Roxhill Developments Ltd

**Northampton Gateway, Northampton**

# BAT SURVEYREPORT

February 2018

**FPCR Environment and Design Ltd**
Registered Office: Lockington Hall, Lockington, Derby DE74 2RH
Company No. 07128076. [T] 01509 672772 [F] 01509 674565 [E] mail@fpcr.co.uk [W] www.fpcr.co.uk



| Rev | Issue Status | Prepared / Date | Approved/Date |
|---|---|---|---|
| - | Draft 1 | SAR / 02.02.2018 | RJS / 02.02.18 |
| | | | |
| | | | |

## CONTENTS

1.0 INTRODUCTION ..... 3

2.0 LEGISLATION ..... 4

3.0 METHODOLOGY ..... 5

4.0 RESULTS ..... 15

5.0 DISCUSSION & RECOMMENDATIONS ..... 30

6.0 APPENDICIES ..... 41

## FIGURES

Figure 1: Site Location & Bat Consultation Results

Figure 2: Main Site Tree Plan

Figure 3: Highway Mitigation Works Tree Plan

Figure 4: Building B1 First Survey

Figure 5: Building B1 Second Survey

Figure 6: Barn C First Survey

Figure 7: Barn C Second Survey

Figure 8: Barn C Third Survey

Figure 9a: Bat Transect Main Site June

Figure 9b: Bat Transect Main Site July

Figure 9c: Bat Transect Main Site August Dusk

Figure 9d: Bat Transect Main Site August Dawn

Figure 9e: Bat Transect Main Site September

Figure 9f: SE Bat Transect May 2016

Figure 9g: SW Bat Transect May 2016

Figure 9h: NW Bat Transect May 2016

Figure 10: NE Bat Transect June 2016

Figure 11: Static Detector 2016 Locations Highway Mitigation Works

Figure 12: Static Detector 2017 Locations Highway Mitigation Works

## APPENDICES

Appendix 1: Tree Assessments – Main Site

Appendix 2: Tree Assessments – Highway Mitigation Works

Appendix 3: 2016 Static Detector Results

Appendix 4: 2017 Static Detector Results

# 1.0 INTRODUCTION

1.1 The following bat report has been prepared by FPCR Environment & Design Ltd on behalf of Roxhill Developments Ltd. It provides details of all bat surveys undertaken at land to the west of Junction 15, Northamptonshire. The proposed development site includes an area of land off Junction 15 of the M1 known as the main site and a site to the south of this known as the highway mitigation works. The surveys comprised; desktop study, ground-based tree and building assessments, aerial tree inspections, nocturnal tree and building surveys, bat activity transects and static detector surveys.

## Site Location and Context

### Main Site

1.2 The site covers approximately 180ha and is located to the west of Junction 15 of the M1 motorway (central grid reference SP 74749 54728, Figure 1), in Northamptonshire. It is bound by Collingtree Road to the north, the M1 and A508 to the east, a rail line to the west and agricultural land to the south. The site comprises agricultural fields bisected by hedgerows, with woodland blocks, tree lines and ditches also present. An area used for recreational shooting is located roughly at the centre of the site and this comprises a mosaic of habitats, including woodland, dense and scattered scrub, closely-mown grassland, a pond and several shooting features such as a shed and a shooting lodge. Several other buildings are also present across the site, some of which are now disused.

1.3 The surrounding landscape consists of farmland with further wooded areas, hedgerows, and waterbodies. The villages of Collingtree and Milton Malsor are located close to the north-east and north-west of the site respectively.

### Highway Mitigation Works

1.4 The site includes a strip of land that crosses arable fields to the north and west of the village of Roade, Northamptonshire (centred on grid reference SP 748 516) as shown on Figure 1. The site was dominated by fields used for cereal crop during the survey period with a series of boundary hedgerows and two small woodland blocks in the south and north of the site. The central part of the site was dominated by improved grassland pasture fields with associated boundary hedgerows. Surrounding land use included the residential environs within the village of Roade to the east and further arable farmland with associated hedgerows and woodland blocks to the north, west and south. The northern part of the site was bisected by an active railway that ran through the centre of Roade.

## Development Proposals

1.5 The development proposals comprise the construction of

- an intermodal freight terminal including container storage and HGV parking, rail siding to serve individual warehouses, and with the capability to also provide a ‘rapid rail freigh’ facility as part of the intermodal freight terminal
- Up to 469,000 sq m (gross internal area) of warehousing and ancillary b uildings, with additional floorspace provided in the form of mezzanines

- New road infrastructure and works to the existing road network, inclouding the provision of a new access and associated works to the A508, anew bypass to the village of Roade, substantial improvements to J15 and to the J15A of the M1 motorway, the A45, and other highway improvements at junctions on the local highway network
- Strategic landscaping and tree planting, including diverted public rights of way
- Earthworks and demolition of existing structure on the main site

## 2.0 LEGISLATION

2.1 Before any development proposals take place measures must be taken to ensure that the legislation concerning bats is not breached as a result of works. Bats are afforded full protection under the Wildlife & Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2010 (as amended).

2.2 Under Regulation 41 of the Conservation of Habitats and Species Regulations 2010 (as amended) it is illegal to:

- Deliberately capture, injure or kill any wild animal of a European Protected Species (EPS),
- Deliberately disturb wild animals of an EPS (affecting ability to survive, breed or rear young) – disturbance of animals includes in particular any disturbance which is likely to impair their ability to survive, to breed or reproduce, or to rear or nurture their young,
- Deliberately disturb wild animals of an EPS (impairing ability to migrate or hibernate) – disturbance of animals includes in particular any disturbance which is likely to impair their ability in the case of hibernating or migratory species to hibernate or migrate,
- Deliberately disturb wild animals of an EPS (affecting local distribution and abundance) – disturbance of animals includes in particular any disturbance which is likely to affect significantly the local distribution or abundance of the species to which they belong,
- Deliberately disturb wild animals of an EPS (whilst occupying a structure of place used for shelter or protection) – intentionally or recklessly disturb any wild animal while it is occupying a structure or place which it uses for shelter or protection,
- Damage or destroy a breeding site or resting place of a wild animal an EPS.

2.3 Under the Wildlife and Countryside Act 1981 (as amended) it is illegal to:

- Recklessly or intentionally kill, injure or take any wild animals included in Schedule 5.
- Recklessly or intentionally damage or destroy, or obstruct access to any structure or place which any wild animal included in Schedule 5 uses for shelter or protection,
- Recklessly or intentionally disturb any such animal while it is occupying a structure or place which it uses for shelter or protection.

2.4 If impacts to bats or their roosts cannot be avoided a European Protected Species Licence from Natural England is required in order to allow proposals to derogate from the Legislation (Licenses cannot be obtained to provide protection against offences under the Wildlife & Countryside Act 1981 (as amended)). As part of the application process a number of ‘Tests’ have to be met by the application.

2.5 Natural England Guidance Note: European Protected Species and the Planning Process – Natural England's Application of the 'Three Tests' to Licence Applications (March 2011) states:

*"In determining whether or not to grant a licence Natural England must apply the requirements of Regulation 53[5] of the Regulations and, in particular, the three tests set out in sub-paragraphs (2)(e), (9)(a) and (9)(b)[6].*

*(1)* ***Regulation 53(2)(e****) states: a licence can be granted for the purposes of "preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment".*

*(2)* ***Regulation 53(9)(a)*** *states: the appropriate authority shall not grant a licence unless they are satisfied "that there is no satisfactory alternative".*

*(3)* ***Regulation 53(9)(b)*** *states: the appropriate authority shall not grant a licence unless they are satisfied "that the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range."*

2.6 Conservation status is defined as *"the sum of the influences acting on the species concerned that may affect the long term distribution and abundance of its population within its territory"*. It is assessed as favourable when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long term basis as a viable component of its natural habitats, and
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- There is, or will probably continue to be, a sufficiently large habitat to maintain its populations on a long term basis.

2.7 These tests must not only reach agreement with Natural England when assessing a Licence application they must also be assessed by the planning authority when determining a planning application.

## 3.0 METHODOLOGY

### Desktop Study

3.1 Desktop surveys of the Junction 15 and Roade Bypass sites were undertaken in August 2013 and March 2016 respectively for existing ecological data regarding all bat species within a 1 kilometre radius of the site. The following organisations were contacted:

- Northamptonshire Biodiversity Records Centre (NBRC)
- Northamptonshire Bat Group

3.2 The Multi-Agency Government Information for the Countryside (MAGIC) website (www.magic.gov.uk) was consulted for information on the presence of statutorily protected sites including Special Areas of Conservation (SAC) within 5km and Sites of Special Scientific Interest (SSSIs), within 2km.

3.3 Existing survey data from previous work undertaken by FPCR was also consulted with (see FPCR 2013-2014).

## Field Surveys

### Pre-Survey Habitat Assessment

3.4 For both sites, this assessment was carried out prior to any bat surveys being undertaken, information taken from FPCR Bats Survey Report (November 2014 (see planning application Ref: S/2014/2468/EIA)) and aerial photography was used to assess the potential usage of the site by bats, including what species may be present, what habitat was suitable for bats, any potential roosting locations, potential foraging and commuting areas.

3.5 This assessment aims to provide a guide to the amount of survey effort expended which should ultimately be proportional to:

- The type and scale of the proposed development and its predicted impacts on bats
- The size, nature and complexity of the development site,
- The likelihood of bats being present or affected,
- The species and numbers of individuals concerned, and
- The type of roost and/or habitat affected.

3.6 The site was also categorised for its habitat suitability for bats, which would also provide guidance on survey effort. The habitat suitable was assessed using guidance from the bat surveys, good practice guidelines (Bat Conservation Trust, 3rd Edition 2016).

## Roost Surveys

### Tree Surveys

Ground Assessments

3.7 For both sites, the tree assessments were undertaken from ground level, with the aid of a torch and binoculars by a licensed or experienced bat worker from FPCR (Natural England Licence Number: 2016-25412-CLS-CLS & 2015-19188-CLS-CLS) on 18th September 2013 (S/2014/2468/EIA), 30th June, 13th September and 15th September 2016. During the survey Potential Roosting Features (PRF) for bats such as the following were sought (Based on P16, British Standard, *Surveying for bats in trees and woodland* – Guide, October 2015):

- Natural holes (e.g. knot holes) arising from naturally shed branches or branches previously pruned back to a branch collar.
- Man-made holes (e.g. cavities that have developed from flush cuts or cavities created by branches tearing out from parent stems.
- Woodpecker holes.
- Cracks/splits in stems or braches (horizontal and vertical)
- Partially detached, loose or platy bark.
- Cankers (caused by localised bark death) in which cavities have developed.
- Other hollows or cavities, including butt rots.
- Compression of forks with included bark, forming potential cavities.
- Crossing stems or branches with suitable roosting space between.
- Ivy stems with diameters in excess of 50mm with suitable roosting space behind (or where roosting space can be seen where a mat of thinner stems has left a gap between the mat and the trunk).
- Bat or bird boxes.
- Other suitable places of rest or shelter.

3.8 Certain factors such as orientation of the feature, its height from the ground, the direct surroundings and its location in respect to other features, may reduce enhance or reduce the potential value.

3.9 Based on the above, trees were classified into general bat roost potential groups based on the presence of these features. Table 1 (below) broadly classifies the potential categories as accurately as possible as well as discussing the relevance of the features. This table is based upon Table 4.1 and Chapter 6 in *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (J., Collins (Bat Conservation Trust), 2016).

3.10 Although the British Standard Document (British Standard, *Surveying for bats in trees and woodland – Guide*, October 2015) groups trees with moderate and high potential, these have been separated below (as per Table 4.1 in The Bat Conversation Trust Guidelines) to allow more specific survey criteria to be applied.

**Table 1: Classification and Survey Requirements for Bats in Trees**

| **Classification of Tree** | **Description of** Category and Associated Features **(based on** Potential Roosting Features **listed above)** | **Likely Further Survey work** |
|---|---|---|
| Confirmed Roost | Evidence of roosting bats in the form of live bats, droppings, urine staining, mammalian fur oil staining, etc. | A Natural England derogation licence application will be undertaken. This will require a combination of aerial assessment by roped access bat workers **and** nocturnal survey during appropriate period (May to August).<br>Replacement roost sites commensurate with status of roost to be provided.<br>Works to be undertaken under supervision using a good practice method statement. |
| High Potential | A tree with one or more Potential Roosting Features that are obviously suitable for larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter protection, conditions (height above ground level, light levels, etc) and surrounding habitat but unlikely to support a roost of high conservation status (i.e. larger roost, irrespective of wider conservation status).<br>Examples include (but are not limited to); woodpecker holes, larger cavities, hollow trunks, hazard beams, etc. | A combination of aerial assessment by roped access bat workers **and** nocturnal survey during appropriate period (May to August).<br>Following additional assessments, tree may be upgraded or downgraded based on findings.<br>After completion of survey work, some good practice removal operations **likely** to be required. |
| Moderate Potential | A tree with Potential Roosting Features which could support one or more potential roost sites due to their size, shelter protection, conditions (height above ground level, light levels, etc) and surrounding habitat but unlikely to support a roost of high conservation status (i.e. larger roost, irrespective of wider conservation status).<br>Examples include (but are not limited to); woodpecker holes, rot cavities, branch socket cavities, etc. | A combination of aerial assessment by roped access bat workers **and /or** nocturnal survey during appropriate period (May to August).<br>Following additional assessments, tree may be upgraded or downgraded based on findings.<br>After completion of survey work, some good practice removal operations likely to be required. |
| Low Potential | A tree of sufficient size and age to contain Potential Roosting Features but with none seen from ground or features seen only very limited potential.<br>Examples include (but are not limited to); loose/lifted bark, shallow splits exposed to elements or upward facing holes. | No further survey required but some good practice removal operations may be required |
| Negligible/No potential | Negligible/no habitat features likely to be used by roosting bats | None. |

* The Conservation of Habitats & Species Regulations 2010 (as amended) affords protection to breeding sites or resting places at all times. For an area to be classified as a breeding site or resting place, the Regulations require there to be a reasonably high probability that the species will return to the sites and / or place.

