Bat Emergence Survey Report for Hudnalls Cottage, Hewelsfield, Gloucestershire

Commissioned by: Mrs C. Lai

Author: Ashley Butler MSc

Version: Final

Date: 15/9/23

Grid Reference: SO558019

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Executive summary

NewWays Ecology undertook a bat scoping assessment July 2023. The building was assessed as having a 'moderate potential' to support roosting bats, and found scattered droppings within the boiler room which has an external door. These droppings are likely to be pipistrelle sp.

Based on the above assessment and in line with Bat Conservation Trust Guidelines, NewWays Ecology undertook two bat activity survey visits at Hudnalls Cottage, Hewelsfield which were carried out in August 2023. The purpose of this survey work was to determine presence of roosting bats and provide advice to inform a planning application for the extension of the cottage.

Over the two visits, up to 13 bats were witnessed emerging from and returning to the house. These included a maximum count of 5 soprano pipistrelle, 8 *myotis* sp. Bats and an individual common pipistrelle. There was a moderate level of activity around the site. Common Pipistrelle, soprano pipistrelle, myotis sp., and brown long-eared utilised the garden surrounding the cottage for foraging over both surveys. Commuting passes by noctules, leisler's and lesser horseshoes were also recorded.

The evidence gathered during the surveys suggests that during the time of the survey the site is an active bat roost. The site likely hosts a maternity roost for small numbers of soprano pipistrelles and myotis sp. bats. The planned works to the roof at Hudnalls Cottage, Hewelsfield may result in the disturbance, modification and destruction of a bat roost. The proposed new extension is unlikely to impact the roost.

In order to avoid offences a protected species mitigation licence will be required from Natural England before works can commence if works to the roof structures/ void are planned.

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1. Introduction

1.1. Background

In relation to the proposed extension of Hudnalls Cottage, Hewelsfield NewWays Ecology carried out a bat scoping assessment in July 2023 during which evidence of bats was found and several features were identified that were suitable to support roosting bats within the building. The building was assessed as having moderate potential as well as confirmed presence.

The proposed development includes the extension of the cottage and works to the original roof.

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This report presents the results of two bat activity surveys carried out in August 2023. These were led by Ashley Butler MSc (licenced under class license 2016-20666-CLS-CLS (Mr. Steven Wadley)). The grid reference for this site is SO558019.

The purpose of this survey work was to determine presence of roosting bats and where necessary prescribe further surveys and/or appropriate mitigation advice to inform the planning application for the proposed works at the site.

This survey and report was carried out at the request of Mrs Cecily Lai of Hudnalls Cottage, Hewelsfield.

1.2. Site description

The site is located at national grid reference SO558019. Hudnalls Cottage is a traditional stone built cottage likely to date from the 1800s. It has been enlarged later c. mid 20th C. This development includes a block to the east and a flat roof garage. The cottage and extension are constructed of stone walls and traditional slate tiles. The newer section is rendered.

The location of the site is shown in Figure 1 and the extent of the site boundary is shown in Figure 2. The building surveyed is shown in Figure 3.

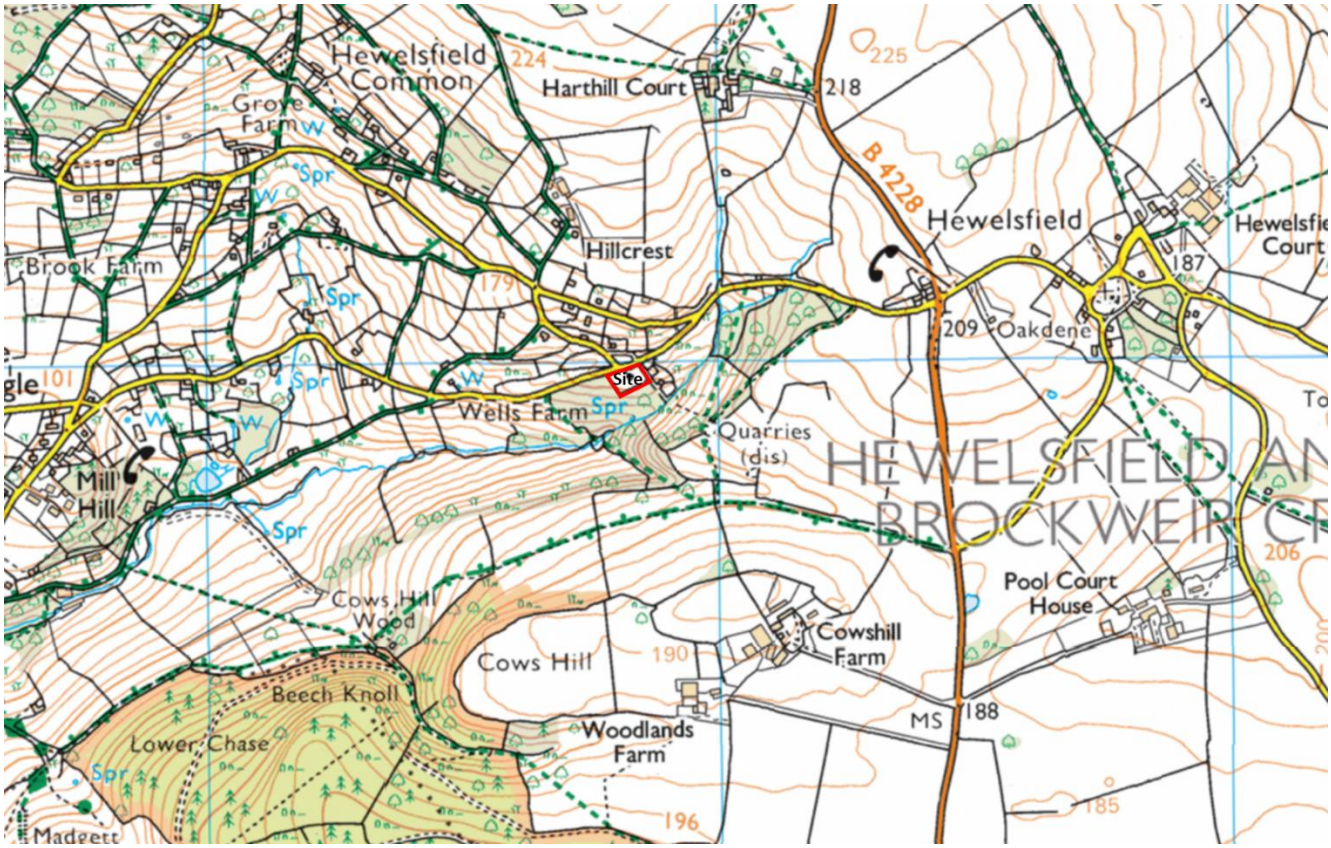

Figure 1: Site location. Contains Ordnance Survey data © Crown copyright and database right 2023

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Figure 2: Site boundary. Images produced courtesy of Google maps (Map data ©2023 Google).

