



BAT SURVEY AND MITIGATION REPORT

BROAD OAK FARM BARNS, ROSSETT

MR S TROWBRIDGE

19 OCTOBER 2018

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1 INTRODUCTION

1.1 Background Information

- 1.1.1 Sambrook Associates Ltd was instructed by Mr S. Trowbridge in September 2018 to produce a bat appraisal and mitigation design based upon the results of a series of bat surveys that were undertaken in 2017 and 2018, in relation to the proposed development at Broad Oak Farm Barns, Rossett. The farmstead comprises a range of barns and it is proposed to develop part of the Site through renovation or demolition of buildings.
- 1.1.2 Bat surveys were undertaken in 2008 by The Tyrer Partnership on behalf of Environmental Research and Advisory Partnership (see Appendix A) in relation to a previous application on this Site. The results of these surveys have been reviewed and utilised to provide contextual information for the formation of assessment, conclusions and mitigation design.
- 1.1.3 As part of the Ecology Appraisal, Bowland Ecology undertook an external and internal inspection of the barns within the Site in September 2016. This survey highlighted the need to undertake follow up activity surveys in accordance with advice provided in the Bat Conservation Trust (BCT) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (Collins, 2016).
- 1.1.4 This reports summarises the results and conclusions of previous surveys and details the results of the activity surveys undertaken by Sambrook Associates in 2017 and 2018. This report also provides an outline mitigation strategy which will form part of an application to Natural Resources Wales (NRW) for a derogation licence.
- 1.1.5 The 2017/2018 surveys are led by Rebecca Sambrook MCIEEM (a Full Member of the Chartered Institute of Ecology and Environmental Management (CIEEM)) and adheres to that organization's Code of Professional Conduct. Rebecca has been designing and conducting bat surveys, assessing impacts and designing appropriate mitigation for over 16 years, involving hundreds of projects. Rebecca has brought in licensed bat surveyors, where required.

1.2 Site Description

- 1.2.1 The farmstead is located within a rural setting, on the fringe of the village of Rossett and comprises a farmhouse, attached office and a range of agricultural outbuildings. The majority of buildings comprise traditional red brick with either slate or corrugated fibre cement roofing. Some of the buildings are attached, others are single. The buildings have clearly had different uses from open fronted buildings for storing hay and straw, to enclosed sectioned buildings used for housing animals.
- 1.2.2 The farmstead is surrounded by arable and pasture fields and there are a number of mature trees in close proximity, many of which are within the garden of the farmhouse. The railway line that runs close to the farmstead and the adjacent lane provide potentially good commuting habitat.

2 LEGISLATION

- 2.1.1 All bat species are protected in the UK under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). The species is also protected under Annex II of the Council Directive 92/43/EEC 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora (the EC Habitats Directive). This has been transposed into UK law by the Conservation of Habitats and Species Regulations 2010 (as amended) in England and Wales. Bats are referred to as European Protected Species (EPS).
- 2.1.2 It is an offence to deliberately capture, injure or kill a bat; intentionally or recklessly disturb in a way that would affect their local distribution or abundance, or affect their ability to survive, or breed. It is also an offence to damage or destroy a bat roost and to possess, advertise, control, transport, sell, exchange or offer for sale/exchange any live or dead bat or any part of a bat.
- 2.1.3 If you wish to undertake works that would affect an EPS then you will need a licence. Natural Resources Wales (NRW), in exercise of the powers conferred under regulation 53(1) and 56(3) (a) of the Conservation of Habitats and Species Regulations 2010, may issue licences for the following purposes:
- 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;
 - Preventing the spread of disease;
 - Preventing serious damage to livestock, foodstuffs for livestock, crops, vegetables, fruit, growing timber or any other form of property or to fisheries; to allow people to carry out activities which would otherwise be illegal;
- 2.1.4 Before issuing a licence under the Habitats Regulations, the licensing authority must be satisfied that “there is no satisfactory alternative” to the work as proposed and, that the proposed actions “will not be detrimental to the maintenance of the population of the species at a favourable conservation status (FCS)”.
- 2.1.5 To ensure these requirements are met, the licensing authority must have enough information to complete an assessment of the application. This includes sufficient survey data so that the roost and how it is used by bats is understood and impacts upon the roost are appropriately assessed so that mitigation and/or compensation can be designed into the proposed development that will ensure the bat population can be incorporated and maintained in the long term.
- 2.1.6 Seven bat species are UK BAP Priority Species. These are as follows:
- Barbastelle *Barbastella barbastellus*
 - Bechstein’s *Myotis bechsteinii*
 - Brown long-eared *Plecotus auritus*
 - Greater horseshoe *Rhino ferrumequinum*
 - Lesser horseshoe *Rhinolophus hipposideros*
 - Common noctule *Nyctalus noctula*
 - Soprano pipistrelle *Pipistrellus pygmaeus*

