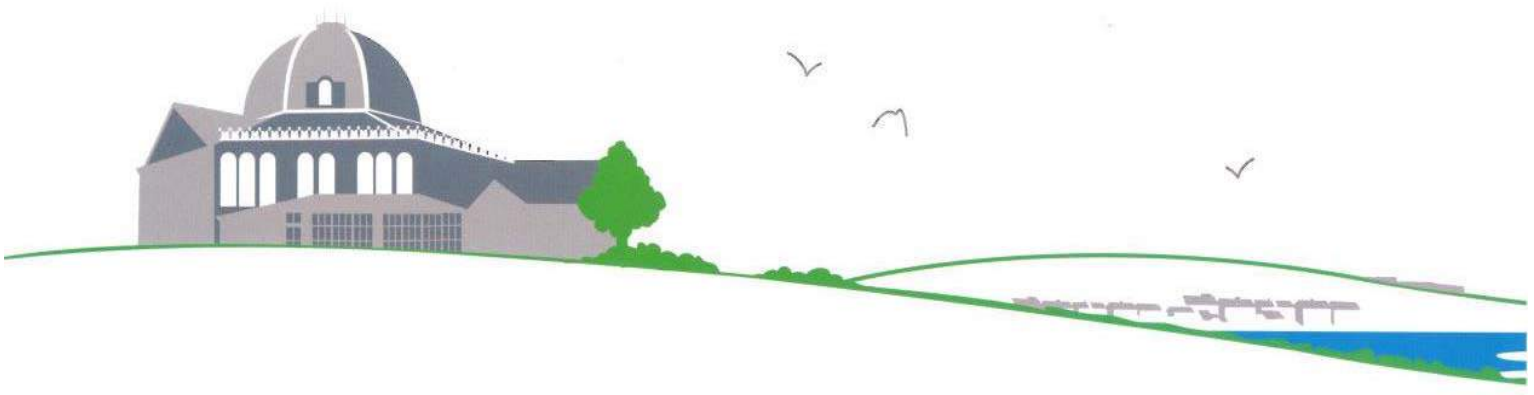
Penny Anderson Associates Ltd
CONSULTANT ECOLOGISTS

MR M MELLOR

STAR BANK, OAKAMOOR

BAT EMERGENCE / RE-ENTRY SURVEY



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BAT EMERGENCE / RE-ENTRY SURVEY

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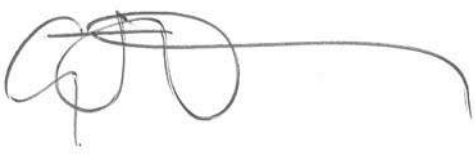
This project has been undertaken in accordance with PAA policies and procedures on quality assurance.



Signed:_____

CONTENTS

1. INTRODUCTION

Background

1.1 Penny Anderson Associates Ltd (PAA) was commissioned by Mr Mellor to investigate potential usage of barns by roosting bats at a site on Star Bank, Oakamoor (hereafter referred to as the 'site'). A daytime inspection was carried out in September 2016; two of the buildings (small stone barns) were assessed as having high potential for use by roosting bats and the remaining buildings were assessed as negligible potential. As a follow up to that initial assessment, dusk emergence and dawn re-entry surveys were recommended for the two stone barns, which are proposed for conversion to residential use.

1.2 The daytime inspection is reported separately (PAA 2016), the emergence and re-entry surveys are the subject of this report.

Site Description

1.3 The site comprises a small farmyard on Star Bank, Oakamoor. The two buildings surveyed are situated at the southern end of the yard and flanked by grassland and broad-leaved woodland.

Bat Biology

1.4 There are 17 species of native bats known to be resident (i.e. breed) in the British Isles. British bats feed entirely on insects and have developed a complex sonar system, known as echolocation, which enables them to find prey and navigate around their environment at night.

1.5 Habitat requirements vary widely, both on an individual and species level, although certain features, such as woodland, parkland, traditional pasture, marshes and areas of freshwater, are often focal points for foraging, as insects are plentiful in these areas (Mitchell-Jones 2004). Bats use linear features such as rivers, hedgerows, roads and woodland edges as landmarks in order to commute from one location to another (Schofield and Mitchell-Jones 2003).

1.6 Bats utilise different roosts at different times of the year. Between late October and March, bats hibernate; this requires an unexposed roost with a stable temperature, typically a cave, cellar or tunnel. Around March, the bats emerge and gradually move to their summer roosts, typically within man-made structures or suitable crevices in trees. During the spring and summer period female bats gather together at maternity roosts to give birth and rear their young. Most births occur between late June and mid-July, with the young able to fly within three to five weeks (Altringham 2003; Waters and Warren 2003). By the end of August, most of the young bats are independent and the colony begins to break up (Schofield and Mitchell-Jones 2003). Mating takes place between August and December, either at the winter hibernation site or at autumn breeding sites. The numbers of bats utilising these roosts can vary from single bats to hundreds of bats in a nursery colony or hibernation site (Altringham 2003).

