this report, it should be noted that living creatures are capable of migration and whilst protected species may not have been located during the survey duration, their presence may be found on a site at a later date.

The views and opinions contained within this document are based on a reasonable timeframe between the completion of the survey and the commencement of any works. If there is any delay between the commencement of works that may conflict with timeframes laid out within this document, or have the potential to allow the ingress of protected species, a suitably qualified ecologist should be consulted.

It is the duty of care of the landowner/developer to act responsibly and comply with current environmental legislation if protected species are suspected or found prior to or during works.

## 1.0 Introduction

### Background

- 1.1 The Ecology Partnership Ltd was commissioned by Rydon Homes and Gleeson Strategic Land Limited to undertake a bat survey of land north of Water Lane, Angmering following an initial ecological appraisal in August 2015. The report stated that:

*“All the mature trees and semi-mature trees on site, including the trees growing along the tree lines and the hedgerows, provide good opportunities for foraging bats. Hedgerows and tree lines also help connect the site to the wider landscape ensuring that bats can move with ease across the area using these linear features for shelter, protection and opportunistic foraging. Tree lines and hedgerows should therefore be maintained or enhanced where possible.*

*The site is approximately 37ha and is considered likely to be used by foraging bats. It is considered that a bat transect survey should be carried out to establish the most important areas of the site that are used by bats for commuting. It must be demonstrated that significant commuting routes for bats between roost sites and foraging grounds are considered within the design of the scheme.”*

- 1.2 The Ecology Partnership undertook two transect surveys and anabat surveys in 2015. The results of the survey work are summarised in section 2 of this report. It was considered that due to the change in the red line boundary and the time delay between initial surveys and the potential new application date, that further update surveys would be required.
- 1.3 Section 2 of this report sets out the results of the previous surveys undertaken in 2015. Section 3 sets out the methodology of The Ecology Partnership’s 2017 survey and the results. The implications discussed in Section 4. Conclusions are provided for in chapter 5 of this report.

1.4 The site is located to the north of Water Lane on the eastern edge of the town of Angmering in West Sussex. The site adjacent to the South Downs National Park boundary and is adjacent to ancient woodland along the eastern site boundary. The surroundings also comprise of low-density residential housing, major A-roads and agricultural fields. There are no designated sites with 5km of the site. The initial redline boundary in 2015 has been altered. The new red line boundary is shown below and includes an additional parcel of land to the southwest of the site.



Figure 1: Approximate red line boundary of the site

### **Description of Proposed Development**

- 1.5 The site has received planning proposals for the construction of up to 525 residential dwellings with up to 3 hectares of employment land. Open space provision and SUDS will also be included within the illustrative master plan.

### **2.0 Previous Surveys (2015)**

#### **Bat Transect Activity Surveys**

- 2.1 A total of two dusk transect activity surveys were carried out on 26<sup>th</sup> August and 8<sup>th</sup> September 2015. The surveys followed the 2012 Bat Conservation Trust (BCT) guidelines. A predetermined transect route was agreed and followed for the duration of the survey. The route was designed to record flyovers and activity around the site and to follow linear features, such as hedgerows and tree lines, which bats are known to use as commuting corridors. These habitats also provide the most suitable habitat on site for foraging.
- 2.2 The dusk surveys started 30 minutes before sunset and observations were maintained until 2 hours after sunset. Bats usually emerge about twenty minutes after sunset depending on the species, light level, weather conditions and time of year. Peak activity will normally last for about two hours after sunset, during times of peak insect activity.
- 2.3 All surveyors were equipped with Bat Box Duet heterodyne, frequency division detectors and hard disc recorders. In addition, a Wildlife Acoustics Echo Meter Touch was used.
- 2.4 Two Anabat Express remote recording devices were also deployed over a number of nights in order to gauge activity levels and record species using the site. One was located within the hedgerow along the northern edge of transect route 1 and the other within the tree line along the access track road, which is located between transect route 1 and

2 (Figure 2). The calls from the Anabat Express device were analysed using Anabook software.



**Figure 2: Location of transect routes (yellow and numbered) and anabats (blue) for August and September 2015**

- 2.5 The first survey was conducted at dusk on 26<sup>th</sup> August 2015. Sunset was at 20:01 and the temperature was 17°C with a slight breeze and 30% cloud cover.
- 2.6 The first bat of the survey in section 1 was a common pipistrelle (*Pipistrellus pipistrellus*) recorded at 20:25 foraging along the northern edge of the field. Common pipistrelles

- were recorded flying along this hedgerow and then following the edge of the ancient woodland in a southerly direction. A relatively high level of common pipistrelle activity was recorded along the hedgerow next to the access track, with bats recorded foraging up and down this dark route as well as appearing to be using this feature to move across the landscape. Only common pipistrelles were recorded during this survey and no bats, such as big bats (e.g. noctules and serotines), were recorded flying overhead across the agricultural field. All activity was limited to the edges of the field.
- 2.7 In section 2, common pipistrelles were recorded along the western part of the site from 20:45, with one brief pass by a big bat at 20:49. Activity along the access road was also recorded with approximately 11 passes along this transect route. All species recorded using this feature were common pipistrelles. No other bats were recorded during the survey period with only sporadic passes by common pipistrelles being recorded along the edges of the site.
- 2.8 In section 3, again common pipistrelles were the first species recorded, with the most activity recorded on the eastern side of this transect which lies adjacent to the woodland. One soprano pipistrelle was recorded on the hedgerow along the southern aspect of the transect at 20:40. The remaining bats recorded were common pipistrelle and these were recorded along the edges of the transect. The field was grazed and no bats were recorded using the field or flying over the field.
- 2.9 The second survey was undertaken on 8<sup>th</sup> September 2015. The temperature was 15°C and it was a dry and clear evening. Sunset was at 19:35.
- 2.10 In section 1, the first bat was recorded at 19:47 using the access road with numerous common pipistrelles (at one point 5 were recorded) foraging around some of the mature oaks and moving along the hedgerows. No bats were recorded along the western edge of the central hedgerow and along the central hedgerow, until several pipistrelles were recorded along the ancient woodland edge and using the hedgerow area on the eastern section for foraging. No bats were recorded along the southern section of the field and

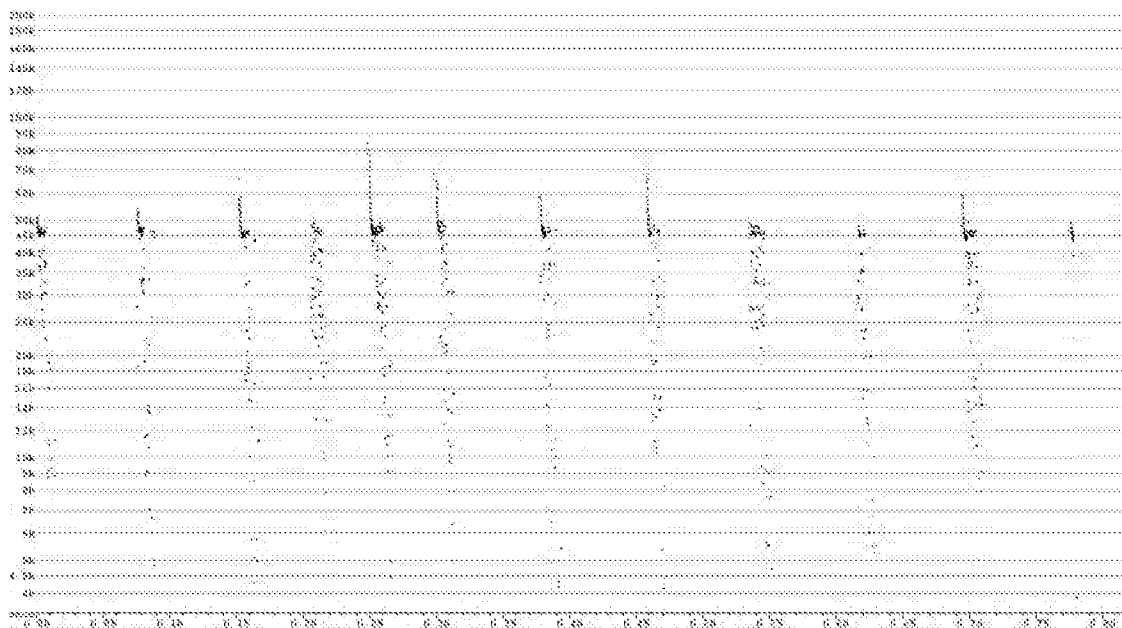
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- no bats were recorded flying over the field.
- 2.11 The first bat of section 2 was recorded at 20:15 which was a serotine (*Eptesicus serotinus*). This passed on two occasions along the western edge of the site. A further big bat, either a noctule or Leisler's, was recorded at 20:19 along the northwest edge of the site. For the remainder of the survey only common pipistrelle species were recorded, largely on the very edges of the site and associated with tree lines. The pass rate was considered to be low, with several common pipistrelles passes, especially along the access road, with a total of 8 passes recorded along this edge and only two or three passes along the remaining edges of the site.
- 2.12 Again, recordings in Section 3 were dominated by common pipistrelles. The most activity was located on the eastern edge of the site associated with the tip of the off-site woodland. The first common pipistrelle was recorded at 20:25. One noctule (*Nyctalus noctula*) pass was recorded along the northern edge of the site at 20:28. The remainder of the survey recorded only common pipistrelles with only 5 passes along the northern and western edge and a peak of 15 passes along the eastern edge of the transect.