3 METHODOLOGY

3.1 Introduction

- 3.1.1 A series of surveys have been undertaken of the buildings within the farmstead in 2008 and 2016 all of which were undertaken in accordance with guidance pertaining at the time of the surveys. Since these were undertaken, the extent of the proposed development Site (i.e. the red line boundary) has decreased in size.
- 3.1.2 The results of previous surveys in 2008 have been reviewed to provide context and the Bowland Ecology preliminary building assessment in 2016 has also been reviewed. During the assessment, the surveyor assigned value to each of the buildings for their potential to support bats. Each barn was assigned a negligible, low, moderate or high value. The extent of the subsequent activity surveys detailed within this current report are based upon the values assigned by Bowland Ecology, to which Sambrook Associates agrees. Bowland Ecology surveyed all of the buildings within the farmstead but since the size of the proposed development Site has decreased, not all of the buildings have been taken forward for further detailed survey. Nevertheless, for ease, building reference numbers used in this report correspond with the numbers assigned by Bowland Ecology.
- 3.1.3 The following surveys have been undertaken in 2017/2018:

Table 3.1

Year	Date	Survey	Building
2017	22 June	Activity (dusk) survey	13 & 14
	29 June	Update preliminary building inspection Activity (dusk) survey	
	20 June	Activity (dusk) survey	5, 8, 9, 10
	07 July	Activity (dawn) survey	9, 13 & 14
	26 July	Update preliminary building inspection (am) Update preliminary building inspection (pm)	8, 9, 10, 11, 12 13 & 14
2018	27 February	Update preliminary building inspection	1, 2, 3, 4, 5, 6, 7
	14 September	Update preliminary building inspection Activity (dusk) survey	2
	30 September	Activity (dawn) survey	2

3.2 Preliminary Building Inspection

- 3.2.1 The barns were inspected both externally and internally for evidence of the presence of bats. The survey started with an examination of the external parts of the barn to locate potential roosting features such as lifted/missing tiles, gaps around soffits, barge boards and similar. Evidence such

as staining, droppings, urine splashes and individuals were also searched for. With no evidence externally, an internal inspection was undertaken, searching for the same evidence.

2017

- 3.2.2 On 26 July 2017, the survey of Buildings 8-12 was carried out by Rebecca Sambrook MCIEEM. Buildings 13 and 14 were inspected later that day by Rebecca Sambrook and Eleanor Weir MCIEEM because bats had been recorded emerging and re-entering the building during the activity surveys but due to the open nature of the buildings, it was not possible during these surveys to accurately record specifically where bats were roosting.

2018

- 3.2.3 The survey was carried out on 27 February of buildings 1-7 by Rebecca Sambrook. Building 2 was also surveyed by Carl Capewell gradCIEEM (NRW licence 78232:OTH:CSAB:2018). The weather was cold with an average temperature of 0°C, and snowy. In September, Building 2 was re-surveyed by Rebecca Sambrook and Mark Benson. The weather was mild and dry.

3.3 Bat Activity Surveys

- 3.3.1 The surveys followed the methodology set out in the Bat Conservation Trust Handbook *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (Collins, 2016).
- 3.3.2 Dusk and dawn surveys were undertaken during appropriate weather conditions. The dusk surveys commenced 15 minutes before dusk until 1.5-2 hours after and the dawn survey commenced 1.5-2 hours before dawn until 15 minutes after.

2017

- 3.3.3 All of the surveyors are experienced in bat activity surveys; Rebecca Sambrook, Dr Martin Page MCIEEM, Tim Green, and Carl Capewell. Between three and four surveyors were positioned strategically so that good coverage of the building/s was achieved.
- 3.3.4 The surveyors used the following bat detectors; a Wildlife Acoustics' EM3+, an Anabat SD2, an Elekon Batlogger M Bat, an Anabat Walkabout and Wildlife Acoustics' EM Touch detectors. The data was analysed by the surveyors using Wildlife Acoustics' Kaleidoscope 3.1.1 software and BatSound software and reviewed by Rebecca Sambrook.
- 3.3.5 In addition to bat detectors, a night vision camera was used to focus on a hole in the roof of building 14. It had been identified as a potential bat egress/entrance point during the first survey on 22 June. A surveyor therefore set up a camera to monitor this point during the dawn survey on the 7 July.
- 3.3.6 Eight buildings within the red line boundary have been identified for survey. The number of activity surveys undertaken was determined by the value assigned during the building inspection. Of note in Table 1, Buildings 9 and 10 which were originally identified as having low potential, were subject to a second survey because a bat was seen to suddenly appear in the yard between the two buildings, where a surveyor was positioned. It was not picked up by the surveyors positioned at either end of the Buildings and so must have emerged from either Building 9 or 10. It was subsequently found to be emerging from Building 9.

3.3.7 The following buildings are within the redline boundary and were therefore subject to survey:

Table 3.2: Surveys Conducted

Building ref	Value assigned	Number of surveys	Type of survey	Comments
5	Low	1	Dusk	
8	Low	1	Dusk	
9	Low	3	Dusk and dawn	3 surveys due to possible emergence from building during first survey
10	Low	2	Dusk and dawn	2 surveys as building 9 above
11	Low	1	Dusk	
12	Low/negligible	1	Dusk	
13	High	2	Dusk and dawn	
14	High	2	Dusk and dawn	

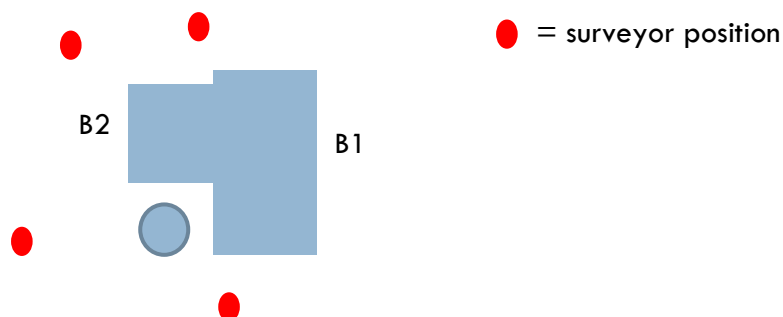
3.3.8 The following table provides details of the surveys.

