

# Bats in Churches Final Report

The Church of St Mary the Virgin, Pembridge

*Client: Natural England*



**March 2023**



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# St Mary the Virgin, Pembridge

## Bats in Churches Final Report 2023

### 1. Summary Page

Objectives	<ul style="list-style-type: none"><li>The Bats in Churches Project (BiC) is a partnership between Natural England, the Church of England, the Bat Conservation Trust, the Churches Conservation Trust and Historic England that seeks to mitigate the negative effects of bats on church users, whilst safeguarding roosts for the future.</li><li>Instruction by Natural England included undertaking bat surveys at the church of St Mary the Virgin, Pembridge, and developing and implementing a bespoke Bat Management Plan (BMP). The objective of the project has been to investigate specific issues of concern and the causes of conflicts between bats and church users and to develop novel solutions to overcome these issues.</li></ul>
Summary of Findings	<ul style="list-style-type: none"><li>Church users reported significant issues caused by the presence of bats, including disruption to services, damage to monuments and artefacts and a large cleaning burden to church volunteers.</li><li>Four species of bat regularly use St Mary's for roosting, socialising or hibernating: common pipistrelle (<i>Pipistrellus pipistrellus</i>), soprano pipistrelle (<i>P. pygmaeus</i>), Natterer's bat (<i>Myotis nattereri</i>) and brown long-eared bat (<i>Plecotus auritus</i>).</li><li>Natterer's bats roosting, flying and socialising inside the church are responsible for the majority of issues reported by church users. A maternity colony of this species uses the church in a complex and dynamic manner, as part of a linked roost resource in the local area.</li><li>Excluding bats from identified roosts in areas of concern with the church successfully reduced the quantity of faeces falling in these sensitive areas. However, bats continued to socialise in these locations and roosted in alternative areas close by.</li><li>Enclosure of an area used as a maternity roost was successful in allowing bats to continue to breed within this roost, but did not stop faeces from falling inside the church.</li></ul>
Conclusions	<ul style="list-style-type: none"><li>Excluding Natterer's bats from specific roost locations was successful in reducing damage to specific parts of the church, but is unlikely to result in bats leaving the area entirely.</li><li>The maternity roost was successfully enclosed within an area used by Natterer's bats in previous years and during this study in 2022. However, the design of the enclosed area and access point would benefit from further minor modification to prevent faeces from falling into the church. This work is planned for April 2023.</li><li>The roosting, flying and socialising of Natterer's bats, together with frequent roost switching and the unpredictable and dynamic use of the church interior by the colony, continue to present a challenge. Scattered droppings and urine can cover large areas of the nave and south transept and this issue can arise at different times of the active season for bats, as well as varying across years.</li><li>The BMP for St Mary's presents a novel and simple solution to the problem of widespread damage and cleaning requirements caused by bat social behaviour, which we hope will be trialled in the church during the summer of 2023.</li></ul>

# St Mary the Virgin, Pembridge

## Bats in Churches - Final Report 2023

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### 2. Introduction

#### 2.1 *The Bats in Churches Project*

- 2.1.1. This Report describes the outcome of bat surveys, liaison with stakeholders, the design and implementation of a Bat Management Plan (BMP) and subsequent monitoring of bat populations at the church of St Mary the Virgin, Bearwood Lane, Pembridge, HR6 9DZ. The Report is produced by Mortimer Environmental and Pure Ecology on behalf of Natural England, as part of the Bats in Churches Project.
- 2.1.2. The Bats in Churches Project (BiC) is a unique partnership between Natural England, the Church of England, the Bat Conservation Trust, the Churches Conservation Trust and Historic England and is supported by the National Lottery Heritage Fund. Churches have become increasingly important roosting sites for bats as populations have declined due to habitat loss and loss of old buildings. However, due to the open structure of these buildings, the faeces and urine associated with bat roosts can cause smell, mess and damage to important historic artefacts. BiC seeks to mitigate the perceived negative effects of bats on church users (such as damage to historic monuments from faeces and urine and an increased cleaning burden), while preserving the roosts and maintaining the favourable conservation status (FCS) of the bat populations concerned. For more information see <https://batsinchurches.org.uk/>.
- 2.1.3. In March 2019, Mortimer Environmental was commissioned by Natural England to undertake bat surveys and develop a BMP for the church of St Mary the Virgin (hereafter known as 'St Mary's'). This work was undertaken in partnership with Pure Ecology and in consultation with Davidson-Watts Ecology.

#### 2.2 *Site Description & Location*

- 2.2.1. St Mary's is located at Ordnance Survey grid reference SO 39090 58065. The church comprises a nave with north porch, north and south aisles and north and south transepts. It is a Grade 1 listed historic building, dating from the early 13th Century. The nave, north and south transepts and chancel arch were rebuilt during the early 14<sup>th</sup> Century with the north porch added in the late 14<sup>th</sup> Century. Later restoration works were undertaken in 1898 and 1957.



- 2.2.2. The building is constructed of sandstone rubble with some ashlar facing and ashlar dressings and has clay tiled roofs. Inside there is a trussed-rafter roof to the nave and transepts ([Church of St Mary | Historic England](#)).
- 2.2.3. There is a separate belfry situated 5 m north-east of the church. This is also Grade 1 listed, having early 13<sup>th</sup> Century origins and later reconstructed during the 15<sup>th</sup> and 16<sup>th</sup> Centuries. It is a timber-framed structure with later added sandstone rubble walls to the lower stage. It has weatherboard cladding, a lower hipped and upper pyramidal roof covered with stone slate and shingle to the spire ([BELFRY | Historic England](#)). The belfry does not lie within the responsibility of the parochial church council (PCC).
- 2.2.4. St Mary's is considered to be of high archaeological, architectural and historical significance (St Mary the Virgin, Pembridge, Statement of Significance 2019). Inside, the church contains two 15<sup>th</sup> Century chest tombs with effigies, a large 13<sup>th</sup> Century font and a Jacobean pulpit. There are trace wall paintings in the south transept and traces of the Lord's Prayer in the south aisle, dating to the 18<sup>th</sup> Century. There are thirteen framed tapestries embroidered in 2012-15 by members of the parish, depicting the history of Pembridge from the Domesday survey to the present day. These Pembridge tapestries are a visitor attraction and are located in the west nave.
- 2.2.5. The village of Pembridge sits in a rural location, with surrounding countryside represented by a mixture of grazed pasture, arable farmland and small patches of broadleaved woodland. The church sits to the south of the village, 80 m to the south of the main street (A44). The river Arrow lies 410 m to the north of the church and Mosely Common SSSI is 1 km to the west. The cemetery lies to the east of the church, situated in approximately 1 ha of closely mown amenity grassland. Immediately to the south of the churchyard is a moat and mound, where Pembridge castle once stood.
- 2.2.6. A site location plan and aerial view of St Mary's are shown in Figure 1.

### 2.3 Previous Studies of Bats at St Mary's

- 2.3.1. Herefordshire Mammal Group (HMG) Reports (2014-2017) indicate that a maternity colony of Natterer's bats (*Myotis nattereri*) was present inside St Mary's during the months of June in 2014-2017, with peak counts of 40 to 57 individuals. The maternity roost was located at the west end of the south aisle. Common pipistrelle (*Pipistrellus pipistrellus*) and soprano pipistrelle bats (*P. pygmaeus*) were also recorded inside the church and main entry/egress points to the church interior were under the eaves of the south transept and south nave.

### 2.4 Bat Roost Visit Report (2017)

- 2.4.1. A previous BiC Bat Roost Visit Report completed in August and September 2017 reported maternity colonies of Natterer's and pipistrelle bats present in the church along with brown long-eared bats

(*Plecotus auritus*), as indicated by the presence of droppings in the north transept (Bats in Churches Bat Roost Visit Report Form 2017).

- 2.4.2. Natterer's droppings were also recorded throughout the nave, north aisle, south aisle and south transept, and around potential exit points at the eaves on the west and east aspects of the south transept. Church wardens had reported the presence of dead bats and pups during the summer of 2017.
- 2.4.3. The issues raised in the 2017 Bat Roost Visit report included bats in the church interior, damage to furnishings/artefacts/memorial/organ, droppings, impact on community activities/use, impact on worship and smell. These issues had been present for longer than five years, with reports of urine staining and spotting to walls and pews, as well as damage to paintings, displays and models. Bats were also reported to disrupt worship, with droppings even falling during services.
- 2.4.4. Droppings and urine were reported to create a heavy cleaning burden, with cleaning taking place as often as the church is used (sometimes daily). Despite the issues caused by bats, church users had a neutral attitude towards them, stating that they are tolerant of the bats but want to eliminate the negative impacts of them.

## 2.5 *Statement of Significant 2019*

- 2.5.1. A Statement of Significance for St Mary's was commissioned by BiC in 2019 and produced by the Architectural History Society (St Mary the Virgin, Pembridge, Statement of Significance 2019). This report concluded that damage to artefacts and monuments by staining from bat urine was apparent, although there is not a major bat presence in the chancel, which contains a large number of furnishings and monuments of high significance. Outside of this area, items of high significance that were impacted by bats included the Jacobean pulpit and lectern, as well as the font and wall monuments.

## 2.6 *Relevant Protected Species Legislation*

- 2.6.1. All bats and any place used by bats for shelter (i.e., a roost) are legally protected under the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2017 (as amended) in England and Wales. When taken together this legislation makes it an offence to:
  - Kill, injure, take or disturb a bat (note that disturbance in this context refers to actions that could inhibit a bat's ability to survive and reproduce or rear their young, to hibernate or to significantly affect the local distribution or abundance of the species);
  - Destroy, damage, obstruct or otherwise interfere with a bat roost, breeding site or resting place, whether the roost is occupied at the time or not; and



- Sell, or offer for sale, a bat or any part thereof, live or dead.

2.6.2. The legislation that protects bats allows for licensing under Regulation 55 of the Conservation of Habitats and Species Regulations (2017) for the purpose of preserving public health, or public safety, or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment.

2.6.3. In accordance with the requirements of the Conservation of Habitats and Species Regulations (2017) a bat licence can only be issued where the following requirements are satisfied:

- that there is no satisfactory alternative; and
- that the action authorised will not be detrimental to the FCS of the population or species in their natural range.

