



Ashfield Land Management and Gazeley GLP Northampton s.à.r.l

## Annex E: Bat Survey Report (Part 2 - Junction 15a)

Rail Central

Project No. 855950

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**RSK**

## RSK GENERAL NOTES

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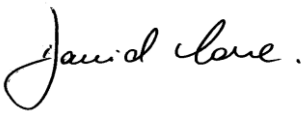
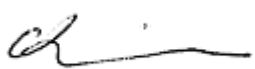


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# EXECUTIVE SUMMARY

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1. This report presents the results of bat surveys of the Grand Union Canal at Junction 15a of the M1 in connection with proposals to develop a rail freight interchange at land to the south of Milton Malsor in Northamptonshire. Surveys were undertaken in 2017 and included bat activity along the canal itself as well as preliminary roost assessment surveys of trees and bridges along its length. This report is in addition to the report for the main development site.
2. The site comprises the M1 junction (15A) with the A43, and adjacent land including the following habitat types; arable fields, improved grassland, rough grassland, amenity-turf, broad-leaved woodland, scattered trees, hedgerows, scrub and waterbodies. There are three tunnels on the site that are formed by the roads (M1 and A43) passing over the Grand Union canal.
3. The preliminary roost assessments of the bridges found them to have highly suitable features for roosting bats. Where suitable roosting features or evidence of bats was found in the bridges, dusk emergence and dawn re-entry surveys have been completed and no roosting bats discovered.
4. Ground level and aerial assessments of trees has been carried out on trees across the site. A total of 33 trees have been assessed and only 3 have either moderate or high potential for bats. No bats or evidence of bats has been found in any of the trees during these surveys
5. Three bat activity transects were devised to ensure full coverage of the site. The transect survey's identified use by commuting and foraging bats along the length of the canal but identified the highest levels of activity where the roads crossed the canal and where the canal crossed over the River Nene. In addition a static bat detector was deployed at approximately the location where the majority of works on the junction will be undertaken.
6. Both transect surveys and static surveys have shown that the canal is used extensively by bats for commuting and foraging. At least 7 species of bat were recorded during both types of survey including passes recorded of Barbastelle bat an Annex II species (Conservation of Habitats and Species Regulations 2010).
7. The canal and its surrounding habitat has been evaluated as having high potential for bats particularly commuting and foraging bats.
8. Assessment of the foraging and commuting habitat using Wray (2010) shows that both are of Regional value.



# 1 INTRODUCTION

## 1.1 Purpose of this Report

This report presents the results of the preliminary roost assessments of 3 bridges and 33 trees, and the results of both bat activity transect surveys and static bat detector surveys.

These surveys were undertaken on land around J15a of the M1 (ordnance survey grid reference SP 727 571) to accompany an application to the Ministry of Transport as part of an Nationally Significant Infrastructure Project application for a rail freight interchange. The proposed works entail improvements to the junction with the M1 and the A43 at Junction 15A including the construction of a new bridge over the Grand Union Canal immediately to the south of the existing bridges. *Figure E1* shows the site location and an aerial photograph of the site and *Figure E2* shows the site layout.

**Table E2.1 – Objectives of Surveys**

Survey objective	Comments
<b>Determine presence / absence of bats</b>	To determine the presence or absence of bats within the Bridges and trees on the site particularly those Bridges and trees likely to be demolished or removed to facilitate the development.
<b>Determine bat usage of site (e.g. maternity, hibernation, night roosts in various structures (specify)).</b>	To determine if any bats were present within Bridges or trees and establish the status of that use.
<b>Identify foraging, commuting or swarming sites (explain)</b>	To identify important commuting routes and foraging areas used by bats. To establish how continued use of any important commuting routes or foraging could be maintained post development.

## 1.2 Project Description

The proposals are the construction of new access roads between the M1 and the A43 with the construction of a new slip road on the south side of the junction that includes an elevated road crossing the Grand Union Canal to the south of the existing junction.

## 1.3 Site Description

Habitats on the Junction 15a site comprise arable field, improved grassland, rough grassland, amenity-turf, broad-leaved woodland, broad-leaved plantation, scattered trees, hedgerows, scrub, tall ruderals, ornamental planting, ditches, brooks, a canal, a swamp, ornamental and bare ground. The principal habitat associated with the site is the Grand Union Canal which runs from North to South beneath and crossed by the A43 and the M1.

The habitats present are mapped within the Phase 1 map (*Figure E4*).

## **Description of Off Site Areas**

The site is located north of the village of Milton Malsor, which consists of houses and recreation areas. The off site areas are dominated by the M1 motorway and A43 trunk road. There is farmland consisting of arable fields in the wider area.

## **1.4 Structure of this Report**

The remainder of the report is structured as follows:

- *Section 2* describes the survey methods;
- *Section 3* summarises the results;
- *Section 4* details the evaluations and conclusions; and
- *Section 5* lists the documents referenced in this report

*Appendix A* provides the survey details

*Appendix B* provides the photographic plates

*Appendix C* provides the relevant legislation; and

*Appendix D* provides the figures

## 2 METHODS

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### 2.1 Introduction

The site was the subject to a number of survey methods so that all bat activity including roosting, commuting and foraging were identified. The surveys were designed using the methods outlined in the Bat Surveys for Professional Ecologists (Collins 2016). Where a deviation from the methods in the survey guidelines was applied this is explained in the relevant section including justification for that deviation. Survey details including weather condition and personnel are provided in Appendix C

### 2.2 Desk Study

Bat data for 5 km around the central point of site has been obtained from the Northamptonshire Bat Group (*Figure E3*).

### 2.3 Visual Inspection of Bridges

Ecologists from RSK inspected three bridges formed where the A43 and M1 carriageways cross the Grand Union Canal below (*Figure E5.2*).

Surveyors used a 1,000,000-candle power torch, and binoculars to aid identification of features. The bridges were assessed for their bat roost potential according to the following factors that influence the likelihood of bat roosting.

- Surrounding habitat: whether there are potential flight-lines and bat foraging areas nearby.
- Construction detail: the type and construction of architectural features such as drainage pipes or naturally occurring voids within the bridges.
- Bridge condition: whether there were suitable gaps within the external construction of the bridges that may give access to internal voids.
- Internal conditions: bats favour sheltered locations with a store temperature regime, protection from the elements and little wind/light/rain penetration.
- Potential bat-access points: whether there is flight and crawl access.
- Potential roosting locations: descriptions of all bat-accessible voids, cracks and crevices.

