Wild Wings Ecology

Bats in Churches Project:

St Margaret's Church

Witton

Bat Survey & Management Plan Report

October 2021

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Surveys • Training • Research

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1. Summary

St Margaret's Church, Witton underwent bat surveys in summer 2021 to inform a proposal for managing the impacts of the bats on the church whilst protecting the church bat population. This work was undertaken as part of Natural England's Bats in Churches Project (funded by the Heritage Lottery Fund).

St Margaret's Church is home to a maternity colony of common pipistrelles, probable day (possible occasional small maternity) roosts of Natterer's bats and soprano pipistrelles and day/night roosts of brown long-eared bat.

The church has experienced long-term negative impacts from the presence of bats in the church interior, with staining/bleaching from bat droppings/urine on the floor, walls, pews, organ pipes, brasses and monuments.

Management options were discussed with church representatives and the architect and include:

- Creating a pipistrelle roost area in the south-east corner of the nave eaves/wall-top (accessible from the tower staircase) – this area is highly suitable for enhancement.
- Construction of one/two rafter bat boxes on the south side of the nave at an existing access point and roost area.
- Smaller stone-coloured 'ecostyrene' crevice boxes to be positioned under the eaves of the south aisle (close to the main access point over the south door).
- Fixing of a wooden maternity bat box to the south elevation of the outbuilding in the north-east corner of the churchyard (subject to plans to convert the building).
- Blocking of the north-east corner of the nave and south-east corner of the vestry access points to encourage access on southern side and likelihood of uptake of artificial roosts on southern side.
- The church is highly 'bat-porous' with many potential access points, so complete blocking of all access points is very unlikely to be feasible and prohibitively expensive. However, if artificial roosts were adopted and had evidence of maternity use, subsequent targeted blocking could be justified (e.g. the south door).

Careful monitoring will be needed to assess if measures are effective in reducing the impact of bats on the church, assess how bats respond to the measures and ensure no adverse impacts on the bat populations. It is also a requirement for licensed works and is essential to inform future best practice. Monitoring proposed includes: visual inspections, bat activity surveys and use of roost cameras for the south-east nave roost area. Adoption of new/artificial roosts takes time but it is hoped that over time the bats will begin to use the new roosts, helping to alleviate the impacts of bat presence inside the church.

2. Introduction

2.1. Purpose

Wild Wings Ecology was contracted to undertake bat surveys and produce an ecology report and management plan for Natural England's 'Bats in Churches Project' (funded by Heritage Lottery Fund). The church assessed was St Margarets, Witton in Norfolk. This report details the surveys that were undertaken and proposes a management approach to help reduce the impact of the bats on the church whilst minimising risks to the church's bat populations.

2.2. St Margaret's Church, Witton

2.2.1. Location

St Margaret's Church is located to the east of Bacton Road in the village of Witton (population c. 300 people), near North Walsham, Norfolk, NR28 9TS (grid reference: TG 33108 31577), see Figures 1 & 2. The church is within the district of North Norfolk, in a rural location. The church is encircled by mature trees, providing shelter, beyond which is an agricultural landscape. There is small block of woodland (Church Plantation) situated to the west of the church and the extensive Bacton Wood (also known as Witton Woods) is located approximately 1 km to the south-west. The North Norfolk coast is 2.8 km to the north-east of the church.

There are no designated sites within 2 km of the church.

2.2.2. Statement of Significance

Statement of Significance Summary (2021, written by Rachel Arnold, Bats in Churches Project Heritage Advisor):

"St Margaret's Church in Witton is a Grade 1 listed Saxon church, with substantial surviving original material. Of particular significance are the eleventh-century round windows, the round tower and some large stone quoins at the base of the west wall of the nave, which are also thought to be eleventh-century. Inside the church are medieval pews and font, some wall mounted monuments and an east window, which is an early work by renowned Victorian firm Clayton and Bell.

Droppings and urine are found spread throughout the church and cause significant staining to the pews, pulpit and wall-mounted monuments. Bats appear to enter primarily through the south door and it is covered with droppings. Cleaning is a huge burden for the small group of volunteers and has an impact on the significant interiors."

Figure 1. Location (landscape scale) of St Margaret's Church, Witton (red star) on Google Earth Pro 2020 aerial image. Yellow circle indicates the 2 km radius Core Sustenance Zone[1] (CSZ) around the church for common pipistrelles, green circle indicates the 3 km radius CSZ for soprano pipistrelles and brown long-eared bats and the blue circle indicates the 4 km CSZ for Natterer's bats.

[1]"A Core Sustenance Zone refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost." (Bat Conservation Trust, 2016).

