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## **Phase 2 Protected Species Assessments**

**Land at Sunny Corner, Copse Lane, Walberton, West  
Sussex**

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## **Report Summary**

1. This document summarises the findings of a suite of Phase 2 protected species surveys carried out upon Land at Sunny Corner, Copse Lane, Walberton further to a Phase 1 Habitat survey and Preliminary Ecological Appraisal that was completed by the Ecology Co-op on the 6<sup>th</sup> March 2017. Further to recommendations in this report, surveys have been undertaken for dormice, great crested newts, bats and reptiles.
2. The site totals approximately 0.9 hectares in area and includes the following habitats – species poor grassland, hedgerows with trees, dense bramble and hawthorn scrub and a stream. The land does not appear to be intensively managed and is topped regularly.
3. Protected species identified during Phase 2 surveys at this site includes the presence of a population of slow worms, dormice, and commuting and foraging bats.
4. Some outline mitigation measures for bats, dormice and reptiles has been outlined in the relevant parts of section 6, however a separate detailed ‘Mitigation Statement’ is recommended to detail how these species will be protected through the development and where possible net benefits to the conservation of these species will be provided.

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## **1 INTRODUCTION**

### ***1.1 Purpose of the Report***

A Phase 1 Habitat survey and Preliminary Ecological Appraisal was completed by The Ecology Co-op on the 6<sup>th</sup> March 2017 at Land at Sunny Corner, Copse Lane, Walberton. This assessment identified the potential for reptiles, bats, dormice and great crested newts to be present on the site. As such, phase 2 surveys for each of these species/taxonomic groups were recommended.

This document summarises the findings of the suite of Phase 2 protected species surveys carried out on land at Land at Sunny Corner, Copse Lane, Walberton. The grid reference for the site centre is SU 963064. Where necessary this report outlines mitigation measures required to protect wildlife as well as compensate for any potential harm to habitats of value that could take place.

These phase two surveys were managed and overseen by Paul Whitby, a Full member of the Chartered Institute for Ecology and Environmental Management (CIEEM) and a Chartered Ecologist (CEcol) and Jess Burkitt, a graduate member of CIEEM.

These surveys and report were carried out and produced at the request of Mr and Mrs Holden.

### ***1.2 Background***

#### ***1.2.1 The Site***

The site surveyed is a plot of land at Sunny Corner, which is 0.9 hectares in area and is situated just off Copse Lane in Walberton, West Sussex (see Figure 1). The grid reference for the site is SU 963064. The site is made up of a large field of species-poor grassland with species-rich and species-poor hedgerows with trees surrounding the site. There are dense patches of scrub along the boundaries of the site with a stream running along the western boundary.

Further detailed information about the site, including descriptions of all habitats present and biodiversity records for all protected species in the area can be found in the separate Phase 1 habitat survey report for the site.



**Figure 1.** An aerial image showing the location of the site. The site boundary is outlined in red.

### 1.2.2 The Development proposal

Mr and Mrs Holden, the owners of this land, intend to submit a planning application for the development of 9 residential units (see Figure 2 below).

The development proposal is for 9 residential dwellings with associated gardens and garages within the site with access from West Walberton Lane on the western boundary (Figure 2). The area within the red line boundary is to be cleared of species poor semi-improved grassland and some scrub habitat in order to make way for this development, with the hedgerows and garden habitat areas to be enhanced for wildlife.

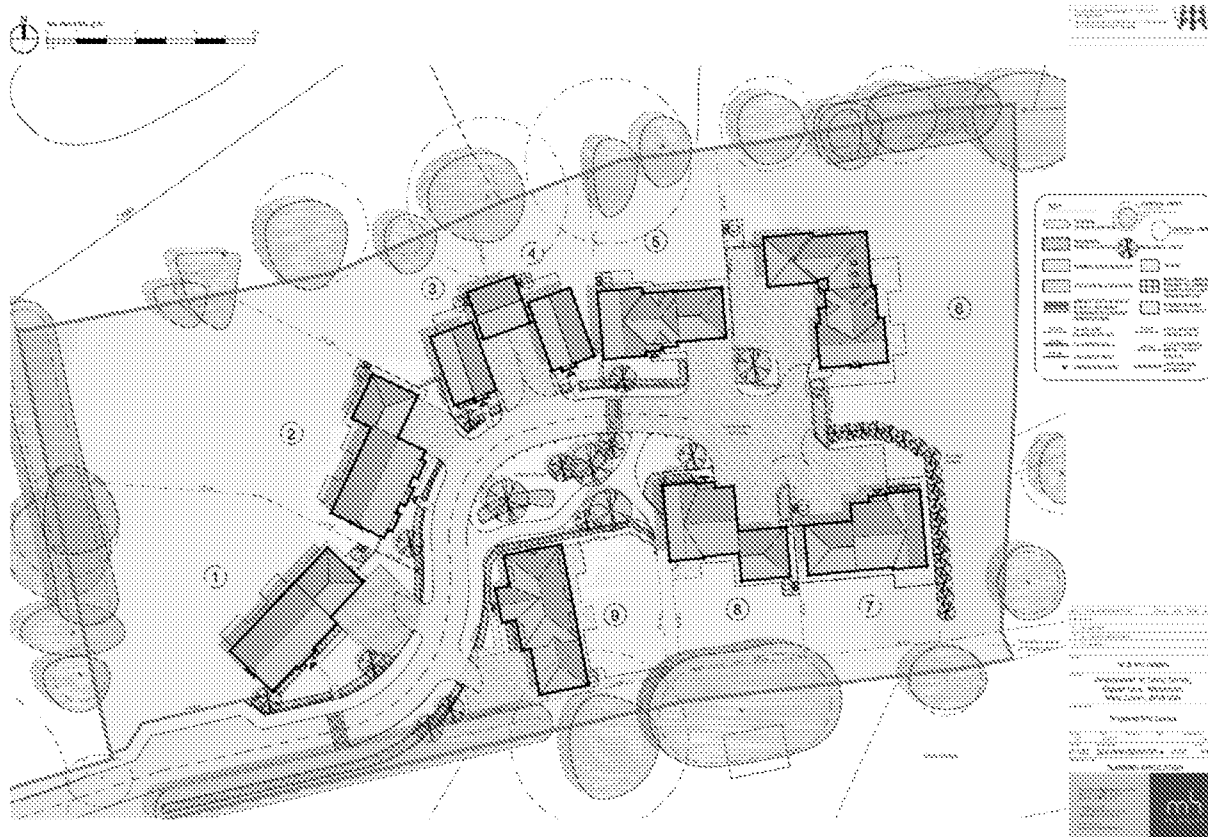


**Figure 2.** The proposed layout of the Sunny Corner development, with a red line indicating the site ownership boundary.

### 1.2.3 Findings of the Preliminary Ecological Appraisal

#### 1.2.3.1 Bats

The site was identified to include a number of features of value for foraging bats, with the hedgerows, and woodland presenting the most valuable features present. In addition, the stream located along the western boundary could also provide value for commuting and foraging bats.

It was recognised that there was potential for woodland habitat adjacent to the site to support roosting bats that would commute across the land at Sunny Corner to forage along the stream, grassland and hedgerows.

Bat roosting habitat potential was identified across the site, with three mature trees with features that could support roosting bats identified that would require static surveys (see Section 4).

#### 1.2.3.2 Nesting Bird Habitat

All of the hedgerows and dense scrub have a high potential to support a variety of birds during the nesting bird season (1<sup>st</sup> March to 31<sup>st</sup> of August).



### **1.2.3.3 Dormice**

The hedgerows that are connected to the woodland adjacent to the site were identified as being suitable dormouse habitat. The most potentially valuable habitat identified was within the hedgerows, with hazel, oak, rose, cherry laurel, alder and large patches of dense bramble and hawthorn scrub on all boundaries. Suitable habitat also includes the broadleaved Ancient re-planted Woodland parcel adjacent to the site which has a high density of hazel and is part of the National Dormouse Monitoring Programme (NDMP).

The area of suitable connected woodland habitat adjacent to the Sunny Corner site totals more than two hectares, making this woodland a suitable size to support a long-term viable dormouse population.

As such a dormice presence/absence survey was recommended on land at Sunny Corner and the findings of this survey are discussed in section 6.3.

### **1.2.3.4 Great Crested Newts**

No ponds were identified on the site during the survey and however seven ponds located within 500m of the site boundary of the site were identified using aerial background imagery. Pond 1 is 36 metres from the site boundary and has a fish population, Pond 2 is 86 metres from the site boundary and, also contains a fish population. Pond 3 is 51 metres from the site boundary and it is pipe-fed and used for surface run-off from the house and gardens located at Sunny Corner. Habitat Suitability Index (HSI) assessments were carried out on these ponds. Access was not permitted for Ponds 4, 5, 6 and 7 and therefore HSI assessments were not carried out.

Resultantly, environmental DNA assessments were recommended for Ponds 1, 2 and 3 due to the suitable terrestrial habitat and the close proximity of the ponds to the proposed site. Findings of this survey are discussed in section 6.4.

### **1.2.3.5 Reptiles**

The entirety of the site comprises of suitable foraging habitat for reptiles, which is rough, dense grassland, providing suitable cover for this group of species. Other features such as hedgerows, woodland and scrub may be used for hibernating.