2.6.4. Developed as part of the BiC project, works that may impact bat roosts in churches are permitted in special cases for trained ecologists through a Natural England Bats in Churches Class Licence (BiCCL). The licence gives highly trained ecologists flexibility to trial bespoke methods that attempt to minimise impacts of bats in churches where historic monuments are being damaged and/or bats are affecting the community's use of their church.

2.6.5. An application to Natural England for the BiCCL will assess the level of damage caused to the church. This includes an assessment of damage to monuments and artefacts, disruption to church activities and functions, and the burden of cleaning the building. Impacts caused by the presence of bats must be significant, and whilst there is not a prescribed threshold to evaluate damage, the National Heritage Protection Plan makes clear the importance of preventing damage to places of special architectural or historic interest. Users of this licence must implement management measures to safeguard bats and ensure the ecological function of the site is maintained.

## 2.7 *Aims & Objectives of BiC at St Mary's*

2.7.1. The BiC project aims to work closely with churches to gather ecological, built heritage and social information to inform the development of a 'Bat Management Plan' (BMP), with approaches designed to support the church in reducing the impact of bats on historic artefacts and church users. The project also aims to produce a sustainable network of skilled volunteers to provide ongoing support to church communities with bats. The specific aims and objectives at St Mary's (as detailed in Sections 3-7 below) were as follows:

- **Section 3: Bat Roost Visit Report & Bat Surveys 2019/20** – To hold an initial meeting with the parochial church council (PCC) and to complete a Bat Roost Visit Report of St Mary's during May

2019 to understand the issues caused by bats, the impact of bats on users of the church and the outcomes church users hope to achieve through participation in the project. To carry out a suite of dusk emergence/pre-dawn re-entry surveys during the bat activity period (May to September) at St Mary's, in collaboration with members of HMG, to identify the species of bat using the church, the type and location of roosts present, the entry/egress points and to evaluate the conservation significance of bat roosts in the church;

- **Section 4: Bat Management Plan** - To develop a BMP for St Mary's, in consultation with stakeholders, containing a suite of bespoke management measures aimed at reducing negative impacts of bats on church users and historic monuments. The plan will include an embedded mitigation strategy that adheres to the Mitigation Hierarchy of avoid, minimise or compensate for impacts on bats and bat roosts and which meets the FCS legal test under The Conservation of Habitats and Species Regulations (2017). To obtain a site registration for St Mary's under Natural England's BiCCL to undertake the works described in the BMP;
- **Section 5: BMP Phase 1** - To implement Phase 1 of the BMP and monitor any effects on bat populations;
- **Section 6: BMP Phase 2** - To refine or amend the BMP in light of Phase 1 works and to implement strategies under Phase 2. To monitor any effects on bat populations;
- **Section 7: Conclusions & Recommendations** - To assess the success (or otherwise) of different management options and the outcomes for bats, bat roosts and church users. To make recommendations for further work and ongoing monitoring of the bat roost resource at St Mary's.

### 3. Bat Roost Visit Report & Bat Surveys 2019/20

#### 3.1 *Internal/External Inspection Including Bat Roost Visit Report*

- 3.1.1. A daytime inspection and meeting with PCC members at St Mary's were undertaken on 3<sup>rd</sup> May 2019 by two experienced bat ecologists, one holding a Natural England Bat Class Licence WML CL18 (Bat Survey Level 2) bat licence. A Bat Roost Visit Report Form was completed in consultation with church wardens in order to evaluate the impacts of bats on historic monuments and on church users (Bat Roost Visit Report Form, St Mary the Virgin, 2019). The survey adhered to professional standards detailed in the *Good Practice Guidelines* published by the Bat Conservation Trust (BCT; 2016). Full details of the methodologies used are given in Bats in Churches Report, St Mary the Virgin Church, MDWE (2019).
- 3.1.2. The daytime inspection revealed faeces from a small sized bat (such as a pipistrelle) in the north and south aisles. Faeces that were larger in size were found scattered in the nave and south aisle, with large scatterings found in the south transept. These were identified as Natterer's bat faeces, and this was confirmed by DNA analysis carried out by SureScreen Scientifics. Full details and results of the internal/external inspection are given in Bats in Churches Report, St Mary the Virgin Church, MDWE (2019).
- 3.1.3. The Bat Roost Visit Report highlighted the following issues with bats at St Mary's: bats in the church interior, building repair work, damage to furnishings/artefacts/memorials/organ, droppings, impact on community activities/use, impact on worship, intolerance and smell. Church users reported damage to the fabric of the church, monuments, fixtures and fittings. They noted that all wooden furniture is marked with droppings/stains and that everything in the building can be affected by the faeces. Bats disrupt worship by flying around during evening events and because of the time required to clean before worship/events.
- 3.1.4. The outcomes the church representatives wished to achieve through working with the project were listed as follows:
- To manage the bats inside the church;
  - To raise awareness of the importance of the church for bats/biodiversity and involve local communities;
  - To receive support for cleaning bat mess.

### 3.2 Bat Surveys 2019/20

3.2.1. Full details of the methodologies used during surveys conducted at St Mary's during 2019 and 2020 are given in Bats in Churches Report, St Mary the Virgin Church, MDWE (2019), Bats in Churches Static Logger Survey (2020) and are summarised below:

- Dusk Emergence/Pre-dawn Re-entry Surveys: Three dusk emergence surveys and one pre-dawn re-entry survey were carried out between 10 May and 4 September 2019. Surveys followed professional standards detailed in the BCT *Good Practice Guidelines* (2016) and guidance provided by BiC. Surveys were undertaken by a team of four professional bat surveyors (one or more holding a Natural England CL18 [level2] bat licence). Surveyors used bat detectors recording echolocation calls in full spectrum output and Canon XA11/XA25 camcorders equipped with infrared (IR) torches and set to IR recording mode. Members of HMG also attended surveys.
- Static Automated Acoustic Monitoring: A static acoustic recording device (SM4, Wildlife Acoustics) was deployed in the interior of St Mary's on 19 July and left *in situ* for 14 days. The device was set to record from one hour before sunset to one hour after dawn. Recorded bat calls were analysed using Kaleidoscope Pro software (Wildlife Acoustics).
- Winter Hibernation Surveys: Two static acoustic recording devices (SM4, Wildlife Acoustics) were deployed in the interior of St Mary's on 16 January 2020 and 03 February 2020 and left *in situ* for 10 days on both occasions. Units were set to record from one hour before sunset to one hour after sunrise and calls were analysed using BatExplorer Pro and BatSound software (Elekon).

3.2.2. Surveyor locations, positions of IR cameras and locations of the static acoustic devices are shown in Figure 2.

3.2.3. Surveys show that St Mary's supports four species of roosting bats (common pipistrelle, soprano pipistrelle, brown long eared bat and Natterer's bat). Brown long-eared bats and a single serotine bat were also recorded inside the church by the static acoustic recording device.

3.2.4. Bat activity inside the church in 2019 was significantly lower than that recorded by HMG in previous years. No bats were detected using roosts in the western end of the south aisle or nave, which have previously supported a maternity colony of Natterer's bats. Seven day roosts inside the church supported one or two Natterer's bats, with a peak count of seven bats in total using the church between May and September 2019 (Figure 2). This indicates that the Natterer's maternity colony was likely to be using a site located elsewhere in the local area during 2019.

3.2.5. Bats were seen emerging from the church interior at locations in the south transept (Figure 2). Other emergences of single common pipistrelle bats may have originated from day roosts located within the exterior building structure (Figure 2).

- 3.2.6. Roosts of other species within the church supported low numbers of bats in 2019, with peak counts of seven common pipistrelle, three soprano pipistrelle and one brown long-eared bat. However, there was regular and continuous night time bat activity within the church, with sustained periods of socialising by several species.
- 3.2.7. Churchwardens reported a general reduction in droppings seen in the church in 2019 compared to previous years, with significantly less in the area previously used as a maternity roost. However, there remained a substantial cleaning burden throughout the breeding season. Bats flying and socialising inside the church appeared to produce the widespread and scattered bat faeces and urine. Natterer's bat activity was determined to be the main cause of the problem, with this species switching roosting locations frequently over the course of the summer and generating most of the scattered faeces.
- 3.2.8. Winter hibernation surveys recorded common and soprano pipistrelle bats using the interior of St Mary's through the 2020 hibernation period. A single brown long-eared bat call was detected during January. There was no evidence to suggest that Natterer's bats use the church as a hibernation roost.

### 3.3 *Ecological Evaluation & Impact Assessment*

- 3.3.1. Biological Records Centre data were provided by Herefordshire Biological Records Centre (HBRC) in February 2023 for records of bats within a 2 km radius of St Mary's. Multi-Agency Geographic Information for the Countryside (MAGIC) Maps website ([www.magic.gov.uk](http://www.magic.gov.uk)) was searched for European Protected Species (EPS) mitigation licences relating to bats within 2 km of the church.
- 3.3.2. There were 83 records of bats within 2 km of St Mary's within the last 10 years (data proved by HBRC). Of these, 60 records appear to relate to the church and surrounding area of moat (grid reference SO390580) and include common and soprano pipistrelle, brown long-eared bat, Natterer's bat and noctule (*Nyctalus noctula*), including a maternity colony of Natterer's bats in 2014-2017. The remaining records relate to common and soprano pipistrelle and unidentified *Myotis* species, recorded in fields and gardens surrounding the Pembridge area. There were no records of EPS mitigation licenses relating to bats recorded within 2 km of the site.
- 3.3.3. The church has been assigned an ecological value based on the approach described in the 'Guidelines for Ecological Impact Assessment in the UK & Ireland' published by the Chartered Institute of Ecology and Environmental Management (2018) which defines the resource (in this case the bat roost resource within the church) within a geographical context. Full details can be found in Bats in Churches Report, St Mary the Virgin Church, MDWE (2019).
- 3.3.4. Although surveys in 2019 did not indicate the church was being used as a maternity roost, it is considered as such for the purposes of the assessment due to its' presence there in the past. Natterer's

bats in England are considered to be common and widespread and population sizes have increased since 1999 (BCT, 2018). The Natterer's bat maternity roost is therefore considered to be of *local* level value.