### **Anabat Remote Recording**

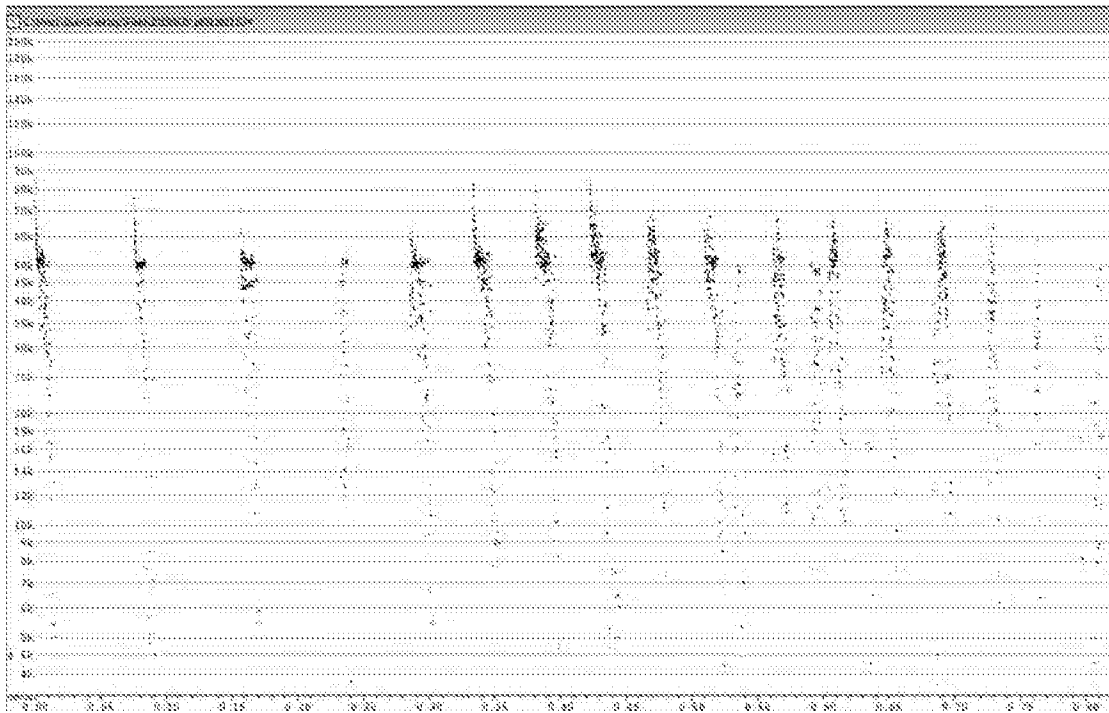
- 2.13 Anabat Express remote recording devices were deployed within the central section of the hedgerow along the top of transect 1 and the access road between transect 1 and 2 in the northern section.
- 2.14 Table 1 below shows the analysis of the anabat which was located along the northern edge of transect 1, within the central hedgerow of the site.
- 2.15 It can be seen that common pipistrelles were by far the most commonly recorded species using this section of the site (Figure 4) and that soprano pipistrelle calls were very low in comparison (Figure 5). Myotis calls, believed to have been Natterer's, were also low (Figure 6) along with brown long-eared bats, serotines and noctules.

*Table 1: Anabat acoustic sound analysis on northern edge of transect 1*

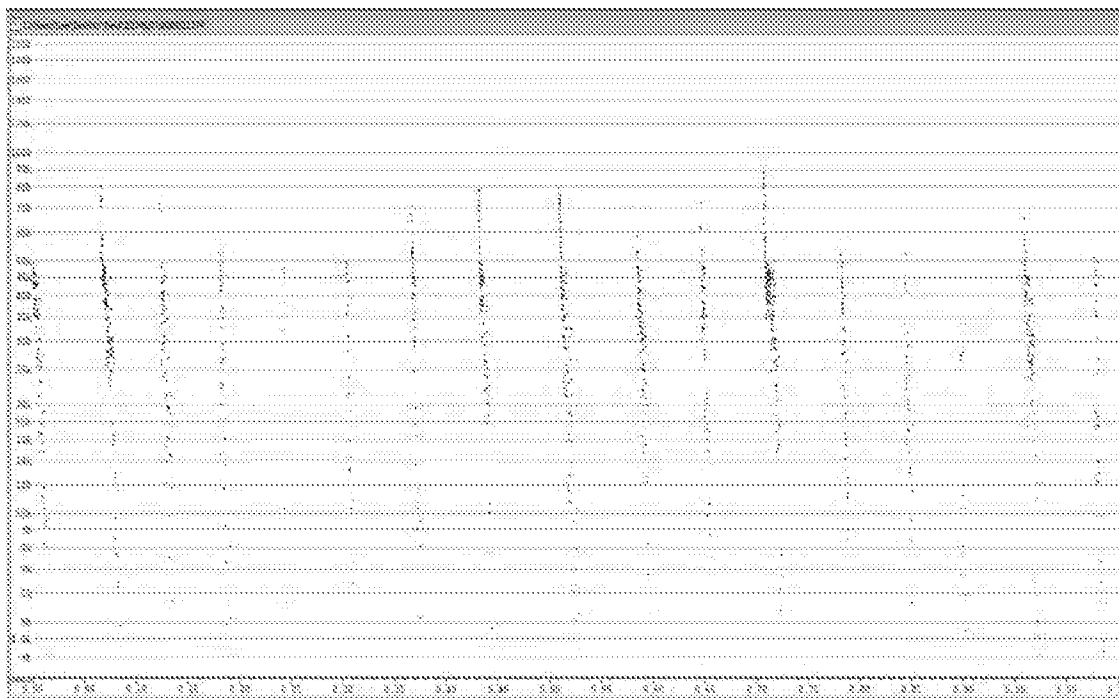
| Date       |                             | Common pipistrelle | Soprano pipistrelle | Brown long-eared | Serotine | Noctule  | Myotis   |
|------------|-----------------------------|--------------------|---------------------|------------------|----------|----------|----------|
| 26/08/2015 | Time of first recorded call | 21:25:15           | 21:50:59            | n/a              | 05:11:39 | 22:07:40 | n/a      |
|            | Call frequency              | 6                  | 1                   | 0                | 1        | 1        | 0        |
| 27/08/2015 | Time of first recorded call | 21:21:51           | 21:46:53            | n/a              | 21:41:41 | n/a      | 00:45:21 |
|            | Call frequency              | 20                 | 2                   | 0                | 4        | 0        | 5        |
| 28/08/2015 | Time of first recorded call | 21:18:15           | 01:39:08            | 00:13:58         | 21:39:08 | 05:23:07 | n/a      |
|            | Call frequency              | 42                 | 1                   | 5                | 1        | 2        | 0        |
| 05/09/2015 | Time of first recorded call | 21:05:10           | n/a                 | n/a              | n/a      | n/a      | 22:16:34 |
|            | Call frequency              | 55                 | 0                   | 0                | 0        | 0        | 2        |
| 06/09/2015 | Time of first recorded call | 21:07:06           | 01:42:05            | 22:59:40         | 22:04:32 | 21:19:23 | 23:10:03 |
|            | Call frequency              | 212                | 6                   | 4                | 8        | 2        | 6        |
| 07/09/2015 | Time of first recorded call | 21:04:19           | 20:53:59            | n/a              | 21:15:59 | n/a      | 22:40:14 |
|            | Call frequency              | 129                | 5                   | 0                | 3        | 0        | 2        |



