



Norwich Western Link

Environmental Statement

Chapter 11: Bats

Appendix 3: 2021 Bat Roost Survey Report

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1 Introduction

1.1.1 WSP UK Ltd was commissioned by NCC to complete a comprehensive suite of bat surveys for the Scheme, including the following works for winter 2020 and the 2021 survey season:

- Undertake an updated desk-based assessment to identify nearby bat roosts likely to be impacted by the Scheme.
- Complete Ground Level Tree Assessment (GLTA) surveys of trees, to determine the suitability of trees to support roosting bats. This survey was targeted at trees which were not assessed in 2020 as a result of access constraints.
- Complete climbing aerial inspections of trees graded as of moderate to high suitability to support bat roosts, targeting trees which could not be accessed in 2020 and new trees identified as a result of the above 2021 GLTA surveys.
- Dusk emergence and dawn re-entry surveys of trees graded as of moderate or high suitability, which were considered unsafe to climb or where tree climbing inspection proved inconclusive. This survey was targeted at trees which were not subject to emergence/re-entry surveys in 2020 as a result of access constraints, and any new trees identified as a result of the 2021 GLTA or aerial inspection surveys.
- Hibernation inspection of trees which were safe for aerial inspection, and which had been assessed as having moderate or high bat roosting suitability or identified as a confirmed roost.
- Dusk emergence and dawn re-entry surveys of structures identified during the Preliminary Roost Assessment in 2020, including structures at Low Farm, Pump Farm and Lacey Bungalow.
- Hibernation inspections of structures, to assess the suitability of structures to support hibernating bats.



- 1.1.2 The objectives of previous bat surveys are detailed in the 2019 and interim 2020 bat reports (WSP, 2020 and WSP, 2021a).
- 1.1.3 We have included a summary of key information shown in this document in an accessible format. However, some users may not be able to access all technical details. If you require this document in a more accessible format please contact norwichwesternlink@norfolk.gov.uk.



Norfolk County Council

NORWICH WESTERN LINK ROAD

2021 Bat Roost Survey Report





Norfolk County Council

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2021 Bat Roost Survey Report

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1 Introduction

1.1 Project background

1.1.1 The Norwich Western Link Road (NWL) is a highway scheme linking the A1270 Broadland Northway from its junction with the A1067 Fakenham Road to the A47 trunk road near Honingham.

The NWL, hereafter referred to as the Scheme, will comprise:

- Dualling the A1067 Fakenham Road westwards from its existing junction with the A1270 to a new roundabout located approximately 400m to the northwest.
- Construction of a new roundabout.
- Constructing a dual carriageway link from the new roundabout to a new junction with the A47 near Honingham.

1.1.2 As part of a separate planned scheme, National Highways proposes to realign and dual the A47 from the existing roundabout at Easton to join the existing dual carriageway section at North Tuddenham. If that scheme proceeds, it is expected that National Highways will construct the Honingham junction, and the Norwich Western Link will connect to the north-eastern side of that junction.

1.1.3 The Scheme will cross the River Wensum and its flood plain by means of a viaduct. In addition, six other structures are proposed to cross minor roads and to provide habitat connectivity. The Scheme will include ancillary works such as provision for non-motorised users, necessary realignment of the local road network, including the stopping up of some minor roads, and the provision of environmental mitigation measures.

1.2 Ecological background

WSP was commissioned in 2019 to complete baseline bat surveys to inform the route optioneering process (WSP UK Ltd, 2020a). This included ground level tree assessments, bat activity surveys, bat radio tracking and bat hibernation surveys.

Following selection of a preferred route (Route C) and further consultation, the methodology and survey area was refined to provide a complete data set to inform appropriate mitigation measures for the chosen preferred route and therefore termed “Scheme”. Survey data from 2020 is reported in an interim bat survey report (WSP UK Ltd, 2021a).

This technical report presents the methods and results of roosting bat surveys undertaken in 2021 and should be read in conjunction with the bat radio tracking report (WSP UK Ltd, 2021b) and bat activity report (WSP UK Ltd, 2021c) which together with earlier interim reporting, capture the results of survey completed between 2019-2021 to inform the Scheme.

Bat surveys have also been completed in association with the separate planned scheme to realign and dual the A47 to the south of the Scheme (Highways England, 2021a-c), and construction of the Northern Broadway to the north-east of the Scheme (Mott Macdonald, 2020 & 202; BSG, 2010; Greena Ecological Consultancy, 2013a-b).

1.3 Brief and objectives

WSP UK Ltd was commissioned by NCC to complete a comprehensive suite of bat surveys for the Scheme, including the following works for winter 2020 and the 2021 survey season:

- Undertake an updated desk-based assessment to identify nearby bat roosts likely to be impacted by the Scheme.
- Complete Ground Level Tree Assessment (GLTA) surveys of trees, to determine the suitability of trees to support roosting bats. This survey was targeted at trees which were not assessed in 2020 as a result of access constraints.
- Complete climbing aerial inspections of trees graded as of moderate to high suitability to support bat roosts, targeting trees which could not be accessed in 2020 and new trees identified as a result of the above 2021 GLTA surveys.
- Dusk emergence and dawn re-entry surveys of trees graded as of moderate or high suitability, which were considered unsafe to climb or where tree climbing inspection proved inconclusive. This survey was targeted at trees which were not subject to emergence/re-entry surveys in 2020 as a result of access constraints, and any new trees identified as a result of the 2021 GLTA or aerial inspection surveys.
- Hibernation inspection of trees which were safe for aerial inspection, and which had been assessed as having moderate or high bat roosting suitability or identified as a confirmed roost.
- Dusk emergence and dawn re-entry surveys of structures identified during the Preliminary Roost Assessment in 2020, including structures at Low Farm, Pump Farm and Lacey Bungalow.
- Hibernation inspections of structures, to assess the suitability of structures to support hibernating bats.

The objectives of previous bat surveys are detailed in the 2019 and interim 2020 bat reports (WSP, 2020 and WSP, 2021a).

1.4 Survey areas

The areas covered by each of the survey types listed in Section 1.3 are hereafter referred to as the ‘Survey Areas’ and are defined below in Table 1-1.

Table 1-1 – Summary of Survey Areas for roosting bat surveys completed in 2021.

Survey Type	Survey Area Definition
Ground Level Tree Assessments	All trees within a 100m buffer of the Scheme alignment, excluding those scoped out from further assessment as detailed in Table 2-1.
Climbed aerial inspections of trees and dusk emergence/dawn re-entry surveys of trees	A number of the trees subject to survey in 2021 were initially identified in 2019 or 2020. The original survey area for trees covered all areas up to and within a 25m buffer of the Scheme boundary. Following the selection of the preferred route, this was subsequently updated during the 2020 survey season to incorporate all land up to and within a 100m buffer of the Scheme alignment.
Hibernation inspection of trees	

Survey Type	Survey Area Definition
	Due to the differing extents of the Scheme boundary and the Scheme alignment, occasionally trees surveyed fell within the 100m route alignment buffer but outside the 25m Scheme boundary, and <i>vice versa</i> .
Dusk emergence and dawn re-entry surveys of structures	All structures within a 100m buffer of the Scheme, excluding those scoped out from further assessment as detailed in Table 2-2.
Hibernation inspection of structures	Structures within 500m of the Scheme which were potentially suitable for use by hibernating bats, as detailed in Section 2.6.