- 3.3.5. Brown long-eared bats are considered widespread and common with stable populations since 1999 (BCT, 2018). They are also a NERC 2006 S41 species of principal importance. The brown long-eared bat day roost is therefore considered to be of *site* level value.
- 3.3.6. Soprano pipistrelles are considered common and widespread and their populations have been stable in England since 1999. They are listed as species of principal importance on the NERC Act S41. The soprano pipistrelle occasional day roost and hibernation roost is therefore considered to be of *site* level value.
- 3.3.7. Common pipistrelle populations are considered to be increasing in England since 1999 and are common and widespread. The common pipistrelle occasional day roost and hibernation roost is therefore considered to be of *site* level value.
- 3.3.8. Proposed measures aimed at eliminating or reducing Natterer's bat activity (and the associated impacts of faeces and urine) at St Mary's need to consider the potential consequences, including the loss of day roosts and a maternity roost, a reduction in available area for socialisation and the risk of disturbance of the main Natterer's bat maternity roost. Additionally, impacts could result in the loss common pipistrelle, soprano pipistrelle and brown long-eared bat day roosts and hibernation roosts. Overall, this would result in a permanent negative effect on bats that would be significant at the *local* level.

#### 3.4 *Stakeholder liaison & public engagement*

- 3.4.1. Meetings were held in May and October 2019 with the PCC, ecologists from Mortimer Environmental and Pure Ecology and BiC stakeholders, including the BiC Heritage Advisor, BiC Engagement Officer, DAC Secretary, Historic England, church architect and churchwardens. Meetings were used to explain the aims and objectives of the BiC project, to understand the issues caused by bats at St Mary's and the outcomes church users hope to achieve. Additionally, meetings allowed for the results of the bat surveys undertaken in 2019 to be explained and to support development of a BMP that seeks to mitigate negative effects of bats whilst safeguarding the FCS of bat species using the church.
- 3.4.2. A further meeting was held with the Chair and Bat Lead at HMG, to establish their participation in the project (including taking part in surveys and long-term monitoring of project outcomes) and offer training opportunities to local bat volunteers.
- 3.4.3. A 'Bat Night' was held at the church on 17 August 2019 organised by an ecologist from Mortimer Environmental, the BiC Engagement Officer and members of the PCC. The night consisted of a



presentation about bats and the BiC project, bat themed activities and refreshments, identification of bat droppings inside the church and use of bat detectors to identify bats emerging from the church at dusk. It was attended by approximately 35 members of the public and volunteers from HMG.

- 3.4.4. The meeting outcomes and the BMP developed in consultation with church users are described in Section 4, below.

## 4. Bat Management Plan

### 4.1 Meeting Outcomes

- 4.1.1. Meeting outcomes show that church users are tolerant of the bats at St Mary's, but not of the mess they produce, which damages artefacts and creates a substantial cleaning burden. The mess is produced by the Natterer's maternity colony roosting in the west end of the south aisle (in previous years) and by Natterer's bats flying and socialising in the church. The latter causes a widespread scattering of bat faeces and urine, which is particularly problematic for church users.
- 4.1.2. Meetings discussed the following options to mitigate the adverse effects of bat activity within the church:
- Excluding bats from the church by closing access and egress points and the difficulties associated with this in a church the size of St Mary's;
  - Deterrents - directed use of artificial lighting or acoustic deterrents to modify Natterer's bat flight patterns within the church and discourage bats from flying over the pews, kitchen and other areas regularly used by the congregation;
  - Coverings and guards to catch droppings – where possible, design covers or partitions in proposed bat flight areas to capture bat droppings, with the aim of providing measures that will reduce the cleaning burden and enable the church to be cleaned more efficiently when required;
  - Roost exclusion – permanent exclusion of bats from roost locations that are causing major conflict; and,
  - Compensatory roost features – install bat boxes with the aim of creating an array of artificial roosts with a range of temperatures that Natterer's bats can use throughout the breeding season, depending on their reproductive status and energy requirements.
- 4.1.3. The feasibility of each option was discussed and considered with respect to maintaining the FCS of the Natterer's bat population. With agreement of church users and stakeholders, the BMP outlined below was developed with several management options aimed at mitigating the impacts of faeces and urine on St Mary's, to be carried out under a Natural England BiCCL.
- 4.1.4. The BMP was split into two phases, with the option to review and amend the second phase of works in light of the findings/effectiveness of the first phase. The full BMP, along with a review of alternative methods to deliver the objectives and further justification of the proposed methods, can be found in Bats in Churches Report, St Mary the Virgin Church, MDWE (2019). A summary of the BMP is given below in Table 1.

**Table 1.** Bat Management Plan for St Mary the Virgin, Pembridge

Prescription	Method	Timings	Rationale
<b>PHASE 1</b>			
Radiotracking of Natterer's bats at St Mary's	Two trapping /tagging and radiotracking surveys of five bats per session	May/June and August/Sep 2020	To confirm access/exit points and identify other roost locations within the large church interior. Other roosts in the local area to be identified, which is essential for understanding the context of St Mary's as part of a wider linked roost resource and how and why the maternity colony may switch roost locations between years.
Roost monitoring and recording social activity	Two surveys using night vision cameras to monitor roost behaviour and social activity at the western end of the nave and south transept and/or other areas of the church that support colony roosts in 2020. The objective was to record a minimum of three nights activity in core areas occupied Natterer's bats.	May/June and August/Sep 2020	Video footage captured by IR camera or thermal imaging to be analysed to assess the type and level of Natterer's bat activity in colony core areas where the build-up of bat faeces is problematic for church activities.  To understand the types of bat behaviour that are causing the scattering of faeces, and to obtain results against which the effectiveness of the management plan can be assessed.
Monitoring of faeces	One survey per month in the absence of cleaning for up to seven days prior to survey. Systematic counts or sweep, collect and weigh.	May – September 2020	Establish accurate and systematic baselines for quantities of bat faeces from which future quantitative assessment/analysis of success of mitigation/deterrent measures can be reliably assessed.
Exclude bats from roosts in sensitive areas of the church	Emergence checks and soft blocking of roosts on three consecutive nights, followed by permanent access blocking.	Autumn 2020	Excluding bats from roosts in sensitive areas of the church (west nave and east nave above the pulpit and lectern) to prevent faeces and urine from damaging important monuments and the Pembridge tapestries.
Provision of compensatory roost features under the eaves of the south aisle	Identify new locations at the western end of the church and south aisle to build bespoke under-eave roost boxes.	Autumn 2020	Provide alternative roosting locations and compensation for loss of roosts in the nave, maintaining FCS of the bat population.

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Prescription	Method	Timings	Rationale
Enclose the area used previously as a maternity roost	Boarding of the gap between the wall and first beam in the west end of the south aisle, ensuring access points are provided at both top and bottom of boarded roost feature.	Autumn 2020	To prevent faeces from the maternity roost falling into the church interior, reducing the cleaning burden for volunteers.
Monitoring of excluded and new roosts	Emergence surveys of new roosts and former roost locations via walked transects	May-September 2021	To determine effectiveness of exclusion measures and monitor use of new roosts.
Monitoring of faeces	One survey per month in the absence of cleaning for up to seven days prior to survey. Systematic counts or sweep, collect and weigh.	May – September 2021	To provide an accurate and systematic assessment of quantities of faeces to be compared against the established baseline, to assess effectiveness of roost exclusion measures.
Phase 1 Assessment & Development of Phase 2	Evaluations of success (or otherwise) of Phase 1 works with the PCC. Further development of the BMP and implementation in Phase 2.	2021-2022	Undertaking bat management and mitigation methods using an incremental approach allows flexibility to adapt and develop the plan as necessary to achieve success. If closure of roosts and enclosing the maternity roost fail to reduce levels of bat faeces and urine inside the church, a more experimental approach may be adopted.
<b>PHASE 2</b>			
Use of deterrents to prevent bats from flying and socialising in the church interior	An experimental approach	May-September 2023	If after implementation of Phase 1, bat faeces and urine continue to cause issues for church users, the BMP will be developed and refined as necessary. Furthermore, an experimental approach to deterring bats from flying in certain areas will be considered, in consultation with Natural England, to ensure the FCS of bat populations is maintained.

## 5. Implementation of BMP Phase 1 (2020-2022)

### 5.1 Bat Activity Surveys 2020

- 5.1.1. It was not possible to undertake radiotracking surveys during the summer of 2020, due to restrictions imposed during the COVID-19 pandemic. Therefore, surveys were adapted to provide information on roost locations inside St Mary's and consisted of dusk through to dawn walked transect surveys of the church interior. The details of these are described in full in St Mary the Virgin Church, Pembridge Update Bat Surveys (2020) and are summarised below.
- 5.1.2. Together with surveys of faeces undertaken throughout the summer months (detailed below), internal walked transect surveys were used to confirm key areas where roost locations and social activity was causing issues with levels of bat faeces. In summary, two surveys were undertaken on the 18<sup>th</sup> of June 2020 and the 12<sup>th</sup> of August 2020 by two surveyors (one holding a Natural England CL18 [level 2] bat licence) equipped with bat detectors recording echolocation calls in full spectrum output, two Canon XA11 camcorders equipped with infrared (IR) torches and set to IR recording mode and Thermal Eye X200xp lighting. Surveys began 15 minutes before sunset and finished 15 minutes after sunrise. Members of the Herefordshire Mammal Group also attended the survey in June and carried out dusk emergence observations of the church exterior. Surveyor locations and positions of IR cameras are detailed in Figure 3.
- 5.1.3. Two static acoustic recording device (SM4, Wildlife Acoustics) were deployed in the interior of St Mary's on the 6<sup>th</sup> of June 2020 and the 12<sup>th</sup> of August 2020 and left *in situ* for six days. Devices were set to record from one hour before sunset to one hour after dawn and recorded bat calls were analysed using BatExplorer Pro and BatSound software (Elekon).
- 5.1.4. The internal survey in June recorded up to six Natterer's bats, two common pipistrelle and one soprano pipistrelle bat. In August, 25 to 35 Natterer's bats were recorded in the church. The core colony roost areas were in survey zones 4, 5 and 7 (Figure 3) where social activity and roost swarming behaviour was observed and recorded. Most of the flying and social behaviour was recorded in the roof apex. Internal and external surveys confirmed access points in the south and north transepts and west gable wall, with bats predominantly using the south transept access points for entering and leaving the church.
- 5.1.5. As in 2019, surveys showed that the maternity colony of Natterer's bats were likely to be using an alternative area to roost during the earlier part of the breeding season (May to July) as numbers of bats recorded inside the church at this time was low.
- 5.1.6. Static acoustic recording devices identified Natterer's bats, common and soprano pipistrelles during both periods of survey and a single brown-long eared bat inside the church during August. Activity

was higher during August than in June, with a greater number of call being recorded in the south transept and east nave than the north aisle.