*Figure 4: Common pipistrelle pass along the northern edge of transect 1 in 2015*



*Figure 5: Soprano pipistrelle pass along the northern edge of transect 1 in 2015*



*Figure 6: Myotis species pass along the northern edge of transect 1 in 2015*

- 2.16 Table 2 below shows the analysis of the anabat which was located along the access road, which supports a hedgerow on either side of the track and lacks lighting. This section lies between transect 1 and 2.

**Table 2: Anabat acoustic sound analysis along the access track route in 2015**

| Date       |                             | Common pipistrelle | Soprano pipistrelle | Brown long-eared | Serotine | Noctule  | Myotis   |
|------------|-----------------------------|--------------------|---------------------|------------------|----------|----------|----------|
| 26/08/2015 | Time of first recorded call | 21:22:35           | n/a                 | n/a              | n/a      | n/a      | n/a      |
|            | Call frequency              | 1336               | 0                   | 0                | 0        | 0        | 0        |
| 27/08/2015 | Time of first recorded call | 21:11:30           | 00:59:34            | 22:53:30         | n/a      | 23:31:31 | 23:38:44 |
|            | Call frequency              | 66                 | 1                   | 6                | 0        | 1        | 6        |
| 28/08/2015 | Time of first recorded call | 21:14:29           | 22:56:58            | 21:57:39         | n/a      | n/a      | 23:21:18 |
|            | Call frequency              | 103                | 6                   | 17               | 0        | 0        | 5        |
| 05/09/2015 | Time of first recorded call | 21:06:43           | 21:06:36            | 21:46:43         | n/a      | 21:53:11 | 22:07:14 |
|            | Call frequency              | 76                 | 2                   | 5                | 0        | 2        | 40       |
| 06/09/2015 | Time of first recorded call | 20:54:19           | n/a                 | 21:25:37         | n/a      | n/a      | 21:37:31 |
|            | Call frequency              | 23                 | 0                   | 5                | 0        | 0        | 24       |
| 07/09/2015 | Time of first recorded call | 20:58:12           | 21:19:34            | n/a              | n/a      | 21:51:49 | 22:18:11 |
|            | Call frequency              | 69                 | 2                   | 0                | 0        | 1        | 29       |

- 2.17 It can be seen from Table 2 that again recordings were dominated by common pipistrelles. Very little activity of other species was recorded during the remote recording, however, a total of six species was recorded using this feature during the survey period.

- 2.18 Common pipistrelle was by far the most abundant species using the site. These bats were observed foraging around mature trees and along habitat edges on site and the recordings from the anabat support this. Noctule and serotine, much like the transect

surveys, recorded a low number of passes of these species and it is likely that they commute through the site during the night, to and from more favourable foraging habitat. Myotis and long eared bat species were recorded during the survey, again using the site in very low frequencies. These species were not recorded during the transect surveys. Only a couple of passes of soprano pipistrelle were recorded during the manned transect survey and this is reflected in the anabat data.

### **3.0 Update Bat Surveys 2017**

#### **Bat Transect Activity Surveys**

- 3.1 A total of three dusk or dawn transect activity surveys were carried out on 7<sup>th</sup> June (dawn), 8<sup>th</sup> August (dusk) and 28<sup>th</sup> September (dusk) 2017. A total of three surveys were undertaken to accommodate the added compartment, to the southwest of the original red line boundary.
- 3.2 The surveys followed BCT guidelines (2016). A predetermined transect route was agreed and followed for the duration of the survey, during which bat flyovers and activity were recorded. The route was designed to follow linear features such as hedgerows and tree lines which bats are known to use as commuting corridors. These habitats also provide the most suitable habitat on site for foraging. Figure 7 below displays the layout of the transect routes.
- 3.3 The dusk surveys started 30 minutes before sunset and observations were maintained until 2 hours after sunset. Dawn surveys started 2 hours before dawn and continued 30mins after dawn.
- 3.4 Anabats were set up in three locations within the red line boundary to assess important foraging routes and commuting routes. The location of these are shown in Figure 7.



*Figure 7: This shows three transect routes within the site boundaries. Transect route 1 (T1) includes the additional section added to the original reed line boundary. T2 and T3 are also shown, which incorporates a large area of largely sub optimal habitat. Anabat locations (A1, A2, and A3) are shown in blue.*

*7<sup>th</sup> June Dawn 2017*

- 3.5 Dawn was at 04:48 and the survey commenced at 02:48. The survey was completed just after 05:00. The temperature was mild at 15°C and the weather was overcast.

- 3.6 Common pipistrelles were recorded within transect 1 (T1), the additional area, from 03:52, with numerous passes along the northern boundary of the site, flying to the west. Common pipistrelles were recorded foraging around the scrub areas along the edges and off site to the east (outside the redline boundary). A total of 15 passes by common pipistrelles were recorded until the survey completed at dawn. The last common pipistrelle was recorded at 04:28. No other bats were recorded within this transect.
- 3.7 Low levels of activity were recorded in T2 and T3 with only common pipistrelles recorded on these transects. The activity was dominated along the central access route and on the ancient woodland edges on the east and on the woodland edges on the north west. Passes were sporadic with T2 passes limited to 12 passes and T3 to 9 passes. No other bats were recorded during the transects.

#### *8<sup>th</sup> August Dusk 2017*

- 3.8 The second activity survey was completed on 8<sup>th</sup> August 2017 at dusk. Sunset was at 20:35 and the temperature was 14°C. The first bat was recorded in T1 and was a common pipistrelle almost at sunset, recorded at 20.37 flying from the west over the transect route to the east. A further two common pipistrelles were recorded in this transect during the survey, within 15minutes of the first bat. No other bats were recorded during the survey period.
- 3.9 Low levels of activity were recorded within T2 and T3 as per previous surveys with common pipistrelle and soprano pipistrelles recorded along the woodland edges and tree lines. Common and soprano pipistrelles were also recorded foraging up and down the access road, which supports some mature trees and hedgerows on either side. A single serotine pass was recorded in T2 at 20.44. No other species were recorded during the survey.