Legislative Context

1.7 All wild species of bat are protected under the Wildlife and Countryside Act (WCA) 1981, which has also been amended by later legislation, including the Countryside and Rights of Way (CRoW) Act 2000 and this legislation is applicable to England and Wales.

1.8 Bat species are also listed under Annexes IIa and IVa of the EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora, also known as the 'Habitats Directive'.

Inclusion on Annex IVa means they are consequently identified as European Protected Species (EPS) and protected under the Conservation of Habitats and Species Regulations 2010.

1.9 Under this legislation it is an offence to kill or injure a bat, disturb a bat whilst it is roosting, and obstruct, damage or destroy a breeding site or resting place, whether the animal is in occupation or not. There are additional offences relating to possession, control and sale of a live or dead bat or part of such an animal.

1.10 In addition, seven native British bat species including the soprano pipistrelle (*Pipistrellus pygmaeus*) and the brown long-eared bat (*Plecotus auritus*), that are frequently found in buildings, are listed as a 'Priority Species' under the 2011 biodiversity strategy for England, Biodiversity 2020: A strategy for England's wildlife and ecosystem services, under the 2012 UK Post-2010 UK Biodiversity Framework. These Priority Species are also referred to as 'species of principal importance' for the conservation of biodiversity in England and Wales within Section 74 of the CRoW Act 2000, and Sections 41 (England) and 42 (Wales) of the Natural Environment and Rural Communities (NERC) Act 2006.

1.11 Section 11 of the National Planning Policy Framework (NPPF) states that the planning system should contribute to and enhance the natural and local environment by minimising impacts on biodiversity and providing net gains in biodiversity where possible. The NPPF also includes the requirement to contribute to the Government's commitment to halt the overall decline in biodiversity and to promote the reservation, restoration and re-creation of priority habitats, ecological networks and the protection and recovery of priority species populations, linked to national and local targets. Reference is made to Circular 06/2005 Biodiversity and Geological Conservation - Statutory Obligations and Their Impact within the Planning System in respect of statutory obligations for biodiversity and geodiversity conservation.

1.12 Local authorities in England are required to ensure that where significant harm resulting from development cannot be avoided (through locating on alternative sites with less harmful impacts), adequately mitigated or, as a last resort, compensated for, planning permission is refused. The commitment to preserving, restoring or enhancing biodiversity is further emphasised for England and Wales in Section 40 of the NERC Act 2006.

2. METHODS

Overview

2.1 Survey methodology followed current good practice guidelines published by The Bat Conservation Trust (Collins 2016) and all visits were undertaken within the appropriate season on nights with weather conditions considered to be suitable for bat survey.

2.2 The survey visits were led by licensed Bat Ecologists Sarah Ross[1] MCIEEM[2] and Hazel Robson[3] MCIEEM. Both have extensive experience of bat surveys and therefore are appropriately qualified for this type of survey based on the CIEEM competency framework (CIEEM 2013). The survey team also included principal consultant Gerard Hawley MCIEEM, Senior Ecologist Chloe Pritchard MCIEEM, Ecologists Victoria Burton ACIEEM and Caroline Boffey ACIEEM, and Assistant Ecologists Sam Hubbard and Rob Lamb, with four surveyors present for each visit.

2.3 The two barns are identified as B1 and B2 on the site plan, with B1 being the larger of the two structures. For ease of reference, this is consistent with the numbering used in the daytime survey report (PAA 2016).

Dusk Emergence and Dawn Re-entry Surveys

2.4 A total of two dusk emergence and one dawn re-entry surveys were carried out to confirm presence/likely absence of roosting bats, and to highlight roost entrances and enable bat roost characterisation where roosts were confirmed.

2.5 Each survey lasted for approximately two hours, with emergence surveys commencing approximately 15 minutes prior to sunset and re-entry surveys concluding at approximately 15 minutes after sunrise to take in the most likely periods when bats would be observed at a roost site.

2.6 Weather conditions were recorded at the start and end of each survey. Temperature and humidity were measured using a hygro-thermometer (810-190 www.etiltd.com). Wind was estimated using the Beaufort Wind Force Scale, ranging from 0 calm to 5 moderate breeze (NB while the scale extends to hurricane force 12, 6 or higher would be unsuitable conditions for survey). Cloud cover was estimated using the standard meteorological scale of oktas (eighths), where 0/8 is a completely clear sky and 8/8 is completely overcast.