Due to this a reptile presence/absence survey was recommended for the site and a discussion of the results of this reptile survey is provided in Section 6.5.

## **2 SURVEY METHODOLOGY**

The methodology for the phase 2 surveys were specific to the initial recommendations and the species or taxonomic groups being surveyed. The methods for each phase 2 survey is detailed below.

### **2.1 Bat Surveys**

#### **2.1.1 Bat Activity Emergence Surveys**

Six bat activity surveys have been undertaken on land at Sunny Corner, Copse Lane in Walberton.



## **Phase 2 Assessments, Land at Sunny Corner, Walberton**

These surveys followed best practice techniques as outlined by the Bat Conservation Trust (BCT) (Collins, J 2016)<sup>1</sup>. Corresponding weather conditions and details for the survey are detailed in the table below.

During the bat surveys surveyors walked a specific assigned route across the whole of the site to collect bat activity data. During the first and second surveys one surveyor walked a transect encompassing the north and western boundaries of the site with the other surveyor walking a second transect which encompassed the south and eastern boundaries (see Figure 3).

During the third and fourth survey one surveyor walked a transect encompassing the entire site. The second surveyor undertook a single emergence survey on two trees with bat roosting potential. They were positioned to best observe any bat emergence from the trees as well as commuting bats along the relevant site boundary (see Figure 3).

During the fifth survey one surveyor walked a transect encompassing the entire site. The second surveyor undertook a single emergence survey on one tree with bat roosting potential. They were positioned to best observe any bat emergence from the tree as well as commuting bats along the relevant site boundary (see Figure 3).

During the sixth survey one surveyor walked a transect encompassing the north and eastern boundaries of the site with the other surveyor walking a second transect which encompassed the south and western boundaries (see Figure 3).

The surveyors recorded bat activity using Echo meter touch bat detectors featuring auto-identification of bat species and automatically triggered recordings for later review. The number of bat passes along the transect were recorded, together with the species and time of detection. All bats were identified to species level, where possible, on site. Echolocation calls were analysed using Kaleidoscope computer software which facilitates species identification. Where possible, additional notes on type of flight (for example, commuting or foraging) and direction of flight were also recorded.

**Table 1.** Weather conditions during bat activity/emergence surveys carried out at Sunny Corner.

| <b>Date</b> | <b>Survey start time/end time</b> | <b>Temp. degrees centigrade, weather conditions throughout survey</b> | <b>Surveyors</b>                                                                                                         |
|-------------|-----------------------------------|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| 13-04-17    | 19:48-21:31<br>Sunset – 21:31     | Max/Min temp.: 12 / 8°C<br>100% cloud cover, 0-5mph wind and dry.     | Paul Whitby, BSc, MCIEEM,<br>CEcol (Natural England license holder: 2015-15959-CLS-CLS).<br>Briony Hill, BSc, Grad CIEEM |

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<sup>1</sup> Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn).

## Phase 2 Assessments, Land at Sunny Corner, Walberton



|          |                               |                                                                         |                                                                                                                         |
|----------|-------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| 22-05-17 | 20:40-22:30<br>Sunset – 20:55 | Max/Min temp.: 14 / 9°C<br>20% cloud cover and 0-5mph wind,<br>damp     | Sam Lunn BSc, MSc, ACIEEM,<br>(Natural England bat licence no:<br>2017-28250-CLS-CLS).<br>Jess Burkitt, BSc, Grad CIEEM |
| 14-06-17 | 21:00-22:48<br>Sunset – 21:18 | Max/Min temp.: 17 / 17°C<br>10% cc, 0-5mph wind, dry                    | Paul Whitby BSc, MCIEEM, CEcol<br>Briony Hill, BSc, Grad CIEEM                                                          |
| 10-07-17 | 21:00-23:00<br>Sunset – 21:15 | Max/Min temp: 18 / 15°C.<br>30% cloud cover and 5-10 mph<br>wind, dry.  | Sam Lunn, BSc, MSc, ACIEEM<br>Briony Hill, BSc, Grad CIEEM                                                              |
| 16-08-17 | 20:03-22:00<br>Sunset – 20:22 | Max/Min temp: 17 / 15.5°C.<br>95% cloud cover and 0-5 mph wind,<br>dry. | Jess Burkitt BSc, Grad CIEEM<br>Hamish Muirden BSc, Grad CIEEM                                                          |
| 06-09-17 | 19:27-21:03<br>Sunset – 19:38 | Max/Min temp: 14.2/ 9.2°C<br>Clear, 0% cloud cover and 0-5mph<br>wind.  | Paul Whitby BSc, MCIEEM, CEcol<br>Sam Lunn BSc, MSc, ACIEEM                                                             |



**Figure 3.** Map of routes walked during bat activity surveys around the site are outlined in red and blue. The arrows indicate the trees that were surveyed by a static surveyor – yellow indicates tree 1 surveyed on the 14<sup>th</sup> June 2017, orange represents tree 2 surveyed on the 10<sup>th</sup> July, white indicates tree 3 the surveyed on the 16<sup>th</sup> August.



### 2.1.2 Static Bat Logger Deployment

One static bat logger has been deployed across the Sunny Corner site on three occasions on the 13<sup>th</sup> of April, 14<sup>th</sup> of June and the 4<sup>th</sup> of September. Locations the loggers were set are shown in Figure 4.

For all surveys a Peersonic detector and full spectrum recorder RPA2 enclosed within a Waterproof IP67 Enclosure was left in the field for at least 5 days, which is the maximum lifetime of the battery. The Peersonic detector is a passive recording device with real time full spectrum calls that can be viewed in detail once downloaded on Analysis software so that the species of bat making a call can (where possible) be identified.

By undertaking these surveys in early April, June and September, the data gathered will cover the most active periods for bats in accompaniment with the activity surveys undertaken. Whilst the data gathered from bat loggers cannot be used to establish information of foraging and commuting by bats, it does provide information throughout the night, rather than the period immediately after bat emergence, which is observed during activity surveys.



**Figure 4.** Location of static bat loggers deployed on 13<sup>th</sup> April, 14<sup>th</sup> June and 4<sup>th</sup> September indicated with yellow dots.

## 2.2 Dormouse Assessment

A dormouse presence/likely absence survey is undertaken by placing nest tubes upon trees and suitable shrubs in suitable habitat where dormouse habitat is most favourable. Nest tubes are small plastic tubes with wooden trays that dormice will use to build their summer nests in. Nest tubes are effective between April and November and typically 50 nest tubes are deployed in suitable habitat and left for several

## Phase 2 Assessments, Land at Sunny Corner, Walberton



months over the survey season. An adequate 'thoroughness' score must be achieved, which is dependent on how many tubes are used and over how many months they are deployed. An index of probability is used to determine how effective checks within particular months of the year will have been in establishing 'likely absence' of dormice. A minimum score of 21 should be achieved to establish 'likely absence' in the event that no signs of dormice are found (see Table 2).

| Month     | Index of Probability |
|-----------|----------------------|
| April     | 1                    |
| May       | 4                    |
| June      | 2                    |
| July      | 2                    |
| August    | 5                    |
| September | 7                    |
| October   | 2                    |
| November  | 2                    |

**Table 2.** Index of probability for Dormouse Presence

On the 29<sup>th</sup> March 2017, a total of 42 nest tubes were spread within the hedgerows on land at Sunny Corner, on Copse Lane in Walberton, West Sussex. Figure 5 below illustrates the linear routes used to place the dormouse nest tubes in distinct areas within the site. The nest tubes are spread out amongst the hedgerows within the site. A target of 50 nest tubes was not achieved due to the small area of suitable habitat present along the site boundaries and the lack of suitable features to install nest tubes across the site.

Dormouse checks are undertaken in the mornings and may commence only 1 month after the nest tubes have been positioned. A suitably qualified ecologist is able to determine the difference between activity and actual sightings of dormice and other species. Dormice typically build a compact nest using green leaves, honeysuckle bark, grasses and occasionally other materials such as moss and lichens.



**Figure 5.** The linear placement of dormouse nest tubes across the land at Sunny Corner.

### *2.3 Great Crested Newts*

Environmental DNA (eDNA) assessments were carried out at Ponds 1 and 2 within 500m of the nearest site boundary. An eDNA assessment was made by taking at least 20 water samples from suitable locations spaced around the banks of each of the ponds between mid-April and the end of June. The samples are mixed, added to ethanol and sent for testing by Surescreen Scientifics. A report is produced by Surescreen Scientifics indicating the presence or absence of great crested newt DNA.

### *2.4 Reptiles*

The survey was carried out by placing artificial refugia around the site, in areas of suitable habitat for reptiles, which heat up in the sun and provide cover. A total of 20 roofing felt sheets were used and placed according to Figure 6 below. Reptiles are attracted to these refugia to warm up in the mornings and late afternoon to regulate their temperature and a suitably qualified surveyor is able to count the number and in some cases the sex of each species present.

A total of seven surveys are undertaken and the highest count of reptiles from these visits is used to estimate the population of each reptile species on the site as low, medium or exceptional.

The survey refugia were placed around the site, focusing on the areas of suitable grassland habitat where they would warm up in the morning or afternoon sun. The coverage of the survey sheets was spaced evenly around the site where possible avoiding areas that would be constantly shaded by trees



(see Figure 6 below).