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**28<sup>th</sup> September Dusk 2017**

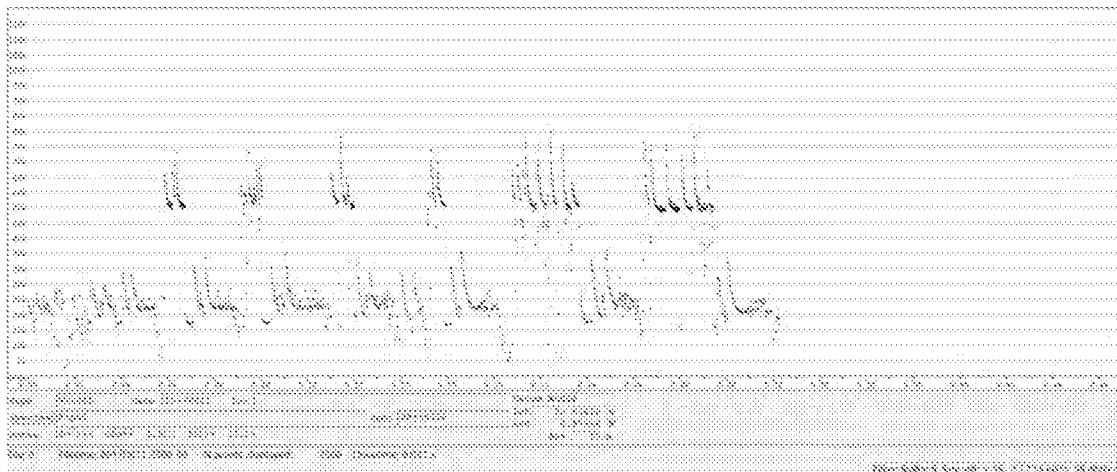
- 3.10 The fourth activity survey was completed on 28<sup>th</sup> September 2017 at dusk. Sunset was at 18:46 and the weather was overcast with a slight breeze and a temperature of 16°C. The first bat of the survey was a noctule recorded along the footpath in the northwest corner of the site at 19:02. Another noctule was heard briefly flying overhead along the eastern boundary of T3 at 19:10. Both a common and soprano pipistrelle were observed foraging at the junction between T3 and T2 at 19:15. At 19:28 and 19:31 a common pipistrelle was seen foraging along the woodland edge in T2. Another common pipistrelle was recorded along the southern boundary of T2 at 19:38. At 19:43 and 19:46 a common pipistrelle was recorded foraging along the western boundary of the large field in T2. This was quickly followed by a Nathusius' pipistrelle along the same edge at 19:47. No other bats were recorded during this survey.

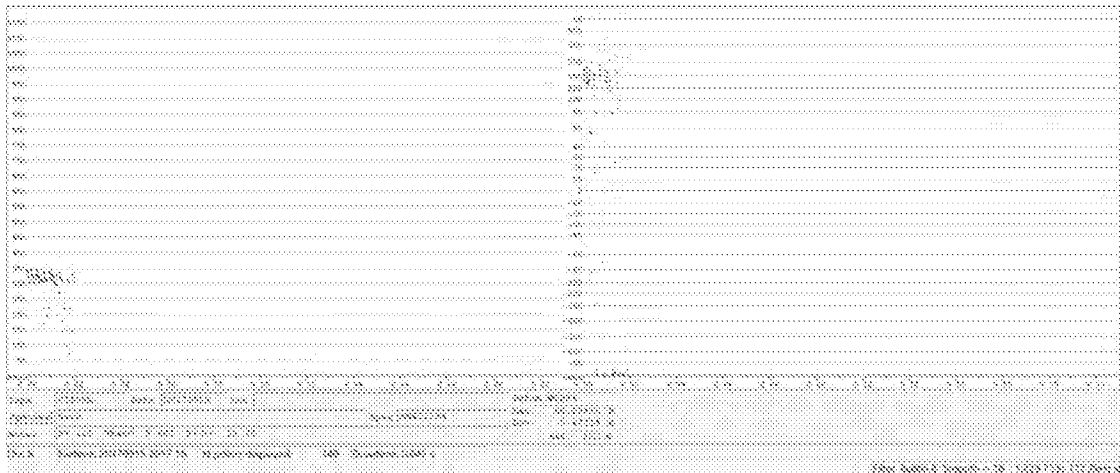
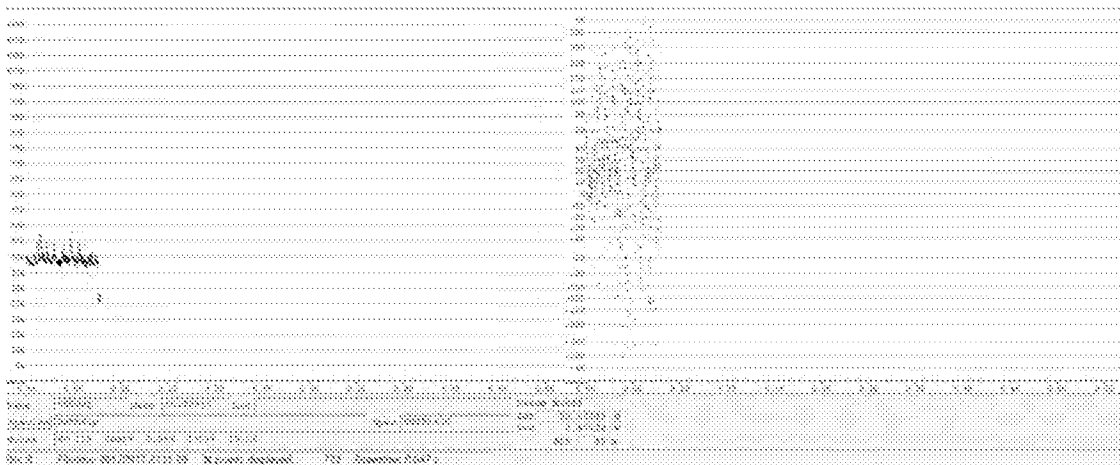
**Anabat Remote Recording**

- 3.11 Anabats were deployed on site in three locations in order to cover the most important areas as determined during the site walkover (Figure 7). These anabats were deployed between 28<sup>th</sup> June-3<sup>rd</sup> July, 8<sup>th</sup>-14<sup>th</sup> August and 12<sup>th</sup>-19<sup>th</sup> September 2017. The raw data for these locations is presented in Appendix 1.
- 3.12 A total of nine bat species were recorded across the whole of the site. Common pipistrelle were the most numerous species followed closely by soprano pipistrelle (Figure 8). Myotis passes were relatively low in comparison, although this varied according to the time of the year. Big bats (noctule, serotine and Leisler's) and brown long-eared bats were recorded only occasionally. In addition to the common species, the rare barbastelle bat was also recorded on site although the number of passes made were very low; between 1 and 8 calls per night recorded (Figure 9). Nathusius' pipistrelle was also recorded but only on two separate occasions over the entire survey period (Figure 10).

- 3.13 Of the three locations, the most recordings overall were collected along the access track (AB1). Over 3000 common and soprano pipistrelle passes were recorded along the access track in August and September compared with a maximum of 200 pipistrelle passes recorded by AB2. AB3 recorded the lowest number of overall passes each month compared with the other two locations.
- 3.14 It should be noted that in August, AB3 could not be set up in its original location as crops made this area inaccessible. Instead, it was placed along the northern tree line of the larger field in transect 2. Direct comparisons cannot be made due to variations in bat activity over the year, however, more activity was recorded along this tree line in August than that recorded at the original location in June and September. This is probably due to the fact that the tree line is connected both to the woodland edge along the west of the site and the access track. Despite this, the same species were recorded at both locations with the exception of Nathusius' pipistrelle which was only recorded at the original location twice in September.

*Figure 8: Soprano pipistrelle foraging and social calls along access track on 11<sup>th</sup> August 2017*



*Figure 9: Barbastelle call along the access track on 15<sup>th</sup> September 2017**Figure 10: Nathusius' pipistrelle call in northwest corner of site on 17<sup>th</sup> September 2017*

## 4.0 Discussion

### Bat Species and Activity

- 4.1 During the bat transect activity surveys, low to moderate levels of activity were recorded throughout the site, with the majority of passes from common pipistrelles. Common pipistrelle are the most common and widespread species in the UK and these

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were observed foraging within the mature trees on the access track and on habitat edges, in particular the woodland to the east of the site.