2.7 Surveyors were positioned at vantage points close to the target buildings to observe any bats entering or exiting potential roost features. Each surveyor was equipped with a Batbox Duet bat detector to aid detection in the field, and an Anabat SD1 to record bat calls and enable sonogram analysis to confirm identification of any species found to be roosting.

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[1] *Natural England class licence registration number 2015-12600-CLS-CLS, survey level 2 (WML-CL18)*

[2] *Full member of Chartered Institute of Ecology and Environmental Management*

[3] *Natural England class licence registration number 2015-10504-CLS-CLS, survey level 2 (WML-CL18)*

2.8 During each of the surveys, two Anabat Express bat detectors were also placed within the internal rooms of the larger barn (B1) to record any calls of bats flying within this building. At the second dusk survey, the detector at the southern end of the building was left *in situ* to monitor for bat activity over a period of one week.

Data Analysis

2.9 Recorded bat calls from each of the survey visits were analysed using specialist sound analysis software Analook W. Based on parameters such as peak frequency and call duration, each call was assigned to a particular bat species. Sonograms illustrating calls recorded for each of the bat species confirmed to be roosting at the site are provided in Appendix 1.

Limitations

2.10 Visual observation of bat activity is constrained by light levels. While surveyors may be able to see bats silhouetted against the sky, individuals flying against a background of dark buildings or trees are much more difficult to spot. The use of bat detectors to hear echolocation calls helps to ensure that activity is not missed. However, in low light conditions it is not always possible to ascertain details such as direction of flight.

2.11 Bat detectors have a range of approximately 20m. Some species, such as noctule bats (*Nyctalus noctula*) have very loud echolocation calls that can travel over long distances and therefore may be detected at greater range, whilst others such as brown long-eared bats typically have very quiet calls that may only be detected at fairly close range. The apparent absence of echolocation calls can be a useful identification feature in itself for this species and therefore this is not considered to be a constraint to the project.

2.12 The site was fully accessible on each survey visit and all surveys were carried out on nights with weather conditions suitable for bats to be active.

2.13 Overall, there were no signification limitations to the surveys carried out and the results are considered to provide a robust representation of bat activity at the site.

3. RESULTS

Overview

3.1 The survey results have confirmed that the larger of the two barns (B1) is used as a roost by brown long-eared bats.

3.2 The locations of the roosts are highlighted on Figure 1 and photographs to highlight roost entrances are provided in Appendix 2. Sonograms illustrating recorded calls of the bat species encountered at the site are provided in Appendix 1.

3.3 The survey dates, times and weather conditions are presented in Table 1, with temperature and humidity readings taken using a hygro-thermometer (810-190 www.etiltd.com).

Table 1 Dates and Weather Conditions of Emergence and Re-entry Surveys

Date	Survey Type	Start Time	Sunrise/ Sunset	End Time	Weather Conditions
18/05/17	Dusk	2045	2104	2230	Dry with light wind at the start, and lessening towards the end of the survey. Temperature 10.0ºC dropping to 9.6ºC by end of survey. Relative humidity 90% decreasing to 88%. Cloud cover 8/8 throughout.
13/06/17	Dusk	2120	2135	2255	Dry and calm throughout. Temperature 16ºC dropping to 12ºC by end of survey. Relative humidity 75% increasing to 86%. Cloud cover 7/8 throughout.
18/07/17	Dawn	0330	0505	0520	(Forecast temperature on the preceding evening was well above 10ºC). Dry and calm throughout. Temperature 16ºC dropping to 14ºC by end of survey. Relative humidity 52% increasing to 68%. Cloud cover1/8 throughout.

Dusk Emergence Survey: 18/05/2017

3.4 Common pipistrelle (*Pipistrellus pipistrellus*) bats were seen and heard from approximately 20 minutes after sunset and then frequently throughout the survey. None were seen to emerge from a roost.

3.5 Calls of noctule bats were also detected from approximately 20 minutes after sunset and then again occasionally during the remainder of the survey. These bats did not emerge from the buildings.

3.6 At approximately 25 minutes after sunset a single bat was seen to approach from the west, fly into B1 through the open doorway on the south-eastern elevation and then out through the adjacent window. Approximately one minute later a second bat was seen to emerge from the same window. No echolocation calls were detected from either individual. Three of the surveyors recorded seeing or hearing brown long-eared bats at this time. Ten minutes later at approximately 35 minutes after sunset another brown long-eared bat was seen to emerge from the same window. No brown long-eared bat calls were recorded by either of the detectors situated within the barn.

Dusk Emergence Survey: 13/06/2017

3.7 Common pipistrelle bats were seen and heard from approximately five minutes after sunset, seen earliest at the north-western corner of the barns. This species was encountered frequently throughout the survey, with a maximum of two individuals seen together at any one time. None were seen to emerge from the buildings.