3.11 Where features suitable to be used as a roost site were identified, evidence that bats had used the site as a roost where features, where accessible, was sought. Such evidence comprises live or dead bats, droppings, urine staining, and grease /scratch marks on wood.

Aerial Tree Inspections

3.12 Aerial inspections were completed (where required and access was possible) on trees at both sites identified during the ground level inspection as providing features suitable to be used as a bat roost. Features surveyed in further detail during the aerial survey included; cracks, fissures, cavities, woodpecker/rot holes or missing limbs. Evidence of use sought comprised live or dead bats, droppings, urine staining, internal smoothing and grease/scratch marks on wood. Presence of dense ivy cover was also noted as this can obscure the aforementioned features.

3.13 Each feature suitable for roosting bats was visually inspected using torches and/or endoscopes as appropriate. The characteristic of each feature was considered to assess its suitability to support roosting bats in order to determine a suitable course of action to accommodate tree removal, if required, in line with Table 1. The size and exposure to the elements of each was additionally taken into account, as were features such as dense cobwebs or the habitation of a feature by other species (e.g. woodpeckers, squirrels, wasps etc.).

3.14 All FPCR tree climbers are NPTC Certified to Climb Trees (J/101/2449) and Perform Aerial Rescue (A/101/2450) – Level 2. The climbing methodology used follows that detailed within the Arboriculture and Forestry Advisory Group (AFAG) Tree Climbing Operations Leaflet (AFAG401). Climbing equipment was inspected following guidelines outlined in the Lifting Operations and Lifting Equipment Regulations 1998.

**Main Site**

3.15 The aerial tree inspections were completed by Samuel Arthur (2015-19188-CLS-CLS) and Tom Bennett (2016-25412-CLS-CLS) on 30th June 2016.

**Highway Mitigation Works**

3.16 The aerial tree inspections were completed by Tom Bennett (2016-25412-CLS-CLS) and Sam Newbold on 25th October 2016.

Nocturnal Surveys

**Main Site**

3.17 In 2016 nocturnal dusk emergence and dawn re-entry surveys were completed on a number of trees identified with bat roosting potential which would potentially be affected by the proposed development (Appendix 1). Surveyors were positioned at various aspects of the trees from approximately 15 minutes prior to sunset and 90-120 minutes after or 120 minutes prior until sunrise and 15 minutes after sunrise. The number and species of bats observed emerging or entering the tree was recorded.

3.18 Ultrasonic bat detectors (Bat Box Duets) were used by surveyors to aid in identification. All of the nocturnal surveys were conducted in appropriate conditions, i.e. ambient temperature exceeding 10˚C and little wind / rain (Table 2).

**Table 2: Survey Conditions**

| Date | Trees Covered | Sunset/Sunrise | Wind (0-5) | Temperature °C | Cloud Cover % | Rain (mm) |
|---|---|---|---|---|---|---|
| 22.09.16 | T100, T102 | 19:01 | 1 | 17 | 15 | 0 |

**Highway Mitigation Works**

3.19 In 2016 nocturnal dusk emergence and dawn re-entry surveys were completed on four trees identified with bat roosting potential which would potentially be affected by the proposed development (Appendix 2). Surveyors were positioned at various aspects of the trees from approximately 15 minutes prior to sunset and 90-120 minutes after or 120 minutes prior until sunrise and 15 minutes after sunrise. The number and species of bats observed emerging or entering the tree was recorded.

3.20 Ultrasonic bat detectors (BatBox Duets) were used by surveyors to aid in identification. All of the nocturnal surveys were conducted in appropriate conditions, i.e. ambient temperature exceeding 10˚C and little wind / rain (Table 3).

**Table 3: Survey Conditions**

| Date | Trees Covered | Sunset/Sunrise | Wind (0-5) | Temperature °C | Cloud Cover % | Rain (mm) |
|---|---|---|---|---|---|---|
| 29.09.16 | T208, T223 | 18:44 | 1 | 15 | 40 | 0 |
| 30.09.16 | T205, T207, T222 | 18:45 | X | X | X | X |

**Building Surveys**

**Main Site**

Internal / External Building Assessment

3.21 The exterior of the buildings were visually assessed in 2014 for potential access points and evidence of bat activity. A further assessment of the exterior was made before the first nocturnal survey which was undertaken on 4th July 2016. Features such as small gaps under barge/soffit/fascia boards, raised or missing ridge tiles and gaps at gable ends, which have potential as access points, were sought. Evidence that bats actively used potential access points includes staining within gaps and bat droppings or urine staining under gaps, a note being made wherever these were present. Where access to potential access point was possible a full inspection using an endoscope was completed to identify current or previous evidence of use such as the physical presence of bats or bat droppings. Indicators that potential access points had not recently been used included the presence of cobwebs and general detritus within the access.

3.22 INTERNAL BUILDING INSPECTIONS?

3.23 The above assessments were completed by a licensed bat worker from FPCR (Natural England Licence Number: 2015-10587-CLS-CLS).

**Highway Mitigation Works**

3.24 No buildings were present on site.

Nocturnal Building Surveys

**Main Site**

3.25 Nocturnal surveys were undertaken on the buildings on the site. The barns within the east of the site (buildings A, B and C) were surveyed three times and the Courteen Hall shooting lodge (building B1) in the centre of the site was surveyed twice based upon the bat roosting potential of the buildings as determined during the internal/external inspections (see below).

3.26 Two dusk (emergence) surveys and one dawn (re-entry) survey were undertaken on buildings A, B and C and one dusk (emergence) survey and one dawn (re-entry) survey were undertaken on building B1 with surveyors positioned on aspects of the building from 15 minutes prior until 90 minutes following sunset or 90 minutes prior to sunrise until sunrise. The number and species of bats observed emerging or entering the buildings was recorded. These surveys were completed on 4th July 2016 (dusk), 21st July 2016 (dusk) and 9th August 2016 (dawn).

3.27 Ultrasonic frequency division bat detectors (BatBox Duets) were used by surveyors to aid in identification of echolocation calls. All of the nocturnal surveys were conducted in appropriate conditions, i.e. ambient temperature exceeding 10˚C and little wind and no rain (see Table 4).

3.28 These surveys were completed by licensed bat workers from FPCR (including Natural England Reference Numbers: 2015-14965-CLS-CLS and 2015-19188-CLS-CLS) and trainee bat workers.

**Table 4: Summary of Nocturnal Bat Survey of Buildings**

| Date | Start Time | Finish Time | Sunset/ Sunrise | Temperature (°C) | Rain | Wind | Cloud Cover (%) | Buildings Surveyed |
|---|---|---|---|---|---|---|---|---|
| 04/07/2016 | 21:11 | 22:50 | 21:26 | 17 | None | Light breeze | 30 | Buildings 1 & A-C |
| 21/07/2016 | 20:55 | 23:10 | 21:10 | 19 | Light intermittent drizzle | None | 100 | Buildings A-C |
| 09/08/2016 | 04:06 | 05:53 | 05:38 | 10 | None | Light breeze | 10 | Buildings 1 & A-C |

## Activity Surveys

3.29 The potential for the site and immediate surrounds to support feeding and commuting bats was also assessed, particular regard being given to the presence of continuous treelines, water courses and hedges providing good connectivity in the landscape, and the presence of varied habitat such as scrub, woodland, grassland and open water in the vicinity.

**Activity Transect Surveys**

3.30 The primary objectives of transects completed was to identify foraging areas, commuting routes, species composition and species utilisation of the development area.

3.31 This methodology takes into account the statutory guidance from English Nature (now Natural England)[1] and further guidelines introduced by the Bat Conservation Trust[2] and JNCC[3]. The survey effort was determined from recommendations provided in BCT[2] guidance, the relevant survey guidance over the survey period.

3.1 The transect routes were determined prior to survey in order to cover most areas of the site and included point count stops to identify activity levels around the features of potential value to bats that are to be most affected by proposals (i.e. hedgerows, tree lines, dense scrub etc). Each point count was five minutes long, during which time all bat activity was recorded.

3.2 Dusk transects were commenced either prior to or at sunset and were a minimum of 2 hours in duration. The dawn transect commenced approximately 120 minutes prior to sunrise until sunrise. Each transect was walked at a steady pace and when a bat passed by, the species, time and behaviour was recorded on a site plan to help to form a general view of the bat activity present on site and highlight any habitats types associated with bat activity.

3.3 Surveyors used Wildlife Acoustics Inc. Echo Meter Touch® bat detectors were utilised in conjunction with Echo Meter Touch® app and Apple Inc. iPad® during the transect surveys to detect bats and aid species identification.

3.4 Post-survey, bat calls were analysed using bat calls were analysed using AnalookW© (Chris Corben) software package and/or BatSound® Pro (Pettersson Elektronik) software package, by taking measurements of the peak frequency, inter-pulse interval, call duration and end frequency. From this, the level of bat activity across the site in relation to the abundance of individual species foraging and commuting along habitats was assessed.

**Main Site**

3.5 Eight activity surveys were undertaken in 2013/2014 (see planning ref: S/2014/2468/EIA) across all six of the bat active months. In addition, four activity transects were completed over the active survey period in 2016. Due to the size of the site, two transect routes covering habitats across the site were completed during June (dusk), July (dusk), August (dusk and dawn) and September (dusk). In 2017, five surveys were undertaken in June, July, August and September.

3.6 All transects were undertaken when conditions were suitable (i.e. when the ambient air temperature exceeded 10ºC and there was little wind and no rain) see Table 5.

**Table 5: Activity Transect Survey Conditions**

| Date | Sunset/ Sunrise | Temperature at start and end of survey °C | Rain (0-5) | Wind (0-5) | Cloud % |
|---|---|---|---|---|---|
| 30.06.16 | 21:28 | 16-13 | 1 | 2 | 100 |
| 11.07.16 | 21:21 | 19-16 | 0 | 2 | 40 |
| 11.08.16* | 20:34 | 18-16 | 0 | 3 | 100 |

[1] English Nature (2004) *Bat Mitigation Guidelines.*
[2] Bat Conservation Trust, 2016. *Bat Surveys for Professional Ecologists Good Practice Guidelines* 3rd edition.
[3] JNCC (1999) *Bat Workers Manual*

| | | | | | |
|---|---|---|---|---|---|
| 12.08.16* | 05:43 | 16-17 | 0 | 1 | 100 |
| 08.09.16 | 19:34 | 17-14 | 0 | 2 | 15 |

*Survey completed within one 24 hour period counts as one survey occasion.

**Highway Mitigation Works**

3.7 Three activity transects were completed over the active survey period in 2016. Due to the size of the site, two transect routes covering habitats across the site were completed during June (dusk), July (dusk), and September (dusk).

3.8 All transects were undertaken when conditions were suitable (i.e. when the ambient air temperature exceeded 10ºC and there was little wind and no rain) see Table 6.

**Table 6: Activity Transect Survey Conditions**

| Date | Sunset/ Sunrise | Temperature at start and end of survey °C | Rain (0-5) | Wind (0-5) | Cloud % |
|---|---|---|---|---|---|
| 23.06.16 | 21:28 | 18-17 | 0 | 1 | 95 |
| 11.07.16 | 21:21 | 19-16 | 0 | 2 | 85 |
| 22.09.16 | 19:01 | 15-13 | 0 | 1 | 20 |

**Automated Static Bat Detector Surveys**

3.9 Static passive recording broadband detectors were deployed on site to supplement the manual transects surveys. In addition, passive recording is stipulated in the guidance document Bat Conservation Trust (2016) Good Practice Guidelines 3rd edition[4].

3.10 Passive monitoring was undertaken using an automated logging system Wildlife Acoustics Inc. Song Meter® SM2BAT+ bat detectors with outputs saved to an internal storage device. SM2BAT+ detectors were placed along linear features considered to be of value to bats, such as hedgerows, woodlands, watercourses and tree lines.

3.11 Devices were placed in each location for an extended period of time of suitable weather conditions (little no rain/wind and temperatures above 10°C). The conditions over each of the survey period were however representative for the timing of the survey. Detectors were programmed to activate 30 minutes before dusk and recorded continuously until 30 minutes following sunrise.

3.12 For the purposes of analysis if the static detector was out over 5 nights the additional nights were only assessed for Annex II bat species. The recorded data was analysed using AnalookW© (Chris

[4] Collins, J. (ed.)(2016) Bat Surveys for Professional Ecologists: Good Practicee Guidelines (3rd edn). The Bat Conservation Trust, London.