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Figure 3: Buildings surveyed

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Hudnalls Cottage is located in a rural location within the scattered settlement of Hewelsfield and Hewelsfield Common in the Forest of Dean District of Gloucestershire. Hewelsfield is located on the west side of the River Severn estuary and to the east of the River Wye. The site is located approximately 5 km west of the River Severn and 2km east of the River Wye. The site borders a small area of mature broadleaf woodland and Bailey Lane to the north but otherwise is surrounded by scattered dwellings, semi-improved pasture and other small areas of woodland. To the east of the site the landscape drops away steeply towards the Wye Valley. The surrounding landscape is rural and comprises a mixture of arable and pasture farmland with woodlands and hedgerows providing good ecological connectivity and foraging opportunities for bats. 100m to the south of the site is the tree-lined riparian corridor of an unnamed brook which flows into the River Wye. There are extensive areas of woodland within 2 km to the south and east, including Cow's Hill Wood, Madgett Hill, Oakhill Wood and Shorn Cliff and Caswell Wood which forms part of the Wye Valley Woodland SAC. Hewelsfield Common, a mosaic of woodland, scattered trees, scrub/tall herb and grassland, lies within 800m to the north-west. These habitats provide good opportunities for roosting, foraging and commuting bats within the local area. Roosting potential locally is high due to areas of ASNW and numerous older buildings.

Figure 4: Habitat surrounding the site

1.3. Development proposals

The proposed development includes a single storey extension of the cottage and works to the existing roof.

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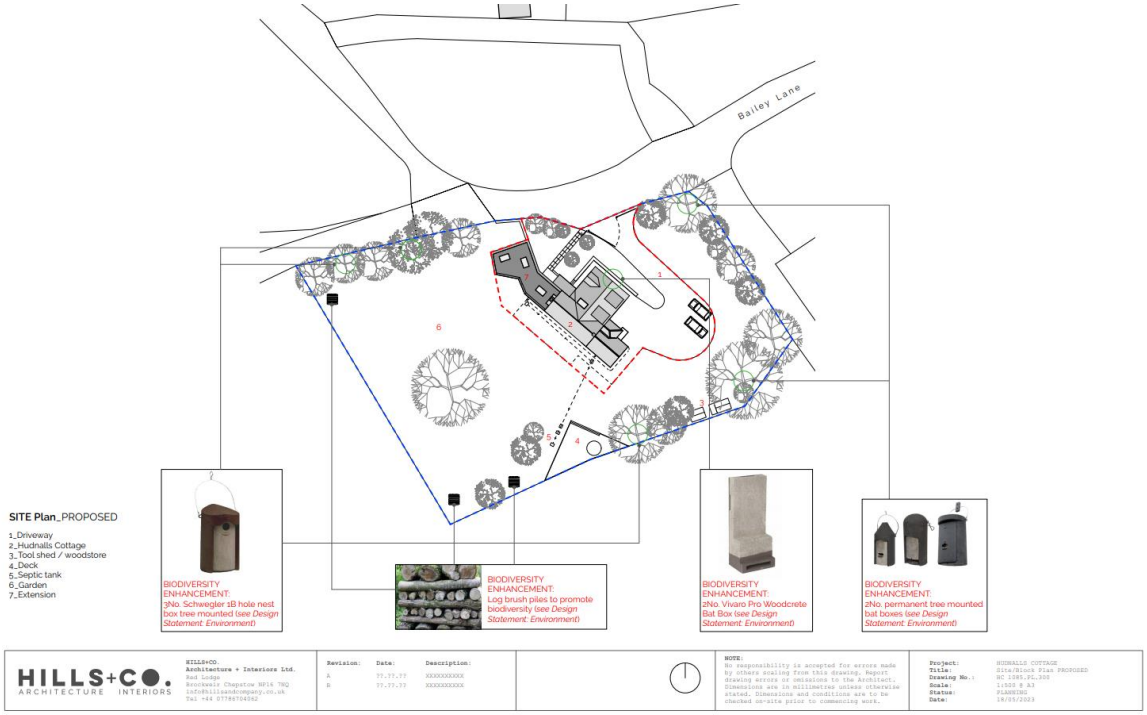

Figure 5: Plans for the site - July 2023 (Hils+Co)

1.4. Legal Protection

Details of legislation and legal protection afforded to all species of bats are given in Appendix 1.

The results of this survey will be used to determine the need for appropriate mitigation strategy to ensure compliance with UK wildlife legislation.

2. Methodology

2.1. Desk Survey

A data search for bat and roof nesting birds was carried out with data provided by Gloucestershire Centre for Environmental Records (GCER) in July 2023. Reference was also made to Natural England's MAGIC website1 for detail on nearby statutorily designated sites and records of granted Natural England protected species bat mitigation licences within a 2 km radius of the site.

Designated sites of importance to bats within the 10 km radius of the site include the following:

- Wye Valley and Forest of Dean Bat Sites SAC – Sylvan House Barn SSSI – 1.7km
- Wye Valley and Forest of Dean Bat Sites SAC – Wye Valley Lesser horseshoe bat sites SSSI (Llandogo Priory) – 4km
- Wye Valley and Forest of Dean Bat Sites SAC – Devil's Chapel and Scowles SSSI – 5.3km
- Wye Valley and Forest of Dean Bat Sites SAC – Caerwood and Ashbury Goose House – 5.4km
- Wye Valley and Forest of Dean Bat Sites SAC – Old Bow and Old ham Mine SSSI – 6.3km

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The Wye Valley & Forest of Dean Special Area of Conservation (SAC) Bat Sites are a complex of sites scattered across the Forest of Dean and wye Valley which between them support important breeding and hibernating populations of lesser horseshoe bat (*Rhinolophus hipposideros*) and greater horseshoe bat (*Rhinolophus ferrumequinum)*. The nearest of these sites is located approximately 1.7 km northwest of Hudnalls Cottage; Sylvan House Barn SSSI is designated for its nationally significant breeding population of lesser horseshoe bats, and consists of the roof void of a stone built barn.

GCER provided 68 records of bats within a 2 km radius of the site, recorded between 2004 and 2022. At least nine species have been recorded, namely common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*P. pygmaeus*), brown long-eared bat (*Plecotus auritus*), leisler's (*Nyctalus leisleri*), serotine (*Eptesicus serotinus*), western barbastelle (*Barbastella barbastellus*), Daubenton's bat (*M. daubentoniid)*, and lesser horseshoe bat, as well as indeterminate species records. The nearest recorded roost is a maternity roost supporting approximately 60 lesser horseshoe bats approximately 600 m southwest of the site recorded in 2017.

Reference to Natural England's MAGIC website, which holds records of granted protected species licences, identified one licence for bat species within 2 km of the site. The nearest licence is for the lawful destruction of a soprano pipistrelle and lesser horseshoe resting place 600 m northwest of the site (EPS Licence: EPSM2017-28703).

An absence of records does not mean that a particular species is not present, merely that it has not been recorded. Many species records are not obtainable from the sources utilised and therefore there may be further undetected records for such species on the study site or in the local area.

2.2. Scoping survey

The scoping survey was undertaken on 10th July 2023 by Ashley Butler of NewWays Ecology. The survey covered the cottage, as shown in Figure 3.