3.8 Calls of noctule bats were also detected occasionally during the survey, commuting overhead. These bats did not emerge from the buildings.

3.9 At approximately 30 minutes after sunset a single bat was seen to emerge from a crevice in the stonework on the gable end of B2 (see Plates 3 and 4, Appendix 2). No echolocation calls were heard from this individual and it was noted down by the surveyor as a brown long-eared bat.

3.10 At approximately 40 minutes after sunset a single bat was briefly glimpsed flying away from the south-west gable end of B1. It was thought to have appeared from above the doorway and potentially emerging from a crevice in the stonework at this location (see Plate 2, Appendix 2). Approximately 3 minutes after a bat was seen to fly out of the open window and calls of a brown long-eared were briefly registered on the bat detector.

3.11 Brown long-eared bats were seen and heard foraging around the buildings frequently during the rest of the survey, with a maximum of two individuals seen together at any one time. No bat calls were recorded by the Anabat Express detector placed inside the northern room of B1 during the survey.

Dawn Re-entry Survey: 18/07/2017

3.12 Occasional common pipistrelle bats were seen and heard early on during the survey to the front of the barns. However, there was much more sustained foraging activity by this species within the trees and scrub to the rear. A maximum of two individuals were seen together at any one time. The last common pipistrelle was recorded at approximately 50 minutes before sunrise and none were seen entering or exiting the barns.

3.13 Brown long-eared bats were seen and heard foraging around both barns from the beginning of the survey, with a maximum of two individuals seen together at any one time. There was continuous activity around B1 for a period of half an hour until approximately one hour before sunrise.

3.14 At approximately one hour before sunrise a single brown long-eared bat was seen flying around the smaller of the two barns (B2) before entering a roost in a crevice at the edge of roof tiles on the north-western gable end (See plates 2 and 3, Appendix 2).

3.15 At approximately 50 minutes before sunrise a single brown long-eared was seen to fly out of the open window on the south-western gable end of B1 before flying around to the front of the barn

and a few minutes later a bat was seen to fly in through the open doorway on the north-western elevation (see Plate 1, Appendix 2). No bats were seen to leave the building after this time and no calls were detected to indicate individuals flying inside the building.

3.16 At approximately 45 minutes before sunrise another brown long-eared bat was seen to fly past the barns in a northerly direction and no further bat activity was detected.

Static Monitoring in B1: 14-25/06/2017

3.17 A total of 18 instances of common pipistrelle bat calls were recorded during the monitoring spread over four separate nights of the ten day period. These were all very brief sequences of echolocation calls suggesting a bat flying past rather than any sustained period of activity within the range of the detector.

3.18 No brown long-eared bat calls were detected during the monitoring period.

4. EVALUATION

4.1 The surveys have confirmed that both of the stone barns (B1 and B2), are used by small numbers of brown long-eared bats.

4.2 Based on the small number of individuals seen, the type of features used and the apparent lack of any sustained social activity within the buildings, these are considered to be day roosts[4].

4.3 The roost features on B2 were discrete crevice features in the external stonework that did not provide access to the internal room of the barn. There was no evidence of the bats using the internal areas of B2 as part of their roost space. In addition to a small crevice on the external stonework that was used on a single occasion, the open doorways and window on the north-west and south-west elevations of B1 were the access points consistently used for this building. However, the precise resting place inside the structure could not be confirmed. Although bats were seen entering and exiting the barn on each of the survey visits at times that would indicate the presence of a roost, surveyors did not observe any sustained flying activity inside the barn, suggesting that the bats were flying straight to or from their resting place.

4.4 Based on the structural features of the barn, the most likely resting place is considered to be the wall plate at the gable ends. Other typical resting places for brown long-eared bats would be at the ridge or in timber joints. However, the ridge beam comprised a narrow strip of wood that is wholly exposed with no shelter where a bat could remain unseen and although the roof is supported by king posts there were no obvious crevices in the timbers or between the joints.

4.5 Brown long-eared bats are relatively common and widely distributed throughout most of the UK, and the population in Great Britain is currently considered to have been stable since 1999 (BCT 2017). A day roost of this type of species is considered to be of relatively low conservation significance (Mitchell-Jones 2004).

4.6 With the proposals being to convert the two small barns for residential use, there will not be scope to retain the existing roost entrances on B1, as bats are using the open doorways and windows that will need to be sealed to make the building weather-tight, as well as a crevice on a wall that will be enclosed within the accommodation. However, there may be scope to retain or replicate the existing crevice features used on B2, as these are on the external surface only.

4.7 As all British bats are European Protected Species, the proposed conversion of the barns presents the following potential impacts, all of which would be an offence under current wildlife legislation:

- Disturbance of up to three brown long-eared bats in day roosts;
- Modification or destruction of day roosts; and
- Risk of harm to individual bats.