**Figure 6.** The position of reptile refugia spread across the land at Sunny Corner.

### 3 LEGAL PROTECTION

Legal protection applying to relevant bird, mammal, herpetofauna and invertebrate species is detailed in Appendix 1 of this report. This includes both national and European legislation that protects badgers, bats, dormice, reptiles, roman snails and breeding birds.

## 4 RESULTS

### 4.1 Bat Surveys

#### 4.1.1 Bat Activity Surveys

The results of the bat activity surveys undertaken at Sunny Corner are described below with maps illustrating the use of the site by bat species. A key to these maps is provided below, whilst the colour coding for bat species is provided in the figure reference for each map.

Throughout the six activity surveys completed a total of 7 species were recorded; common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), Nathusius' pipistrelle (*Pipistrellus nathusii*), serotine (*Eptesicus serotinus*), common noctule (*Nyctalus noctula*), long-eared bat (*Plecotus spp*), *Myotis sp.* and a non-echolocating bat.

Where possible, species identification was carried out to species level, except for *Myotis* and *Plecotus*

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bats, as they are often inseparable through sound analysis alone, and therefore were identified to genus level only.

### Key to bat activity maps

- ↔ = Bat foraging activity
- = Bat commuting activity and direction of flight observed
- = Bat heard, but not observed in flight.

### 13<sup>th</sup> April 2017

Bat activity was recorded between 20:05 and 21:26 by five species common pipistrelles, soprano pipistrelles, *Myotis* sp., long-eared bat and serotine recorded commuting and foraging throughout this time. A non-echolocating bat was also documented. Activity was recorded along all the sites boundaries. The results of the surveys are detailed in Figure 7.



**Figure 7.** Bat activity recorded at Sunny Corner on the 13<sup>th</sup> April, with blue representing common pipistrelle bats, green representing soprano pipistrelle, yellow represents brown long-eared bats and red representing *Myotis* sp.. A non-echolocating bat is shown in grey. Thicker lines represent greater activity observed.

### 22<sup>nd</sup> May 2017

Bat activity was recorded between 21:05 and 22:14 by four species common pipistrelles, soprano pipistrelles, *Myotis* sp. and serotine recorded commuting and foraging throughout this time. Activity was recorded along all the sites boundaries. The results of the surveys are detailed in Figure 8.

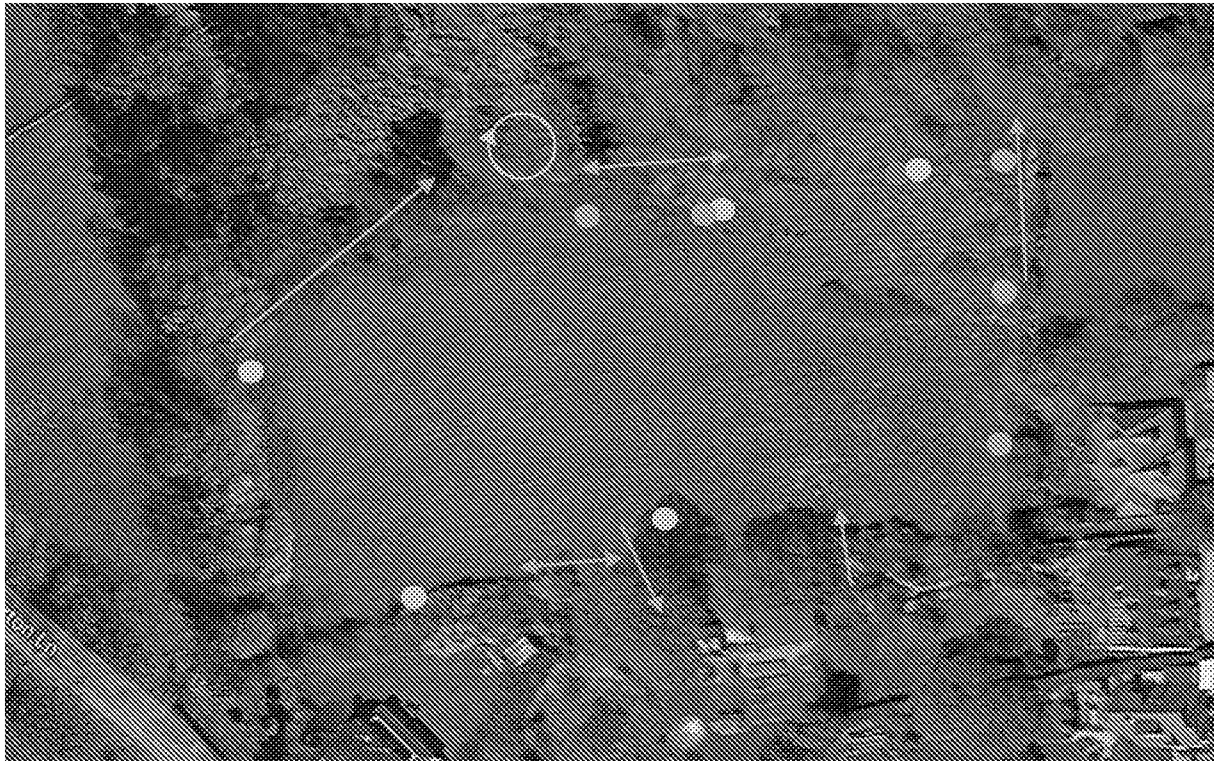


**Figure 8.** Bat activity recorded at Sunny Corner on the 22<sup>nd</sup> May, with blue representing common pipistrelle bats, green representing soprano pipistrelle, orange representing serotine bats, yellow represents brown long-eared bats and red representing *Myotis sp.*. Thicker lines represent greater activity observed.

#### 14<sup>th</sup> June 2017

Bat activity was recorded between 21:26 and 22:43 by five species; common pipistrelles, soprano pipistrelles, Nathusius' pipistrelle, brown long-eared bat and noctule. These species were recorded commuting and foraging throughout this time. Activity was recorded along north, south and western boundaries of the site. Social calling by common and soprano pipistrelles was recorded. The results of the surveys are detailed in Figure 9.



**Figure 9.** Bat activity recorded at Sunny Corner on the 14<sup>th</sup> June, with blue representing common pipistrelle bats, green representing soprano pipistrelle, white representing Nathusius' pipistrelle, pink representing noctule bats, yellow represents brown long-eared bats and a non-echolocating bat is shown in grey. Thicker lines represent greater activity observed.

### 10<sup>th</sup> July 2017

Bat activity was recorded between 21:10 and 22:53 by four species; common pipistrelles, soprano pipistrelles, brown long-eared bat and serotine and recorded commuting and foraging throughout this time. Activity was recorded along all the sites boundaries. The results of the surveys are detailed in Figure 10.



**Figure 10.** Bat activity recorded at Sunny Corner on the 10<sup>th</sup> July, with blue representing common pipistrelle bats, green representing soprano pipistrelle, orange representing serotine bats, yellow represents brown long-eared bats. Thicker lines represent greater activity observed.

#### 16<sup>th</sup> August 2017

Bat activity was recorded between 20:21 and 21:30 by three species; common pipistrelles, soprano pipistrelles and brown long-eared bat commuting and foraging throughout this time. Activity was low during this survey. The results of the surveys are detailed in Figure 11.



**Figure 11.** Bat activity recorded at Sunny Corner on the 16<sup>th</sup> August, with blue representing common pipistrelle bats, green representing soprano pipistrelle, yellow represents brown long-eared bats. Thicker lines represent greater activity observed.

#### 6<sup>th</sup> September 2017

Bat activity was recorded between 19:27 and 21:03 with four species including common pipistrelle, soprano pipistrelle, serotine, brown long-eared and *Myotis spp.* The results of the survey are shown in Figure 12.



**Figure 12.** Bat activity recorded at Sunny Corner on the 6<sup>th</sup> of September, with blue representing common pipistrelle, green representing soprano pipistrelle, red representing serotine, yellow representing brown long-eared



bats. Thicker lines indicate greater activity observed.

#### 4.1.2 Bat Emergence Surveys

No bats were seen to emerge from Tree 1, an ash with 5 woodpecker holes along the northern boundary of the site during the emergence survey on the 14<sup>th</sup> June.

No bats were seen to emerge from Tree 2 the oak tree with a rotten limb along the northern boundary of the site during the emergence survey on the 10<sup>th</sup> July.

No bats were seen to emerge from Tree 3 the oak tree with ivy on the trunk and two broken limbs during the emergence survey on the 16<sup>th</sup> August.

Activity observed by static surveyors on each of the above surveys has been incorporated into the appropriate figures in section 4.1.1.

#### 4.1.3 Static Logger Deployment

Below, the data recorded for each of the bat logger surveys is provided.

##### Location 1

This detector was positioned along the western boundary of the site (see Figure 4). The detector was located within a tree line through which a stream flows where it was felt that there was a high likelihood of detecting commuting and foraging bats. The detector recorded echolocation calls for five consecutive nights from the 13<sup>th</sup> April 2017 to the 17<sup>th</sup> April 2017.

A total of seven species were recorded during the survey including common pipistrelle, soprano pipistrelle, nathusius's pipistrelle, serotine, common noctule, *Myotis sp.* and barbastelle.

Common pipistrelle and soprano pipistrelle activity were recorded on all five nights with a peak count of 109 passes by common pipistrelles and 29 passes by soprano pipistrelles.

