EVOLUTION ECOLOGY LTD

"Providing Common Sense Solutions for Sustainable Development"

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Yew Tree Farm

Preliminary Roost Appraisal (PRA) Bat Survey – January 2023



Preliminary Roost Appraisal (PRA) Bat Survey

At

Yew Tree Farm,
Eaves Lane,
Armshead,
Stoke-on-Trent,
Staffordshire,
ST2 8LY

For

Lee Millward (Property Owner)

0. Executive Summary

0.1 Report rationale

This report has been prepared at the request of Lee Millward (property owner). This is in relation to the identification and location of protected bat and bird species at Yew Tree Farm, Eaves Lane, Armshead, Stoke-on-Trent, Staffordshire, ST2 8LY(grid reference: SJ 92298 48511).

The 'Preliminary Roost Appraisal (PRA) Survey' (daytime inspection survey) was undertaken by Evolution Ecology Ltd on the following date;

- 23rd of January 2023 (PRA survey).

0.2 Background

Under the current proposals, the site is to be redeveloped.

Bat and Bird Ecology

Bats - Dusk and dawn bat activity surveys (May to August) will need to be undertaken to confirm the presence or absence of roosting bats at the site (farmhouse).

If bats are present, a detailed method statement will need to be produced to safeguard the bats at the building/site (a Natural England licence might be required). Further information to follow once the dusk/dawn bat activity surveys have been completed.

Birds – An updated bird inspection of the building will be undertaken during the dusk/dawn bat activity surveys.

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1 INTRODUCTION

This report has been prepared at the request of Lee Millward (property owner). This is in relation to the identification and location of protected bat and bird species at Yew Tree Farm, Eaves Lane, Armshead, Stoke-on-Trent, Staffordshire, ST2 8LY (grid reference: SJ 92298 48511).

The 'Preliminary Roost Appraisal (PRA) Survey' (daytime inspection survey) and the bat activity surveys (dusk/dawn) were undertaken by Evolution Ecology Ltd on the following dates;

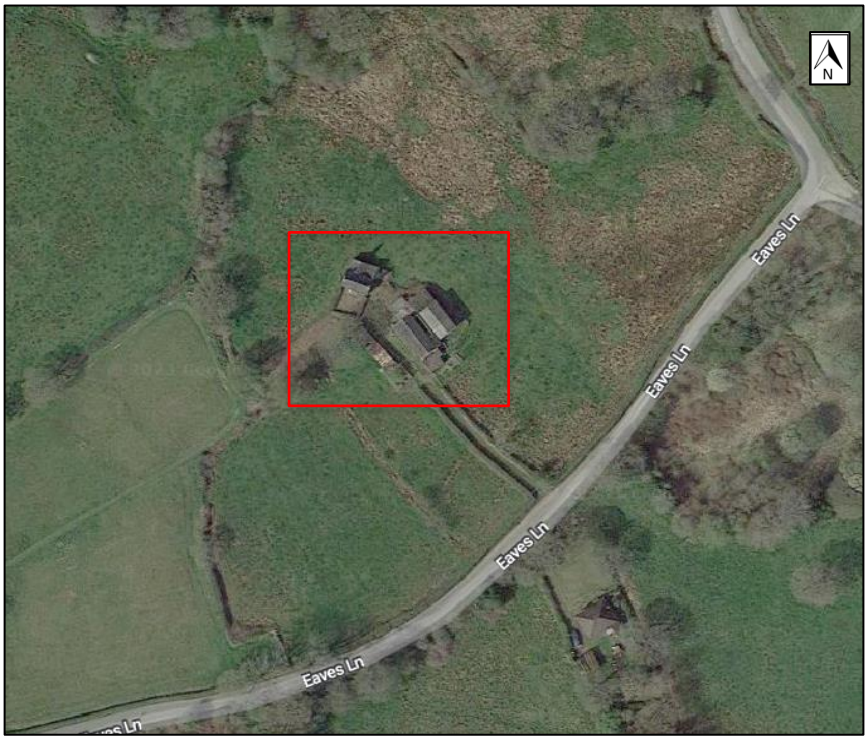
- 23rd of January 2023 (PRA survey).

1.1 Site Description

Farmland, scattered trees, and hedgerows surround the site. Into the broader landscape, there is farmland, scattered trees, roads and hedgerows.

Therefore, the site and the surrounding area contain roosting, commuting, and foraging features for the local bat and bird populations.

Figure 1: An aerial map showing the location of the building at the site in relation to some of the local landscape.



1.2 Proposed works

Under the current proposals, the site is to be redeveloped.

1.3 Aims of the survey

The actions of the surveyors on-site and during the production of the report were conducted in accordance with Bat Conservation Trust (BCT) guidelines (3rd Edition). The aim of the survey was to undertake an appraisal of the building/s and the surrounding area to establish the following:

1.3.1 Survey protocol considered any protected bat species on-site

Bats

- To establish the probability of bats and their roost sites being present at the proposed redevelopment site.
- To assess the roost status.
- To assess suitable food resources and habitat requirements.
- If a roost site is found, to provide an impact assessment.

