

Barns J and K, Hixham Hall Barns, Furneux Pelham

Great crested newt and
bat survey and
assessment

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1. Summary

- 1.1.1** Katie Worrall proposes to convert two barns, known as Barns J and K, in Hixham Hall Farm to holiday lets (use class C1). The proposals include repairs, renovation, and alterations to both barns to make them fit for habitation.
- 1.1.2** It is understood that applications for planning and listed building consent for the proposed development will be submitted to East Herts District Council (EHDC) shortly.
- 1.1.3** The applications will also be supported by a Preliminary Ecological Appraisal undertaken by Temple in November 2021. This identified great crested newts as a potential ecological constraint to the proposed development and recommended further surveys to determine the presence or likely absence of this species from within the proposed development site. Evidence of roosting bats was also recorded in Barn J, and a single bat was recorded roosting in Barn K. Three emergence and/or return to roost bat surveys were therefore recommended of Barns J and K.
- 1.1.4** Katie Worrall commissioned Babec Ecological Consultants to undertake a great crested newt survey of water bodies within 250m of the proposed development site and a suite of further bat surveys of Barns J and K, and produce a technical report detailing the findings.
- 1.1.5** Babec Ecological Consultants undertook great crested newt surveys on 19 May 2022 and a suite of bat surveys between 14 June and 28 July 2022. The surveys and assessments were undertaken by appropriately licensed and experienced ecologists following the relevant good practice guidelines.
- 1.1.6** The results of the great crested newt surveys indicate the likely absence of great crested newts from within the proposed development site. The proposed development should therefore be compliant with the relevant legislation and planning policy with respect to this species.
- 1.1.7** The results of the further bat surveys of Barn J indicate the presence of a barbastelle day roost (Roost A), two common pipistrelle day roosts (Roosts B and C) and a common pipistrelle night roost (Roost D). The barbastelle day roost (Roost A) is assessed to be of moderate conservation value¹, while all other roosts are assessed as being of low conservation value.
- 1.1.8** The results of the further bat surveys of Barn K indicate the presence of six common pipistrelle day roosts (Roosts A, F, G, H, I and J), one common pipistrelle night roost (Roost E), one brown long-eared night roost/ feeding perch (Roost B), a barbastelle day roost (Roost C) and a Natterer's bat day roost (Roost D). The barbastelle day roost (Roost C) and the Natterer's bat day roost (Roost D) are assessed to be of moderate conservation value², while all other roosts are assessed as being of low conservation value.
- 1.1.9** Given that common pipistrelle, brown long-eared bats and barbastelle are known to roost within buildings over winter, the presence of hibernation roost(s) of these species cannot be ruled out.
- 1.1.10** All species of bat and their roosts are strictly protected by legislation and policy, including the Conservation of Habitats and Species Regulations 2017 (as amended) and the National Planning Policy Framework³. Without mitigation and licensing the proposed development would contravene this legislation and policy. This is because the conversion of Barns J and K would damage or destroy several bat roosts, as listed above. Without mitigation the proposed development would also result in harm and/or significant disturbance of individual bats.

¹ Mitchell -Jones (2004). *Bat Mitigation Guidelines*. English Nature, Peterborough.

² Mitchell -Jones (2004). *Bat Mitigation Guidelines*. English Nature, Peterborough.

³ Department for Communities and Local Government (2021). *National Planning Policy Framework*.

- 1.1.11** However, by using established mitigation techniques⁴ it should be possible to avoid harm to individual bats and maintain the populations of barbastelle, common pipistrelle, brown long-eared and Natterer's bats at a favourable conservation status. Licensing measures and a suitable mitigation strategy have been provided in Section 6 of this report. Provided these measures are fully adopted, the proposed development should be compliant with the above legislation and planning policy relating to bats.
- 1.1.12** Government policy encourages the incorporation of ecological enhancements into development proposals. Appropriate recommendations for ecological enhancements have also been included in Section 6.

⁴ Mitchell-Jones (2004). *Bat Mitigation Guidelines*. English Nature, Peterborough.

2. Introduction

2.1 Development background

2.1.1 Katie Worrall proposes to convert two barns, known as Barns J and K, in Hixham Hall Farm to holiday lets (use class C1). The proposals include repairs, renovation, and alterations to both barns to make them fit for habitation, including internal alterations and insertion of new windows and roof lights. One of three internal partitions in Barn J is to be removed and a new first floor and staircase is to be constructed in Barn K. All roof tiles will be removed from Barns J and K to allow the roofs to be repaired, and existing tiles will be reused, wherever possible. It is understood that the aim is to retain all existing weatherboarding on the exterior of both barns. The proposals described above are hereafter referred to as ‘the proposed development’.

2.1.2 The proposed development site is located in Hixham Hall Farm off Lower Farm Lane in Furneux Pelham, East Hertfordshire (grid reference TL453268), see Figure 1 in Appendix A.

2.2 Planning and Ecology background

2.2.1 Applications for planning and listed building consent for a previous scheme to convert the barns into residential dwellings were submitted to East Herts District Council (EHDC) in November 2022 (EHDC reference 3/22/2438/FUL and 3/22/2439/LBC). The applications were subsequently refused by East Herts District Council (EHDC) in March 2023.

2.2.2 It is understood that new applications for planning and listed building consent for the proposed development will be submitted to East Herts District Council (EHDC) shortly.

2.2.3 The new application will be informed by a Preliminary Ecological Appraisal (PEA) undertaken by Temple in November 2021⁵ of a wider area of land, incorporating Barns J and K. The PEA identified great crested newts and bats as potential ecological constraints to the development of Barns J and K. The main findings relating to great crested newts were that:

- While no records of great crested newts were identified within the proposed development site during the desk study, several records of great crested newts were identified within 2km of the proposed development site.
- No water bodies were found within the proposed development site; however, two water bodies were identified within 250m of the proposed development site.
- Suitable great crested newt terrestrial habitat was identified within and adjacent to the proposed development site.

2.2.4 The main findings relating to roosting bats were that:

- Ninety records of eight species of bats were identified within 2km of the search area during the desk study, including brown long-eared bat (*Plecotus auritus*), common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), Natterer’s bat (*Myotis nattereri*), serotine (*Eptesicus serotinus*), whiskered bat (*Myotis mystacinus*), barbastelle (*Barbastella barbastellus*) and Leisler’s bat (*Nyctalus leisleri*).
- Bat droppings were recorded scattered on the floor of Barn J, which was assessed as having high potential to support roosting bats.

⁵ Temple (2022). *Preliminary Ecological Appraisal of Hixham Hall Barns, Buntingford, Hertfordshire*. Version 3.0, Issued 23 March 2022.

- A single bat (species not defined) was recorded roosting in a mortice and tenon joint in Barn K, confirming the barn as a bat roost.

2.2.5 As a result of the findings, further surveys were recommended to determine the presence or likely absence of great crested newts from water bodies within 250m of the proposed development site. Three emergence/ return to roost bat surveys were also recommended to characterise the roost recorded in Barn K and determine the presence or likely absence of roosting bats from Barn J.

2.2.6 It should be noted that planning and listed building consent were granted in January 2023 for the conversion of an adjacent barn (known as Barn A) to a four-bedroom residential dwelling (EHDC references 3/22/0663/FUL and 3/22/0665/LBC). The applications were supported by a Preliminary Ecological Appraisal⁶, and great crested newt and bat survey and assessment⁷. The results of the surveys indicate the presence of a Natterer's bat day roost, a common pipistrelle maternity roost, two common pipistrelle day roosts and two brown long-eared day roosts within Barn A.

2.3 The brief and objectives

2.3.1 Babec Ecological Consultants were commissioned on 11 May 2022 to undertake a great crested newt survey of water bodies within 250m of the proposed development site and a suite of further bat surveys of Barns J and K, and to produce a technical report detailing the findings. The objectives were to:

- Determine the presence or likely absence of great crested newts within the proposed development site.
- Characterise the bat roost recorded in Barn K and determine the presence or likely absence of further bat roosts within Barn K.
- Determine the presence or likely absence of bat roosts within Barn J, and if present, characterise any bat roosts recorded.
- Provide appropriate recommendations to enable the proposed development to proceed in accordance with the relevant legislation and policy relating to great crested newts and roosting bats.

⁶ Temple (2022). *Preliminary Ecological Appraisal of Hixham Hall Barns, Buntingford, Hertfordshire*. Version 3.0, Issued 23 March 2022.

⁷ Babec Ltd (2022). *Great Crested Newt and Bat Survey and Assessment | Hixham Hall Barns, Furneux Pelham*. Report reference WRL101/R001V1, issued 8 September 2022.

3. Methods

3.1 Personnel

- 3.1.1** The great crested newt scoping assessment, Habitat Suitability Index Assessment and eDNA survey were undertaken by Jon Bannon BSc MSc MCIEEM with assistance from Agnes Rutter BSc MSc. Jon holds a Natural England class licence for great crested newts (2015-18966-CLS-CLS), is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and has over 12 years' commercial experience in undertaking great crested newt surveys. Agnes is a qualifying member of CIEEM, has one year of experience of undertaking great crested newt surveys and holds a Natural England class licence for great crested newts (2022-10260-CL08-GCN).
- 3.1.2** The roost checks were undertaken by Jon Bannon, who holds a Natural England level 2 class licence for bats (registration number 2015-11543-CLS-CLS) and has over 12 years' commercial experience in conducting building inspections for bats. Jon is also the named ecologist on several Natural England bat mitigation licences.
- 3.1.3** The emergence and return to roost surveys were undertaken by Jon Bannon, Agnes Rutter, Alex Matthams BSc MSc ACIEEM and Alex Burrows BSc MSc. Jon has over 12 years' commercial experience in conducting these types of surveys; Agnes Rutter, Alex Matthams, Alex Burrows have approximately three, five and three years of experience in undertaking these types of survey, respectively. Alex Matthams is also an associate member of CIEEM and Alex Burrows is a qualifying member of CIEEM.

3.2 Great crested newt survey

Survey rationale

- 3.2.1** In the first instance a 250m great crested newt survey area was defined around the proposed development site, in line with Natural England guidelines⁸. Water bodies were identified from within the great crested newt survey area using 1:10,000 Ordnance Survey mapping and aerial imagery. A total of four water bodies (P1, P2, P3 and P4) were identified within the great crested newt survey area, as shown on Figure 2 in Appendix A.

Initial scoping assessment

- 3.2.2** Each water body within the great crested newt survey area (P1, P2, P3 and P4) was visited by a licensed great crested newt worker on 19 May 2022. During this stage, any water bodies meeting the following criteria were scoped out of requiring further survey:
- Water body no longer exists or is dry.
 - Water body is not considered to be accessible to great crested newts (e.g. vertically sided structures).
 - Water body incorporates moderate to fast flowing water only, with no pooled areas of still water.
 - Water bodies that support populations of large fish (e.g. fishing lakes) and have limited refuge areas for great crested newts.

⁸ Natural England (2020). *Great Crested Newt Method Statement for EPS licence application, guidelines on geographical limits of survey*. Form: GCN Method Statement WML-A14-2 (Version April 2020).

Habitat Suitability Index assessment

- 3.2.3** All water bodies within the great crested newt survey area that were not scoped out of requiring further surveys were then assessed for their suitability to support breeding populations of great crested newts using the 'Habitat Suitability Index' (HSI) method, which provides a measure of suitability based upon ten indices. To that end, HSI assessments were undertaken of water bodies P1, P2 and P3 on 19 May 2022, following standard methodology⁹.
- 3.2.4** Indices are attributed a score (expressed as values between 0 and 1) and are used to calculate the HSI of each water body, which is determined as a geometric mean using the following equation: $HSI = (SI1 * SI2 * SI3 * SI4 * SI5 * SI6 * SI7 * SI8 * SI9 * SI10)^{1/10}$. The result of this calculation is a single number between 0 and 1, with the number 1 representing the most suitable water body habitat.
- 3.2.5** The HSI scores are then used to classify water bodies in terms of their suitability to support breeding populations of great crested newt, as shown in Table 1.

Table 1. Categorisation of HSI values.

HSI score	Suitability of water body to support breeding populations of great crested newt
<0.5	Poor
0.5-0.59	Below average
0.6-0.69	Average
0.7-0.79	Good
>0.8	Excellent

Environmental DNA (eDNA) sampling

- 3.2.6** Further survey was then undertaken to determine presence or likely absence of great crested newts from all water bodies within the great crested newt survey area that were not scoped out of requiring further surveys. To that end water samples were collected from water bodies P1, P2 and P3 on 19 May 2022 in accordance with techniques approved by Natural England¹⁰. The collected water samples were then submitted for eDNA laboratory analysis, following the DEFRA WC1067 protocol.

3.3 Bat surveys

Roost checks

- 3.3.1** The interior of Barns J and K was searched for roosting bats or secondary evidence of bats on 14 June 2022. Samples of droppings were subsequently submitted for DNA analysis to determine the species(s) of bat present. Two tell tales (approximately 2m x 2m sheets of plastic) were also deployed in Barn K, to assist in detecting fresh evidence of bats. A further roost check of Barn K was undertaken on 7 July 2022 and the tell tales were checked for fresh evidence of bats.

Emergence and return to roost surveys

- 3.3.2** The barns were each subject to two emergence surveys and one return to roost survey, following the methods set out in the Bat Conservation Trust's good practice guidelines¹¹ and interim guidance

9 Oldham, R. S., Keeble, J., Swan, M. J. S. and Jeffcote, M. (2000). *Evaluating the suitability of habitat for the great crested newt (Triturus cristatus)*. Herpetological Journal, 10, 143-155.

10 Biggs J, Ewald N, Valentini A, Gaboriaud C, Griffiths RA, Foster J, Wilkinson J, Arnett A, Williams P and Dunn F 2014. *Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (Triturus cristatus) environmental DNA*. Freshwater Habitats Trust, Oxford.

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

note¹². In the first instance, three surveyor locations were selected around each of the barns to allow a good view of all potential access points for bats. During emergence surveys, surveyors watched potential access points constantly, while during return to roost surveys bats were tracked back to any access points within the view of the surveyors. Surveyor locations are illustrated in Figures 4, 5, 6, 7, 8, and 9 in Appendix A.

3.3.3 Surveyors were equipped with full-spectrum Elekon Batlogger M bat detectors to detect and record bat echolocation calls, as well as night vision aids (NVAs) to aid in the detection of roosts. NVAs comprised Canon XA series video cameras equipped with infrared lamps, as detailed in Appendix B. Where a bat roost was recorded, bat calls were analysed using Elekon BatExplorer software to identify bat species, and video footage was analysed to confirm the location of the roost.

3.3.4 Each emergence survey commenced 15 minutes before sunset and ended 90 minutes after sunset. Return to roost surveys started 90 minutes before sunrise and ended 15 minutes after sunrise. Weather conditions during each survey were recorded, including rain, wind strength, cloud cover and maximum and minimum temperatures. The dates of the emergence and return to roost surveys and weather conditions recorded during the surveys are provided in Table 2.

Table 2. Dates of emergence and return to roost surveys and weather conditions.

Visit No.	Survey type	Surveyor locations	Date	Temp (°C)		Cloud cover (oktas)	Rain	Wind *	Overall suitability for survey
				Min	Max				
Barn J									
1	Emergence	1, 2, 3	14/06/22	11.4	14.4	3	None	1-1	Optimal
2	Emergence	1, 2, 3	07/07/22	13.8	17.9	0	None	0-0	Optimal
3	Return	1, 2, 3	28/07/22	12.7	13.8	4	None	0-1	Optimal
Barn K									
1	Return	1, 2, 3	15/06/22	8.4	8.9	0	None	0-0	Suitable
2	Emergence	1, 2, 3	05/07/22	11.4	16.6	1	None	0-0	Optimal
3	Emergence	1, 2, 3	28/07/22	12.4	16.8	3	None	1-1	Optimal

*Measured on the Beaufort scale

3.4 Limitations of survey methods

3.4.1 The great crested newt scoping assessment, Habitat Suitability Index assessment and environmental DNA sampling was undertaken in mid-May, which is within the Natural England water sample collection period and is an optimal time of year for undertaking these types of assessment. No access or survey limitations were noted.

3.4.2 All emergence and return to roost surveys were undertaken in suitable or optimal weather conditions during June and July, which are optimal months for undertaking this type of survey and incorporate the bat maternity period. The level of further survey undertaken is in accordance with the minimum survey levels for confirmed roosts as set out in the Bat Conservation Trust's good practice guidelines¹³. No further limitations were noted during any of the surveys.

12 Bat Conservation Trust (2022). *Interim Guidance Note: Use of night vision aids for bat emergence surveys and further comment on dawn surveys*. Available at www.bats.org.uk.