Noctules were recorded on one night with a peak of 2 passes recorded. *Myotis sp.* were recorded on two nights with a peak count of 4 recorded. The peak count for serotine passes was on the 15<sup>th</sup> April with 4 passes recorded. Nathusius pipistrelles were recorded on two nights with a peak count of 1.

A single barbastelle call was recorded on one night at 22:32 indicating a commuting individual.

Table 3 shows the full results from the static logger deployment in location 1 during April 2017.

**Table 3:** Species recorded and the total number of passes per day in Location 1 in April 2017.

| Date     | <i>Eptesicus serotinus</i> | <i>Nyctalus noctula</i> | <i>Myotis sp.</i> | <i>Pipistrellus pipistrellus</i> | <i>Pipistrellus pygmaeus</i> | <i>Barbastella barbastellus</i> | <i>Pipistrellus nathusii</i> |
|----------|----------------------------|-------------------------|-------------------|----------------------------------|------------------------------|---------------------------------|------------------------------|
| 13.04.17 | 1                          | 0                       | 0                 | 109                              | 20                           | 0                               | 0                            |
| 14.04.17 | 1                          | 0                       | 4                 | 103                              | 24                           | 1                               | 0                            |
| 15.04.17 | 4                          | 0                       | 1                 | 47                               | 29                           | 0                               | 0                            |

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|          |   |   |   |     |    |   |   |
|----------|---|---|---|-----|----|---|---|
| 16.04.17 | 0 | 0 | 0 | 103 | 18 | 0 | 1 |
| 17.04.17 | 0 | 2 | 0 | 75  | 19 | 0 | 1 |

### Location 2

This detector was positioned at the south-western corner of the site (see Figure 4). The detector was located within a small clearing in the tree line where a small stream passes through where it was felt that there was a high likelihood of detecting commuting and foraging bats. The detector recorded echolocation calls for five consecutive nights from the 14<sup>th</sup> June 2017 to the 18<sup>th</sup> June 2017.

A total of eight species were recorded during the survey including common pipistrelle, soprano pipistrelle, nathusius's pipistrelle, serotine, common noctule, *Myotis sp.*, barbastelle and brown long-eared.

Common pipistrelle and soprano pipistrelle activity were recorded on all five nights with a peak count of 187 passes by common pipistrelles and 26 passes by soprano pipistrelles.

Noctules were recorded on three nights with a peak of 2 passes recorded. *Myotis sp.* were recorded on three nights with a peak count of 2 recorded. Serotines were recorded on four nights with a peak of 8 passes recorded. Brown long-eared bats were recorded on four nights with a peak count of 3 passes recorded. Nathusius' pipistrelles were recorded on four nights with a peak count of 3 passes. Barbastelles were recorded on two nights with a peak count of 2 passes.

Table 4 shows the full results from the static logger deployment in location 2 during June 2017.

**Table 4:** Species recorded and the total number of passes per day in Location 2 in June 2017.

| Date     | <i>Eptesicus serotinus</i> | <i>Nyctalus noctula</i> | <i>Myotis sp.</i> | <i>Pipistrellus pipistrellus</i> | <i>Pipistrellus pygmaeus</i> | <i>Pipistrellus nathusii</i> | <i>Barbastella barbastellus</i> | <i>Plecotus auritus</i> |
|----------|----------------------------|-------------------------|-------------------|----------------------------------|------------------------------|------------------------------|---------------------------------|-------------------------|
| 14.06.17 | 0                          | 0                       | 1                 | 48                               | 7                            | 2                            | 0                               | 0                       |
| 15.06.17 | 2                          | 2                       | 2                 | 187                              | 26                           | 3                            | 1                               | 1                       |
| 16.06.17 | 5                          | 0                       | 0                 | 137                              | 26                           | 0                            | 0                               | 3                       |
| 17.06.17 | 8                          | 1                       | 2                 | 155                              | 15                           | 2                            | 0                               | 3                       |
| 18.06.17 | 7                          | 2                       | 0                 | 96                               | 4                            | 2                            | 2                               | 3                       |

### Location 3

This detector was positioned at the south-western corner of the site for a second time (see Figure 4). The detector was set out for five consecutive nights from the 4<sup>th</sup> of September to the 9<sup>th</sup> of September however only one night of echolocation calls were recorded due the high activity level and the logger reaching its memory capacity. This was due to the detector being triggered by the stridulation calls of crickets and it is very difficult to eliminate from the triggering parameters used without also eliminating bat calls.

A total of eight species were recorded during the survey including common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, serotine, common noctule, *Myotis sp.*, barbastelle and brown long-



eared.

Table 5 shows the full results from the static logger deployment in location 3 during September 2017.

| Date                | <i>Eptesicus serotinus</i> | <i>Nyctalus noctula</i> | <i>Myotis sp.</i> | <i>Pipistrellus pipistrellus</i> | <i>Pipistrellus pygmaeus</i> | <i>Pipistrellus nathusii</i> | <i>Barbastella barbastellus</i> | <i>Plecotus auritus</i> |
|---------------------|----------------------------|-------------------------|-------------------|----------------------------------|------------------------------|------------------------------|---------------------------------|-------------------------|
| 4.09.17/<br>5.09.17 | 33                         | 6                       | 16                | 1401                             | 125                          | 2                            | 9                               | 7                       |

## 4.2 Dormouse Assessment

Six dormouse nest-tube checks have been completed on land at Sunny Corner according to best practice. The first check was undertaken on the 27<sup>th</sup> of April 2017 and two dormouse nests were identified with one active dormouse and one dormouse in torpor (Figure 14). Three of the tubes had some hazel and bramble leaves, some honeysuckle bark and some willow leaves.

The second check was undertaken on the 24<sup>th</sup> of May 2017 and four active dormouse nests were identified along the southern, western and northern boundary of the site with an active dormouse in one of the nests. A degraded dormouse nest was found in a tube along the southern boundary and two nest tubes had some bramble leaves and some willow leaves in them.

The third dormouse check was carried out on the 28<sup>th</sup> of June 2017 and five dormouse nests were identified in the southern, western and northern boundaries along with nest tube that had a number of green leaves in it.

The fourth dormouse check was carried out on the 31<sup>st</sup> of July 2017 and seven dormouse nests were identified in the southern, western and northern boundaries along with two active dormice in two of the nests.

The fifth dormouse check was carried out on the 29<sup>th</sup> of August 2017 and nine dormouse nests were identified in the southern, western, northern and eastern boundaries. Five of the nests had an active dormouse present within.

The sixth dormouse check was carried out on the 26<sup>th</sup> of September 2017 and thirteen dormouse nests were identified in the southern, western, eastern and northern boundaries. Three of the nests had an active dormouse present within.

Figure 16 shows the location of the dormouse nests found throughout the six survey visits.



**Figure 13.** One of the dormouse nests identified along the northern boundary.

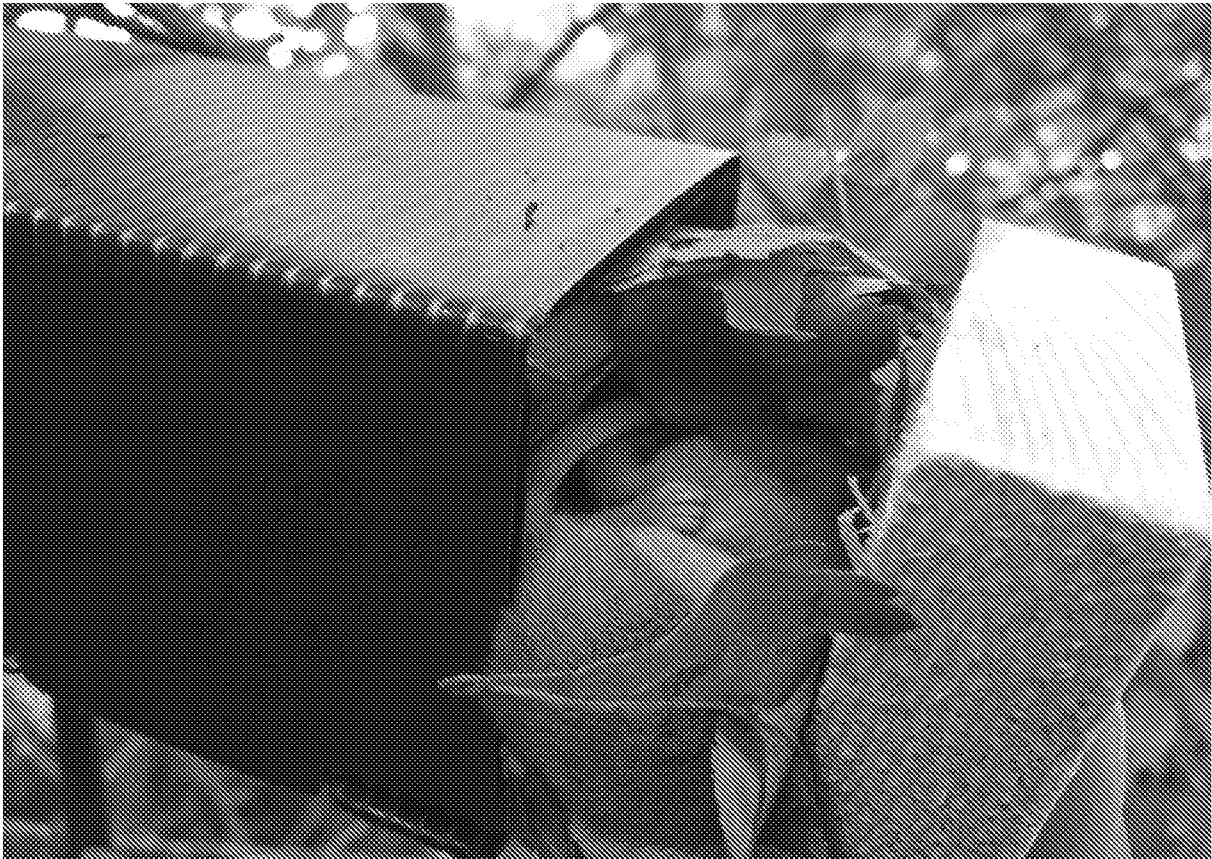


**Figure 14.** A dormouse in torpor found along the southern boundary.



**Figure 15.** One of the dormouse nests along the southern boundary of the site.



**Figure 16.** The yellow arrow indicates the location of the dormouse nests identified during the April, May, June, July, August and September 2017 surveys.