1.3.2 Survey protocol also considered any protected bird species on-site:

Barn Owls

- To establish if barn owls were using the site.
- To locate nest sites if present.
- To assess what types of activities were shown within the site of interest.
- To evaluate suitable food resources and habitat requirements.
- To provide an impact assessment if barn owls are present.

Birds

- To establish if birds were using the site.
- To locate nest sites if present.
- To assess what types of activities were shown within the site of interest.
- To evaluate suitable food resources and habitat requirements.
- To provide an impact assessment if nests are found.

1.3.3 The information was subsequently used in conjunction with the knowledge of the proposed works at the site to determine:

- What impacts are the works likely to have on any protected species found at the site.
- The need for any Natural England development licence application to be made in respect of activities concerning protected species.
- Recommendations for any mitigation measures that would be required.

2 SURVEY METHODOLOGY

2.1 Summary of survey methods

This report aims to provide an ecological evaluation of the site in relation to its suitability for bat and bird utilisation. The survey considered the potential for roosting bats and gathered any anecdotal evidence (i.e., bats, bat droppings, feeding remains, urine stains and grease marks) that may support their presence within the building unit(s).

2.1.1 Walkover survey

A walkover survey of the site and a visual inspection of the building were undertaken to determine the availability of the required resources for the protected species in the immediate area. This would allow us to determine:

- Presence or absence of bats on-site (i.e., roosting).
- Evidence and/or potential of bat roosts on-site (i.e., summer roosts).
- Whether additional surveys are required.

2.1.2 External Inspection of the Building/s Elevations

The building on-site was inspected both externally and internally for signs of bat activity. Notes were made on the following in accordance with the guidelines published by the BCT for the scoping and surveying of building/s and built structures:

The objective of this survey was to locate suitable ingress, and egress points that protected species (bats) could use to fly into the building/s and also to identify any areas within the building/s in which these species may be able to roost and/or nest. The survey method used to inspect the external walls and roof of the buildings was a visual assessment with the use of binoculars, a torch, an endoscope, and ladders in full daylight.

This allowed us to determine the following information:

- Type and age of building/s.
- Type of construction.
- Presence of potential roost features (e.g., missing roof tiles, raised tiles, roof voids).
- Presence of suitable entry and exit points (e.g., broken windows, missing windows and doors/ridges and the apex of the buildings).
- Amount and location of evidence of bats such as the presence of live or dead bats, droppings, grease marks, urine stains and/or characteristic smell of bats.

2.1.3 Internal Inspection of the Building/s Elevations and Rooms

The object of this survey was to locate and focus on areas that provide appropriate environmental conditions for bats. To do this, we must:

- Look for warm dark areas, joints, crevices, beams and cavities for possible bat roost sites and nest sites.
- Locate roost sites.
- Listen for bats.
- Examine floors, walls and structural elements for droppings, corpses, skeletons and dead insects.

2.1.4 Building/s Rating

In the absence of evidence, structures have been assigned a rating of suitability from negligible to a high potential for supporting bats. The rating is based on the location of the structure in the surrounding landscape, the number and type of features suitable for use by bats and the surveyor's experience.

For example, a structure with a high level of regular disturbance with few opportunities for access by bats that is in a highly urbanised area with few or no mature trees, parkland, woodland or wetland would generally equate to having negligible potential.

Conversely, a pre-20th century or early 20th-century building with many features suitable for use by bats close to good foraging habitat would have high potential.

2.1.5 Roost Categories

Any structures with evidence of bats will be further evaluated to assess which of the following roost categories may be present on-site (if any):

- **Maternity or Nursery Roost** – used by breeding bats, where pups are born and raised to independence (anecdotal evidence may support this prospect).
- **Hibernation Site** – where bats may be found during the winter (this is assessed within the context of this report).
- **Daytime Summer Roost** – used by males and/or non-breeding females.
- **Night Roost** – where bats rest between feeding bouts during the night but are rarely present during the day.

- **Feeding Roost** – where bats temporarily hang up to eat an item of prey.
- **Transitional (or Swarming) Site** – where bats may be present during the spring or autumn (this cannot be assessed within the context of this report).

2.1.6 Bat Detector Survey (Dusk/Dawn surveys)

If required, the object of this survey is to detect active bats leaving possible roost sites identified in the external and internal surveys. This is achieved by:

- Being at the site 30 minutes before sunset and 90 minutes before sunrise.
- Listening for social calls at potential roost sites.
- Standing at different transect points around the buildings, using the bat detector to hear the bats, plus trying to see the first bats emerge.
- Standing at different transect points at foraging areas.
- Carrying out this survey up to two hours after the first bats emerge and 15 minutes after sunrise. This will cover the emergence and returning period to the roost site for some bat species.

2.1.7 Evidence will be used to determine whether a European Protected Species (EPS) licence will be required to ensure legal compliance during development. This will also include identifying which mitigation measures [if any] would be most appropriate.

2.2 Pre-survey Data Search

2.2.1 Staffordshire Ecological Record (Local Records Centre) was commissioned to conduct an ecological data search of all protected bat and bird species within a 2km radius of the site.