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

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- 3.4.3** The barns were subject to a roost check in June and Barn K was subject to an additional roost check in July. Both checks were undertaken during the active period for bats and the bat maternity period. Limitations noted during the roost check included limited access to parts of Barn J and difficulty searching for droppings on the concrete floor of Barn K. However, tell tales were deployed in Barn K to enable fresh droppings to be recorded and given that a full suite of surveys has been undertaken of each barn, these limitations are not considered to be significant.
- 3.4.4** It should be noted that whilst every effort has been made to provide a comprehensive assessment of the proposed development site for great crested newts and roosting bats, no investigation can ensure the complete characterisation and prediction of the natural environment.
- 3.4.5** Habitats and their potential to support protected species change over time and therefore the results of the surveys will become less reliable as time progresses. In this instance, the results of the great crested newt surveys should not be relied upon after two years from the date of the surveys and the results of the bat surveys should not be relied upon after 18 months from the date of the last survey visit.

4. Results and interpretation

4.1 Great crested newt surveys

Initial scoping assessment

- 4.1.1** Water body P4 (as shown in Figure 2 in Appendix A) was scoped out of requiring further assessment for great crested newts due to being dry at the time of survey (despite heavy rainfall the previous evening). The remaining water bodies (P1, P2 and P3) were not scoped out of requiring further assessment and were therefore subject to further surveys for great crested newts.

Habitat Suitability Index assessment

- 4.1.2** Of water bodies P1, P2 and P3 which were not scoped out of requiring further assessment, one was assessed as having an HSI score of average (P3) and two were assessed as having HSI scores of 'poor' (P1 and P2). The results of the HSI assessment are provided in full in Appendix C.

Environmental DNA (eDNA) sampling

- 4.1.3** Water samples from water bodies P1, P2 and P3 tested negative for great crested newt DNA¹⁴ indicating the likely absence of great crested newts from these water bodies and the proposed development site. The results of the great crested newt eDNA analysis are provided in Appendix D.

4.2 Bat surveys

Roost check

Barn J

- 4.2.1** No bats were recorded during the roost check. However, approximately 15 mixed-age droppings were identified directly below an area of loose roofing felt. A sample of these droppings (sample 1) was subject to multi-species DNA analysis which confirmed the droppings belong to barbastelle bat¹⁵. The number and location of droppings indicates the presence of a barbastelle day roost (Roost A).

Barn K

- 4.2.2** No bats were recorded during the roost checks. However, a concentration of approximately 20 mixed-age droppings were identified in a corner of the barn, in close proximity to several gaps in mortice and tenon joints (i.e. where a confirmed roost was previously recorded within the barn¹⁶). A sample of these droppings (sample 1) was subject to multi-species DNA analysis which confirmed the droppings belong to common pipistrelle, brown long-eared and barbastelle bats¹⁷.
- 4.2.3** Approximately 200 further mixed-age droppings were recorded scattered throughout the interior of the barn, a sample of which was also analysed (sample 2) and confirmed to belong to common pipistrelle, brown long-eared bat, barbastelle and Natterer's bat¹⁸.
- 4.2.4** In addition to the droppings, the feeding remains of large yellow underwing moth (*Noctua pronuba*) and peacock butterfly (*Aglais io*) were scattered throughout the interior of the barn, especially below the ridge beam.

¹⁴ SureScreen Scientifics (2022). *Analysis of environmental DNA in pond water for the detection of great crested newts (Triturus cristatus)*. Report dated 01 June 2022.

¹⁵ Swift Ecology (2022). *DNA analysis results for Hixham Hall Barns, Furneux Pelham*. Order no. 1307

¹⁶ Temple (2022). *Preliminary Ecological Appraisal of Hixham Hall Barns, Buntingford, Hertfordshire*. Version 3.0, Issued 23 March 2022.

¹⁷ Swift Ecology (2022). *DNA analysis results for Hixham Hall Barns, Furneux Pelham*. Order no. 1307

¹⁸ Swift Ecology (2022). *DNA analysis results for Hixham Hall Barns, Furneux Pelham*. Order no. 1307

- 4.2.5** The number and location of droppings indicates the presence of common pipistrelle, barbastelle and Natterer's bat day roosts (Roosts A, C and D, respectively) and the droppings and feeding remains below the ridge beam indicate the use of the barn as a brown long-eared night roost/feeding perch (Roost B).
- 4.2.6** The tell tales were checked for fresh evidence of bats on 7 July 2022; approximately 10 wings and 15 droppings were recorded at tell tale 1, approximately 7 wings and 30 droppings were recorded at tell tale 2. The droppings were not analysed but, together with the feeding remains, provide further evidence of brown long-eared bats using Roost B as a night roost/feeding perch.
- 4.2.7** The results of the roost check and the locations of the tell tales are illustrated in Figure 3 in Appendix A, and photographs taken during the roost check are presented in Figure 14 in Appendix A.

Emergence and return to roost surveys

- 4.2.8** Bats were recorded emerging and returning to roost to several features on both barns J and K during all survey visits, as detailed in Table 3 and illustrated in Figures 4, 5, 6, 7, 8 and 9 in Appendix A, respectively.

Interpretation of the results of the bat surveys

Barn J

- 4.2.9** The results of the surveys indicate the presence of a barbastelle day roost (Roost A), two common pipistrelle day roosts (Roosts B and C) and a common pipistrelle night roost (Roost D). The barbastelle day roost (Roost A) is of moderate conservation value¹⁹, while all other roosts are assessed as being of low conservation value.
- 4.2.10** Given that common pipistrelle and barbastelle are also known to roost within buildings over winter, the presence of hibernation roosts of these species cannot be ruled out.
- 4.2.11** Our full interpretation of the results of the emergence and return to roost surveys is provided in Table 4 and a summary of roost locations is set out in Figure 10 in Appendix A.

Barn K

- 4.2.12** The results of the surveys indicate the presence of six common pipistrelle day roosts (Roosts A, F, G, H, I and J), one common pipistrelle night roost (Roost E), one brown long-eared night roost/ feeding perch (Roost B), a barbastelle day roost (Roost C) and a Natterer's day roost (Roost D). The barbastelle day roost (Roost C) and the Natterer's bat day roost (Roost D) are of moderate conservation value²⁰, while all other roosts are assessed as being of low conservation value.
- 4.2.13** Given that common pipistrelle, brown long-eared bats and barbastelle are known to roost within buildings over winter, the presence of hibernation roost(s) of these species cannot be ruled out.
- 4.2.14** Our full interpretation of the results of the emergence and return to roost surveys is provided in Table 4 and a summary of roost locations is set out in Figure 11 in Appendix A.

19 Mitchell -Jones (2004). *Bat Mitigation Guidelines*. English Nature, Peterborough.

20 Mitchell -Jones (2004). *Bat Mitigation Guidelines*. English Nature, Peterborough.

Table 3. Results of the emergence and return to roost surveys.

Visit no	Figure	Date	Survey type (survey locations)	Results of the survey	Incidental records of bat activity
Barn J					
1	4	14/06/22	Emergence (1, 2, 3)	Roost B Two common pipistrelle bats emerged via a gap under the fascia on the western gable end at 14 minutes and 22 minutes after sunset.	High levels of activity from commuting and foraging common pipistrelle. Passes from commuting and foraging soprano pipistrelle were also noted. Other species recorded include long-eared bats, myotis and a noctule, Leisler's or serotine bat. The first bat recorded was a common pipistrelle at 14 minutes after sunset, which emerged from Roost B.
				Roost C Three common pipistrelle bats emerged via gaps under roof tiles on the western gable end (on the southern elevation of the pitched roof) at 16, 22 and 27 minutes after sunset.	
				Roost D One common pipistrelle returned to roost to a gap under the fascia on the western gable end at 65 minutes after sunset.	
2	5	07/07/22	Emergence (1, 2, 3)	Roost B Two common pipistrelle bats emerged from beneath the weatherboarding on the western gable end at 15 minutes and 22 minutes after sunset. One common pipistrelle emerged from under the weatherboarding on the southern elevation of the barn at 18 minutes after sunset.	High levels of activity from commuting and foraging common pipistrelle and moderate levels of activity from commuting and foraging soprano pipistrelle. Other species recorded include long-eared bats and barbastelle. The first bat recorded was a common pipistrelle at 15 minutes after sunset which emerged from Roost B.
				Roost C Two common pipistrelles emerged via gaps under roof tiles on the southern elevation of the pitched roof at 16 and 18 minutes after sunset.	
				Roost D One common pipistrelle returned to roost at the weatherboarding on the western gable end at 55 minutes after sunset.	
3	6	28/07/22	Return to roost (1, 2, 3)	Roost C One bat echolocating at around 50 kHz, considered most likely to be a common pipistrelle, returned to roost under a roof tile on the southern elevation of Barn J at 17 minutes before sunrise. One common pipistrelle returned to roost under roof tiles at the western gable end at 18 minutes before sunrise.	High levels of activity from commuting and foraging common pipistrelle with social calls also noted. Moderate commuting and foraging activity from soprano pipistrelle. Other bat species recorded included long-eared bats and myotis. The last bat recorded was a common pipistrelle at 12 minutes before sunrise.

Visit no	Figure	Date	Survey type (survey locations)	Results of the survey	Incidental records of bat activity
				Roost B One common pipistrelle returned to roost to a gap under the fascia on the eastern gable end at 15 minutes before sunrise.	Two common pipistrelle bats were noted exhibiting roosting behaviour at the gap between the fascia and the weatherboarding on the western gable end (Roost B) around one hour before sunrise, however, no bats were recorded returning to roost at this location during this survey.
Barn K					
1	7	15/06/22	Return to roost (1, 2, 3)	Roost A One common pipistrelle returned to roost via a gap under the fascia on the side of the western gable end at 48 minutes before sunrise.	High levels of activity from commuting and foraging common pipistrelle with social calls also noted. Other species recorded include soprano pipistrelle, long-eared bats, myotis and barbastelle. The last bat recorded was a common pipistrelle at 29 minutes before sunrise.
				Roost F One common pipistrelle returned to roost to the half hip apex at the northern gable end at 51 minutes before sunrise.	
2	8	05/07/22	Emergence (1, 2, 3)	Roost G One common pipistrelle emerged from the half hip apex at the southern gable end at 10 minutes after sunset.	High levels of activity from commuting and foraging common pipistrelle with social calls also noted. Other species recorded include soprano pipistrelle, long-eared bats and myotis. The first bat recorded was a common pipistrelle at six minutes after sunset.
				Roost H One common pipistrelle emerged from the half hip apex at the western gable end at 15 minutes after sunset.	
				Roost I One common pipistrelle emerged from a roof tile on the western elevation at 23 minutes after sunset.	
				Roost A One common pipistrelle emerged from the weatherboarding on the northern gable end at 36 minutes after sunset.	
				Roost E One common pipistrelle returned to roost to the weatherboarding on the northern gable end at 49 minutes after sunset.	
				Roost B One brown-long eared bat returned to roost via a gap under the fascia on the southern gable end at 52 minutes after sunset. One brown-long eared bat returned to roost via a gap under the fascia on the northern gable end at 57 minutes after sunset. Three brown long-eared bats returned to roost via a gap under the fascia on the western gable end between 62 and 75 minutes after sunset.	

Visit no	Figure	Date	Survey type (survey locations)	Results of the survey	Incidental records of bat activity
3	9	28/07/22	Emergence (1, 2, 3)	Roost A One common pipistrelle emerged from the weatherboarding on the southern gable end at six minutes after sunset. One common pipistrelle emerged from under the fascia on the southern gable end at eight minutes after sunset.	High levels of activity from commuting and foraging common pipistrelle with social calls also noted. Other species recorded include soprano pipistrelle, long-eared bats and barbastelle. The first bat recorded was a common or soprano pipistrelle at five minutes after sunset.
				Roost G One common pipistrelle emerged from the half hip apex at the southern gable end at 10 minutes after sunset.	
				Roost J Three common pipistrelle emerged from underneath roof tiles on a south facing roof pitch between 10 and 14 minutes after sunset.	
				Roost B Two brown-long eared bats returned to roost via a gap under the fascia on the northern gable end at 61 and 78 minutes after sunset.	

Table 4. Interpretation of the results of the surveys (to be read in conjunction with Figures 10 and 11 in Appendix A).

Bat species	Roost number and description	Roosting location(s)	Access point(s)	Cons. status ²¹	Interpretation of roost type and numbers of bats
Barn J					
Barbastelle	Roost A A concentration of approximately 15 mixed-age droppings were identified directly below an area of loose roofing felt during the roost check on 14 June 2022; DNA analysis confirmed the species as barbastelle bat. No barbastelles were recorded to emerge from or return to roost to Barn J during any of the survey visits.	Area of loose roofing felt in the western end of the barn.	Unknown, but most likely access points are gaps under the fascia on the western and eastern gable ends; gaps in the weatherboarding on the southern and western elevations.	Mod	The results of the surveys indicate the presence of a barbastelle day roost which is used infrequently by an individual, or low numbers of bats. Barbastelle are considered to be rare in the UK and Hertfordshire ²² . Given that surveys were undertaken during the bat maternity season, it is considered unlikely that the barn supports a maternity roost of barbastelle. Whilst it is unusual for

²¹ Mitchell -Jones (2004). *Bat Mitigation Guidelines*. English Nature, Peterborough.

²² Herts & Middlesex Bat Group (2022). *Bats in Hertfordshire & Middlesex*. <https://hmbg.org.uk/bats-in-hertfordshire-middlesex>, accessed 25 August 2022.

Bat species	Roost number and description	Roosting location(s)	Access point(s)	Cons. status ²¹	Interpretation of roost type and numbers of bats
					barbastelle to hibernate in buildings over winter ²³ , barbastelle have been known to hibernate in barns ²⁴ , so the presence of a hibernation roost of this species cannot be ruled out.
Common pipistrelle	<p>Roost B Two common pipistrelle bats emerged from a gap under the fascia on the western gable end on 14 June 2022 (survey visit 1).</p> <p>Two common pipistrelle bats emerged from gaps in the weatherboarding on the western gable end on 7 July 2022 (survey visit 2). One common pipistrelle emerged from under the weatherboarding on the southern elevation of the barn on 7 July 2022 (survey visit 2).</p> <p>One common pipistrelle returned to roost to a gap under the fascia on the eastern gable end on 28 July 2022 (survey visit 3). Two common pipistrelle bats were also noted exhibiting roosting behaviour at the gap between the fascia and the weatherboarding on the western gable end; however, no bats were recorded returning to roost at this location.</p>	Within the interior of the barn, but exact roosting locations are unknown. The most likely roosting locations are within mortice and tenon joints or between internal panelling and weatherboarding.	Gaps under the fascia on the western and eastern gable ends; gaps in the weatherboarding on the southern and western elevations.	Low	<p>The results of the surveys indicate the presence of two common pipistrelle day roosts (Roosts B and C) and a common pipistrelle night roost (Roost D) which are used regularly by low numbers of bats.</p> <p>Common pipistrelle bats are considered to be occasionally common and widespread in the UK and Hertfordshire²⁵.</p> <p>Given that surveys were undertaken during the bat maternity season, it is considered unlikely that the building supports a maternity roost of common pipistrelle. However, common pipistrelle are known to hibernate in buildings over winter, so the presence of a hibernation roost of this species cannot be ruled out.</p>
	<p>Roost C Two common pipistrelle bats emerged from a gap between the fascia and a roof tile on the western gable end (on the southern elevation of the pitched roof) on 14 June 2022 (survey visit 1). One common pipistrelle emerged from missing mortar between roof tiles on the southern elevation of the pitched roof on 14 June 2022 (survey visit 1).</p> <p>One common pipistrelle emerged from a gap under a roof tile on the southern elevation of the pitched roof on 7 July 2022 (survey visit 2). One common pipistrelle emerged from a gap between the fascia and a roof tile on the</p>	Gap between the roof tiles and the lining of the roof on the southern elevation of the barn.	Gaps under roof tiles	Low	

23 Mitchell -Jones (2004). *Bat Mitigation Guidelines*. English Nature, Peterborough.

24 Cornwall Mammal Group (2022). *Barbastelle*. <https://www.cornwallmammalgroup.org/barbastelle>, accessed 7 October 2022.

25 Herts & Middlesex Bat Group (2022). *Bats in Hertfordshire & Middlesex*. <https://hmbg.org.uk/bats-in-hertfordshire-middlesex>, accessed 25 August 2022.