The building was assessed for its potential to support bats or bat roosts according to industry standard guidelines (Collins, 2016). This involves a consideration of various factors including:

- Light levels
- Temperature regime and protection from weather
- Access to the interior of the building or to other suitable roost sites
- Potential roost sites
- Building construction
- Habitat context

Based on these factors, an assessment was made of whether the building might support bats, and the type and number of roosts that might be present. The building was assigned a roost potential category (Collins, 2016) according to the criteria outlined in Table 1 below, based on the results of the assessment.

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Table 1: Guidelines for assessing the potential suitability of buildings/structures for roosting bats (based

Category	Category description
Negligible	Negligible habitat features on site likely to be used by roosting bats.
Low	A building or structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation).
Moderate	A building or structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only).
High	A building or structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.
Known roost	Building or structure currently supporting bats (based on presence of bats, or evidence of use such as droppings, carcasses etc.).

A detailed inspection was made of the exterior and interior of the building for any evidence of bat use, such as live or dead bats, droppings, scratch marks, staining and prey remains (e.g. moth or butterfly wings), and in some cases the absence of cobwebs. Large quantities of cobwebs in roof voids or at access points tend to be suggestive of no bat use, although this evidence is not conclusive.

Features identified as possible bat access points or potential roosting locations were thoroughly searched where possible, using powerful torches, binoculars and an endoscope to facilitate the process. Ladders were available to enable more detailed inspection of cracks and crevices as far as access allowed.

2.3. Limitations of scoping surveys

Full access to the loft space was not possible. The loft was not boarded out and has been lined with glass fibre insulation. A full view of the loft space to the north was not possible either due to the location of the water tank.

2.4. Activity surveys

Two activity surveys were undertaken on the 2nd and 30th August 2023. The surveys were led by Ashley Butler MSc (Applied Ecology- University of Gloucestershire). Ms. Butler is an experienced ecologist and specialises in Ancient Woodland flora, National Vegetation Classification, Phase 1 Habitat Surveys and commercial survey work in Wales and England. Ms. Butler has been involved in commercial bat surveys since 2017 and is an associate under Mr Steve Wadley's bat license – Natural England bat license (2016-20666-CLS-CLS). All surveys were carried out in appropriate weather conditions using the methodology set out in the best practice guidelines prepared by the Bat Conservation Trust and CIEEM.

The survey focused upon the features of interest on the external faces of the property, with a particular focus upon the potential bat entry/exit points, such as the apexes, ridge tiles, and facia

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boards. The surveyors positioned themselves accordingly, at an appropriate vantage point in view of these interest features, and the locations of these are indicated in Figure 4. The dusk emergence survey commenced approximately 30 minutes before sunset and lasted approximately 2 hours, the optimum time for bats to emerge from a roost, in order to record any bats that may emerge from the building. The dawn survey commenced 1,5 hours before sunrise and lasted approximately 2 hours, covering the optimum time for bats to return to the building.

The surveyors recorded any bat activity on or around the potential roosting entry/exit features identified during the scoping survey, using full spectrum real time handheld bat detectors (Batlogger Elekton M1 and M2, and BatScanner Elekton) to identify species through call frequencies.

All bat passes were noted, and all bats identified to species level where possible. Echolocation calls were recorded by the detectors in-built sound cards and subsequently analysed using BatExplorer software which facilitates species identification. Where possible additional notes on size, flight height, type of flight (such as commuting, foraging, fast or slow) and direction of flight were also recorded.

For pipistrelle species the following criteria, based on measurements of peak frequency, were used to classify calls:

- Common Pipistrelle ≥42 kHz and <49 kHz
- Soprano Pipistrelle >51 kHz
- Nathusius' Pipistrelle <39 kHz
- Common/Soprano pipistrelle ≥49 kHz and <51 kHz
- Common/Nathusius' Pipistrelle ≥39 kHz and <42 kHz

In addition, calls by bat species of the *myotis* genus were not identified to species level. Bats in this genus cannot reliably be separated on calls alone due to the overlap in call characteristics between the species. Calls from this species group have been identified as 'myotis sp.'.This is also true for grey long-eared bats and brown long-eared bats. Calls from this species group have been identified as 'long-eared bat sp.'.

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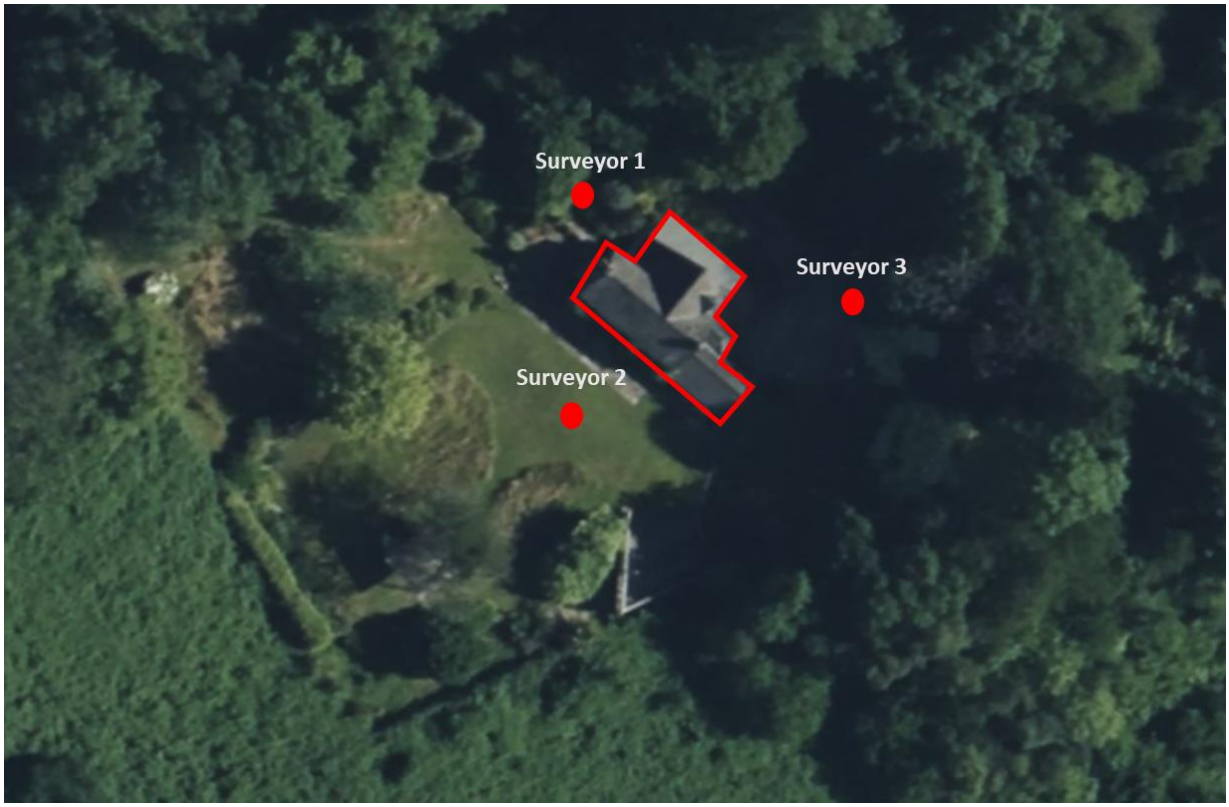

Figure 4: Site plan, showing the positions of surveyors (red dots) on the surveys

2.5. Limitations of emergence surveys

In accordance with best practice guidelines, two survey visits were undertaken, and all survey visits were undertaken in accordance with best practice guidelines, during the peak period in bat activity and during good weather conditions. The results presented here are therefore considered to be an accurate representation of the general use of the property by roosting bats.