The dormouse survey at Sunny Corner was not affected by any significant constraints, though some nest tubes could not be found on the June, July, August and September surveys due to the hedgerow and scrub growth. Suitable locations to install dormouse nest tubes was constrained by a lack of suitable habitat and size of the site.

### 4.3 Great Crested Newts

Seven ponds were identified within 500m of the nearest site boundary in the Phase 1 report. Access was not permitted for the three ponds connected to the stream (Ponds 5, 6 & 7) and the large pond within the woodland (Pond 4), so a Habitat Suitability Assessment (HSI) could not be carried out on these ponds (see Figure 17). Environmental DNA assessments were carried out on Pond 1 and Pond 2 located within 500m of the nearest site boundary (See Figure 17 and Table 5). The water level within Pond 3 was very low at the time of survey and therefore it was unsuitable to carry out an eDNA assessment.

The results from the eDNA assessments are shown in Table 5.

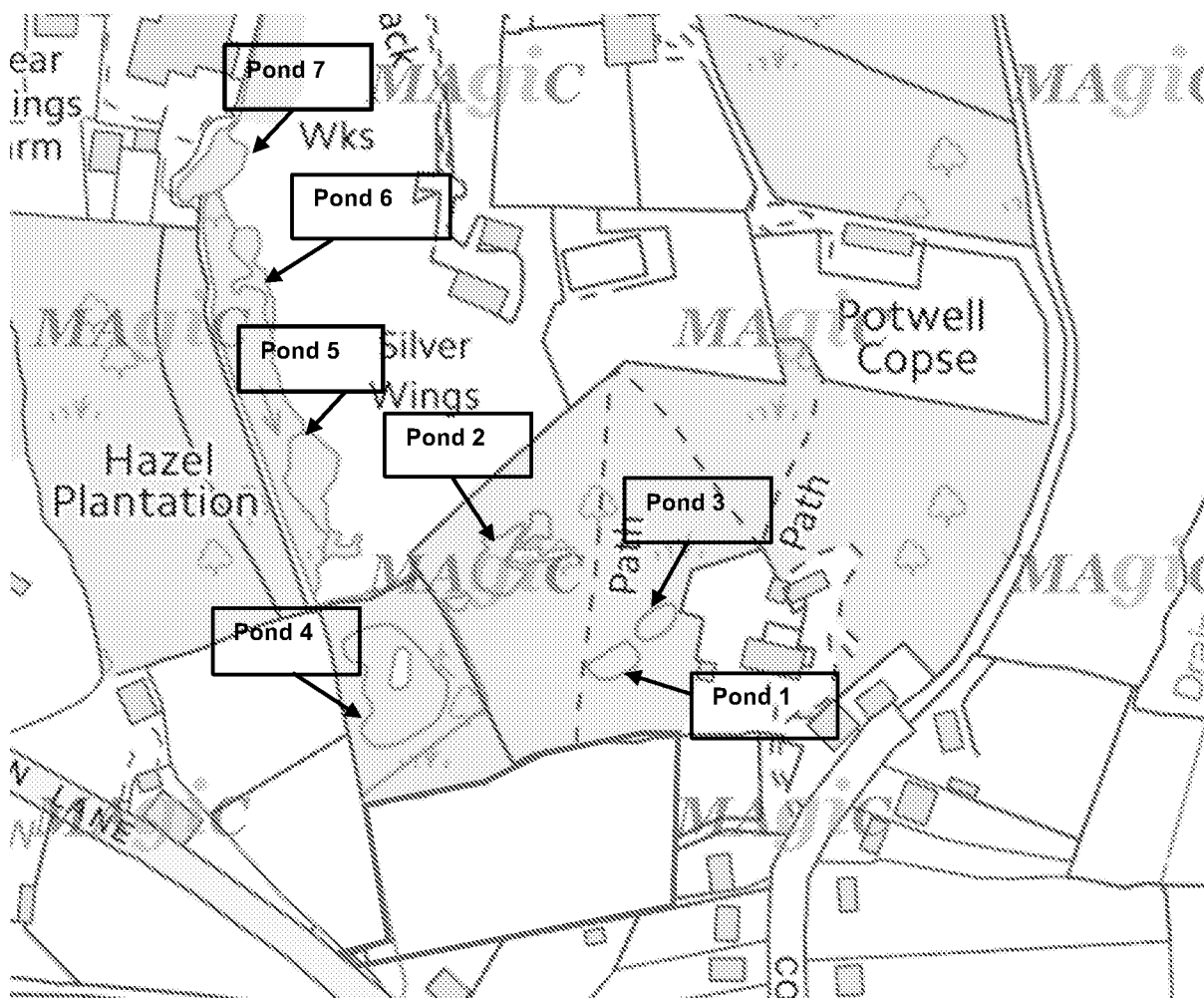


**Figure 17.** A MAGiC map showing the location of the ponds in relation to the site outlined in red and Pond 1 and Pond 2 which were eDNA tested.

|       |                                     |              |      |      |      |          |   |
|-------|-------------------------------------|--------------|------|------|------|----------|---|
| 30800 | Sunny Corner Woodland Pond (Pond 2) | SV 9643 0656 | Pass | Pass | Pass | Negative | 0 |
| 30801 | Sunny Corner Pond 1                 | SV 9645 0654 | Pass | Pass | Pass | Negative | 0 |

**Table 5.** The eDNA results from Surescreen Scientific.

## 4.4 Reptiles

A total of 20 survey sheets were placed across the land at Sunny Corner on and left for a minimum of ten days to 'bed in' before the commencement of the survey process. Below, Table 6 provides the weather data and findings from each reptile survey.



**Table 6:** Results of reptile survey undertaken at Sunny Corner, Walberton. SW – Slow worm, GS – Grass snake, CL – Common Lizard, Juv – Juvenile, SA – Sub adult, F- Female, M – Male.

| Date     | Air Temp °C | Weather Notes, cc = Cloud cover                      | Species Total            |
|----------|-------------|------------------------------------------------------|--------------------------|
| 10/4/17  | 12/20 °C    | 20% cloud cover, light, dry breeze                   | 1x MSW, 1x FSW, 1x FSASW |
| 12/4/17  | 13/26 °C    | 20% cloud cover light breeze, dry but preceding rain | 2x MSASW, 1x MSW         |
| 19/04/17 | 9.5/16.5 °C | 70% cloud cover, light breeze, dry                   | 2x MSW, 2x FSW, 1x SASW  |
| 24/04/17 | 15/19.5 °C  | 100% cloud cover, still, dry                         | 5x FSW                   |
| 29/04/17 | 13.5/16 °C  | 100% cloud cover, light breeze, dry                  | 5 x FSW                  |
| 4/05/17  | 15/20 °C    | 90% cloud cover, light breeze, dry                   | 1x SASW, 1x FSW, 1x MSW  |
| 9/05/17  | 10.5/16 °C  | 80% cloud cover, light breeze,                       | 3x FSW, 2x MSW, 1x JuvSW |

|               | Low population<br>Score 1 | Good population<br>Score 2 | Exceptional population<br>Score 3 |
|---------------|---------------------------|----------------------------|-----------------------------------|
| Adder         | <5                        | 5 - 10                     | >10                               |
| Grass snake   | <5                        | 5 - 10                     | >10                               |
| Common lizard | <5                        | 5 - 20                     | >20                               |
| Slow-worm     | <5                        | 5 - 20                     | >20                               |

**Figure 18.** The classification of reptile population from Froglife Advice Sheet 10.

## 5 CONSTRAINTS/LIMITATIONS

An initial site assessment such as this is only able to act like a 'snapshot' to record any flora or fauna that is present at the time of the survey. It is therefore possible that some species may not have been present during the survey, but may be evident at other times of the year. For this reason, habitats are assessed for their potential to support some species, even where no direct evidence (such as droppings) has been found.

### Dormouse survey

During the dormouse surveys three of the boxes could not be checked as a result of a significant growth of bramble scrub.

### Bat survey

All bat surveys can only reflect activity recorded at that time. The movement of bats throughout the year means that certain species might be present without having been identified despite an appropriate survey effort being employed.