Corben) software package and/or BatSound® Pro (Pettersson Elektronik) software package to assess the amount of bat activity on site by recording the number of bat passes.

**Main Site**

3.13 In accordance with the size of the site, the number of manual activity transect routes undertaken and the assessment of habitat suitability to support foraging and commuting bats, static units were deployed on site for a minimum of 5 consecutive nights during June to September 2016 (see Figures 9a-9e) along hedgerow H25 and along hedgerow H2.

**Highway Mitigation Works**

3.14 In accordance with the size of the site, the number of manual activity transect routes undertaken and the assessment of habitat suitability to support foraging and commuting bats, static units were deployed on site for a minimum of 5 consecutive nights during the months of June, July and September 2016 (see Figures 9f-9h) along two hedgerows either side of the railway line.

## Limitations

**Main Site**

3.15 During 2016 static detectors were deployed for extended periods over a minimum of 5 consecutive nights; additional nights (over 5) were obtained on some occasions due to poor weather or detector failure within the initial 5 night survey period (detector failures in August and September 2016).

3.16 During the dusk emergence survey on 21st July 2016 light rain fell intermittently during the survey. However, bats were recorded foraging during the survey and so the light rain is not considered to be a major limitation to this survey effort as bats had emerged from nearby roost sites.

3.17 Surveys began in June due to late instruction from Roxhill Developments Ltd. however to overcome this, a monthly survey effort was undertaken rather than a seasonal effort and so the overall number of activity surveys has been greater than a seasonal effort. The previous survey report (FPCR Bats Survey Report (November 2014)) also found evidence of bat roosts on site and so monthly surveys were also undertaken for this reason. It is felt that due to the comprehensive survey works undertaken in 2014 which have been approved by the local planning authority (see planning reference S/2014/2468/EIA), combined with the spring survey works in 2017 that the late start in 2016 is not a significant survey limitation. Especially when it is considered that the habitats on site were considered unchanged since the 2013/2014 survey effort.

**Highway Mitigation Works**

3.18 During 2016 static detectors were deployed for extended periods over a minimum of 5 consecutive nights; additional nights (over 5) were obtained on some occasions due to poor weather or detector failure within the initial 5 night survey period (detector failure in August 2016).

3.19 Seasonal surveys began in June due to late instruction from Roxhill Developments Ltd. however to overcome this, two surveys were undertaken in the summer months to help overcome the effect of missing the spring survey season so that overall number of activity surveys has been the same level of effort as a seasonal effort.

# 4.0 RESULTS

## Desktop Study

4.1 Species recorded in area surrounding the Junction 15 site and the Roade Bypass site included common pipistrelle bat *Pipistrellus pipistrellus*, soprano pipistrelle bat *Pipistrellus pygmaeus*, unidentified pipistrelle species *Pipistrellus sp.*, Daubenton's bat *Myotis daubentonii*, Natterer's bat *Myotis nattereri* and brown long-eared bat *Plecotus auritus*.

4.2 The closest roosts to the Junction 15 site were common pipistrelle *P. pipistrellus* and soprano pipistrelle *P. pygmaeus* roosts that had been recorded to the east of the M1 within the village of Collingtree (SP 75 55). The majority of the remaining records were associated with the urban areas of Blisworth (SP 72 53), Milton Masor (SP 73 55) and Northampton (SP 75 57 & SP 75 58).

4.3 The closest records to the Roade Bypass site were for *Pipistrellus sp*. roosts located in at least two locations within Roade (SP 75 51), and also at Courteenhall Church (SP 76 53). There was also a record of a brown long-eared bat roost *P. auritus* c. 750m south of the Roade Bypass site boundary (SP 76 50).

4.4 Consultation of existing survey data from previous surveys undertaken by FPCR found that five common pipistrelle bats were observed emerging from Barn C on 26th September 2013. They were observed emerging from underneath a tile of the southern slope of the roof. A single common pipistrelle bat was seen to emergence from this same barn on 10th July 2014. Again this was observed emerging from underneath a tile on the southern slope of the roof.

## Roost Surveys

### Tree Assessments

### Main Site

Tree Assessments

4.5 Ground level assessments and aerial assessments were completed on all trees across the site (Appendix 1).

*Confirmed Roosts*

4.6 No bat roosts in tree features were confirmed during the ground-based assessments.

*High Potential Trees*

4.7 From the completed assessments, a single tree was identified as containing high bat roosting potential (TC).

*Moderate Potential Trees*

*4.8* From the completed assessments, four trees were identified as containing moderate bat roosting potential (T20, T21, T49 and T51).

### Highway Mitigation Works

Ground Level Assessment

4.9 Ground level assessments and aerial assessments were completed on all trees across the site (Appendix 2) with the exception of T200, T211, T214, T216, T217, T219, T223 and T225. These trees may require further survey work if the proposed development is to affect these tree standards.

*Confirmed Roosts*

4.10 No bat roosts in tree features were confirmed during the ground-based assessments.

*High Potential Trees*

4.11 From the completed aerial assessments, no trees were identified as having a high potential to support roosting bats.

*Moderate Potential Trees*

*4.12* A single tree was identified as having moderate bat roosting potential (T207).

Nocturnal Surveys

**Main Site**

4.13 Following the completion of the above assessments nocturnal surveys were completed on the two high potential (TA and TC) trees on 22nd September 2016. During the survey no bats were observed emerging from either tree.

4.14 During the survey of TA, common pipistrelle *P. pipistrellus* bats were heard commuting and foraging and a noctule bat was recorded commuting at 19:41. A *Nyctalus* species was heard commuting at 20:11. None of the bats heard were observed (data not shown).

4.15 During the survey of TC, common pipistrelle *P. pipistrellus* bats were heard commuting and foraging throughout the survey. Most bats were unobserved as they were flying behind the surveyor but the bats which were seen were observed commuting along the hedgerow with a single bat coming from the farm complex over the road outside the site at 19:35 (data not shown).

4.16 From the completed nocturnal survey work no bats were identified emerging or returning to roost within any of the above trees.

**Highway Mitigation Works**

4.17 Following the completion of the above assessments, nocturnal surveys were completed on five moderate potential trees (T205, T207, T208, T214 and T222) on 29th and 30th September 2016 and 1st October 2016 and a second nocturnal survey was undertaken on tree T214 on 15th August 2017. During the surveys no bats were observed emerging from any tree (data not shown). During the surveys, common pipistrelles, *Myotis* bat species and noctule bats were recorded. No other bat species were recorded during this survey.

4.18 During the 2017 survey, common pipistrelle and noctule bats were recorded during the survey. No other bats were recorded during this survey (data not shown). No bats were observed emerging from the tree.

4.19 From the completed nocturnal survey work no bats were identified emerging or returning to roost within any of the above trees.

**Building Surveys**

**Main Site**

Internal / External Building Assessment

Building 1 (Estate Hunting Lodge)

4.20 Building 1 (B1), the Corteen Estate Hunting Lodge, was situated within the centre of the site (Figure 4) and was a single-storey, stone and timber-built cottage with a multi-pitched / hipped roof. The tile material included both slate and corrugated metal on different areas, and features of note for potential bat roosting areas included multiple access holes in the stonework and lead flashing around chimneys. Since the previous survey work undertaken in 2014 (FPCR Bats Survey Report (November 2014)), renovation work had been undertaken on the building which had sealed up all of the gaps in the stonework.

4.21 The building could be divided into three distinct areas:

- Area A (western end) had a slate roof. A boarded window was present on the western apex and provided a limited roosting feature for bats. No internal surveys were undertaken.
- Area B (centre) had a single pitched sloping roof covered in new bituminous roofing felt and contained facility and storage rooms. No internal surveys were undertaken.
- Area C (eastern end) had a concrete-based corrugated roof. No internal surveys were undertaken.

4.22 There were very few areas that provided suitable roosting areas for bats. During the external survey, no evidence of a bat roost was found.

Barns A, B & C (Farm Barns)

4.23 Three barns were present to the east of the hunting lodge.

4.24 Barn A was a single-storey brick-built barn with a corrugated iron roof. It was open fronted with three walls. There was no roof void. The underside of the tiles was exposed and wooden supporting beams were present. This building had no roosting potential for bats due to the lack of suitable features including no roof void and extremely open nature.

4.25 Barn B was a modern structure with a concrete base. It was a steel and corrugated iron construction which was also open fronted and was considered to provide no potential to support roosting bats due to the lack of suitable features.

4.26 Barn C was a tall stone barn with a corrugated concrete-based roof, a large section of which was missing on the eastern aspect. It had an open front and the base consisted of brick and concrete along with exposed wooden beams present inside. There were a small number of gaps in the stonework, particularly around the wooden beams. It is possible that these areas provided some hibernation opportunity for bats in the winter period.

**Photo 1: Building 1 (South-east Aspect)**

**Photo 2: Building 1 (West Aspect)**

**Photo 3: Barns A (South-east Aspect)**

**Photo 4: Barn B & C (South Aspect)**

**Photo 5: Barn C (North-west Aspect)**

**Photo 6: Barn C Interior**

Nocturnal Building Surveys

Building B1

4.27 During the dusk survey on 4th July 2016 (Figure 4), no bats were observed to enter or exit the building. The first bat was recorded at 21:44 (a common pipistrelle *P. pipistrellus*) and both commuting and foraging activity was recorded from common pipistrelles *P. pipistrellus* and a single soprano pipistrelle *P. pygmaeus* bat species. No other bat species were recorded during the survey. The soprano pipistrelle *P. pygmaeus* was observed commuting over the building and common pipistrelle *P. pipistrellus* bats were observed foraging in the trees and along the front of the shooting lodge. All other common pipistrelle *P. pipistrellus* bats were observed commuting.

4.28 During the dawn survey on 9th August 2016 (Figure 5), no bats were observed to enter or exit the building. The first bat was recorded at 04:15 - a common pipistrelle *P. pipistrellus* bat was heard commuting past but not seen. All other bats recorded on the survey were common pipistrelle *P. pipistrellus* bats with individuals observed foraging over the top of the shooting lodge and along the track to the west of the building. All other contacts were non-visual. No other bat species was heard.

Barn C

4.29 During the dusk emergence survey on 4th July 2016 (Figure 6), no bats were observed emerging or re-entering barn C. Bats were observed commuting around the other barns which consisted of common pipistrelles *P. pipistrellus*. The first bat was recorded at 21:51 with all bats recorded and observed commuting. A single common pipistrelle *P. pipistrellus* was heard foraging at 22:31 but not seen.

4.30 During the dusk emergence survey on 21st July 2016 (Figure 7), no bats were observed emerging or re-entering barn C. The first bat was recorded at 22:10. A single common pipistrelle *P. pipistrellus* bat was observed foraging in a southerly direction along the western side of barn C at 22:29. All other bat contacts were non-visual and consisted of common pipistrelle *P. pipistrellus* bats alone. No other bat species were recorded during the survey.

4.31 During the dawn re-entry survey on 9th August 2016 (Figure 8), no bats were observed emerging or re-entering any of the barn buildings. No bat activity was recorded at all during this survey.

## Activity Surveys

### Activity Transects (Figures 9a – 9h)

### Main Site

June 2016

4.32 Bat activity was greater in the southern transect during the June 2016 activity transects. Common pipistrelle *P. pipistrellus* was the only bat species identified foraging and commuting on site.

Transect Route A - North

4.33 During the transect, a total of eight bat contacts were recorded. All bats were common pipistrelle *P. pipistrellus* with the exception of a single soprano pipistrelle *P. pygmaeus*. Five contacts were recorded in the walked sections between point counts and three were recorded at point count six. The first bat was in the north-west corner of the site along the northern boundary (hedgerow H23) and was a non-visual contact of a commuting common pipistrelle *P. pipistrellus* bat at 21:34. The second was a non-visual contact of a commuting common pipistrelle *P.pipistrellus* bat at 22:28 and was along hedgerow H24. The third was a foraging common pipistrelle *P. pipistrellus* at 23:14 along hedgerow H9. A total of five passes of this bat were recorded. The same bat was then recorded continuously at point count five along the same hedgerow for the duration of the point count with multiple passes. It was also recorded whilst the surveyors were walking to point count six. A second common pipistrelle *P. pipistrellus* bat was also observed during this time from 23:22 – 23:26 when two common pipistrelle *P. pipistrellus* bats were seen together. Both bats were foraging above hedgerow H9. A single common pipistrelle *P. pipistrellus* bat was recorded commuting along

hedgerow H11 at 23:26 and a soprano pipistrelle *P. pygmaeus* was recorded during point count six at 23:32 along with two passes of common pipistrelle *P. pipistrellus* bats.

Transect Route B - South

4.34 During the transect, a total of 14 bat contacts were recorded. All bats recorded were common pipistrelle bats *P. pipistrellus*. Ten bats were recorded in the walked sections between point counts and four were recorded in point counts two and four. The first bat was recorded at 21:51 with two commuting passes along hedgerow H**X/TN1**. The bat was flying in an easterly direction towards the eastern boundary of the site (hedgerow H**X/TN2**). The majority of bat activity was concentrated in the southern half of the transect, mainly along hedgerow H3 and H17 with most of these bats being recorded as foraging individuals. A foraging common pipistrelle bat was also recorded at the intersection between H17 and H18. The only bat recorded further north than this during this transect route was at point count four adjacent to the Courteen Hall Shooting Lodge. Heavy rain started to fall at 23:46 which lasted until the end of the transect. No bats were recorded once the heavy rain had started.