A description of each bridge was recorded on survey sheets, and digital photographs were taken as a record. The bridges were categorised into a standard scheme as described in *Table 2*.

An examination of each bridge was made for bats and evidence of bats. This consisted of an external examination only. Features inspected (if present) included:

- wall bases;



- wall ledges and wall tops where accessible;
- cracks, crevices and sheltered voids; and
- gaps between road sections

Evidence of roosting bats includes droppings, urine stains, staining from fur-oils, scratch marks, wear marks, feeding remains, dead bats, odour, squeaking and chattering, and in some cases the absence of cobwebs.

Bat droppings provide evidence that bats use a structure and can help to identify roosting locations where piles accumulate beneath roosting sites or entrance points. The location, size, shape, texture and colour of the droppings can be used to aid species identification. All droppings found were compared to a reference collection of droppings from known species. The number and condition (age) of droppings can indicate the size of the roost and when it was last used.

## 2.4 Ground Level Tree Assessment (GLTA)

All trees on the site were assessed from ground level using binoculars to identify potential roost features (PRF) on the tree that may support roosting bats. These features can include ivy cover, splits, and cavities within the trunk of the tree or its limbs. Each tree is then given a grading which is based on the guidance in the Bat Surveys for Professional Ecologists as shown in *Table E2.2*.

All ground level tree assessments were carried out during suitable weather conditions by James Pattenden (Natural England Class Licence 2015-106-CLS-CLS) and Neil Withers.

Aerial surveys were carried out by trained staff on all suitable trees identified during the GLTA. All surveys were carried out in suitable weather conditions. All lead surveyors used for aerial and ladder surveys of trees all held at least Level 2 licences for the disturbance of bats and were all trained for aerial survey and rescue.

**Table E2.2 Classification criteria for structures and trees**

Category (Potential to support roosting bats)	Description
Negligible potential	Negligible habitat features on site likely to be used by roosting bats.
Low Potential	A structure or tree with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation).
Moderate potential	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).
High Potential	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.
Confirmed roost	Bats or evidence of bats recorded within the Bridge during the initial inspection surveys or during dusk/dawn surveys. A confirmed record (supplied by records centre/local bat group) would also apply.

## 2.5 Aerial Surveys

Aerial surveys take the form of an inspection of PRF identified during the preliminary assessment from a ladder or using rope access methods. All staff used for aerial surveys are trained in City and Guilds NPTC Level 2 Award - Tree Climbing and Rescue and all lead surveyors also possess at least a Natural England Class Level 2 licence allowing the survey for and disturbance of bats.

The PRF's are closely inspected using torches, mirrors and endoscopes to search for evidence of bats including droppings, staining from sebaceous oil and scratch marks. In the case of tree roosts bats are often present infrequently and roost switching after relatively short periods of time is common amongst those species that use trees. Evidence of bats in the form of droppings are frequently missing due to the actions of weather and invertebrates present within tree cavities.

In some cases it is not possible to fully inspect a feature using these methods due to factors such as depth of a cavity or due to the tree being used by another sensitive species. Where evidence of bats is found or a full survey of the tree is not possible then additional dusk emergence or dawn re-entry surveys are required.

## 2.6 Dusk Emergence and Dawn Re-entry Surveys

Dusk emergence and dawn re-entry surveys following the Bat Surveys Best Practice Guidelines were carried out on bridges or trees where suitable features for bats were

identified. Surveyors were positioned so that all suitable features on a bridge or tree could be observed. Surveyors observed the features for bats, either emerging during a dusk survey or re-entering during a dawn survey. All surveyors were equipped with a bat detector which records the echolocation of bats. These calls were recorded to either a stereo solid state recorder or to SD cards within the detectors. Where there is ambiguity over the species of bat these calls were analysed using sound analysis software. These can include BatSound, Kaleidoscope and BatExplorer.

### **2.6.1 Video Observation During Dusk Emergence and Dawn Re-entry Surveys.**

Video cameras with infra red recording capacity were positioned so that the full extent of the underside and sides of each bridge was visible. To illuminate the viewed area infrared lamps were used and were either mounted on separate tripods or where an iRedzilla infrared lamp was used this mounted on the top of the camera. At least two cameras were used at each bridge.

Equipment used included Canon XA20 and Sony XR video cameras all with infrared recording capability.

All video recorded during surveys was viewed and assessed aided by Motion Meercat software which is an open source software tool for finding ecological events in long video recordings.

## **2.7 Transect Surveys**

Surveyors equipped with bat detectors walked a pre-determined transect route along the Grand Union Canal. The route (approximately 4 km in length) was designed to encompass the three bridge crossings of the site.

Surveyors were equipped with bat detectors to record all bat activity. Surveyors started each survey at dusk and walked between pre-determined points recording all bat activity. They recorded the time, location, flight style (if the bat was visible), field identification of the bat species, and what the bat was doing (*i.e.* commuting, foraging or song flighting). Some detectors use inbuilt GPS to locate the position of the bat and these GPS readings can be exported to a map. Features along the transect route that may be significant for bat activity were identified and static recording is undertaken at these points. The surveyors walked the route until complete with the survey lasting between two and three hours (*Figure E6*).

Transect surveys were planned according to guidance from Bat Survey Guidelines (Collins, 2016).

During the initial appraisal of the canal adjacent to the site it was considered to have high potential for foraging and commuting bats. Therefore the transect route was walked twice a month during each month of the bat active season (where weather conditions were appropriate) between May and October 2017. All transects are shown on *Figures E7 – E12*.

## 2.8 Static Bat Detector Surveys

Either a Wildlife Acoustics Song Meter 2 Bat+ (SM2) detector or a BatLogger A+ were installed at a single location at the site close to Junction 15A for five days each month during May, June, July, August, September and October 2017 as shown in *Figure E6*. Each detector was located alongside the canal in habitat typically used by foraging or commuting bats.