Bat species	Roost number and description	Roosting location(s)	Access point(s)	Cons. status ²¹	Interpretation of roost type and numbers of bats
	southern elevation of the pitched roof on 7 July 2022 (survey visit 2). One bat echolocating at around 50 kHz, considered most likely to be a common pipistrelle, returned to roost to a gap under the fascia on the eastern gable end on 28 July 2022 (survey visit 3). One common pipistrelle returned to roost to missing mortar between roof tiles on the southern elevation of the pitched roof on 28 July 2022 (survey visit 3).				
	Roost D One common pipistrelle returned to roost to a gap under the fascia on the western gable end at 65 minutes after sunset during the emergence survey on 14 June 2022 (survey visit 1). One common pipistrelle returned to roost to a gap in the weatherboarding on the western gable end at 55 minutes after sunset during the emergence survey on 7 July 2022 (survey visit 2).	Unknown, but likely on beams within the interior of the barn.	Gaps under the fascia on the western gable end; gaps in the weatherboarding on the western elevation.	Low	
Barn K					
Common pipistrelle	Roost A A concentration of approximately 20 mixed-age droppings were identified below several potential roosting features, including mortice and tenon joints, during the roost check on 14 June 2022; a further 200 mixed-age droppings were scattered throughout the interior of the barn. DNA analysis confirmed the presence of common pipistrelle droppings in both samples. One common pipistrelle returned to roost to a gap under the fascia on the side of the western gable end on 15 June 2022 (survey visit 1). One common pipistrelle emerged from the weatherboarding on the northern gable end on 5 July 2022 (survey visit 2). One common pipistrelle emerged from the weatherboarding on the southern gable end on 28 of July	Within the interior of the barn, most likely within mortice and tenon joints.	Gaps in the weatherboarding on the northern and southern gable ends, and gaps under the fascia on the side of the western gable end.	Low	The results of the surveys indicate the presence of six common pipistrelle day roosts (Roosts A, F, G, H, I and J) and one night roost (Roost E) which are used regularly by low numbers of bats. Common pipistrelle bats are considered to be occasionally common and widespread in the UK and Hertfordshire ²⁶ . Given that surveys were undertaken during the bat maternity season, it is considered unlikely that the building supports a maternity roost of common pipistrelle. However, common pipistrelle are known to hibernate in buildings over winter, so the

²⁶ Herts & Middlesex Bat Group (2022). *Bats in Hertfordshire & Middlesex*. <https://hmbg.org.uk/bats-in-hertfordshire-middlesex>, accessed 25 August 2022.

Bat species	Roost number and description	Roosting location(s)	Access point(s)	Cons. status ²¹	Interpretation of roost type and numbers of bats
	2022 (survey visit 3). One common pipistrelle emerged from a gap under the fascia on the southern gable end on 28 July 2022 (survey visit 3).				presence of a hibernation roost of this species cannot be ruled out.
	Roost E One common pipistrelle returned to roost at the weatherboarding on the northern gable end at 49 minutes after sunset during the emergence survey on 5 July 2022 (survey visit 2).	Unknown, but likely on beams within the interior of the barn.	Gaps in the weatherboarding on the northern gable end.	Low	
	Roost F One common pipistrelle returned to roost to the half hip apex of the northern gable end on 15 June 2022 (survey visit 1).	Gap under a hip tile at the half hip apex of the northern gable end.	Gap under a hip tile.	Low	
	Roost G One common pipistrelle emerged from the half hip apex of the southern gable end on 5 July 2022 (survey visit 2). One common pipistrelle emerged from the half hip apex of the southern gable end on 28 July 2022 (survey visit 3).	Gap under a hip tile at the half hip apex of the southern gable end.	Gap under a hip tile.	Low	
	Roost H One common pipistrelle emerged from the half hip apex of the western gable end on 5 July 2022 (survey visit 2).	Gap under a hip tile at the half hip apex of the western gable end.	Gap under a hip tile.	Low	
	Roost I One common pipistrelle emerged from a roof tile on a west facing roof pitch of the barn on 5 July 2022 (survey visit 2).	The crevice between the roof tiles and the lining on a west facing roof pitch.	Gaps under roof tiles.	Low	
	Roost J Three common pipistrelle bats emerged from underneath roof tiles on a south facing roof pitch on 28 July 2022 (survey visit 3).	The crevice between the roof tiles and the lining on a south facing roof pitch.	Gaps under roof tiles.	Low	
Brown long-eared bat	Roost B A concentration of approximately 20 mixed-age droppings were identified in a corner of the barn during the roost check on 14 June 2022; a further 200 mixed-age droppings were scattered throughout the interior of the barn. DNA analysis confirmed the presence of brown long-eared bat droppings in both samples.	Along the ridge beams.	Gaps under the fascia on the northern, western and southern gable ends.	Low	The results of the surveys indicate the presence of a brown long-eared night roost/feeding perch which is used regularly by low numbers of bats.

Bat species	Roost number and description	Roosting location(s)	Access point(s)	Cons. status ²¹	Interpretation of roost type and numbers of bats
	<p>The feeding remains of large yellow underwing moth and peacock butterfly were also recorded scattered throughout the interior of the barn, especially below the ridge beam.</p> <p>Tell tales placed below the ridge beam were checked for fresh evidence of bats on 7 July 2022; approximately 10 wings and 15 droppings were recorded at tell tale 1, approximately 7 wings and 30 droppings were recorded at tell tale 2.</p> <p>During the emergence survey on 5 July 2022 (survey visit 2), one brown-long eared bat returned to roost to a gap under the fascia on the southern gable end at 52 minutes after sunset and another returned to roost to a gap under the fascia on the northern gable end at 57 minutes after sunset. Three brown long-eared bats then returned to roost to a gap under the fascia on the western gable end between 62 and 75 minutes after sunset.</p>				<p>Brown long-eared bats are considered to be widespread and relatively frequent in the UK and Hertfordshire²⁷.</p> <p>Given that surveys were undertaken during the bat maternity season, it is considered unlikely that the building supports a maternity roost of brown long-eared bats. However, brown long-eared bats are known to hibernate in buildings over winter, so the presence of a hibernation roost of this species cannot be ruled out.</p>
Barbastelle	<p>Roost C A concentration of approximately 20 mixed-age droppings were identified below several potential roosting features, including mortice and tenon joints, during the roost check on 14 June 2022; a further 200 mixed-age droppings were scattered throughout the interior of the barn. DNA analysis confirmed the presence of barbastelle droppings in both samples.</p> <p>No barbastelles were recorded to emerge from or return to roost to Barn K during any of the survey visits.</p>	Unknown, but most likely location is within mortice and tenon joints within the interior of the barn.	Unknown, but most likely via gaps in the weatherboarding.	Mod	<p>The results of the surveys indicate the presence of a barbastelle day roost which is used infrequently by an individual, or possibly low numbers of bats.</p> <p>Barbastelle are considered to be rare in the UK and Hertfordshire²⁸.</p> <p>Given that surveys were undertaken during the bat maternity season, it is considered unlikely that the barn supports a maternity roost of barbastelle. Whilst it is unusual for barbastelle to hibernate in buildings over winter²⁹, barbastelle have been known to hibernate in barns³⁰, so the presence of a hibernation roost of this species cannot be ruled out.</p>

27 Herts & Middlesex Bat Group (2022). *Bats in Hertfordshire & Middlesex*. <https://hmbg.org.uk/bats-in-hertfordshire-middlesex>, accessed 25 August 2022.

28 Herts & Middlesex Bat Group (2022). *Bats in Hertfordshire & Middlesex*. <https://hmbg.org.uk/bats-in-hertfordshire-middlesex>, accessed 25 August 2022.

29 Mitchell -Jones (2004). *Bat Mitigation Guidelines*. English Nature, Peterborough.

30 Cornwall Mammal Group (2022). *Barbastelle*. <https://www.cornwallmammalgroup.org/barbastelle>, accessed 7 October 2022.

Bat species	Roost number and description	Roosting location(s)	Access point(s)	Cons. status ²¹	Interpretation of roost type and numbers of bats
Natterer's bat	<p>Roost D Approximately 200 mixed-age droppings were recorded scattered throughout the barn during the roost check on 14 June 2022. DNA analysis confirmed the presence of Natterer's bat droppings within the sample.</p> <p>No Natterer's bats were recorded to emerge from or return to roost to Barn K during any of the survey visits.</p>	Unknown, but most likely location is within mortice and tenon joints within the interior of the barn.	Unknown, but most likely via gaps in the weatherboarding.	Mod	<p>The results of the surveys indicate the presence of a Natterer's bat day roost which is used infrequently by a single, or possibly low numbers of bats.</p> <p>Natterer's are considered to be widespread but relatively scarce in the UK and Hertfordshire³¹.</p> <p>Given that surveys were undertaken during the bat maternity season, it is considered unlikely that the barn supports a maternity roost of Natterer's bat. It is also unusual for Natterer's bat to hibernate in buildings over winter¹⁵ and, as such, the presence of a Natterer's hibernation roost is considered to be unlikely.</p>

³¹ Herts & Middlesex Bat Group (2022). *Bats in Hertfordshire & Middlesex*. <https://hmbg.org.uk/bats-in-hertfordshire-middlesex>, accessed 25 August 2022.

5. Assessment

5.1 Great crested newts

5.1.1 Great crested newts and their habitat are strictly protected by the Conservation of Habitats and Species Regulations 2017 (as amended) and the Wildlife and Countryside Act 1981 (as amended). Development affecting great crested newts is subject to a licensing procedure administered by Natural England.

5.1.2 As the results of the surveys indicate the likely absence of great crested newts from the proposed development site, there are no known issues with regards the proposed development and great crested newts. The proposed development should therefore be compliant with the relevant legislation and planning policy with respect to this species.

5.2 Roosting bats

5.2.1 All species of bat and their roosts are strictly protected by the Conservation of Habitats and Species Regulations 2017 (as amended) and the Wildlife and Countryside Act 1981 (as amended). Taken together, these make it an offence to:

- Deliberately capture, injure, kill or disturb a bat.
- Deliberately disturb a bat in such a way as to be likely to:
 - Impair its ability to survive, to breed or reproduce, or to rear or nurture its young.
 - Impair its ability to hibernate or migrate.
 - Affect significantly the local distribution or abundance of the spaces to which they belong.
- Damage or destroy a breeding site or resting place of a bat.
- Disturb a roosting bat or obstruct access to a roost or place of shelter.

5.2.2 Development affecting bats and their roosts is also subject to a licensing procedure administered by Natural England.

5.2.3 In addition to the above legislation, the government circular on biodiversity³² states that “*the presence of a protected species is a material consideration when a planning authority is considering a development proposal that, if carried out, would be likely to result in harm to the species or its habitat*”. Barbastelle and brown long-eared bats are also Species’ of Principal Importance under the NERC Act (2006) which places a duty on East Hertfordshire District Council to have regard for these species’ when determining the planning application.

5.2.4 Without mitigation and licensing the proposed development would contravene the legislation and policy set out above. This is because the conversion of the Barn J would damage or destroy a barbastelle day roost (Roost A), two common pipistrelle day roosts (Roosts B and C) and a common pipistrelle night roost (Roost D). Furthermore, the conversion of Barn K would also damage or destroy six common pipistrelle day roosts (Roosts A, F, G, H, I and J), one common pipistrelle night roost (Roost E), one brown long-eared night roost/ feeding perch (Roost B), a barbastelle day roost (Roost C) and a Natterer’s bat day roost (Roost D). Without mitigation the proposed development would also likely result in harm and/or significant disturbance to individual bats.

³² Office of the Duty Prime Minister (2005). *Government circular: Biodiversity and geological conservation – statutory obligations and their impact upon the planning system.*

5.2.5 However, by using established mitigation techniques³³ it should be possible to avoid harm to individual bats and maintain the populations of barbastelle, Natterer's, common pipistrelle and brown long-eared bats at a favourable conservation status. An appropriate mitigation and licensing strategy is provided in Section 6 of this report. Providing these measures are fully adopted, the proposed development should be compliant with the above legislation and policy relating to roosting bats.

5.3 Ecological Enhancements

5.3.1 Central government policy also encourages the incorporation of ecological enhancements into development proposals. For example, Paragraph 180d of the National Planning Policy Framework (2021) states that '*... opportunities to improve biodiversity in and around developments should be integrated as part of their design...*'.

5.3.2 While a suite of ecological enhancements have already been recommended within the Preliminary Ecological Appraisal³⁴, a series of further measures to enhance the proposed development for bats in accordance with this policy, has been provided in Section 6 of this report.

³³ Mitchell-Jones (2004). *Bat Mitigation Guidelines*. English Nature, Peterborough.

³⁴ Temple (2022). *Preliminary Ecological Appraisal of Hixham Hall Barns, Buntingford, Hertfordshire*. Version 3.0, Issued 23 March 2022.

6. Recommendations

6.1 Licensing

6.1.1 Once planning and listed building consent for the proposed development has been granted and any conditions relating to bats have been discharged, it will be necessary to obtain a protected species licence from Natural England to allow the proposed works to Barns J and K to lawfully proceed. Licence applications for development affecting bats are subject to very close scrutiny and must satisfy regulations set out in the Conservation of Habitats and Species Regulations 2017 (as amended) that:

- The actions are essential for '*imperative reasons of overriding public interest*' or public health and safety.
- '*There is no satisfactory alternative*', and
- '*The action authorised will not be detrimental to the maintenance of the population of the species conserved at a favourable conservation status in their natural range*'.

6.1.2 The protected species licence application must demonstrate compliance with these regulations and be accompanied by a method statement that incorporates a mitigation strategy to ensure that the proposed development will not be detrimental to the favourable conservation status of bats.

6.1.3 Licensable works to Barns J and K may only commence upon receipt of a protected species licence from Natural England and must only be undertaken in strict accordance with the licence documents.

6.2 Bat mitigation strategy

6.2.1 To avoid harm to individual bats and maintain the population of bats at a favourable conservation status, Katie Worrall has agreed to adopt the mitigation measures detailed below. These measures³⁵ will be incorporated into the protected species licence application to Natural England:

Removal of roosting features

6.2.2 The following mitigation measures will be adopted during the removal of roosting features from Barns J and K:

- Alternative roosting opportunities will be provided for bats prior to any works to Barns J or K commencing. This will be achieved by installing three improved crevice bat boxes or bat boxes of similar specifications, on nearby trees. Bat boxes will be installed at least 3m from ground level with their entrances free from obstruction and not be lit by external lighting.
- All contractors are to be given a toolbox talk by the named ecologist or an accredited agent on the bat mitigation licence prior to any works to the barns commencing. The toolbox talk will include a discussion of the presence of bat roosts, the location of roosts, the protection afforded to bats, what to do if a bat is found and a suitable working approach.
- Roosting features will be only removed from Barns J and K outside of the hibernation period when bats are most vulnerable to harm and disturbance. Therefore, roosting features will only be removed from Barns J and K between 15 March and 31 October (inclusive). Roosting features will only be removed in suitable weather conditions (no heavy rain or high winds) and once overnight temperatures have been above 8°C for at least five consecutive nights.

³⁵ These measures may be slightly amended, if required by Natural England in order for them to grant a bat mitigation licence.

- The first step in removing roosting features will comprise installing exclusion devices on all accessible mortice and tenon joints within the interior of Barns J and K. The exclusion devices will allow any bats present within the roosting features to leave, but not return to roost. The exclusion devices will be fitted by the named ecologist or an accredited agent on the bat mitigation licence.
- Once the exclusion devices have been in place for at least five evenings with suitable weather conditions (no heavy rain or high winds and overnight temperatures of at least 8°C) the named ecologist or an accredited agent will supervise the careful removal by hand of suitable roosting features from Barns J and K. Roosting features that will be removed will include (but not be limited to) internal wall panelling, ridge tiles, hip tiles and roof tiles. If possible, any bats encountered during this 'soft-strip' will be captured and placed into one of the newly installed tree mounted bat boxes.
- The internal wall panelling lining the walls of the barn should be removed during the soft strip, however, it is understood that the current intention is to retain existing weatherboarding in place. The risk of bats continuing to roost between the limited crevices between the weatherboards is considered to be low once the roof has been removed and the interior of the barns has become open to the elements and exposed. However, if a bat is encountered when the named ecologist or an accredited agent on the bat mitigation licence is not present on site then all works will cease until they have been contacted and provided appropriate advice.
- Once the above roosting features have been removed, the proposed development can proceed without timing constraint.

Provision of replacement roosting opportunities Barn J

6.2.3 As shown on Figure 12 in Appendix A, a total of nine permanent replacement roosting opportunities capable of supporting the types of roost currently present within barn J will be incorporated into the fabric of the newly converted barn. These will comprise:

- One gap (approximately 25mm) will be created under the weatherboarding to replace the barbastelle day roost A. The gap will allow barbastelle bats to access a crevice between the weatherboarding and bitumen felt lining.
- Four gaps (approximately 25mm) will be created under the weatherboarding to replace the common pipistrelle day roost B. The gaps will be located at the same locations that common pipistrelles currently use to access the barn and will allow common pipistrelle bats to access crevices between the weatherboarding and bitumen felt lining.
- Four gaps (approximately 60-80mm x 15-25mm) will be created under roof tiles to replace common pipistrelle day roost C. The gaps will be located at the same location that common pipistrelles currently use and will allow common pipistrelle bats to access crevices between the roof tiles and bitumen felt lining.
- No action is proposed to mitigate for the loss of common pipistrelle night roost D, as this roost is considered to be of limited conservation value.

6.2.4 Non-bitumen coated membranes (formerly known as breathable roofing membranes) will not be used to line the roof or weatherboarding of the renovated barn, as bats can get tangled in these and die. Only wooden boarding or hessian-backed bituminous Type 1F felt that is a non-woven short fibre construction will be used.

6.2.5 Any external lighting that is required in the proximity of barn J will be located below eaves level and will point away from any newly created access points for bats.