July 2016

Transect Route A - North

4.35 During the transect, a total of 11 bat contacts were recorded. These were all common pipistrelle *P. pipistrellus* bats with the exception of a single *Nyctalus* species bat pass during point count four at 22:14. Four bat contacts were recorded during point counts whilst seven were recorded in the walked sections between point counts. The first bat was recorded at 21:43 which was a non-visual contact of a foraging common pipistrelle *P. pipistrellus* along hedgerow H30. The majority of bat activity was concentrated around hedgerows H11 and H9. Several of these bat contacts were of foraging bats.

Transect Route B - South

4.36 During the transect, a total of 15 bat contacts were recorded. All bats were common pipistrelle *P. pipistrellus* bats consisting of either commuting or foraging individuals. The first bat was seen at 22:05 along hedgerow H2. Earlier activity was recorded around the Courteen Hall Shooting Lodge area with later activity being recorded with activity being recorded later on around point counts four, five and six.

August 2016 – Dusk Survey

Transect Route A - North

4.37 During the transect, a total of nine bat contacts were recorded. These were all common pipistrelle *P. pipistrellus* bats with the exception of a noctule *N. noctula* bat pass at 21:15 commuting over the field adjacent to hedgerow H19 and a single *Nyctalus* species bat pass at 21:56 which was recorded commuting along hedgerow H11. The first bat recorded was the noctule at 21:15 which was shortly followed by a common pipistrelle *P. pipistrellus* at 21:17 foraging in the mixed plantation woodland. Most bat contacts were recorded during the walked sections between point counts. A foraging common pipistrelle *P. pipistrellus* bat was recorded during point count five. The majority of bat activity was concentrated around the centre of the site in particular in relation to the mixed

plantation woodland, the broadleaved woodland plantation and tall ruderal areas adjacent to hedgerows H10, H15, H1 and H11. Several of these bat contacts were of foraging bats.

Transect Route B - South

4.38 A total of nine common pipistrelle *P. pipistrellus* bat contacts were recorded during the transect consisting of both commuting and foraging individuals. No other bat species were recorded. Seven of the contacts were in woodland, two were in arable habitat and one contact was along a hedgerow. The first bat was heard at 21:05 commuting over or along RW1 in the southern part of the site. As with the northern transect route (5.44), the majority of bat activity was around the woodland habitats associated with the centre of the site. All bat contacts were non-visual observations.

August 2016 – Dawn Survey

Transect Route A - North

4.39 Activity was spread more evenly during this transect with the first bat being recorded at 03:41 flying along the road adjacent to hedgerow H23. This was a foraging common pipistrelle bat. All bats recorded during this transect were common pipistrelle bats and were recorded in the walked sections between point counts. There was still activity associated with the central area of the site around hedgerows H15, H10, H9 and H11. A foraging common pipistrelle *P. pipistrellus* was recorded during point count four. Activity consisted of largely foraging individuals with two commuting bats heard towards the start (03:56) and end (05:13) of the transect.

Transect Route B - South

4.40 A total of nine bat contacts were recorded during this transect. Eight were common pipistrelle *P. pipistrellus* bats with the final bat contact of the morning recorded at 05:08 being a soprano pipistrelle *P. pygmaeus* bat commuting through the broadleaved plantation woodland adjacent to hedgerow H15. The first bat was seen at 03:44 commuting along hedgerow H**X**. Once again the majority of the bat activity during this survey was recorded in and around the woodlands immediately to the north of the Courteen Hall Shooting Lodge area. Bats were also recorded during point counts one and two to the south of the application site.

September 2016 – Dusk Survey

Transect Route A - North

4.41 Bat activity was once again associated with the central area of the site around hedgerows H15, H11, H10, H9, H8 and H1. Bat species recorded during this survey consisted of common pipistrelle *P. pipistrellus* bats, soprano pipistrelle *P. pygmaeus* bats, noctule *N. noctula* bats, *Nyctalus* species bat and a *Myotis* species bat. The first bat was recorded at 19:49 at point count 1 along the eastern boundary adjacent to the M1 motorway. A soprano pipistrelle *P. pygmaeus* was recorded commuting at point count two. A noctule *N. noctula* bat was heard foraging overhead at 20:07 at hedgerow H11. Two common pipistrelle *P. pipistrellus* bats were observed foraging over hedgerow H9 and a soprano pipistrelle *P. pygmaeus* bat was observed foraging between hedgerow H24 and the field adjacent to the east. A single *Myotis* species of bat was recorded at 20:29 commuting along hedgerow H9.

Transect Route B - South

4.42 A total of eleven bat contacts were recorded during this transect. Eight were common pipistrelle *P. pipistrellus* bats, one was a *Pipistrellus* species bat, one was a *Myotis* bat species and one a *Nyctalus* species bat. The first bat was a common pipistrelle *P. pipistrellus* bat recorded at 20:14 which was commuting north from pond P1 towards hedgerow H1. The *Myotis* bat species was recorded at 20:51 at point count four and was heard foraging along the woodland edge. Two minutes later a *Nyctalus* species bat was heard foraging overhead but was not observed. A common pipistrelle *P. pipistrellus* bat was heard foraging along hedgerow H40 at 21:17 and during point count two along RW1.

**Highway Mitigation Works**

June 2016

4.43 Bat activity was greater in the southern transect during the June 2016 activity transects. Common pipistrelle *P. pipistrellus*, soprano pipistrelle *P. pygmaeus* and noctule *N. noctula* bats were the only bat species identified foraging and commuting on site.

Transect Route A - North

4.44 During the transect, a total of 13 bat contacts were recorded. Bat species included common pipistrelle *P. pipistrellus* (11 contacts), soprano pipistrelle *P. pygmaeus* (one contact) and nocule *N. noctula* (one contact). Eleven of these contacts were recorded in the walked sections between point counts and two were recorded during point count four and six. The first bat was in the north-east corner of the transect route between point counts two and three, along hedgerow H103. It was a non-visual contact of a commuting soprano pipistrelle *P. pygmaeus* bat at 22:13. The first common pipistrelle *P. pipistrellus* was heard in the walked sections between point counts three and four at the western end of hedgerow H104 and was a non-visual contact. The noctule *N. noctula* was heard later into the transect at 23:41 in the walked section between point counts six and seven, adjacent to Blisworth Road and was a non-visual contact.

Transect Route B - South

4.45 During the transect, a total of 18 bat contacts were recorded. All bats recorded were common pipistrelle *P. pipistrellus* bats with the exception of a single commuting pass of a soprano pipistrelle *P. pygmaeus* bat at point count four at 22:26. The first common pipistrelle *P. pipistrellus* bat was recorded at 22:34 in the south-western part of the transect route close to the dismantled railway. The majority of bats recorded were foraging individuals; only three bats were recorded commuting (including the soprano pipistrelle *P. pygmaeus*). Twelve bats were recorded in the walked sections between point counts and six were recorded in four of the point counts (point counts three, four and seven). The majority of bat activity was concentrated in the southern half of the transect route in the south-western area with the majority of bats being foraging individuals.

July 2016

4.46 Bat activity on the two transect routes was very similar in terms of activity levels and bat species recorded. Activity was concentrated along the live railway line and to the south-west of the transect areas.

Transect Route A - North

4.47 During the transect, a total of 12 bat contacts were recorded. These consisted of common pipistrelle *P. pipistrellus* bats, soprano pipistrelle *P. pygmaeus* bats and a single pass of a *Myotis* species. The first bat was recorded during point count three at 22:20 which was a commuting common pipistrelle *P. pipistrellus*. During the transect there were six passes of common pipistrelle *P. pipistrellus* bats consisting of both commuting and foraging individuals. The first soprano pipistrelle *P. pygmaeus* bat was recorded during the walked section between point counts three and four along the live railway line at 22:28. A single *Myotis* species of bat was recorded foraging during point count four at the end of hedgerow H108. The majority of bat activity on this transect was concentrated either side of the railway line, just north of the Roade cutting. Most of the bats recorded were from foraging individuals.

Transect Route B - South

4.48 During the transect, 12 bat contacts were recorded which consisted of mainly common pipistrelle *P. pipistrellus* bats with individual commuting passes from a soprano pipistrelle *P. pygmaeus* bat and *Myotis* species. The first bat recorded was a common pipistrelle *P. pipistrellus* at 21:41 which was located in the walked sections between point counts one and two. The soprano pipistrelle *P. pygmaeus* bat and *Myotis* species passes were heard towards the end of the transect with the soprano pipistrelle *P. pygmaeus* recorded during the walked section between point counts six and seven and the *Myotis* species was recorded during point count seven. All bats were identified as commuting individuals with the exception of a common pipistrelle *P. pipistrellus* recorded at 22:12 which made five foraging passes.

September 2016 – Dusk Survey

Transect Route A - North

4.49 Bat activity was once again associated with the hedgerows close to the live railway line with six common pipistrelle *P. pipistrellus* contacts recorded and a single soprano pipistrelle *P. pygmaeus* bat recorded. The first bat was a common pipistrelle recorded foraging during point count four on the bridge over the railway line. The single commuting soprano *P. pygmaeus* bat registration was recorded at 19:51 in the walked section along the western side of the railway line between point counts four and five. All common pipistrelle *P. pipistrellus* bat contacts were foraging individuals. The last bat recorded was a common pipistrelle *P. pipistrellus* at 20:29 along Blisworth Road.

Transect Route B - South

4.50 The southern transect route was adjusted for the September survey due to additional access being granted. The adjusted route allowed assessment of bat activity within the proposed redline boundary of the bypass. Activity along this new route was fairly evenly spread with common pipistrelle *P. pipistrellus* bats recorded at the centre section of the route. The first bat was recorded at 19:33, a foraging common pipistrelle *P. pipistrellus*. All bats recorded during this transect were common pipistrelles *P. pipistrellus*. Bats were also recorded during point counts four and seven with all other bats being recorded or observed in the walked sections in-between transects.

**Static Bat Detector Survey**

**Main Site**

July 2016

4.51 The total amount of survey time for each static detector was 43 hours with the detector deployed from the evening of 30th June until the morning of 5th July (inclusive).

4.52 Bat activity was much lower at the static location along hedgerow H2 (unit 2) with just 27 bat registrations being recorded. These consisted of common pipistrelle *P. pipistrellus* bat (25 of the 27 registrations were of this species), a single noctule *N. noctula* bat registration and a single brown long-eared *P. auritus* bat registration. No other species were recorded at this location in this survey period.

4.53 Much higher activity was identified along the hedgerow H25 (unit one) with an average of 135 registrations being recorded per hour. A total of seven species or species-groups were recorded. These consisted of common pipistrelle *P. pipistrellus* bat, soprano pipistrelle *P. pygmaeus* bat, Nathusius' pipistrelle *Pipistrellus nathusii* bat, *Myotis* species bat, *Nyctalus* species bat, noctule *N. noctula* bat and brown long-eared *P. auritus* bat. The most-frequently recorded bat species was common *P. pipistrellus* and soprano pipistrelle *P. pygmaeus* whilst only 3 Nathusius' pipistrelle *P. nathusii* registrations were recorded and a single noctule *N. noctula* bat registration was recorded.

4.54 No Annex II bat species were identified on any additional nights of static recordings.

August 2016

4.55 The total amount of survey time for each static detector was 55 hours with the detector deployed from the evening of 11th August until the morning of 16th August (inclusive).

4.56 Bat activity was much lower at the static location along hedgerow H2 (unit four) with an average of just 9.5 bat registrations being recorded each hour. These consisted of common pipistrelle *P. pipistrellus* bat, soprano pipistrelle *P. pygmaeus* bat (the most frequently recorded species), *Pipistrellus* species bat (two registrations), *Myotis* species bat (three registrations), noctule *N. noctula* bat and brown long-eared *P. auritus* bat (four registrations each) and *Nyctalus* species bat (two registrations). No other species were recorded at this location in this survey period.

4.57 Much higher activity was identified along the hedgerow H25 (unit three) with an average of 91 registrations being recorded per hour. A total of seven species or species-groups were recorded. These consisted of common pipistrelle *P. pipistrellus* bat, soprano pipistrelle *P. pygmaeus* bat, *Pipistrellus* species bat, *Myotis* species bat, *Nyctalus* species bat, noctule *N. noctula* bat and brown long-eared *P. auritus* bat. The most frequently recorded bat species was common *P. pipistrellus* and soprano pipistrelle *P. pygmaeus* whilst only 1 brown long-eared *P. auritus* bat registration was recorded.

4.58 No Annex II bat species were identified on any additional nights of static recordings.

September 2016 – first deployment

4.59 The total amount of survey time for each static detector was 65 hours with the detector deployed from the evening of 8th September until the morning of 13th September (inclusive).

4.60 Bat activity was lower at the static location along hedgerow H2 (unit six) with an average of just one bat registration being recorded each hour. These consisted of common pipistrelle *P. pipistrellus* bat, soprano pipistrelle *P. pygmaeus* bat (the two most frequently recorded species),

*Myotis* species bat (two registrations), noctule *N. noctula* bat (one registration) and brown long-eared *P. auritus* bat (two registrations each). No other species were recorded at this location in this survey period.