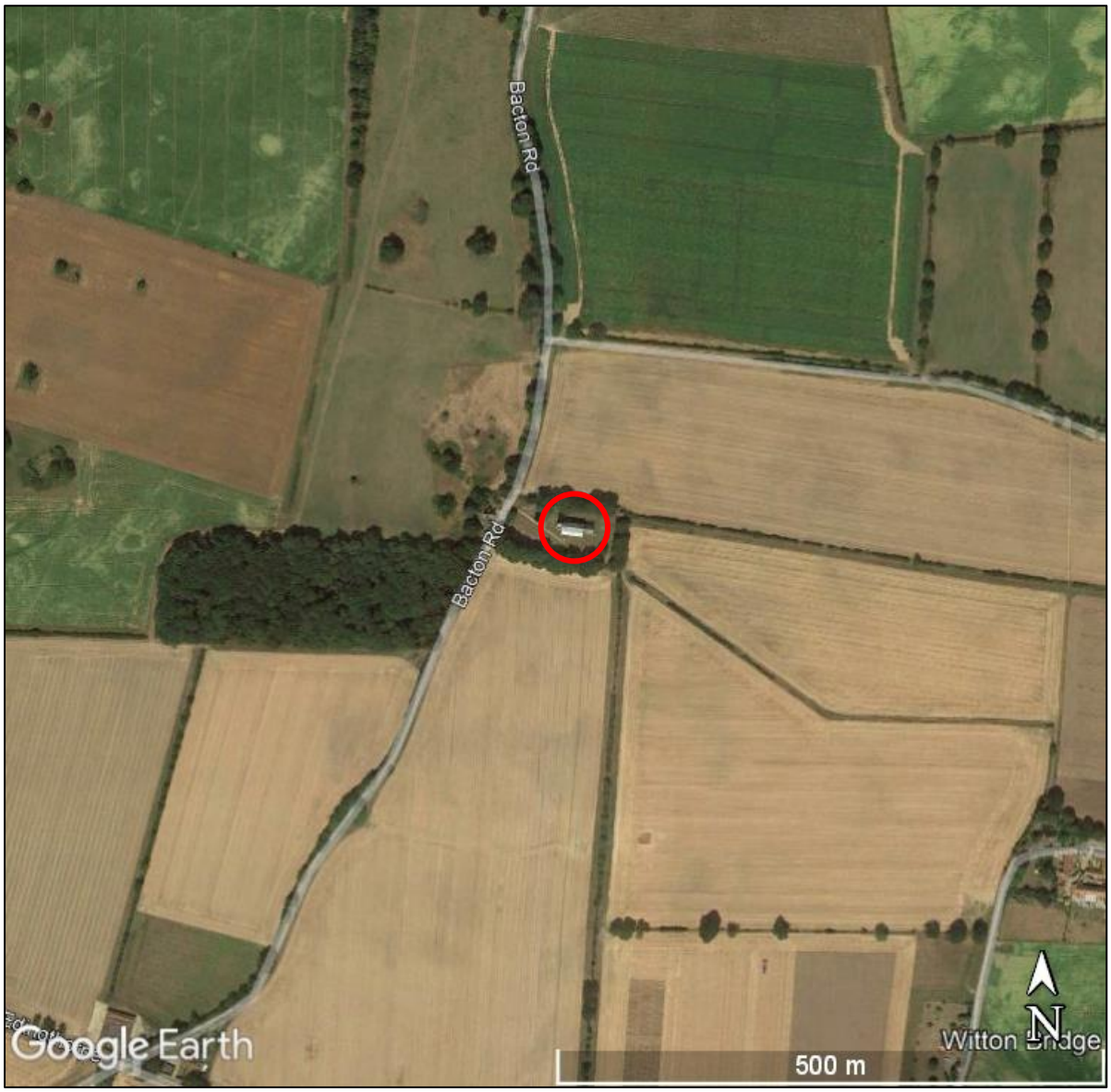

Figure 2. St Margaret's Church, Witton (circled in red) with surrounding habitats - Google Earth Pro 2020 aerial image.

2.2.3. History of bat use/previous bat survey work

The church was subject to bat surveys in 2015 by Philip Parker Associates in relation to repair works to the tower (primarily). A visual inspection was undertaken on 27th June, dusk emergence surveys on 28th July and 17th September and dawn re-entry surveys on 29th July and 18th September. Peak counts were as follows: common pipistrelle 64, Natterer's bat 32, brown long-eared bat 5 and soprano pipistrelle 1.

The common pipistrelles were roosting in the middle of the nave. Their main access was over the south aisle door, with smaller numbers accessing from the eaves of the south and north sides of the nave and chancel and eaves of the south aisle and vestry. The Natterer's bat roost was not inside church but situated in the porch (off the south aisle). Brown long-eared bats were recording roosting in the chancel and behind the organ

(west end of nave/tower). Serotine droppings were also found on the tower steps during each survey visit (but none recorded accessing the church during surveys).

The church was subject to the Bats in Churches Project 'Light Touch Survey' on 4th August 2017 (by Philip Parker), see Appendix 1.

3. Methodology

3.1. Visual inspection

A detailed daytime visual inspection of the church was undertaken on the 12th April 2021 by Dr Charlotte Packman (see Table 1 for surveyor details). The visual inspection provided an update to the 'Light Touch Survey' which was completed on 4th August 2017 (using the 'Bats in Churches Heritage Lottery Fund Heritage Grant Bat Roost Visit Report Form', see Appendix 1, attached as a separate document as contains personal details).

The visual inspection updated information on bat usage of the building (probable species, impacts, photos and observations). A torch, endoscope, binoculars, camera and ladder were available for use during the inspection.

An initial meeting was held prior to the visual inspection, attended by:

- Churchwardens Charles Owles and John Pugh, and Sophie Owles
- Church Architect Ruth Blackman
- Bats in Churches Project staff: Engagement Officer Diana Spencer and Heritage Advisor Rachel Arnold
- Ecologist Charlotte Packman

3.2. Bat activity surveys

Bat activity surveys were undertaken between May and August 2021, following the Bats in Churches Class Licence Survey Criteria (see Appendix 2). The activity surveys sought to identify/confirm species using the church, bat numbers, roost locations, exit and re-entry points and observe behaviour (both inside and outside the church).

Dusk emergence surveys were undertaken on: 10th May, 20th July and 2nd August 2021. Dusk emergence surveys are best suited to obtaining accurate counts (most, if not all the bats, are likely to emerge during the survey and in a manner that is relatively easy to count), determining exit locations, species and, internally, roost locations. Note that where a bat is recorded re-entering the church during an emergence survey, the subsequent bat to emerge (if applicable and if of the same species) is not counted to avoid potentially counting the same individual emerging more than once during a survey, thereby giving a minimum count as the total.

The dawn re-entry survey was carried out on 24th June 2021. The dawn re-entry survey focussed on assessing bat activity inside and outside of the church, identifying/confirming species using the church, roost locations, entry points and observations of behaviour. Dawn surveys are less well suited to reliably recording numbers of bats roosting at a church. This is because accurate counts of bats re-entering at larger roosts can be difficult due to 'dawn swarming' behaviour and because some bats will almost certainly have already returned to the roost before the survey

commences. Note that where a bat is recorded emerging from the church during a re-entry survey, the subsequent bat to re-enter (if applicable and if of the same species) is not counted to avoid potentially counting the same individual re-entering more than once during a survey, thereby giving a minimum count as the total.

Survey details, including surveyors, timings and weather conditions (which were suitable), are provided in Table 2.

Four-five surveyors were present for each survey to observe potential bat access/roost locations on the building's exterior, with one surveyor always positioned inside the church for the duration of the survey (see Table 1 for surveyor details and credentials). Each surveyor was equipped with an infrared camcorder (Canon XA11/20) and the building's exterior and interior subject to infrared floodlighting to provide excellent visibility in the dark, without disturbing the bats. Where necessary, infrared camera footage was subsequently reviewed using VLC Media Player. Surveyors were also equipped with full spectrum recording bat detectors (mostly Wildlife Acoustics Echo Meter Touch). Where verification was needed, bat call recordings were subsequently reviewed using Kaleidoscope Viewer (Wildlife Acoustics). Surveyors also utilised two-way radios to corroborate observations between surveyors and especially for comparing exterior and interior observations during surveys (e.g. exterior versus interior exit and re-entry locations and determining if any roosts were exterior roosts only). Tally counters were used to aid accurate recording of numbers.

Table 1. Surveyor names, initials (as used in Table 2) and credentials.

Surveyor name & qualifications	Initials	Bat licences held	Licence numbers
Dr Charlotte Packman BSc (Hons), MSc, PhD CEcol[1] MCIEEM[2]	CP	Bats in Churches Class Licence (CL32, Level 2) Bat Mitigation Class Licence (CL21) Level 3 Bat Survey Class Licence (CL19) Level 4 Bat Survey Class Licence (CL20)	B32RC001 RC155 2015-16479-CLS-CLS 2015-11760-CLS-CLS
Ben Jervis BSc (Hons), MSc MCIEEM[2]	BJ	Level 2 Bat Survey Class Licence (CL18)	2016-25752-CLS-CLS
Christine Hipperson BSc (Hons) MCIEEM[2]	CH	Level 2 Bat Survey Class Licence (CL18)	2015-16077-CLS-CLS
Holly Nichols BSc (Hons)	HN	Level 2 Bat Survey Class Licence (CL18)	2020-44423-CLS-CLS
Karl Charters BSc (Hons)	KC	Level 2 Bat Survey Class Licence (CL18)	2015-13353-CLS-CLS
Ash Murray BSc (Hons)	AM	Level 2 Bat Survey Class Licence (CL18)	2015-16562-CLS-CLS
John Worthington-Hill BSc (Hons), MSc	JW	n/a	n/a
Jenny Donelan BSc (Hons), MSc	JD	n/a	n/a
William Soar BSc (Hons)	WS	n/a	n/a

[1]CEcol = Chartered Ecologist (with the Chartered Institute for Ecology & Environmental Management)

[2]MCIEEM = (full) Member of the Chartered Institute for Ecology & Environmental Management

Table 2. Bat activity survey timings (24 hr), weather conditions and surveyors (see Table 1 for surveyor details).