Table 3.3: Survey Data 2017

Date	Building ref	Survey type	Time started	Time completed	Temperature	Weather conditions
22.06.17	13 & 14	Dusk	21.16	23.10	18°	Dry, mild, bright
29.06.17	8, 9, 10, 11, 12	Dusk	21.25	23.15	13°	Damp, mild, cloudy, light drizzle until 22.00
30.06.17	5, 8, 9, 10	Dusk	21.25	23.15	15°	Mild, dry
07.07.17	9, 13 & 14	Dawn	02.55	05.15	15°	Mild, dry

2018

- 3.3.9 In accordance with a request for more information from Wrexham County Borough Council, two activity surveys were undertaken. The first survey was undertaken at dusk on the 14 September 2018. The survey commenced 15 minutes before sunset until 1.5-2 hours after. The second survey was undertaken at dawn on the 30 September 2018 and commenced 1.5 hours before sunrise until 15 minutes after.
- 3.3.10 All of the surveyors are experienced in bat activity surveys; Rebecca Sambrook BSc (Hons) MCIEEM (lead surveyor) and Jack Halpin BSc (Hons), assisted by Tim Green and Mark Benson. The surveyors were positioned strategically so that good coverage of the building was achieved.



- 3.3.11 The surveyors each used a Wildlife Acoustics' EM Touch detector.

- 3.3.12 The following table provides details of the survey.

Table 3.4: Survey Data 2018

Date	Sunrise	Time started	Time completed	Temperature during survey	Weather conditions
14/09/2018	19:30	19:15	21:05	15°	Dry, mild, calm
30/09/2018	07:11	05:41	07:19	10°	Dry, cool, calm

3.4 Limitations

- 3.4.1 No significant limitations were encountered during the surveys. The survey on 29 June 2017 started with light drizzle but this did not stop the emergence of bats and the level of activity was in fact higher than that encountered on the drier evening of the 30 June 2017.
- 3.4.2 During the February 2018 survey, some of the ground immediately adjacent to barn walls was covered in snow and therefore may be covering evidence, however, due to the time of year it is unlikely that evidence such as droppings, staining etc would be present anyway. The 2018 activity surveys were undertaken later in the season which can often result in maternity colonies being missed. However, Building 2 was also inspected at this time and no evidence of accumulations of droppings or feeding remains were identified throughout the building and there are no cracks, crevices, roofing membrane or cavities that large groups of bats, such as maternity colonies could use.

3.4.3 Many of the buildings are attached to each other and so some of the buildings were surveyed collectively. Nevertheless, all of the external walls were covered by strategic positioning of the surveyors. Plate 1 below shows location of buildings (taken from Bowland Ecology Ecological Appraisal).



Plate 1: Location of buildings

4 RESULTS

4.1 Introduction

- 4.1.1 The following section provides a summary of the results and conclusions from the 2008 and 2016 surveys and details the results of the surveys undertaken in 2017 and 2018.

4.2 Previous Surveys

- 4.2.1 **2008:** The building inspection in 2008 identified evidence of roosting brown long eared bats in two buildings; 13 (droppings and 5 individuals) and 14 (droppings). Following the activity surveys, undertaken in September, it was considered that up to seven brown long eared bats were present within the buildings. A breeding roost was not suspected but the need to obtain a licence before developing the barns was advised. It was also noted that a common pipistrelle *Pipistrellus pipistrellus* roost was located in the office building which is connected to the farmhouse. This is not included in the current application.
- 4.2.2 **2016:** In September 2016, during the preliminary building inspection, Bowland Ecology provided a description and assigned a value to each building within the redline boundary as follows:
- Buildings 1, 3, 4 and 5-11 were considered to be low potential to support bats
 - Building 12 was considered to be Low-negligible potential
 - Building 2 was considered to be moderate/high potential (although upper floor was not assessed)
 - Buildings 13 and 14 were considered to be high potential.
 - Building 15 was considered to be moderate potential (though is now not part of the ongoing assessment)

4.3 Preliminary Building Inspection

- 4.3.1 The update preliminary building inspections undertaken in 2017/18 concurs with the suitability values assigned in 2016 by Bowland Ecology with many of the potential roosting features for crevice dwelling species in a poorer state of repair than in 2016.
- 4.3.2 The 2016 survey identified Building 2 as medium/high potential, however, the upper floor was not accessed and so a thorough survey could not be achieved. In 2018, the upper floor of the building was accessed and comprehensively surveyed.