2.3 Surveyors Information

2.3.1 The survey was undertaken by licensed bat ecologist/s and members of the Institute of Ecology & Environmental Management (CIEEM):

- **Mr Paul Keeling** BSc (Hons), MCIEEM, Principal Ecologist, Natural England Bat Survey Licence Number: 2015-11546-CLS-CLS Bat Survey Level 2.

- **Mr Ashley Milward -** Assistant Ecologist.

2.4 Field surveys

2.4.1 Evolution Ecology Ltd has no previous ecology information about the site.

2.4.2 Roost Surveys - weather conditions and timing

The building on-site was externally and internally inspected for the presence of bats and birds with the use of binoculars, torches, an endoscope and ladders in full daylight.

Table 1: Preliminary Roost Appraisal (PRA) Survey, Environmental Variables

Environmental variables	PRA Survey of the building/site – 23rd of January 2023.
Temp Start	3°C
Temp Finish	4°C
Humidity Start	55%
Humidity Finish	55%
Cloud Cover Start	60%
Cloud Cover Finish	60%
Wind Speed Average	6mph
Precipitation	Dry

2.4.3 Roost and Activity Surveys

During the PRA survey, the equipment used included an endoscope, ladders and torches.

The type of equipment used for dusk and dawn bat activity surveys are the Batbox Duet, S.S.F. Bat2 heterodyne and frequency division bat detectors, along with the Echo Meter Touch 2 (E.M.T.) bat detector.

Echo Meter Touch 2

The E.M.T. bat detector is a real-time data recorder that distinguishes bat calls from other sound sources (online signal analysis).

Calls are recorded digitally as call sequences. The E.M.T. is used alongside Batbox Duet and S.S.F. Bat2 heterodyne and Frequency Division bat detectors and provides an unbiased statistical analysis of bat species recorded during a survey on site. All statistical analysis software is included in the E.M.T., giving us real-time results quickly and efficiently.

3 RESULTS

3.1 Pre-survey data search

Staffordshire Ecological Record (SER) was commissioned to carry out an ecological data search of all protected bat and bird species within a 2km radius of the site. The investigations uncovered records of numerous bat and bird species within the vicinity of the site. However, no records were recorded at the site.

Bats - Table 11 shows all UK BAP and non-BAP bat species. Those highlighted in bold were identified within the 2km search radius.

Table 11: The bats identified in the SER's 2km ecological data search.

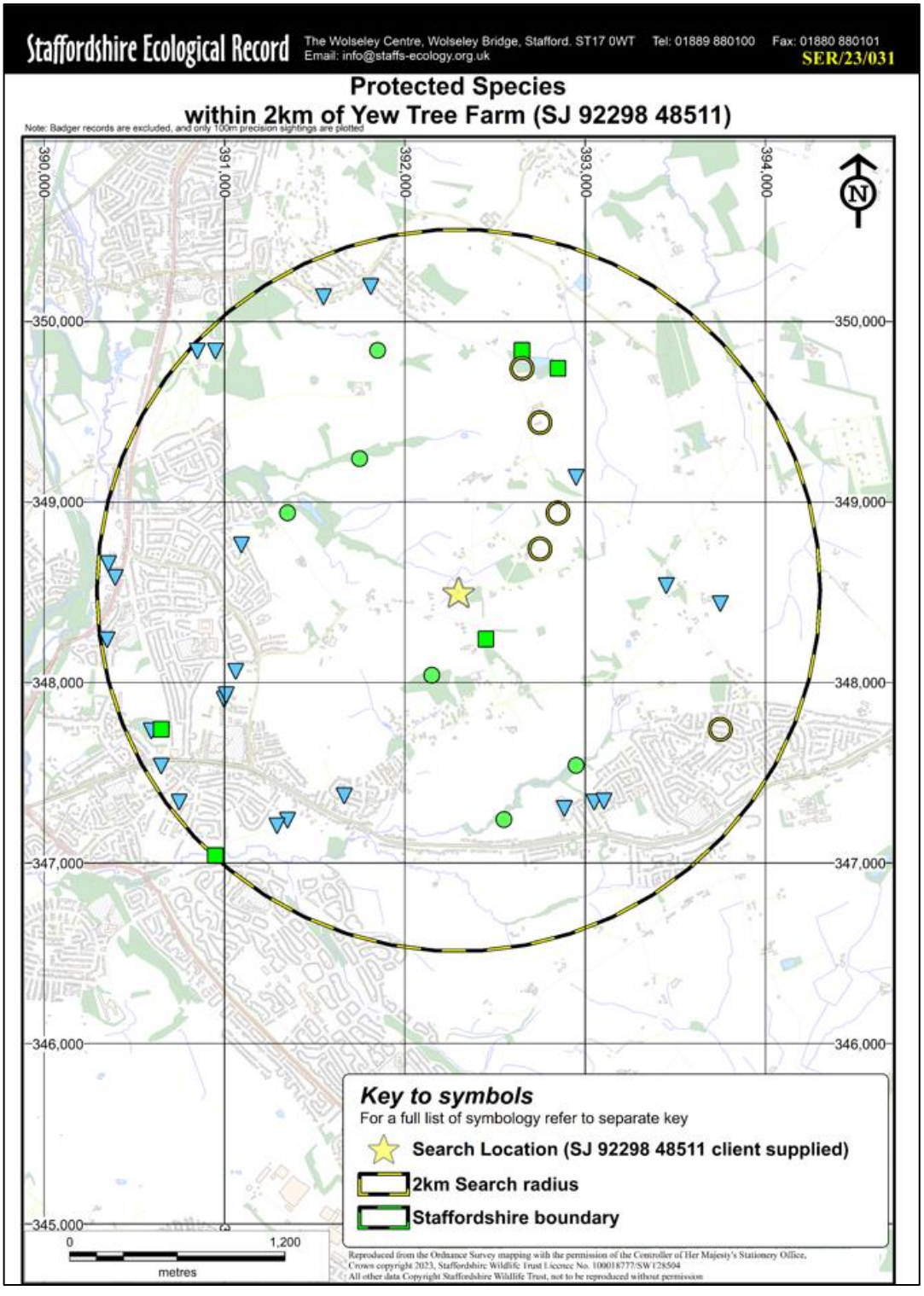
UK BAP	Common name	Latin binomial	County records within 2km
☑	Barbastelle	*Barbastella barbastellus*	☒
☑	Bechstein's	*Myotis bechsteinii*	☒
☑	**Brown Long-eared**	***Plecotus auritus***	☑
☑	**Noctule**	***Nyctalus noctula***	☑
☑	Greater Horseshoe	*Rhinolophus ferrumeguinum*	☒
☑	Lesser Horseshoe	*Rhinolophus hipposideros*	☒
☑	Soprano pipistrelle	*Pipistrellus pygmaeus*	☑
☒	Alcathoe	*Myotis alcathoe*	☒
☒	**Brandt's/Whiskered**	***Myotis brandtii/mystacinus***	☑
☒	**Common pipistrelle**	***Pipistrellus pipistrellus***	☑
☒	Daubenton's	*Myotis daubentonii*	☒
☒	Grey Long-eared	*Plecotus austriacus*	☒
☒	Leisler's	*Nyctalus leisleri*	☒
☒	Nathusius' pipistrelle	*Pipistrellus nathusii*	☒
☒	Natterer's	*Myotis nattereri*	☒
☒	Serotine	*Eptesicus serotinus*	☒