Dusk/ dawn survey	Date	Survey timings			Weather conditions				
		Sunset/ sunrise	Survey start	Survey end	Start temp. (°C)	End temp. (°C)	Precipitation	Windspeed (Beaufort Scale)	Cloud cover (%)
Dusk 1	10/05/21	20:37	20:22	22:00	11	10	Nil	3	10
Surveyors: CP, HN, JW, BJ, CH									
Dusk 2	20/07/21	21:06	20:51	22:30	19	17	Nil	2	40
Surveyors: CP, BJ, AM, KC									
Dusk 3	02/08/21	20:52	20:37	22:07	13	10	Nil	0	5
Surveyors: CP, BJ, CH, WS									
Dawn 1	24/06/21	04:30	02:30	04:40	9	8	Nil	0	30
Surveyors: CP, KC, JD, BJ, CH									

4. Results

4.1. Visual inspection

Refer to the St Margaret's Church, Witton 'Light Touch Survey' 'Bats in Churches Heritage Lottery Fund Heritage Grant Bat Roost Visit Report Form' from 4th August 2017. This contains personal details (names and addresses etc.) and therefore is not included here but is attached as a separate Appendix (1). The findings from visual inspections undertaken in July 2015, August 2017 (Light Touch Survey), both by Philip Parker Associates, and 12th April 2021 (C. Packman) are detailed in Figure 3. Photographs of the church are provided in Appendix 3.

St Margarets is a medium-sized medieval flint church with lead (nave) and slate (chancel) roof coverings. Long-term impacts of bat presence can be seen throughout the church: staining/bleaching from bat droppings/urine on the floor, walls, pews, organ pipes, brasses and monuments.

At the time of the April 2021 visual inspection, fresh pipistrelle-type droppings were concentrated (indicative of roost locations) along the centre of the nave (beneath the central ridge beam). The main access point for the pipistrelles appears to be over the south aisle door (with droppings adhered to both sides of the door). There were also pipistrelle-type droppings in the tower, particularly in a section just below the first floor, where the wall top and eaves of the south-west corner of the nave are accessible.

There were some old brown long-eared bat-type droppings behind the organ (west end of the nave/tower). There were also some Natterer's bat-type droppings adhered to the north wall of the porch, above the south aisle door, indicating the presence of a roost in the porch roof.

The church appears highly 'bat-porous' with many potential access points at eaves level as well as over the south door.

The church representatives described concerns about bat droppings and urine which create a substantial cleaning burden and have caused damage to the organ as well as staining to pews, walls, brasses and monuments. Measures taken to date to try to manage the impact of bats on the church include regular cleaning, plastic sheet coverings over pews, tables, food and books for sale and a cover over the top of the organ to try to prevent droppings from accumulating inside the pipes. However, these measures are labour intensive and not sufficient to mitigate the damage from droppings and urine and are not a sustainable long-term solution.

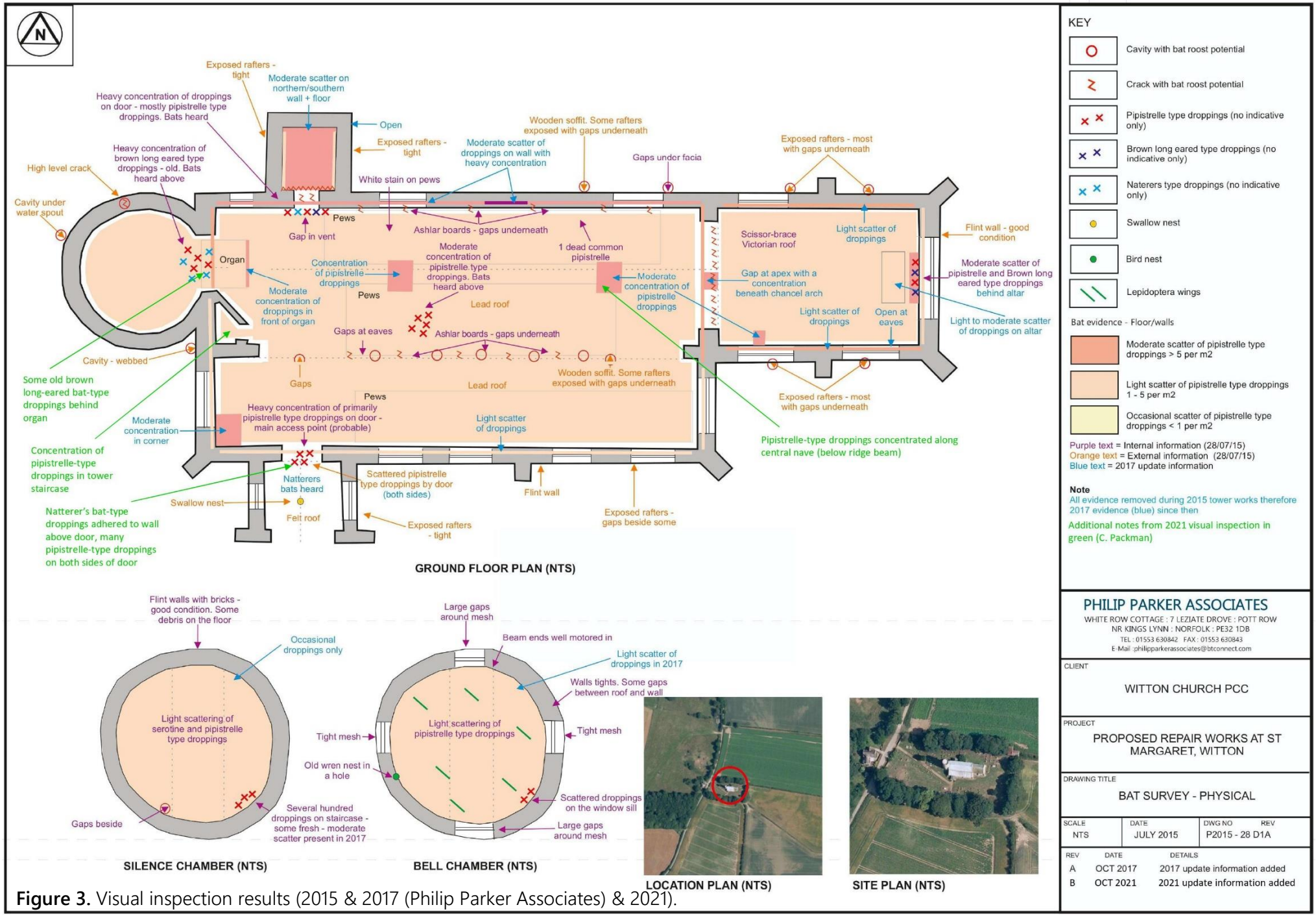

Figure 3. Visual inspection results (2015 & 2017 (Philip Parker Associates) & 2021).