Provision of replacement roosting opportunities Barn K

6.2.6 As shown on Figure 13 in Appendix A, a total of 13 permanent replacement roosting opportunities capable of supporting the types of roost currently present within barn K will be incorporated into the fabric of the newly converted barn. These will comprise:

- Four gaps (approximately 15-25mm) will be retained or created under the weatherboarding to replace common pipistrelle day roost A. The gaps will be located at the same locations that common pipistrelles currently use to access the barn and will allow common pipistrelles to access crevices between the weatherboarding and bitumen felt lining.
- Three gaps will be created under hip tiles to replace common pipistrelle day roosts F, G and H. These will be installed at the half-hip apex of the northern, southern and western gable ends to replicate the current roost locations and will allow common pipistrelles to access gaps beneath the hip tiles.
- Four gaps (approximately 60-80mm x 15-25mm) will be created under roof tiles to replace common pipistrelle day roosts I and J. The gaps will be located at the same locations that common pipistrelles currently use, and will allow bats to access crevices between the roof tiles and bitumen felt lining.
- One gap (approximately 25mm) will be created under the weatherboarding to replace barbastelle day roost C. The gap will allow barbastelle bats to access a crevice between the weatherboarding and bitumen felt lining.
- One gap (approximately 25mm) will be created under the weatherboarding to replace the Natterer's bat day roost D. The gap will allow Natterer's bats to access a crevice between the weatherboarding and bitumen felt lining.
- No action is proposed to mitigate for the loss of brown long-eared night roost/ feeding perch (Roost B) or common pipistrelle night roost (Roost E), as these roosts are of limited conservation value.

6.2.7 Non-bitumen coated membranes (formerly known as breathable roofing membranes) will not be used to line the roof or weatherboarding of the renovated barn, as bats can get tangled in these and die. Only wooden boarding or hessian-backed bituminous Type 1F felt that is a non-woven short fibre construction will be used.

6.2.8 Any external lighting that is required in the proximity of the barn will be located below eaves level and will point away from any newly created access points for bats.

Post development

6.2.9 The following will be undertaken to monitor bat use of the replacement roosts and inform appropriate remedial action (if necessary):

- A single emergence survey will be undertaken of barns J and K in years one and three following the completion of the development.
- Retained bat boxes on trees will be checked on a single occasion by a licensed bat worker in years one and three following the completion of the development.

6.3 Ecological enhancements for roosting bats

6.3.1 The following measures will also be adopted to enhance the proposed development site for roosting bats:

- The tree mounted bat boxes will be retained upon the completion of the development.
- A total of four additional gaps will be created under the roof tiles (as shown on Figures 12 and 13 in Appendix A) to allow bats to access the crevices between the roof tiles and bitumen felt lining.

Appendix A | Figures

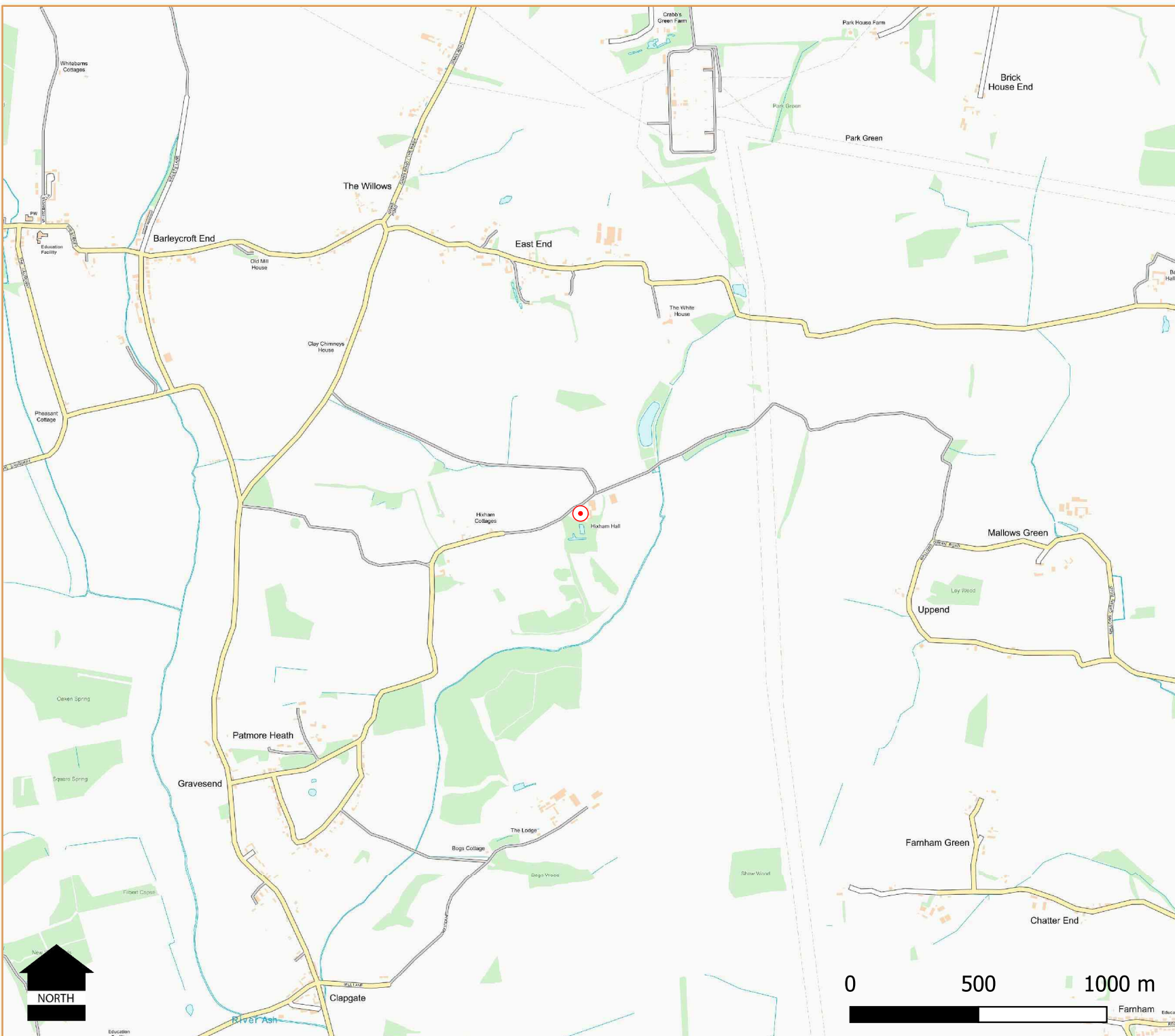


Figure 1.
Location of the proposed development site

- Legend**
- ⊙ Proposed development site

Date of survey	N/A	
Date of issue	13 October 2022	
Job reference	WRL101	
Drawn by	AR	Checked by JB/TB
Status	Final	



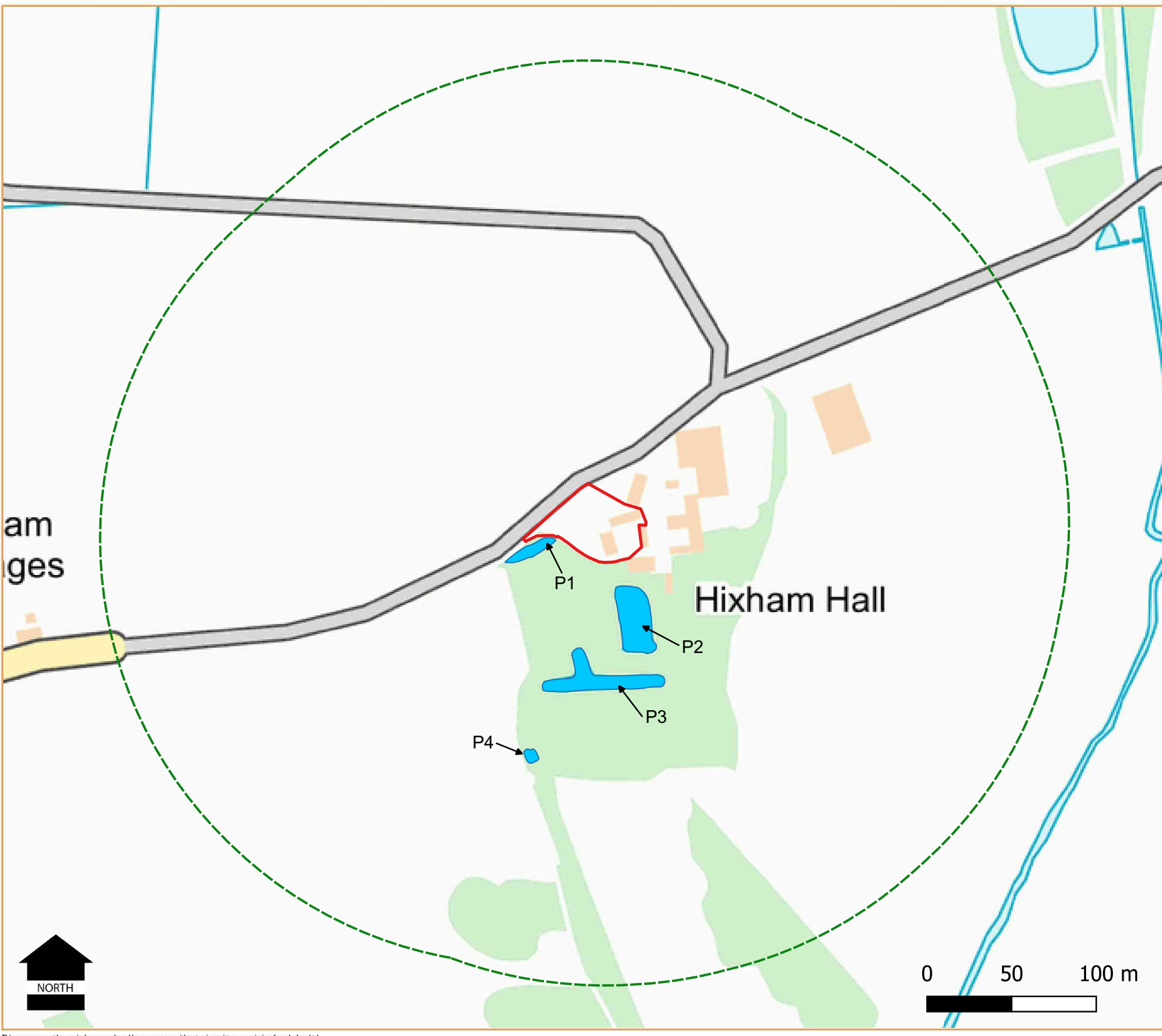


Figure 2.
Location of water bodies within 250m of the proposed development site

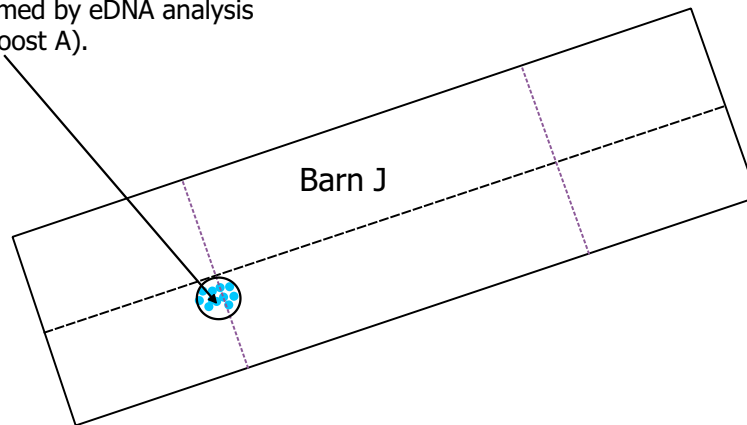
Legend

- Proposed development site
- 250m great crested newt survey area
- Water bodies

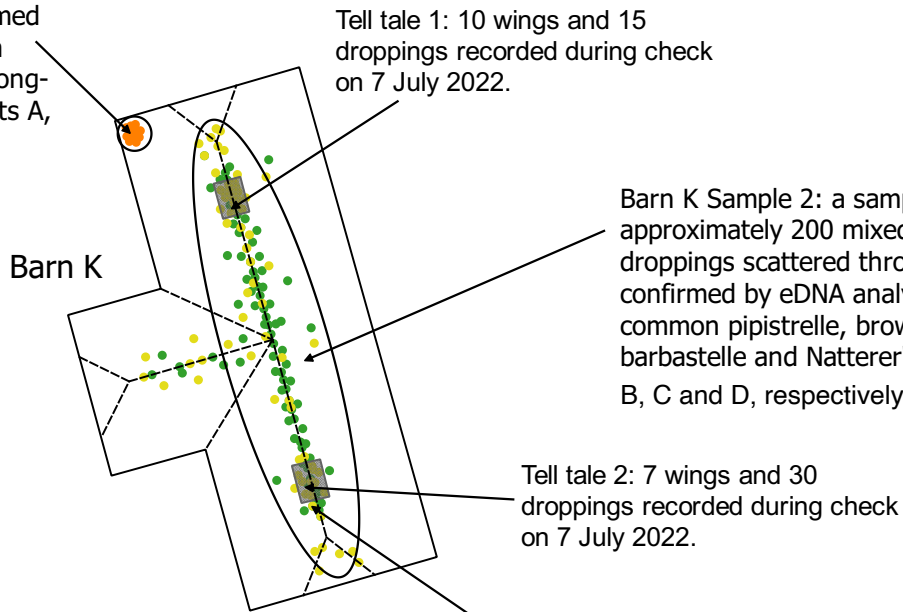
Date of survey	N/A	
Date of issue	13 October 2022	
Job reference	WRL101	
Drawn by	AR	Checked by JB/TB
Status	Final	


 Ecological Consultants

Barn J Sample 1: approximately 15 mixed-age droppings concentrated directly below an area of loose roofing felt were confirmed by eDNA analysis to be from barbastelle bat (Roost A).



Barn K Sample 1: approximately 20 mixed-age droppings concentrated below a mortice and tenon joint were confirmed by eDNA analysis to be from common pipistrelle, brown long-eared and barbastelle (Roosts A, B and C).



Barn K Sample 2: a sample of approximately 200 mixed-aged bat droppings scattered throughout barn were confirmed by eDNA analysis to be from common pipistrelle, brown long-eared, barbastelle and Natterer's bat (Roosts A, B, C and D, respectively).

Figure 3.

Results of the roost check for bats

Legend

- Droppings confirmed as barbastelle bat
- Droppings confirmed as common pipistrelle, brown long-eared bat and barbastelle
- Droppings confirmed as common pipistrelle, brown long-eared bat, barbastelle and Natterer's bat
- Feeding remains of large yellow underwing moth and peacock butterfly
- Tell tale

Date of survey 14 June and 7 July

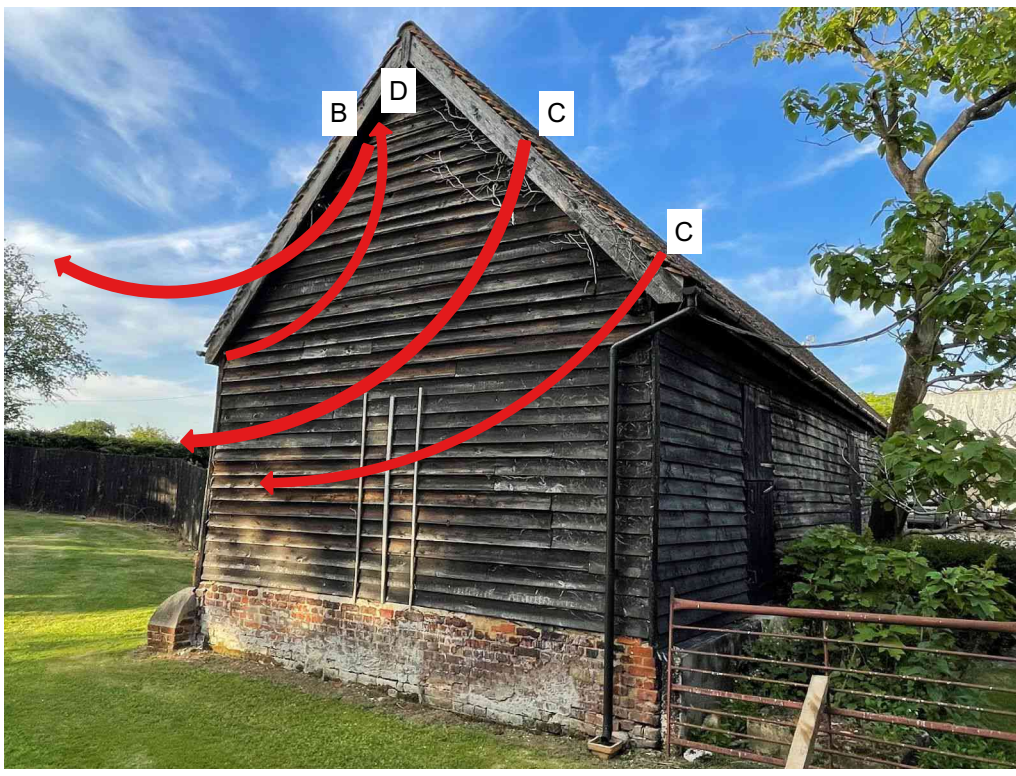
Date of issue 13 October 2022

Job reference WRL101

Drawn by AR Checked by JB/TB

Status Final





Two common pipistrelle bats emerged from a gap under the fascia on the western gable end at 14 minutes and 22 minutes after sunset (Roost B)

Three common pipistrelle bats emerged from gaps under roof tiles on the western gable end (on the southern elevation of the pitched roof) at 16, 22 and 27 minutes after sunset (Roost C).