Birds - With regards to birds, a number of protected species have been identified within the 2km search radius. However, none were recorded at the site.

All UK birds can be split into three categories of conservation importance (red, amber and green – please see RSPB for more information).

Please see Figure 2 below for the locations of the bat and bird records obtained through the ecological data search.

Figure 2: Protected Species within 2km of Yew Tree Farm



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A legend to the map showing Nature Conservation Sites and Species

Introduction

These colours are used on the site alert mapping within the SWT GIS, but SER cannot guarantee the same colours are used in any other mapping system, particularly those based on ArcView.

Statutory Designations from Natural England's web-site

- National Nature Reserves — NNR (boundary not available owing to OS restrictions)
- Sites of Special Scientific Interest — SSSI (boundary not available owing to OS restrictions)
- Local Nature Reserves — LNR (boundary not available owing to OS restrictions)

Non-statutory Designations from the Staffordshire Grading System (1995 onwards)

- Site of Biological Importance (ex Grade 1 SBI) equivalent to "Local Wildlife Site"
- Biodiversity Alert Site (ex Grade 2 SBI)
- Proposed/potential Site of Biological Importance

Geological Sites

- Regionally Important Geological/geomorphological Site (= Local Geological Site)

Staffordshire Wildlife Trust Sites

- SWT Nature Reserves

Other Nature Reserves

- Royal Society for the Protection of Birds

Ancient Woodland Inventory

- Ancient & Semi-natural Woodland
- Ancient Replanted Woodland

Species Information

- Mammals excluding those listed below
- Otter (Lutra lutra)
- Badger (Meles meles) - not normally supplied
- Water Vole (Arvicola terrestris)
- All bat species
- All bird species
- Any other protected species (precise to 100m)
- All Protected Species Records (precise to 1km)
- Amphibians and reptiles excluding those below
- Great Crested Newt (Triturus cristatus)
- Native Crayfish (Austropotamobius pallipes)
- Flowering plants except those below
- Bluebell (Hyacinthoides non-scripta)
- Butterflies and Moths
- BAP Species Records (precise to 100m)
- BAP Species Records (precise to 1km)

Notes:

The Local Nature Reserve and other nature reserve boundaries can overlay the current grading when both layers are actively visible

Where there are multiple species records for the same grid reference the dot for one species may obscure the dots for other species - all species records will be displayed in the accompanying spreadsheet

Not all the above categories may be present on the accompanying map

3.2 Field surveys

3.2.1 Habitat description

Farmland, scattered trees and hedgerows surround the site. Into the broader landscape, there is farmland, scattered trees, roads and hedgerows.

Therefore, the site and the surrounding area contain roosting, commuting, and foraging features for the local bat and bird populations.