4.2. Bat activity surveys

The highest count for common pipistrelles was 60, recorded during both the 20th July and 2nd August dusk surveys. The main roost area for the common pipistrelles was in the nave (mostly at the eastern end) above the central ridge beam (particularly at the apex of the trusses), see Figure 4, R1. A roost was also evident on the southern side of the nave (Figures 4 & 5D, R2) during the June dawn survey. Ten soprano pipistrelles were also recorded exiting the church during the August survey (and a single soprano pipistrelle was flying inside the church during the May survey).

The pipistrelles' main access point is over the south aisle door (Figures 4 & 5A, A1), with the north-east corner of the nave also a favoured access point (Figures 4 & 5B, A2). Small numbers also enter and exit via the eaves at the south-east corner of the vestry (Figures 4 & 5C, A3), passing over the curtain separating the vestry from the nave. A single common pipistrelle exited from the south-west corner of the nave (eaves) during the May survey, with possible access through to the tower stairs (where there are a significant number of pipistrelle-type droppings, see 4.1 & Figure 3). Small numbers of common pipistrelles were recorded exiting/entering at several locations along the eaves on the south side of the nave and south aisle (see Figure 4); access through to the interior was not confirmed therefore these may be exterior roosts only.

Seven Natterer's bats were recorded entering an exterior roost located at the north wall of the porch (in the roof, above the door) during the June dawn survey (not recorded during the others surveys).

Individual brown long-eared bats were observed flying inside the church during the May, June & August surveys (not seen to exit or enter) and roosts were located above the organ (at the west end of the nave/tower, Figure 4, R4) and in the chancel roof (Figure 4, R5 - exact location unknown).

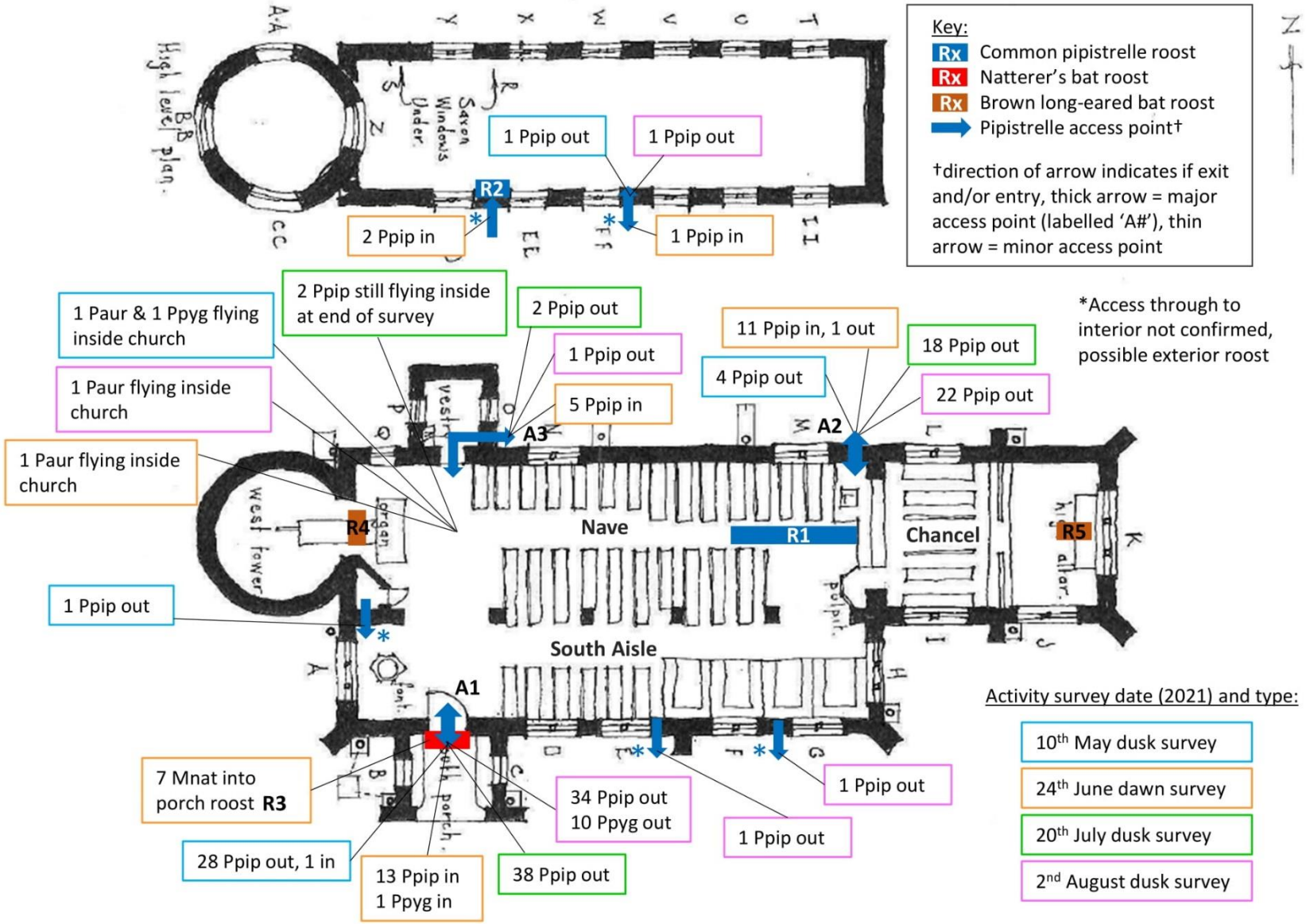

Figure 4. Bat activity survey results: access points (exit and/or entry indicated) by species (see key) and numbers observed for each survey. Main roost areas identified during activity surveys are also shown by species. Species abbreviations: Ppip = common pipistrelle, Ppyg = soprano pipistrelle, Mnat = Natterer's bat, Paur = brown long-eared bat. Results shown on church plan by Birdsall, Swash & Blackman Ltd.