- 4.2 In addition, low levels of activity were recorded by soprano pipistrelles, Nathusius' pipistrelles and noctules. Soprano pipistrelles were briefly recorded but it was considered that the levels of activity by this species was low. Noctule bats were recorded making brief passes through the site and it was not considered that this large bat species was using the site as a key foraging area. Nathusius' pipistrelle was recorded on only one transect survey and may only visit the site occasionally.
- 4.3 Remote recorders in the form of Anabat Express bat detectors were deployed for a series of consecutive nights in August and September 2015 and again in June, July, August and September 2017. These give a good indicator of the level of use on site by bat species.
- 4.4 During the anabat surveys, much like the transect activity surveys carried out, common pipistrelles were by far the dominant species using the site across all of the surveys and all of the transects, with the exception of the access track where soprano pipistrelle passes were also recorded in high numbers. Myotis species, big bats (noctules, serotines and Leisler's), brown long-eareds, Nathusius' pipistrelles and barbastelles were recorded at much lower levels.
- 4.5 The anabat located on the access track recorded 1,297 calls in June/July. A total of 49.5% of these were from common pipistrelles with 46.8% being from soprano pipistrelles. Big bats (noctule, serotine and Leislars) accounted for only 0.15% of the calls. In August a total of 4,018 calls were registered on the anabat A total of 58% were from common pipistrelles, with 41% from soprano pipistrelles. The bag bats totalled 0.55% of the call registrations and barbastelle calls amounted to 0.02%. Indeed, only 1 pass of a barbastelle was recorded during the August survey. In September a total of 3,115 calls were registered. 74% of these were common pipistrelles and 23.4% soprano pipistrelles. The big bats accounted for 0.3% and barbastelles a total of 0.4%. A total of 8,430 registrations from bats were recorded during the survey period.

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- 4.6 The anabat located in the north-western corner of the site recorded considerably less bat passes across the whole of the survey period compared with the anabat set within the access route with a total of 604 calls being registered across the whole of the survey period. In June/July only 176 bat calls were registered with 76.7% being common pipistrelle, with soprano pipistrelle, myotis and big bats forming the remaining passes. In August only 82 calls were registered across the survey period, of these 39% were common pipistrelle, with 40% being the big bats. A single pass by barbastelle bat was recorded. Finally the September surveys registered 346 calls with common pipistrelles being 37.6% of the registrations and myotis being 55%, big bats at 4% and a total of two passes (0.6%) by barbastelle bats.
- 4.7 The anabat set within the most north western corner of the site was established in this position in June/July and in September. In August, no access was possible in this location due to the dense crop (corn). However, this anabat was also considered to be registering significantly less calls during the months established in this corner compared with the central access route. In June / July a total of 50 registrations were made of which 58% were common pipistrelles and 32% soprano pipistrelles. IN September 49 calls were registered, with 26.5% common pipistrelles and the big bats at 32.6%. Nathusius and barbastelle bats were both recorded on two occasions only.
- 4.8 In August, the anabat was established on the central hedgerow, below the race track. A total of 377 calls were registered during this time. 50% of these were from common pipistrelles, with 30% from myotis species. Big bats accounted for 12%. A total of 8 passes by barbastelles were recorded and Nathusius a total of 3 passes.
- 4.9 Across all anabat recordings it can be seen that largely common pipistrelles are the most significant in terms of calls. Big bats, Nathusius, barbastelle and brown long eared bats were all recorded in very low numbers.
- 4.10 Foraging bats make repeated passes within a small area whilst hunting for invertebrates. This means that a high number of passes is likely to be generated by a relatively small
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number of bats throughout the night as opposed to a large number of bats making individual passes. Therefore, the high number of common pipistrelle passes, and sometimes soprano pipistrelle passes, recorded throughout the surveys are likely to have been made by a relatively small number of individuals who use the site frequently to forage.

- 4.11 The big bats (noctules, serotines and Leisler's) were recorded much less frequently than pipistrelles and often only briefly. It is considered likely that these individuals were using the site to commute between roosting and foraging sites.
- 4.12 Myotis calls were relatively low across the site throughout the year, except for along the northern boundary of the southeast field in August and the middle left boundary (AB2) in September. Instead of single figures every night, calls increased to between 30 and 100 on some nights. One, possibly two, species were recorded with some of the calls appearing to be Natterer's but others were not so clear. Natterer's are often associated with deciduous woodland and glean prey off of vegetation. The woodland edges and tree lines on site are likely to be good foraging areas for this species and others. However, it is considered that only a small number of individual Myotis bats are using the site for occasional foraging.
- 4.13 Brown long-eared bats were recorded by the anabats during all three surveys. These bats are difficult to pick up on bat detectors and can often be drowned out by other bats, especially where activity by pipistrelles is relatively high. Therefore, it is considered likely that this species uses the site more often than recorded. This species gleans its prey, such as moths, spiders and flies, from the surface of leaves and is often associated with vegetation edges. The tree lines and woodland edge therefore provide good foraging opportunities for this species.
- 4.14 A small number of barbastelle calls, considered to be typical of foraging, were identified in all Anabat locations on site in August and September 2017. This species is an Annex II (Habitat Directives) species and is considered to be Near Threatened according to the

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IUCN Red List. As this is one of the rarest bat species in the UK, the Habitats Directive requires certain areas where they are found to be designated as a Special Area of Conservation (SAC) to ensure their populations are maintained at a favourable conservation status.

- 4.15 The Mens SAC lies approximately 16.5km north of the site and barbastelles are a qualifying feature for this SAC, although not a primary reason for designation. There are also two other SACs within 22km which are known to support barbastelles. The Mens is an ancient woodland that provides roosting and feeding habitats for barbastelle maternity roosts. The distance between the site and the SPA is within the range for foraging barbastelles as females have been known to travel up to 20km in the summer to find suitable foraging areas (Zeale *et al.* 2012).
- 4.16 It is possible that the barbastelles visiting the site have travelled from The Mens and other nearby SACs or it may be the case that males are roosting in nearby woodlands. Barbastelles roost behind loose bark, in tree cracks and deep in hollow trees in deciduous woodlands, such as the ancient woodland (Groom's Copse) neighbouring the site. Whilst it is considered unlikely that barbastelles are roosting adjacent to site, the small number of foraging bats passing through the site should nevertheless be considered within the design of the scheme. Foraging barbastelles are known to be spread thinly over the landscape and so a low number of passes is to be expected.

### **Ecological Value of the Site**

- 4.17 The site supports habitats that are locally common and widespread. However, deciduous woodland, particularly ancient woodland, is an important habitat for numerous bat species due to the wide variety of invertebrate food it provides as well as being sheltered from the elements. The woodland edge and hedgerows on site are also important linear features which provide landscape connectivity and foraging habitat for certain species. The wider landscape supports large areas of ancient woodland which are connected to site by several hedgerows and tree lines as well as agricultural land.

- 4.18 It is understood that the proposals are to build approximately 525 residential dwellings along with business units, open space and associated infrastructure. This will result in the loss of the race track and agricultural fields, both of which are considered to have limited ecological value. The boundary features, including hedgerows and tree lines, are to remain largely in situ and therefore connectivity through the site will remain intact.
- 4.19 Surveys have demonstrated that the tree lines, hedgerows and woodland edge are used by a range of foraging bat species, including the rare barbastelle bat. This activity was much higher along the access track and woodland edge but considering the design of the scheme, all linear features are important for connectivity across the landscape. Therefore, they should be protected and enhanced as part of the proposals. Detailed recommendations and enhancements are outlined below and also refer to recommendations for other protected species on site, such as dormice. Development which considers bats within the master planning, by retaining important landscape features and providing enhancements for bats, would reduce impacts to bat species to a level which would not be considered significant.