## 5.2 *Bat Faeces Surveys 2020*

- 5.2.1. Surveys of bat faeces inside St Mary's were undertaken each month between June and September inclusive (it was not possible to survey during May as the church was closed due to the COVID-19 pandemic). Full details of the surveys and methodology can be found in *Temporal & Spatial Analysis of Bat Droppings at St Mary the Virgin (2020)*.
- 5.2.2. The results showed that the mass of faeces falling inside the church fell between June and July, before increasing again in August and peaking in September. This was in line with the increase in colony size and associated social behaviour observed during internal bat surveys in 2020. Faeces were found consistently scattered around the south transept throughout the summer, and in the nave during August. Large accumulations of faeces were observed beneath core roosts in the west nave and east nave, corresponding with locations of roosts identified by internal bat surveys.

## 5.3 *Management Works 2021*

- 5.3.1. Internal bat surveys and surveys of faeces were used to identify core roost locations and centres of bat activity that were causing issues with faeces and urine. This information was used to refine the BMP, to confirm which roosts bats should be excluded from and to inform a BiCCL application and an application for Faculty Permission (the permissive right to undertake works to a church building or its contents).
- 5.3.2. Although four species of bat were identified roosting at St Mary's, surveys confirmed that Natterer's bats are the cause of a majority of the bat faeces in the church, with socialisation behaviour around roosts producing accumulations of droppings in these areas. Areas of most concern were confirmed as being in the west nave (around the font and tapestries) and east nave (around the pulpit and lectern).
- 5.3.3. Faculty Permission for the bat management works was not granted until late in 2020, meaning works were rescheduled for April 2021 instead of October 2020. Works proceeded as follows, in accordance with the BMP:
  - Blocking of roosts identified in the west nave and east nave in key areas containing important monuments, to prevent bat faeces and urine from falling in these areas and causing damage to church artefacts. Roosts were accessed using a cherry-picker, with roost exclusion activities undertaken after sunset and after endoscope inspections showed roosts to be unoccupied;



- Enclosure of a roost feature located at the west end of the south aisle which had been used previously as a maternity roost, to prevent faeces from falling into the church interior. Even though Natterer's bats had not formed a maternity colony at St Mary's during 2019 and 2020, these works proceeded in the event that bats should return to this area in the future. This area was enclosed by wooden boarding, with access holes for bats provided at the top and bottom (Figure 4, for location see Figure 6);
- Provision of bespoke compensatory roosts under the eaves of the south aisle. Eaves boxes were designed in consultation with the church architect at Baart, Harris, Newall and these plans are shown in Figure 5 below, with the location of the eaves box shown in Figure 6. Boxes were designed to provide a range of roosting opportunities for bats, with crawling spaces between sections to allow access to the full extent of roost features. An access/egress point to the outside was created to allow bats to enter and leave the roost to the south. Sliding doors to the front provide the option to enclose the roost in the future, preventing bats from accessing the church interior from this location (doors were initially left open to allow bats to find and familiarise themselves with the roost);
- Further alternative roosting options were provided in the form of crevice and chamber bat boxes that were erected in the south transept, south aisle and above the north porch (Figure 6).

#### 5.4 *Bat Activity Surveys 2021*

- 5.4.1. Previous surveys undertaken in 2019 and 2020 (described above) showed that Natterer's bats used roost resources in the east and west nave, which created issues with falling faeces and urine. Use of roost resources in the church changed during the season and across years, therefore closure of some roosts would be unlikely to result in removal of the roost resource from the church, but should reduce use of key activity areas, helping to protect important artefacts and monuments.
- 5.4.2. In 2021, internal bat activity surveys, dusk emergence and pre-dawn re-entry surveys, radiotracking surveys and surveys of faeces were used to assess how bats were using the church after closure of roosts in the east and west nave and enclosure of an area in the south aisle previously used as a maternity roost. Surveys aimed to monitor bat activity, roosts and access points inside the church, to identify linked roost resources in the wider Pembridge area and to assess quantities of bat faeces inside the church compared to those before management works were undertaken.
- 5.4.3. Full details of the bat surveys undertaken in 2021 and methodologies used are given in St Mary the Virgin Church, Pembridge Monitoring Report (2021). In summary, internal surveys were carried out by two surveyors (one holding a Natural England CL18 [level 2] bat licence) equipped with bat detectors recording echolocation calls in full spectrum output, Canon XA11 camcorders equipped with infrared (IR) torches and set to IR recording mode and a FLIR E75 thermal imaging (TI) camera set to recording

mode. This combination ensured the wider field of view provided by the TI camera could be used to identify roost locations from their heat signature and the narrower field of view with higher resolution provided by the IR camera could be used to record behaviour at identified roosts. Surveys were undertaken on consecutive days between the 1<sup>st</sup> and 5<sup>th</sup> of June 2021, and on the 31<sup>st</sup> of August and 1<sup>st</sup> of September 2021. Surveys commenced 15 minutes before sunset and finished 120 minutes after sunset.

- 5.4.4. Dusk emergence and pre-dawn re-entry surveys were also conducted on the 13<sup>th</sup> of July and the 13<sup>th</sup> of August 2021 respectively. Survey methodology followed that described for 2019 and 2020 above.
- 5.4.5. Overall, numbers of bats using the church in 2021 were low and the maternity colony was not present inside the church during the beginning of the breeding season. Activity increased through the season, with peak counts of four to six Natterer's bats recorded using the church in September. Most roosting activity was associated with a loft area in the south transept, in contrast to use in the nave in previous years. A summary of bat survey results, along with a plan of excluded roosts, the enclosed roost and compensatory bat boxes can be found in Figure 6.
- 5.4.6. Surveys revealed that small numbers of Natterer's bats are still using roosts in the west nave, despite closures in this area. Flying and socialising occurred in this area, increasing later in the year (late August). No bats were recorded using roosts in the east nave, but socialisation occurred in this area. Therefore, while most roost exclusions were successful, bats found new roosting locations in nearby roof trusses. Socialisation continues in these key areas and may cause on-going issues with faeces and urine.

## 5.5 *Bat Radiotracking 2021*

- 5.5.1. Radiotracking surveys of Natterer's bats were undertaken in 2021 to identify additional roosting locations inside the church, to monitor the effect of licenced roost closures on bat populations and to identify linked roost resources in the local area. The church interior was previously used as a maternity roost in 2014-2017, but this roost was absent from the church during 2019-2021. Therefore, radiotracking was considered essential to assess the importance of the roost resource at St Mary's in the context of the wider area.
- 5.5.2. Full details of the methodology employed for the radiotracking surveys is provided in St Mary the Virgin Church, Pembridge Radiotracking Report (2021). Two trapping and radiotracking surveys of approximately seven days duration were undertaken in June 2021 and August/September 2021. Surveys were undertaken in line with BCT *Good Practice Guidelines* (2016), by surveyors holding Natural England CL19/20 [level 3/4] bat licences and working under a Natural England BiCCL.

- 5.5.3. Bats were trapped using a combination of a hand net with pole extenders, mist nets and harp traps and fitted with lightweight radio-transmitter tags (Biotrack). Lactating bats were tagged if they met a target weight and were in good condition. Female bats in advanced stages of pregnancy or early lactation were not tagged. Tagged bats were located and tracked with a Sika receiver (Lotek) and a 3-element Yagi antenna (Biotrack). Bats were located during the day to find roost locations and tracked for 3 to 4 hours after release or emergence. Radiotracking fixes were plotted in the field on digitised 1:25,000 scale Ordnance Survey maps and later analysed in Ranges 9 (Anatrak) to calculate home ranges.
- 5.5.4. Once accessible roost sites were identified, exit counts were undertaken using Canon XA11 camcorders equipped with IR torches and set to recording mode.
- 5.5.5. Five Natterer's bats were tagged during each of the two surveys, including nine adult females and one juvenile male (one tag failed, giving a final sample size of nine). Each bat was tracked for between two and four days. Data indicated that the total home range of the colony is approximately 461 ha, with an average individual home range of 54 ha. Foraging areas were primarily along the treelined watercourses of the River Arrow and Curl Brook to the north of Pembridge and within small woodlands and copses to the south (Figure 7).
- 5.5.6. No tagged bats were found to be roosting in St Mary's in June 2021. However, a bat trapped in the moat next to the church was tracked to a roost in a neighbouring property approximately 100 m from the church. Bats tracked to this location roosted here for the duration of the survey in June, within a colony with a peak count of approximately 30 bats. During August/September 2021, tagged bats roosted above the south aisle and west nave of St Mary's, with one bat also roosting in the nearby belfry.
- 5.5.7. To summarise, radiotracking surveys revealed that the roost resource at St Mary's is important within the wider context of the surrounding area, with the maternity colony being located outside of the church in 2021. The pattern of roost use has been found to vary across years and also within breeding seasons, possibly in response to changing weather conditions. After using roost resources elsewhere at the beginning of the season in 2021, Natterer's bats were shown to return to the church for roosting and socialising in August and September. Radiotracking allowed for the identification of additional roosts inside the church and also revealed that implementation of management option in 2021 had no detectable effect on the FCS of the population.