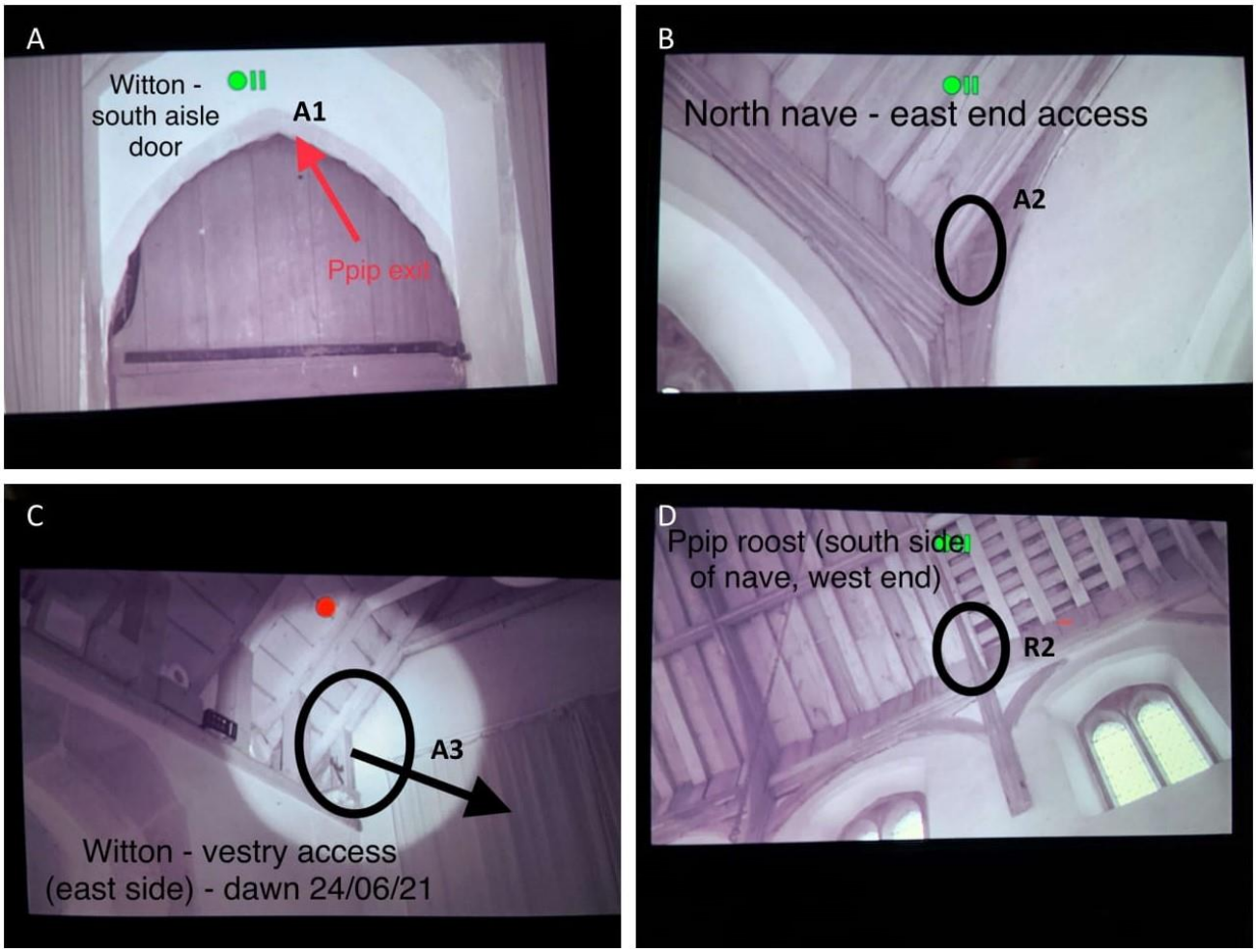

Figure 5. Annotated infrared photos taken during activity surveys showing interior access points. Roosts (Rx) and main access points (Ax) are labelled as in Figure 4.

5. Discussion

The survey data show that St Margarets is home to a maternity colony of common pipistrelles and probable day (possible occasional small maternity) roosts of Natterer's bats and soprano pipistrelles and day/night roosts of brown long-eared bat.

The numbers of common pipistrelles roosting at the church have increased (peak of 41 recorded in July 2015 by Philip Parker Associates, compared to 60 in 2021). The preferred roost location is still the central nave, although the eastern end appears to be favoured. An additional roost was located on the south side of the nave (also used in 2015). The main pipistrelle access, over the south door, has remained the same, as has minor (but increased) use of the south-east corner of the vestry and use of a number of minor access points on the south side of the nave and south aisle (including south-west corner of the nave, with access here to the tower stairs). However, the north-east corner of the nave is now a major access point (not previously recorded). In 2015 pipistrelles also accessed the church via the chancel eaves, which was not observed during the 2021 surveys. Numbers of soprano pipistrelles have also increased (peak of 10 in 2021, compared to 1 in 2015).

In contrast to the pipistrelle bats, the Natterer's bat colony has decreased substantially in size, with a peak count of 32 recorded in 2015 and just seven in 2021 (recorded during the June survey only). Consequently this may no longer be a maternity roost. The same roost location was used in 2015 and 2021, in the porch roof (north wall, above the south door).

In 2015 five brown long-eared bats were recorded roosting in the chancel and above the organ; only individual brown long-eared bats were recorded in 2021 but both of these roost locations are still used.

It is evident that the church is highly 'bat-porous' with many potential access points throughout.

5.1. Proposed management plan

Progress meeting

At a progress meeting on 7th October 2021 (attended by the Churchwardens and PCC members, the Church Architect Ruth Blackman, Bats in Churches Engagement Officer Diana Spencer and Ecologist C. Packman), management options were discussed. Options are presented here. Should any of these be taken forward, the Church Architect and Ecologist will need to be consulted further and detailed specifications drawn-up.

Faculty Jurisdiction (Amendment) Rules 2019

In relation to the Faculty Jurisdiction (Amendment) Rules 2019, an assessment will need to be made as to whether works falls under List A or List B (neither requiring a Faculty, but the latter requiring written approval from the Archdeacon) or if a Faculty is required (along with consultation of The Norwich Diocesan Advisory Committee, DAC).

Bat licence

A bat licence (Site Registration under the Bats in Churches Class Licence, administered by Natural England) may be needed, depending on the options chosen. This can be prepared and submitted by a Bats in Churches Class Licence Registered Consultant (C. Packman is registered to use this licence). Licences are time-consuming to prepare and, once submitted, Natural England typically take six weeks (can be longer) to issue the licence.

Approaches for mitigating the impacts of bats on churches

Approaches for reducing the impact of bats on churches typically fall into four main categories: 'protection', 'deterrent', 'restriction' and 'creation'.

1. **Protection** - measures to protect specific items from damage from bat droppings and urine. Likely to be most suitable where impacts from bats are relatively minor and localised. Unlikely to require a bat licence.

   Example: deflector boards placed over a monument.

   Advantages: typically low cost and relatively quick and easy to install.

   Disadvantages: addresses the 'symptoms' but not the cause, may be more suitable as short-term measures/may not be an effective long-term solution and may require maintenance.

2. **Deterrence** – measures to deter bats from roosting at or using a specific area, typically where concentrations of droppings beneath a roost are damaging an item of heritage significance, or for hygiene reasons e.g. roost is directly above a food preparation/kitchen/children's play area. Other roost locations inside the building continue to be used.

   Example: acoustic deterrent positioned beneath a specific roost location to encourage bats to move from that roost feature.

   Advantages: typically low cost and relatively quick and easy to install.