3.2.2 bat roost and birds nest (including barn owl) survey

Table 2: External features for the buildings identified during the PRA.

'External' features for the buildings	Yes	No
Staffordshire blue/clay tiles	☑	
Slate tiles		☑
Cement/concrete tiles		☑
Felt roof		☑
Pitch roof	☑	
Skylights		☑
Flat roof		☑
Brick solid walls	☑	
Cavity walls		☑
Timber beams		
Rendered walls	☑	
Gaps in the windows	☑	
Cracks/crevices in walls	☑	
Slipped/missing/dislodged tiles	☑	
Gaps around the verge	☑	
Air/ridge vents		☑
Birds' nests		☑
Prefabricated Steel sheeting		☑
Breeze Blocks		☑
Notes: N/A		

Table 3: Internal features for the buildings identified during the PRA.

Internal Features for the buildings	Yes	No
Shed Roof	☑	
Timber beams	☑	
Steel beams		☑
Commercial rooms		☑
Educational rooms		☑
Storage rooms		☑
Warehouse		☑
Agricultural (inc. domestic livestock)		☑
Derelict building	☑	
Moth/Butterfly remains		☑
Mouse droppings		☑
Cobwebs	☑	
Bat droppings		☑
Birds' nests		☑
Notes: N/A		

3.2.3 Summary of the external and internal inspections

Due to the number of potential access points and suitable roosting features, the building is deemed as having 'Moderate' potential for roosting bats

Therefore, two bat activity surveys (dusk/dawn) are required during the bat activity season (May to August).

Table 4: Features of buildings and built structure classification, which may indicate the potential for bats. The full guidance can be found in the Bat Conservation Trust Good Practice Survey Guidelines.

Bat Conservation Trust

Table 7.3 Recommended minimum number of survey visits for presence/absence surveys to give confidence in a negative result for structures (also recommended for trees but unlikely to give confidence in a negative result).

Low roost suitability	Moderate roost suitability	High roost suitability
One survey visit. One dusk emergence or dawn re-entry survey[a] (structures). No further surveys required (trees).	Two separate survey visits. One dusk emergence and a separate dawn re-entry survey.[b]	Three separate survey visits. At least one dusk emergence and a separate dawn re-entry survey. The third visit could be either dusk or dawn.[b]

[a] Structures that have been categorised as low potential can be problematic and the number of surveys required should be judged on a case-by-case basis (see Section 5.2.9). If there is a possibility that quiet calling, late-emerging species are present then a dawn survey may be more appropriate, providing weather conditions are suitable. In some cases, more than one survey may be needed, particularly where there are several buildings in this category.

[b] Multiple survey visits should be spread out to sample as much of the recommended survey period (see Table 7.1) as possible; it is recommended that surveys are spaced at least two weeks apart, preferably more. A dawn survey immediately after a dusk one is considered only one visit.

Table 5: Low/Moderate/High potential building(s) survey recommendations. The full guidance can be found in the Bat Conservation Trust Good Practice Survey Guidelines. These guidelines are what all local authorities abide by.

Table 4.1 Guidelines for assessing the potential suitability of proposed development sites for bats, based on the presence of habitat features within the landscape, to be applied using professional judgement.

Suitability	Description Roosting habitats	Commuting and foraging habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	A 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[a] 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[b]). A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.[c]	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions[a] and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	A structure or tree 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[a] and surrounding habitat.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.

3.2.4 Activity Dusk and/or Dawn Surveys

- At the time of carrying out the PRA survey (daytime inspection – January 2023), it was outside of the activity survey season (May to August).

  Bats hibernate during the winter and come out of hibernation between February/March, to April.

3.2.5 The LUX light meter reader is used to confirm the amount of artificial light pollution at a site and from nearby buildings and streetlights.

Bats have evolved to emerge at night, with only moonlight providing a source of light at night (up to 0.3 Lux). However, with the creation of artificial lights via the installation of streetlights, security lights and light coming from residential and commercial properties, meaning that light pollution can range from 4 Lux to 1000 Lux.

Impacts on bats and their roosts - Artificial lighting is known to affect bat roosting and foraging behaviour, with lighting shown to result in a range of impacts, including roost desertion (BCT, 2009), delayed emergence of roosting bats (Downs et al., 2003), increased activity of some bat species and decreased activity by others (Stone et al., 2012).

A lux meter reading is taken at the site during dusk/dawn bat activity surveys.

Figure 3: A lux meter reading will be taken at the site during dusk/dawn bat activity surveys.

3.2.6 Thermal Images of a building are used to aid in observing any bats emerging/returning from and to the building).

Figure 4: A thermal image will be taken at the site during dusk/dawn bat activity surveys.

4 IMPACT ASSESSMENT

4.1 Constraints on survey information

There were no constraints with regard to obtaining survey information.

4.2 Constraints on equipment used

No constraints were present with regard to the equipment used during the survey (i.e., endoscope, ladders, and high-powered binoculars).

4.3 Potential impacts of the re-development

Based on the current planning proposal whereby:

The site is to be redeveloped.