It should be noted that the dataset includes several trees situated outside of the Survey Areas defined in Table 1-1 due to the following:

- Collection of tree data obtained after January 2021 was assisted by digital data capture techniques which improved accuracy in identifying the precise limits of Survey Areas on the ground, particularly where there were no physical boundaries demarcating the extents of the Survey Areas. Prior to this time, all trees in proximity to Survey Area boundaries were surveyed to avoid any doubt with regards to the extent of the Survey Areas to ensure a complete dataset. As a result, some of the trees surveyed were later found to fall just beyond the Survey Areas once the data was subsequently processed.
- A number of changes to the Scheme boundary/alignment occurred since the original Ground Level Tree Assessment (GLTA) was undertaken in 2019, which consequently resulted in changes to the Survey Areas. A number of trees that previously fell within the Survey Areas based on previous iterations of the Scheme boundary/alignment therefore now fall outside the current Survey Areas.
- On certain land parcels where access was particularly constrained, a decision was made to survey all trees within the parcel, even those that fell outside of the Survey Areas, in order to avoid having to request additional access in the event of further changes to the Scheme boundary/alignment.

2 Methods

2.1 Overview

The methodology applied for all survey techniques described below was completed with reference to best practice guidance and industry standards (Collins, 2016).

Upon completion of surveys in 2020, Natural England were consulted regarding the scope for further surveys in 2021. Following these discussions, it was determined that a number of trees and structures could be scoped out from further survey requirements due to distances from the Scheme or the relative scale of proposed works in the vicinity.

Trees subject to assessment in 2019 and/or 2020 but subsequently removed from the scope of works in 2021 are described in Table 2-1. As such, the trees in Table 2-1 are not considered further within this report.

Table 2-1 – Trees scoped out of further assessment in 2021

Tree references	Rational for removal from 2021 survey scope
Trees 141-155 adjacent to the farm track north of Weston Road.	All trees are situated sufficiently far from the Scheme boundary (outside a 25m buffer zone) and will be retained.
Trees 164-170 along Ringland Lane.	All trees will be retained. The only construction works proposed in this area will be improvements to the existing road (including widening into the adjacent arable field, the creation of passing places, and resurfacing), and as such any potential construction impacts can be sufficiently addressed within a Construction and Environmental Management Plan (CEMP).
Trees 231-245 along the edge of the Gravelpit Plantation.	All trees present are a minimum distance of approximately 80m from the route alignment. All trees will be retained and are present in retained habitats with maintained connectivity to the wider landscape after construction.
Trees 264-273, 275-288, 290-295, 297-299, 301, 303-314, 316-318 to the north of Fakenham Road in the north of the Scheme	All trees will be retained (with suitable connecting habitat also retained) and are adjacent to an existing busy road. Suitable mitigation for noise and lighting impacts will be included within a CEMP and built into the landscape design.

Structures subject to assessment in 2019 and/or 2020, which have been subsequently removed from the scope of works in 2021, are detailed below in Table 2-2. As such, the structures listed in Table 2-2 are not considered further within this report.

Table 2-2 – Structures scoped out of further assessment in 2021

Structure ref	Rationale for removal from 2021 survey scope
Structures 1A1-1A3 Structure 2A1 Structures 3A1-3A4 Structure 4A1 Structure 5A1-5A6	All structures are proposed to be retained and they are located adjacent to an existing main road (A1067). Connecting habitat including extensive woodland to the north, and the River Wensum and associated floodplain to the south, will also be retained. Construction of the viaduct will ensure there is no barrier to movement within the floodplain. Suitable mitigation for noise and lighting impacts will be included within a CEMP and carried through in landscape design.
Structures 9A1-9A4	Structures are to be retained and are located adjacent to an existing busy road (B1535). Connecting habitat to the north and west will also be retained and suitable mitigation for noise and lighting impacts will be included within a CEMP and carried through in the landscape design.

2.2 Desk study

To ensure new survey data is viewed in context, an updated desk study exercise was completed in June 2021. The objective of the desk study was to identify roost data generated by surveys undertaken in association with the Northern Broadway to the north-east of the Scheme.

An online review of bat survey data published online was completed. The review included data generated to inform the planning process, and data generated during post-construction monitoring of the Northern Broadway. Greatest attention was given to data generated through radio-tracking surveys because this spans the survey area for the Scheme and includes roost records for rarer species including barbastelle.

The following reports were reviewed to extract third party roost data:

- BSG (2010). Norwich Northern Distributor Road; Bat Activity and Radio-tracking Surveys 2009.
- Greena Ecological Consultancy (2013a). Report on a bat radio-tracking study of Barbastelle bats; Norwich Northern Distributor Road, 2013 (25th July 2013).
- Greena Ecological Consultancy (2013b). Report on a bat radio-tracking study of Barbastelle bats; Norwich Northern Distributor Road, 2012 (V1A 23 January 2013).
- Mott MacDonald on behalf of NCC (2020) Norwich Northern Distributor Road; Post Construction Barbastelle Bat radio tracking monitoring report: Year 1 2018.

2.3 Ground level tree assessments

This report presents the results of the 2019, 2020 and 2021 GLTA surveys, and supersedes the 2020 interim report (WSP UK Ltd, 2021a).

All trees within a 100m buffer of the route alignment which had not been previously assessed due to access limitations were subject to a GLTA in 2021. All GLTA surveys were completed by ecologists competent in recognising potential features of suitability for tree roosting bats.

In reference to the good practice guidelines and industry standards (Collins, 2016), a visual inspection of the trees from ground level using binoculars and a high-powered torch was undertaken to search for features which provide potential roosting opportunities for bats such as:

- woodpecker holes;
- rot holes;
- hazard beams;
- cracks and splits (e.g. frost cracks);
- knot holes;
- cankers;
- dense ivy; and
- lifting/peeling bark.

Where potential roost features were identified, their location and a brief description were recorded, in order to aid further survey work as required. Where possible, each feature was visually inspected for evidence of use by roosting bats, including:

- bat droppings in, around or below the potential roost feature;
- urine staining below the potential roost feature;
- scratch marks; and,
- characteristic staining (from fur oils).

Where features were present at a height possible for a ground-level inspection to be safely completed (e.g. <2m high), this was completed by a Level 2 licensed bat surveyor using high powered torches and/or an endoscope. Trees were categorised in line with the descriptions in Table 2-3. Trees categorised as having negligible suitability to support roosting bats are not discussed further in this report, beyond those which were downgraded to negligible suitability following further inspection.

Table 2-3 – Tree bat roost suitability classification (Collins, 2016)

Bat roosting suitability	Description of roosting behaviour
Confirmed	A tree with features confirmed to be used by roosting bats either by historic records or evidence recorded during survey.
High	A tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.
Moderate	A tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).
Low	A tree of sufficient size and age to contain potential roosting features but with none seen from the ground or features with only very limited roosting potential.
Negligible	A tree with features of negligible value to tree-roosting bats.

For trees assessed as being of low, moderate or high suitability, information on species, approximate height in metres, and age class was collected. Additionally, a ten-figure grid reference and photographs were collected for all trees assessed as low, moderate or high suitability.