Table 4.1: Preliminary Building Inspection Results

Building ref	Brief description	Potential to support bats	Evidence of bats
1	Two storey red brick building with corrugated fibre cement roof with single storey monopitch tiled roof extension on northern aspect.	Low	None
2	Two storey red brick building with pitched slate roof, ridge tiles, roof lights on northern and southern elevations. Internally, solid floors on ground, upper floor, access via loft hatch	Low	Single butterfly wing

	comprises intact floor boards, open to roof, no roof membrane present, broken gable window which is ivy covered which would block free flight into building, gaps at eaves.		
3	Single storey red brick barn, fibre cement roof in poor condition. Roof part lined internally with fibreboard in poor state of repair.	Low	None
4	Single storey red brick barn, fibre cement roof in poor condition. Roof part lined internally with fibreboard in poor state of repair.	Low	None
5	Single storey red brick barn, fibre cement roof in poor condition. Roof part lined internally with fibreboard in poor state of repair.	Low	None
6	Single storey red brick barn, fibre cement roof in poor condition. Roof part lined internally with fibreboard in poor state of repair.	Low	Occasional butterfly wing
7	Single storey red brick long barn, fibre cement roof in poor condition. Roof part lined internally with fibreboard in poor state of repair.	Low	Occasional butterfly wing
8, 9, 11	Single storey, red brick buildings with pitched, corrugated fibre cement roofs in moderate condition	Low: for crevice dwelling species	B9 & 11: butterfly wings though considered unlikely roosting brown long eared
10	A two storey, red brick building with a pitched, corrugated fibre cement roof in poor condition	Low	None
12	A two storey, red brick barn with mono-pitched, corrugated, fibre cement roof	Low/negligible	None
13	A traditional, two storey red brick barn building with a cross-gabled, c-shaped, pitched, slate roof with ridge tiles	High	Brown long eared droppings and feeding remains
14	A traditional, two storey red brick barn building with a cross-gabled, c-shaped, pitched, slate roof with ridge tiles	High	Brown long eared droppings and feeding remains 12 brown long eared bats identified hanging up on the main ridge beam

4.3.3 The habitats on Site provide low value commuting and foraging habitat for bats. However, the adjacent mature roadside hedgerows, scattered scrub and mature trees provide foraging and commuting habitat for bats.

4.4 2017 Activity Surveys

4.4.1 The 2017 surveys have identified that the buildings 13 and 14 continue to be used by bats. Both brown long eared and pipistrelle bats have been recorded emerging and re-entering the buildings during the surveys. Building 9 has also been identified as a roost for a single common pipistrelle

bat. The other buildings surveyed did not exhibit any evidence of bats and none were seen emerging or re-entering the buildings.

- 4.4.2 **General activity** – activity across the Site was surprisingly low across all survey nights. The occasional noctule (2 bats on one night) was seen commuting from the south, crossing the Site high overhead in a northerly direction. The sightings were early in the evening at 21.53 (29/06) and 21.55 (30/06) and slightly later on the 22/06 at 22.18. Both common and soprano pipistrelles were recorded commuting and socialising across the Site in very low numbers; no more than two or three seen at any one time. Very little foraging was recorded; a single soprano pipistrelle and single common pipistrelle were seen and recorded foraging around the alleyways between buildings 8, 9, 10, 11 and 12 on 29/06 both of which disappeared north of the Site. Brown long eared bats were seen within the courtyard area, along the lane and to the back of building 13 (single bat). Very few of the sightings were picked up on any of the bat detectors but the size, flight pattern and behaviour of the bats indicated with certainty, they were brown long eared bats.
- 4.4.3 **Building 13** – originally (in 2008) confirmed as a brown long eared roost, with evidence in the form of droppings being recorded in 2016, this building continues to be used by this species throughout the summer months. During the dusk survey on 22/06, three or four individuals were seen emerging from a broken window on the courtyard side of the building see Figure 1 below. Similarly, during the dawn survey on 07/07, five individuals were seen re-entering the building through the broken window.
- 4.4.4 **Building 14** – originally (in 2008) confirmed as a brown long eared roost, with evidence in the form of droppings recorded in 2016, this building continues to be used by this species throughout the summer months. Common pipistrelle were also recording using the building during the 2017 surveys. During the dusk survey on the 22/06, up to four bats were seen flying within the roof void of the large opening on the courtyard side of the building (one at 21.52 and three at 22.25). No echolocation calls were recorded by the bat detectors but the bats were of a size and exhibited typical flight patterns and behaviour of brown long eared bats. Three of the bats flew out through a hole in the roof, the other flew out of the large opening and headed south, over the farmhouse/office and gardens. Three common and one soprano pipistrelle were also recorded flying out of the large opening and heading south, over the farmhouse/office and gardens. No bats were seen re-entering building 14 from the courtyard area but the night vision camera recorded activity around the hole in the roof and footage shows three or four bats near the hole and disappearing into it. These bats were then observed in free flight within the roof void of the building shortly after their entry into the barn.