4.8 The proposals will need to incorporate appropriate mitigation and avoidance measures to avoid harm to bats and maintain the favourable conservation status of the local population. See Section 5 for more detailed recommendations.

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[4] *Day roost – a place where individual bats, or small groups of males, rest or shelter in the day but are rarely found by night in the summer.*

5. RECOMMENDATIONS

5.1 In line with current good practice, if development has not begun within two years of this report the bat surveys should be repeated to re-assess bats' usage of the site and confirm the location and nature of any roosting activity at that time. Based on the current survey results and proposals for the site, the following recommendations are made.

Licence Application

5.2 Upon receipt of planning consent, a licence application to Natural England will be required. A standard licence application typically takes at least 30 days for Natural England to process and requires the completion of several documents:

- Application form (providing details of the site, applicant and named ecologist);
- Method statement (providing a detailed description of predicted impacts and mitigation strategy); and
- Work schedule (setting out the timescale for the proposed work).

5.3 Based on the roosts being of relatively low conservation status, and for a single species, the site may meet the criteria for inclusion in the Bat Low Impact Class Licence Scheme, which typically has a much faster turn-around time but permits a significantly shorter period of licensable works. The work schedule will need to be considered to determine the most appropriate means of licensing at this site.

Mitigation Strategy

5.4 A mitigation strategy will be required to avoid or compensate for impacts on roosting bats, and the following points will need to be considered:

- Provision of alternative roost habitat for brown long-eared bats to offset the loss of the existing day roosts;
- Measures to avoid causing harm to individual bats during the course of the works; and
- Sensitive lighting scheme that minimises impacts on bats post-development.

5.5 With suitable mitigation measures in place it is anticipated that there would be no detriment to the favourable conservation status of local bat populations. Further details on different aspects of the proposed mitigation strategy are provided below.

Provision of Roost Habitat

5.6 Roost habitat suitable for brown long-eared bats will need to be provided. Although the conversion works will result in the loss of the existing features on B1, and make those on B2 unsuitable during the course of construction due to noise and disturbance, there is scope to retain some permanent roost features on the exterior of B2 and potentially create additional new features on B1. Using the existing roost features and locations as a guide, the following is proposed:

- Bat boxes on nearby buildings and/or trees to provide construction phase roost habitat;

- Retaining crevice features in locations close to the existing roost sites on the north-western gable end of B2 by leaving small gaps between the stonework when the building is re-pointed; and

- Creating new access points for bats at the ridge of B1 using raised ridge tiles or leaving a small gap in the mortar at the apex on a gable end to provide access to the ridge beam.

5.7 The buildings are very small and offer little opportunity for the creation of loft space without significantly compromising the dimensions and headroom for the new residential accommodation. Based on the fact that the bats did not appear to be using the internal rooms for flying, the type of roosts (day roosts), the small number of individuals affected and their use of other crevice features that can be retained, it is not considered necessary to provide access to any roof void or loft space.

Avoiding Harm to Bats during Works

5.8 Appropriate mitigation and avoidance measures will be required to avoid injury to any bats during the course of the works. The full scope of these measures, taking into account the exact work schedule, will be confirmed within the licence application to Natural England. However, it is anticipated that the following will be required:

- Toolbox talk to contractors to brief them on the presence of bats, the locations of confirmed roost features, the requirements of the Natural England licence and implications of non-compliance with that document;

- Careful destructive search and soft strip of the roof under the supervision of a licensed bat ecologist;

- Endoscope inspection of crevice features noted to be used by bats prior to any re-pointing in these areas;

- Licensed bat ecologist to be 'on call' to attend the site in the event that bats are encountered at any other point during the works;

- In the event that bats are encountered when the ecologist is not on site, works in that area must cease immediately and must not resume until further advice has been sought from a licensed bat ecologist; and

- Supervision and/or inspection of new or retained roost features to ensure that they are fit for purpose.

5.9 In addition to this, breathable roofing membranes (BRMs) must not be used in any areas where bats would have access. BRMs present a significant risk of harm to bats as over time their claws will pull tiny threads in the membrane and cause them to become entangled, resulting in their entrapment and subsequent death. This damage to the membrane also reduces its effectiveness. The only roof lining fabric considered safe for use in bat roosts is Type 1F bitumen felt (Waring *et al.* 2012).

Timing of Works

5.10 Based on the presence of day roosts during the active season for a small number of a relatively common and widespread bat species, seasonal restrictions on works are not necessary (Mitchell-Jones 2004).

5.11 Nevertheless, it is good practice for works where bats may be encountered, such as destructive searches of known roost features, to be undertaken on relatively warm and dry days to avoid exposing bats to harsh weather conditions that may compromise their welfare.