## 5.6 *Bat Faeces Surveys 2021*

- 5.6.1. Surveys of faeces were conducted in 2021 using the same methodology as in 2020. Full details are provided in Temporal & Spatial Analysis of Bat Droppings at St Mary the Virgin (2021). There were

negligible quantities of faeces recorded in the church during visits in May and June, but quantities increased markedly in July, before reducing again in August and September. Most faeces were located in the south transept, corresponding to roost use in this area observed during internal bat surveys. However, faeces were scattered throughout the nave, with an accumulation in the east nave recorded during the August survey, again corresponding to patterns of socialisation observed during internal bat surveys.

- 5.6.2. Overall, the mass of faeces collected in the church interior fell by 41% compared to 2020. Notably, accumulations that were present in the west nave and in the area of the pulpit and lectern in the east nave in 2020 were not detected in 2021. This suggests that measures to close roosts in these areas were effective in reducing the quantity of faeces that fell in close vicinity to key church artefacts in these areas. However, accumulations were found in other areas of the west and east nave, showing that bats were switching to roost locations nearby rather than moving away from the area entirely.

## 5.7 *Bat Activity Surveys 2022*

- 5.7.1. A dusk survey undertaken on the 8<sup>th</sup> August 2022 found the Natterer's colony had dispersed from the church. A team of four surveyors comprised of two professional ecologists and two HMG volunteers covered the south aisle and south transept, with two surveyors inside the church and two surveyors monitoring known external access points. Surveys followed professional standards detailed in the BCT Good Practice Guidelines (2016) with each surveyor using bat detectors recording echolocation calls in full spectrum output. One surveyor positioned in the south aisle was equipped with a Canon XA11 camcorder fitted with IR torch. The camera was positioned on the bat enclosure box at the western end of the south aisle, shown on Figure 6. The bat enclosure box was known to have been used by breeding females earlier in the year because grounded pups had been found under the roost entrance in June.
- 5.7.2. There was very low activity inside the church in August. One Natterer's bat was recorded in the south transept, and appeared to exit the church at 21:55hrs (95 minutes after sunset). Four Natterer's bats also possibly emerged from the south transept of the church between 21:24-21:40hrs, and may have been roosting at the top of the south transept wall, and four common pipistrelle bats emerged from external crevices in the south aisle.
- 5.7.3. With the Natterer's bat colony having dispersed from the church the decision was taken not to undertake a second dusk survey in 2022.

## 5.8 *Bat Faeces Surveys 2022*

- 5.8.1. Surveys were conducted using the same methodology as in 2020 and 2021 and further details can be found in *Temporal & Spatial Analysis of Bat Droppings at St Mary the Virgin (2022)*. In contrast to previous years, the mass of faeces falling inside the church increased markedly for the period of May to June, but was almost negligible in August. This was due to large accumulations of faeces in the west end of the south aisle under the enclosed area that had previously been used as a maternity roost. Inspection with a torch from ground level revealed that bats were roosting inside the enclosed area and the presence of grounded Natterer's bat pups underneath confirmed this was a maternity roost.
- 5.8.2. In July, faeces were found under the maternity roost and in the south transept and west nave. Very low levels of faeces were observed in the church through August and September. As in 2021, accumulations of faeces were not observed in the immediate vicinity of the lectern and pulpit. Overall, the mass of faeces showed a 1.5-fold increase between 2020 and 2022 and a 2.7-fold increase between 2021 and 2022. A graph of the mass of faeces collected from St Mary's each month between May and September, for 2020, 2021 and 2022 is shown in Figure 8.
- 5.8.3. Surveys carried out at St Mary's between 2019 and 2022 have shown contrasting patterns of roost use by Natterer's bats. In some years, bats form a maternity colony outside of the church in a neighbouring property, before returning later in the season to roost and socialise. In other years (such as in 2022), the maternity colony forms inside the church, at the west end of the south aisle. Later in the season, bats are largely absent from the church, indicating the colony has dispersed elsewhere.
- 5.8.4. This creates two separate issues with bat faeces, which may change on a year-to-year basis. Firstly, scattering of faeces and urine can occur over large areas of the church, particularly the south transept and nave when bats use the church for flying and socialising once juveniles are on the wing. Secondly, large accumulations of faeces can occur in the area of the south aisle underneath the maternity roost. This area needed to be blocked off from the public in 2022 due to the mess created, despite the area having been enclosed during 2021 management works.

## 5.9 *Summary of BMP Phase 1*

- 5.9.1. In 2020, a bespoke BMP was developed for St Mary's to manage the impacts of bat faeces and urine on the church and church users while maintaining the FCS of resident bat populations. Surveys undertaken between 2019 and 2022 indicate that a colony of Natterer's bats using the church to roost and socialise are causing the issues identified. The colony of bats use the church in a dynamic and complex manner, as part of a network of linked roosts in the local area, including neighbouring properties and the belfry.

- 5.9.2. Bat urine and faeces cause damage throughout the church. In particular, important monuments and artefacts are affected, including the pulpit and lectern in the east nave and the font and tapestries in the west nave. As part of the BMP, bats were excluded from these locations in 2021. Subsequent surveys and monitoring revealed this was successful in reducing bat activity in these areas and in particular in protecting the lectern and pulpit. However, flying and social behaviour continues in these areas and bats are also finding alternative roosting locations in nearby roof trusses.
- 5.9.3. A maternity colony of Natterer's bats was not present in the church during 2019-2021. However, management options were implemented to enclose the area used previously as a maternity roost, to prevent faeces from falling into the church interior. The maternity colony returned to the church in 2022 and roosted in the enclosed area in the west end of the south aisle, demonstrating that the management works were successful in preserving this roost and protecting the FCS of the maternity population. However, faeces continued to fall into the church as bats were roosting directly above a small access hole created at the top of the now enclosed roost. Consequently, minor adjustments to the enclosed roost area and associated access hole will be required before the start of the 2023 breeding season to address this issue and provide church users with the reduced cleaning burden they are anticipating.
- 5.9.4. In years when the Natterer's bat maternity colony forms outside of the church, bats appear to return to St Mary's later in the season to roost and to socialise. This continues to result in scattering of faeces and urine over wide areas of the church interior. This issue is particularly problematic in the nave and south transept, where it creates a considerable cleaning burden. Adaptations to Phase 2 of the BMP need to consider the differing patterns of roost use at St Mary's across years and adopt novel approaches to deter bats from flying and socialising in distinct areas of the church in order to address this ongoing concern. In addition, consideration may be given to maintain and improve the wide roost resource in the Pembridge area, such that bats are encouraged to spend less time inside the church during the breeding season.



## 6. Implementation of Bat Management Plan Phase 2 (2022-2023)

### 6.1 *Revision of BMP*

- 6.1.1. In light of the results of the implementation of Phase 1 of the BMP, further refinements are required, which are planned to be implemented in Phase 2 in 2023.
- 6.1.2. Excluding Natterer's bats from roosts in sensitive areas of the church during Phase 1 of the BMP appears to have been successful in reducing quantities of bat faeces falling in discreet areas, helping to protect and preserve important artefacts and monuments, such as the pulpit and lectern. However, faeces may still fall into the church below other roosts close by and flying and socialising behaviour of bats inside the church continues to result in widespread scattering of faeces and urine throughout large areas of the church interior.
- 6.1.3. Flying and socialising behaviours could potentially be reduced in certain areas of the church through the use of deterrent approaches. Further research is needed in this area and an experimental approach is currently being planned for St Mary's during the summer of 2023, in consultation with Natural England.
- 6.1.4. Enclosure of the roost used by the maternity colony of Natterer's bats was partly successful. Bats returned to roost in this area in 2022 and used the roost inside of the boarded area, accessing it through a gap left at the top. However, bats roosted directly above the access hole resulting in faeces falling into the church again, creating a large area of mess. It is expected that a minor adjustment to the design of the enclosure and the associated access hole should prevent this from happening in the future, ensuring bats can continue to use this area as a maternity roost, with further reduction in impacts on church users.
- 6.1.5. Work to add an internal baffle to the enclosed area, to direct faeces away from the access hole, is scheduled for mid-April 2023.

### 6.2 *Further Work for 2023*

- 6.2.1. Due to delays in the proposed schedule of surveys, monitoring and BMP works caused by the COVID-19 pandemic, ongoing monitoring of the bat population at St Mary's will continue through the 2023 bat breeding season, to include emergence surveys and surveys of faeces. These surveys will monitor the effects of adjustments to the roost enclosure and the effects of bat flying and socialising behaviour before, during and after the scheduled lighting trial.
- 6.2.2. This period will also include a handover of future surveying and monitoring of bat populations at St Mary's to members of HMG. Bat volunteers have agreed to undertake annual surveys at St Mary's from 2023 onwards and to report their findings back to Natural England.

### 6.3 *Public Engagement*

- 6.3.1. Ecologists from Mortimer Environmental will be attending a bat event taking place at St Mary's during June 2023 as part of the 'Love Your Burial Ground' week. This will include bat-related children's activities and a bat walk, organised by the PCC, BiC, Mortimer Environmental and HMG. It is anticipated that this will raise the profile of the BiC project and will increase awareness and knowledge of bats in the local community, including the importance of protecting and enhancing bat habitats in the village. We have also contributed material to information boards to be erected inside the church and to St Mary's new website (currently under development), describing our involvement with the church, results of bat surveys and providing a link to the BiC project.

## 7. Conclusions & Recommendations

### 7.1 Conclusions

- 7.1.1. The localised roost closures completed at St Mary's church under licence from Natural England in 2021 proved to be effective in significantly reducing the quantity of bat faeces falling over the pulpit and lectern. However, the reduction in quantities of bat faeces falling over remaining areas of the church, as recorded in 2021, did not continue through subsequent years, and reflects the considerable challenges associated with bats, including the resident Natterer's bat maternity colony. These regularly switch roost locations, and make use of a large number of potential roost features present within this large, complex, historic structure.
- 7.1.2. Nonetheless, enclosure of the Natterer's bat maternity roost at the western end of the south aisle was successful, in that bats readily accepted the adapted roost feature, and whilst faeces continued to accumulate beneath this now enclosed roost in 2022, monitoring suggests that minor adjustment to the design of the roost will address this issue and contain the faeces within the roost. Work to adjust the roost design has been scheduled for April 2023, after which it is anticipated the quantity of bat faeces falling in this location will reduce significantly.
- 7.1.3. For the purposes of this report, and to assess how church members viewed the success of the project, the churchwardens at St Mary's were asked questions regarding their participation. Their answers are given in Table 2, below.