Based on the features present and the location of the trees, the potential for different types of bat roost to be present was also considered. For the purposes of this GLTA, potential roosts types were grouped as follows, with descriptions as defined by the Bat Conservation Trust (Collins, 2016):

- **maternity (breeding roost)** – where female bats give birth and raise their young to independence;
- **satellite roosts** – an alternative roost found in close proximity to the main nursery colony used by a few individual breeding females to small groups of breeding females throughout the breeding season;
- **transitional roosts** – used by a few individuals or occasionally small groups for generally short periods of time on waking from hibernation or in the period prior to hibernation;
- **night roosts** - a place where bats rest or shelter in the night but are rarely found in the day. May be used by a single individual on occasion or it could be used regularly by the whole colony;
- **day roosts** - a place where individual bats, non-breeding females or small groups of males, rest or shelter in the day but are rarely found by night in the summer;
- **mating roosts** - where mating takes place from late summer and can continue through winter; and
- **hibernation roosts** - where bats may be found individually or together during winter. They have a constant cool temperature and high humidity.

2.4 Aerial inspections of trees

Any trees identified as being of moderate or high suitability for tree-roosting bats (or a confirmed roost) have been subject to a follow-up presence/likely absence survey, either comprising aerial inspection surveys described in this section, or dusk emergence/dawn re-entry surveys described in Section 2.5.

Negligible and low suitability trees did not receive a follow-up presence/likely absence survey in accordance with best practice survey guidance (Collins, 2016). Low suitability trees have been recorded on a plan and will be considered as part of the bat mitigation strategy for the Scheme.

Aerial inspection surveys were undertaken by qualified tree-climbers holding a Level 2 Natural England bat licence (or were supervised by an ecologist holding a Natural England Level 2 licence).

Where possible, ladders were used to access features that were less than 3m high. Any features greater than 3m in height (or where ladder access was deemed unsafe) were subject to aerial climbing inspections. Surveyors undertook inspections with high powered torches, endoscopes and mirrors. Information about the features were noted, for example, dimensions and exposure to cold, rain and light. After inspection, the suitability of the potential roost feature was re-evaluated depending on the suitability of the feature to support roosting bats, and re-categorised as appropriate (as low, moderate or high).

The number of aerial inspections conducted for each tree was proportional to the level of bat roosting suitability assigned. In accordance with current best practice guidance (Collins, 2016), two aerial inspections were completed for trees with moderate suitability, and three separate aerial inspections were completed for trees with high suitability or trees with confirmed roosting status. Each separate aerial inspection was considered as a separate survey visit.

2.5 Dusk emergence and dawn re-entry surveys of trees and structures

In addition to trees which could not be safely climbed, structures assessed as having suitability to support roosting bats in 2020 were subject to dusk emergence/dawn re-entry surveys in 2021 to determine the presence or likely absence of roosting bats.

Dusk emergence/dawn re-entry surveys were undertaken by surveyors experienced in completing emergence/re-entry surveys for trees and structures.

Surveyors noted features on the tree or structure from which bats were observed emerging or returning. Surveyors recorded the species and time of activity, as well as noting any flight lines and comments on activity (i.e. commuting or foraging).

For emergence/re-entry surveys of trees and structures, the number of survey visits completed was proportional to the level of assigned bat roosting suitability as show in Table 2-4 below. This is in line with current best practice guidance (Collins, 2016). A single survey visit for trees comprised the following:

- aerial inspection survey (as described above, where safe and practical to do so);
- dawn re-entry survey; or
- dusk emergence survey.

A single survey visit for buildings comprised either a dusk emergence survey or a dawn re-entry survey.

Table 2-4 – Recommended number of presence/likely absence based on Collins (2016)

Roost suitability	Recommended minimum number of survey visits for trees	Recommended minimum number of survey visits for structures
Low	No further survey required. Tree will be subject to checks immediately prior to felling.	One survey visit.
Moderate	Two separate survey visits.	Two separate survey visits.
High	Three separate survey visits	Three separate survey visits.

Roost suitability	Recommended minimum number of survey visits for trees	Recommended minimum number of survey visits for structures
Confirmed Roost	At least three separate survey visits, or until the roost has been characterised.	At least three separate survey visits, or until the roost has been characterised.

Tree Surveys

Surveyors positioned themselves in order to achieve optimal visibility of the tree and any potential roosting features. In most cases one surveyor could survey the tree adequately, however, in some cases where there was restricted visibility or many features, a second surveyor was required.

Dusk emergence surveys began 15 minutes before sunset and continued for at least 1.5 hours. The dawn re-entry surveys began a minimum of 1.5 hours before sunrise and continued until 15 minutes after sunrise.

Surveyors used a variety of bat detectors, including Batlogger M, Echometer touch, and Duet to listen to and record bat echolocation calls. On every survey occasion, surveyors were aided by either an infra-red or thermal imaging camera to enable visibility of the tree in darkness.

Structure Surveys

Sufficient numbers of surveyors were positioned around the building on each survey to ensure visibility of all the potential roosting features identified during the 2020 Preliminary Bat Roost Assessment surveys.

Dusk emergence surveys began 15 minutes before sunset and continued for at least 1.5 hours, typically lasting 90 minutes due to limited visibility of potential roosting features on structures after this time. The dawn re-entry surveys began two hours before sunrise and continued until 15 minutes after sunrise, except for a few instances detailed in Section 2.8 below.

Surveyors used Batlogger M, Duet and Anabat detectors to listen to and record bat echolocation calls.

2.6 Hibernation surveys of trees

Trees assessed as having moderate or high suitability during the 2019 and 2020 GLTA surveys, or trees identified as confirmed roosts, were subject to two separate inspections during the hibernation season, to determine the presence or likely absence of hibernating bats.

Where possible, identified potential (or confirmed) roosting features were inspected from ground level using a high-powered torch or endoscope as appropriate. Where potential or confirmed roosting features could not be inspected from ground level, an aerial inspection was completed with the use of a ladder or otherwise by qualified tree-climbers holding a Level 2 Natural England bat licence (or were supervised by an ecologist holding a Natural England Level 2 licence).

As the hibernation surveys were largely conducted as an aerial inspection to fully inspect roosting features, hibernation surveys were not completed for trees with moderate, high or confirmed roosting status which were considered unsafe to climb.

2.7 Hibernation surveys of structures

A review of aerial base mapping and ordnance survey mapping was undertaken as part of the desk study exercise in 2019 to identify structures with the potential to support hibernation roosts within a 500m buffer of the Scheme (WSP, 2020). The search focused on identifying structures likely to support an important hibernation roost, including churches, underground structures/bunkers and timber-framed agricultural barns.

Important hibernation roosts are those which have been deemed suitable for a diverse range of species and/or large numbers of bats to hibernate. Buildings considered likely to support individual hibernating bats (e.g. residential properties and commercial properties) were excluded from the search, as it is considered that such structures are less likely to support important hibernation roosts and due to the difficulty in searching typical hibernation features associated with these buildings (e.g. cavity walls, ridge tiles etc). Hibernation surveys of the identified structures considered possible to support an important hibernation roost which could not be conducted in 2019 due to access restrictions were subsequently completed in 2021.