Nevertheless, bats can use roosting features intermittently throughout the year and may be present in larger or smaller numbers depending on their breeding cycle, weather conditions, and in response to disturbance. These surveys record the emergence of bats at the time of the survey visits and therefore only provide a snapshot of bat roosting activity at the site at that time. Bats may be present at other times and the results should therefore be viewed with caution.

3. Results

3.1. Scoping survey

Hudnalls Cottage is a traditionally built, stone cottage probably dating from the 1800s (Section1) with a series of newer extensions (sections 2-4). It is set within a large and mature garden and is adjacent to an area of mature broadleaf woodland. The layout is shown below. The main cottage is

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constructed of stone with sections 2, 3 and 4 being stone or block built and rendered. The cottage and sections 2 and 3 have a slate roof and section 4 has a bitumen laid flat roof.

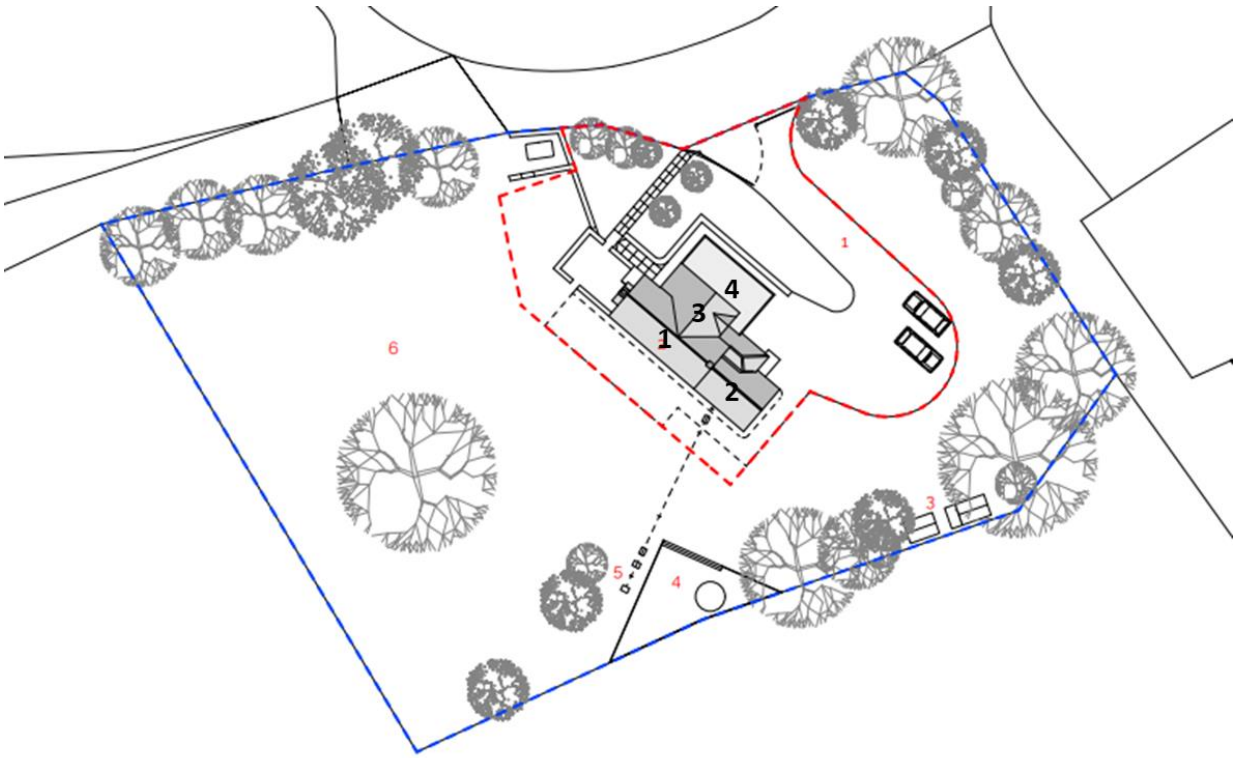

Figure 6: Hudnalls Cottage layout plan

3.1.1 Exterior

The cottage comprises four main parts (Figure 6; Plates 11 and 12): an original rectangular stone built cottage with a pitched roof (section 1), a block or stone-built and rendered extension with pitched roof on the southeast elevation (section 2), a block or stone-built and rendered extension with pitched roof on the northeast elevation (section 3), and a flat roofed block-built and rendered garage extension (section 4) currently used as an office on the northeast elevation. The stone walls of sections 1 are generally in good condition with intact pointing. The render on the walls of Sections 2, 3 and 4 is in good condition with no cracks of lifting noted. The main pitched roofs of the cottage (sections 1, 2 and 3) supports a slate roof and concrete ridge tiles. These are in good condition and well-sealed with no visible gaps for roosting bats, except for several small gaps noted under a few of the ridge tiles. There are several cracks along the tile verges of section 1. There are wooden soffits covering the eaves on section 1 with numerous gaps between the soffit and stone work that could offer bats access into the roof void of the original cottage (Plate 5 and 9). A bee's nest was also noted accessing the roof space of section 3 at the point were section 3 and section 1 join on the northern aspect (Plate 4). There is a significant are of rot on the wooden bargeboards on section 1 on the north east aspect (Plate 5). The garage extension (section 4) is flat roofed and is tightly sealed, offering very limited potential for roosting bats, except for occasional or opportunistic

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roosting within gaps behind the fascia boards; however, these gaps contained extensive cobwebbing, suggestive of no recent bat use (plate 2). The building has wooden doors which are well sealed and maintained in good condition, with no gaps noted. The windows are wooden framed and good condition with all window frames tightly sealed. There are 2 chimney stacks on the original cottage. The pointing on each stack is in good condition and the associated lead flashing is tight to the building.

On the northwest side of the original cottage there is a small boiler room with an external door. At the time of the survey the door was ajar providing potential access into the space. The wooden door also showed signs of rot at the base which means it does not fit tight to the floor (plate 6).