Disadvantages: addresses the 'symptoms' but not the cause, may be more suitable as short-term measures/may not be effective long-term solution. Localised effect, not suitable for sites with significant widespread impacts. Requires electrical supply. Sound produced is uncomfortable for people, but the unit is used with a timer so only operated at night (and can be switched off for any evening services). Bat licence required.

3. **Restriction/partial exclusion** – confining the bats to specific areas around access points/preventing access to interior to limit impacts. This approach is typically coupled with blocking and (4.) 'Creation' as a 'carrot and stick' approach. Likely to be most suitable where bat impacts are substantial (large numbers of bats causing widespread damage to items of heritage significance and limiting use of the church). May only be suitable at some churches i.e. due to the church construction, layout and use, location of bat roosts and access points and species present. Restricted roost areas must provide a range of conditions and options that can support the species and roost types present at the church.

   Examples: partition to confine bats to a section of the church, false ceiling to create a void that contains the bats, blocking and 'boxing-in' to confine bats to void above wall-top.

   Advantages: can be very effective in removing impacts from bats (particularly where these are widespread and significant) whist retaining roosts at the church, long-term solution, typically requires little maintenance.

   Disadvantages: usually costly and 'high risk' i.e. for the church – may not be successful, for the bats – may cause desertion or impact numbers or breeding success (if restricted roost area(s) does not provide suitable conditions), can take a long time for bats to adopt/adjust. May require repeated/reactionary blocking to achieve desired result. Blocking of highly 'bat-porous' churches is unlikely to succeed. Needs close monitoring to ensure bat welfare is not harmed and to maximise the likelihood of success. Typically requires a phased approach over the course of at least a year. Requires a bat licence.

   Examples of churches where this approach has been successful: All Saints Church, Braunston-in-Rutland and St Nicholas Church, Stanford on Avon (both with soprano pipistrelle maternity colonies which have been maintained at the churches but without access to the interior).

4. **Creation** – provision of new roosting opportunities/'enhancements' at or in close proximity to the church. 'Carrot no stick' approach (typically where partial exclusion/blocking is not feasible but impacts are significant and widespread, also appropriate for medium to high conservation significance roosts).

Example: provision of a large maternity bat box on church exterior, construction of rafter bat boxes, opening-up of putlog holes on building's exterior, creation of suitable conditions and roost features in tower.

Advantages: lower risk to bats compared to 'restriction' (no forced exclusion) and therefore does not require intensive monitoring, not limited by bat roost locations or access points, likely to be less costly and more easily achievable than 'restriction', may not require a bat licence (e.g. if creation is not at existing access points or roost areas).

Disadvantages: no reduction in impact on church until new roosts adopted, which typically takes several years and success is by no means guaranteed (i.e. new roosts may not be adopted) – however if new roosts are at least partially adopted, could be followed-up with some 'restriction'/blocking if appropriate (licence required).

Examples of churches where this approach has been successful: St Nicholas Church, Stanford on Avon (soprano pipistrelle maternity colony adopted large, heated exterior bat box on north side of church – but it was several years before the maternity colony moved into the box).

Options for St Margarets (a combination of options may be chosen), see Figure 6:

1. **Protection**
   - Few options – some items (including organ) already covered, but limited effectiveness.

2. **Deterrence**
   - Unlikely to be suitable for the church – other than potentially above the organ (acoustic deterrent) to prevent bats roosting directly above it.

3. **Restriction/partial exclusion**
   - Exclusion of bats from the interior is very unlikely to be feasible for this highly 'bat-porous' church with many potential access points, therefore would be unlikely to succeed and probably prohibitively costly.
   - Unlikely to be suitable for restricting bats to a specific area of the church. A false ceiling in the vestry could be considered, but conditions are not naturally suitable (north side/cold) therefore would require additional heating and may have limited success.
   - However, restriction of some access points could encourage uptake of below 'creation' options:
     - Fitting a one-way excluder or blocking the north-east corner of the nave access (A2 in Figures 4 and 5B) and the south-east corner of the vestry (A3 in Figures 4 and 5C). Access to the north-east corner of the nave may require cherry picker hire or scaffolding.

- If 'creation' options were adopted and had evidence of maternity use, other access points (e.g. the south aisle door) could potentially subsequently be blocked.

4. Creation

- Enhancement of roosting opportunities in the south-west corner of the nave eaves/wall top (see photo in Figure 7A). This is easily accessible via the tower stairs and has signs of existing bat use (pipistrelle-type droppings). This area is naturally warm (southern elevation and under lead roof) and therefore has potential to provide ideal conditions for pipistrelle maternity roost use if suitable roost features were constructed here.

- Construction of one or two 'rafter bat boxes' on the south side of the nave where there is a known pipistrelle access point and roost area, R3 (in 2015 and 2021) – see Figure 4 and Figure 5D for location, Figure 7B provides an example of a church rafter bat box.

- Fixing a large wooden maternity bat box on the outbuilding located to the north-east of the church (see Figure 7 D & E). Southern elevation is ideal. However, may not be suitable if planning to convert this building (although could be worked into conversion plans).

- Addition of smaller, stone-coloured 'ecostyrene' bat boxes (see Figure 7C) on south aisle, close to door access (proximity to existing access should increase likelihood and speed of uptake).

The more 'creation' options used, the greater the likelihood of successful uptake and provision of a range of suitable conditions.

A poster can be produced for the church to display for visitors with information about the bats and mitigation approaches being used.

Monitoring methods

- Regular activity surveys (and visual inspections) to check numbers, access locations, roost locations, uptake of artificial roosts/bat boxes and progress towards reducing impact. For licensed works, the requirement is for a minimum of two visits per season (pre- and post-maternity) for five years post-works. More intensive monitoring may be needed short-term, following works (e.g. blocking).

- Roost cameras could be fitted to the south-west nave/tower enhancement area, providing footage for the church to use/a feature of interest and also enabling monitoring of artificial roost use. Requires an electrical supply.