As per the Collins (2016) survey guidelines, the static detectors provided data collected over a minimum of five consecutive nights in each month of deployment to augment the data collected during the transect surveys. Survey dates were selected when the weather *forecast* indicated suitable weather conditions for foraging and commuting bats (*i.e.* air temperature above 8°C, the absence of strong winds and minimal precipitation). The units were set up to continuously record from 30 minutes before sunset until 30 minutes after sunrise. Microphones were mounted on extension cables at least 3m off the ground.

All recordings were stored on memory cards and analysed using either Kaleidoscope Pro® or BatExplorer® software programs. All automated identifications and 'no ID' files from the software were double checked by an experienced ecologist. In addition, all 'noise' files recorded during each deployment for each detector were reviewed for any bat echolocation call hidden within, which had not been identified as a bat call by the software.

The Kaleidoscope Pro® analysis software produces a single file for each recording of ultrasonic activity. Where these ultrasonic recordings include bats, the level of bat activity was quantified by the number of files (for the purposes of this analysis deemed as bat 'passes') for each recorded species for each night and monitoring period. Note that there is no way of extrapolating how many bats were being recorded from this acoustic only data, just the level of activity.

## 2.9 Sound Analysis

Echolocation calls were identified down to species wherever possible; however, depending on the type of bat encountered and call recorded it is not always possible to reliably identify all bats beyond their genus. In particular, because of the similarities of their frequency modulated calls, *Myotis* bat species cannot reliably be separated. Therefore, in this region of England, a 'Myotis bat' call is most likely to comprise either: Natterer's Bat (*M. nattereri*), Daubenton's Bat (*M. daubentonii*), Whiskered Bat (*M. mystacinus*) or Brandt's Bat (*M. brandtii*) but could also be Bechstein's Bat (*M. bechsteinii*).

Note that it can also be difficult to separate some calls of *Plecotus* bats (in Northamptonshire most likely to be the Brown Long-Eared Bat, *Plecotus auritus*, rather than the Grey Long-Eared Bat, *P. austriacus*) as well as separating some *Plecotus* calls from *Myotis* bats. It can also be difficult to distinguish between the two bats in the

*Nyctalus* genus, Noctule (*N. noctula*) and Leisler's bat (*N. leisleri*), and occasionally alongside Serotine (*Eptesicus serotinus*). Some calls of Common Pipistrelle (*Pipistrellus pipistrellus*) also overlap with either Nathusius' Pipistrelle (*P. nathusii*) or Soprano Pipistrelle (*P. pygmaeus*). Analysis of cryptic calls can also be more difficult with faint or poor quality recordings.

Lastly, there are a number of variables that affect the detectability of a bat, ranging from its biology and ecology, to the environmental conditions and condition of the equipment, and so there are limitations in drawing certain conclusions about bat activity on a site from the use of bat detectors / sound analysis alone.

## 2.10 Methods of Evaluation

In order to provide a means of evaluating the bat assemblages in both a spatial context and in the context of previous assessments, the monitoring results have been evaluated against adapted criteria from Wray *et al.* (2010). This method has also been used in the absence of any other recognised approach.

For this method, where bats (species and likely number of) are found using certain habitats (to roost, commute or forage) their population is assigned a relative ecological value. This value is partly based upon how well used a habitat is and partly upon how rare the bat species is.

In this method of assessment British bat species are subdivided into groups, dependent upon how common they are: common, rarer and rarest as shown in *Table E2.3*. These were further subdivided based upon the location of the site surveyed (i.e. in England).

**Table E2.3: Categorising bats by distribution and rarity in England.**

Rarity in England:	Bat Species:
<b>Rarest</b> (population estimated to be under 10,000)	Greater Horseshoe Bat ( <i>Rhinolophus ferrumequinum</i> ) Bechstein's Bat ( <i>Myotis Bechsteinii</i> ) Alcathoe Bat ( <i>Myotis Alcathoe</i> ) Greater Mouse-Eared Bat ( <i>Myotis myotis</i> ) Barbastelle Bat ( <i>Barbastella barbastellus</i> ) Grey Long-Eared Bat ( <i>Plecotus austriacus</i> )
<b>Rarer</b> (population estimated to be 10,000 to 100,000)	Lesser Horseshoe Bat ( <i>Rhinolophus hipposideros</i> ) Whiskered Bat ( <i>Myotis mystacinus</i> ) Brandt's Bat ( <i>Myotis brandii</i> ) Daubenton's Bat ( <i>Myotis daubentonii</i> ) Natterer's Bat ( <i>Myotis nattereri</i> ) Leisler's Bat ( <i>Nyctalus leisleri</i> ) Noctule ( <i>Nyctalus noctula</i> ) Nathusius' Pipistrelle ( <i>Pipistrellus nathusii</i> ) Serotine ( <i>Eptesicus serotinus</i> )

Rarity in England:	Bat Species:
<b>Common</b> (population estimated to be over 100,000)	Common Pipistrelle ( <i>Pipistrellus pipistrellus</i> ) Soprano Pipistrelle ( <i>Pipistrellus pygmaeus</i> ) Brown Long-Eared Bat ( <i>Plecotus auritus</i> )

To calculate the score (shown in brackets in the tables below) for commuting routes or foraging areas according to Wray *et al.*, (2010), the numerical values in *Table E2.4* (commuting) are each added together to give a total for each species recorded on the site, and the same is then also done for *Table E2.5* (foraging). The highest value obtained for a species across both tables is then used in the assessment. This value is applied to the overall scoring system shown in *Table E2.6* to give an assessment of the importance of the site to foraging and commuting bats within a geographic frame of reference.