4.61 Higher activity was identified along the hedgerow H25 (unit five) with an average of 12 registrations being recorded per hour. A total of seven species or species-groups were recorded. These consisted of common pipistrelle *P. pipistrellus* bat, soprano pipistrelle *P. pygmaeus* bat, Nathusius' pipistrelle *P. nathusii* bat, *Pipistrellus* species bat, *Myotis* species bat, *Nyctalus* species bat, noctule *N. noctula* bat. The most frequently recorded bat species was common *P. pipistrellus* and soprano pipistrelle *P. pygmaeus* whilst only one *Myotis* species bat and one Nathusius' pipistrelle *P. nathusii* bat registration were recorded.

4.62 No Annex II bat species were identified on any additional nights of static recordings.

September 2016 – second deployment

4.63 Two additional static detectors were deployed after an off-site detectors for an adjacent application failed to record for the full five nights. The total amount of survey time for each static detector was 71 hours with the detector deployed from the evening of 22nd September until the morning of 27th September (inclusive).

4.64 Bat activity was lower at the static location along hedgerow H2 (unit eight) with an average of seven bat registrations being recorded each hour. These consisted of common pipistrelle *P. pipistrellus* bat (the most frequently recorded species), soprano pipistrelle *P. pygmaeus* bat (26 registrations), *Pipistrellus* species (five registrations), *Myotis* species (34 registrations), noctule *N. noctula* bat (six registrations), *Nyctalus* species (21 registrations), brown long-eared *P. auritus* bat (22 registrations), Nathusius' pipistrelle *P. nathusii* (two registrations) and barbastelle *Barbastella barbastellus* (a single registration). No other species were recorded at this location in this survey period.

4.65 Higher activity was identified along the hedgerow H25 (unit 7) with an average of 10 registrations being recorded per hour. A total of six species or species-groups were recorded. These consisted of common pipistrelle *P. pipistrellus* bat (10 registrations per hour), soprano pipistrelle *P. pygmaeus* bat (31 registrations), *Pipistrellus* species bat (five registrations), *Myotis* species (a single registration), *Nyctalus* species (seven registrations) and noctule *N. noctula* bat (five registrations).

4.66 Due to personnel being unable to collect this detector straight after the recording period, the detector was left in-situ for longer than the required five nights. During the additional two nights of recording, a single barbastelle *B. barbastellus* bat registrations was recorded on 27th September 2016 between 20:01 and 22:00.

**Highway Mitigation Works**

July 2016

4.67 The total amount of survey time for each static detector was 43 hours with the detector deployed from the evening of 30th June until the morning of 5th July (inclusive).

4.68 Bat activity was much lower at the western static location along an off-site field hedgerow to the north of Roade with just 13 bat registrations being recorded over two of the five days. All the

registrations consisted of common pipistrelle bat. No other species were recorded at this location in this survey period.

4.69 Higher activity levels were identified along the eastern static location on-site with a total of 40 bat registrations being recorded over the five days. A total of five species or species-groups were recorded. These consisted of common pipistrelle *P. pipistrellus* bat, soprano pipistrelle *P. pygmaeus* bat, *Pipistrellus* species, *Nyctalus* species and noctule *N. noctula* bat. The most-frequently recorded bat species were common pipistrelles *P. pipistrellus* (30 registrations) with the other species being recorded in much smaller numbers. There were just three registrations of noctule *N. noctula* and *Nyctalus* species.

4.70 No Annex II bat species were identified on any additional nights of static recordings.

August 2016

4.71 The total amount of survey time for each static detector was 55 hours with the detector deployed from the evening of 11th August until the morning of 16th August (inclusive).

4.72 Bat activity was much higher at the western static location along an off-site hedgerow to the north of Roade with an average of 56.9 bat registrations being recorded each hour (almost one per minute). Ninety-eight percent of these registrations were of common pipistrelle *P. pipistrellus* bats. The remaining 1.9% consisted of soprano pipistrelle *P. pygmaeus* bat (42 registrations), noctule *N. noctula* (seven registrations), *Nyctalus* species (two registrations), *Myotis* species (five registrations) and barbastelle *B. barbastellus* bat (four registrations). No other species were recorded at this location in this survey period. Three of the barbastelle *B. barbastellus* bat registrations were recorded between 21:01-22:00 and one was recorded between 00:01-01:00.

4.73 Far lower activity was identified along the eastern on-site hedgerow unit with an average of six registrations being recorded per hour. A total of eight species or species-groups were recorded. These consisted of common pipistrelle *P. pipistrellus* bat, soprano pipistrelle *P. pygmaeus* bat, *Pipistrellus* species bat, *Myotis* species, *Nyctalus* species, noctule *N. noctula* bat, barbastelle *B. barbastellus* bat and brown long-eared *P. auritus* bat. The most frequently recorded bat species were common pipistrelle *P. pipistrellus* (78% of all registrations) whilst just three barbastelle *B. barbastellus* bat registrations were recorded.

Additional data

4.74 The static detector at this location was left out longer than five nights due to personnel being unavailable to retrieve the unit. During the additional nights of recording, an additional six barbastelle *B. barbastellus* bat registrations were recorded on the dates below.

**Table 7. Eastern static. Additional night barbastelle bat registrations in August**

| Date | Number of barbastelle bat registrations |
|---|---|
| 16/08/2016 - 17/08/2016 | 1 |
| 18/08/2016 - 19/08/2016 | 2 |
| 19/08/2016 - 20/08/2016 | 1 |
| 21/08/2016 - 22/08/2016 | 2 |

September 2016 – first deployment

4.75 The total amount of survey time for the on-site static detector was 65 hours whilst the off-site detector failed three and a half days into the survey period. Detectors were deployed from the evening of 8th September until the morning of 13th September (inclusive).

4.76 Bat activity was lower at the eastern static location along the on-site hedgerow location with an average of 10 registrations being recorded each hour. Eight bat species or species-groups were recorded which consisted of common pipistrelle *P. pipistrellus* bat, soprano pipistrelle *P. pygmaeus* bat (the two most frequently recorded species) and smaller numbers of *Pipistrellus* species (two registrations), *Myotis* species (13 registrations), noctule *N. noctula* bat (11 registrations), brown long-eared *P. auritus* bat (11 registrations) and barbastelle *B. barbastellus* bat (one registration). No other species were recorded at this location in this survey period.

4.77 This static unit recorded three nights due to a failure of the static detector. However higher activity was identified along the off-site hedgerow with an average of 81 registrations being recorded per hour. A total of seven species or species-groups were recorded. These consisted of common pipistrelle *P. pipistrellus* bat, soprano pipistrelle *P. pygmaeus* bat, *Pipistrelle* species, *Myotis* species, noctule *N. noctula* bat, brown long-eared *P. auritus* bat and barbastelle *B. barbastellus* bat. The most frequently recorded bat species was common pipistrelle *P. pipistrellus*, soprano pipistrelle *P. pygmaeus* and *Pipistrellus* species whilst only six *Myotis* species, seven noctule *N. noctula* bats, four brown long-eared *P. auritus* and four barbastelle *B. barbastellus* bat were recorded.

4.78 No Annex II bat species were identified on any additional nights of static recordings.

September 2016 – second deployment

4.79 Due to the western static detector failing to record an entire five night period during the original deployment, both of the September static surveys were repeated. The total amount of re-deployed survey time for each static detector was 71 hours with the detectors deployed from the evening of 22nd September until the morning of 27th September 2016.

4.80 The eastern on-site detector recorded lower bat activity than the western off-site detector with an average number of bat registrations of four per hour. Species and species-groups recorded included common pipistrelle *P. pipistrellus* which made up 74% of all registrations, soprano pipistrelle *P. pygmaeus* (15%), *Myotis* species (2.8%), barbastelle *B. barbastellus* bat (2.5%), brown long-eared *P. auritus* bat (1.6%), noctule *N. noctula* (1.3%), *Nyctalus* species (0.9%) and *Pipistrellus* species (0.6%). A number of barbastelle *B. barbastellus* bat registrations were recorded. The 2.5% barbastelle *B. barbastellus* registrations translates to eight registrations.

4.81 The western off-site detector recorded a far larger level of bat activity with an average number of 21 registrations per hour. The breakdown of this consists 90% of the registrations were from common pipistrelle *P. pipistrellus* bats, 6.4% were barbastelle *B. barbastellus* bats, 1% were soprano pipistrelle *P. pygmaeus* bats, 0.7% were brown long-eared *P. auritus* bats, 0.3% were noctule *N. noctula* bats, 0.3 *Pipistrellus* species, 0.3 *Myotis* species, 0.1 *Nyctalus* species. The 6.4% for barbastelles *B. barbastellus* translates to 99 registrations.

Additional data

4.82 The static detector at this location was left out longer than five nights due to personnel being unavailable to retrieve the unit. During the additional two nights of recording, an additional 52 barbastelle *B. barbastellus* bat registrations were recorded on the dates below.

**Table 8. Western static. Additional night barbastelle *B. barbastellus* bat registrations in September**

| Date | Number of barbastelle bat registrations |
|---|---|
| 27/09/2016 – 28/09/2016 | 29 |
| 28/09/2016-29/09/2016 | 23 |

July 2017 – Additional Survey targeting barbastelle bats

4.83 Three static bat detector units were deployed in July 2017 to further survey the area where a considerable number of barbastelle bats were recorded on the 2016 static bat detectors. In 2017, a static detector unit was located at the edge of the strip of continuous dense scrub on the western bank of the railway, a second unit was located along hedgerow H114 and a third unit along hedgerow H111. All three units were deployed between 26th July and 31st July 2017 (inclusive) with each static recording for 49 hours across the five nights.

4.84 Static 1 adjacent to the embankment of railway scrub recorded a small number (32) of registrations. These consisted of 28 common pipistrelle registrations, two soprano pipistrelle registrations and two *Nyctalus* bat species registrations.

4.85 Static 2 was deployed along hedgerow H114 and recorded 1524 registrations. Almost all of these consisted of common pipistrelle bats, the remaining six registrations consisted of soprano pipistrelle (one registration), *Myotis* bat species (three registrations), a single registration of *Nyctalus* bat species and a single registration of a noctule bat. No other bat species were recorded during this period.

4.86 Static 3 was deployed along hedgerow H111 and recorded the largest number of registrations during the July 2017 survey period (4042). Again the majority of these consisted of common pipistrelle bats (4029 registrations). Other bat species recorded consisted of soprano pipistrelle (12 registrations) and a single registration from a noctule bat.

Static Summary

**Main Site**

4.87 Bat species identified during the static detector surveys comprised; common pipistrelle *P. pipistrellus* bat, soprano pipistrelle *P. pygmaeus* bat, Nathusius' pipistrelle *P. nathusii* bat, *Pipistrellus* species, brown long-eared *P. auritus* bat, *Myotis* species, *Nyctalus* species, noctule *N. noctula* and barbastelle *B. barbastellus*. A small number (6) of bat registrations were unable to be identified to species or genus level due to the poor-quality of the recordings (this is due to recording quality issues which includes scenarios such as bats being very far away from the microphone). Table **9** below gives the percentage species breakdown across all static detector surveys.

**Table 9 Species breakdown across all static surveys in 2016**

| **Species breakdown across all surveys 2016** |
|---|

| Species | Percentage |
|---|---|
| Common pipistrelle *P. pipistrellus* | 97.4 |
| Soprano pipistrelle *P. pygmaeus* | 1.6 |
| *Pipistrellus* species | 0.4 |
| *Myotis* species | 0.3 |
| Noctule *N. noctula* | 0.1 |
| Brown long-eared *P. auritus* | 0.1 |
| *Nyctalus* species | 0.1 |
| Unknown species | 0.0 |
| Nathusius' pipistrelle *P. nathusii* | 0.0 |
| Barbastelle *B. barbastellus* | 0.0 |

**Highway Mitigation Works**

4.88 Bat species identified during the static detector surveys comprised; common pipistrelle *P. pipistrellus* bat, soprano pipistrelle *P. pygmaeus* bat, *Pipistrellus* species, barbastelle *B. barbastellus*, *Myotis* species, *Nyctalus* species, noctule *N. noctula* and brown long-eared *P. auritus* bat. Table **10** below gives the percentage species breakdown across all static detector surveys.

4.89 In addition to the 2016 static detector deployments, a further three static bat detectors were deployed in July 2017 to further investigate the high number of barbastelle bat passes recorded during the September period. No further barbastelle bat calls were recorded during the 2017 surveys which further backs up the conclusion that no roost uses the hedgerows in this area for commuting between woodlands, rather they are used by individual male bats in the autumn period when the juvenile bats are pushed out of the woodlands by the rest of the maternity colonies.

**Table 10 Species breakdown across all static surveys 2016**

| Species breakdown across all surveys 2016 | |
|---|---|
| **Species** | **Percentage** |
| Common Pipistrelle *P. pipistrellus* | 93.6 |
| Soprano Pipistrelle *P. pygmaeus* | 3.6 |
| Barbastelle *B. barbastellus* | 1.3 |

| | |
|---|---|
| *Pipistrelle* Species | 0.4 |
| *Myotis* Species | 0.3 |
| Noctule *N. noctula* | 0.3 |
| Brown Long-eared *P. auritus* | 0.3 |
| *Nyctalus* Species | 0.2 |

## 5.0 DISCUSSION & RECOMMENDATIONS

5.1 All UK species of bat are listed on the Conservation of Habitats and Species Regulations 2010 (as amended) making it illegal to deliberately disturb any such animal or damage / destroy a breeding site or roosting place of any such animal. Bats are also afforded full legal protection under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). Under this legislation it is illegal to recklessly or intentionally kill, injure or take a species of bat or recklessly or intentionally damage or obstruct access to or destroy any place of shelter or protection or disturb any animal whilst they are occupying such a place of shelter or protection. Some bat species, including soprano pipistrelle *P. pygmaeus*, are Species of Principal Importance under Section 41 of the Natural Environment and Rural Communities Act 2006 (NERC).