Figure 1: Dusk and dawn survey results Buildings 13 & 14

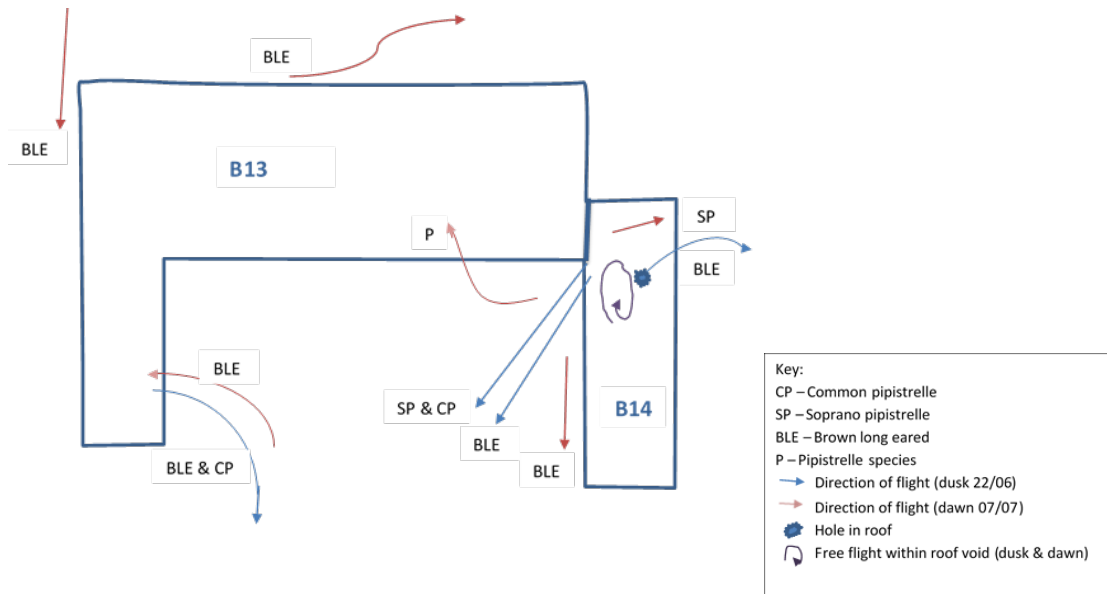


Plate 2: Building 13 showing broken window



Plate 3: Building 14 showing open void



4.4.5 Building 9 – identified as low potential during the 2008 and 2016 surveys, the building was observed on 28 and 29 June and during the dawn survey on 6 July. During the survey on 28 June, a single common pipistrelle bat suddenly appeared in the alleyway between buildings 9 and 10. It was not observed by the other surveyors positioned at either end of the alleyway so it must have emerged from one of the buildings but it was not possible to definitively identify which of the two buildings it was. The building was again subject to a survey on the 29 June to try to locate the egress point. The surveyor was able to observe the grey air vents on the side of building more closely (suspecting that this was the most likely emergence point), and was able to confirm that the bat had indeed emerged from building 9. The dawn survey on 07/07 also concluded that the individual was roosting in building 9, gaining access to the building via the air vents.

Figure 2: Dusk and dawn surveys Building 9

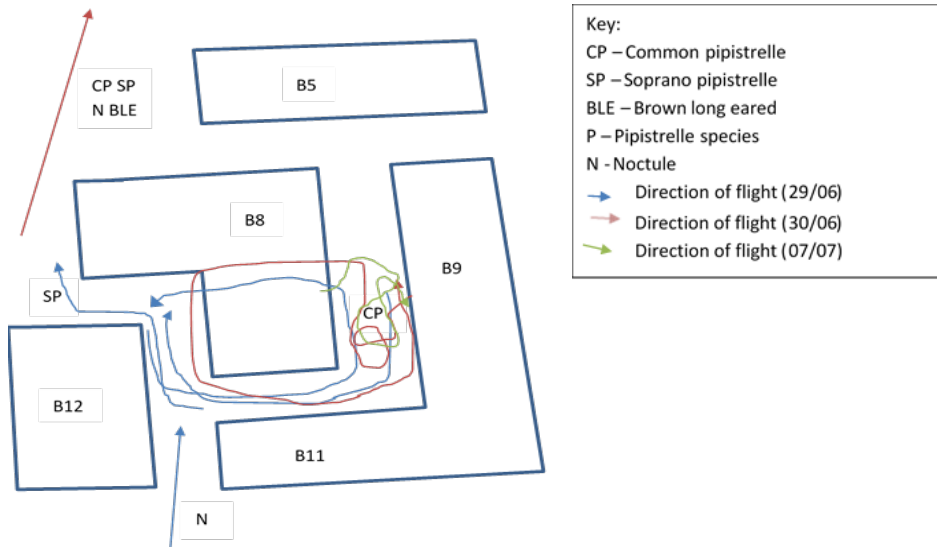


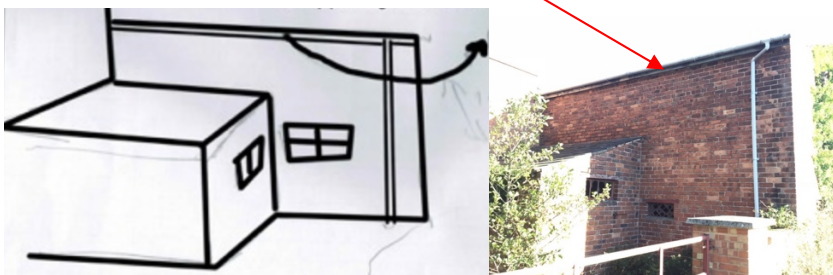
Plate 4: Air vents



4.5 2018 Activity Surveys

- 4.5.1 **Dusk survey 14/09/2018 Building 2:** Two soprano pipistrelle *Pipistrellus pygmaeus* bats were seen to emerge from under the rafters on the northern elevation of Building 2 at 19:54 and 20:06 (see below and photographs).