**Table E2.4: Valuing Commuting Routes.**

Species	Likely No. of Bats	Roosts / Potential Roosts Nearby	Type and Complexity of Linear Features
Common (2)	Individual bats (5)	None (1)	Absence of (other) linear features (1)
		Small number (3)	Un-vegetated fences and large field sizes (2)
Rarer (5)	Small number of bats (10)	Moderate number / Not known (4)	Walls, gappy or flailed hedgerows, isolated well grown hedgerows, and moderate field sizes (3)
		Large number of roosts or close to a SSSI (5)	Well grown and well connected hedgerows, small field sizes (4)
Rarest (20)	Large number of bats (20)	Close to or within a SAC for the species (20)	Complex network of mature well-established hedgerows, small fields and rivers/streams (5)

**Table E2.5: Valuing Foraging Areas.**

Species	Likely No. of Bats	Roosts / Potential Roosts Nearby	Foraging Habitat Characteristics
Common (2)	Individual bats (5)	None (1)	Industrial or other site without established vegetation (1)
		Small number (3)	Suburban areas or intensive arable land (2)
Rarer (5)	Small number of bats (10)	Moderate number/Not known (4)	Isolated woodland patches less intensive arable and/or small towns and villages (3)



Species	Likely No. of Bats	Roosts / Potential Roosts Nearby	Foraging Habitat Characteristics
		Large number of roosts or close to a SSSI (5)	Larger or connected woodland blocks, mixed agriculture and small villages/hamlets (4)
Rarest (20)	Large number of bats (20)	Close to or within a SAC for the species (20)	Mosaic of pasture, woodlands and wetland areas (5)

**Table E2.6: Scoring System for Valuing Sites for Commuting and Foraging Bats.**

Geographic Frame of Reference	Score
International	>50
National	41-50
Regional	31-40
County	21-30
District, local or parish	11-20
Not important	1-10

## 3 RESULTS

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### 3.1 Background Data Search

Data supplied by the Northamptonshire Bat Group shows records for a total of eight species (*Figure E3*) which include

- *Pipistrellus pipistrellus* (Common Pipistrelle);
- *Pipistrellus pygmaeus* (Soprano Pipistrelle);
- *Myotis daubentonii* (Daubenton);
- *Myotis nattereri* (Natterers);
- *Myotis mystacinus*/*Myotis brandti* (Whiskered/Brandts);
- *Nyctalus noctula* (Noctule);
- *Plecotus auritus* (Brown Long-eared); and
- *Barbastellus barbastellus* (Barbastelle).

Most records are flight records but there are four Common Pipistrelle and two Whiskered /Brandt roosts all within c.5 km of the Grand Union Canal. All bat records supplied by the bat group are mapped in *Figure E3*.

### 3.2 Visual Inspections of Bridges

#### 3.2.1 Bridge Descriptions

All bridges within the red line boundary that were considered for survey are shown in *Figure E5.2*.

**Table E2.7 Bridge Descriptions**

Bridge No	Bridge No and Type	Bridge Description
Bridge 1 – A43 North	Bridge 1 – road bridge	This is a concrete bridge carrying the A34 road at the northern end of the site. The bridge has extensive expansion joints where bats could roost.
Bridge 2 – M1	Bridge 2 – road bridge that forms a short tunnel	This is a bridge carrying the M1 across the Grand Union Canal. The bridge forms a tunnel along the canal across the canal approximately 15 m in length. There a number of small cavities along the length of the bridge. Additionally there are a number of drainage pipes that exit through the walls at a high level on the walls. These would make potentially good roosts for Daubenton bats.
Bridge 3 – A43 South	Bridge 3 – road bridge	This is a concrete bridge carrying the A34 road at the southern end of the site. The bridge has extensive expansion joints where bats could roost.

All three bridges were assessed as having high potential for roosting bats with features such as gaps between concrete panels being present. Full details of the assessment can be found in *Table E2.8*.

**Table E2.8 - Bridges**

	Date	Species Observed	Roost Type	Structure Reference	Roost Location	Potential Access Points	Dimensions of existing roosts
<b>Bridge 1 – A43 North (Plates 1 – 2)</b>	11.07.2017	None	None Identified	Bridge 1 – A43 North	None Found	In spaces between road deck panels	N/A
	<b>Notes and Observations:</b> This is a bridge span over the Grand Union Canal carrying the A34 trunk road. The bridge is constructed from pre-formed concrete panel spans that run longitudinally across the canal. There are extensive gaps between all panels of the bridge. These gaps provide potential roosting opportunities for a number of bat species. Plates 1 – 2, Section 7. This Bridge is classified as having <b>HIGH</b> bat roost potential as shown in <i>Table E2.2</i> .						
	Date	Species Observed	Roost Type	Structure Reference	Roost Location	Potential Access Points	Dimensions of existing roosts

<b>Bridge 2 – M1 Bridge (Plates 3 – 4)</b>	11.07.2017	None	None Identified	Bridge 2 – M1	None Found	Through run off pipes within the walls	N/A
	<p><b>Notes and Observations:</b> This bridge carries the M1 motorway across the Grand Union Canal. The bridge is long and forms a tunnel. It has an arched roof and is generally smooth along its length. There are a number of run off pipes that are positioned high up on the walls of the bridge that could be accessed by bats.</p> <p>Plates 3 – 4, Section 7. This Bridge is classified as having <b>HIGH</b> bat roost potential as shown in <i>Table E2.2</i>.</p>						
	Date	Species Observed	Roost Type	Structure Reference	Roost Location	Potential Access Points	Dimensions of existing roosts
<b>Bridge 1 – A43 North (Plates 5 – 6)</b>	11.07.2017	None	None Identified	Bridge 3 – A43 South	None Found	In spaces between road deck panels	N/A
	<p><b>Notes and Observations:</b> This is a bridge span over the Grand Union Canal carrying the A34 trunk road. The bridge is constructed from pre-formed concrete panel spans that run longitudinally across the canal. There are extensive gaps between all panels of the bridge. These gaps provide potential roosting opportunities for a number of bat species.</p> <p>Plates 5 – 6, Section 7. This Bridge is classified as having <b>HIGH</b> bat roost potential as shown in <i>Table E2.2</i>.</p>						

### 3.3 GLTA and Aerial Survey Results

A total of 33 trees were assessed using the methods shown in the Bat Survey Guidelines, as shown in *Section 2.1.4*. All trees assessed as having moderate or high potential were then subject to either aerial or ladder accessed assessments. No evidence of bats was discovered in any of the trees during these assessments. There were some trees that when inspected had their grading reduced to either low or negligible potential meaning no further surveys on them was necessary as advised in *Collins, 2016*