One common pipistrelle returned to roost to a gap under the fascia on the western gable end at 65 minutes after sunset (Roost D).

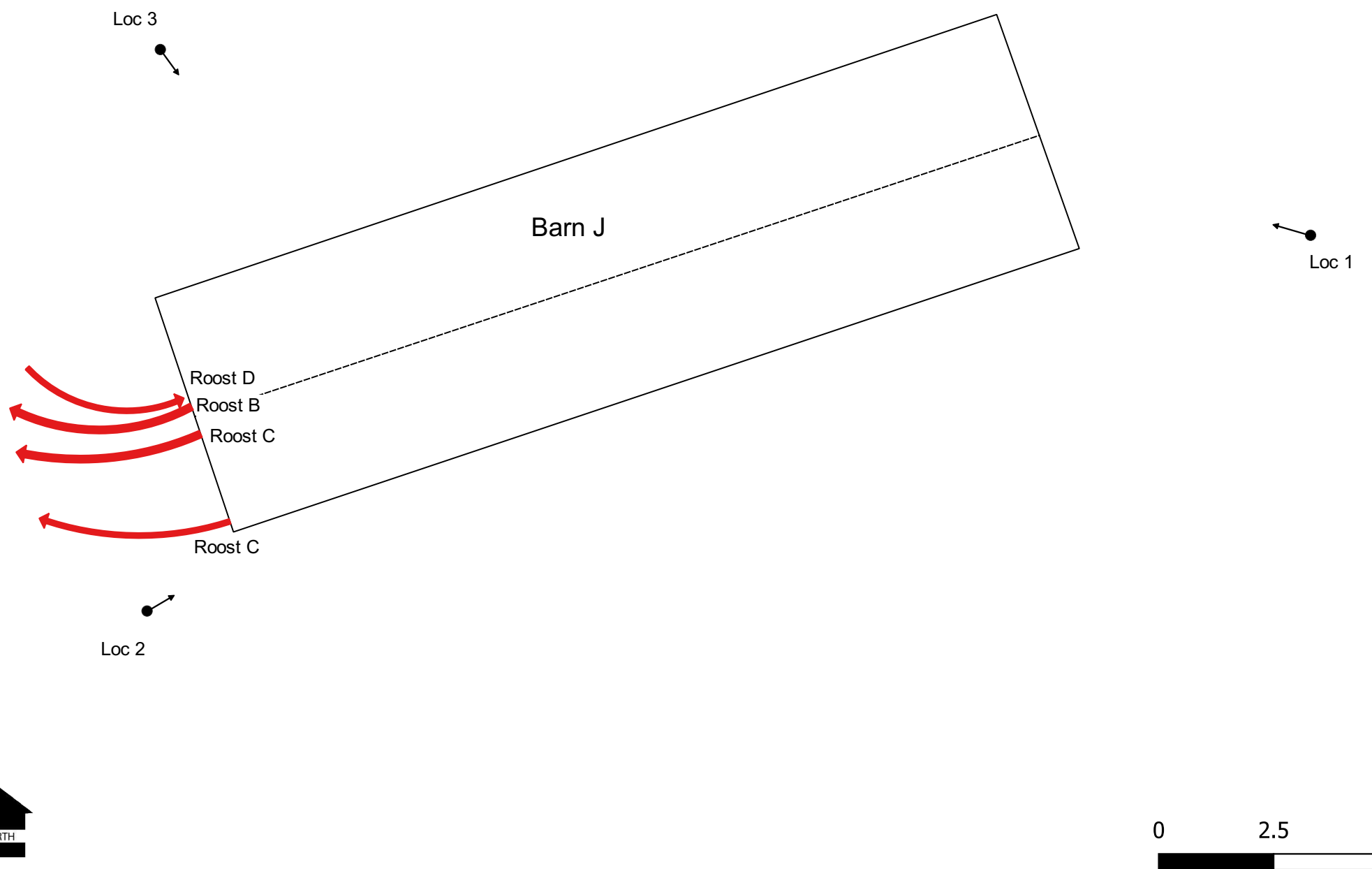


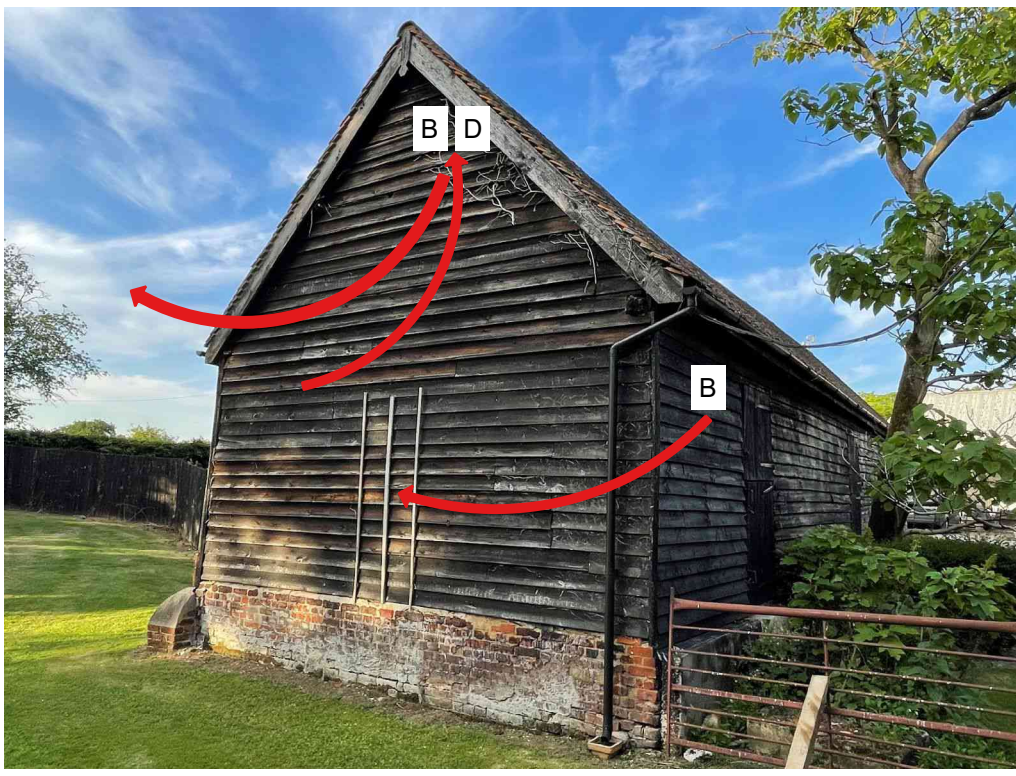
Figure 4.
Results of bat survey
visit 1, Barn J

Legend

- Surveyor locations
- Common pipistrelle emergence/ return to roost

Date of survey	14 June 2022	
Date of issue	13 October 2022	
Job reference	WRL101	
Drawn by	AR	Checked by JB/TB
Status	Final	





Two common pipistrelle bats emerged from beneath the weatherboarding on the western gable end at 15 minutes and 22 minutes after sunset (Roost B).

One common pipistrelle emerged from under the weatherboarding on the southern elevation of the barn at 18 minutes after sunset (Roost B).

One common pipistrelle returned to roost at the weatherboarding on the western gable end at 55 minutes after sunset (Roost D).



Two common pipistrelles emerged from gaps under roof tiles on the southern elevation of the pitched roof at 16 and 18 minutes after sunset (Roost C).

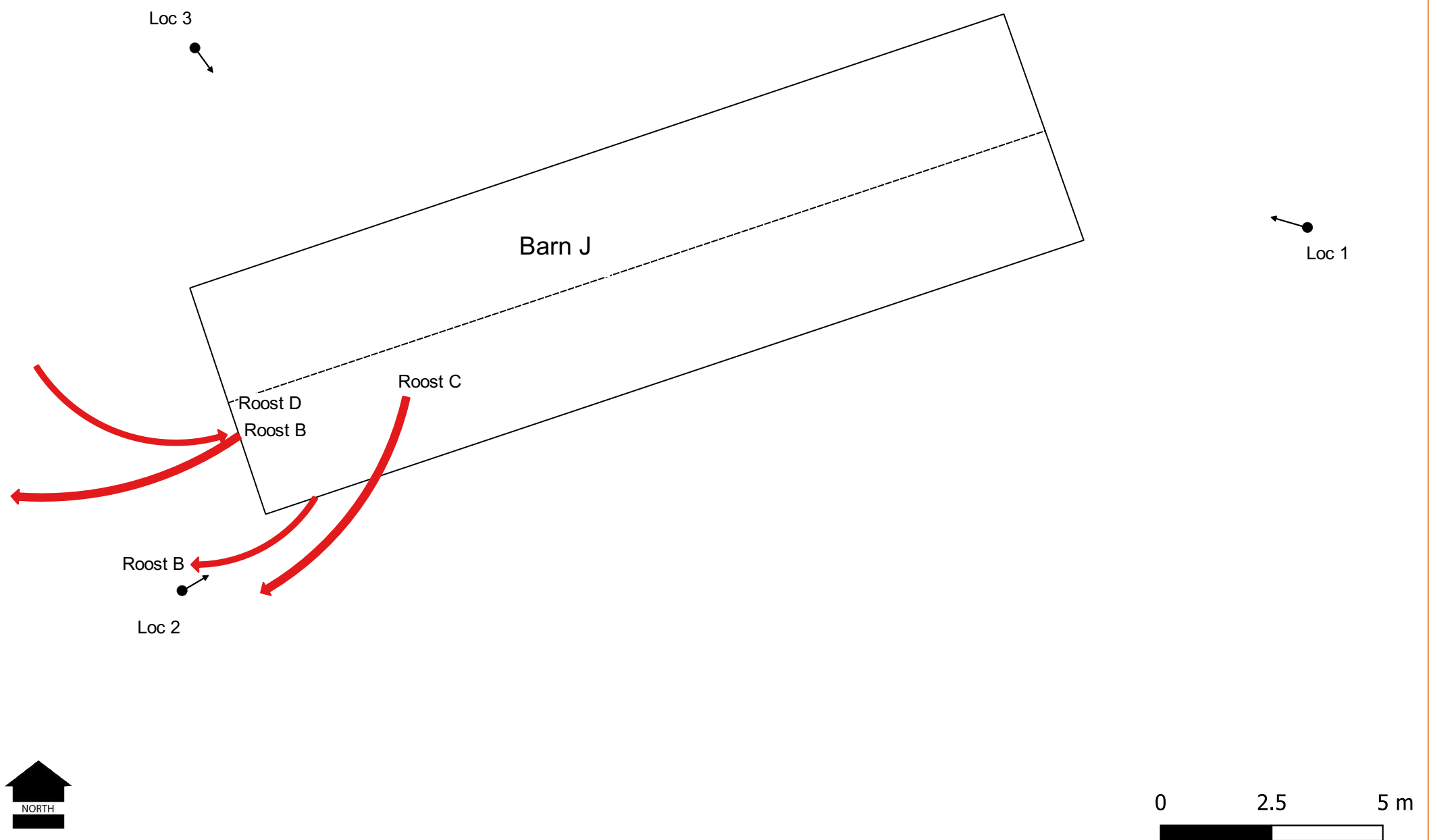
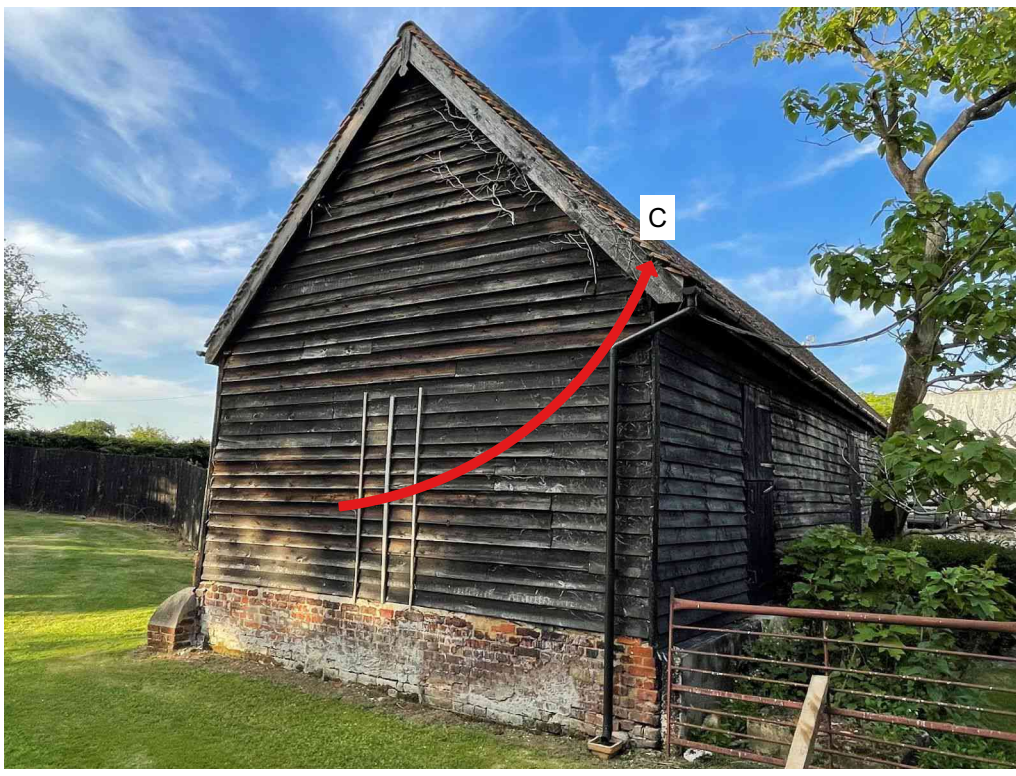


Figure 5.
Results of bat survey
visit 2, Barn J

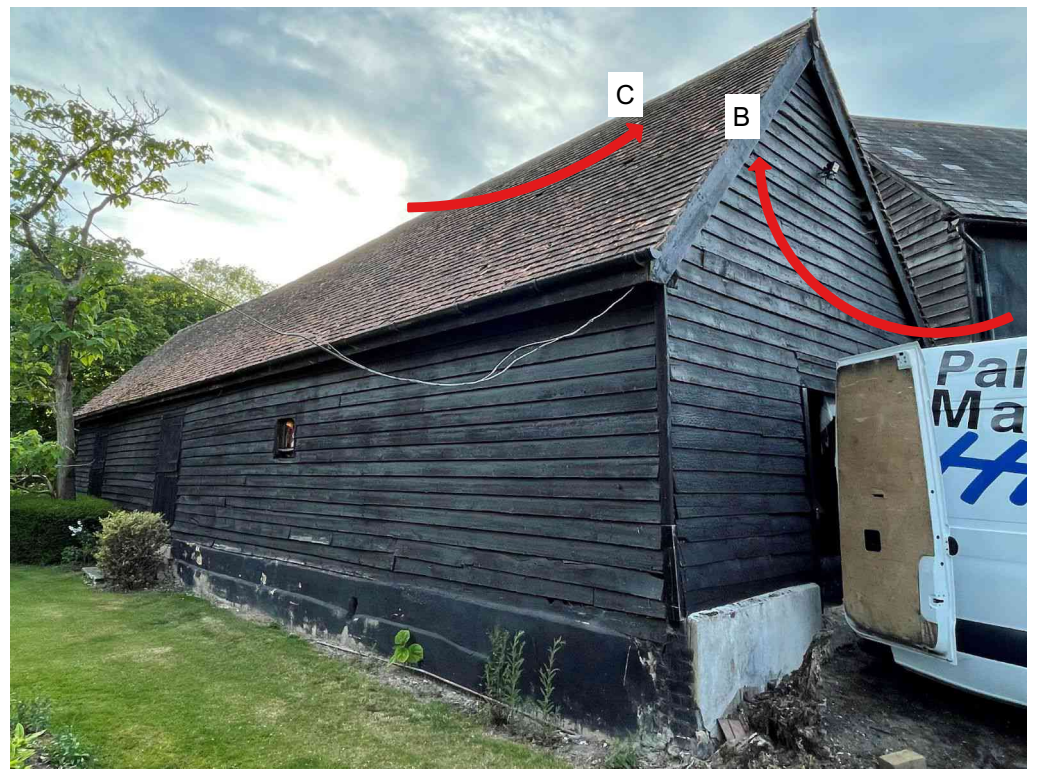
- Legend**
- Surveyor locations
 - ➔ Common pipistrelle emergence/ return to roost

Date of survey	7 July 2022	
Date of issue	13 October 2022	
Job reference	WRL101	
Drawn by	AR	Checked by JB/TB
Status	Final	





One common pipistrelle returned to roost under roof tiles at the western gable end at 18 minutes before sunrise (Roost C).