**Table 2.** PCC Feedback Regarding Participation in the BiC Project.

Question:	Response:
Are you glad you have participated in this project? Why?	We are very happy to have participated in this scheme. By working together with the Church of England, Natural England and ecologists we hope our project can be used to develop future schemes to enable churches to protect the fabric of their churches and help protect the bats, as required by the legislation that is in place.
Do you feel attitudes to bats at St Mary's have improved due to participation in the project?	Yes- by engaging with this scheme we have shared with our PCC and congregation the process we have been through and enabled them to recognise that the church can be used by both congregations and bats. Most but not all have engaged with this.
Has the church benefitted in any way from participation? How?	Yes- the scheme has introduced some mitigation measures, which haven't actually got rid of our original problem but has tried to manage the movement of bats so that any problems are contained in certain areas. It has also provided us with information and displays which are on show for our visitors advising of the work that has been carried out by this project and introducing people to this scheme. The scheme has also supported events where we have engaged with people, encouraging them to be aware

Question:	Response:
	of the bats within our church and its surrounding area and to provide information and guidance as to their protection. We have also received practical advice with regard to the cleaning of our church and the lessening of damage to the fabric contained within it. It has also highlighted the legal responsibilities of managing a building that also houses bat colonies.
Do you feel this project has been a success? What improvements could be made?	This project is successful in the fact that it has brought together the ecologists, who have the knowledge to monitor and introduce schemes to mitigate against damage and the church members who have had the job of trying to protect the fabric of their buildings from damage, caused by a species which is protected by law. As the project is coming to the end there needs to be set guidance and support for all churches who have a problem and that there is continuing support for those who have already taken part in the scheme. The work that has already been carried out needs to be used to guide future projects and must not be allowed to just disappear when the scheme comes to the end.

7.1.4. It is considered that the BiC project at St Mary's has achieved success in delivering the key outcomes of reducing bat mess in sensitive areas of the pulpit and lectern and by reducing the overall quantity of bat faeces falling inside the church through enclosure of the Natterer's bat maternity roost. Furthermore, the project has increased awareness of the importance of the church for bats and involved local communities in educational events at the church, in addition to providing training opportunities for and engagement with local bat volunteers, who will provide ongoing monitoring of bat populations and support to church users.

## 7.2 Recommendations

7.2.1. Scattering of bat faeces and urine across the wider church interior is considered likely to remain an ongoing issue for the reasons given above. As a result, the following recommendations are made to supplement and develop on those mitigation measures already in place:

- Opportunities for deploying deterrents to encourage bats away from key areas of the church interior should be considered and explored. Research should be commissioned to understand the effectiveness of potential deterrents and to ensure their use does not result in negative impacts on resident bat colonies and the FCS of local bat populations. No form of bat deterrent should be deployed without prior consultation and agreement with Natural England.
- Continual and ongoing improvement should be made to the local network of bat foraging habitats and roost features, recognising that the St Mary's is one of a depleting number of historic local structures available and accessible to bats. Radio-tracking surveys undertaken in 2021 demonstrated that bats using the church, including the resident Natterer's maternity colony, also

make use of a wider network of roost resources, including trees located within the adjacent moat, the belfry and a nearby open-fronted garage structure. However, careful consideration should be given to local planning proposals, ensuring the remaining limited number of roost features associated with local structures and trees is not depleted further. Supplementing the local network of roost features over the coming years (including through installation of bat boxes on mature trees within the adjacent moat), will help to reduce the ongoing impact of bats on church users by providing bats with alternative roosts locations and further reducing the frequency and duration that bats use the church for roosting and socialisation purposes. Similarly, improving local habitats in terms of invertebrate prey abundance and diversity will encourage foraging bats away from the church and could be undertaken across St Mary's church yard, much of which is currently heavily mown and of limited value to biodiversity and foraging bats.

- 7.2.2. Our work on the BiC project at St Mary's and at St Margaret of Antioch in Wellington (Bats in Churches Final Report, St Margaret of Antioch, Wellington, 2023), has shown that use of church structures by bats is less important to local bat populations in Herefordshire than in other countries such as Norfolk (Zeale *et.al*, 2016). This is likely to reflect regional differences in farming practices and local land use, and highlights opportunities to embrace the recommendations detailed above, and improve the surrounding network of bat foraging habitats and roost features which are likely to encourage bats away from St Mary's church in the long-term, improving the experience of church users for many decades to come.

## 8. References

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## 9. Figures



*Figure 1: Location Plan*

Site location plan (A) and aerial view (B) of the church of St Mary the Virgin, Pembridge. Images courtesy of Google Earth.

St Mary the Virgin, Pembridge  
Bats in Churches Final Report 2023

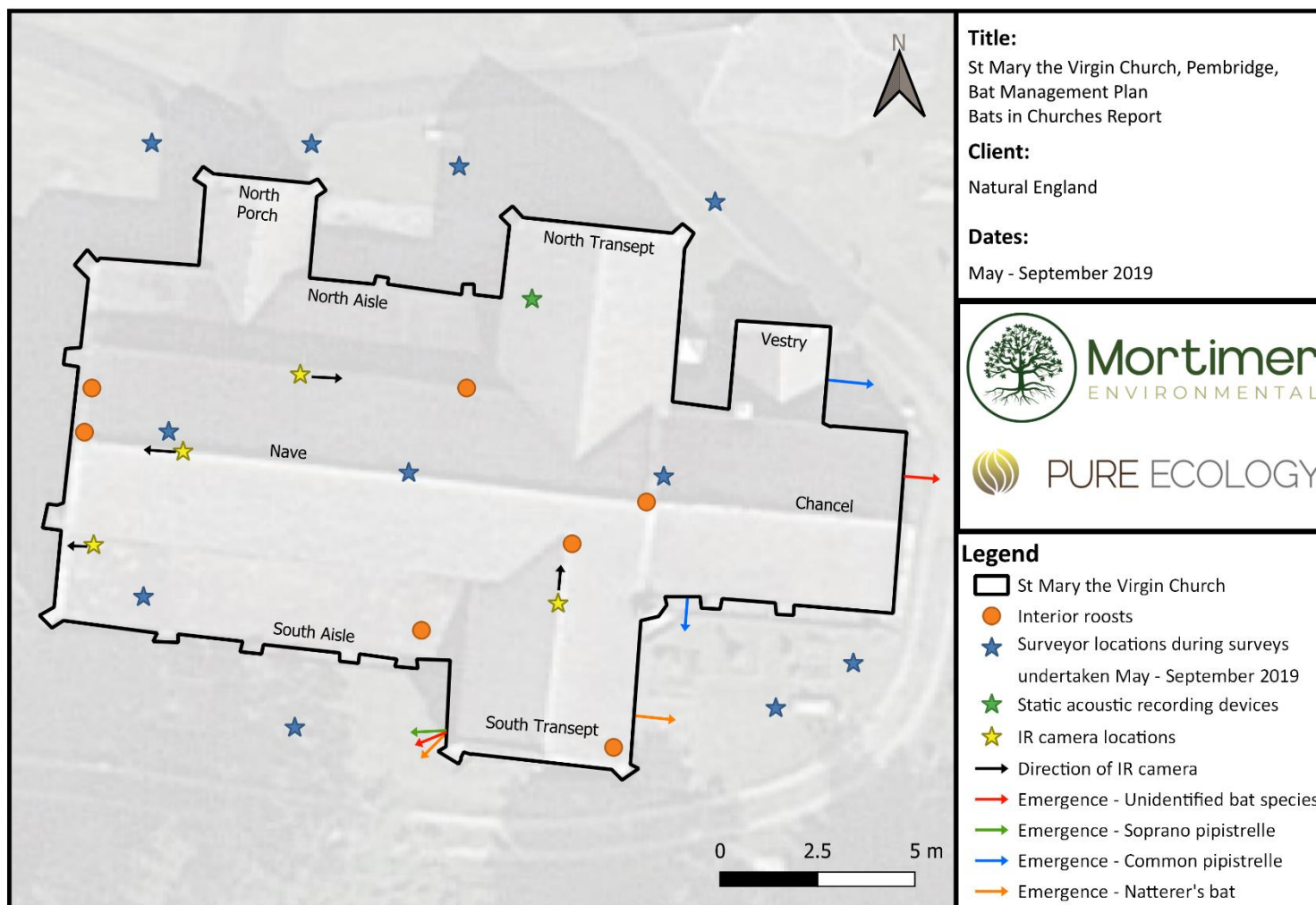


Figure 2: Bat Survey Results 2019

GIS Plan of St Mary's, Pembridge, showing positions of surveyors and position of the IR cameras. Dawn re-entry and dusk emergence bat survey results are summarised.