**Table E2.9: Results of GTLA**

Tree Number (Figure E14)	Species	Easting	Northing	DBH	PRF Description	Height	Distance from trunk	Aspect	GTLA Date	GTLA Grade
1	Cut Willow	472457	257117	0.3	Small feature on cut branch where bark has split. Tree has been felled.	1.5	0	N	wc 30.05.17	Low
	Ash	472551	257069	multi stem med 0.5 large st	No BRP	12	-	-	wc 30.05.17	No BRP
2	Ash	472548	257065	0.2 multi stem med	Vertical split in branch adjacent to stream (viewed from w bank)	1.7	1.5	W	wc 30.05.17	Mod
	Mixed	472544	257055	0.15	Trees adjacent to stream mostly hawthorn, no BRP	Upto 5	-	-	wc 30.05.17	-
6	Crack Willow (Just outside site)	472474	256921	1.5	Cavity where branches overlap	5 from stream	2.5	S	wc 30.05.17	Mod
					Flaking bark on trunk with possible cavity	3 from stream	0	N		Low
	Crack Willow	472459	256908	0.3 multi	No BRP	12	-	-	wc 30.05.17	No BRP

				stem med						
	Crack Willow x2	472451	256897	0.2	No BRP	8	-	-	wc 30.05.17	No BRP
	Ash	472550	257022	1.5	Some lacking bark but appears superficial. No BRP.	15	-	-	wc 30.05.17	No BRP
	Ash	472545	257031	1.2	No BRP.	12	-	-	wc 30.05.17	No BRP
3	Goat willow	472575	257065	35 multi stem med	Some small rot holes in the stems (frost cracks) that provide cavity suitable for individual bats	2	0	S and E	wc 30.05.17	Low
									wc 30.05.17	
4	Goat Willow	472585	257068	0.5 multi stem med	Vertical split in one of the stems	2-4	0	S	wc 30.05.17	Low
					Horizontal split in broken branch, with cavity.	3	0.5	N	wc 30.05.17	Low
	Alder	472591	257070	0.4	No BRP	13	-	-	wc 30.05.17	No BRP
	Mixed	472612	257078	0.1	Dense scrub patch dominated by hawthorn but also including blackthorn elder and Hazel. Adjacent to motorway fencing.	Upto 6	-	-	wc 30.05.17	No BRP
	Goat willow	472604	257083	0.2	Goat willow scrub. No BRP	upto 6	-	-	wc 30.05.17	No BRP
	Alder	472596	257081	0.5	No BRP	15	-	-	wc 30.05.17	No BRP
	Mixed	472607	257051	Upto 0.2	Small individual trees in wet flat area adjacent to	Upto 5	-	-	wc 30.05.17	No BRP



					canal. Inc goat willow and hawthorn.					
	Ash	472585	256949	Upto 0.5	Group of immature-semi-mature ash trees in edge of woodland block. No brp.	Upto 8	-	-	wc 30.05.17	No BRP
	Mixed	472658	257067	upto 0.1	Mixed hedgerow adjacent to canal towpath. inc dogwood, blackthorn, elder, hazel, hawthorn, no BRP	Upto 5	-	-	wc 30.05.17	No BRP
	Ash	472657	257050	0.4	No BRP	9	-	-	wc 30.05.17	No BRP
	Ash	472656	257034	0.4	No BRP	9	-	-	wc 30.05.17	No BRP
5	Ash	472648	256980	1.75	Possible cavity under split in branch	8	4	SW	wc 30.05.17	Low
					Possible cavity in small knot hole	7	7	NE		Low
					Cavity in old wind on low branch overhanging field.	2.5	5	E		Mod
	Mixed	472662	257019	Upto 0.1	Mixed hedgerow on road edge. Inc dogwood, hawthorn, Hazel, blackthorn, birch and ash. No BRP.	5	-	-	wc 30.05.17	No BRP
	Blackthorn	472644	256921	0.1	Blackthorn row adjacent to	6	-	-	wc 30.05.17	No BRP

					footpath					
	Ash	472649	256905	upto 0.4	Group of Ash trees adjacent to memorial bench. No BRP	upto 15	-	-	wc 30.05.17	No BRP
	Ash	472647	256830	0.4 multi stem med	No BRP	15	-	-	wc 30.05.17	No BRP
	Mixed	472636	256788	Upto 0.4	Group of Semi-mature Ash and Hawthorn beyond fence line on road embankment. Although all sides were not inspected due to location, no BRP seen or expected.	Upto 13	-	-	wc 30.05.17	No BRP

**Table E2.10: Results of Tree Climbing Surveys**

Tree Number	Further Survey 1 (Type & Date)	Notes	Further Survey 2 (Type & Date)	Notes	BRP following inspection
1	Climbing. 01.06.17	No evidence	N/A	Fully inspected – no evidence of bats.	Low
2	Climbing. 01.06.17	Extends approximately 12cm into branch. Located on E side of stream but viewed from W side.	Climbing. 27.07.17. JD & SD	Fully inspected – no evidence of bats.	Mod
3	Climbing. 01.06.17	Fully inspected – no evidence of bats.	N/A	N/A	Low
4	Climbing. 01.06.17	Fully inspected – no evidence of bats.	N/A	N/A	Low
5	Climbing. 01.06.17	Negligible	Climbing. 27.07.17. JD & SD	Fully inspected - no bats	Negligible
		Negligible			Negligible
		Moderate cavity - extends approximately 30cm. Clean internally and sheltered.			Mod
6	Climbing. 01.06.17	Appears to be located just outside of the site. No evidence.	Climbing. 27.07.17. JD & SD	Fully inspected, no bats. Crack-willow, overlapping branch in cavity extends 15cm down into damaged branch. Open at top and exposed - Low potential.	Low

### 3.4 Dusk and Dawn Survey Results – Bridges

Tables E2.11-E2.13 provide information from the three dusk emergence or dawn re-entry surveys undertaken at each bridge.