One bat echolocating at around 50 kHz, considered most likely to be a common pipistrelle, returned to roost under a roof tile on the southern elevation of Barn J at 17 minutes before sunrise (Roost C).

One common pipistrelle returned to roost to a gap under the fascia on the eastern gable end at 15 minutes before sunrise (Roost B).

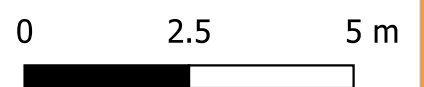
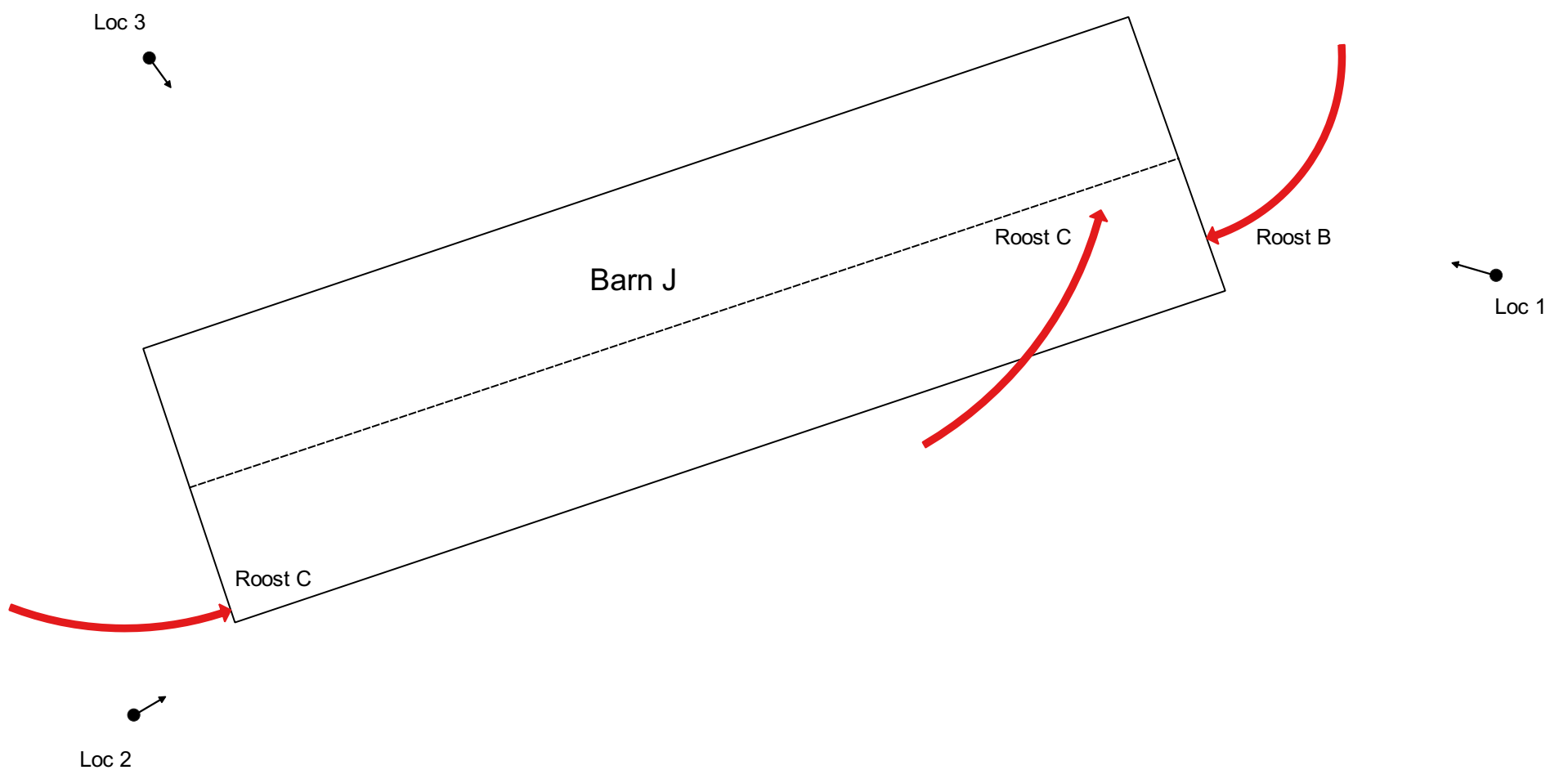


Figure 6.
Results of bat survey
visit 3, Barn J

- Legend**
- Surveyor locations
 - ➔ Common pipistrelle return to roost

Date of survey	28 July 2022	
Date of issue	13 October 2022	
Job reference	WRL101	
Drawn by	AR	Checked by JB/TB
Status	Final	





One common pipistrelle returned to roost to the half hip apex at the northern gable end at 51 minutes before sunrise (Roost F).



One common pipistrelle returned to roost via a gap under the fascia on the side of the western gable end at 48 minutes before sunrise (Roost A).

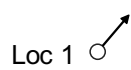
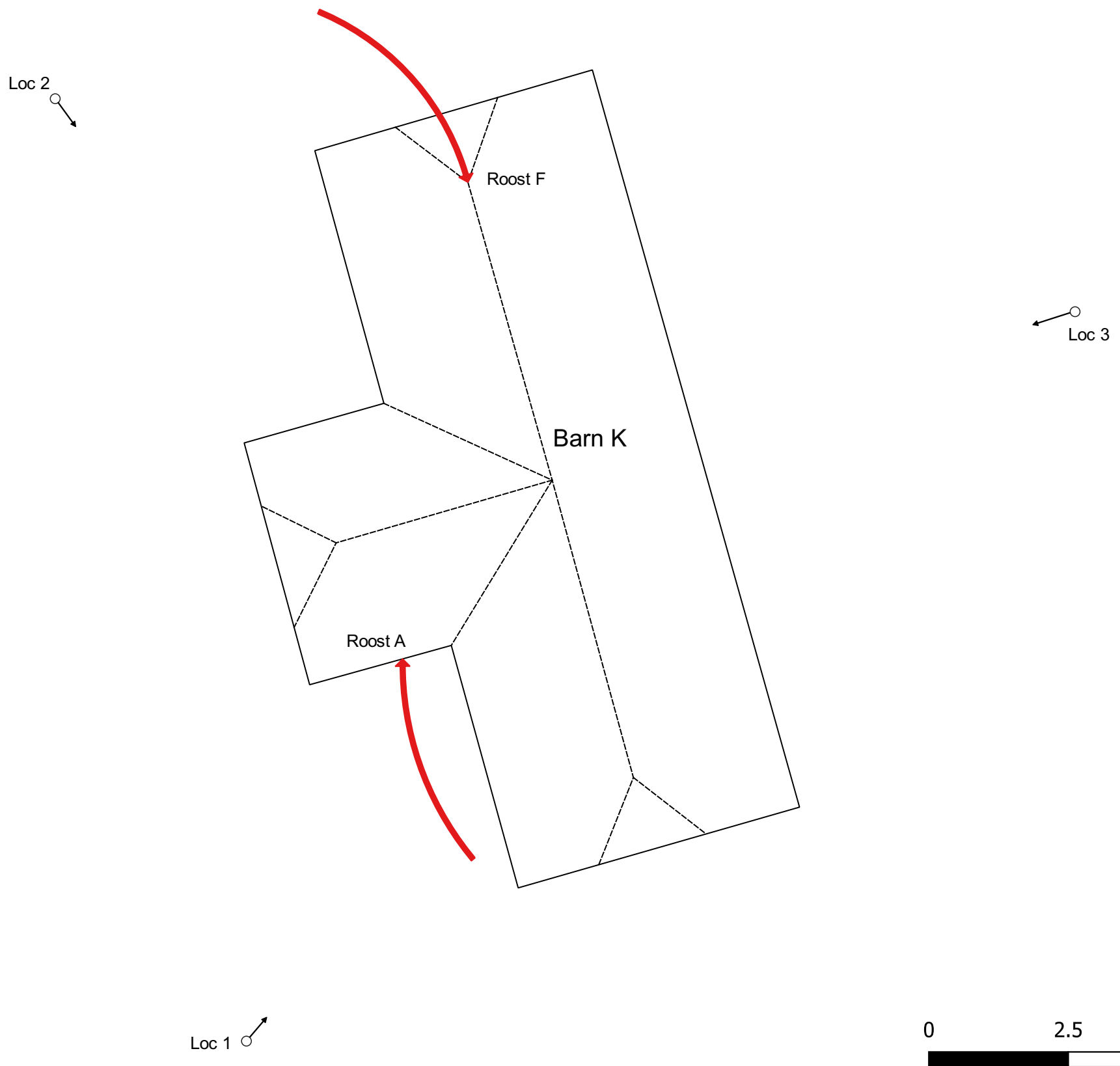
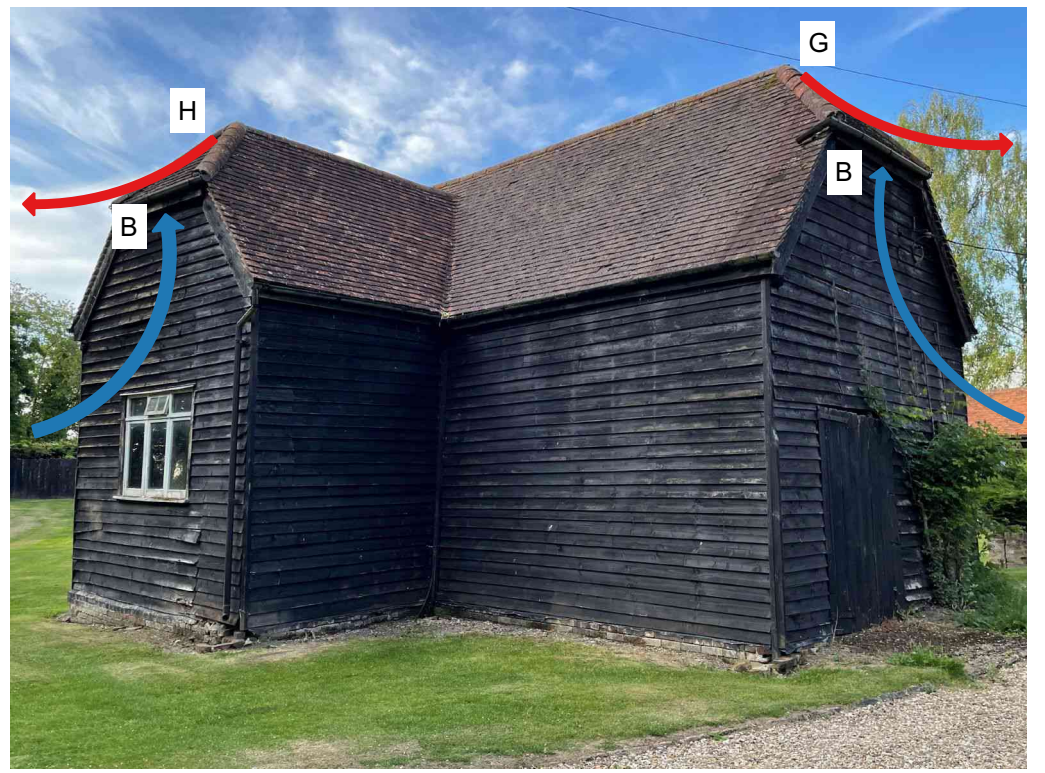
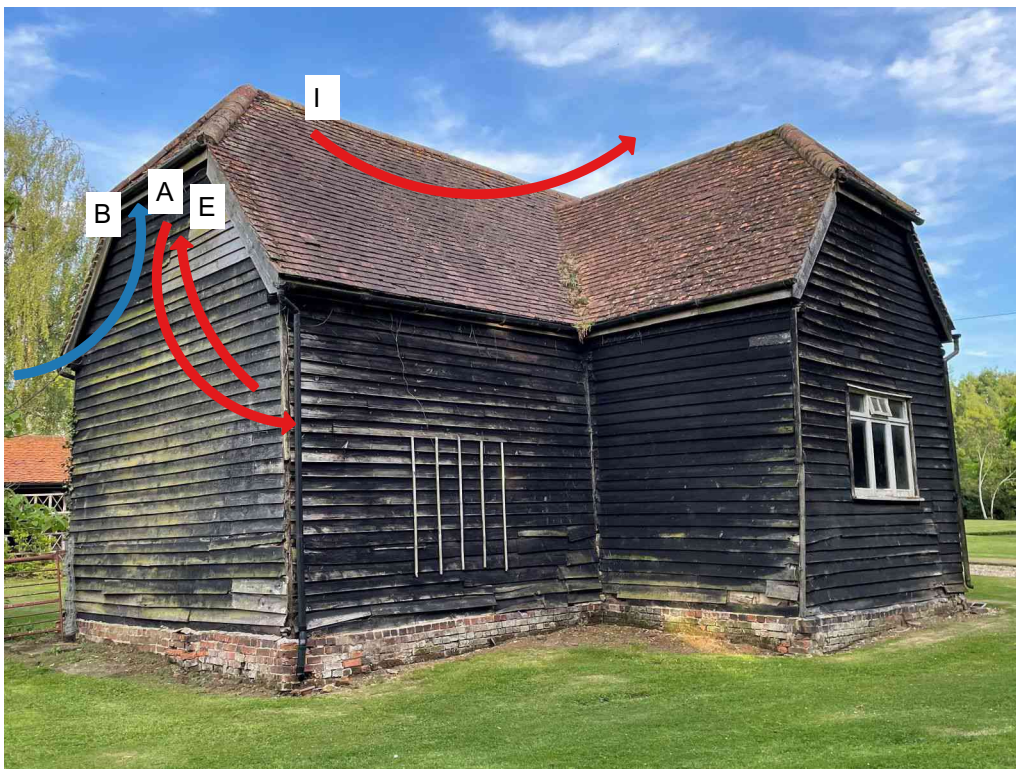


Figure 7.
Results of bat survey
visit 1, Barn K

- Legend**
- Surveyor locations
 - ➔ Common pipistrelle return to roost

Date of survey	15 June 2022	
Date of issue	13 October 2022	
Job reference	WRL101	
Drawn by	AR	Checked by JB/TB
Status	Final	





One common pipistrelle emerged from a roof tile on the western elevation at 23 minutes after sunset (Roost I).

One common pipistrelle emerged from the half hip apex at the southern gable end at 10 minutes after sunset (Roost G).

One common pipistrelle emerged from the weatherboarding on the northern gable end at 36 minutes after sunset (Roost A).

One common pipistrelle emerged from the half hip apex at the western gable end at 15 minutes after sunset (Roost H).

One common pipistrelle returned to roost to the weatherboarding on the northern gable end at 49 minutes after sunset (Roost E).

One brown-long eared bat returned to roost via a gap under the fascia on the southern gable end at 52 minutes after sunset (Roost B).

One brown-long eared bat returned to roost via a gap under the fascia on the northern gable end at 57 minutes after sunset (Roost B).

Three brown long-eared bats returned to roost via a gap under the fascia on the western gable end between 62 and 75 minutes after sunset (Roost B).