**Roost Sites**

Trees

*High Potential Trees*

**Main Site**

5.2 Two trees were identified as containing high potential for roosting bats (TA and TB). From the completed survey work no bats have been identified roosting within these trees. If these trees are to be affected by the development proposals, further survey work is recommended to re-assess the status of these two trees including nocturnal survey work. Any retained trees within the development should, where possible, have 10m buffers implemented surrounding these trees in order to reduce any likely effects from lighting.

**Highway Mitigation Works**

5.3 From the survey work undertaken at the site, all trees identified as containing high bat roosting potential during the initial survey were subsequently downgraded to a lower category. No trees on site were considered as a result of the survey work to contain high potential roosting features.

*Moderate Potential Trees*

**Main Site**

5.4 Eight trees were identified as containing moderate potential for roosting bats (TB, TK, T49, T51, T43, T20 and T21). From the completed survey work no bats have been identified roosting within these trees. If these trees are to be affected by the development proposals, further survey work is recommended to re-assess the status of these eight trees. Any retained trees within the development should, where possible, have 10m buffers implemented surrounding these trees in order to reduce any likely effects from lighting.

**Highway Mitigation Works**

5.5 A single tree was identified as containing moderate potential for roosting bats (T207). From the completed survey work no bats have been identified roosting within these trees. If these trees are to be affected by the development proposals, further survey work is recommended to re-assess the status of this tree. Any retained trees within the development should, where possible, have 10m buffers implemented surrounding these trees in order to reduce any likely effects from lighting.

*Low Potential Trees*

**Main Site**

5.6 From the completed survey work 13 trees were identified as offering low potential for roosting bats (TD, TE, TF, TH, TI, TJ, T10, T12, T30, T31, T35, T36 and T46). From the completed survey work no bats have been identified roosting within these trees. It is not anticipated that these trees will display natural suitable features for roosting bats in the timescales of the development. However, should any trees be affected by such events as storms or strong winds, further survey work may be required in the future however this is considered unlikely.

**Highway Mitigation Works**

5.7 From the completed survey work, five trees were identified as offering low potential for roosting bats (T201, T208, T218, T220 and T221). From the completed survey work no bats have been identified roosting within these trees. It is not anticipated that these trees will display natural suitable features for roosting bats in the timescales of the development. However, should any trees be affected by such events as storms or strong winds, further survey work may be required in the future however this is considered unlikely.

<u>Buildings</u>

**Main Site**

5.8 Four buildings were identified within the proposed development site. From the completed survey work undertaken, buildings B1 and Barns A and B were assessed as providing no potential for roosting bats and therefore the presence of a bat roost is not a statutory constraint to development and these buildings.. Barn C was assessed as providing low potential for roosting bats and subsequent nocturnal emergence and re-entry surveys were undertaken. No bat roosts were observed as a result of the surveys undertaken in 2016-2017 however previous survey work undertaken by FPCR in 2013 and 2014 found a bat roost present in this building with five common pipistrelles observed emerging on 26th September 2013 and a single common pipistrelle emerging on 10th July 2014. As such this bat roost is a statutory constraint to development and a European

protected species licence will be required from Natural England to allow derogation from the law and demolish this building.

Habitat – Foraging / Commuting

**Main Site**

5.9 Over the surveys a minimum of eight species or genus of bat were identified using the site. These species included common pipistrelle *P. pipistrellus* bat, soprano pipistrelle *P. pygmaeus* bat, Nathusius' pipistrelle *P. nathusii* bat, *Pipistrellus* species, brown long-eared *P. auritus* bat, *Myotis* species, *Nyctalus* species, noctule *N. noctula*. Two additional species was identified during the desk study, Daubenton's *Myotis daubentonii* bat and Natterer's *Myotis nattereri* bat. This assemblage of species located on a site on the urban infrastructure fringe with an assemblage of habitats comprising of mainly arable land with some water courses, ponds, woodland, dry ditches and hedgerows is typical for a site of this size and nature in Northamptonshire.

5.10 Common pipistrelle *P. pipistrellus* is one of the UK's most common bat species and was the most frequently encountered across the site during both the transect survey and the static detector surveys. Soprano pipistrelle *P. pygmaeus*, *Pipistrellus* species and *Myotis* species were also recorded throughout the entire survey period but the frequency that these species were recorded was lower than that for common pipistrelle. Low numbers (less than 100 registrations) of *Nyctalus* species, noctule *N. noctula* and brown long-eared *P. auritus* were recorded throughout the entire survey period. Extremely low numbers of Nathusius' pipistrelle *P. nathusii* bat were recorded during July and September in the northern part of the site.

Pipistrelle Species

5.11 Common pipistrelle *P. pipistrellus*, the most frequently recorded species, with the highest level of activity occurring in July and August which is what would be expected as June is the maternity period for bats and so by July the female bats are busy feeding both themselves and the juveniles back at the roost and by August juvenile bats are on the wing foraging for themselves and as such foraging activity is likely to increase in these two months. The highest activity level and most frequent habitats utilised by common pipistrelle occurred in association with;

- H1, H11, H9, H10, H25; and
- RW1 and the arable field compartments to the south of RW1.

5.12 The results indicate that specifically these habitats form part of a small part of their foraging habitats within their natural range. The results do not demonstrate that the hedgerows form a significant commuting route to roost sites surrounding the site, as significant activity both at dusk and dawn was not recorded.

5.13 Soprano pipistrelle *P. pygmaeus* was the second most commonly recorded species across the site. This species is known to forage specifically near to water courses. This species was recorded more sporadically across the site with only the northern transect routes picking up the species during surveys. However sorpano's were also recorded on the static detectors. The following features were utilised by soprano pipistrelle *P. pygmaeus* throughout the survey season;

- H15, H25; and
- the central dense scrub area to the immediate north of the Courteen Hall shooting lodge.

5.14 Nathusius' pipistrelle *P. nathusii* are widespread but rare across the UK most commonly encountered on migration late summer/autumn although some do remain all year and breed in the UK. This species as identified during the static detector surveys in July (three registrations) and September (one registration) in the middle of hedgerow H25 of which are a typical habitat in which this species would be found. No other registrations were identified. Within Northamptonshire it is likely that this species is under recorded and thus records of these species are not considered significant as it is likely that this species was foraging or commuting within its natural range.

*Myotis* species

5.15 Unidentified *Myotis* species were identified during the transect and static surveys utilising;

- H25 and H41.

5.16 The highest level of *Myotis* bat activity occurred during the second September period along H41.

Nyctalus species

5.17 *Nyctalus* species and noctule *N. noctula* were recorded at the two static detector locations and during transects were recorded at hedgerows H9, H11 and H25.

5.18 The highest levels of bat activity by the above species occurred along H25 in the second September period with 27 registrations.

Plecotus species

5.19 Brown long-eared *P. auritus* bats were not detected during the transect surveys but were identified utilising the two hedgerows on which the static detectors were placed in small numbers which was to be expected owing to the difficult nature of detecting this species. The highest levels of activity were identified along H25 in the second September period with 22 registrations.

Barbastelle *B. barbastellus*

5.20 Barbastelle bats were not detected during the transect surveys but single passes were recorded on both the static detectors during the second September survey period. One of these was near the start of the evening (static location unit 7, September, hedgerow H41, figure 10) whilst the second was in the middle of the night (static location unit 8, September, hedgerow H25, figure 10)

**Highway Mitigation Works**

5.21 Over the surveys a minimum of eight species or genus of bat were identified using the site. These species included common pipistrelle *P. pipistrellus* bat, soprano pipistrelle *P. pygmaeus* bat, *Pipistrellus* species, brown long-eared bat *P. auritus*, *Myotis* species, *Nyctalus* species, noctule *N. noctula* and barbastelle *B. barbastellus*. Three additional species was identified during the desk study, Daubenton's *M. daubentonii* bat and Natterer's bat *M. nattereri*. This assemblage of species located on a site on the urban infrastructure fringe with an assemblage of habitats comprising of mainly arable land with some water courses, ponds, woodland, dry ditches and hedgerows is typical for a site of this size and nature in Northamptonshire.

5.22 Common pipistrelle *P. pipistrellus* is one of the UK's most common bat species and was the most frequently encountered across the site during both the transect survey and the static detector surveys. Soprano pipistrelle *P. pygmaeus* and *Pipistrellus* species were also recorded throughout

the entire survey period but the frequency that these species were recorded was lower than that for common pipistrelle *P. pipistrellus*. Low numbers (less than 100 registrations) of *Myotis* species, *Nyctalus* species, noctule *N. noctula* and brown long-eared *P. auritus* were recorded during the survey period. Brown long-eared *P. auritus* bat and *Myotis* species were not recorded during the July survey period. A moderate number of barbastelle *B. barbastellus* bat passes were recorded at the two static detector locations in the August and September deployment periods. A total of 119 registrations were recorded over the survey period. The eastern on-site static location recorded a total of 12 registrations over the period whilst the western off-site location recorded 107 registrations. Due to the static detectors being left out on site for longer than five nights on two occasions, some additional barbastelle *B. barbastellus* bat data was captured. The eastern on-site location had an additional six registrations in August and the western off-site location had an additional 52 registrations in September.

Pipistrelle Species

5.23 Common pipistrelle *P. pipistrellus*, the most frequently recorded species, with the highest level of activity occurring in August and September which is to be expected as juvenile bats are on the wing foraging as well as the adults and by September this species has entered the mating season and as such foraging and call activity is likely to increase in these two months. The highest activity level and most frequent habitats utilised by common pipistrelle *P. pipistrellus* occurred in association with the hedgerows and whilst some bats were observed commuting across or over field compartments, the majority of activity was of bats commuting and foraging along the hedgerows. The hedgerows to the south-west of the southern transect route appear to display a concentration of activity whilst the northern transect routes were quieter overall but again the hedgerows either side of the railway line in the northern transect route seem to show bat consistent level of bat contacts across the three surveys.

5.24 The static detector information suggests that the western static detector (hedgerow H111) was placed on is part of a commuting route from a roost somewhere in the village of Roade. 93% of all bat registrations made on the static detectors were of this species. The timings of these contacts for the busy summer period (August) show high levels of activity throughout the night but starting early and ending late. Peaks in the middle of the evening may suggest that adult bats are returning to the roost to feed their young before heading back out to their foraging grounds. The first set of autumn data for the same location shows a similarly high level of activity with peaks at the start and end of the evening which suggests that bats are commuting from and to a roost.

5.25 Soprano pipistrelle *P. pygmaeus* was the second most commonly recorded species across the site. This species is considered to be a more riparian species which may suggest the lower activity levels as there were no large water bodies on site. During the walked transect surveys a small number of soprano pipistrelles *P. pygmaeus* were recorded. Just nine contacts were obtained during the survey period. Higher proportions were recorded on the static detectors but this still accounted for just 4% of the total registrations.

*Myotis* species

5.26 Unidentified *Myotis* species were identified during the static surveys with a total of 46 passes recorded over a total of 471 hours. The three largest period totals occurred during the eastern unit's August and two September deployments with nine registrations in August, 13 in the first September deployment and nine in the second autumn deployment. The results indicate that the hedgerows

form a small part of their commuting or foraging habitats within their natural range. The results do not demonstrate that the hedgerows form a significant commuting route to roost sites surrounding the site, as significant activity both at dusk and dawn was not recorded.

Nyctalus species

5.27 *Nyctalus* species and noctule were recorded on both walked transects and static detector surveys. During the walked transects, a single individual *Nyctalus* species was recorded during the June transect on the northern route. A total of 58 noctule *N. noctula* and *Nyctalus* species registrations were recorded during the static detector recording hours. The two busiest occasions were on the eastern unit in July and August with 12 and 13 registrations respectively.

Plecotus species

5.28 Brown long-eared *P. auritus* bats were identified on the static detectors with consistently low levels of activity however this is not surprising given that the calls of brown long-eared *P. auritus* bats are rarely detected. The highest recorded levels of activity occurred on the eastern unit in August with a total of 11 registrations.

Barbastelle bat *B. barbastellus*

5.29 A considerable number of barbastelle bat registrations were recorded during the static survey period with a total of 119 being recorded over the 471 hours, plus an additional 58 registrations from an additional three nights of recording. The off-site western static recorded most registrations (159 registrations) compared with the on-site eastern static (18). The peak in activity came in September which is when juvenile male barbastelle *B. barbastellus* bats leave woodland to more open ground as they are pushed out of the woodland by the females. The timings of the 159 registrations suggest that the bat(s) were largely foraging as there was little activity during the dusk and dawn hours. Further to this, additional survey effort to investigate this was undertaken in 2017 with the additional deployment of three static detectors in this area during July 2017. No barbastelle bat registrations were recorded during this 2017 survey effort which further confirms the above discussion.