**Table E2.11 – Dusk and Dawn Surveys Bridge 1 – A43 North**

Date	Survey Type	Species Observed	Roost Type	Structure Reference	Roost Location	Potential Access Points	Dimensions of existing roosts
10.07.2017	Dusk Emergence	Common Pipistrelle, Soprano Pipistrelle and Myotis spp	None Identified	Bridge 1 – A43 North	None Found	In spaces between road deck panels	N/A
<b>Notes and Observations:</b> Numerous bats were observed and recorded on bat detectors during this survey but no bats were observed entering or emerging from any gaps or crevices within the bridge							
09.08.2017	Dusk Emergence	Common Pipistrelle, Soprano Pipistrelle and Myotis spp	None Identified	Bridge 1 – A43 North	None Found	In spaces between road deck panels	N/A
<b>Notes and Observations:</b> Numerous bats were observed and recorded on bat detectors during this survey but no bats were observed entering or emerging from any gaps or crevices within the bridge. Video cameras were deployed observing all aspects of the bridge. Although numerous bats were observed none entered or left any of the crevices within the bridge.							
21.08.2017	Dusk Emergence	Common Pipistrelle, Soprano Pipistrelle and Myotis spp	None Identified	Bridge 1 – A43 North	None Found	In spaces between road deck panels	N/A
<b>Notes and Observations:</b> Numerous bats were observed and recorded on bat detectors during this survey but no bats were observed entering or emerging from any gaps or crevices within the bridge. Video cameras were deployed observing all aspects of the bridge. Although numerous bats were observed none entered or left any of the crevices within the bridge. Bats were noted approaching the crevices during the survey but this was where they were predating on Moths that were emerging from the crevices.							
05.09.2017	Dawn re-entry	Common Pipistrelle, Soprano Pipistrelle and Myotis spp	None Identified	Bridge 1 – A43 North	None Found	In spaces between road deck panels	N/A
<b>Notes and Observations:</b> Numerous bats were observed and recorded on bat detectors during this survey but no bats were observed entering or emerging from any gaps							

or crevices within the bridge. Video cameras were deployed observing all aspects of the bridge. Although numerous bats were observed none entered or left any of the crevices within the bridge.

**Table E2.12 – Dusk and Dawn Surveys Bridge 2 – M1**

Date	Survey Type	Species Observed	Roost Type	Structure Reference	Roost Location	Potential Access Points	Dimensions of existing roosts
10.07.2017	Dusk Emergence	Common Pipistrelle, Soprano Pipistrelle and Myotis spp	None Identified	Bridge 2 – M1	None Found	In spaces between road deck panels	N/A
<b>Notes and Observations:</b> Numerous bats were observed and recorded on bat detectors during this survey but no bats were observed entering or emerging from any gaps or crevices within the bridge							
10.08.2017	Dusk Emergence	Common Pipistrelle, Soprano Pipistrelle and Myotis spp	None Identified	Bridge 2 – M1	None Found	In spaces between road deck panels	N/A
<b>Notes and Observations:</b> Numerous bats were observed and recorded on bat detectors during this survey but no bats were observed entering or emerging from any gaps or crevices within the bridge. Video cameras were deployed observing all aspects of the bridge. Although numerous bats were observed none entered or left any of the crevices within the bridge.							
22.08.2017	Dawn re-entry	Common Pipistrelle, Soprano Pipistrelle and Myotis spp	None Identified	Bridge 2 – M1	None Found	In spaces between road deck panels	N/A
<b>Notes and Observations:</b> Numerous bats were observed and recorded on bat detectors during this survey but no bats were observed entering or emerging from any gaps or crevices within the bridge. Video cameras were deployed observing all aspects of the bridge. Although numerous bats were observed none entered or left any of the crevices within the bridge.							
05.09.2017	Dusk Emergence	Common Pipistrelle, Soprano Pipistrelle and Myotis spp	None Identified	Bridge 2 – M1	None Found	In spaces between road deck panels	N/A
<b>Notes and Observations:</b> Numerous bats were observed and recorded on bat detectors during this survey but no bats were observed entering or emerging from any gaps or crevices within the bridge. Video cameras were deployed observing all aspects of the bridge. Although numerous bats were observed none entered or left any of the crevices within the bridge.							

**Table E2.13 – Dusk and Dawn Surveys Bridge 3 – A34 South**

Date	Survey Type	Species Observed	Roost Type	Structure Reference	Roost Location	Potential Access Points	Dimensions of existing roosts
10.07.2017	Dusk Emergence	Common Pipistrelle, Soprano Pipistrelle and Myotis spp	None Identified	Bridge 2 – M1	None Found	In spaces between road deck panels	N/A
<b>Notes and Observations:</b> Numerous bats were observed and recorded on bat detectors during this survey but no bats were observed entering or emerging from any gaps or crevices within the bridge							
10.08.2017	Dusk Emergence	Common Pipistrelle, Soprano Pipistrelle and Myotis spp	None Identified	Bridge 2 – M1	None Found	In spaces between road deck panels	N/A
<b>Notes and Observations:</b> Numerous bats were observed and recorded on bat detectors during this survey but no bats were observed entering or emerging from any gaps or crevices within the bridge. Video cameras were deployed observing all aspects of the bridge. Although numerous bats were observed none entered or left any of the crevices within the bridge.							
22.08.2017	Dawn re-entry	Common Pipistrelle, Soprano Pipistrelle and Myotis spp	None Identified	Bridge 2 – M1	None Found	In spaces between road deck panels	N/A
<b>Notes and Observations:</b> Numerous bats were observed and recorded on bat detectors during this survey but no bats were observed entering or emerging from any gaps or crevices within the bridge. Video cameras were deployed observing all aspects of the bridge. Although numerous bats were observed none entered or left any of the crevices within the bridge.							
05.09.2017	Dusk Emergence	Common Pipistrelle, Soprano Pipistrelle and Myotis spp	None Identified	Bridge 2 – M1	None Found	In spaces between road deck panels	N/A
<b>Notes and Observations:</b> Numerous bats were observed and recorded on bat detectors during this survey but no bats were observed entering or emerging from any gaps or crevices within the bridge. Video cameras were deployed observing all aspects of the bridge. Although numerous bats were observed none entered or left any of the crevices within the bridge.							