Lighting Design

5.12 Bats are nocturnal and adapted to forage in low-light conditions. Whilst some species can be fairly tolerant of artificial illumination, brown long-eared bats in particular are fairly sensitive to this type of disturbance. Therefore, potential impacts of new lighting should be considered.

- Lamps must be directed where they are needed to avoid unnecessary light spillage;
- Consider the use of timers and/or motion sensors to limit periods of illumination to essential times only;
- Avoid illumination of roost entrances as this may deter bats from using them; and
- Lighting should also be minimised on trees and other such features near the building to maintain their value as foraging and commuting habitat for bats.

5.13 Reference should be made to the Bat Conservation Trust's publication on lighting for further guidance on suitable specifications (BCT 2007).

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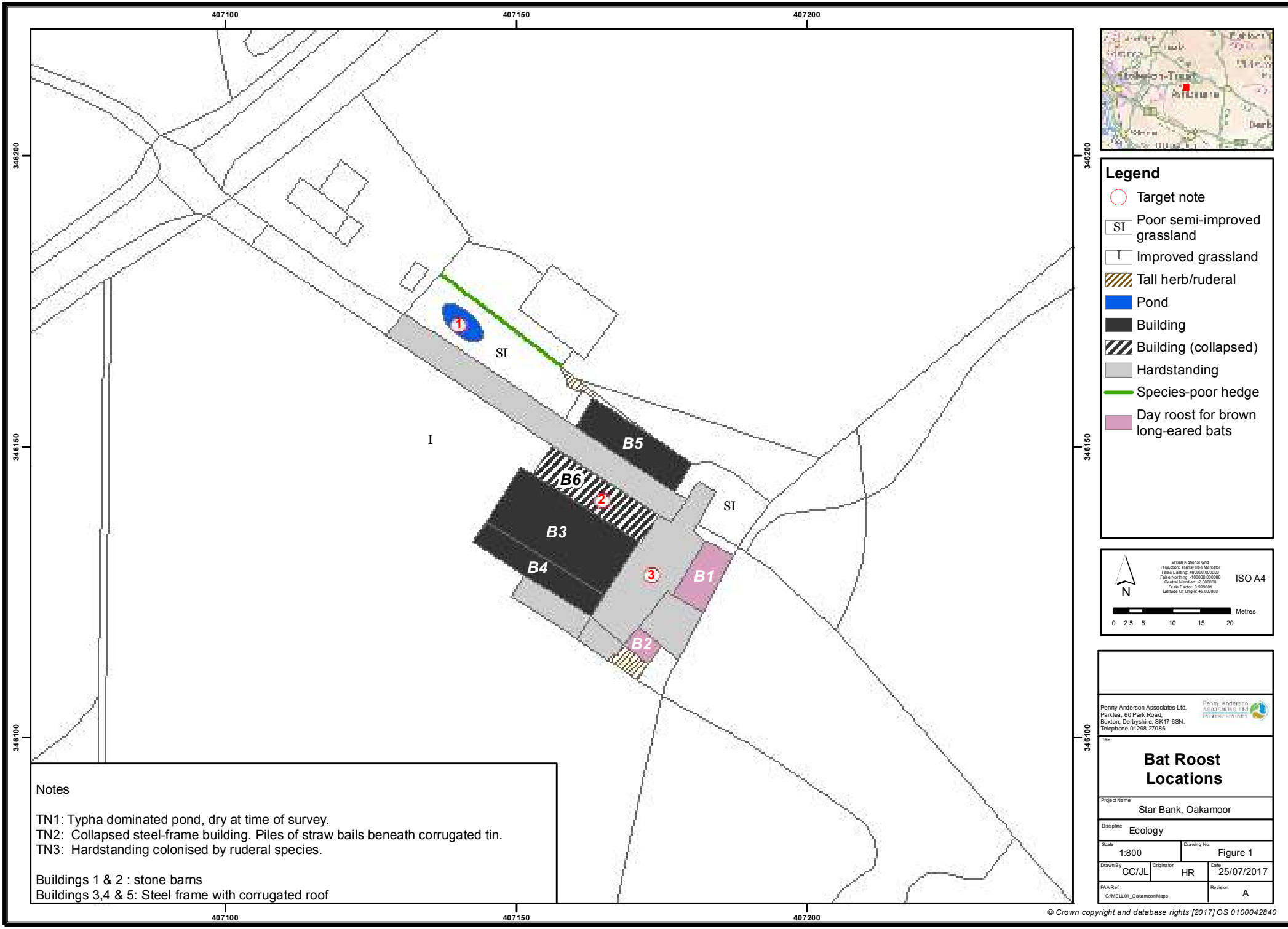
7. ABBREVIATIONS