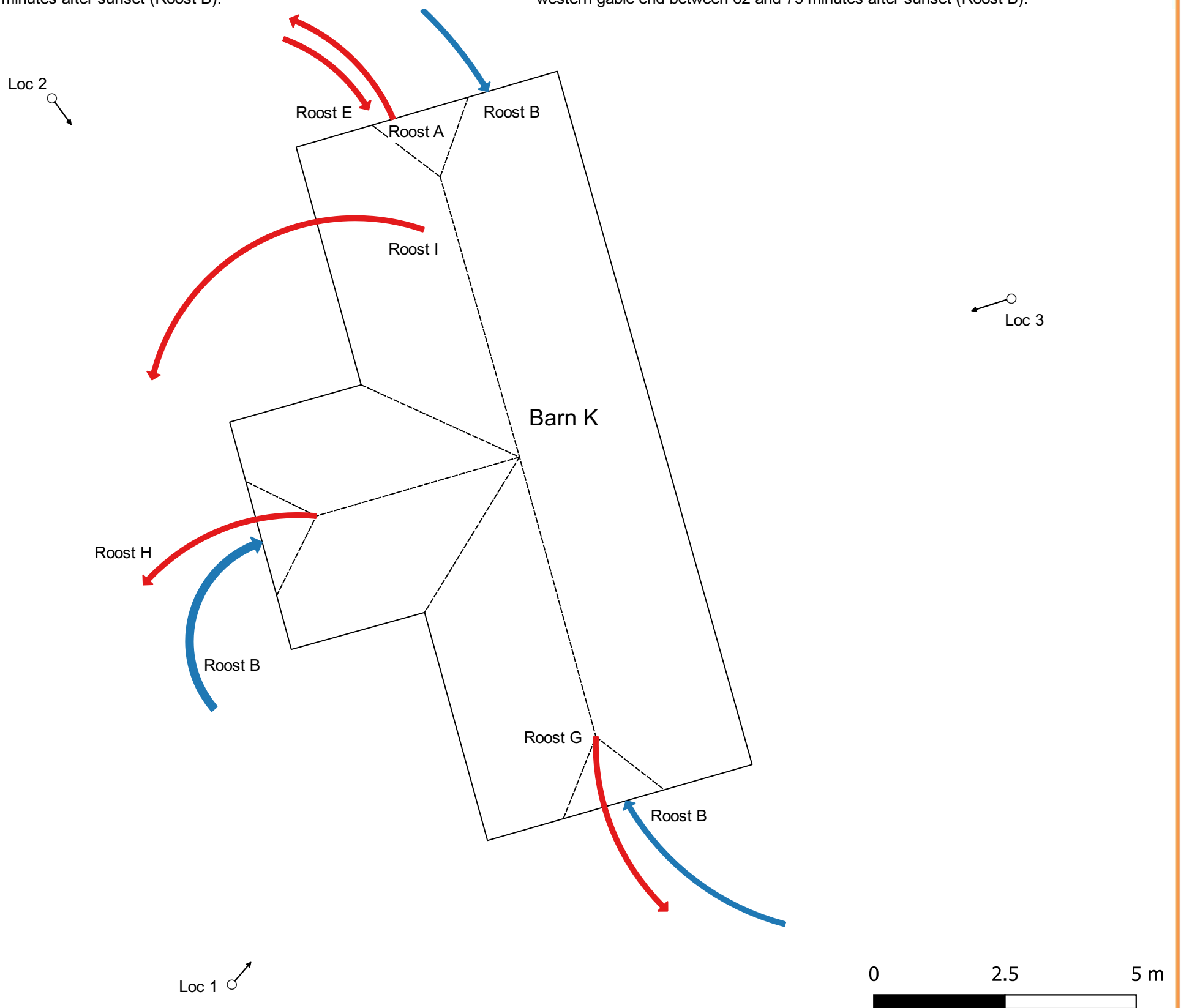


Figure 8.
Results of bat survey visit 2, Barn K

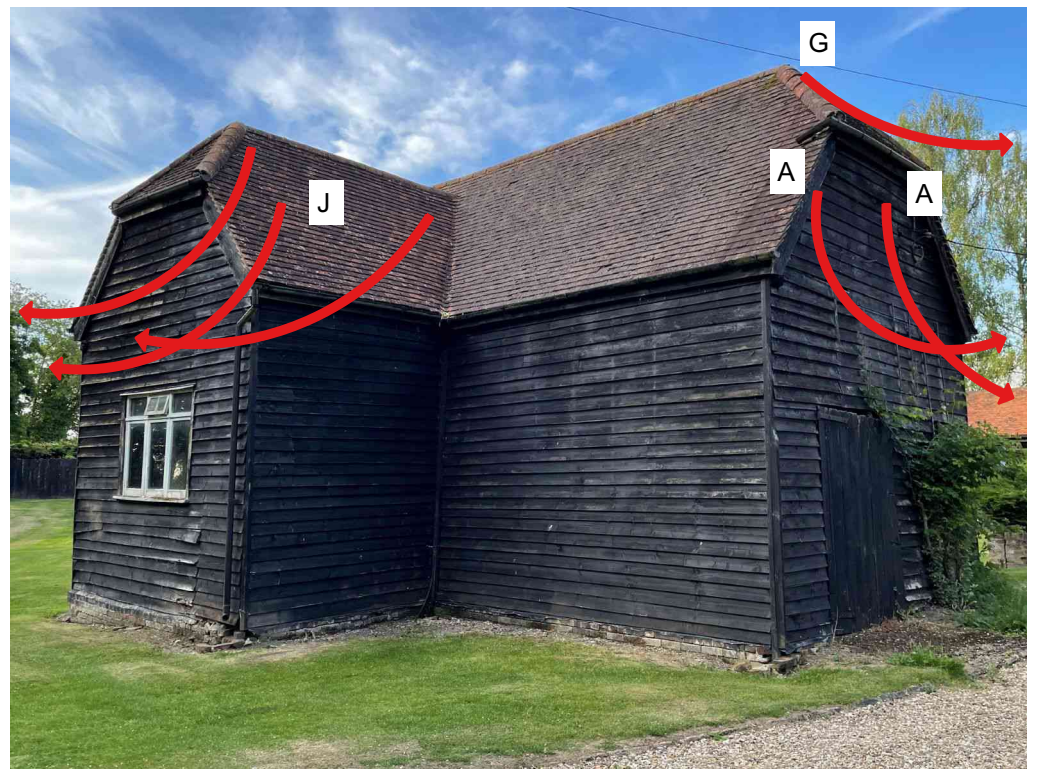
Legend	
○	Surveyor locations
→ (red)	Common pipistrelle emergence/ return to roost
→ (blue)	Brown long-eared bat return to roost

Date of survey	5 July 2022	
Date of issue	13 October 2022	
Job reference	WRL101	
Drawn by	AR	Checked by JB/TB
Status	Final	





Two brown-long eared bats returned to roost via a gap under the fascia on the northern gable end at 61 and 78 minutes after sunset (Roost B).



One common pipistrelle emerged from the weatherboarding on the southern gable end at six minutes after sunset (Roost A).

One common pipistrelle emerged from under the fascia on the southern gable end at eight minutes after sunset (Roost A).

One common pipistrelle emerged from the half hip apex at the southern gable end at 10 minutes after sunset (Roost G).

Three common pipistrelle emerged from underneath roof tiles on a south facing roof pitch between 10 and 14 minutes after sunset (Roost J).

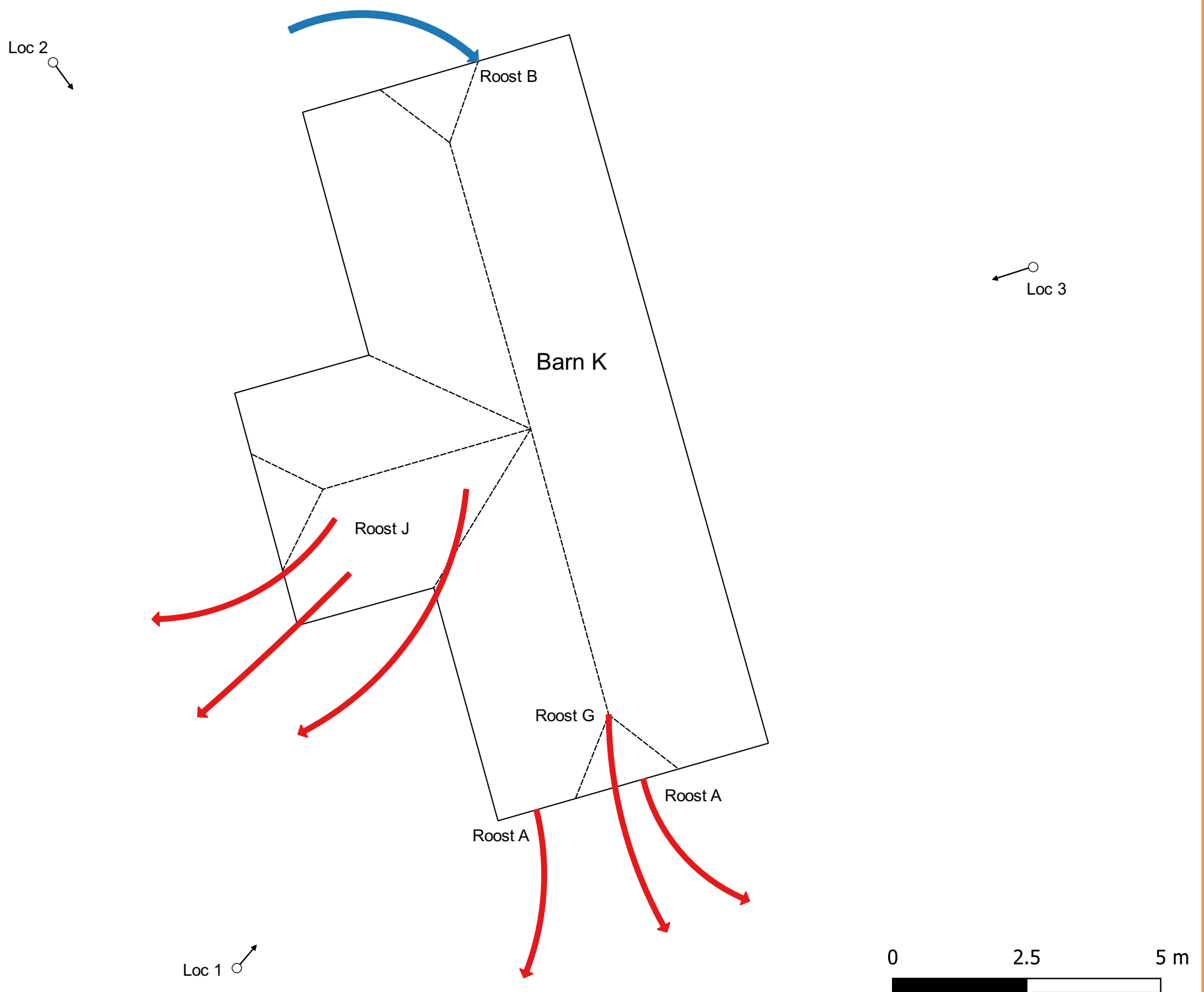


Figure 9.
Results of bat survey
visit 3, Barn K

Legend

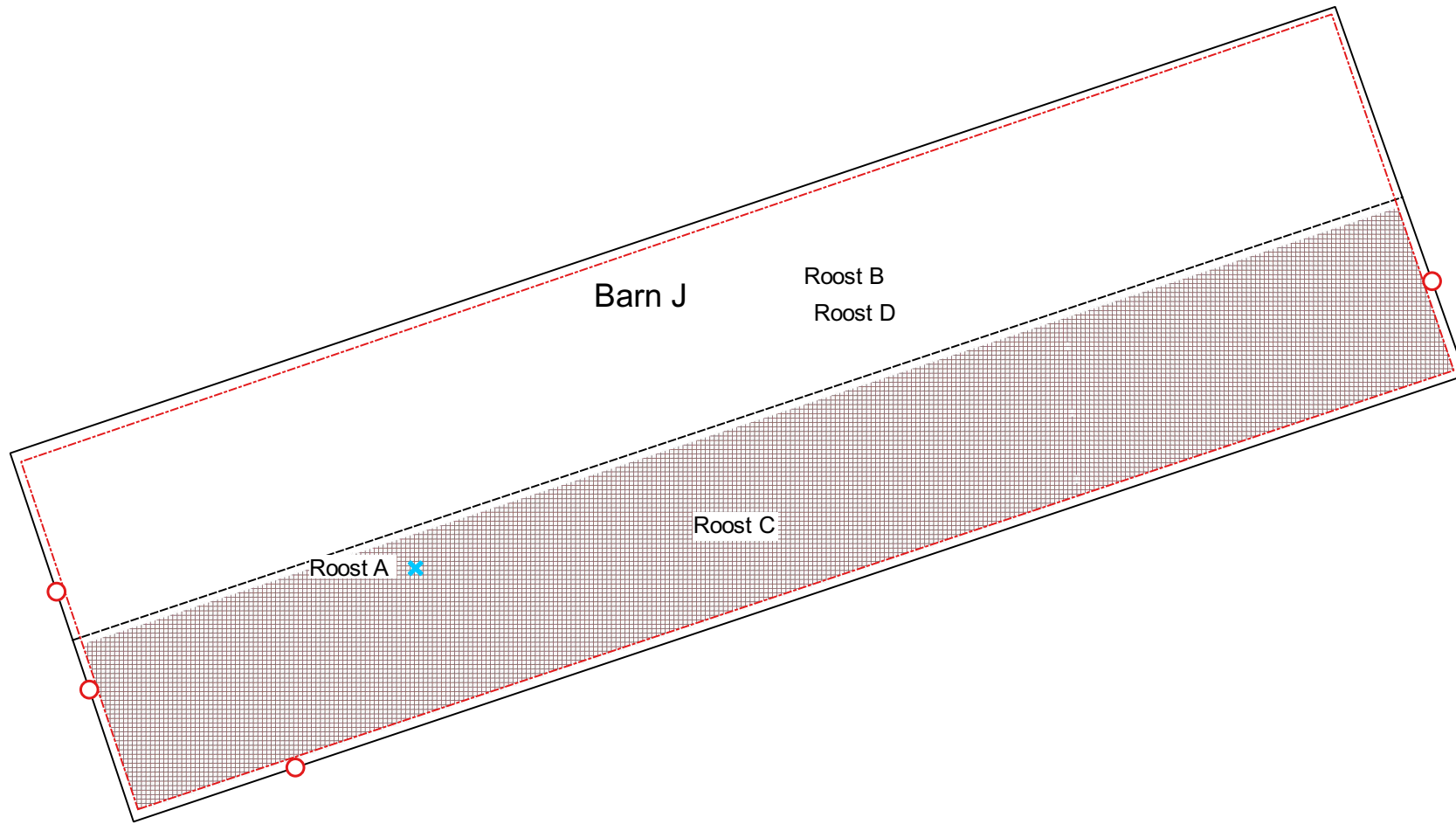
- Surveyor locations
- Common pipistrelle emergence
- Brown long-eared bat return to roost

Date of survey	28 July 2022	
Date of issue	13 October 2022	
Job reference	WRL101	
Drawn by	AR	Checked by JB/TB
Status	Final	







Figure 10.

Bat roost
summary, Barn J



Legend

Indicative location of roosts

-  Barbastelle day roost (Roost A)
-  Common pipistrelle day roost (Roost B) and night roost (Roost D)
-  Common pipistrelle day roost (Roost C)
-  Common pipistrelle access points to Roosts B and D

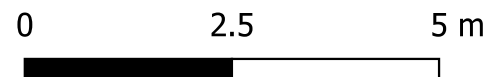
Date of survey 14 June - 28 July 2022

Date of issue 13 October 2022

Job reference WRL101

Drawn by AR Checked by JB/TB

Status Final



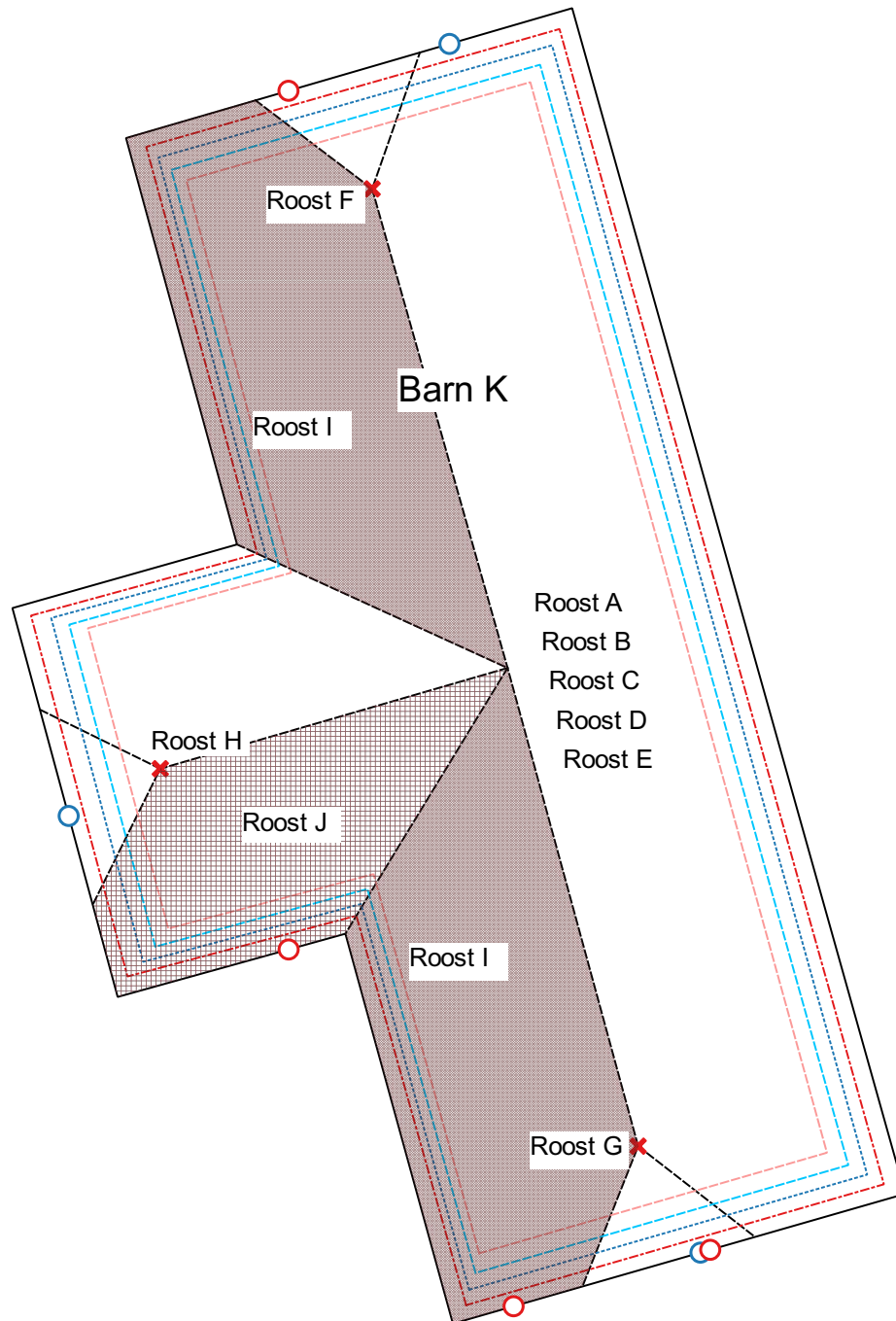


Figure 11.