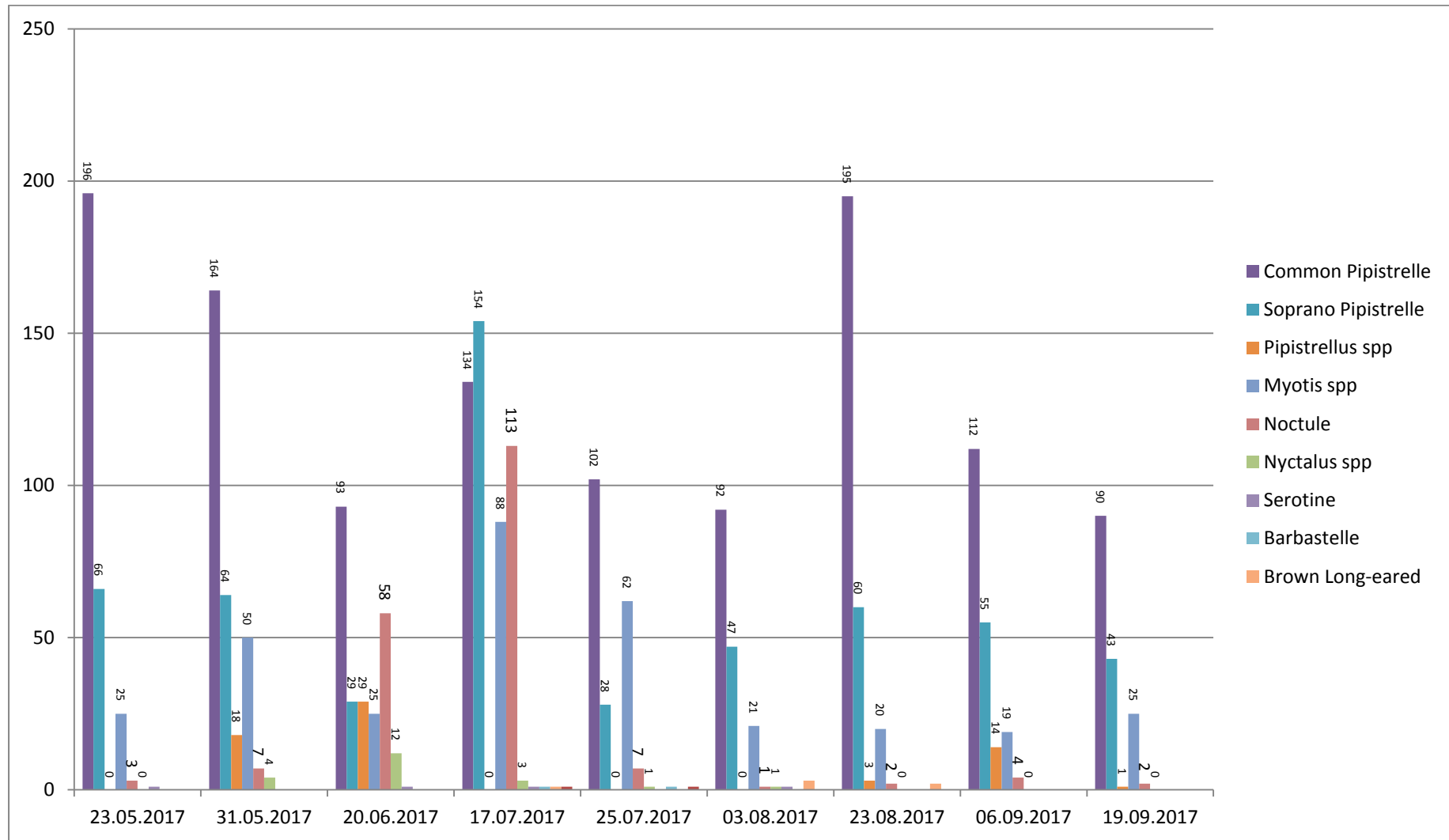
### 3.5 Transect Survey Results

Results of the dusk and dawn transect surveys are provided in *Tables E2.14 and E2.15*.

**Table E2.14 – Transect Survey Results - Dusk**

	Common Pipistrelle	Soprano Pipistrelle	Pipistrellus spp	Myotis Spp	Noctule	Nyctalus spp	Serotine	Barbastelle	Brown Long- eared
23.05.2017	196	66	0	25	3	0	1	0	0
31.05.2017	164	64	18	50	7	4	0	0	0
20.06.2017	93	29	29	25	58	12	1	0	0
17.07.2017	134	154	0	88	113	3	1	1	1
25.07.2017	102	28	0	62	7	1	0	1	0
03.08.2017	92	47	0	21	1	1	1	0	3
23.08.2017	195	60	3	20	2	0	0	0	2
06.09.2017	112	55	14	19	4	0	0	0	0
19.09.2017	90	43	1	25	2	0	0	0	0

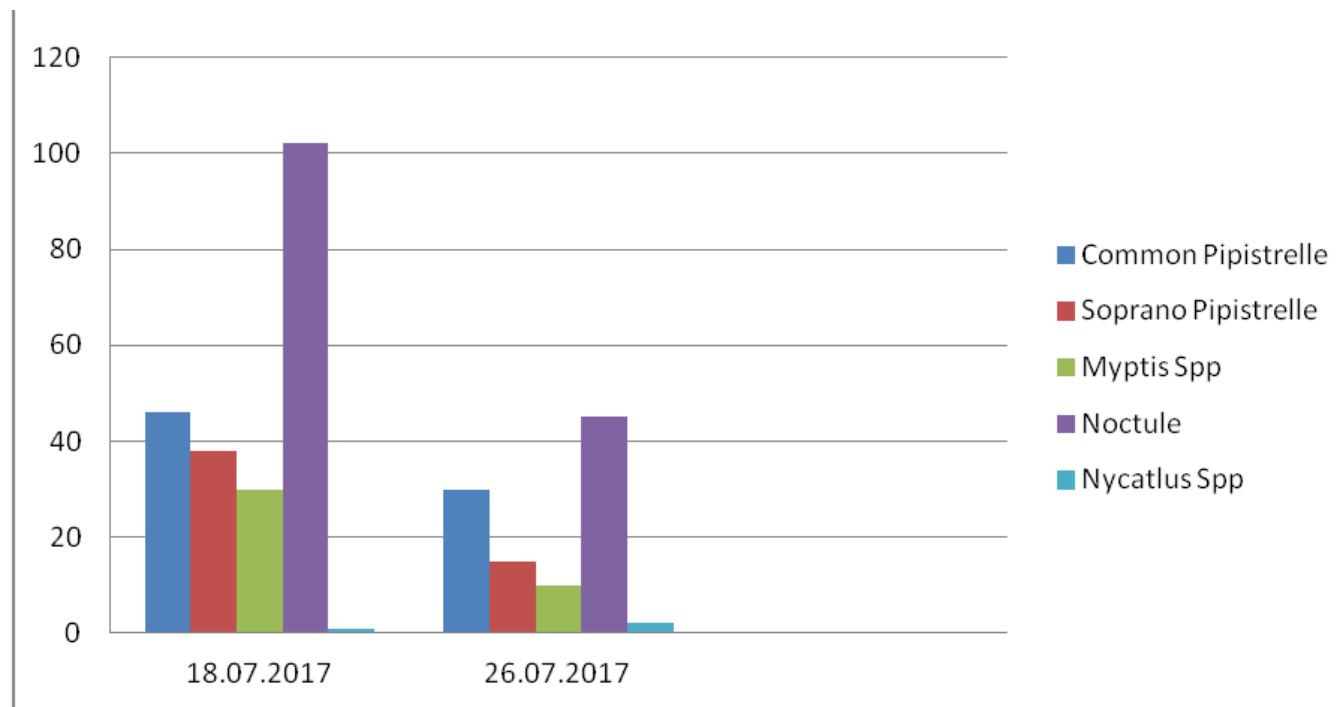
Chart E2.1 – Totals for all Dusk Transect Surveys