Great crested newt survey

- Access was not permitted for the three ponds located on the water way which links up with the stream that runs along the western boundary of the land at Sunny Corner. Access was not permitted to Pond 4 which is cut off by the stream which runs along the western boundary of the land at Sunny Corner.
- An eDNA assessment was not carried out on Pond 3 due to the water level being too low for sampling (this must be a minimum of 5cm depth).

## **6 DISCUSSION AND RECOMMENDATIONS**

### **6.1 Bats**

The results of the bat activity surveys indicate that bat activity is concentrated along the western boundary with the stream, the hedgerows along the southern boundary and the woodland along the northern boundary. Bat activity along the eastern boundary appears limited (see Figures 7, 8, 9, 10, 11 & 12).

Moderate species diversity has been recorded during the bat activity surveys undertaken with seven species; common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, serotine, common noctule, brown long-eared bat, *Myotis sp.* and a non-echolocating bat recorded, whilst barbastelle were detected through the deployment of static loggers. Across the surveys it became clear that the common pipistrelle is by far the most common species (which is typical for the majority of habitats in the UK).

A total of 16 passes by Nathusius' pipistrelle bats were recorded. This is one of the less common bat species in the UK, with an estimated population of 16,000 individuals according to the Bat Conservation Trust website. The species has a scattered distribution in the UK, but is generally more common in the southeast and it is a species believed to be expanding, with greater records having been made in successive years.

Barbastelle bats were recorded each time the loggers were deployed with a total of 1 pass in April, a total of 3 passes in June and a total of 9 passes in September. Barbastelles, an Annex II species, are rare in the UK and found only in the south, with an estimated population of 5,000 individuals according to the Bat Conservation Trust website. Barbastelle bats are very sensitive to light and it is important that a detailed lighting plan is put in place to ensure that the use of this flight corridor is not impacted by artificial light sources.

No bats were recorded emerging from Tree 1, 2 or 3. As a result, based on the information gathered, no further surveys or mitigation is required specifically for these trees, unless any proposals develop to fell, or cut back these trees, in which case specific advice will be required in order to implement a precautionary approach.

Avoidance, mitigation and compensation measures for the potential impacts to foraging and roosting habitat as a result of the development will need to be incorporated into the development. Measures will be detailed in full within the Mitigation Statement. Such measures could include:



- Retention of existing trees and shrubs wherever possible to maintain existing foraging and commuting routes, in particular the western tree line which is used as a commuting route by barbastelle bats.
- Obtaining a tree protection order (TPO) for the treeline on the western boundary to ensure the flight line is maintained in the long term, given that this habitat will be part of the garden spaces of two properties.
- A sensitive lighting plan that maintains dark areas of suitable foraging and commuting habitat in accordance with guidance provided by the Bat Conservation Trust (see Appendix 2) with a 'no light zone' created along the western boundary.
- New roosting opportunities for bats incorporated into the fabric of buildings close to the boundaries of the site e.g. Schwegler 1FR bat tubes, bat access tiles and Schwegler 2FE wall mounted bat shelters which can easily be incorporated into the build or onto external faces of properties to provide net gain in bat roosting habitat. These features will be suitable for all pipistrelle bat species, including the least common nathusius pipistrelle.
- The instillation of at least three Schwegler woodcrete bat boxes such as the 2F and 2FN bat boxes on suitable mature trees away from sources of artificial light.
- A soft landscape planting scheme using native species that encourage invertebrate prey which should include the planting of a new species rich hedgerow with trees along the eastern boundary and wildflower seeding.

## **6.2 Nesting Birds**

Any scrub, trees or hedgerows to be cleared must be removed outside of the nesting bird season (1<sup>st</sup> March to 31<sup>st</sup> August) unless features are first hand searched by a suitably qualified ecologist.

## **6.3 Dormice**

The results of six checks have identified the presence of dormice within the hedgerows on land at Sunny Corner (see Figures 14 & 16). Indirect impacts on common dormice are possible such as increased human disturbance, introduction of artificial light and increased risk of predation by cats, whilst the direct removal of some scrub and hedgerow habitat may be required during the creation of the new access road and during landscaping work.

A European Protected Species (EPS) license will be required to allow habitat clearance of sections of scrub and hedgerows. A mitigation strategy is therefore required to ensure both the habitat connectivity is maintained within the landscape and, also there will be an increase in favorable dormouse habitat that could help ensure the longevity of the dormouse population.

Whilst detailed mitigation will need to be included within a future EPS license application, mitigation has been provided below which will need to be included in the landscaping plan for this development to ensure that it will be compatible with future dormouse mitigation proposals.

1. Additional planting to support existing hedgerows is recommended along the boundaries of the field (see Figure 19). Planting blackthorn along the existing hedgerows and within the newly created hedgerows will reduce the risk of dormouse predation by cats and also increase the

2. Creation of new hedging bordering the site will benefit dormice both in creating new foraging habitat and creating new connectivity to the woodland adjacent to the site and the surrounding landscape. The proposed new hedging will include planting 50% hawthorn, 10% blackthorn, 10% hazel, 10% wild privet, 10% dogwood and 10% wayfaring tree, which produce food for dormice across the whole of their active season. Honeysuckle should also be planted at a density of at least 1 plant per two linear metres, as this plant is important for dormice, both as a food source and for nesting.
3. The hedgerows should be managed to a height of no less than 2 metres high and 1.5 metres wide to ensure they offer suitable cover and grow to a good fruiting height. The hedgerows should only be cut in February where possible, so the fruits associated with the hedgerow trees are available for as long as possible, whilst also avoiding the nesting bird season (1<sup>st</sup> March to 31<sup>st</sup> August).
4. All retained hedgerows will be protected during the construction phase by Heras fencing. A small 50cm high chicken wire fence line could be installed close to the base of the hedgerow to help deter cats from predating upon wildlife within the hedgerows.

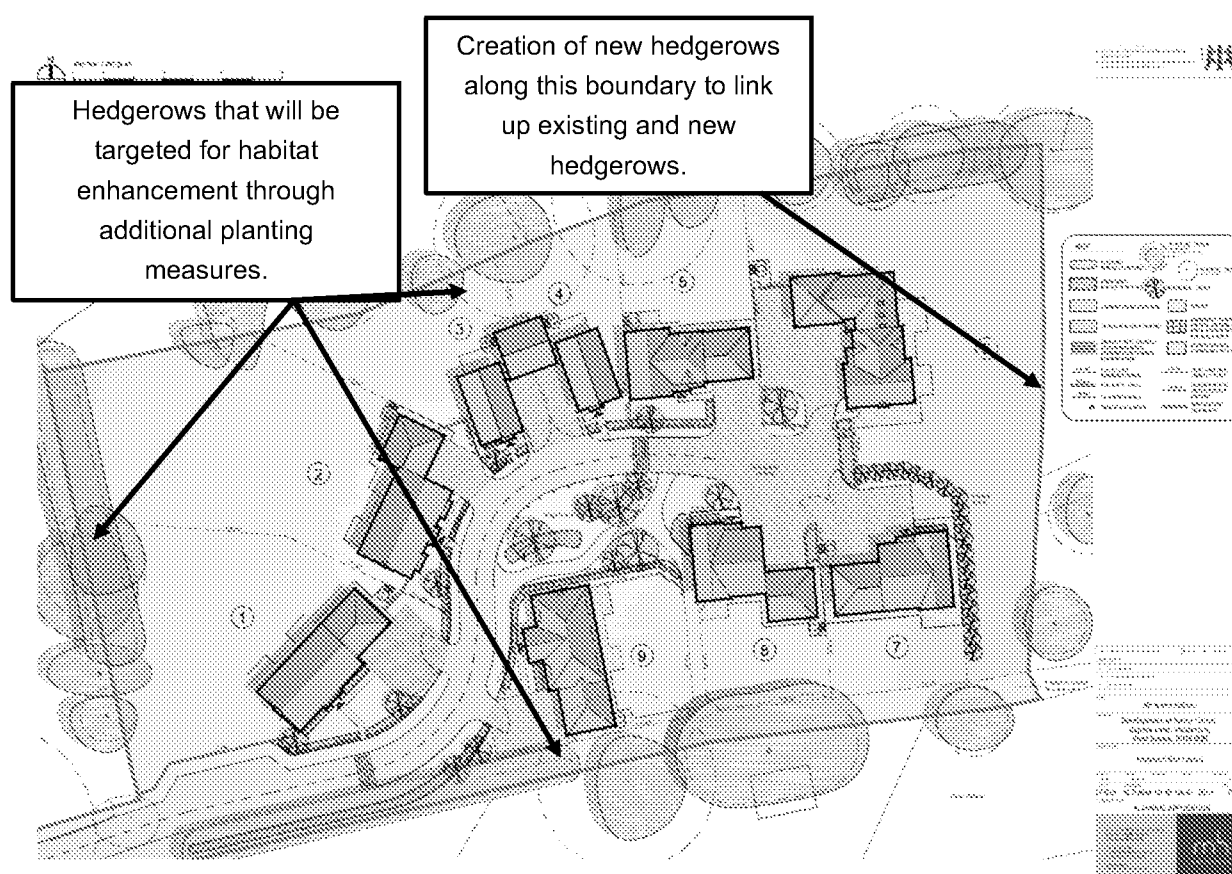


**Figure 19.** Proposed habitat enhancement and mitigation measures for dormice.



## **6.4 Great Crested Newts**

Great crested newt DNA was not identified within Ponds 1 and 2 which indicates the likely absence of this species and that it is highly unlikely that great crested newts would be found within the construction zone at any time. Although access was not permitted for Ponds 4, 5, 6 and 7, using background mapping it is clear that Ponds 5, 6 and 7 are all located on a flowing water course that runs along the western boundary of the site which may indicate the presence of fish and a moving waterbody, therefore making the ponds unsuitable to support great crested newts, which are predated upon by fish and will only breed in still water. Pond 4 is not on the water course, however the stream acts as a likely barrier to movement to the site for this species as breeding great crested newts do not inhabit running water. The nearest records for great crested newts obtained from the Sussex Biodiversity Record Centre (SxBRC) are 1.3km and 1.8km away from the nearest site boundary.