Summary

5.30 Overall the habitat features of both sites utilised most commonly / with the highest levels of bat activity across the site comprised of hedgerows H111, H129 and H130 along with the scrub area either side of the live railway line in the Roade Bypass area of the application site and hedgerows H11, and the central area to the immediate north of the Courteen Hall shooting lodge in the main Junction 15 area of the application site.

5.31 Some of these features will be lost as a result of the development being constructed and there will be some loss of existing foraging sites and loss of a main commuting route for common pipistrelles *P. pipistrellus* from the village of Roade into the wider landscape to the north and the partial loss of a barbastelle *B. barbastellus* foraging area (hedgerows H114, H115 and the area of scrub to the south of this). However, the static detector was placed further north along the hedgerow which is in the section of hedgerow to be retained and whilst the hedgerow connects the village of Roade to the wider landscape, barbastelle *B. barbastellus* bats will not be flying much further southwards along the hedgerow to forage due to the light disturbance from the area. Barbastelles *B.*

*barbastellus* are a woodland specialist and are sensitive to light, even when foraging outside of woodlands in the wider landscape. It is likely that the area is used by individual numbers of bats and being sub-optimal habitat utilised largely in the autumn period is likely to be used by male barbastelle *B. barbastellus* bats whilst the females remain in the optimal woodland habitat off site to the east and therefore it is considered that the loss of the southern half of the hedgerow and scrub area beyond will not affect the favourable conservation status of the species.

5.32 With the exception of the above mentioned hedgerow H111 where the western off-site static detector was placed, the results do not demonstrate that the hedgerows form a significant commuting route to roost sites surrounding the site as significant activity at both dusk and dawn was not recorded. However it should be noted that all hedgerows on site provide suitable commuting and foraging habitat for all bat species found on site and further survey effort may be required if hedgerows or sections of hedgerows are to be removed as part of the development.

**Bat Mitigation & Enhancements**

5.33 Following the developments the sites offer significant opportunities to provide enhancements for the local population of bats. The following provides an overview of the mitigation and enhancements which will be provided through development of the site.

Roosts

**Both sites**

5.34 As a result of a common pipistrelle bat roost being present in Barn C on the Main Site in 2013 and 2014, a mitigation strategy will be put in place to ensure that the risk of harm to bats during demolition is minimised and to provide suitable alternative sites for roosting bats. This strategy will be delivered through an appropriate Natural England European Protected Species (EPS) derogation licence that will be in place prior to demolition. Given the low status of roosts the mitigation will specify that a pre-demolition survey is conducted to make certain that bats are not present immediately prior to works. Demolition will then include the soft stripping of suitable roosting under the supervision of an appropriately licenced bat worker. Prior to demolition bat boxes will be sited on retained features to provide alternative roosting opportunities for the local bat population. These measures are considered sufficient to ensure that the Favourable Conservation Status (FCS) of the local bat populations is maintained.

5.35 Retained trees with high or moderate bat roosting potential will be incorporated into the green infrastructure. A 10m buffer should be implemented surrounding these retained trees to reduce the likely effects from lighting. Additionally high / moderate bat roosting potential trees should be included within dark corridors for bats where possible.

5.35.1. Should any trees with high or moderate potential be due to be removed, the removal of the mature tree will be carried out according to a precautionary method statement in order to ensure legal compliance. The statement will cover the appropriate mitigation measures to ensure that bats are adequately protected during tree works. In brief, this will include precautionary nocturnal surveys and / or aerial tree climbing inspections to ensure the sensitive removal of the trees only when it is

confirmed to be unoccupied by bats. Providing that no bats are present the tree will be section felled by experienced arborists under the supervision of an appropriately licensed bat worker. In the event that bats are confirmed to be present then works will be halted until an appropriate Natural England EPS derogation licence is put in place. This licence would detail the appropriate timing and safe working practices necessary to ensure that the risk to bats is minimised and that suitable alternative roosting sites are provided. These measures would be sufficient to ensure that (should bats be present) the FCS of local bat population is not altered.

5.36 The inclusion of a variety of bat boxes would provide new potential roosting sites for bats within the local area. Boxes should include models such as Schwegler 2F-DFP (with double front panel), 1FS (maternity box) and 1FW (hibernation box) located around the development site on suitable trees and particularly along the southern area of the main Junction 15 application site where a green area is planned to incorporate the two woodland blocks. Boxes should be located in sheltered spots and placed at a height of around 3 metres from the ground but no higher than 4 metres to allow safe future inspection. Boxes should also be arranged around the site so that a number of different aspects are covered with between two and three boxes per tree facing south-east and south-west aspects. Trees with three boxes should also include a box facing a northerly direction.

Hedgerows

**Main Site**

5.37 The majority of hedgerows are to be lost within the proposed development. To compensate for the loss, additional native species planting will be provided throughout the green infrastructure and open space area to add greater value than what is to be lost. The retained hedgerows will be included within the green linkages and should be “gapped up” with native species; this will increase species diversity, strengthen the hedgerow and improve the corridor for foraging bats.

5.38 Preference will be given to planting species of local provenance within the hedgerows and woodland that will be nectar and fruit producing species to provide foraging for insects, birds and mammals. Species should include alder *Alnus glutinosa*, beech *Fagus sylvatica*, silver birch *Betula pendula,* wych elm *Ulmus glabra, gean cherry Prunus avium*, hornbeam *Carpinus betulus,* English oak *Quercus robur,* rowan *Sorbus aucuparia,* goat willow *Salix caprea,* hawthorn *Crataegus monogyna*, hazel *Corylus avellana*, field maple *Acer campestre*, blackthorn *Prunus spinosa*, dogwood, *Cornus sanguinea*, elder *Sambucus nigra,* guelder rose *Viburnum opilus*, field rose *Rosa arvensis* and dog rose *Rosa canina*.

5.39 Management of the hedgerows should be undertaken in an ecologically sensitive manner to enhance the nature conservation value. Such management may include;

- Allowing the hedgerow to reach at least a height of 3m. Once reached the hedgerow can be ‘topped out’ to maintain the height or to suit circumstances, with a width of at least 1-2m;
- A proportion of trees within the hedgerow such as English oak *Quercus robur* and field maple *Acer campestre* should be allowed to mature into standard trees to provide nesting and foraging opportunities for local wildlife and a varied habitat structure; and
- Grassland along the hedgerow base should be allowed to grow to provide a graduated sward height and habitat.

**Highway Mitigation Works**

5.40 Some hedgerows are to be lost within the proposed development. The partial loss of the hedgerow to the west of the live railway line should be mitigated for commuting common pipistrelles *P. pipistrellus* and foraging barbastelle *B. barbastellus* bats. This section of bypass should have directional lighting at a low height with the lighting system acquiring deflectors to prevent light spill outside of the bypass area. The edges of the bypass should also be planted up with trees and shrubs to further prevent any light spill on to the surrounding habitat. Given the use of the same hedgerow by common pipistrelle *P. pipistrellus* bats, a feasible mitigation proposal would be to incorporate the existing hedgerow running along the top of the live railway line. The bypass will cross the top of the railway cutting and given the depth of the cutting there is enough space to provide bats with a green commuting corridor underneath the bypass and above the railway line. Careful planting design may encourage bats to slightly alter their current commuting route to fly below the bypass.

5.41 Preference will be given to planting species of local provenance within the hedgerows that will be nectar and fruit producing species to provide foraging habitat for insects, birds and mammals. Species should include alder *Alnus glutinosa*, beech *Fagus sylvatica*, silver birch *Betula pendula,* wych elm *Ulmus glabra, gean cherry Prunus avium*, hornbeam *Carpinus betulus,* English oak *Quercus robur,* rowan *Sorbus aucuparia,* goat willow *Salix caprea,* hawthorn *Crataegus monogyna*, hazel *Corylus avellana*, field maple *Acer campestre*, blackthorn *Prunus spinosa*, dogwood, *Cornus sanguinea*, elder *Sambucus nigra,* guelder rose *Viburnum opilus*, field rose *Rosa arvensis* and dog rose *Rosa canina*.

5.42 Management of the hedgerows should be undertaken in an ecologically sensitive manner to enhance the nature conservation value. Such management may include;

- Allowing the hedgerow to reach at least a height of 3m. Once reached the hedgerow can be 'topped out' to maintain the height or to suit circumstances, with a width of at least 1-2m;
- A proportion of trees within the hedgerow such as English oak *Quercus robur* and field maple *Acer campestre* should be allowed to mature into standard trees to provide nesting and foraging opportunities for local wildlife and a varied habitat structure; and
- Grassland along the hedgerow base should be allowed to grow to provide a graduated sward height and habitat.

<u>Lighting & Connectivity</u>

**Main Site**

5.43 Urbanisation often results in higher levels of light pollution[5] which is an increasing problem for bats. Increasing light levels can result in a reduction in a number of effects such as disturbance / loss of roost sites and commuting routes, effect to the feeding behaviour of bats / available resources and increase chances of being preyed upon[6]. As such a sensitive lighting design should be incorporated into the development to minimise any impacts arising for lighting.

5.44 Lighting considerations which are recommended to be implemented during construction and incorporated into the development in order to ensure minimal light spill from the site include;

5 Stone, E.L. (2013) *Bats and lighting: Overview of current evidence and mitigation*.
6 Bat Conservation Trust & UK Institute of Lighting Professional (May 2009). Bats and Lighting in the UK. Bats and Built Environment Series. London & Rugby.

- During the construction period no lighting is present at night.
- Lighting is directed to where it is needed, to avoid light spillage, particularly along the hedgerow and woodland edges.
- Lighting that is incorporated into the development design should be low pressure sodium lights as light is emitted at one wavelength and as such has a low attraction to insects.
- Any upward lighting should be avoided.
- Security lighting backing onto sensitive hedgerows and watercourses will be low wattage (<70W) motion censored lights[7]. These should be provided at construction stage to forestall a future installation of unsuitable lighting which could impact on bats.
- Where possible across the site, dark corridors should be designed to ensure and incorporate habitats of value to bats for foraging, potential roosting and commuting into the wider area. Hedgerows, water courses, ponds and trees which are to be included within the corridors should be buffed (usually 10m) that will ensure that the features utilised by bats will maintain a low light level.

5.45 The implementation of all of the above will ensure habitat connectivity across the remaining site hedgerows and into the wider area for foraging and commuting bats. Overall the proposed design is likely to improve the quality and amount of resources available for bats across the site as a consequence of the proposals.

**Highway Mitigation Works**

5.46 The lighting of a bypass has the potential to cause high disturbance potential in particular with regard to hedgerow H111, H112 and H113 together with the scrub area which links these hedgerows with the village of Roade. With such a high number of common pipistrelle *P. pipistrellus* bats using this area to commute and barbastelle *B. barbastellus* bats using this as a foraging area it is important that the design of the Bypass does not impact on these species at this particular location. It is recommended that no lighting is used on this short section of Bypass as it crosses the railway line to allow bats to commute underneath the bypass and above the railway line to move across the new road. The edges of the Bypass should be planted with dense shrubs to reduce the amount of noise from the traffic as vehicle noise is known to disturb foraging bats[8] or potentially have noise-reducing barriers/screens installed which may also double as lighting deflectors if lighting is absolutely necessary. The Bypass should be designed in a way which allows the underside of the Bypass to contain a large enough flight area either side of the live railway line to be used as an underpass.

5.47 With the application of the above mentioned mitigation and enhancements, the overall proposed development has the potential to provide siginificant positive effects to the local bat population.

7 Stone, E.L. (2013) Bats and lighting: Overview of current evidence and mitigation.

8 Schaub, A., Ostwald, J., and Siemers, B.M. (2008) *Foraging bats avoid noise*. The Journal of Experimental Biology 211, 3174-3180.