3.1.2 Interior

Internally the cottage is used as a residential living space including the garage extension which is now used as an office accessed via a porch (section 4) on the south-eastern elevation. There is a large single void accessed through a hatch in the ceiling of a bedroom. The void runs the length of the original cottage on a northwest to southeast line then extends over section 3 to the northeast. The void approximately 1.5 m in height at the apex. There is a ridge board along the apex; the timbers are square cut and in good condition (Plate 14). The internal gable stonework on the souteast gable end is roughly mortared, and thus there may be gaps and cracks providing suitable roosting opportunities for crevice dwelling bats (Plate 13). The view to the northwest gable was obscured by the location of the water tank. The void is dark, with no daylight ingress through the eaves. The void provides good protection from wind and adverse weather. The roof is lined with traditional bitumastic felt, mostly in good condition. The roof space is insulated with 18inch glass fibre insulation and is not boarded out for storage. Levels of human disturbance are likely to be very low. There was a reasonable number of dense cobwebs within the space. There is no suitable flying access for horseshoe bats; although the internal flight space is good for void-roosting bats, such as brown long-eared or Natterer's bats, with few obstructions and a reasonable void height. There are no other roof voids with access in the building.

Internal inspection of the boiler room showed small numbers of bat droppings on the floor which are likely to be pipistrelle due to the size and shape (plate 8). These were mixed with mouse and rat droppings. The internal stonework is roughly mortared, and thus there may be gaps and cracks providing suitable roosting opportunities for crevice dwelling bats (plate 7).

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Plate 1 – Facias on southeast elevation of garage extension looking towards the porch	*Plate 2 – facias on the northeast elevation of the garage*
	
Plate 3 – facias on northwest elevation of garage and section 3 looking towards original cottage	*Plate 4 – Connection point of section 3 to original cottage. Location of bees nest*

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Plate 5 – facia boards on northeast and north west elevations of cottage showing section of rot on northeast elevation

Plate 6 – external boiler room on northwest elevation

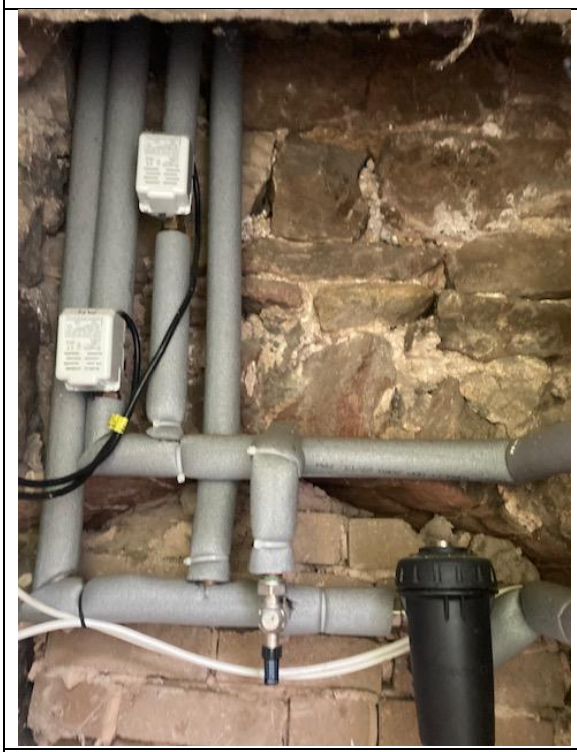

Plate 7 – internal stonework in boiler room

Plate 8 – location of pipistrelle sp, dropping on floor of boiler room

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Plate 9 – Facias on southeast elevation of cottage	*Plate 10 – facias on south east elevation of section 2*
	
Plate 11 – View of site looking northwest	*Plate 12 – view of site looking northeast*

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Plate 13- internal view of southeast gable stone work

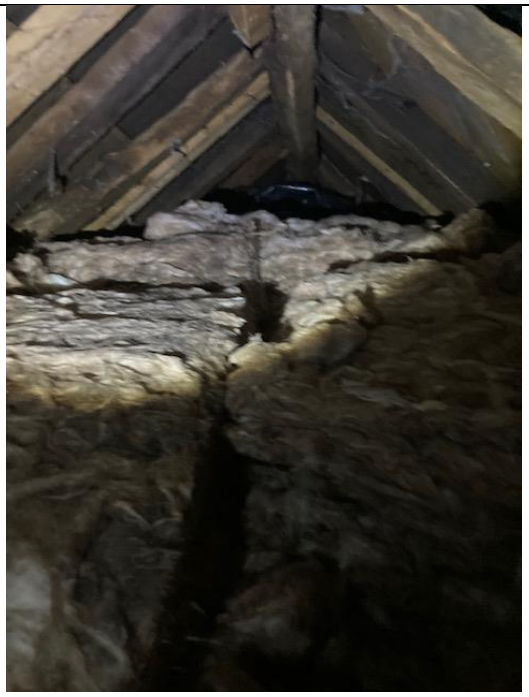

Plate 14 – internal view northwest along pitch

3.1.3 Assessment of Bat Roost Potential

The presence of bat droppings on the floor of the boiler room confirms that bats have utilised the building for roosting. Bat activity surveys were subsequently undertaken to establish whether the building is still currently used by these species, and to characterise the nature of the roosts present.

Places where bats could potentially roost include:

- Gaps between the slates and bitumastic felt lining;
- Gaps underneath the ridge tiles;
- In the roof void via access through gaps between the soffits and walls;
- Cracks along tile verges;
- Cracks and crevices within the internal gable stone walling;

In summary, the PRA confirmed that the cottage is a roost for a species of bat, and is considered to have 'moderate' roosting suitability for other species.

3.2. Bat activity surveys

3.1.1. Survey conditions

The dates, times, weather conditions, temperature and personnel for each survey visit is presented in Table 1 below:

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Date	Survey start/end time	Temp (°C), weather conditions	Surveyors
2/8/23	Start: 2030 End: 2215 Sunset: 2058	Max temp: 17°C Min temp: 17°C Wind: 1 BFS Cloud: 30%	Ashley Butler MSc (Surveyor 1) Alice Lawson (Surveyor 2) Jess Bowen (Surveyor 3)
30/8/23	Start: 0450 End: 0640 Sunrise: 0620	Max temp: 11°C Min temp: 9°C Wind: 0 BFS Cloud: 10%	Ashley Butler MSc (Surveyor 1) Rui de Sousa Stayton (Surveyor 2) Alex de Sousa (Surveyor 3)

Table 1

3.2.2. Bat activity results

2nd August 2023

General bat activity levels during the dusk emergence survey were moderate comprising observations and recordings of the following species: common pipistrelle, soprano pipistrelle, *Myotis* species, noctule, lesser horseshoe and long eared sp. Some of the myotis calls were indicative of Natterer's bats.

The first bat recorded during the survey, 20 minutes prior to sunset (2038), was a Myotis sp. bat. The earliest observation of common pipistrelle was 6 minutes prior to sunset and of soprano pipistrelle was 5 minutes prior to sunset. After these times there was regular activity over the site from these three species. A series of commuting passes by lesser horseshoe bats was recorded by surveyor 3 from 21:46. A single commuting passes by a noctule was recorded at 21:30 and a single pass by a long eared sp. Bat was recorded at 21:59. These were both recorded by surveyor 2.