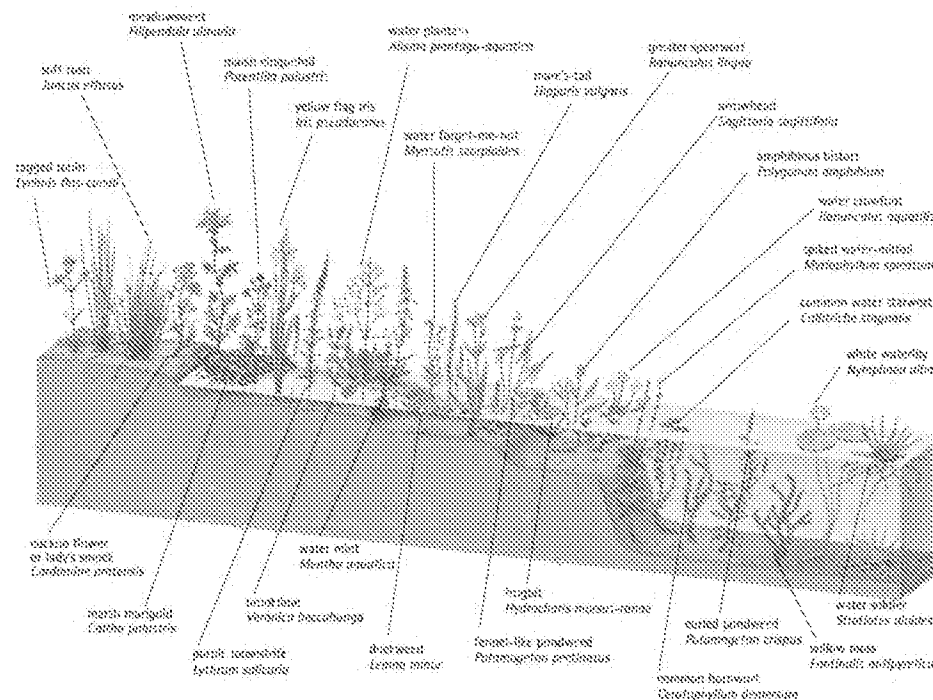
### **Recommendations and Enhancements**

- 4.20 It is recommended that several enhancements are incorporated into the scheme to enable the proposals to provide net gains in biodiversity on site. Suggested enhancements include the improvement of retained habitats through supplementary planting and the creation of new habitats on site through the addition of bat boxes. This would enable the site to support a greater number of bats and other species.
- 4.21 It is also recommended that as much of the habitat on site as possible, including mature trees and hedgerows, be retained as part of the proposals. The latest plans seem to indicate that the majority of the existing linear features will be retained, with some small sections being removed to provide access. These will also be enhanced and new tree lines and hedgerows will be planted. This includes the northern and northwest

- 
- boundaries of the site which need to be enhanced for dormice to connect the ancient woodland with other areas on site.
- 4.22 Hedgerows and tree lines provide rich opportunities for invertebrates which provide important food sources for bats. As such, these should be managed sensitively and their diversity enhanced. New tree planting should use native species of value to wildlife and should include oak, ash, hazel, beech, cherry, hornbeam and rowan. Hedgerows should include species such as hazel, field maple, elder, privet, dog rose and dog wood. Shade-tolerant wildflower seeds can also be sown along the base of the hedgerows. Thick hedges with tussocks and an accumulation of leaf litter are preferred by invertebrates as well as herbaceous plants which are characteristically associated with hedgerows, including species such as cow parsley, hogweed, wild parsnip and hedge parsley (the umbellifer species).
- 4.23 A buffer zone of at least 15m is to be maintained between the ancient woodland and the development. Within the masterplan a buffer zone of 15m has been provided with a footpath / cycle path located beyond the 15m, creating a greater buffer between development and woodland edge. This buffer zone can be planted to provide an extension of the woodland and to enhance this edge for bats. Planting should be done in such a way as to provide structural and species diversity but only using native species. A graded profile with mixed habitats should be created to provide different niches for wildlife. This would include succession from grassland to herbs to shrubs to trees, all of which will cater for different invertebrate species and thus increase the potential prey for a range of bat species. This graded profile should also be implemented along the northern boundary of the site.
- 4.24 Oak trees (*Quercus robur*) are present within the hedgerows along the access track and within the woodland edge. Oak trees are known for their ability to support a range of invertebrates; indeed, the oak tree provides habitats for more organisms than any other tree in the UK. Large numbers of moth larvae feed on oak trees including micro moths, which barbastelles specialise in. Beetles and weevils are also associated with the oak,

boring into the wood or using acorns as nurseries. The oak trees on site provide good foraging habitat for bats and common pipistrelles were recorded foraging around the large oak trees along the main access road and within the edge habitats. Therefore, it is recommended that these are retained on site and sensitively managed to ensure their longevity.

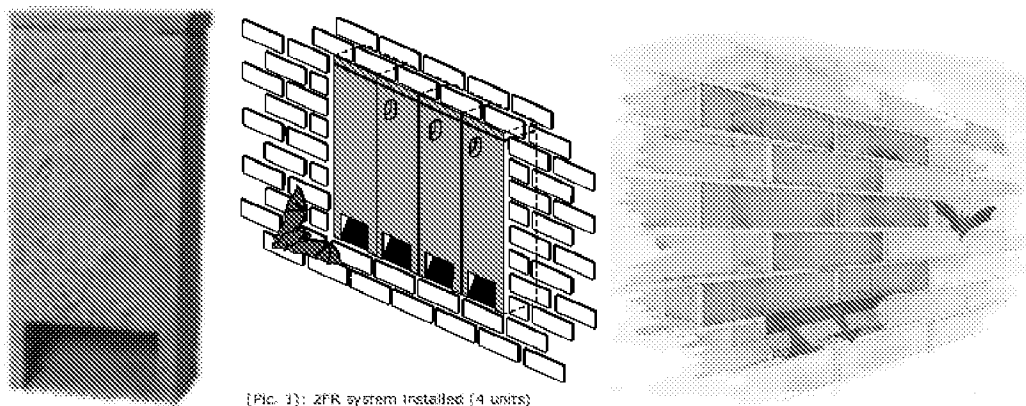
- 4.25 Deadwood is present along the boundaries of the site and should be retained and incorporated into log piles along these boundaries. Dead wood is a valuable habitat for a range of invertebrate species, particularly saprophytic insects such as beetles that noctules and serotines forage for. Log piles can be further enhanced by encouraging flowering climbers to grow on them, for example honeysuckle or clematis. These nectar-rich plants are also an important food source for invertebrate species.
- 4.26 A new pond could be incorporated into the design of the scheme as part of the Sustainable Urban Drainage Systems (SUDS) on site. It could be planted to enhance invertebrate species and again increase the diversity of food sources for bats provided on site (Figure 11). Care must be taken however to ensure that aggressive alien species are not accidentally introduced. Different plants occur at different depths in a pond and so banks with a stepped gradient are best to increase biodiversity, even if only on one side of the pond.



**Figure 11: Typical aquatic plants in a wildlife pond (Langton et al. 2001)**

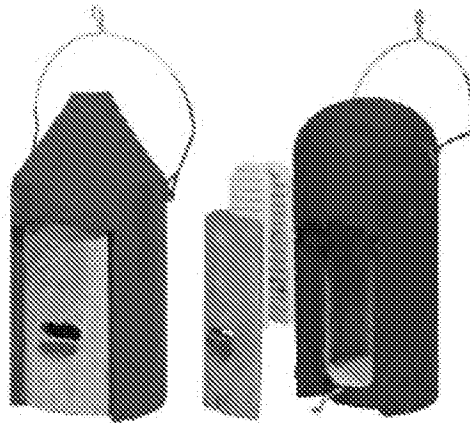
- 4.27 As a number of bat species have been shown to use the woodland edge, hedgerows and tree lines on site, it is recommended that a sensitive lighting scheme is conditioned as part of the planning permission. Lighting can be detrimental to roosting, foraging and commuting bats due to the presence of lit conditions as well as the attraction to light by a range of insects. It is also thought to increase the chances of bats being preyed upon. Any new lighting on site should only be installed if there is a significant need and must be directed away from tree lines and hedgerows along the edges of the site in order to maintain 'dark corridors'. Lighting should also be aimed away from any potential roosting sites such as bat boxes/tubes. Planting or man-made structures required within the build can be used to form barriers against light. Lighting should be hooded or baffled to ensure minimal light spillage. Lamps of greater than 2000 lumens (150W) must not be installed. Low-pressure sodium lamps or high-pressure sodium should be used instead of mercury or metal halide lamps where glass glazing is preferred due to its UV filtration characteristics.