Bat roost summary, Barn K

Legend

- ✕ Common pipistrelle day roosts (Roosts F, G and H)
- Common pipistrelle day roost (Roost A) and night roost (Roost E)
- Common pipistrelle day roost (Roost I)
- Common pipistrelle day roost (Roost J)
- Common pipistrelle access points to Roost A and Roost E
- Brown long-eared night roost/feeding perch (Roost B)
- Brown long-eared access points to Roost B
- Barbastelle day roost (Roost C)
- Natterer's bat day roost (Roost D)

Date of survey 15 June - 28 July 2022

Date of issue 13 October 2022

Job reference WRL101

Drawn by AR Checked by JB/TB

Status Final

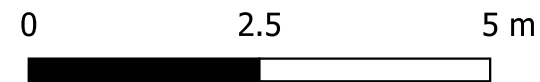





Figure 12.


Replacement bat roosts and enhancements for Barn J

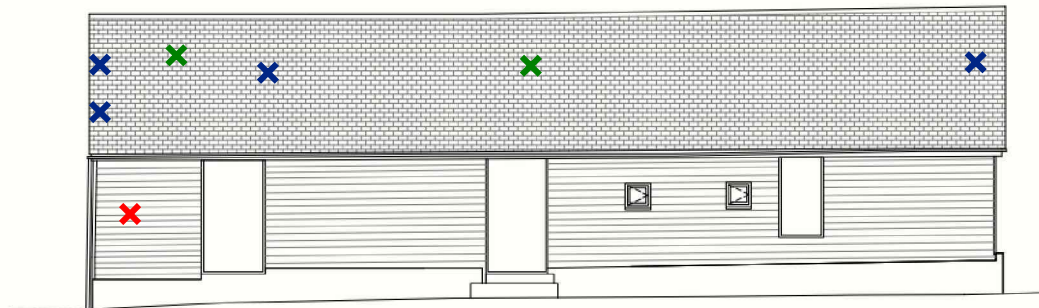
Legend

Replacement bat roosts/access points

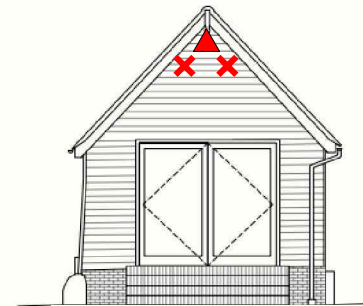
-  Gap under weatherboarding for barbastelle bats (Roost A)
-  Gap under weatherboarding for common pipistrelle (Roost B)
-  Gap under roof tile for common pipistrelle (Roost C)

Enhancements

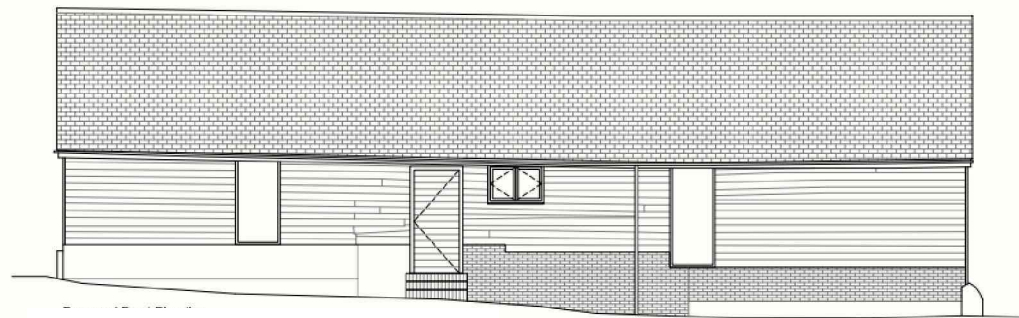
-  Gap under roof tile suitable for crevice dwelling bat species



Proposed southern elevation



Proposed western elevation



Proposed northern elevation



Proposed eastern elevation

Date of survey	N/A	
Date of issue	5 January 2023	
Job reference	WRL101	
Drawn by	AM	Checked by JB/TB
Status	Final	

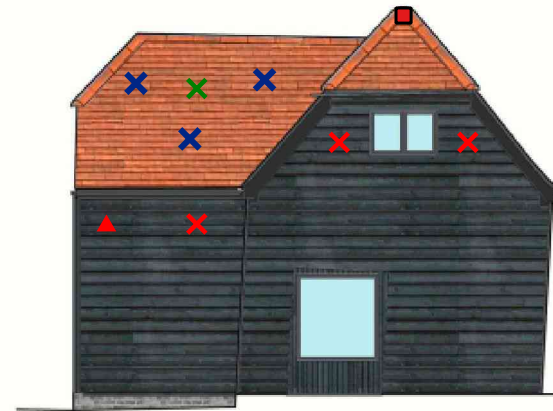


Figure 13.

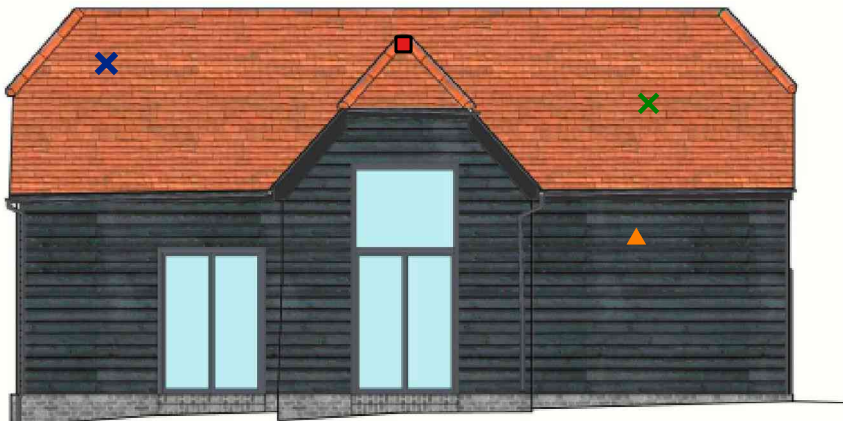
Replacement bat roosts and enhancements for Barn K



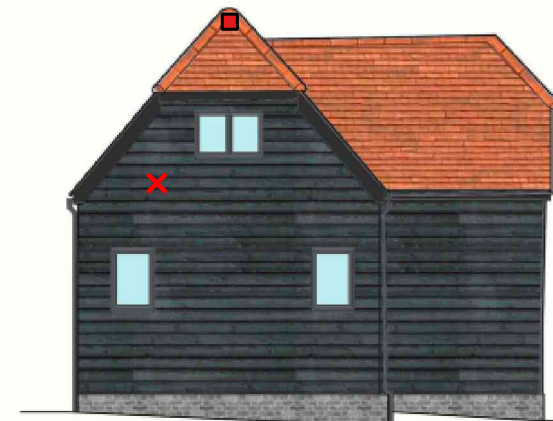
Proposed eastern elevation



Proposed southern elevation



Proposed western elevation



Proposed northern elevation

Legend

Replacement bat roosts/access points

- ✕ Gap under weatherboarding for common pipistrelle (Roost A)
- ▲ Gap under weatherboarding for barbastelle bats (Roost C)
- ▲ Gap under weatherboarding for Natterer's bats (Roost D)
- Gap under hip tile for common pipistrelle (Roost F, G & H)
- ✕ Gap under roof tile for common pipistrelle (Roost I and J)

Enhancements

- ✕ Gap under roof tile suitable for crevice dwelling bat species

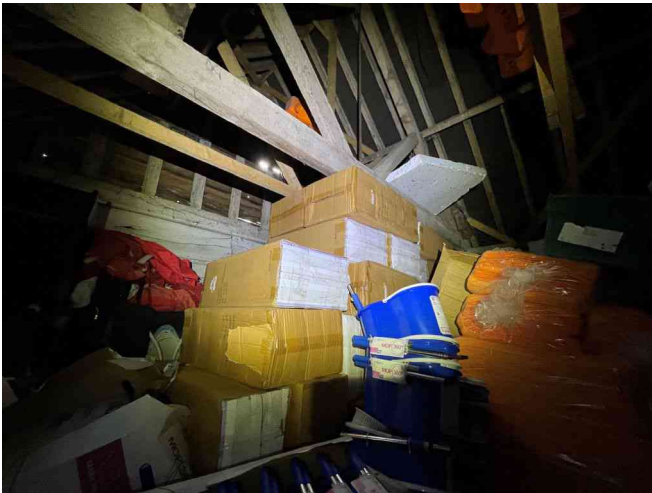
Date of survey	N/A	
Date of issue	5 January 2023	
Job reference	WRL101	
Drawn by	AM	Checked by JB/TB
Status	Final	



Photograph 1: South and east elevations of Barn J.



Photograph 2: West and south gable ends of Barn K.



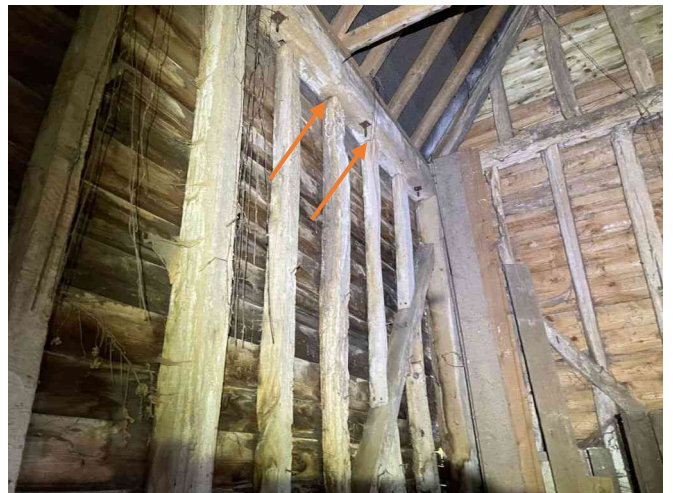
Photograph 3: Internal view of the western gable end of Barn J with gaps visible in weatherboarding.



Photograph 4: Internal view of Barn K.



Photograph 5: Barn J Roost A.



Photograph 6: Internal view of mortice and tenon joints in Barn K.

Figure 14: Photographs

Date of survey	14 June 2022	
Date of issue	5 January 2023	
Job reference	WRL101	
Drawn by	AR	Checked by JB/TB
Status	Final	

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Ecological Consultants

Appendix B | Use of Night Vision Aids (NVAs)

In accordance with Bat Conservation Trust’s interim guidance note³⁶ on the use of night vision aids (NVAs), NVAs were used at each surveyor location on each survey visit. NVAs comprised a Canon XA series video camera equipped with infrared lamps. Surveyors were also equipped with a full-spectrum Elekon Batlogger M bat detector. An example of the equipment used by Babec Ecological Consultants during each survey visit is provided below:



1. Canon XA series camcorder 2. Screen 3. Infrared floodlamp 4. Batlogger-M 5. Thermometer

During emergence surveys, surveyors watched potential roost features directly from the start of the survey until ambient light levels were too low for the potential roost features to be clearly visible, which was typically approximately 20 minutes after sunset. Surveyors then watched potential roost features using their NVAs for the remainder of the survey. During return to roost surveys, surveyors watched potential roost features using NVAs until ambient light levels were high enough for potential roosting features to be clearly visible.

Video footage was recorded for the full extent of each survey. NVA screenshots taken at the start and end of one of the emergence or return to roost surveys are presented in Tables 5 and 6, below. Recorded footage was analysed following the survey when considered appropriate, such as when a bat roost was recorded, when the surveyor suspected the presence of a roost or when a bat was seen but not heard in close proximity to the barns. Where a bat roost was confirmed during video analysis, bat calls recorded during the survey on the Batlogger M detector were analysed using Elekon BatExplorer software to identify the species of roosting bat.

³⁶ Bat Conservation Trust (2022). *Interim Guidance Note: Use of night vision aids for bat emergence surveys and further comment on dawn surveys*. Available at www.bats.org.uk.

Table 5. Screenshots taken from NVAs at each surveyor location on Barn J.



Surveyor location	Start of survey screenshot	End of survey screenshot
1		
2		
3		


Table 6. Screenshots taken from NVAs at each surveyor location on Barn K.

Surveyor location	Start of survey screenshot	End of survey screenshot
1		
2		
3		

Appendix C | Results of the GCN HSI assessment

Appendix C. Results of the GCN HSI assessment.

Water body ref.	Photograph	Detail of suitability indices	Suitability indices	Score
P1		<i>Location</i>	Hertfordshire = Zone A	1
		<i>Pond area</i>	50m ²	0.05
		<i>Pond drying</i>	Dries annually	0.1
		<i>Water quality</i>	Poor	0.33
		<i>Shade</i>	90%	0.40
		<i>Waterfowl</i>	Absent	1
		<i>Fish</i>	Absent	1
		<i>Ponds within 1km</i>	19	1
		<i>Terrestrial habitat</i>	Moderate	0.67
		<i>Macrophytes</i>	5%	0.35
		HSI score	Poor	0.45
P2		<i>Location</i>	Hertfordshire = Zone A	1
		<i>Pond area</i>	500m ²	1
		<i>Pond drying</i>	Never dries	0.9
		<i>Water quality</i>	Moderate	0.67
		<i>Shade</i>	40%	1
		<i>Waterfowl</i>	Minor	0.67
		<i>Fish</i>	Major	0.01
		<i>Ponds within 1km</i>	19	1
		<i>Terrestrial habitat</i>	Moderate	0.67
		<i>Macrophytes</i>	5%	0.35
		HSI score	Poor	<0.5

Water body	Photograph	Detail of suitability indices	Suitability indices	Score
P3		<i>Location</i>	Hertfordshire = Zone A	1
		<i>Pond area</i>	200m ²	0.4
		<i>Pond drying</i>	Never	0.9
		<i>Water quality</i>	Moderate	0.67
		<i>Shade</i>	80%	0.6
		<i>Waterfowl</i>	Minor	0.67
		<i>Fish</i>	Possible	0.67
		<i>Ponds within 1km</i>	19	1
		<i>Terrestrial habitat</i>	Moderate	0.67
		<i>Macrophytes</i>	10%	0.4
		<i>HSI score</i>	Average	0.67

Appendix D | Results of the GCN eDNA analysis

Folio No: E13721
Report No: 1
Purchase Order: WRL101
Client: BABEC LTD
Contact: Jon Bannon

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS (TRITURUS CRISTATUS)

SUMMARY

When great crested newts (GCN), *Triturus cristatus*, inhabit a pond, they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm GCN habitation or establish GCN absence.

RESULTS

Date sample received at Laboratory: 20/05/2022
Date Reported: 01/06/2022
Matters Affecting Results: None

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
4202	Water Body 3	TL 45335 26719	Pass	Pass	Pass	Negative	0
4203	Water Body 1	TL 45279 26785	Pass	Pass	Pass	Negative	0
4205	Water Body 2	TL 45330 26742	Pass	Pass	Pass	Negative	0

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Esther Strafford

Approved by: Chelsea Warner



METHODOLOGY

The samples detailed above have been analysed for the presence of GCN eDNA following the protocol stated in DEFRA WC1067 'Analytical and methodological development for improved surveillance of the Great Crested Newt, Appendix 5.' (Biggs et al. 2014). Each of the 6 sub-sample tubes are first centrifuged and pooled together into a single sample which then undergoes DNA extraction. The extracted sample is then analysed using real time PCR (qPCR), which uses species-specific molecular markers to amplify GCN DNA within a sample. These markers are unique to GCN DNA, meaning that there should be no detection of closely related species.

If GCN DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If GCN DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-laboratory checks on accuracy of results as part of our quality control procedures.

INTERPRETATION OF RESULTS

SIC: **Sample Integrity Check** [Pass/Fail]

When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]

Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample between the date it was made to the date of analysis. Degradation of the spiked DNA marker may lead indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]

The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result: **Presence of GCN eDNA** [Positive/Negative/Inconclusive]

Positive: GCN DNA was identified within the sample, indicative of GCN presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.

Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for GCN presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive. 0/12 indicates negative GCN presence.

Negative: GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of GCN absence, however, does not exclude the potential for GCN presence below the limit of detection.