The following emergences were recorded:

Time	Species	Location
20:38	Myotis sp.	NW apex
20:45	Myotis sp.	NW apex
20:46	Myotis sp.	NW apex
20:53	Myotis sp.	NW apex
20:57	Myotis sp.	NW apex
21:00	Soprano Pipistrelle	NW apex
21:00	Soprano Pipistrelle	Gap between section 2 and porch
21:01	Soprano Pipistrelle	SE apex
21:03	2x Myotis sp.	NW apex

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21:09	Common pipistrelle	SE face of cottage
21:23	Myotis sp.	NW apex
21:26	Soprano Pipistrelle	Gap between section 2 and porch

In total 8 myotis sp. Bats, 4 soprano pipistrelles and 1 common pipistrelle emerged from the cottage.

Figure 7: Survey 1 results

30th August 2023

General bat activity levels during the dawn survey were moderate comprising observations and recordings of the following species: soprano pipistrelle, *Myotis* species, noctule, leisler's and long eared sp. Some of the myotis calls were indicative of Natterer's bats.

The last bat recorded during the survey, at sunrise (06:20), was a noctule bat. The latest observation of myotis sp. bats was 7 minutes prior to sunrise, of long eared sp. Bat was 4 minutes prior to sunrise and of soprano pipistrelle was 12 minutes prior to sunrise. Before these times there was regular activity over the site from these three species. A series of commuting passes by a noctule was recorded from 05:47 and by Leisler's Bat from 05:08. These were both recorded by surveyor 2 with surveyor 3 recording one of the noctule passes.

The following returns were recorded:

Time	Species	Location
05:47	2x soprano pipistrelles	NW apex
05:55	Myotis sp.	NW apex
06:00	Myotis sp.	NW apex

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06:06	Soprano pipistrelle	SE apex
06:07	Soprano pipistrelle	SE apex
06:08	Soprano pipistrelle	SE apex
06:13	Myotis sp.	SE apex

Figure 8: Survey 2 results

4. Evaluation

All species of bat present in the UK receive full protection under The Conservation of Habitats and Species Regulations 2010, and the Wildlife and Countryside Act 1981 (as amended).

The site is located approximately 1.7 km south of the nearest Wye Valley and Forest of Dean Bat SAC Sites; Sylvan House Barn SSSI is notified for its lesser horseshoe breeding populations. Because of the nature and small size of the project, it is considered that there will be no impacts upon summer breeding, swarming or hibernating lesser or greater horseshoe bat sites as the site lies outside the Core Sustenance Zones for these species during the summer breeding and hibernation periods, and surveys show low levels of foraging behaviour by these species around the site. In addition, there are no opportunities for flight access into the roof void for these species, and thus the building does not offer opportunities for roosting, including night roosting, for horseshoe bats. The proposed development will have no impacts on the status of the Wye Valley and Forest of Dean Bat SAC Sites

The initial bat building assessment in July 2023 recorded evidence of bats within the building. The droppings found were likely to be from pipistrelle sp.. The survey also identified a number of potential access points and roosting features. The building was therefore confirmed as a roost and

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considered to have moderate potential to support roosting bats therefore activity surveys were recommended to ascertain whether bats are currently roosting within the building.

Two bat activity surveys carried out by NewWays Ecology in August 2023 reveal a maximum count of 13 bats (8 myotis sp. 4 soprano pipistrelles and 1 common pipistrelle) emerging from the property and 8 bats returning (5 soprano pipistrelle and 3 myotis sp.). Several calls form the myotis sp. Bats emerging from the site can be positively identified as Natterer's bat. It is therefore considered that Hudnalls Cottage is an active bat roost supporting natterer's bat, soprano pipistrelles and an individual common pipistrelle. Due to the numbers present and the behaviour displayed during both surveys – namely the early emergence on the first survey on a dry evening after a day of heavy rain and mirroring behaviour between two bats observed on the dawn survey it is likely the roost is a maternity roost. The early emergence can be seen as a stress response to feed young during a wet summer and the mirroring behaviour in flight was likely a mother and pup. In addition to this there was a moderate level of bat activity around the site with foraging activity focused on the garden to the south west and tree line to the north east of the property. A moderate level of foraging activity by soprano pipistrelles and myotis sp. Bats (including natterer's) was recorded over both surveys.

An individual common pipistrelle was recorded emerging from the facia board on the south west face of the cottage. According to English Nature's Bat Mitigation Guidelines (Mitchell-Jones, 2004), the conservation significance of this roost, involving an individual of a common species, with no maternity colony present, is low.

A maximum count of 8 myotis sp. and 5 soprano pipistrelles were recorded emerging or returning from northwest and southeast apexes of the original cottage, and are considered to form a small maternity roost within the roof structure; according to English Nature's Bat Mitigation Guidelines, the conservation significance of this roost, involving maternity colony of a common species, is moderate.

Common and soprano pipistrelles are common and widespread in Gloucestershire and in the UK. Natterer's bats are considered to be common within the UK.

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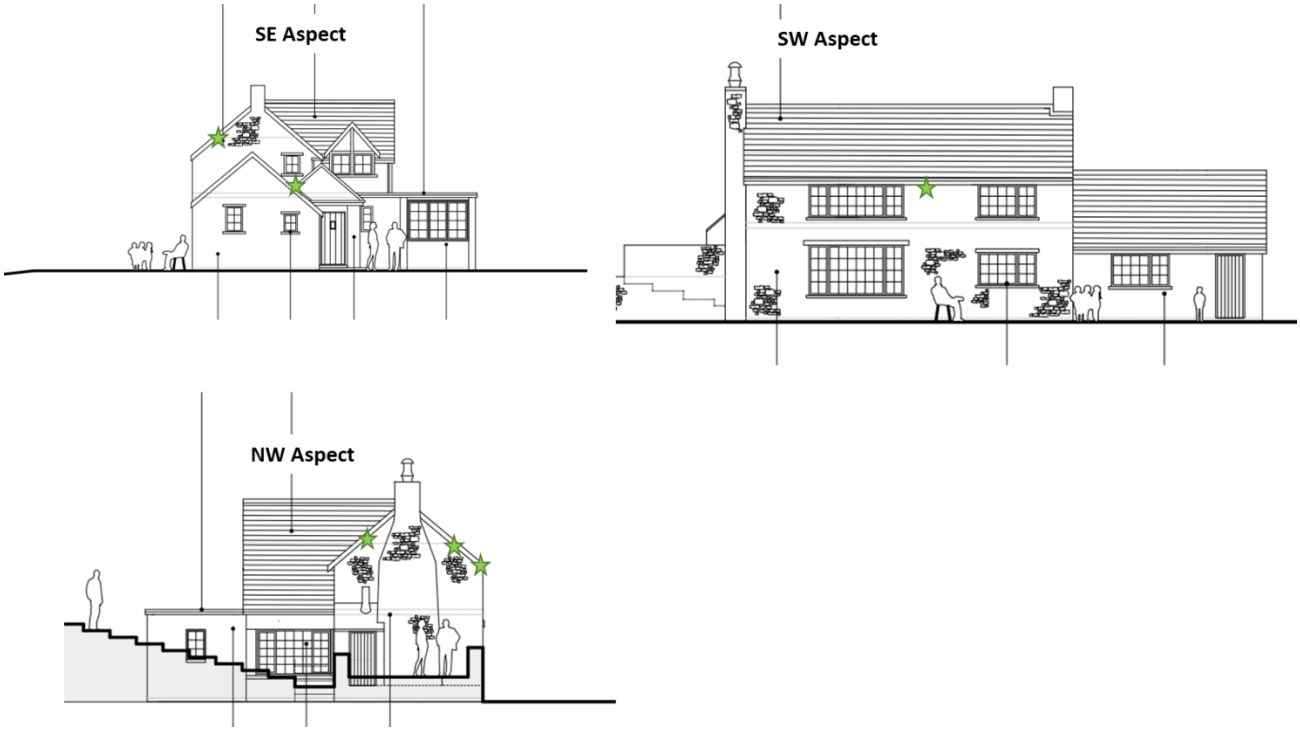