St Mary the Virgin, Pembridge  
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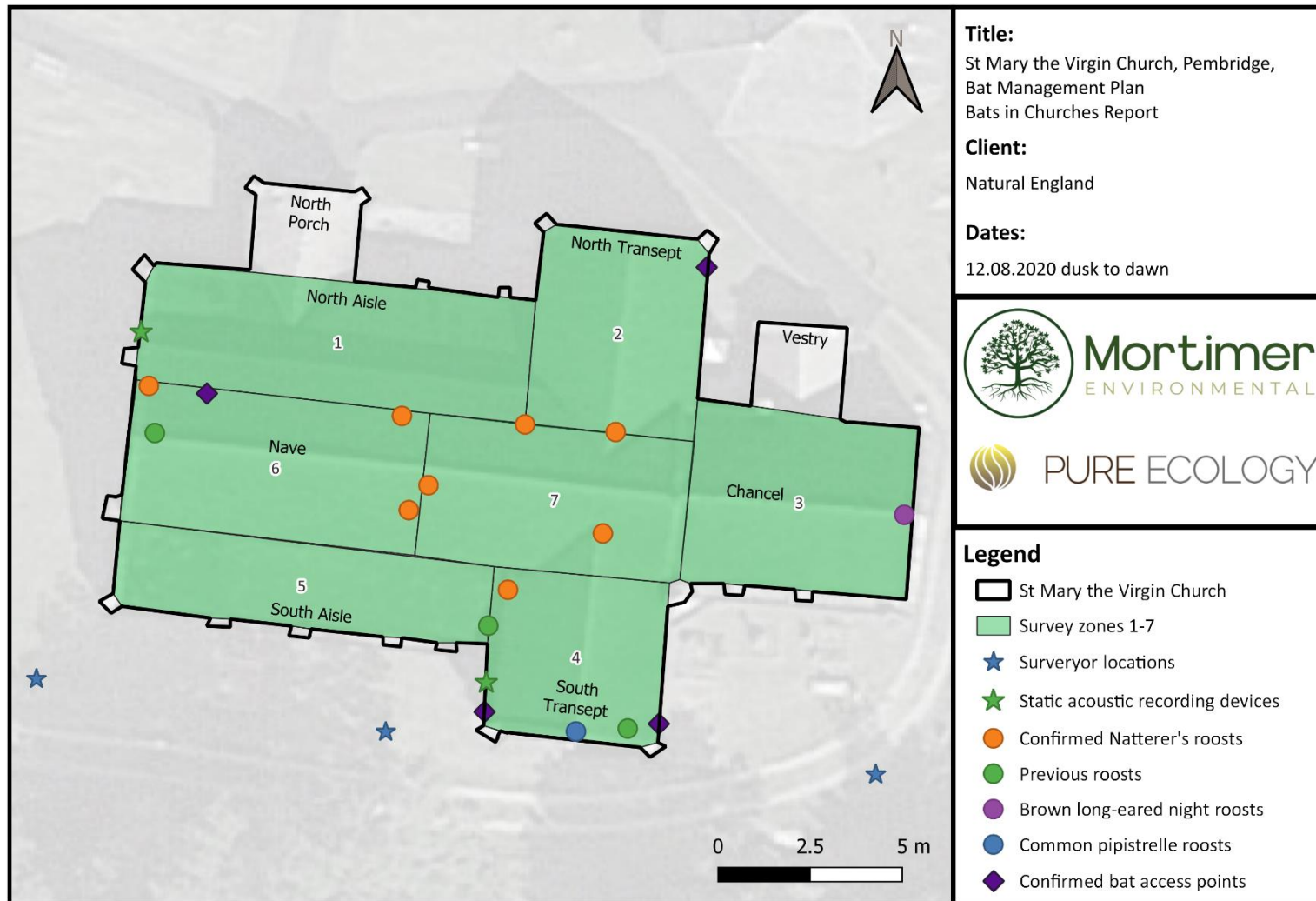


Figure 3: Bat Survey Results 2020

GIS Plan of St Mary's, Pembridge, showing approximate positions of external surveyors and transect survey zones. Bat survey results are summarised.

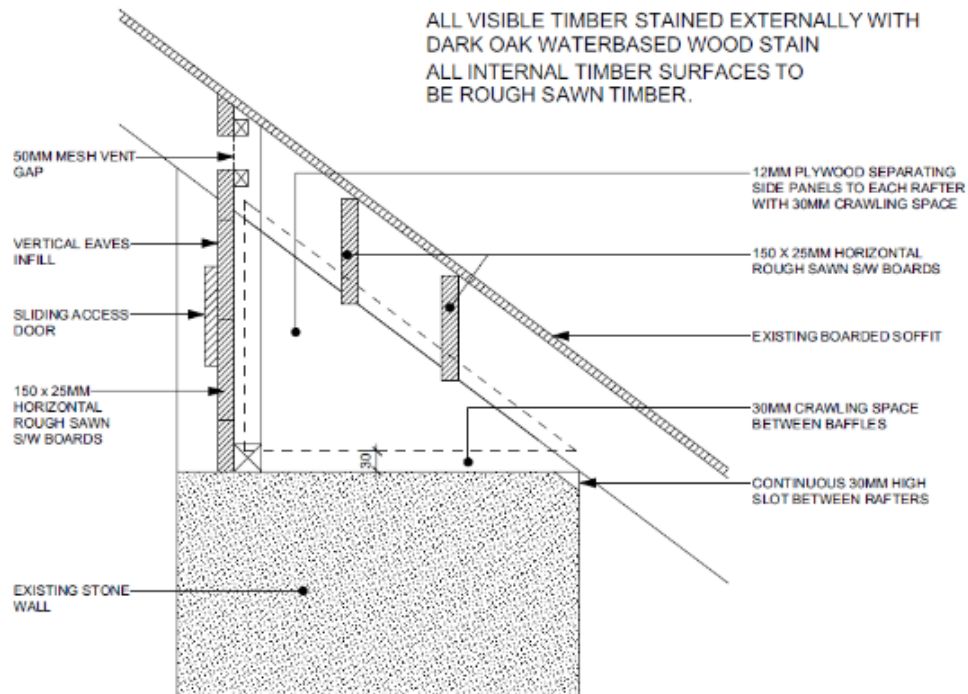


*Figure 4: Management Works at St Mary's Church*

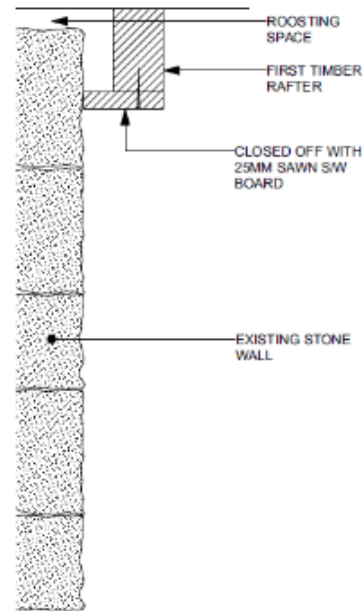
Gap between the roof beam and west wall of the south aisle previously used as a maternity roost by Natterer's bats (A). The area where bats were located in 2014-2017 is circled in yellow. Gap after being enclosed with wooden boarding (B). Access holes for bats are circled in blue and were provided at the top (C) and bottom of the boarded area (D).



A



EAVES DETAIL



WALL HEAD DETAIL

PEMBRIDGE CHURCH BAT BOXES  
EAVES AND WALL HEAD DETAILS SCALE 1:5  
BAART HARRIES NEWALL 2721.03



Figure 5: Management Works at St Mary's Church

Architect's plans of bat roost boxes created under the eaves of the south aisle at St Mary's (Baart, Harris, Newall; A). On completion, sliding doors to the church interior were left open to allow bats to find the roost (B). An access hole (circled in blue) was created to allow bats to enter and exit from the south side of the church (C).