Plate 5 & 6: Building 2 emergence point



4.5.2 Other than this, overall, bat activity was low with common pipistrelle *Pipistrellus pipistrellus* (first recorded at 19:52 emerging from Building 13) and soprano pipistrelle (first recorded at 19:26 commuting and foraging on the lane), recorded intermittently in small numbers, mainly commuting and foraging along the lane and the farm yard/drive between Buildings 1/2 and 13. Overall, surveyors recorded between 5 and 13 bat passes throughout the evening with the last recording occurring at 20:30. A single noctule was heard flying overhead at 20:15.

4.5.3 **Dawn survey 30/09/2018 Building 2:** the dawn survey revealed lower activity levels with a brown long-eared recorded at 06:18 flying along the lane in a southerly direction and a noctule heard overhead at 07:04. Soprano pipistrelle was recorded at 06:01, 06:06, 06:07, 06:31, 06:40 and 06:41. Other bat passes included 2 individuals (no echolocation) that flew along the lane hedge and towards the south of the Site. Surveyors recorded between 2 and 6 bat passes. No bats were recorded entering the building.

4.6 Discussion

4.6.1 Activity across the Site is generally low despite the rural setting of the Site, the suitability of the buildings for roosts and the good connectivity to good quality bat habitat in the wider area. The 2017 activity surveys were undertaken at a core period for bat activity and under optimal weather conditions and therefore it would be expected that these conditions would yield optimum bat activity levels at the Site. The 2018 activity surveys were undertaken later in the survey season (and important roosts such as maternities colonies can be missed) but given the nature of the building and the results of the preliminary roost inspection, it is considered that the building would highly unlikely support a maternity roost. Given this, and in consideration of the results of previous surveys, it is considered that the results obtained are a true reflection of the status of bats at this Site.

4.6.2 The presence of bat roosts has been established within four of the buildings (2, 9, 13 and 14). Building 2 is considered to be a transient roost of opportunistic individuals of Soprano pipistrelle, a common species. Building 9 supports a single common pipistrelle bat and is likely used a transient summer roost. Buildings 13 and 14 support a maternity colony of brown long eared bats, and common and soprano pipistrelles.

4.1 Incidental Observations

4.1.1 During the internal inspections, 25 swallow nests in various degradations were recorded within the buildings. Ecological mitigation will include provision of replacement nests within the proposed car port/garages.

4.2 Appraisal of Potential Effects

4.2.1 The renovation of barns often gives rise to numerous effects on bats in the absence of mitigation. Direct impacts can include disturbance, loss or modification of roosts due to building work including removal of roofs, demolition, plant machinery, increased people presence and lighting, and fragmentation and isolation due to modification of habitats that bats may use to commute to areas for foraging and roosting. Lighting at night during the construction period can cause indirect disturbance to bat roosts and foraging/commuting routes.

4.2.2 Post-construction, the long term impacts of a then habitable residence should be considered. Lighting on the property and associated garden could give rise to impacts on replacement roosts and deter

some species of bats from foraging. The external lighting scheme of the property should be designed sympathetically to reduce the potential for impacts on light sensitive bat species.

- 4.2.3 Since the proposed development comprises the complete renovation or demolition of the buildings, this will give rise to direct impacts upon bats and their roost if measures to prevent harm are not implemented. The scale and significance of this is described below for each building, based upon Natural England's Bat Mitigation Guidelines; Figure 4 and Table 6.1.

Table 4.2: Scale of Impact

Building Ref	Building Ref Site Layout Plan	Evidence of bats	Likely Impact	Conservation Significance	Scale of Impact on Population Viability
1	M	No	Part demolition – may impact on B2	NA	NA
2	M	2 soprano pipistrelle – transient roost	Renovation – destruction of roost	Low	Low
3	L	No	Demolition – no impact	NA	NA
4	K	No	Part demolition – no impact	NA	NA
5	I	No	Demolition – no impact	NA	NA
6	H	No	Demolition – no impact	NA	NA
7	J	No	Demolition – no impact	NA	NA
8	F	No	Demolition – no impact	NA	NA
9	D	1 pipistrelle – transient roost	Demolition	Low	Low
10	E	No	Demolition – no impact	NA	NA
11	D	No	Renovation – no impact	NA	NA
12	C	No	Demolition – no impact	NA	NA
13	A	Soprano pipistrelle – summer roost	Renovation – destruction of summer roost	Low-moderate	Medium
		Common pipistrelle – summer roost		Low-moderate	Medium
		Brown-long eared – summer roost		Moderate	High
14	B	Soprano pipistrelle – summer roost	Renovation – destruction summer & maternity roost	Low-moderate	Medium
		Soprano pipistrelle – summer roost		Low-moderate	Medium
		brown-long eared – maternity roost		Moderate-high	High

- 4.2.4 Since the proposed development comprises the complete renovation of the four buildings, this will give rise to impacts upon bats and their roosts if measures to prevent harm are not implemented. To address the impacts identified above, mitigation and compensation will be implemented to ensure that individuals are protected from harm and there is no net loss of roosting opportunities in the long term.

- 4.2.5 Furthermore, the development can commence only upon the granting of a licence from Natural Resources Wales. The following Section 5 provides an outline mitigation strategy for the proposed development. The information provided will form the basis of a licence application.