**Appendix 1: Tree Assessments – Main Site**

| Tree No. | Tree Species | Features | Whole Tree Initial Assessment - Potential for roosting Bats | Whole Tree Final Assessment - Potential for roosting bats | Further Work Required | Felling recommendations | Other comments |
|---|---|---|---|---|---|---|---|
| A | Ash, Fraxinus excelsior | Woodpecker Hole At 8M - East | High | Pending further surveys | Nocturnal Surveys | | |
| B | Ash, Fraxinus excelsior | Knot Hole (Natural) At 6M - West | Moderate | Negligible | Aerial Assessment | | Next to highway |
| C | Ash, Fraxinus excelsior | Knot Hole (Natural) At 5M - East, Hollow Trunk N Stem At 0M - All, Branch Tear Out At 6M - East, Knot Hole (Natural) At 5M - South | High | High | Aerial Assessment | | Next to highway |
| D | Ash, Fraxinus excelsior | Knot Hole (Natural) At 4M - West | Low | Low | None | | |
| E | Ash, Fraxinus excelsior | Branch Tear Out At 7M - East | Low | Low | None | | |
| F | Ash, Fraxinus excelsior | Knot Hole (Natural) At 5M - South | Low | Low | None | | |
| G | English Oak, Quercus robur | | Negligible | Negligible | None | | |
| H | English Oak, Quercus robur | | Low | Low | None | | |
| I | Ash, Fraxinus excelsior | Knot Hole (Natural) At 3M - North | Low | Low | None | | |
| J | Ash, Fraxinus excelsior | Knot Hole (Natural) At 4M - South | Low | Low | None | | |
| K | Ash, Fraxinus excelsior | Knot Hole (Natural) At 3M - North West | Moderate | Pending further surveys | Aerial Assessment | | Can do off ladder |
| T10 | English Oak, Quercus robur | Partially Detached Platey Bark At 7M - South East | Low | Low | None | | |
| T12 | English Oak, Quercus robur | Ivy At 0M - All Over | Low | Low | None | | |
| T20 | Ash, Fraxinus excelsior | Woodpecker Hole At 6M - North | Moderate | Moderate | None | | |
| T30 | English Oak, Quercus robur | Other Vertical Or Horizontal Crack Or Split At 6M - All Aspects | Low | Low | None | | Features are only superficial |
| T31 | English Oak, Quercus robur | Partially Detached Platey Bark At 6M - West | Low | Low | None | | |
| T35 | English Oak, Quercus robur | Branch Tear Out At 7M - South | Low | Low | None | | |
| T36 | Ash, Fraxinus excelsior | Partially Detached Platey Bark At 5M - All | Low | Low | None | | |
| T37 | English Oak, Quercus robur | | Negligible | Negligible | None | | |

| Tree No. | Tree Species | Features | Whole Tree Initial Assessment - Potential for roosting Bats | Whole Tree Final Assessment - Potential for roosting bats | Further Work Required | Felling recommendations | Other comments |
|---|---|---|---|---|---|---|---|
| T43 | English Oak, Quercus robur | Knot Hole (Natural) At 6M - South West | Moderate | Pending further surveys | Aerial Assessment | | |
| T46 | English Oak, Quercus robur | Partially Detached Platey Bark At 5M - All | Low | Low | None | | |
| T49 | English Oak, Quercus robur | Branch Tear Out At 6M - South, Hazard Beam At 8M - South | Moderate | Moderate | None | | |
| T51 | English Oak, Quercus robur | Knot Hole (Natural) At 12M - West | Moderate | Moderate | None | | |

## 6.0 APPENDIX 2: TREE ASSESSMENTS – HIGHWAY MITIGATION WORKS

| Tree No. | Tree Species | Features | Whole Tree Initial Assessment - Potential for roosting Bats | Whole Tree Final Assessment - Potential for roosting bats | Further Work Required | Felling recomendations | Other comments |
|---|---|---|---|---|---|---|---|
| T200 | Ash, Fraxinus excelsior | Knot Hole/ Cavity (From Pruning) At 3M - North West | Moderate | Pending further surveys | Aerial Assessment | | |
| T201 | English Oak, Quercus robur | Partially Detached Platey Bark At 5M - All Over | Low | Low | None | | |
| T202 | English Oak, Quercus robur | | Negligible | Negligible | None | | Only surveyed from East potentially a feature on western side |
| T203 | English Oak, Quercus robur | | Negligible | Negligible | None | | Only assessed from east |
| T204 | English Oak, Quercus robur | Other Vertical Or Horizontal Crack Or Split At 5M - East, Partially Detached Platey Bark At 6M - East | Low | Pending further surveys | Aerial Assessment | | |
| T205 | English Oak, Quercus robur | Knot Hole (Natural) At 2M - East, Partially Detached Platey Bark At 6M - East | High | Moderate | Nocturnal Surveys | | 2 x branch socket cavity and 1 x hole east facing |
| T206 | Ash, Fraxinus excelsior | | Negligible | Negligible | None | | |
| T207 | Ash, Fraxinus excelsior | Other Vertical Or Horizontal Crack Or Split At 2M - East | Moderate | Moderate | None | | Split in main trunk and branch socket cavity, tree has potential in current state however the feature is very unst5 |
| T208 | Ash, Fraxinus excelsior | Branch Tear Out At 5M - South | Moderate | Low | Aerial Assessment | | Split on main stem |
| T209 | Sycamore, Acer pseudoplatanus | | Negligible | Negligible | None | | |
| T210 | English Oak, Quercus robur | | Low | Pending further surveys | Aerial Assessment | | Split on underside of branch |
| T211 | Ash, Fraxinus excelsior | | High | Pending further surveys | Aerial Assessment | | 4 x woodpecker holes and one knot hole |
| T212 | English Oak, Quercus robur | | Negligible | Negligible | None | | |
| T213 | Ash, Fraxinus excelsior | | Negligible | Negligible | None | | |
| T214 | Ash, Fraxinus excelsior | | Moderate | Pending further surveys (nocturnal survey undertaken 15th August 2017). | Aerial Assessment | | Branch socket cavity roadside |
| T215 | Ash, Fraxinus excelsior | | Negligible | Negligible | None | | Dense ivy |
| T216 | Ash, Fraxinus excelsior | | High | Pending further surveys | Nocturnal Surveys | | 3 x south facing woodpecker holes |
| T217 | Ash, Fraxinus excelsior | | Moderate | Pending further surveys | Nocturnal Surveys | | Branch socket cavity and crevice on stem approx 8m high east facing. West facing gap in branch 8m high |

| Tree No. | Tree Species | Features | Whole Tree Initial Assessment - Potential for roosting Bats | Whole Tree Final Assessment - Potential for roosting bats | Further Work Required | Felling recomendations | Other comments |
|---|---|---|---|---|---|---|---|
| T218 | English Oak, Quercus robur | | Low | Low | None | | Upward facing branch socket cavity |
| T219 | Ash, Fraxinus excelsior | | High | Pending further surveys | Aerial Assessment | | North east facing woodpecker holes and split in main stem and broken branch. South west facing branch socket cavities |
| T220 | Ash, Fraxinus excelsior | | Low | Low | None | | Upward facing branch socket cavity |
| T221 | English Oak, Quercus robur | | Low | Low | None | | Bark missing from underside of branch 7m high |
| T222 | Ash, Fraxinus excelsior | Woodpecker Hole At 8M - South, Woodpecker Hole At 8M - West, Branch Tear Out At 8M - East, Woodpecker Hole At 7M - East, Branch Tear Out At 2M - East | High | Moderate | Nocturnal Surveys | | 2 x south facing knot hole 8m high, 1 x west facing woodpecker hole 8m highand split bark. 1 x east facing knot hole 8 m high |
| T223 | Ash, Fraxinus excelsior | | Moderate | Pending further surveys | Aerial Assessment | | Branch socket cavity 8m high |
| T224 | English Oak, Quercus robur | | Negligible | Negligible | None | | |
| T225 | Ash, Fraxinus excelsior | | Moderate | Pending further surveys | Aerial Assessment | | Fissure in branch |
| T226 | Ash, Fraxinus excelsior | | Negligible | Negligible | None | | |
| T227 | Ash, Fraxinus excelsior | | Negligible | Negligible | None | | Very dense ivy |
| T228 | Ash, Fraxinus excelsior | | Negligible | Negligible | None | | Very dense ivy cover |
| T229 | Ash, Fraxinus excelsior | | Negligible | Negligible | None | | Very dense ivy |
| T230 | Ash, Fraxinus excelsior | | Negligible | Negligible | None | | Dense ivy |

**Appendix 3 – 2016 Static Bat Detector Results Table**

| Recording Period | Unit Number | Survey Dates | Survey Hours | Total Avg. per hour | Total Registrations | Common Pipistrelle | | | Soprano Pipistrelle | | | Barbastelle | | | Pipistrelle Species | | | Myotis Species | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Avg. per hour | Peak Count | Period Total | Avg. per hour | Peak Count | Period Total | Avg. per hour | Peak Count | Period Total | Avg. per hour | Peak Count | Period Total | Avg.per hour | Peak Count | Period Total |
| Spr | 1 | 30/06/2016 - 05/07/2016 | 43 | 0.92 | 40 | 0.69 | 16 | 30 | 0.14 | 4 | 6 | 0.00 | 0 | 0 | 0.02 | 1 | 1 | 0.00 | 0 | 0 |
| Spr | 2 | 30/06/2016 - 05/07/2016 | 43 | 0.30 | 13 | 0.30 | 11 | 13 | 0.00 | 0 | 0 | 0.00 | 0 | 0 | 0.00 | 0 | 0 | 0.00 | 0 | 0 |
| Sum | 3 | 11/08/2016 - 16/08/2016 | 55 | 6.05 | 333 | 4.74 | 61 | 261 | 0.62 | 11 | 34 | 0.05 | 3 | 3 | 0.07 | 2 | 4 | 0.16 | 3 | 9 |
| Sum | 4 | 11/08/2016 - 16/08/2016 | 55 | 56.94 | 3132 | 55.84 | 1524 | 3072 | 0.76 | 28 | 42 | 0.07 | 4 | 4 | 0.00 | 0 | 0 | 0.09 | 4 | 5 |
| Aut | 5 | 08/09/2016 - 13/09/2016 | 65 | 10.15 | 663 | 7.51 | 267 | 491 | 2.02 | 44 | 132 | 0.02 | 1 | 1 | 0.03 | 1 | 2 | 0.20 | 4 | 13 |
| Aut | 6 | 08/09/2016 - 13/09/2016 | 65 | 81.33 | 5314 | 77.50 | 2479 | 5064 | 2.83 | 101 | 185 | 0.06 | 4 | 4 | 0.67 | 34 | 44 | 0.09 | 4 | 6 |
| Aut | 0 | 22/09/2016 - 27/09/2016 | 71 | 4.46 | 317 | 3.32 | 154 | 236 | 0.70 | 25 | 50 | 0.11 | 3 | 8 | 0.03 | 1 | 2 | 0.13 | 3 | 9 |
| Aut | 0 | 22/09/2016 - 27/09/2016 | 71 | 21.67 | 1539 | 19.67 | 991 | 1397 | 0.23 | 14 | 16 | 1.39 | 43 | 99 | 0.07 | 4 | 5 | 0.06 | 1 | 4 |

| Recording Period | Unit Number | Survey Dates | Survey Hours | Total Avg. per hour | Total Registrations | Brown Long-eared | | | Noctule | | | Nyctalus Species | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Avg. per hour | Peak Count | Period Total | Avg. per hour | Peak Count | Period Total | Avg. per hour | Peak Count | Period Total |
| Spr | 1 | 30/06/2016 - 05/07/2016 | 43 | 0.92 | 40 | 0.00 | 0 | 0 | 0.02 | 1 | 1 | 0.05 | 1 | 2 |
| Spr | 2 | 30/06/2016 - 05/07/2016 | 43 | 0.30 | 13 | 0.00 | 0 | 0 | 0.00 | 0 | 0 | 0.00 | 0 | 0 |
| Sum | 3 | 11/08/2016 - 16/08/2016 | 55 | 6.05 | 333 | 0.13 | 4 | 7 | 0.05 | 2 | 3 | 0.16 | 6 | 9 |
| Sum | 4 | 11/08/2016 - 16/08/2016 | 55 | 56.94 | 3132 | 0.00 | 0 | 0 | 0.13 | 5 | 7 | 0.04 | 1 | 2 |
| Aut | 5 | 08/09/2016 - 13/09/2016 | 65 | 10.15 | 663 | 0.17 | 8 | 11 | 0.17 | 7 | 11 | 0.03 | 1 | 2 |
| Aut | 6 | 08/09/2016 - 13/09/2016 | 65 | 81.33 | 5314 | 0.06 | 3 | 4 | 0.11 | 7 | 7 | 0.00 | 0 | 0 |
| Aut | 0 | 22/09/2016 - 27/09/2016 | 71 | 4.46 | 317 | 0.07 | 2 | 5 | 0.06 | 2 | 4 | 0.04 | 1 | 3 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aut | 0 | 22/09/2016 - 27/09/2016 | 71 | 21.67 | 1539 | 0.15 | 4 | 11 | 0.07 | 3 | 5 | 0.03 | 2 | 2 |

**Appendix 4 – 2017 Static Bat Detector Results Table**

| Recording Period | Unit Number | Survey Dates | Survey Hours | Total Avg.per hour | Total Registrations | Common Pipistrelle | | | Soprano Pipistrelle | | | Myotis Species | | | Nyctalus Species | | | Noctule | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Avg.per hour | Peak Count | Period Total | Avg.per hour | Peak Count | Period Total | Avg.per hour | Peak Count | Period Total | Avg.per hour | Peak Count | Period Total | Avg.per hour | Peak Count | Period Total |
| Jul | 1 | 26/07/2017 - 31/07/2017 | 49 | 0.65 | 32 | 0.57 | 22 | 28 | 0.04 | 2 | 2 | 0.00 | 0 | 0 | 0.04 | 2 | 2 | 0.00 | 0 | 0 |
| Jul | 2 | 26/07/2017 - 31/07/2017 | 49 | 30.86 | 1524 | 30.74 | 633 | 1518 | 0.02 | 1 | 1 | 0.06 | 3 | 3 | 0.02 | 1 | 1 | 0.02 | 1 | 1 |
| Jul | 3 | 26/07/2017 - 31/07/2017 | 49 | 81.86 | 4042 | 81.59 | 1406 | 4029 | 0.24 | 7 | 12 | 0.00 | 0 | 0 | 0.00 | 0 | 0 | 0.02 | 1 | 1 |
| | | Total | 148 | 37.68 | 5598 | 37.53 | 1406 | 5575 | 0.10 | 7 | 15 | 0.02 | 3 | 3 | 0.02 | 2 | 3 | 0.01 | 1 | 2 |