The exterior of each accessible structure was inspected for evidence of hibernating bats (e.g. droppings, urine staining, odour in poorly ventilated areas and live/dead bats). Surveyors used binoculars, high-powered torches and endoscopes to identify and investigate potential hibernation features used by bats. Internal inspections were also undertaken where access had been agreed and it was considered safe to do so with regards to structural integrity as well as COVID-19 social distancing measures. Where hibernating bats were present or suspected to be present, the following measures were implemented to minimise disturbance:

- noise levels were kept to a minimum;
- red light filters were used to reduce disturbance where possible, except where it was necessary to use white light to take photographs for identification;
- photography of bats was avoided where possible, or otherwise the amount of time spent photographing a bat was kept to a minimum and flash photography was not used;
- the amount of time spent within proximity of hibernating bats was kept to a minimum;
- a maximum of two surveyors were present within the proximity of a bat at any given time, to prevent a rise in temperature; and
- the endoscope and boots were cleaned with disinfectant between each use as a biosecurity measure to avoid the spread of white nose syndrome (an emergent disease of hibernating bats).

Structures were subject to two survey visits during the hibernation season for bats (typically December to March inclusive, depending on weather conditions). For some structures, a single survey visit was conducted where it was considered that the value of a second survey was limited (e.g. where the inspection of features was not possible and the survey was only useful for determining the possible value of the structure for hibernation). Full details on structures this applies to is provided in Table B2 (Appendix B).

2.8 Dates of survey and personnel

The dates of the surveys completed in 2021 and details on the relevant personnel are provided below in Table 2-5. Structure references described in Table 2-5 are consistent with those detailed in the 2020 interim bat report (WSP, 2021).

Table 2-5 – Dates of survey and personnel used

Trees or structures	Survey Type	Dates of survey	Personnel
Trees	Ground Level Tree Assessment	22, 26 January 2021. 27 April 2021.	GLTAs were completed by ecologists competent in recognising potential bat roosting features. Any inspection of features at ground level (e.g. using an endoscope) were coordinated and undertaken by a licenced bat ecologist.
Trees	Aerial Inspection	11, 17, 18, 19, 20, 28 May 2021. 8, 9, 29 June 2021. 20 July 2021.	Aerial inspections were coordinated and undertaken by teams of two ecologists (at least one holding a Level 2 Natural England class licence for bats) qualified in tree climbing and aerial rescue.
Trees	Dusk emergence / dawn re-entry	Various dates ranging between May – September 2021. For a full list of dates, see Table A-1 in Appendix A.	Tree emergence/re-entry surveys were undertaken by surveyors with experience in conducting such surveys.
Trees	Hibernation surveys	27 January 2021 16, 19 and 25 February 2021 2 and 3 March 2021	Hibernation surveys were completed as aerial inspections, and as such were coordinated and undertaken by teams of two ecologists (at least one holding a Level 2 Natural England class licence for bats) qualified in tree climbing and aerial rescue.
Structures	Dusk emergence / dawn re-entry	<u>Structure 8A1</u> 4 June 2021, 5 July 2021, 20 July 2021 <u>Structure 6A1</u> 19 May 2021, 9 June 2021, 23 June 2021	Structure emergence/re-entry surveys were undertaken by surveyors with experience in conducting such surveys.

		<u>Structure 6A2</u> 25 May 2021, 17 June 2021, 30 June 2021 <u>Structure 6A3</u> 18 May 2021, 2 June 2021 <u>Structure 6A4</u> 11 May 2021, 1 June 2021, 15 June 2021 <u>Structure 7B1</u> 20 May 2021, 8 June 2021, 6 July 2021 <u>Structure 7B2</u> 13 May 2021 28 May 2021, 10 June 2021	
Structures	Hibernation surveys	13, 21, 25 and 28 January 2021 24 February 2021 5, 23 and 26 March 2021	Hibernation structure surveys were undertaken by teams of ecologists, with at least one holding a Level 2 Natural England class licence for bats)

2.9 Notes and limitations

Every effort has been made to provide a comprehensive set of survey data. However, the following notes and limitations apply to the surveys described above:

General

- Due to the potential for bats to colonise potential roosting features over time, the results of the roosting bat surveys described in this report should be considered valid for up to 18 months in accordance with best practice guidelines (CIEEM, 2019). Should the submission of the planning application be delayed beyond this time, further surveys may be required to update the baseline data for the Scheme.
- Dusk emergence and dawn re-entry surveys are unlikely to provide a complete measure of incidental bat activity due to the tendency for *Plecotus* species to use low intensity calls which are rarely detected unless passing within 5m of a detector. Even then, *Plecotus* species do not always echolocate when foraging. However, this is not expected to affect the findings of the roosting status of trees recorded for the Scheme, as additional equipment was utilised e.g. infra-red or thermal cameras, where practical, to enhance the findings of the survey results.

COVID-19

- Survey work was always undertaken following the most up-to-date government guidance regarding the COVID-19 pandemic at the time of survey. On occasion, this meant limiting the survey effort i.e. not undertaking internal inspections of structures where this would result in a breach of social distancing measures. To counter this limitation buildings with no internal access and suspected roof voids present were assessed via the precautionary principle.

- Internal surveys of structures for the hibernation surveys were not completed, unless it was deemed safe to do so (i.e. where the property or structure was vacant), and in these instances appropriate social distancing measures were adhered to.

Roosting Bats

- GLTA surveys can be undertaken at any time of year, but are optimal between November and April inclusive, as outside this period tree foliage may restrict visibility. All GLTA surveys conducted in 2021 were completed within this optimal period.
- A number of trees identified during the GLTA surveys were considered unsafe to climb, and therefore potential roosting features within these trees were not subject to an aerial inspection. This is not considered to be a significant limitation, as dusk emergence/dawn re-entry surveys were utilised as an alternative survey method to determine presence or likely absence of roosting bats in these instances.
- As above, trees considered unsafe to climb following the GLTA surveys were also not subject to hibernation survey, which was also conducted using aerial inspection methods. In addition, some trees which were included within the scope for hibernation surveys were subsequently unsafe to climb during the hibernation period or were otherwise unable to be climbed as a result of access limitations. For these trees, a precautionary approach was taken whereby any tree not subjected to a hibernation survey but considered suitable to support a hibernation roost from the GLTA results was therefore assumed to support a hibernation roost. The trees affected by this approach are detailed in Section 3.6.
- Woodland roosting bats are known to exhibit regular roost switching behaviour, and therefore roost locations may be used intermittently and not consistently each year (Kuhnert *et al.*, 2016). The use of trees and potential roost features by bats changes as a result of a range of factors including weather and microclimatic conditions. Due to the ephemeral nature of trees and the roost switching behaviour of tree roosting bats, a combination of survey methods (including the use of infra-red/thermal imaging cameras and radiotracking surveys described separately in the radiotracking report) have been conducted to ensure the baseline information is as robust as possible.
- Seventeen of the 120 trees subject to hibernation survey were not climbed on both or a single visit for hibernation inspection due to health and safety issues, and a further four trees were not subject to one or more hibernation inspections as a result of access limitations. In addition, five trees were downgraded to negligible hibernation suitability on the first survey visit and were therefore not subject to a second visit, and two trees were not climbed either because the feature had been lost in high winds or because the features were too small to endoscope. One tree could not be located during the hibernation visits and has subsequently been felled by the landowner due to ash dieback.
- As a result of access restrictions, the second hibernation inspection of structures 9B1-9B7, 10A1-10A3, 11A1-11A3 and the initial hibernation inspection of Keeper's Cottage 1-4 were delayed until March 2021, which falls outside the recommended hibernation survey period (December – February inclusive) (Collins, 2016). This is not considered to be a significant limitation for Keeper's Cottage 1-4, given that these structures were assessed as having negligible hibernation suitability on the first survey visit. Additionally, hibernating bats and/or evidence of hibernating bats was recorded in several of the bunker structures 9B1-

9B7, 10A1-10A3 and 11A1-11A3 during the second hibernation survey visit and therefore the roosting status of such structures could be confirmed.