- The potential impacts have been identified as follows:

4.3.1 *Designated sites*

Any designated sites nearby are not applicable to the proposed project, as only works to the building are taking place. This, therefore, means that any building work would be of no detriment to the surrounding landscape.

4.3.2 *Roosts*

Short-term impacts: Disturbance

Currently unknown.

Long-term impacts: Roost modification

Same as ‘Short-term impacts: Disturbance.'

Long-term impacts: Roost loss

Same as ‘Short-term impacts: Disturbance.'

4.3.3 Foraging and commuting habitat.

It is considered that the works to the building would have a negligible effect on potential foraging and commuting habitat at the site/area.

4.4 Legislation and Policy Guidance

National Planning Policy Framework, Section 11: The recently published framework in 2012 replaces the previous Planning Policy Statement 9. Section 11: Conserving and enhancing the natural environment reaffirms the government's commitment to maintaining green belt protections and preventing urban sprawl, retains the protection of designated sites and preserves wildlife, aims to improve the quality of the natural environment and halt declines in species and habitats, protects and enhances biodiversity and promotes wildlife corridors.

Article 10 of the E.C. Habitats Directive: The published article requires government to develop features such as 'stepping-stones' on the landscape, such as clusters of ponds, tracts of rough grassland or scrubland and vegetated railway line embankments.

Wildlife and Countryside Act 1981: All species of bat are fully protected under the Wildlife and Countryside Act 1981, the European Conservation (Natural Habitats, etc.) Regulations 1994, and the Countryside and Rights of Way Act 2000. This legislation makes it illegal to possess or control any live or dead specimens, to damage, destroy or obstruct access to any structure or place used for shelter, protection or breeding, and to intentionally disturb a bat while it is occupying a structure or place which it uses for that purpose.

Most resident nesting birds are protected under the Wildlife and Countryside Act 1981, which protects birds, nests, eggs, and nestlings. Some rarer species, such as barn owls, are afforded extra protection.

5 ECOLOGICAL PROVISIONS

Bats - Dusk and dawn bat activity surveys (May to August) will need to be undertaken to confirm the presence or absence of roosting bats at the site (farmhouse).

If bats are present, a detailed method statement will need to be produced to safeguard the bats at the building/site. Further information to follow once the dusk/dawn bat activity surveys have been completed.

Birds - Birds – An updated bird inspection of the building will be undertaken during the dusk/dawn bat activity surveys.

6 SUMMARY

6.1 Bat and Bird Ecology

Bats - Dusk and dawn bat activity surveys (May to August) will need to be undertaken to confirm the presence or absence of roosting bats at the site (farmhouse).

If bats are present, a detailed method statement will need to be produced to safeguard the bats at the building/site (a Natural England licence might be required). Further information to follow once the dusk/dawn bat activity surveys have been completed.

Birds – An updated bird inspection of the building will be undertaken during the dusk/dawn bat activity surveys.

7 REFERENCES

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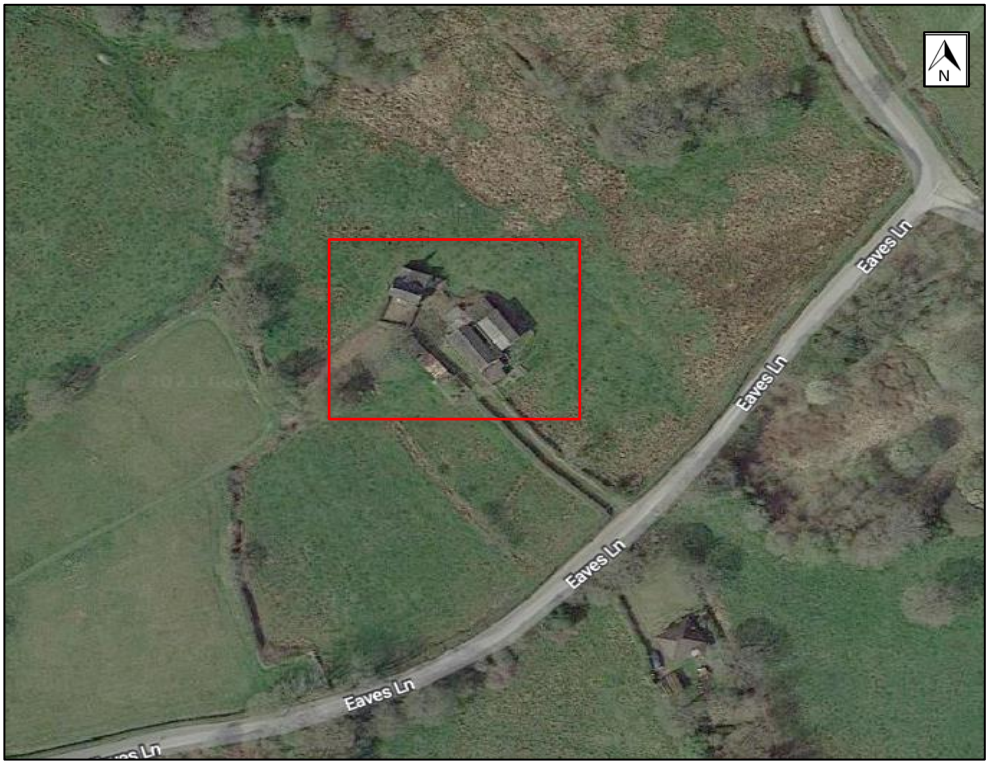
8 APPENDICES