BRM	Breathable Roofing Membrane
CRoW	Countryside and Rights of Way
EPS	European Protected Species
NERC	Natural Environment and Rural Communities
NPPF	National Planning Policy Framework
PAA	Penny Anderson Associates Ltd
WCA	Wildlife and Countryside Act

FIGURE



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Bat Roost Locations

Project Name: Star Bank, Oakamoor

Discipline: Ecology

Scale: 1:800

Drawing No.: Figure 1

Drawn By: CC/JL

Originator: HR

Date: 25/07/2017

PAA Ref.: G:\MELL01_Oakamoor\Maps

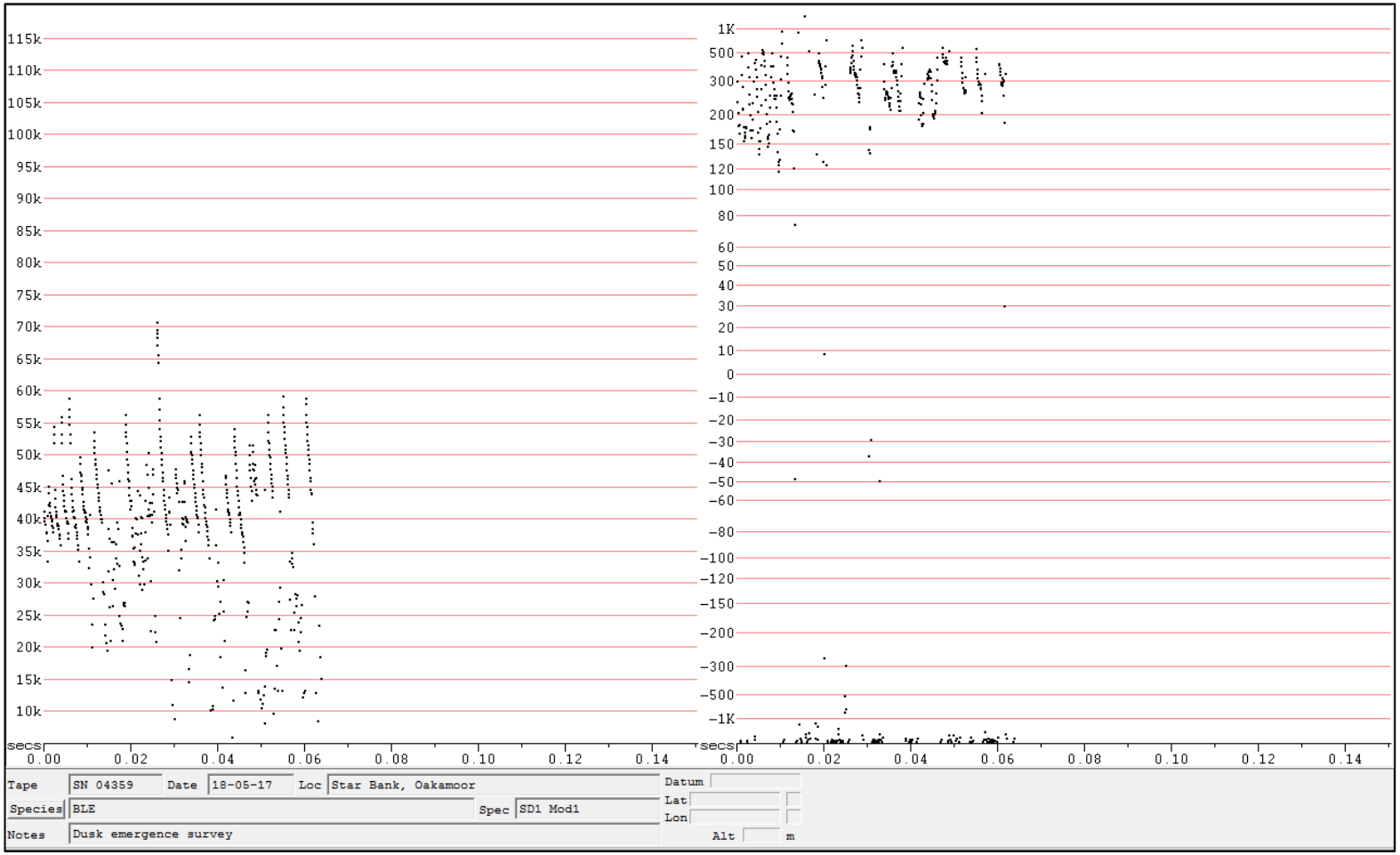
Revision: A

APPENDICES

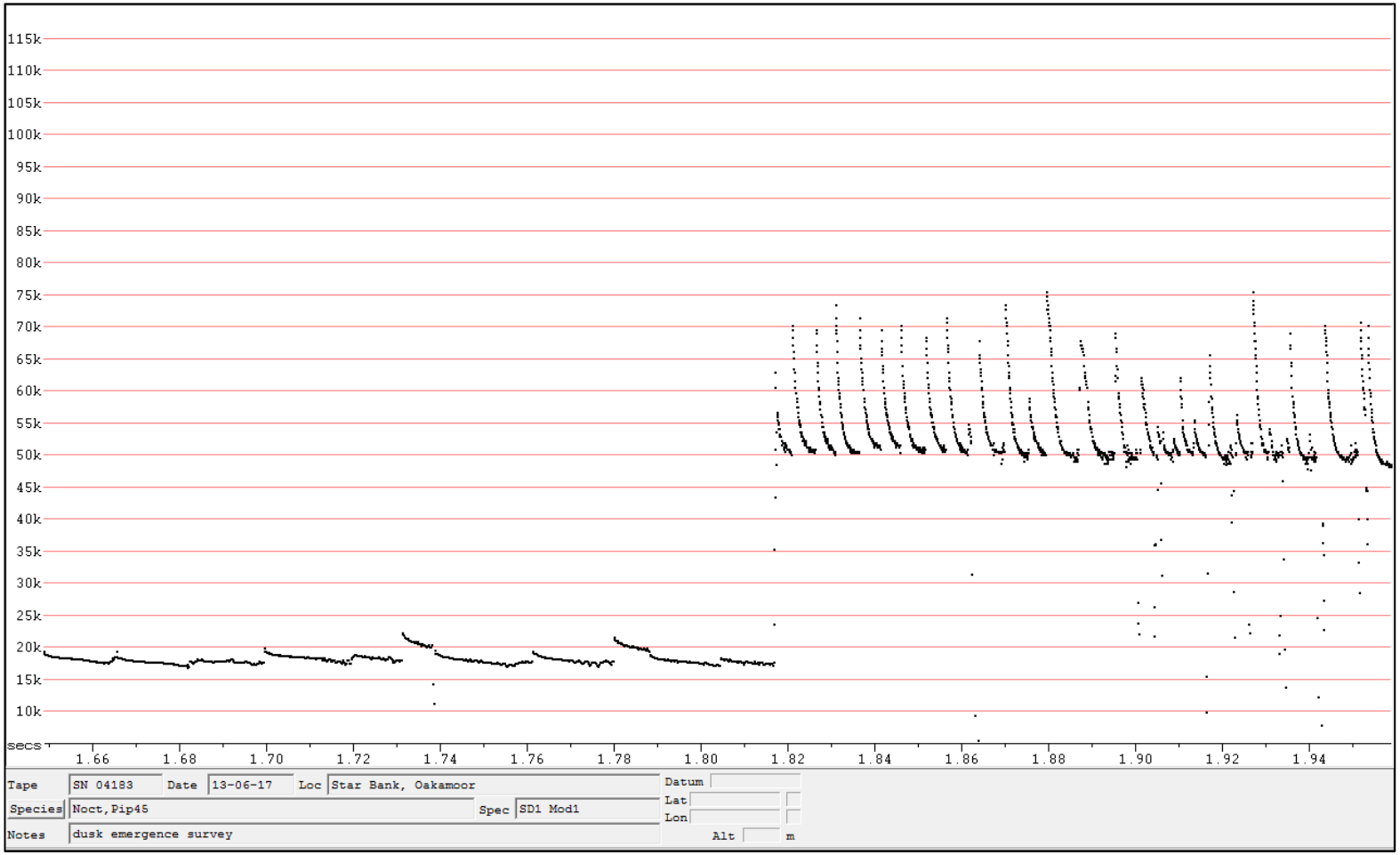
APPENDIX 1

Sonograms

Sonogram 1: Echolocation calls of brown long-eared bats found roosting in the barns. Recorded by Anabat SD1 and analysed using Analook (view: F7 compressed, frequency & slope).



Sonogram 2: Echolocation calls of noctule and common pipistrelle bats also detected foraging at the site, but not roosting in the barns.
Recorded by Anabat SD1 and analysed using Analook (view: F7 compressed, frequency only).



APPENDIX 2

Site Photographs

Plate 1

Building B1 - day roost for brown long-eared bats. Roost entrances via open doorways on north-western elevation and south-western gable end.

Plate 2

Building B1 - roost entrances on south-western elevation and also a crevice feature in the external stonework.

Plate 3

Building B2 – day roost for brown long-eared bats with roost features on NW gable end.

Plate 4

Roost features – crevices between stones on NW facing gable end.
(Discrete crevice features only, neither providing access to interior of barn.)

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