- Structure Rutterford 1 could not be accessed on the second hibernation survey visit scheduled in February 2021, as a result of ownership changes and access restrictions. This is not considered to be a significant limitation to the hibernation survey given that one survey visit of the structure was completed in January 2021, during which no evidence of hibernating bats was recorded, and the metal construction of the building is considered to be of low suitability to support hibernating bats.
- One surveyor undertaking a dusk emergence survey of structure 6A4 on 11 May 2021 experienced a detector fault, and as such no sound file recordings were available for this surveyor location on this date, despite an emergence observed by this surveyor on this date. This is not considered to be a significant limitation as emergences at this structure were also recorded by separate surveyors on this same date, with further emergence and re-entry behaviour recorded on subsequent survey visits to this structure. As such, it is considered that there is sufficient data of this structure to confirm its roosting status.
- On four of the dawn re-entry surveys completed for structures, the survey commenced two hours before sunrise and ended at sunrise or several minutes after sunrise. These surveys were completed at in May and June at the peak of summer bat activity and were only terminated before the recommended time set by good practice guidance (Collins, 2016) where it was very light for extended period before the 'true' sunrise time and after prolonged periods of no bat activity.

3 Results

Overview

A summary of the results for roosting bat surveys completed in 2021 is presented in Sections 3.2 to 3.8. An overall summary of all summer and hibernation roosts identified as a result of 2019, 2020 and 2021 surveys is then presented in Section 3.9 which supersedes roost data in previous reporting (WSP, 2020 and WSP, 2021).

The summary of roosts in Section 3.9 excludes details of roosts identified as a result of the 2021 radiotracking surveys, which are presented separately in the 2021 radiotracking report. This report should be read in conjunction with the 2021 radiotracking report to gain a full understanding of the roosts identified for the Scheme.

3.1 Desk study

The location of all roosts identified as a result of the desk study exercise are presented in Figure A-1 in Appendix A.

3.2 Ground level tree assessments

A total of 346 trees have been subject to GLTA surveys throughout 2019, 2020 and 2021. Of these 338 trees were recorded as having bat roosting suitability within the Survey Area. The remaining 8 trees had negligible suitability for bats. The total number of trees which fall under each category following the 2021 GLTA surveys are as follows:

- Low roosting suitability: 120 trees
- Moderate roosting suitability: 141 trees
- High roosting suitability: 43 trees
- Confirmed summer roosts: 34 trees

Of the 34 trees with confirmed summer roosts, three trees (trees 4, 15 and 33) are considered to support a bat roost as a precaution due to limited survey efforts as a result of health and safety issues (presence of active bee and hornet nests). All remaining trees within the Survey Area were considered to be of negligible roosting suitability at the time of survey.

The above is also inclusive of the additional 22 trees with bat roosting suitability, identified within the Survey Area as a result of 2021 GLTA surveys. This includes:

- Low roosting suitability: three trees
- Moderate roosting suitability: 15 trees
- High roosting suitability: four trees

None of the trees surveyed in 2021 were found to support roosting bats at the time of the GLTA survey.

The results of the GLTA surveys undertaken to date (including 2019, 2020 and 2021) are presented in Appendix A, including a full table of results and survey dates (Table A-1) and drawings showing the location of the trees (Figure A-2).

Of the 338 trees identified with bat roost suitability:

- 95 were identified with low suitability during the GLTA and not subject to further surveys;
- 124 trees were subject to aerial tree inspections (with 25 trees downgraded to low, and 8 trees downgraded to negligible following aerial inspections);
- 7 trees were subject to a mixture of aerial tree inspections and dusk / dawn surveys; and
- 43 trees that were subject to only dusk / dawn surveys.

A total 69 moderate and high suitability trees were scoped out from further surveys due to distances from the Scheme, or the relative scale of proposed works in the vicinity. These trees are detailed in Table 2-1.

3.3 Aerial inspections of trees

A total of 131 trees have been surveyed via aerial inspection throughout 2019, 2020 and 2021, including 37 trees in 2021. A total of three new summer roosts were identified as a result of the 2021 aerial inspection surveys, including a:

- common pipistrelle *Pipistrellus pipistrellus* roost in tree 69,
- Natterer’s bat *Myotis nattereri* roost in tree 214, and
- brown long-eared bat *Plecotus auritus* roost in tree 329.

Full details of the roosts recorded within these trees, in addition to the summer trees roosts previously recorded during 2019 and 2020, are presented in Section 3.9.

Of the 37 trees subject to aerial inspection in 2021, 22 trees were downgraded in suitability upon further aerial inspection and one tree was upgraded in suitability. A summary of the trees reclassified in 2021 are presented below in Table 3-1, with full results for all trees and the locations of all trees provided in Appendix A.

Table 3-1 – Summary of trees reclassified as a result of 2021 aerial inspection surveys

Tree reference	GLTA suitability	Aerial inspection Suitability
47	High	Low
50	Moderate	Low
52	Moderate	Negligible
67	High	Moderate
68	High	Moderate
71	High	Moderate
179	Moderate	High
225	Moderate	Negligible
227	Moderate	Low
230	High	Moderate
261	Moderate	Negligible
262	Moderate	Low
324	Moderate	Negligible
326	Moderate	Negligible (fallen before aerial inspection)

327	High	Moderate
328	High	Low
333	Moderate	Low
334	Moderate	Low
336	Moderate	Negligible
338	Moderate	Low
339	Moderate	Low
344	Moderate	Low

3.4 Dusk emergence and dawn re-entry surveys of trees

A total 50 trees have been subject to dusk emergence and/or dawn re-entry surveys throughout 2019, 2020 and 2021, which have identified a total of nine confirmed summer roosts in trees. Of these 50 trees, seven were also subject to aerial climb inspections.

The above is inclusive of one bat roost recorded as a result of the 2021 dusk emergence/dawn re-entry surveys of trees: a soprano pipistrelle *Pipistrellus pygmaeus* roost in tree 345. In addition, tree 125 was confirmed as a soprano pipistrelle roost during emergence/re-entry surveys following inconclusive DNA analysis of droppings collected from the tree in 2020. Further confirmation of the roosting status of tree 69 was also gained from an emergence survey following two aerial inspections, during which a single common pipistrelle was recorded emerging.