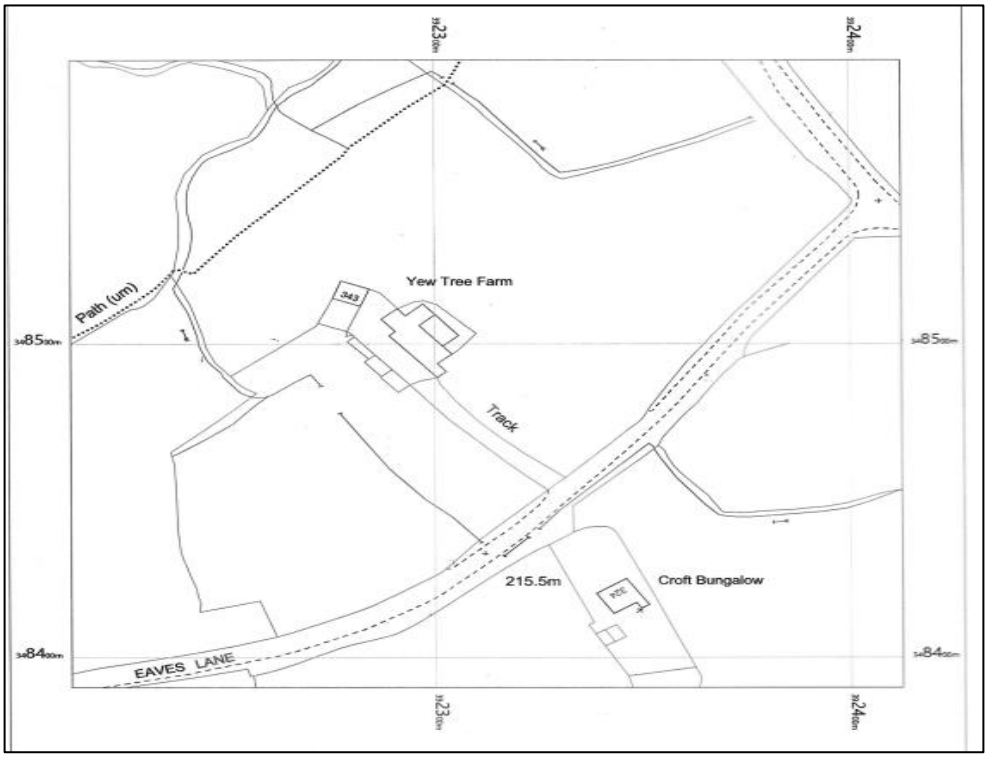
Appendix A: Site Plans

Appendix B: Additional Photographic Records

Appendix C: Bats and Artificial Light

Appendix A: Site Plans.





Appendix B: Additional Photographic Records

Plate 1: A photograph showing the south and east elevations of the building and the gap in the verge (red dashed square).



Plate 2: A photograph of the east elevation of the building.



Plate 3: A photograph of the north and west elevations of the building.

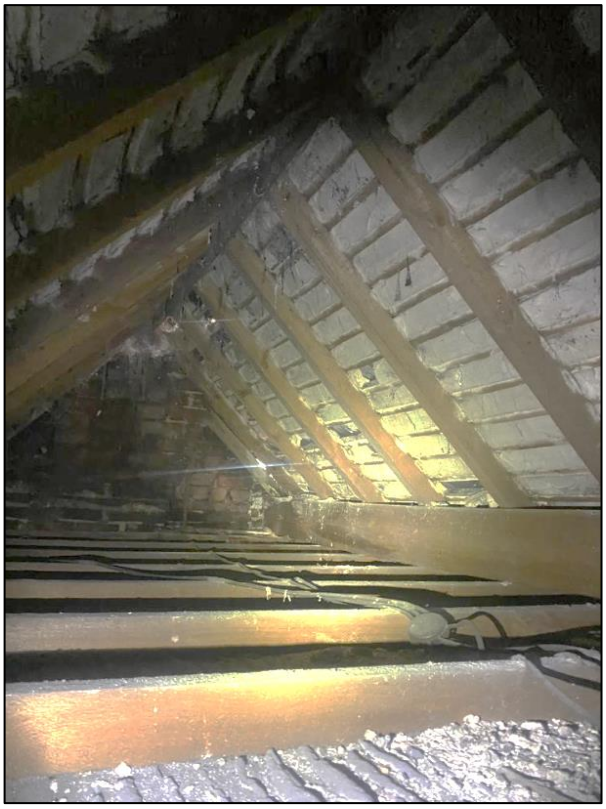


Plates 4 and 5: Photographs of the bedrooms inside the building.





Plate 6: A photograph of the loft.