Figure 9: Roost Access Points

5. Conclusion and recommendations

5.1 Conclusion

The site is currently an active roost. Hudnalls cottage hosts a maximum count of 8 myotis sp. Bats, 5 soprano pipistrelles and an individual Common pipistrelle. It is likely to be a small maternity roost for soprano pipistrelles and myotis sp. (likely natterer's bats).

The proposals are for the extension of the cottage to the northwest and works to the roof therefore there will be impacts upon bat roosts and associated access points.

On the evidence provided by the surveys undertaken, if the proposed work to the roof is carried this will have an impact upon bats and their roosts and, therefore, offences will occur without appropriate mitigation. Depending on the final detail of the planning proposals, without appropriate mitigation, the proposed works could potentially result in the following adverse impacts on bats:

- Disturbance to bats while works are going on, including increased noise, dust and vibration, and changes to the lighting and temperature regime in and around roosts;
- Death or injury of bats that may be roosting within or under materials to be removed/modified;
- Loss, interference with and/or obstruction of access points and associated flight lines;
- Temporary or permanent modification of existing voids or structures so that they are no longer accessible or suitable for use by roosting bats, for example if the voids lose space or internal flight connectivity within one another;

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- Destruction of bat roosts.

Because the presence of bat roosts has been confirmed, a bat mitigation plan will be required (dependant on final plans) to ensure that the favourable conservation status of the bats at the site can be maintained during and after works.

The proposed new extension will have no impact on the roof space.

In order to avoid offences a protected species mitigation licence will be required from Natural England before works can commence if works to the roof structures/ void are planned.

Roost type	Development effect	Scale of impact		
		Low	Medium	High
Maternity	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction; modification		✓	
	Temporary disturbance outside breeding season	✓		
	Post-development interference			✓
Major hibernation	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction; modification		✓	
	Temporary disturbance outside hibernation season	✓		
	Post-development interference			✓
Minor hibernation	Destruction			✓
	Isolation caused by fragmentation			✓
	Partial destruction, modification		✓	
	Modified management		✓	
	Temporary disturbance outside hibernation season	✓		
	Post-development interference		✓	
	Temporary destruction, then reinstatement	✓		
Mating	Destruction		✓	
	Isolation caused by fragmentation		✓	
	Partial destruction	✓		
	Modified management	✓		
	Temporary disturbance	✓		
	Post-development interference	✓		
	Temporary destruction, then reinstatement	✓		
Night roost	Destruction	✓		
	Isolation caused by fragmentation	✓		
	Partial destruction	✓		
	Modified management	✓		
	Temporary disturbance	✓		
	Post-development interference	✓		
	Temporary destruction, then reinstatement	✓		

NB This is a general guide only and does not take into account species differences. Medium impacts, in particular, depend on the care with which any mitigation is designed and implemented and could range between high and low.

Figure 10: Scale of roost impacts (Bat mitigation Guidelines, 2004)

5.2 Recommendations

Because bat roosts are confirmed as present, a comprehensive mitigation plan will be required. The mitigation plan should be designed to accommodate the species of roosting bat present and to ensure that bats are not harmed during works and that there are no negative effects on bat populations.

The following key mitigations are required:

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- Works to original cottage roof limited to only be carried out between 1st October and 31st March – optimum period for disturbance to maternity roost;
- Bat tiles to provide access into loft over main cottage;
- Facia board access points to allow access into loft over main cottage;
- Two crevice bat boxes to be installed around the site prior to works commencing to provide a space to move bats to if required;
- Wall mounted crevice bat box to be installed on the east face of the building post construction;
- Any new external lighting should be low level, warm white LEDs PIR lights on short timers.

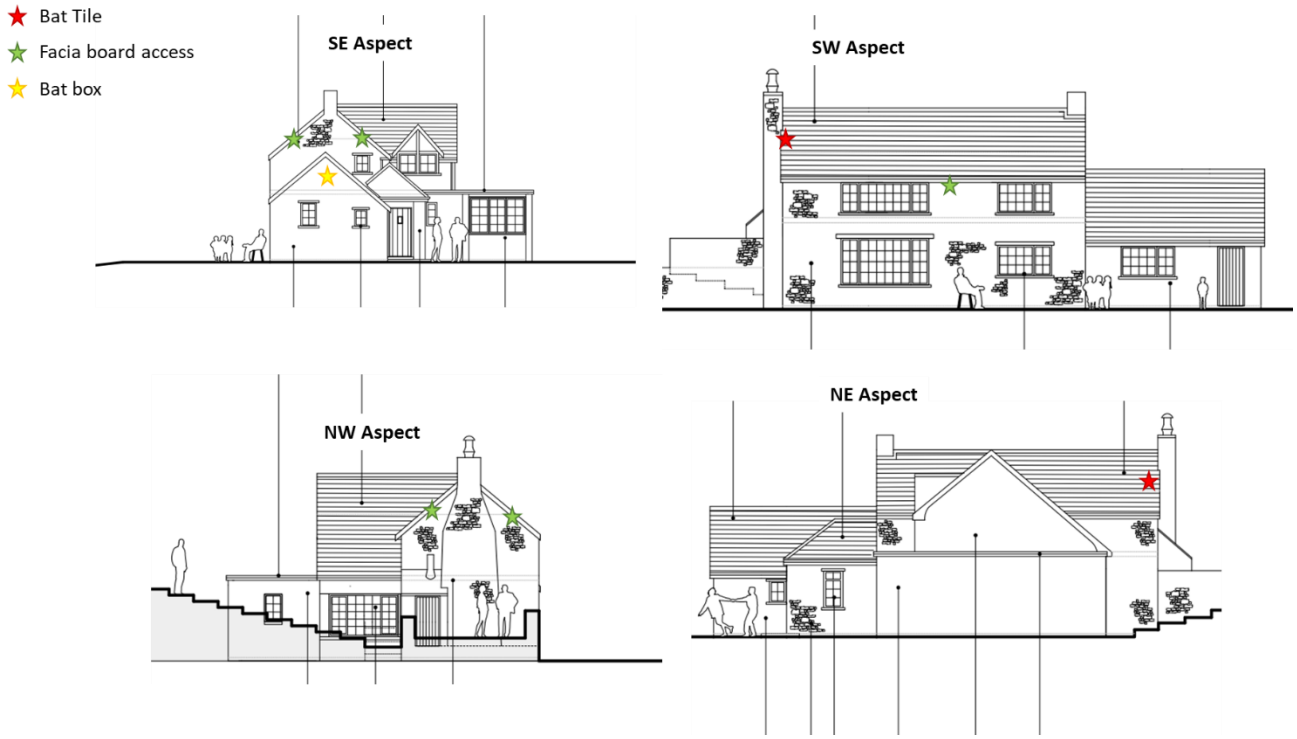

Figure 11: Mitigations - roost access points

As a confirmed bat roost will be impacted, a protected species mitigation licence will be needed from Natural England prior to commencement of the works. The licence can be applied for only after any necessary Planning Permissions are in place.