A full summary of all tree roosts identified from 2019, 2020 and 2021 data is presented in Section 3.9 (excluding roosts identified as a result of radiotracking surveys).

3.5 Hibernation surveys of trees

A total of 120 trees were considered for hibernation surveys in 2021, given their assigned roosting suitability (moderate, high or confirmed roost), their proximity to the Scheme and their suitability for safe climbed inspections. Of these 120 trees, six were found to support hibernation roosts for bats including the following:

- Tree 41 – soprano hibernation roost;
- Tree 78 – noctule *Nyctalus noctula* and brown long-eared bat hibernation roost;
- Tree 103 - *Myotis* sp. roost;
- Tree 124 – possible hibernation roost for unknown species (droppings present, but tree also a confirmed summer roost) assumed to be present as a precaution;
- Tree 253 – *Pipistrellus* sp. hibernation roost; and
- Tree 254 – brown long-eared bat hibernation roost.

A full summary of all tree roosts, including summer and hibernation roosts identified from 2019, 2020 and 2021 data is presented in Section 3.9 (excluding roosts identified as a result of radiotracking surveys).

Seven trees were not subject to a full hibernation survey. This includes the following:

- Tree 121 for which the potential roosting feature was lost in high winds before the first survey visit;
- Tree 203, which could not be located during the hibernation survey, and which has subsequently been felled by the landowner due to ash dieback concerns; and
- Trees 132, 207, 225, 339 and 345, which were assessed as having negligible hibernation suitability on the first survey visit and were therefore not subjected to a second visit.

A precautionary approach was adopted in the assessment of 18 trees for the hibernation survey. This was due to a number of limiting factors as detailed in Section 2.9. Full details of the trees which were not subject to a full hibernation inspection are presented in Table 3-2.

Table 3-2 – Details of trees not subject to hibernation surveys due to limitations

Tree ref.	Details of survey limitation
5	Hibernation survey not conducted due to health and safety issues. Tree could not be climbed safely as surveyors could not get two anchor points.
21	Hibernation survey not conducted. Potential roosting feature identified as too small to endoscope.
23	First survey visit completed in March 2021 due to access limitations, as such a second visit could not be completed within hibernation season.
36	Hibernation survey not conducted due to health and safety issues. Tree heavily ivy-clad.
48	Hibernation survey not conducted due to health and safety issues. Tree heavily ivy-clad.
58	Hibernation survey not conducted due to health and safety issues. Tree is dead and therefore not safe to climb.
118	Hibernation survey not conducted due to health and safety issues. Tree was within floodwater during both hibernation survey visits.
120	Hibernation survey not conducted due to health and safety issues. Tree was within floodwater during both hibernation survey visits.
127	Second hibernation survey visit not completed due to flooding.
131	Hibernation survey not conducted due to health and safety issues. Tree was within floodwater during both hibernation survey visits.
163	Hibernation survey not conducted due to health and safety issues. Tree could not be climbed safely due to proximity to road.
194	Hibernation survey not conducted due to health and safety issues. Tree could not be climbed safely as surveyors could not get two anchor points.
199	Hibernation survey not conducted due to health and safety issues. Tree was within floodwater during both hibernation survey visits.
230	First visit conducted in March due to access limitations, and therefore no time was available to conduct a second survey visit.
259	Hibernation survey not conducted due to health and safety issues. Tree could not be climbed safely as surveyors could not get two anchor points.

329	Hibernation survey not conducted due to health and safety issues. Tree could not be climbed safely as surveyors could not get two anchor points.
331	Hibernation survey not conducted due to access limitations.
332	Hibernation survey not conducted due to access limitations.

Under the precautionary assessment, trees with access limitations described in Table 3-2 are considered to support hibernation roosts, for the purposes of designing appropriate mitigation for the Scheme. Similarly, trees which were not part of the survey scope for hibernation surveys based on their known limitations for climbing are also considered to support hibernation roosts as a precaution, where the GLTA results indicate that the tree has suitability to support hibernation roosts. A summary of trees assumed to support a hibernation roost on a precautionary basis is provided below in Table 3-3.

Table 3-3 – Summary of trees assumed to support hibernation roosts under a precautionary assessment

Tree Criteria	Tree Number
Trees assumed to support a hibernation as a precaution due to incomplete hibernation surveys (for reasons of H&S/access etc):	<ul style="list-style-type: none"> ■ Tree 5; ■ Tree 21; ■ Tree 23; ■ Tree 36; ■ Tree 48; ■ Tree 58; ■ Tree 118; ■ Tree 120; ■ Tree 127; ■ Tree 131; ■ Tree 194; ■ Tree 199; ■ Tree 230; ■ Tree 259; ■ Tree 329; ■ Tree 331; and ■ Tree 332. <p>17 trees total</p>

Tree Criteria	Tree Number
<p>Trees assumed to support a hibernation roost due to exclusion from hibernation survey effort (i.e. unsafe to climb from the outset, and subject to summer emergence surveys) or inconclusive survey results, and on the basis of the GLTA assessment:</p>	<ul style="list-style-type: none"> ■ Tree 53; ■ Tree 55; ■ Tree 57; ■ Tree 67; ■ Tree 88; ■ Tree 124; ■ Tree 136; ■ Tree 160; ■ Tree 161; ■ Tree 162; ■ Tree 163; and ■ Tree 193. <p>12 trees total</p>

3.6 Dusk emergence and dawn re-entry surveys of structures

Dusk emergence and dawn re-entry surveys were completed for structures 6A1-6A4, 7B1-7B2 and 8A1 which were subject to a Preliminary Bat Roost Assessment (PBRA) survey in 2020 (WSP, 2021) and which were scoped in for further assessment due to proximity to the Scheme and the likely severance of surrounding connecting habitat.

The surveys identified the following:

- Structures 6A1, 6A2, and 6A4 were confirmed as summer day roosts for low numbers of both common and soprano pipistrelle.
- Structures 7B1 and 7B2 were confirmed as summer day roosts for low numbers of common pipistrelle.
- A common pipistrelle summer day roost was also recorded at building 8A1, in addition to the brown long-eared roost recorded in 2020 (WSP, 2021).
- No bats were recorded emerging from or returning to roost at structure 6A3 and therefore roosting bats are considered to be likely absent from structure 6A3.

A summary of the results from the 2021 dusk emergence and dawn re-entry survey of structures is presented below in Table 3-5, with full results of all survey visits (including roosting locations) and locations of the structures provided in Appendix B.