Appendix C: Bat and Artificial Lights

Artificial lighting is known to affect bat roosting and foraging behaviour with lighting shown to result in a range of impacts including roost desertion (BCT, 2009), delayed emergence of roosting bats (Downs et al., 2003), increased activity of some bat species and decreased activity by others (Stone et al., 2012).

An experimental approach using L.E.D. units, demonstrated that relatively fast-flying bat species, including common pipistrelle, showed no significant impacts as a result of new artificial lighting, even when lighting was set at relatively high levels close to 50 lux. In contrast, slow flying bats, including myotid bats (Myotis spp.) showed sharp reductions in presence, even at low light levels of 3.6 lux (Stone et al., 2012). Current recommendations for all bat species specifies that no bat roost should be directly illuminated (BCT 2014).

Mitigation and lighting design Bat-friendly lighting plans should first look to avoid lighting where possible and minimise lighting impacts by adopting the following measures:

- Lighting curfews or use of P.I.R. sensors. Lighting curfews can be an effective way of avoiding impacts on bats. These curfews may involve either turning off lighting or dimming light units at specific times of the night, dimming units at key times of the year, providing the luminaire allows for this option via a control unit. Lighting to be triggered by P.I.R. sensors can be expected to be illuminated only when required and for a low proportion of the overall time.
- Consider no lighting solutions where possible. Options such as white lining, good signage, and L.E.D. cats eyes, should be considered as preferable, especially within Zones 1 and 2. Reflective fittings may help make use of headlights to provide any necessary illumination in some areas.
- Use only high-pressure sodium, or warm white L.E.D. lamps where possible. High pressure sodium and warm white L.E.D. lamps emit lower proportions of insect-attracting U.V. light than mercury, metal halide lamps, and white L.E.D. lighting. Generally, lamps should have a lower proportion of white or blue wavelengths, with a colour temperature <4200 kelvin recommended (BCT, 2014).
- Minimise the spread of light. The light spread should be kept at or near horizontal to 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. Baffles, hoods, louvres, and shields should be used where necessary to reduce light spill.
- Consider the height of lighting column. While downward-facing bollard lighting is often preferable, it should be noted that a lower mounting height does not automatically reduce impacts to bats as bollard lighting can often be designed to provide up lighting. Where bollard lighting is considered to be the most appropriate system, bollard spacing or unit density should be kept to a minimum and units should be fitted with the appropriate hoods/deflectors to reduce up lighting Column height should be carefully considered to balance task and mitigation measures.
- Avoid reflective surfaces below lights. The polarisation of light by shiny surfaces attracts insects increasing bat activity (BCT, 2012). Consequently, surface materials around lighting require consideration.

The Bat-Year		
	**January**	Hibernating; using up fat reserves.
	**February**	Still hibernating; few fat reserves left.
	**March**	Some activity; occasional bat seen feeding.
	**April**	Awake and feeding at night.
	**May**	Females looking for nursery sites.
	**June**	Young born usually only one.



July Young still suckling.



August Young start catching insects; females leave nursery to find males.



September Mating season begins; start building fat reserves for hibernation.



October Search for suitable hibernation site.



November Hibernation begins although still some activity in warm weather.



December Hibernating.

9 LIMITING CONDITIONS/DISCLAIMERS (Unless stated otherwise)

9.1 The Service

9.2 Evolution Ecology agrees to supply ecological consulting services of a preliminary nature or a more thorough service as advised or as commissioned.

10 Fees

10.1 The client(s) will settle the agreed fee in full, within 30 days of receiving the invoice. Reports will remain the property of Evolution Ecology until full payment has been received. No liability is accepted for the contents of a report that is not paid in full. Any queries should be notified to Evolution Ecology within 7 days of the invoice date.

10.2 If the client(s) fails to pay within the time specified in 2.1 then Evolution Ecology shall charge the client(s) interest on the outstanding fee, both before and after any judgment, at the rate of 4% per annum above the HSBC Bank base rate, until payment is made in full (A part of a month being treated as a full month for the purposes of calculating interest).

10.3 In the event that it is necessary to recover any outstanding fees from the client(s), the client(s) will fully reimburse any costs and expenses incurred during the recovery period, including court costs. Evolution Ecology reserves the right to make a charge for every letter sent and telephone/fax call made, in connection with the recovery.

11 The Report

11.1 If any part of the report is lost, or altered without the written consent of Evolution Ecology, then the entire report becomes invalid.

11.2 The general format of reports is a certified product and cannot be shown, copied or distributed to third parties without the permission of Evolution Ecology. No liability is accepted for the contents of the report, other than to that of the client(s).

11.3 The report will purport not to express any opinion or comment as to the condition or structural integrity of any building and no reliance should be made on any such comments.

12.1 **Insurance Cover**

12.2 All work carried out by Evolution Ecology is covered by a £1,000,000 professional indemnity insurance.

13.1 **Quality of Craftsmanship**

13.2 When appointing an Ecologist, please use only suitably qualified and experienced companies (The Local Authority and the Institute of Ecology and Environmental Managers may be able to provide a select list of such companies)

13.3 Evolution Ecology will not accept liability for any works undertaken by any other companies, or contractors.