If any great crested newts are identified during construction then work must stop immediately and Natural England must be contacted for advice.

## **6.5 Reptiles**

The reptiles survey at this site has identified a 'good' population of slow worms, with most individuals recorded along the north, east and western boundaries where there is dense scrub and rough grassland. The proposed development will see the majority of the site impacted, with almost 100% of suitable reptile habitat lost or disturbed. Therefore, it is recommended that the slow worm population is translocated to suitable habitat that is capable of accommodating this population.

This will involve the installation of temporary reptile fencing which would be required to make a continuous fence line to separate the construction site from all adjacent green habitats where reptiles might migrate onto the site and would need to remain in-situ until all construction work deemed a risk to reptiles has been completed- i.e. earthworks and associated landscaping.

In line with current guidelines outlined by the Amphibian and Reptile Group UK (ARGUK), a target total of 60 translocation visits will be made between mid-March and October, with 'tins' (which can be bitumen and or corrugated metal sheets) placed at a density of not less than 100 per hectare of suitable habitat in line with ARGUK guidelines. Translocation visit will be undertaken as long as the temperature is between 9 degrees and 18 degrees in the morning or mid- afternoon in the absence of wet or very windy weather. All captured reptiles will be placed in a large smooth sided bucket with some green hay at the bottom and then released at a designated receptor site. All translocation details would be recorded into a table such as the example and submitted to the council upon request as evidence of the work undertaken. Although the target number of trapping checks is 60 visits, this should be used as a guide with the total number of visits cut short if there is an early drop in captured numbers and at least 10 visits in suitable weather conditions are made without identifying any reptile presence within the construction zone.

All details of the measures necessary for reptile protection and compensation measures will be included in a 'Mitigation Statement'.



## **6.6 Summary of Findings**

The detailed phase 2 surveys conducted upon the land at Sunny Corner have identified populations of reptiles and dormice present within the site, whilst value for foraging bats has also been identified.

Through consultation with the Ecology Co-op, a development scheme has been designed that takes in to account the ecological constraints and retains valuable habitats present upon the site where possible (the hedgerows and some scrub habitat). In addition, some new habitats are to be created within the site through the enhancement of existing hedgerows and the creation of new hedgerows to link up existing hedgerow habitat.

To ensure that suitable mitigation measures, habitat creation and enhancement measures are put in place, it is important that a Mitigation Statement is produced for this site that sets out in detail not only the measures required to conserve protected species and notable habitats during the construction phase, but also details habitat creation and management measures that cover the short and long-term life of the development and will aim to both offset the impact of the development and where possible provide enhancements for biodiversity.

Should you need any further advice on the information provided above, please do not hesitate to contact The Ecology Co-op.



## 7 Appendix 1 – Legislation and Policy

### General

This section briefly describes the legal protection afforded to protected species. It is for information only and is not intended to be comprehensive or to replace specialised legal advice. It is not intended to replace the text of the legislation, but summarises the salient points.

### Badger

Badger is protected in Britain under the Protection of Badgers Act 1992 and Schedule 6 of the Wildlife and Countryside Act 1981 (as amended).

The legislation affords protection to Badger and Badger setts, and makes it a criminal offence to:

- wilfully kill, injure, take, possess or cruelly ill-treat a Badger, or to attempt to do so;
- interfere with a sett by damaging or destroying it;
- to obstruct access to, or any entrance of, a Badger sett; or
- to disturb a Badger when it is occupying a sett.

### Bats, Dormouse and Great Crested Newt

Dormouse (*Muscardinus avellanarius*), Great Crested Newt (*Triturus cristatus*), and all species of British bat (*Vespertilionidae* and *Rhinolophidae*) are listed on *Schedule 5* of the *Wildlife and Countryside Act 1981* (as amended), and receive full protection under *Section 9*. These species are also all listed as European Protected Species on *Schedule 2* of the *Conservation (Natural Habitats, etc.) Regulations 1994* which gives them full protection under *Regulation 39*. Protection was extended by the *Countryside and Rights of Way Act 2000* (the CROW Act). Under the above legislation it is an offence to:

- kill, injure or take an individual;
- possess any part of an individual either alive or dead;
- intentionally or recklessly damage, destroy or obstruct access to any place or structure used by these species for shelter, rest, protection or breeding;
- intentionally or recklessly disturb these species whilst using any place of shelter or protection; or
- sell or attempt to sell any individual.

It is also an offence to set and use articles capable of catching, injuring or killing bats (for example a trap or poison), or knowingly cause or permit such an action. In the case of Dormouse and all species of British bat there is also protection under *Schedule 6* of *The Wildlife and Countryside Act 1981* (as amended) relating specifically to trapping and direct pursuit of these species.

Dormouse, Great Crested Newt and all species of British bat are included as priority species in the *UK Biodiversity Action Plan* and as species of principal importance for the conservation of biological diversity in England under *Section 74* of the *Countryside and Rights of Way (CROW) Act 2000*.

### Reptiles

Common Lizard (*Lacerta vivipara*), Grass Snake (*Natrix natrix*), Slow-worm (*Anguis fragilis*), and Adder (*Vipera berus*) are listed under *Schedule 5* of the *Wildlife and Countryside Act 1981* (as amended), in respect of *Section 9(5)* and part of *Section 9(1)*. This protection was extended by the *Countryside and Rights of Way (CROW) Act 2000*. Under the legislation it is an offence to:

- intentionally or deliberately kill or injure any individual of these species; or
- sell or attempt to sell any part of these species either alive or dead.



## **Nesting Birds**

All species of bird are protected under *Section 1* of the *Wildlife and Countryside Act 1981* (as amended). Protection was extended by the *Countryside and Rights of Way (CROW) Act 2000*. Under the above legislation it is an offence to intentionally:

- kill, injure or take any wild bird;
- take, damage or destroy the nest of any wild bird while that nest is in use or being built; or
- take or destroy an egg of any wild bird.

Certain species are listed on *Schedule 1* of the *Wildlife and Countryside Act 1981* (as amended) and receive protection under *Sections 1(4)* and *1(5)*. The protection was extended by the *Countryside and Rights of Way (CROW) Act 2000*. There are special penalties where the offences listed above are committed for any *Schedule 1* species and it is also an offence to intentionally or recklessly:

- disturb any such bird when it is building its nest or while it is in or near a nest containing dependant young; or
- disturb the dependant young of any such bird.



## 8 Appendix 2 - Artificial lighting and wildlife

### Interim Guidance: Recommendations to help minimise the impact of artificial lighting

Wherever human habitation spreads, so does artificial lighting. This increase in lighting has been shown to have an adverse effect on our native wildlife, particularly on those species that have evolved to be active during the hours of darkness. Consequently, development needs to carefully consider what lighting is necessary and reduce any unnecessary lighting, both temporally and spatially. When the impacts on different species groups are reviewed, the solutions proposed have commonalities that form the basis of good practice. These are outlined in the following document.

#### Overview of impacts

##### Invertebrates

Artificial light significantly disrupts natural patterns of light and dark, disturbing invertebrate feeding, breeding and movement, which may reduce and fragment populations. Some invertebrates, such as moths, are attracted to artificial lights at night. It is estimated that as many as a third of flying insects that are attracted to external lights will die as a result of their encounter.<sup>1</sup> Insects can become disoriented and exhausted making them more susceptible to predation. In addition, the polarisation of light by shiny surfaces attracts insects, particularly egg laying females away from water. Reflected light has the potential to attract pollinators and impact on their populations, predators and pollination rates. Many invertebrates natural rhythms depend upon day-night and seasonal and lunar changes which can be adversely affected by artificial lighting levels.