Table 3-4 – Summary results of dusk emergence and dawn re-entry surveys for structures

Structure ref.	Summary of survey results	Roosting status
6A1	Individual soprano pipistrelle recorded emerging on all survey visits, in addition to a bat which was observed emerging but not detected by the detector on Visit 3. Single common pipistrelle observed emerging on Visit 1 and Visit 2.	Summer day roost for soprano pipistrelle and common pipistrelle
6A2	Two common pipistrelle and a single soprano pipistrelle recorded emerging on Visit 3.	Summer day roost for soprano pipistrelle and common pipistrelle
6A3	No bats recorded emerging from or returning to roost.	Roosting bats likely absent
6A4	Single common pipistrelle recorded returning to roost on all survey visits. Single soprano pipistrelle emerging on second survey visit. Two unidentified <i>Pipistrellus</i> sp. bats recorded emerging on first survey visit.	Summer day roost for soprano pipistrelle and common pipistrelle
7B1	Individual common pipistrelle recorded emerging from roost on all survey visits.	Summer day roost for common pipistrelle
7B2	Individual common pipistrelle emergence on third survey visit.	Summer day roost for common pipistrelle
8A1	Individual common pipistrelle recorded emerging from roost on all survey visits.	Summer day roost for common pipistrelle

3.7 Hibernation surveys of structures

Of the structures surveyed, seven were confirmed as hibernation roosts due to the presence of actively hibernating bats, dead bats, or due to the presence of fresh droppings. This includes the following structures, of which the majority are bunkers located towards the southern extent of the Scheme as well as All Saints Church:

- Historic bat roost of unknown species in bunker 9B4 – presence of dead bats.
- Brown long-eared bat, *Myotis* sp. (likely Daubenton’s bat *Myotis daubentonii*), and unidentified bat species recorded hibernating in structure 9B6.
- Brown long-eared bat recorded hibernating in structure 10A3.
- Bat droppings (suspected brown long-eared droppings) recorded beneath mortar gaps in structure 11A1.
- Brown long-eared bat recorded hibernating in structure 11A2.
- Brown long-eared bat and Daubenton’s bat recorded hibernating in structure 11A3.
- *Pipistrellus* sp. recorded hibernating behind door lock in All Saints Church.

In addition, the precautionary principle was adopted to consider structure 45A2 as a confirmed hibernation roost, due to the nature of the structure and the access limitations associated with internal inspections.

A summary of the hibernation surveys for all structures surveyed is presented below in Table 3-6, with descriptions, photographs and the locations of all structures surveyed (including confirmed hibernation roosts) presented in Appendix B.

Table 3-5 – Summary results of hibernation surveys of structures

Survey	Structures
Structures with confirmed hibernation roosts	Structures 9B4, 9B6, 10A3, 11A1, 11A2, 11A3 All Saints Church Structure 45A2 (using precautionary principle)
Structures where hibernating bats are considered to be likely absent	Structures 9B1-9B3, 9B5, 9B7, 10A1-2, 45A1, 45A6-A7 Morton Farm 2, 6-7 Rutterford 1-4
Structures considered to be unsuitable for hibernating bats	Keepers Cottage 1-4
Structures considered unlikely to support an important hibernation roost	Morton Farm 1, 3-5 Structure 45A3-A5, 45A8-A9

3.8 Summary of roosts recorded

This section presents an overview of all summer and hibernation roosts recorded to date in trees and structures, excluding roosts identified during the 2021 radiotracking surveys. The presented information is considered to supersede roost data reporting in both the previous bat survey reports (WSP, 2020 and 2021).

TREES

A total of 34 trees supporting 36 roosts have been found to contain roosts between 2019 and 2021 inclusive, comprising the following:

- Two barbastelle *Barbastella barbastellus* summer day roosts (trees 11 & 79);
- Five brown long-eared bat summer day roosts (trees 20, 60, 193, 197, 329), one brown long-eared bat maternity roost (tree 107) and one brown long-eared bat hibernation roost (tree 254);
- Fourteen soprano pipistrelle roosts, including summer day roosts in trees 21, 27, 38, 39, 41, 58, 125, 127, 136, 212, 220, 257, 259 and 345. Tree 41 also supports a hibernation roost for soprano pipistrelle;
- Four common pipistrelle roosts, all of which were summer day roosts in trees 69, 105, 138 and 139;
- Two summer day roosts for Natterer's bat, including trees 214 and 226;
- One transitional roost for Natterer's bat (tree 123)
- One tree with an unidentified *Myotis* sp. roost, a hibernation roost in tree 103;

- One tree (tree 78) supporting a hibernation roost for both an individual noctule and individual brown long-eared bat;
- One hibernation roost for unidentified Pipistrellus sp. in tree 253; and
- One tree supporting a roosts of unknown species. For tree 124, droppings collected during summer surveys were crumbled to confirm they were of bat origin and therefore could not be sent for analysis, and droppings were also recorded during hibernation survey but not analysed.

Table 3-6 below summarises all the identified bat roosts in trees to date, including summer roosts and hibernation roosts, but excluding roosts identified during radio-tracking or desk study exercises. Data labelled as 'N/A' (not applicable) in Table 3-6 denotes that a roost is likely absent based on the survey effort to date. Table 3-6 also includes summer and hibernation roosts assigned on a precautionary basis due to survey limitations.

Table 3-6 – Summary of bat roosts in trees (excluding radio-tracking results)

Tree Ref	Summer Roost Details	Hibernation Roost Details
4	Summer roost assumed to be present as a precaution.	N/A
5	N/A	Tree not climbed due to safety limitations. Hibernation roost assumed as a precaution.
11	Barbastelle summer day roost	N/A
15	Summer roost assumed to be present as a precaution.	N/A
20	Brown long-eared bat summer day roost	N/A
21	Soprano pipistrelle summer day roost	Tree not subject to hibernation survey – could not be climbed as feature too small to endoscope. Hibernation roost assumed as a precaution.
23	N/A	Hibernation survey not completed due to access limitations. Hibernation roost assumed as a precaution.
27	Soprano pipistrelle summer day roost	N/A
33	Summer roost assumed to be present as a precaution.	N/A
36	N/A	Tree not subject to hibernation survey - not climbed due to safety limitations. Hibernation roost assumed as a precaution.
38	Soprano pipistrelle summer day roost	Tree not subject to hibernation survey - not climbed due to safety limitations.

Tree Ref	Summer Roost Details	Hibernation Roost Details
		Hibernation roost considered likely absent based on GLTA results.
39	Soprano pipistrelle summer day roost (in Kent bat box on tree)	N/A
41	Soprano pipistrelle summer day roost (in Kent bat box on tree)	Soprano pipistrelle hibernation roost (in Kent bat box on tree)
48	N/A	Tree not subject to hibernation survey - not climbed due to safety limitations. Hibernation roost assumed as a precaution.
53	N/A	Tree not subject to hibernation survey –not climbed due to health and safety limitations. Hibernation roost assumed as a precaution.
55	N/A	Tree not subject to hibernation survey –not climbed due to access limitations. Hibernation roost assumed as a precaution.
57	N/A	Tree not subject to hibernation survey –not climbed due to access limitations. Hibernation roost assumed as a precaution.
58	Soprano pipistrelle summer day roost	Tree not subject to hibernation survey - not climbed due to safety limitations. Hibernation roost assumed as a precaution.
60	Brown long-eared bat summer day roost	N/A
67	N/A	Tree not subject to hibernation survey –not climbed due to access limitations. Hibernation roost assumed as a precaution.
69	Common pipistrelle summer day roost	N/A
78	N/A	Noctule and brown long-eared bat hibernation roost.
79	Barbastelle summer day roost	Tree not subject to hibernation survey - not climbed due to safety limitations. Hibernation roost considered likely absent based on GLTA results.
88	N/A	Tree not subject to hibernation survey –not climbed due to access limitations. Hibernation roost assumed as a precaution.
103	N/A	Myotis hibernation roost
105	Common pipistrelle summer day roost	N/A
107	Brown long-eared bat maternity roost	N/A