5 OUTLINE MITIGATION STRATEGY

5.1 Introduction

- 5.1.1 Where the potential for impacts on bats and their roosts has been identified, the proposed development must include the implementation of suitable compensation and mitigation measures to prevent harm to bats and their roosts and to maintain favourable conservation status of the species concerned.
- 5.1.2 This mitigation strategy will form the basis of a licence application to Natural Resources Wales. **The development must not commence until a licence has been granted and appropriate mitigation and compensation measures have been implemented.** The results of surveys will be valid for 18 months. If a licence is not applied for by December 2018, some surveys will require repeating in summer 2019.
- 5.1.3 The overriding emphasis of the mitigation strategy is preventing harm and securing the long-term viability of populations. The following principles of mitigation will be taken forward:
- The demolition and renovation of the barns supporting roosts will commence outside of the two most vulnerable periods; breeding (late April to September) and hibernation (November to February);
 - A 'soft demolition' technique will be used for the initial works, to include removal of roof slates by hand.
 - A licensed ecologist will provide a watching brief during the initial works, including removal of roof slates and will be available on an on-call basis throughout construction.
 -
 - A replacement roost will be constructed and be ready for use prior to the demolition of Buildings 2, 9, 13 and 14. The replacement roost:
 - Will be the entire loft space of the parking barn adjacent to the bottom of gardens 1 and 2. The dimensions of the barn (L:12.775m x W:7m x H:5.5m) will result in a loft space of approximately 12mx6.5mx2.6m which is ample size to accommodate the size of the roosts recorded.
 - The loft space will be suitable for both pipistrelle and brown long eared bats, acknowledging that the latter species has very specific roosting requirements; it will be designed to provide a range of temperatures and roost opportunities throughout the year. The barn will be constructed of reclaimed timbers, preferably those from existing on Site barns.
 - The roof pitch will be 50-60 degrees.
 - Access to the loft will be in the form of:
 - two Habitat roof slates, located within the roof on the southern elevation of the roof

- gaps in the mortar/boarding to allow access into wall cavities for crevice dwelling species
- an opening in the western gable end of approximately 30cm wide by 20cm high
- A locked hatch will provide access for maintenance and monitoring of the roost by a licenced bat worker, all other personnel will be excluded;
- The loft will be adequately insulated to avoid heat exchange and also permeation of fumes or noise from cars parked close to the roost;
- A data logger will be installed to monitor temperatures within the replacement loft. It is considered that the new building will sustain more constant temperatures than the current buildings due to their derelict nature and draughty conditions;
- An integrated Istock bat roost will be installed on the western gable wall of the refurbished Building 2. This will directly compensate for the loss of the roost in this building. This will not be completed before the following bat season but the replacement parking barn which will be installed prior to any works commencing, will compensate for this.
- A lighting scheme will be designed that is sensitive to the requirements of bats, in accordance with the new guidance jointly issued by the Institution of Lighting Professionals and Bat Conservation Trust; Guidance Note 08/18: Bats and Artificial Lighting in the UK. The replacement roost building will not be illuminated;
- A landscaping scheme will be designed for the benefit of wildlife, including the use of native shrubs and plants and nectar rich species. This would improve invertebrate populations around the Site and hence increase foraging resources for bats.

5.2 Replacement Roost Site Selection

- 5.2.1 When considering replacement roost site selection, much of the research and evidence shows that a roost replaced in-situ will likely be more successful than a replacement roost located in an alternative building. This evidence has been considered and acknowledged by the roost design team at this Site. When reviewing the site selection, two potential options have been investigated, an in-situ location, and an ex-situ location involving the construction of a parking barn which will incorporate car parking spaces below and a bat loft above.
- 5.2.2 The barn is located on the edge of the Site, adjacent to well established vegetation and open farmland. The parking barn is between 15m and 60m from all of the existing roosts. A review has been undertaken of current evidence and guidance and how these can be applied effectively in the short and long term into both options. For the short term considerations, both options were assessed in terms of which one offered the best opportunities for creating a bat friendly roost, including location, thermal regime, materials and access. And the long term considerations comprised how the roost could be maintained effectively and which option was more likely to ensure the long term viability of each species.
- 5.2.3 It is also acknowledged that certain design requirements in renovations and conversions are not conducive to the effectiveness of a roost and furthermore could result in injury and mortality of

individuals. An example of this is the use of breathable membranes, a preferred membrane used by builders, but one which is widely acknowledged to negatively impact upon bats; once the membrane starts to degrade, it can cause injury and mortality by entrapment of bats on loose fibres. The residential barn will have the breathable membrane be installed. However, in the ex-situ barn, non-breathable membrane such as traditional bitumastic underfelt can be installed which will not have the potential to cause harm to bats.