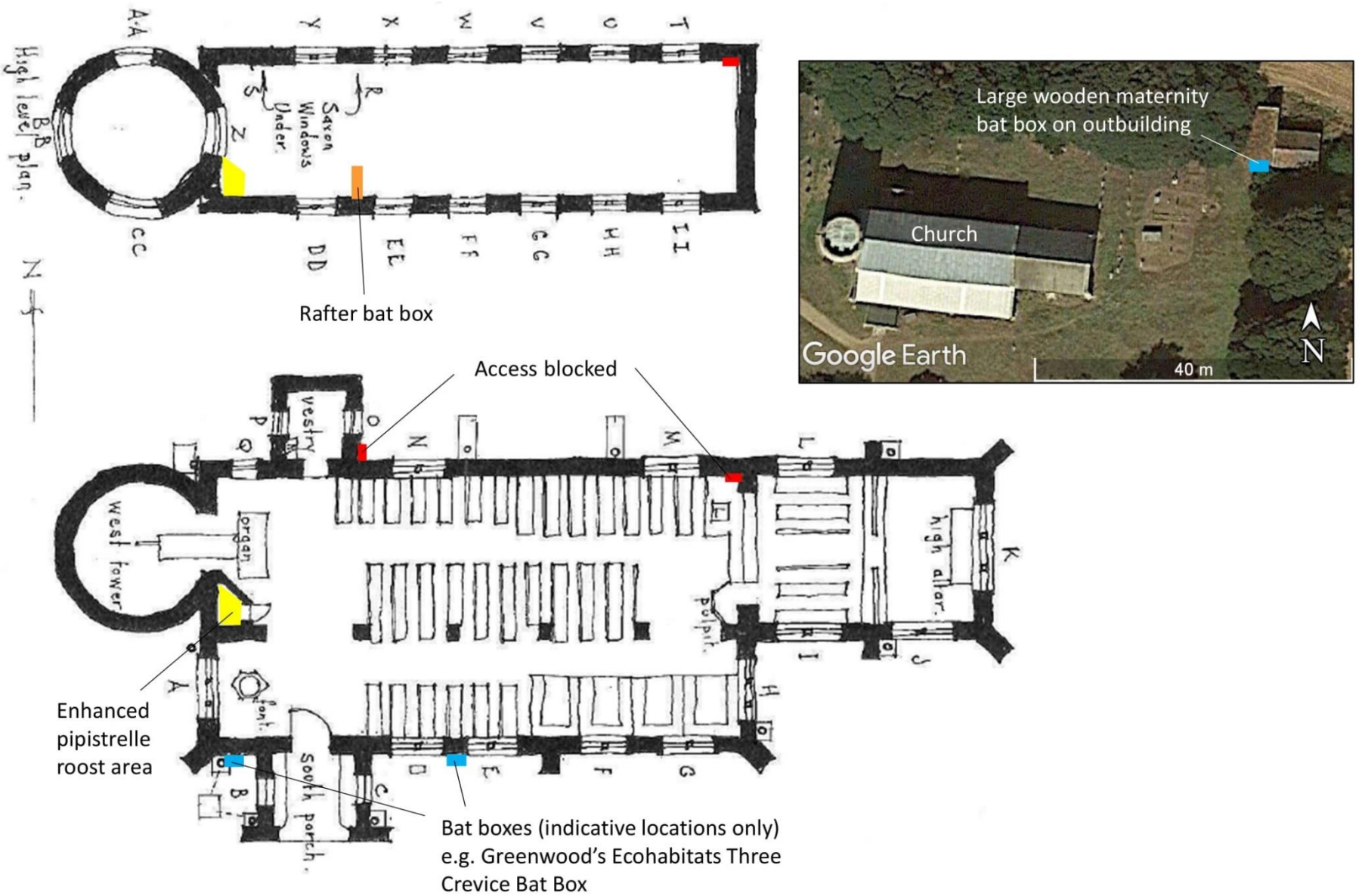

Figure 6. Annotated church plan (plan by Birdsall, Swash & Blackman Ltd) showing locations of management plan options.

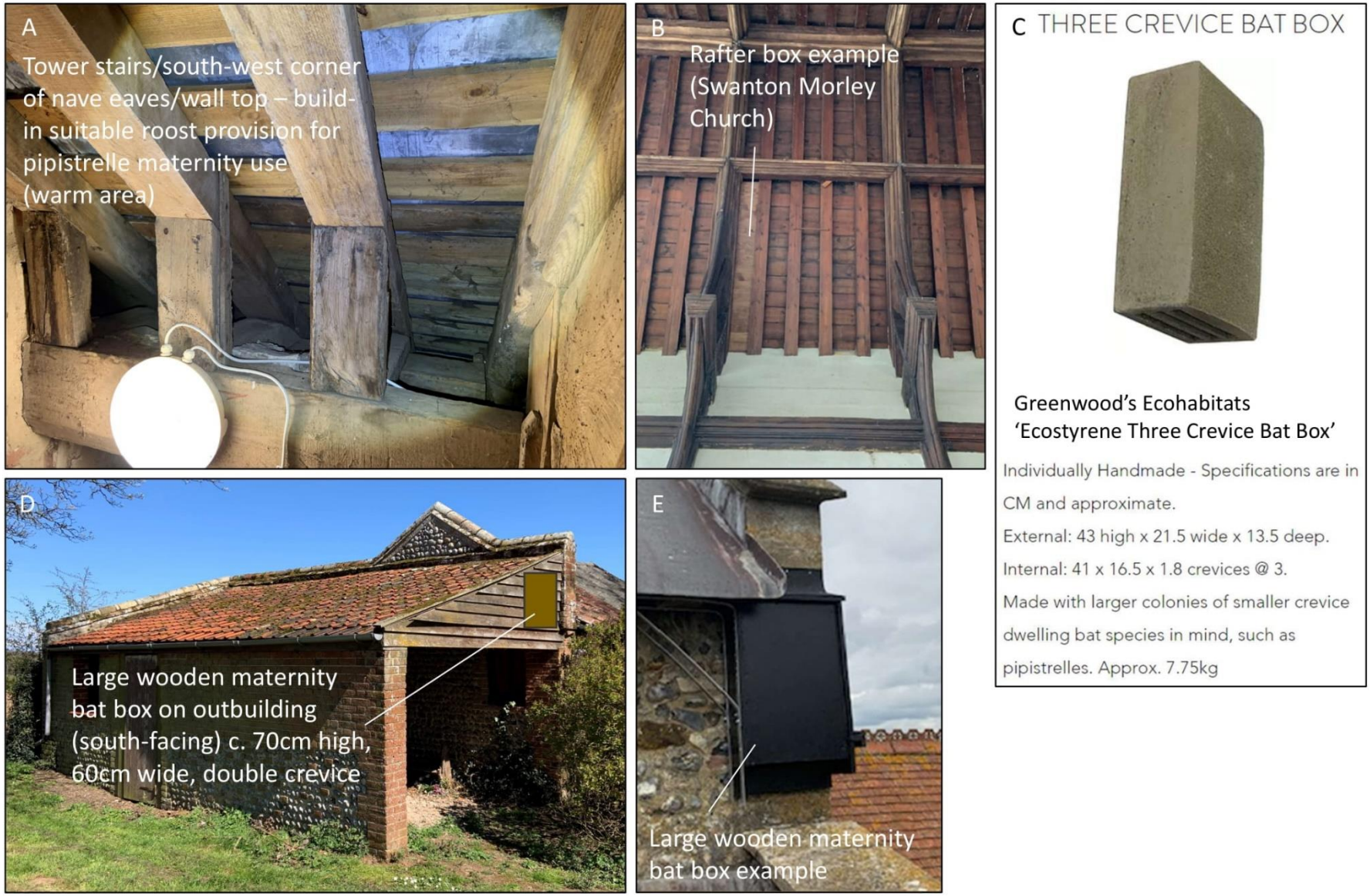

Figure 7. Management plan images.

It is important to recognise that there are no guarantees that the management options will be effective in significantly reducing the impact of bats on the church: bats can behave in unexpected ways and these approaches have not been fully tested before. It is also important to note that it typically takes several years for bats to start using newly created/artificial roosts and bat boxes. However, with a detailed understanding of how bats are using the building, the proposed approaches are considered to be the most appropriate, with the highest chance of success and which balance the need to protect both the church and the bat populations.