- 4.28 To enhance the local bat population and provide roosting opportunities within the new development, it is recommended that integrated bat boxes/tubes be incorporated into the structure of the new buildings (Figure 12). These provide good opportunities for crevice-dwelling species such as pipistrelles. The opening of the bat box/tube will be the only section visible and they are designed so that they require little to no maintenance. Several of these tubes can be established in a row together providing a good-sized roost space. The bat tubes should be inserted as high up as possible in the brickwork. Habitat, in association with the Bat Conservation Trust, provide a range of boxes which are unfaced for render or designed to match the brickwork of the building.



**Figure 12: Bat tubes incorporated into the wall of a building to provide roosting space**

- 4.29 Additional roosting opportunities can be provided by hanging bat boxes on mature trees or buildings around the site. Recommended boxes include:
- Schwegler 2F Bat Box – These boxes are attractive to small bats such as pipistrelles and long-eared bats and can be hung on trees (Figure 13).
  - Schwegler 2FN Bat Box – This is slightly larger than the 2F and provides opportunities for the larger bats such as noctules. These should be hung on mature trees.
  - Schwegler 1FD Bat Box - This box has been designed specifically for smaller bats and provides opportunities as a maternity roost (Figure 13).
  - Schwegler Improved Cavity Bat Box – this is designed for cavity-dwelling species such as brown long-eared bats.



*Figure 13: Schwegler 2F (left) and 1FD (right) bat boxes*

- 4.30 Once designs for the site have been finalised and specific trees have been identified for removal, then these should be checked again for their suitability to support bats. If required, further bat surveys should be undertaken to ensure that no roosts are present within the trees to be lost. These surveys can be either an endoscopic survey after climbing the tree or a dusk emergence/dawn re-entry survey. This will show whether bats are using the trees and whether a licence for felling would be required by Natural England. Bats tend to emerge from their roosts close to sunset, with several bats recorded around this time during the surveys. This may indicate potential roost sites on site or in close proximity to the site.

## 5.0 Conclusions

- 5.1 A number of bat species were recorded using the site for foraging and commuting, including the rare barbastelle bat. The main areas for foraging were the access track into site and the woodland edges with some activity along the other hedgerows. All tree lines and hedgerows on site should be retained and enhanced within the scheme to continue to provide foraging opportunities for the species using the site and to allow bats to move with ease across the landscape.
- 5.2 Recommendations and enhancements have been outlined within this report, aimed at maintaining the most ecologically valuable features of the site post-development.

Additionally, mitigation measures such as the use of native species in any planting scheme including the incorporation of hedgerows, the careful use of lighting and the creation of log piles and a pond to enhance the site for invertebrates are recommended to provide new opportunities on site and to mitigate any loss of tree cover.

- 5.3 It is considered that the development would not impact upon the favourable conservation status of bats in the local area if significant features are to be retained and enhancements are included within the masterplan. It is also considered that net gains for biodiversity can be provided on site through the inclusion of the suggested enhancements which aim to improve the site for bats and other wildlife.

## 6.0 References

Bat Conservation Trust (2008) *Bats and Lighting in the UK – Bats and the built environment series (Version 2)*. Bat Conservation Trust, London.

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Mitchell-Jones, A.J. (2004) *Bat Mitigation Guidelines*. English Nature, Peterborough.

Zeale, M.R.K., Davidson-Watts, I. & Jones, G. (2012) Home range use and habitat selection by barbastelle bats (*Barbastella barbastellus*): implications for conservation. *Journal of Mammalogy*, 93(4):1110-1118.

## Appendix 1 – Raw Anabat Data for 2017

### Access Track (AB1)

#### *Results for Access Track Anabat between 28<sup>th</sup> June and 3<sup>rd</sup> July 2017*

| Date         | Common pipistrelle | Soprano pipistrelle | Serotine | Myotis    | Total |
|--------------|--------------------|---------------------|----------|-----------|-------|
| 28/06/2017   | 99                 | 38                  | 0        | 2         | 139   |
| 29/06/2017   | 93                 | 31                  | 0        | 13        | 137   |
| 30/06/2017   | 64                 | 48                  | 0        | 8         | 120   |
| 01/06/2017   | 249                | 193                 | 2        | 10        | 454   |
| 02/06/2017   | 84                 | 110                 | 0        | 8         | 202   |
| 03/06/2017   | 54                 | 187                 | 0        | 4         | 245   |
| <b>Total</b> | <b>643</b>         | <b>607</b>          | <b>2</b> | <b>45</b> |       |

#### *Results for Access Track Anabat between 8<sup>th</sup> and 14<sup>th</sup> August 2017*

| Date         | Common pipistrelle | Soprano pipistrelle | Noctule  | Serotine  | Leisler's | Myotis    | Brown long-eared | Barbastelle | Total |
|--------------|--------------------|---------------------|----------|-----------|-----------|-----------|------------------|-------------|-------|
| 08/08/2017   | 22                 | 7                   | 0        | 3         | 0         | 3         | 0                | 1           | 36    |
| 09/08/2017   | 0                  | 0                   | 0        | 0         | 0         | 0         | 0                | 0           | 0     |
| 10/08/2017   | 86                 | 11                  | 0        | 0         | 2         | 0         | 0                | 0           | 99    |
| 11/08/2017   | 545                | 1096                | 0        | 6         | 1         | 11        | 0                | 0           | 1659  |
| 12/08/2017   | 1011               | 410                 | 0        | 3         | 1         | 5         | 0                | 0           | 1430  |
| 13/08/2017   | 188                | 3                   | 0        | 1         | 1         | 0         | 0                | 0           | 193   |
| 14/08/2017   | 491                | 104                 | 2        | 1         | 1         | 1         | 1                | 0           | 601   |
| <b>Total</b> | <b>2343</b>        | <b>1631</b>         | <b>2</b> | <b>14</b> | <b>6</b>  | <b>20</b> | <b>1</b>         | <b>1</b>    |       |

#### *Results for Access Track Anabat between 12<sup>th</sup> and 19<sup>th</sup> September 2017*

| Date         | Common pipistrelle | Soprano pipistrelle | Noctule  | Serotine | Leisler's | Myotis    | Brown long-eared | Barbastelle | Total |
|--------------|--------------------|---------------------|----------|----------|-----------|-----------|------------------|-------------|-------|
| 12/09/2017   | 1141               | 80                  | 0        | 0        | 0         | 3         | 0                | 0           | 1224  |
| 13/09/2017   | 89                 | 37                  | 0        | 0        | 0         | 15        | 0                | 2           | 143   |
| 14/09/2017   | 216                | 55                  | 0        | 2        | 1         | 5         | 0                | 0           | 279   |
| 15/09/2017   | 159                | 103                 | 1        | 1        | 0         | 12        | 0                | 8           | 284   |
| 16/09/2017   | 188                | 137                 | 0        | 0        | 0         | 13        | 0                | 1           | 339   |
| 17/09/2017   | 256                | 243                 | 0        | 0        | 2         | 7         | 1                | 2           | 511   |
| 18/09/2017   | 149                | 57                  | 2        | 0        | 0         | 3         | 0                | 0           | 211   |
| 19/09/2017   | 97                 | 17                  | 1        | 0        | 0         | 9         | 0                | 0           | 124   |
| <b>Total</b> | <b>2295</b>        | <b>729</b>          | <b>4</b> | <b>3</b> | <b>3</b>  | <b>67</b> | <b>1</b>         | <b>13</b>   |       |