Tree Ref	Summer Roost Details	Hibernation Roost Details
118	N/A	Tree not subject to hibernation survey - not climbed due to safety limitations. Hibernation roost assumed as a precaution.
120	N/A	Tree not subject to hibernation survey - not climbed due to safety limitations. Hibernation roost assumed as a precaution.
123	Natterer's bat summer transitional roost	N/A
124	Unknown roost (droppings present but crumbled to confirm bat origin)	Droppings recorded during hibernation surveys – inconclusive as to whether these are associated with summer or hibernation roost. Hibernation roost assumed as a precaution.
125	Soprano pipistrelle summer day roost	N/A
127	Soprano pipistrelle summer day roost	Tree not subject to full hibernation survey – second visit not climbed due to safety limitations. Hibernation roost assumed as a precaution.
131	N/A	Tree not subject to full hibernation survey – second visit not climbed due to safety limitations. Hibernation roost assumed as a precaution.
136	Soprano pipistrelle day roost.	Tree not subject to hibernation - not climbed due to safety limitations. Hibernation roost assumed as a precaution.
138	Common pipistrelle summer day roost	Tree not subject to hibernation survey - not climbed due to safety limitations. Hibernation roost considered likely absent based on GLTA results.
139	Common pipistrelle summer day roost	Tree not subject to hibernation survey - not climbed due to safety limitations. Hibernation roost considered likely absent based on GLTA results.
160	N/A	Tree not subject to hibernation survey –not climbed due to safety limitations. Hibernation roost assumed as a precaution.
161	N/A	Tree not subject to hibernation survey –not climbed due to access limitations. Hibernation roost assumed as a precaution.
162	N/A	Tree not subject to hibernation survey –not climbed due to access limitations. Hibernation roost assumed as a precaution.

Tree Ref	Summer Roost Details	Hibernation Roost Details
163	N/A	Tree not subject to hibernation survey –not climbed due to safety limitations. Hibernation roost assumed as a precaution.
193	Brown long-eared bat summer day roost	Tree not subject to hibernation survey - not climbed due to safety limitations. Hibernation roost assumed as a precaution.
194	N/A	Tree not subject to hibernation survey –not climbed due to safety limitations. Hibernation roost assumed as a precaution.
197	Brown long-eared bat summer day roost	Tree not subject to hibernation survey - not climbed due to safety limitations. Hibernation roost considered likely absent based on GLTA results.
199	N/A	Tree not subject to hibernation survey –not climbed due to safety limitations. Hibernation roost assumed as a precaution.
212	Soprano pipistrelle summer day roost	N/A
214	Natterer's bat summer day roost	N/A
220	Soprano pipistrelle summer day roost	N/A
226	Natterer's bat summer day roost	N/A
230	N/A	Tree not subject to full hibernation survey – second visit not completed due to access limitations. Hibernation roost assumed as a precaution.
253	N/A	Pipistrellus sp. hibernation roost.
254	N/A	Brown long-eared bat hibernation roost
257	Soprano pipistrelle summer day roost	N/A
259	Soprano pipistrelle summer day roost	Tree not subject to hibernation survey - not climbed due to safety limitations. Hibernation roost assumed as a precaution.
329	Brown long-eared bat summer day roost	Tree not subject to hibernation survey - not climbed due to safety limitations. Hibernation roost assumed as a precaution.
331	N/A	Tree not subject to hibernation survey –not climbed due to access limitations. Hibernation roost assumed as a precaution.
332	N/A	Tree not subject to hibernation survey –not climbed due to access limitations. Hibernation roost assumed as a precaution.

Tree Ref	Summer Roost Details	Hibernation Roost Details
345	Soprano pipistrelle summer day roost	N/A

Of the tree roosts identified above, 27 are present within the Scheme boundary and 31 are present outside of the Scheme boundary but within 100m. Table 3-7 below summarises the distribution of these trees:

Table 3-7 – Summary of tree roost locations for the Scheme

Tree Criteria	Tree Number
Trees with confirmed roosts present within the Scheme boundary	Trees 4, 5, 15, 21, 38, 39, 41, 57, 58, 78, 103, 105, 107, 118, 123, 124, 125, 136, 138, 139, 160, 212, 220, 230, 253, 254, 259
Trees with confirmed roosts present outside of the Scheme boundary but within 100m buffer	Trees 11, 20, 23, 27, 33, 36, 48, 53, 55, 60, 67, 69, 79, 88, 120, 127, 131, 161, 162, 163, 193, 194, 197, 199, 214, 226, 257, 329, 331, 332, 345.

STRUCTURES

A total of 13 structures have been found to support either a summer or hibernation bat roost during the survey effort to date. This total excludes structures which have been identified as confirmed roosts, which were subsequently scoped out of further works as discussed above in Section 2.1, and comprises the following:

- Three summer day roosts for individual or low numbers of common pipistrelle (7B1, 7B2 and 8A1, which also recorded brown long-eared bat droppings during the PBRA);
- Three summer day roosts supporting low numbers of both common and soprano pipistrelle (6A1, 6A2, 6A4);
- Three hibernation roosts solely used by brown long-eared bats, including individual bats identified in structure 10A3 and suspected brown long-eared bat droppings in structure 11A1 and 11A2;
- Two hibernation roosts shared by multiple species, including brown long-eared bat, *Myotis* sp. and an unidentified species in structure 9B6, and a brown long-eared bat and a Daubenton’s bat in structure 11A3;
- One *Pipistrellus* sp. hibernation roost in All Saints Church; and
- One historic hibernation roost for an unknown species of bat in structure 9B4, identified due to the presence of bat carcasses.

Table 3-8 below summarises all the identified bat roosts in structures to date, including summer roosts and hibernation roosts, but excluding roosts identified during radio-tracking or desk study exercises. Data labelled as ‘N/A’ (not applicable) in Table 3-8 denotes that a roost is likely absent based on the survey effort to date.

Table 3-8 – Summary of bat roosts in buildings (excluding radio-tracking results)

Building Ref	Summer Roost Details	Hibernation Roost Details
7B1	Common pipistrelle day roost	N/A

Building Ref	Summer Roost Details	Hibernation Roost Details
6A1	Common pipistrelle day roost and soprano pipistrelle day roost	N/A
6A2	Common pipistrelle day roost and soprano pipistrelle day roost	N/A
6A4	Common pipistrelle day roost and soprano pipistrelle day roost	N/A
7B2	Common pipistrelle day roost	N/A
8A	Common pipistrelle day roost, brown long-eared bat unconfirmed roost (droppings present)	N/A
9B4	N/A	Unknown species historic hibernation roost (due to presence of bat carcass).
9B6	N/A	Brown long-eared bat hibernation roost, <i>Myotis</i> sp hibernation roost, and unknown species hibernation roost.
10A3	N/A	Brown long-eared bat hibernation roost
11A1	N/A	Brown long-eared bat hibernation roost
11A2	N/A	Brown long-eared bat hibernation roost
11A3	N/A	Brown long-eared bat hibernation roost, and Daubenton's bat hibernation roost.
All Saints Church	N/A	<i>Pipistrellus</i> sp. hibernation roost

4 References

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