The proposed approaches will provide a range of different roost options and conditions, thereby maximising the likelihood of uptake by the bats and minimising the risk of impacting negatively on the bat population. **Comprehensive monitoring is essential to assess the effectiveness of the approaches both in terms of reducing the impact of bats on the church *and* protecting the bat population (i.e. has Favourable Conservation Status been maintained?), to assess if any adjustments to measures are required and also to determine the suitability of approaches to help other churches in future.**

Cost estimates are provided in a separate Appendix (4, Excel spreadsheet). For accurate costings for capital works it will be necessary to obtain quotes from contractors.

6. References

Bat Conservation Trust (2016) Core sustenance zones: determining zone size. Bat Conservation Trust, London. Available at https://cdn.bats.org.uk/pdf/Resources/Core_Sustenance_Zones_Explained_04.02.16.pdf?mtime=20190219173135&focal=none

Philip Parker Associates (2015) St Margaret's Church, Witton, Norfolk - Bat survey and assessment in respect of proposed repair works. Philip Parker Associates, King's Lynn.

Zeale, M.R., Stone, E., Bennitt, E., Newson, S., Parker, S., Haysom, K., Browne, W.J., Harris, S. and Jones, G. (2014) Defra Research Project WM0322 Improving mitigation success where bats occupy houses and historic buildings, particularly churches. Final Report. Available here: http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=2&ProjectID=17863

Appendix 1: Bat Roost Visit Report Form, August 2017

'Bats in Churches Heritage Lottery Fund Heritage Grant Bat Roost Visit Report Form' – completed 4th August 2017.

Submitted as a separate document as includes personal details.

Appendix 2: Bats in Churches Class Licence Survey Criteria

Natural England - minimum survey standards for site registration

The following survey standard describes the **minimum** survey effort required to enable registration of a church for the Bats in Churches Class Licence.

1. High quality survey data, accurately reflecting the usage of the building by bats, must be presented representing at least one full active season.

2. Places of worship will vary considerably in size and structural complexity so methods, techniques and frequency of surveys used must be appropriate and adjusted to suit each situation. Survey methods chosen should maximise collection of information. Surveys should continue until the relevant level of information has been collected.

3. At least four surveys, comprising three dusk and one dawn survey, and one thorough physical inspection, must have been completed for each church applying to be registered in the season prior to starting licensable works. Larger and more complex buildings might require a greater survey effort both in terms of numbers of surveys and numbers of surveyors involved.

4. Surveys should be undertaken in the optimum period for bats (as stated in the BCT Good Practice Guidelines) between May-August. At least one dusk activity survey must be presented from each of the following periods and each survey must be conducted at least two weeks apart:
    a. May to mid-June;
    b. Mid-June to end July; and
    c. August to mid-September.

5. Survey data must be presented from the most recent active season prior to the start of works. If licensed works are planned to begin post maternity period and before the following spring, and a full suite of surveys was conducted the previous year, an update survey will be required during early or mid-maternity period in the year that work is to commence.

6. If surveys meeting the requirements were not undertaken in the active season preceding the intended start of works, but were undertaken within 3 years, a reduced survey effort will be acceptable. In these cases a minimum of two update surveys (one of which must be a dusk survey) will be required. Update surveys should be undertaken between May and August but both may be undertaken earlier in the year i.e. pre or during the maternity period, to allow work to take place immediately prior to or after the maternity season.

7. The mandatory dawn survey must be conducted during the early survey period between May and mid-June. It may be timed to take place directly after an emergence survey.

8. A surveyor must be present inside the building during a dawn survey to identify internal access points.

9. If during the update surveys it is identified that usage of the building by bats has changed significantly, any pre-agreed approach to mitigation must be re-appraised.

10. All major entry and exit points for bats on the exterior of the building *must* be identified. Entry and exit points on the interior of the building *should* be identified.

11. Surveys must identify species of bat and approximate numbers of bats of each species using the building. If breeding roosts are present, this will include a clear understanding of where nursery clusters form and how these and all other roost sites within the building are accessed.

12. Special attention should be given to establishing if access to the interior void of the building is required to access roosting locations or if these locations can be accessed by bats directly from the exterior.

Appendix 3: Photographs (general)

Photo 1. Southern elevation.

Photo 2. Eastern and northern elevations.

Photo 3. Nave interior (from west end facing east).

Photo 4. Nave interior (from east end facing west).

Photo 5. Chancel interior (facing east).

Photo 6. South aisle.

Photo 7. South aisle door (main pipistrelle access).

Photo 8. West end of nave, looking north to curtained doorway to vesty.

Photo 9. Vestry.

Photo 10. Vestry ceiling.

Photo 11. South-west corner of nave wall top/eaves as viewed from tower staircase. Potential roost enhancement area.

Photo 12. Tower staircase and access to south-west corner of nave wall top/eaves. Surfaces scattered with pipistrelle-type droppings.

Photo 13. Tower staircase, potential roost enhancement area (north side).

Photo 14. Tower, first floor.

Photo 15. Tower, bell chamber.

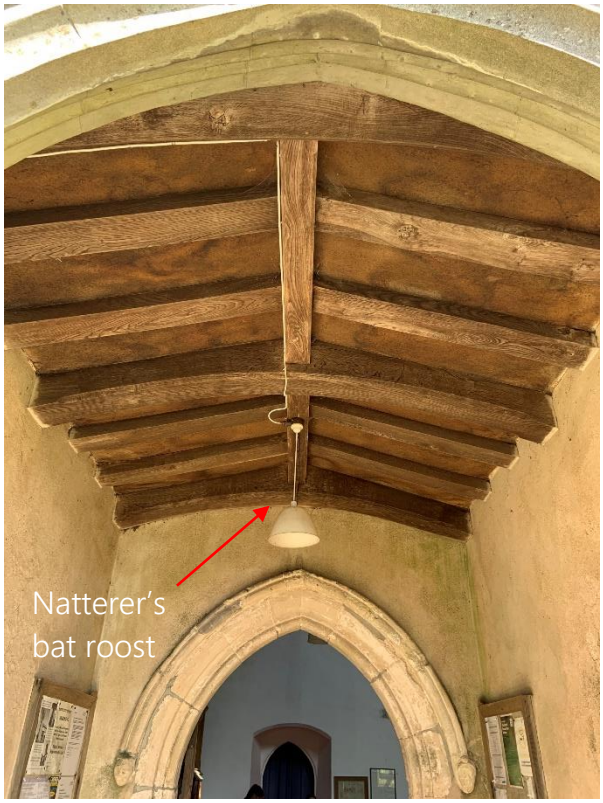

Photo 16. Porch.

Photo 17. Location of outbuilding (north-east corner of churchyard) in relation to church (east end of chancel).

Photo 18. Outbuilding in north-east corner of churchyard.

Photo 19. Outbuilding in north-east corner of churchyard (interior of open western section).

Appendix 4: Budget/estimated costs

Attached as a separate Excel spreadsheet document.