It is not always easy to disentangle the effects of lighting on moths from other impacts of urbanisation. However, it is known that UV and green and blue light, which have short wavelengths and high frequencies, are seen by most insects and are highly attractive to them. Where a light source has a UV component, male moths in particular will be drawn to it. Most light-induced changes in physiology and behaviour are likely to be detrimental. They discern it to be 'light', so they do not fly to feed or mate.<sup>2</sup>

##### Birds

There are several aspects of changes to bird behaviour to take into account. The phenomenon of robins and other birds singing by the light of a street light or other external lighting installations is well known, and research has shown that singing did not have a significant effect on the bird's body mass regulation. However, it was felt that the continual lack of sleep was likely to be detrimental to the birds' survival and could disrupt the long-term circadian rhythm that dictates the onset of the breeding season<sup>3</sup>. Many species of bird migrate at night and there are well-documented cases of the mass mortality of nocturnal migrating birds as they strike tall lit buildings. Other UK bird species that are particularly sensitive to artificial lighting are long-eared owls, black-tailed godwit and stone curlew.<sup>4</sup>

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<sup>1</sup> Bruce-White C and Shardlow M (2011) A Review of the Impact of Artificial Light on Invertebrates - See more at: <http://www.buglife.org.uk/advice-and-publications/publications/campaigns-and-reports/review-impact-artificial-light#sthash.s7GPA1vL.dpuf>

<sup>2</sup> As above

<sup>3</sup> Pollard A. (2009) Visual constraints on bird behaviour. University of Cardiff

<sup>4</sup> Rodriguez A., Garcia A.M., Cervera F. and Palacios V. (2006) Landscape and anti-predation determinants of nest site selection, nest distribution and productivity in Mediterranean population of Long-eared Owls, *Asiootus*. *Ibis*, 148(1), pp.133-145



## **Phase 2 Assessments, Land at Sunny Corner, Walberton**

### **Mammals**

A number of our British mammals are nocturnal and have adapted their lifestyle so that they are active in the dark in order to avoid predators. Artificial illumination of the areas in which these mammals are active and foraging is likely to be disturbing to their normal activities and their foraging areas could be lost in this way. It is thought that the most pronounced effect is likely to be on small mammals due to their need to avoid predators. However, this in itself has a knock-on effect on those predators.

The detrimental effect of artificial lighting is most clearly seen in bats. Our resident bat species have all suffered dramatic reductions in their numbers in the past century. Light falling on a bat roost exit point, regardless of species, will at least delay bats from emerging, which shortens the amount of time available to them for foraging. As the main peak of nocturnal insect abundance occurs at and soon after dusk, a delay in emergence means this vital time for feeding is missed. At worst, the bats may feel compelled to abandon the roost. Bats are faithful to their roosts over many years and disturbance of this sort can have a significant effect on the future of the colony. It is likely to be deemed a breach of the national and European legislation that protects British bats and their roosts.

In addition to causing disturbance to bats at the roost, artificial lighting can also affect the feeding behaviour of bats and their use of commuting routes. There are two aspects to this: one is the attraction that short wave length light (UV and blue light) has to a range of insects; the other is the presence of lit conditions.

As mentioned, many night-flying species of insect are attracted to lamps that emit short wavelength component. Studies have shown that, although noctules, serotines, pipistrelle and Leisler's bats, take advantage of the concentration of insects around white street lights as a source of prey, this behaviour is not true for all bat species. The slower flying, broad-winged species, such as long-eared bats, barbastelle, greater and lesser horseshoe bats and the *Myotis* species (which include Brandt's, whiskered, Daubenton's, Natterer's and Bechstein's bats) generally avoid external lights.

Lighting can be particularly harmful if it illuminates important foraging habitats such as river corridors, woodland edges and hedgerows used by bats. Studies have shown that continuous lighting along roads creates barriers which some bat species cannot cross<sup>5</sup>. It is also known that insects are attracted to lit areas from further afield. This could result in adjacent habitats supporting reduced numbers of insects, causing a further impact on the ability of light-avoiding bats to feed.

These are just a few examples of the effects of artificial lighting on British wildlife, with migratory fish, amphibians, some flowering plants, a number of bird species, glow worms and a range of other invertebrates all exhibiting changes in their behaviour as a result of this unnatural lighting.

## **Recommendations**

### **Survey and Planning**

The potential impacts of obtrusive light on wildlife should be a routine consideration in the Environmental Impact Assessment (EIA) process<sup>6</sup>. Risks should be eliminated or minimised wherever possible. Some locations are particularly sensitive to obtrusive light and lighting schemes in these areas should be carefully planned.

In August 2013, Planning Minister Nick Boles launched the new National Online Planning Guidance Resource aimed at providing clearer protection for our natural and historic environment. The guidance looks at when lighting pollution concerns should be considered and is covered within one of the on line planning practice

<sup>5</sup> Stone E. L., Jones G and Harriss (2009) Street lighting disturbs commuting bats. *Current Biology*, 19, pp 1-5

<sup>6</sup> See also: Institution of Lighting Professionals – Professional Lighting Guide (PLG 04) Guidance on undertaking lighting environmental impact assessments).

guides<sup>7</sup>. The guide provides an overview for planners with links to documents that aim to give planners an overview of the subject through the following discussion points:

1. When is obtrusive light / light pollution relevant to planning?
2. What factors should be considered when assessing whether a development proposal might have implications for obtrusive lighting / light pollution?
3. What factors are relevant when considering where light shines?
4. What factors are relevant when considering how much the light shines?
5. What factors are relevant when considering possible ecological impact?

This can help planners reach the right design through the setting of appropriate conditions relating to performance and mitigation measures at the planning stage.

The Institution of Lighting Professionals (ILP) recommends that Local Planning Authorities specify internationally recognised environmental zones for exterior lighting control within their Development Plans<sup>8</sup>. In instances lacking classification, it may be necessary to request a Baseline Lighting Assessment/Survey conducted by a Lighting Professional in order to inform the classification of areas, particularly for large-scale schemes and major infrastructure projects.

When assessing or commissioning projects that include the installation of lighting schemes, particularly those subject to the EIA process, the following should be considered and relayed to applicants:

- **Ecological consultants should confirm the presence of any sensitive fauna and flora**, advising the lighting designers of bat routes and roosts and other areas of importance in order to ensure that reports correspond with each other.
- **Ecological consultants should consider the need for quantitative lighting measurements**. In some instances it may be necessary for further lighting measurements to be taken. For example, outside an important bat roost. These should follow best practice guidance from the ILP and would ideally be conducted by a Lighting Professional.
- **Where appropriate, professional lighting designers should be consulted** to design and model appropriate installations that achieve the task but mitigate the impacts. This should be done at the earliest opportunity. Early decisions can play a key role in mitigating the impact from lighting.
- **Reports submitted should outline the impacts of lighting in relation to ecology**, making clear reference to the ecological findings, highlighting any sensitive areas and detail proposed mitigation. Consideration should also be given to internal lighting where appropriate.
- **Post –installation checks and sign off upon commissioning should be carried out** by the lighting designer to ensure that the lighting installation has been installed in accordance with the design, that predictions were accurate and mitigation methods have been successful.

Principles and design considerations

#### **Do not**

- **provide excessive lighting**. Use only the minimum amount of light needed for the task.
- **directly illuminate bat roosts** or important areas for nesting birds

#### **Avoid**

- **installing lighting in ecologically sensitive areas** such as: near ponds, lakes, rivers, areas of high conservation value; sites supporting particularly light-sensitive species of conservation significance (e.g. glow worms, rare moths, slow-flying bats) and habitat used by protected species.
- **using reflective surfaces under lights**.

#### **Do**

- **consider employing a competent lighting designer** who will apply the principles of providing the right light, in the right place, at the right time and controlled by the right system.
- **minimise the spread of light** to as close to horizontal as possible and ensure that only the task area is lit. Flat cut-off

lanterns or accessories should be used to shield or direct light to where it is required.

- **consider the height of lighting columns.** It should be noted that a lower mounting height is not always better. A lower mounting height can create more light spill or require more columns. Column height should be carefully considered to balance task and mitigation measures.
- **consider no lighting solutions where possible** such as white lining, good signage and LED cats eyes. These options can also be effective. For example, light only high-risk stretches of roads, such as crossings and junctions, allowing headlights to provide any necessary illumination at other times.
- **use temporary close-boarded fencing until vegetation matures**, to shield sensitive areas from lighting.
- **limit the times that lights are on to provide some dark periods.** The task being lit often varies, for example roads are less used after 23.00hrs and car parks are empty. A lighting designer can vary the lighting levels as the use of the area changes reducing lighting levels or perhaps even switching installations off after certain times. This use of adaptive lighting can tailor the installation to suit human health and safety as well as wildlife needs.

### Technological specifications

Research from the Netherlands has shown that spectral composition does impact biodiversity.

- **Use narrow spectrum light sources** to lower the range of species affected by lighting.
- **Use light sources that emit minimal ultra-violet light**
- **Lights should peak higher than 550 nm**
- **Avoid white and blue wavelengths of the light spectrum** to reduce insect attraction and wherewhite light sources are required in order to manage the blue short wave length content they should be of a warm / neutral colour temperature <4,200 kelvin.

Further guidance on the spectral composition of artificial lighting will be made available following the publication of research from the Netherlands.

### Further reading:

- A review of the impact of artificial light on invertebrates. Buglife. 2011
- Royal Commission on Environmental Pollution. 2009. Artificial light in the environment. London, HMSO
- "The Ecological Consequences of Artificial Night Lighting" edited by Longcore and Rich
- Shedding Light: A survey of local authority approaches to lighting in England. CPRE 2014

<http://planningguidance.planningportal.gov.uk/blog/guidance/light-pollution/when-is-light-pollution-relevant-to-planning/> <http://planningguidance.planningportal.gov.uk/blog/guidance/light-pollution/when-is-light-pollution-relevant-to-planning/>

<sup>8</sup> Institution of Lighting Professionals (2011) Guidance Notes for the Reduction of Obtrusive Light GN01:2011.