St Mary the Virgin, Pembridge  
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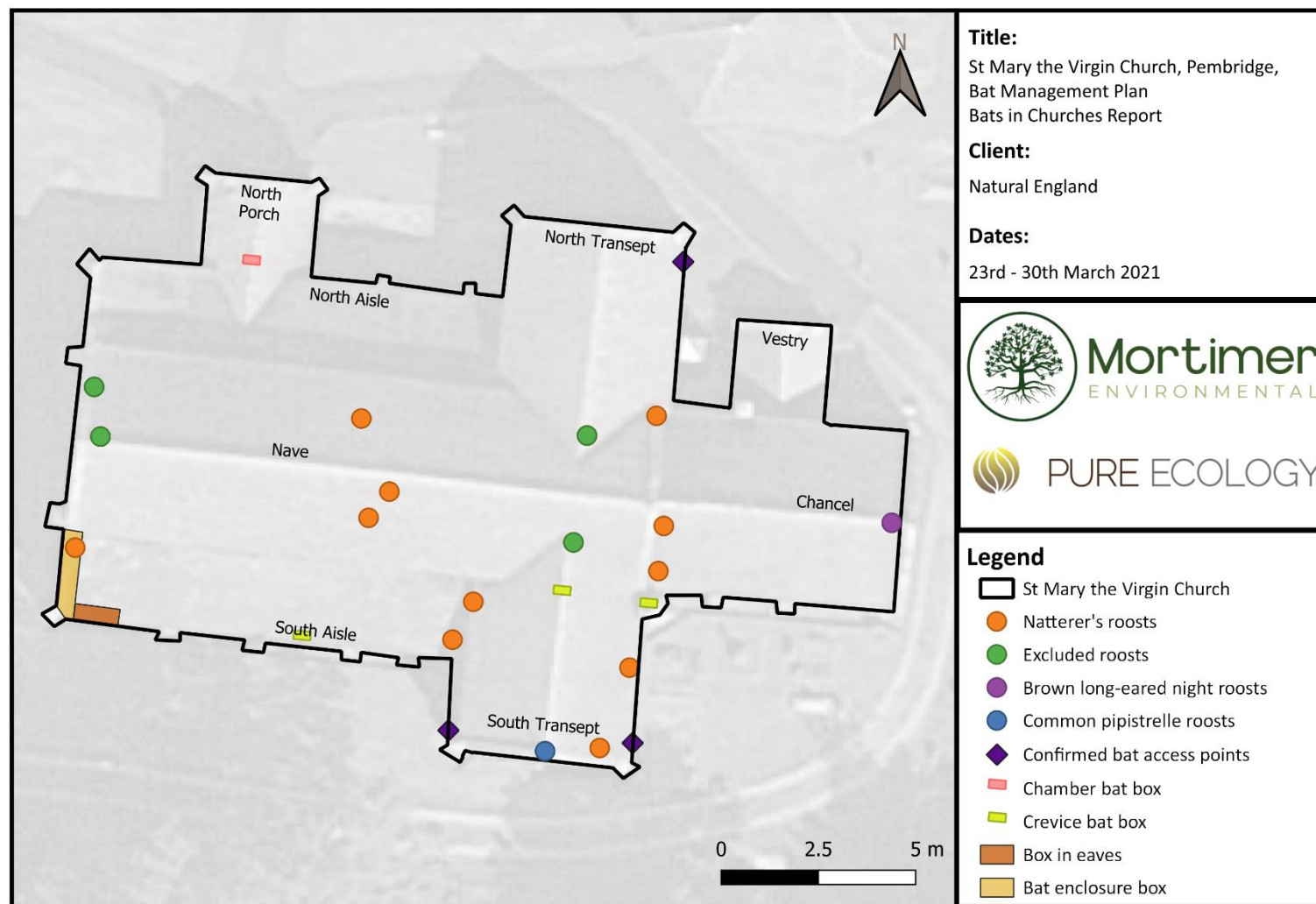
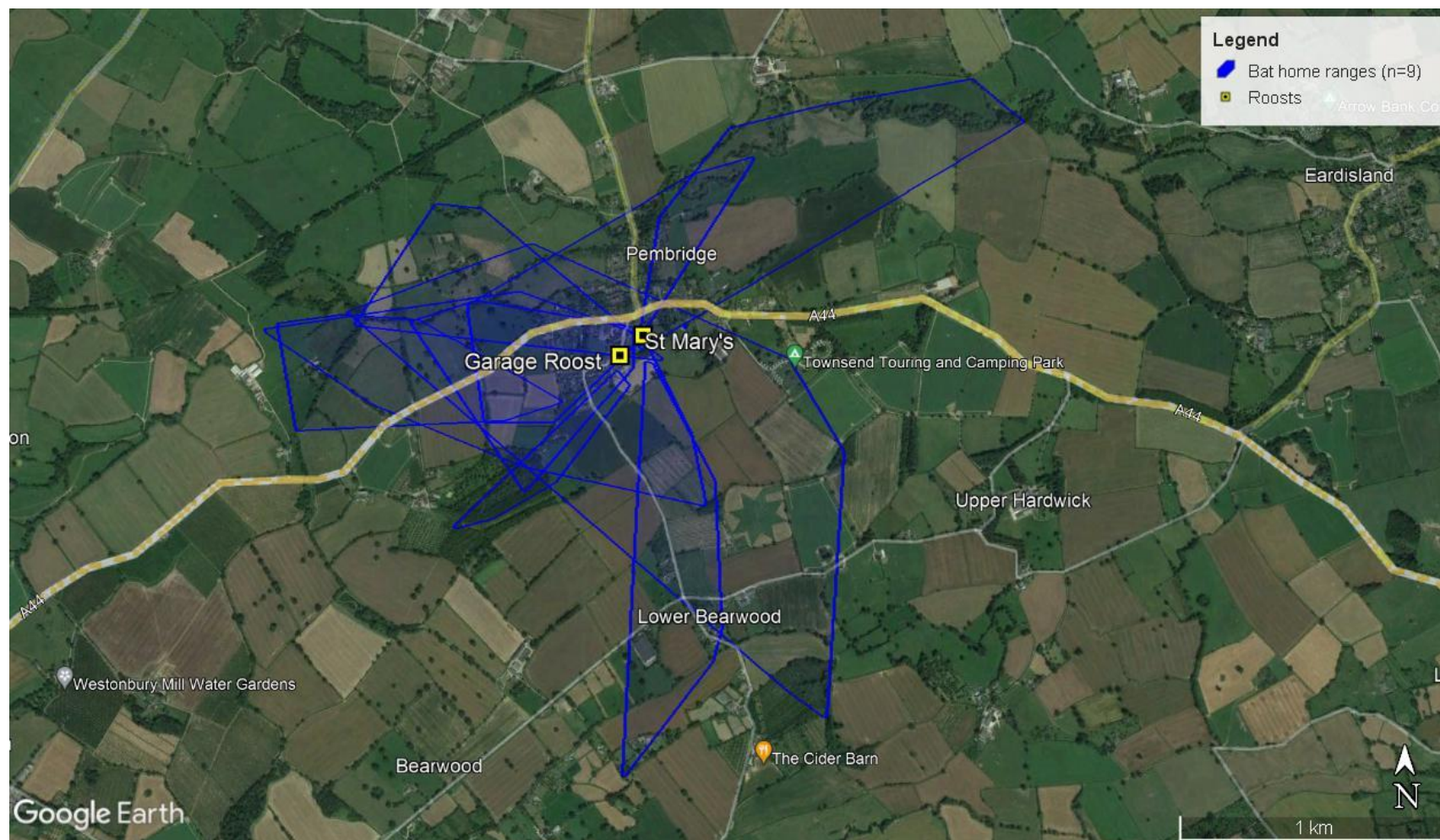


Figure 6: Bat Survey Results & Management Work 2021

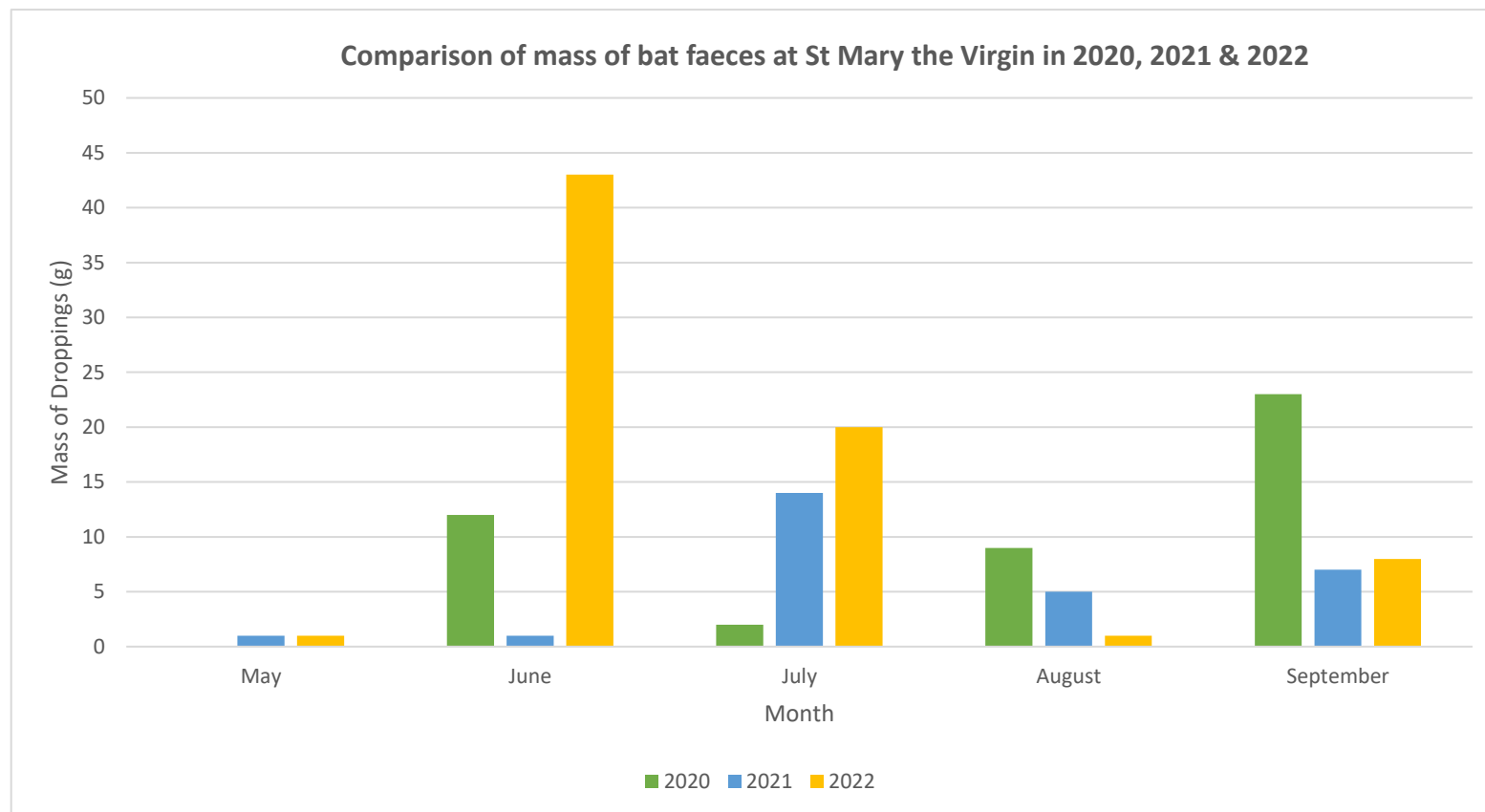
GIS plan of St Mary's Church showing identified bat roosts and access points. Bat roosts excluded during management works in 2021 are shown in green. Locations of compensatory bat roosts are provided, along with a bespoke bat roost in the eaves of the south aisle and an enclosed roost in the south aisle.





*Figure 7: Bat Radiotracking Home Ranges*

Home ranges and tracked roosts of Natterer's bats tagged during 2021. Home ranges were determined using Ranges 9 (Anatrack). Figure reproduced from St Mary the Virgin Church, Pembridge Radiotracking Report (2021). Image courtesy of Google Earth.



*Figure 8: Bat Faeces at St Mary's Church*

Graph showing the mass of bat faeces collected at St Mary's during May to September 2020-2022.

## 10. Annex 1. Guidelines for Proportionate Mitigation.

Taken from the Bat Mitigation Guidelines (Mitchell-Jones, 2004)

<div>Low</div> <div>Conservation significance</div> <div>High</div>	<b>Roost status</b>	<b>Mitigation/compensation requirement (depending on impact)</b>
	Feeding perches of common/rarer species	Flexibility over provision of bat- boxes, access to new buildings etc. No conditions about timing or monitoring
	Individual bats of common species	
	Small numbers of common species. Not a maternity site	
	Feeding perches of Annex II species	Provision of new roost facilities where possible. Need not be exactly like-for-like, but should be suitable, based on species’ requirements. Minimal timing constraints or monitoring requirements
	Small numbers of rarer species. Not a maternity site	
	Hibernation sites for small numbers of common/rarer species	Timing constraints. More or less like-for-like replacement. Bats not to be left without a roost and must be given time to find the replacement. Monitoring for 2 years preferred.
	Maternity sites of common species	
	Maternity sites of rarer species	Timing constraints. Like-for-like replacement as a minimum. No destruction of former roost until replacement completed and usage demonstrated. Monitoring for at least 2 years.
	Significant hibernation sites for rarer/rarest species or all species assemblages	
Sites meeting SSSI guidelines	Oppose interference with existing roosts or seek improved roost provision. Timing constraints. No destruction of former roost until replacement completed and significant usage demonstrated. Monitoring for as long as possible.	
Maternity sites of rarest species		