- 5.2.4 The thermal regime of a bat roost is important in the success of a colony. It is acknowledged that houses are warmer than outbuildings, but the higher temperatures somewhat depend upon the usage of heating within a residential property and there is potential for temperature fluctuations. Further, residential properties are now designed to be 100% heat efficient, meaning that very little heat is lost through ceilings into the loft space. The barn will be designed to replicate the places that bats are currently using and will be of sufficient size for brown long eared bats, with the added benefit of insulation and specifically pitched roof to maximise solar gain.
- 5.2.5 Interference from home owners is the biggest threat to roost within houses. Bats can often lose roosts and/or suffer injury or mortality due to various factors including exclusion, installation of insulation and use of the loft space for storage. The paper *'Roost site selection by the brown long-eared bat Plecotus auritus'*, published in the Journal of Applied Ecology states, *'One of the main threats to bats is considered to be loss of roost sites. In particular, many species appear to be reliant on man-made roosts, either through the loss of natural roost sites such as tree cavities, or because man-made sites offer preferable conditions. Man-made sites, particularly occupied houses, are the source of most interactions between humans and bats. These roosts are susceptible to disturbance, pesticide applications for remedial timber treatment, and deliberate exclusions (e.g. Barclay, Thomas and Fenton 1980; Stebbings 1988)'*. It is considered that a roost within the residential barn would be more susceptible to human interference which will often be undetected and the long-term viability of populations using the roost therefore cannot be guaranteed. The use of the carport as a dedicated loft exclusively for the use of bats will not be subject to such threats. The only access to the loft is via a hatch which can be locked and only accessed by authorised personnel. This prevents homeowners from inadvertently using the loft for storage. A restricted covenant would be drawn up upon the sale of the building which will restrict the use of the barn to parking space only. This would be in place for successive purchasers/owners of the property.
- 5.2.6 Furthermore, it is proposed to implement a monitoring and maintenance programme for 3 years post-construction. This can often prove difficult to undertake for roosts built into houses as it relies on the compliance of the homeowner to allow surveyors into their home on an annual basis. Homeowners are usually more compliant to allow maintenance and monitoring to be undertaken in an outbuildings and hence the longevity of the programme will more likely be sustained.
- 5.2.7 It is considered that there are benefits to both locations in the short term, but that the proposed new barn offers more opportunities for the creation of bat friendly features. Overall, there must be an overriding emphasis on securing the long term viability of populations. This can be achieved by providing a safe, ex-situ roost that will not be subject to undetected interference by home owners, does not comprise degradable membranes, and one that can be effectively monitored and maintained over time so that the outcome of the monitoring and maintenance can contribute to current understanding and knowledge, both at species level and geographically; locally and nationally.

5.3 Post Development Site Safeguard

- 5.3.1 A maintenance and monitoring programme will be implemented for the first 3 years from completion of the renovation.
- 5.3.2 On an annual basis for the first 3 years, a single monitoring dusk or dawn survey will be undertaken in July to record activity around the loft, following methodology set out in Bat Conservation Trust's Bat Surveys for Professional Ecologists, Good Practice Guidelines (3rd Ed.). The loft will also be inspected the following autumn (which is outside of the maternity season so as to avoid disturbing nursing bats and their young) for signs of occupation by bats and maintenance undertaken (if required). The thermal data logger will also be checked.
- 5.3.3 The results of the monitoring programme will be reported to Cofnod and the Local Planning Authority.
- 5.3.4 Table 1 below shows the schedule of works.

Table 4. Schedule of monitoring and maintenance programme.

	Year 1	Year 2	Year 3
Monitoring (dusk/dawn survey in June)	✓	✓	✓
Maintenance (autumn)	✓	✓	✓

6 CONCLUSION AND RECOMMENDATIONS

- 6.1.1 The site has been the subject of extensive surveys and assessment in 2008, 2016, 2017 and 2018. The surveys have established the presence of brown long eared and pipistrelle roosts in Buildings 13 and 14, a common pipistrelle roost in Building 9 and a soprano pipistrelle roost in Building 2.
- 6.1.2 The conversion of the buildings will result in the loss of these roosts. However, the mitigation and compensation that is proposed is aimed at replicating these buildings by providing a 'like for like' dedicated bat barn, located adjacent or close proximity to the existing roost buildings. The barn will be located in the corner of the Site so that it is more sheltered from activity around the residential grounds. The overall aim of the mitigation proposals is to ensure that there will be no detriment to the conservation status of bats.
- 6.1.3 It has been established that because the buildings at Broad Oak Farm are not viable for modern farming practices, there is 'no satisfactory alternative' but to demolish and convert some of the buildings. A 'do nothing approach' would mean that the buildings would rapidly deteriorate making it unsafe, the target of vandalism and theft (current evidence of theft of man hole covers across the Site), and become of no value to bats.
- 6.1.4 Having reviewed options for replacement roost location along with guidance provided in key documents and recent case studies and the experience of the author, it is considered that the proposed new bat loft will deliver an exciting opportunity to provide a tailored and secure environment to encourage the maintenance of both pipistrelles and brown long eared colonies.
- 6.1.5 In addition to mitigation provided for bats, approximately 25 swallow nests were found throughout the buildings. Three parking barns are proposed and 10 artificial swallow cups will be installed on the top of the walls within each of the barns.

7 REFERENCES

Bowland Ecology. 2016. *Broad Oak Farm – Ecological Appraisal*

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

Entwistle, A.C; Racey, P.A; Speakman, J.R. 1997. *Roost Selection by the brown long-eared bat Plecotus auritus*. Journal of Applied Ecology

ERAP. 2008. *Broad Oak Farm – Ecological Survey and Assessment*

ILP & BCT. 2018. *Bats and Artificial Lighting in the UK*, Guidance Note 08/18

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

The Bat Conservation Trust, 2012. *Bats and Buildings – Bats and the Built Environment Series*. BCT, London

www.cofnod.org.uk

www.nhbs.com/title/192461/habibat-bat-access-slate

www.roost.bats.org.uk

APPENDIX A