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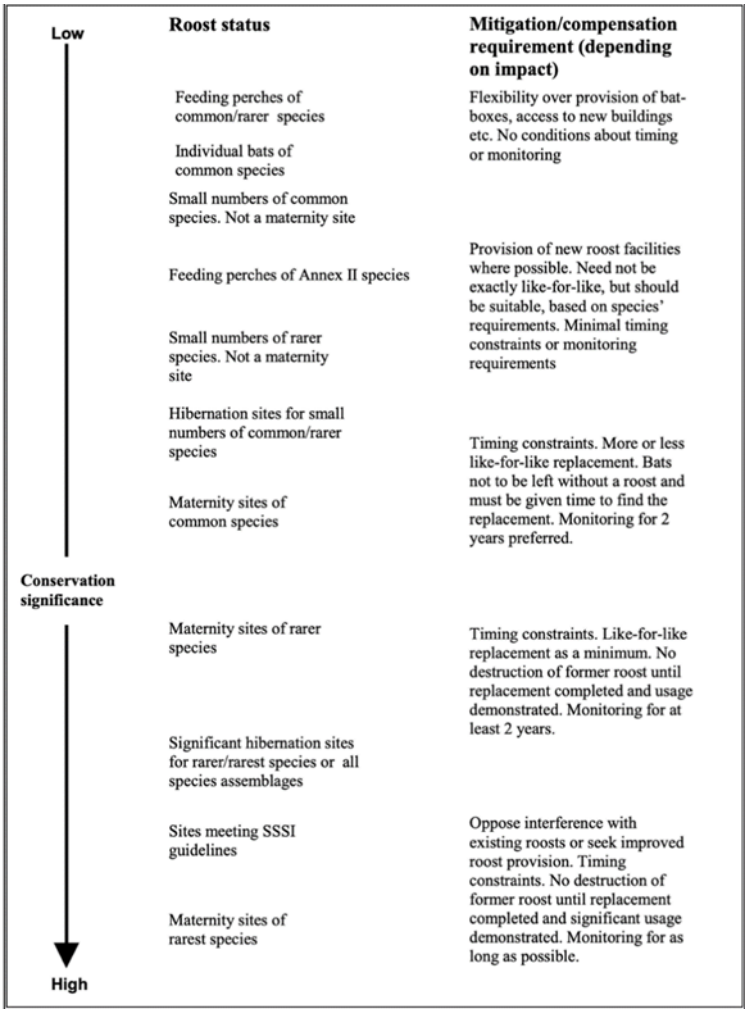

Figure 12: Mitigation hierarchy (Bat Mitigation Guidelines, 2004)

6. References

Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition)* London: The Bat Conservation Trust

Gloucester Wildlife Trust et al. (2016) *A strategy for conservation of horseshoe bats in the Wye Valley and Forest of Dean*

Institution of Lighting Professionals (2018) *Bats and artificial lighting in the UK: Bats and the built environment series (Guidance note 08/18)* Rugby: Institution of Lighting Professionals

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

Mitchell-Jones A.J. and McLeish A.P. (2004) *The Bat Workers Manual 3rd Edition*. Joint Nature Conservation Committee

Natural England (1995) *Sylvan House Barn SSSI notification*

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UK Government. 2017. *Conservation of Habitats and Species Regulations*

Appendix 1 – Legislation and Policy

All species of British bat are fully protected under the Wildlife and Countryside Act 1981 as amended through inclusion in Schedule V. All bat species in the UK are also included in Schedule II of the Habitats Regulations 2010.

Bat species are afforded further protection by the Natural Environment and Rural Communities Act 2006. 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
- deliberate disturbance in such a way as to be likely to impair their ability to:
    - survive, to breed or reproduce, or to rear or nurture their young; or
    - in the case of animals of a hibernating or migratory species, to hibernate or migrate; or
    - to affect significantly the local distribution or abundance of the species to which they belong;
- keep (possess), transport, sell or exchange, or offer for sale or exchange, any live or dead bat, or any part of, or anything derived from a bat.

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 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.

A European Protected Species Mitigation License (EPSM) is required from Natural Resources Wales for any work that would result in an otherwise unlawful activity (e.g. damage to a bat roost). A license can only be issued to permit otherwise prohibited acts if Natural England are satisfied that all of the following three tests are met:

- The proposal is for 'preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment';
- There is no satisfactory alternative; and
- The action authorised by the license will not be detrimental to the maintenance of bat populations at a favourable conservation status in their natural range.

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A bat roost is defined as “any structure or place, which any wild bat uses for shelter or protection.” Bats tend to re-use the same roosts; therefore, legal opinion is guided by recent case law precedents, that a roost is protected whether or not the bats are present at the time. This can include all summer roosts, used for breeding, resting or sheltering and all winter roosts used for hibernating.

Appendix 2 – Examples of bespoke bat roosting features

The 2FE shelter produced by Schwegler. This is designed to be attached to the external wall of a building and provides a shelter for crevice dwelling bats.

Suitable bat box products to be installed integral to the walling of the new sections include:

- Segovia Build-in Woodstone bat box
- Schwegler 2FR Bat Tube

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Bat tiles or slates to be installed to provide access into roof space – an example below

Crevice dwelling bat species often exploit gaps in or under fascias, soffits and bargeboards, to gain entry into buildings. If these features are being removed, replaced or made inaccessible to bats during the development work and bats are known to be using these features, then compensation within the new fascia, soffit or bargeboard should be implemented. This can be as simple as cutting holes in the new soffit box or bargeboard. The holes must be located next to the wall of the building as bats often require a surface (often a wall) to land on before crawling through the access. Examples of this are shown below:

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Appendix 3 – Artificial lighting and wildlife

Interim Guidance: Recommendations to help minimise the impact of artificial lighting – produced by The Bat Conservation Trust.

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. 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.

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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.

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 season3. 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.

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.

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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 cross5. 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. 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 guides 7. 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:

7. When is obtrusive light / light pollution relevant to planning?
8. What factors should be considered when assessing whether a development proposal might have implications for obtrusive lighting / light pollution?
9. What factors are relevant when considering where light shines?
10. What factors are relevant when considering how much the light shines?
11. 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.

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The Institution of Lighting Professionals (ILP) recommends that Local Planning Authorities specify internationally recognised environmental zones for exterior lighting control within their Development Plans. 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 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.***

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Do

- ***consider employing a competent lighting designer*** who will apply the principals 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 at, or near horizontal 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.
- ***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 where white 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

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