**Middle Left Anabat (AB2)***Results for Middle Left Anabat between 28<sup>th</sup> June and 3<sup>rd</sup> July 2017*

| Date         | Common pipistrelle | Soprano pipistrelle | Noctule  | Myotis    | Total |
|--------------|--------------------|---------------------|----------|-----------|-------|
| 28/06/2017   | 18                 | 0                   | 0        | 2         | 20    |
| 29/06/2017   | 14                 | 2                   | 3        | 0         | 19    |
| 30/06/2017   | 49                 | 3                   | 1        | 10        | 63    |
| 01/06/2017   | 17                 | 4                   | 0        | 3         | 24    |
| 02/06/2017   | 18                 | 0                   | 0        | 11        | 29    |
| 03/06/2017   | 19                 | 0                   | 0        | 2         | 21    |
| <b>Total</b> | <b>135</b>         | <b>9</b>            | <b>4</b> | <b>28</b> |       |

*Results for Middle Left Anabat between 8<sup>th</sup> and 14<sup>th</sup> August 2017*

| Date         | Common pipistrelle | Soprano pipistrelle | Noctule  | Serotine  | Leisler's | Myotis   | Barbastelle | Total |
|--------------|--------------------|---------------------|----------|-----------|-----------|----------|-------------|-------|
| 08/08/2017   | 14                 | 1                   | 1        | 2         | 2         | 2        | 0           | 22    |
| 09/08/2017   | 0                  | 0                   | 0        | 0         | 0         | 0        | 0           | 0     |
| 10/08/2017   | 3                  | 1                   | 0        | 1         | 2         | 1        | 0           | 8     |
| 11/08/2017   | 3                  | 3                   | 1        | 2         | 1         | 1        | 0           | 11    |
| 12/08/2017   | 3                  | 3                   | 3        | 2         | 2         | 0        | 0           | 13    |
| 13/08/2017   | 2                  | 2                   | 2        | 3         | 1         | 0        | 0           | 10    |
| 14/08/2017   | 7                  | 1                   | 2        | 5         | 1         | 1        | 1           | 18    |
| <b>Total</b> | <b>32</b>          | <b>11</b>           | <b>9</b> | <b>15</b> | <b>9</b>  | <b>5</b> | <b>1</b>    |       |

*Results for Middle Left Anabat between 12<sup>th</sup> and 19<sup>th</sup> September 2017*

| Date         | Common pipistrelle | Soprano pipistrelle | Noctule  | Serotine | Leisler's | Myotis     | Brown long-eared | Barbastelle | Total |
|--------------|--------------------|---------------------|----------|----------|-----------|------------|------------------|-------------|-------|
| 12/09/2017   | 0                  | 0                   | 0        | 0        | 0         | 0          | 0                | 0           | 0     |
| 13/09/2017   | 1                  | 1                   | 0        | 0        | 1         | 4          | 0                | 0           | 7     |
| 14/09/2017   | 3                  | 0                   | 1        | 2        | 0         | 2          | 0                | 0           | 8     |
| 15/09/2017   | 51                 | 1                   | 3        | 0        | 2         | 33         | 0                | 1           | 91    |
| 16/09/2017   | 27                 | 2                   | 1        | 0        | 0         | 107        | 0                | 0           | 137   |
| 17/09/2017   | 28                 | 3                   | 0        | 1        | 1         | 31         | 0                | 1           | 65    |
| 18/09/2017   | 14                 | 0                   | 0        | 0        | 0         | 9          | 1                | 0           | 24    |
| 19/09/2017   | 6                  | 1                   | 1        | 0        | 1         | 5          | 0                | 0           | 14    |
| <b>Total</b> | <b>130</b>         | <b>8</b>            | <b>6</b> | <b>3</b> | <b>5</b>  | <b>191</b> | <b>1</b>         | <b>2</b>    |       |

**Northwest Corner (AB3)***Results for Northwest Corner Anabat between 28<sup>th</sup> June and 3<sup>rd</sup> July 2017*

| Date         | Common pipistrelle | Soprano pipistrelle | Serotine | Myotis   | Total |
|--------------|--------------------|---------------------|----------|----------|-------|
| 28/06/2017   | 3                  | 1                   | 0        | 0        | 4     |
| 29/06/2017   | 4                  | 7                   | 0        | 1        | 12    |
| 30/06/2017   | 6                  | 1                   | 1        | 1        | 9     |
| 01/06/2017   | 4                  | 5                   | 1        | 0        | 10    |
| 02/06/2017   | 2                  | 2                   | 1        | 0        | 5     |
| 03/06/2017   | 10                 | 0                   | 0        | 0        | 10    |
| <b>Total</b> | <b>29</b>          | <b>16</b>           | <b>3</b> | <b>2</b> |       |

*Results for Northwest Corner Anabat between 12<sup>th</sup> and 19<sup>th</sup> September 2017*

| Date         | Common pipistrelle | Soprano pipistrelle | Nathusius' pipistrelle | Noctule  | Serotine | Leisler's | Myotis   | Brown long-eared | Barbastelle | Total |
|--------------|--------------------|---------------------|------------------------|----------|----------|-----------|----------|------------------|-------------|-------|
| 12/09/2017   | 0                  | 0                   | 0                      | 0        | 0        | 0         | 0        | 0                | 0           | 0     |
| 13/09/2017   | 0                  | 2                   | 0                      | 2        | 1        | 0         | 3        | 0                | 0           | 8     |
| 14/09/2017   | 0                  | 1                   | 0                      | 2        | 1        | 1         | 2        | 0                | 0           | 7     |
| 15/09/2017   | 8                  | 2                   | 1                      | 3        | 0        | 0         | 2        | 0                | 0           | 16    |
| 16/09/2017   | 1                  | 0                   | 0                      | 0        | 1        | 0         | 0        | 1                | 0           | 3     |
| 17/09/2017   | 2                  | 0                   | 1                      | 0        | 1        | 2         | 0        | 1                | 2           | 9     |
| 18/09/2017   | 2                  | 1                   | 0                      | 0        | 0        | 0         | 0        | 0                | 0           | 4     |
| 19/09/2017   | 0                  | 0                   | 0                      | 1        | 0        | 1         | 1        | 0                | 0           | 2     |
| <b>Total</b> | <b>13</b>          | <b>6</b>            | <b>2</b>               | <b>8</b> | <b>4</b> | <b>4</b>  | <b>8</b> | <b>2</b>         | <b>2</b>    |       |

**North Hedgerow of SE Field Anabat (August only)***Results for New Anabat Location between 8<sup>th</sup> and 14<sup>th</sup> August 2017*

| Date         | Common pipistrelle | Soprano pipistrelle | Nathusius' pipistrelle | Noctule  | Serotine  | Leisler's | Myotis     | Brown Long-eared | Barbastelle | Total |
|--------------|--------------------|---------------------|------------------------|----------|-----------|-----------|------------|------------------|-------------|-------|
| 08/08/2017   | 15                 | 3                   | 1                      | 1        | 1         | 0         | 1          | 0                | 0           | 22    |
| 09/08/2017   | 0                  | 1                   | 0                      | 0        | 0         | 0         | 0          | 0                | 0           | 1     |
| 10/08/2017   | 27                 | 2                   | 0                      | 0        | 2         | 0         | 9          | 0                | 0           | 40    |
| 11/08/2017   | 10                 | 2                   | 0                      | 0        | 5         | 1         | 7          | 1                | 4           | 30    |
| 12/08/2017   | 59                 | 2                   | 1                      | 2        | 5         | 2         | 7          | 0                | 2           | 80    |
| 13/08/2017   | 14                 | 2                   | 1                      | 1        | 5         | 1         | 7          | 0                | 2           | 33    |
| 14/08/2017   | 64                 | 3                   | 0                      | 1        | 13        | 6         | 83         | 1                | 0           | 171   |
| <b>Total</b> | <b>189</b>         | <b>15</b>           | <b>3</b>               | <b>5</b> | <b>31</b> | <b>10</b> | <b>114</b> | <b>2</b>         | <b>8</b>    |       |

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