**Table E2.15 – Transect Survey Results - Dawn**

	Common Pipistrelle	Soprano Pipistrelle	Myotis Spp	Noctule	Nyctalus spp
18.07.2017	46	38	30	102	1
26.07.2017	30	15	10	45	2

**Chart E2.2 – Totals for all Dawn Transect Surveys**



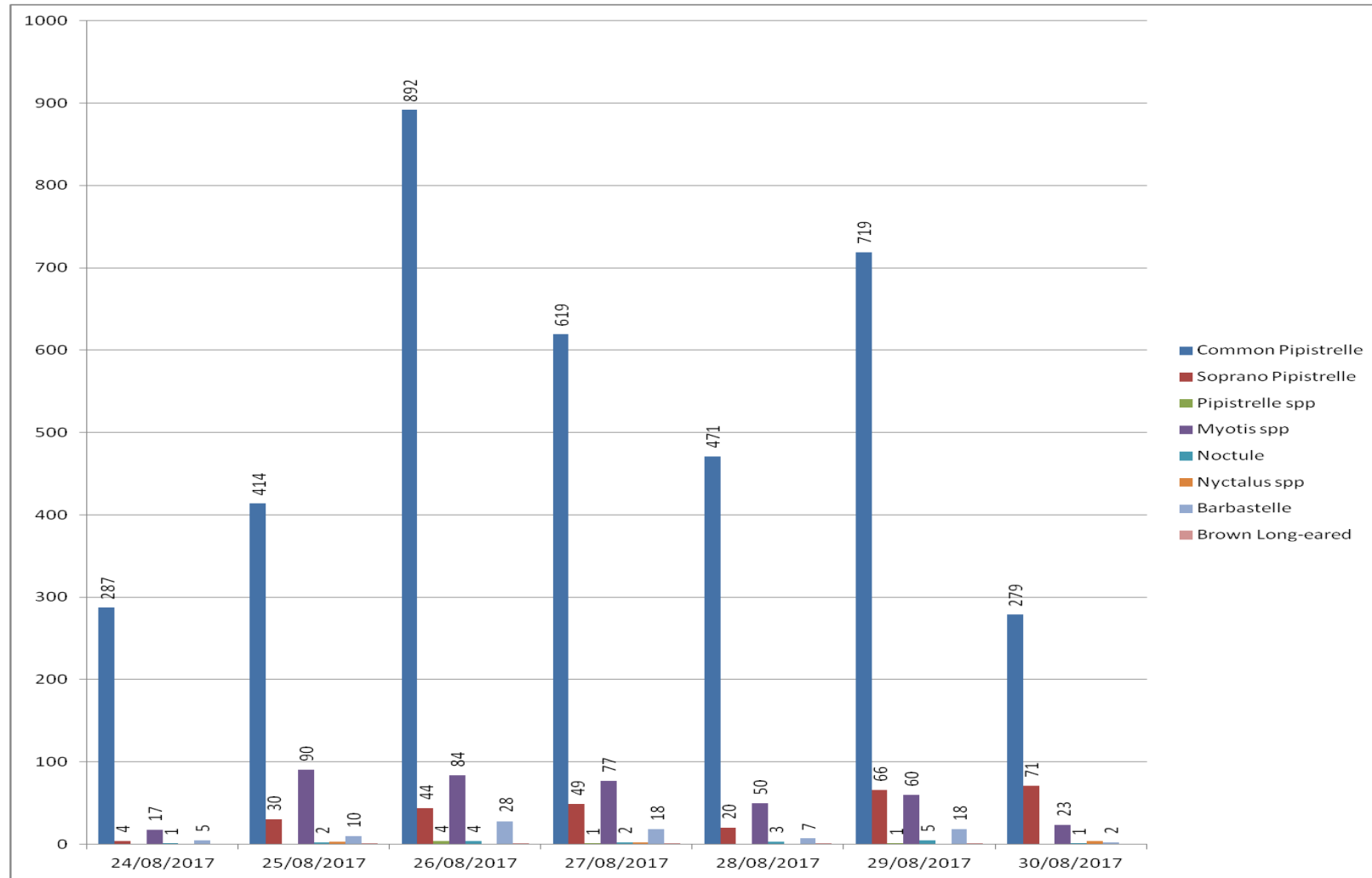
### 3.6 Static Bat Detector Results

Tables E2.16 and E2.17 provide the results of the static detector surveys.

**Table E2.16 - Static Detector SM2+ 24.08.2017 – 30.08.2017**

	Barbaestelle	Myotis sp	Nyctalus	Noctule	Pipistrelle sp	Common pipistrelle	Soprano Pipistrelle	Brown long-eared bat	Grand Total
24/08/2017	5	17		1		287	4		314
25/08/2017	10	90	3	2		414	30	1	550
26/08/2017	28	84		4	4	892	44	1	1057
27/08/2017	18	77	2	2	1	619	49	1	769
28/08/2017	7	50		3		471	20	1	552
29/08/2017	18	60		5	1	719	66	1	870
30/08/2017	2	23	4	1		279	71		380
<b>Grand Total</b>	<b>88</b>	<b>401</b>	<b>9</b>	<b>18</b>	<b>6</b>	<b>3681</b>	<b>284</b>	<b>5</b>	<b>4492</b>

**Chart E2.3 – Static Bat Detector Results SM2+ 24.08.2017 – 30.08.2017**

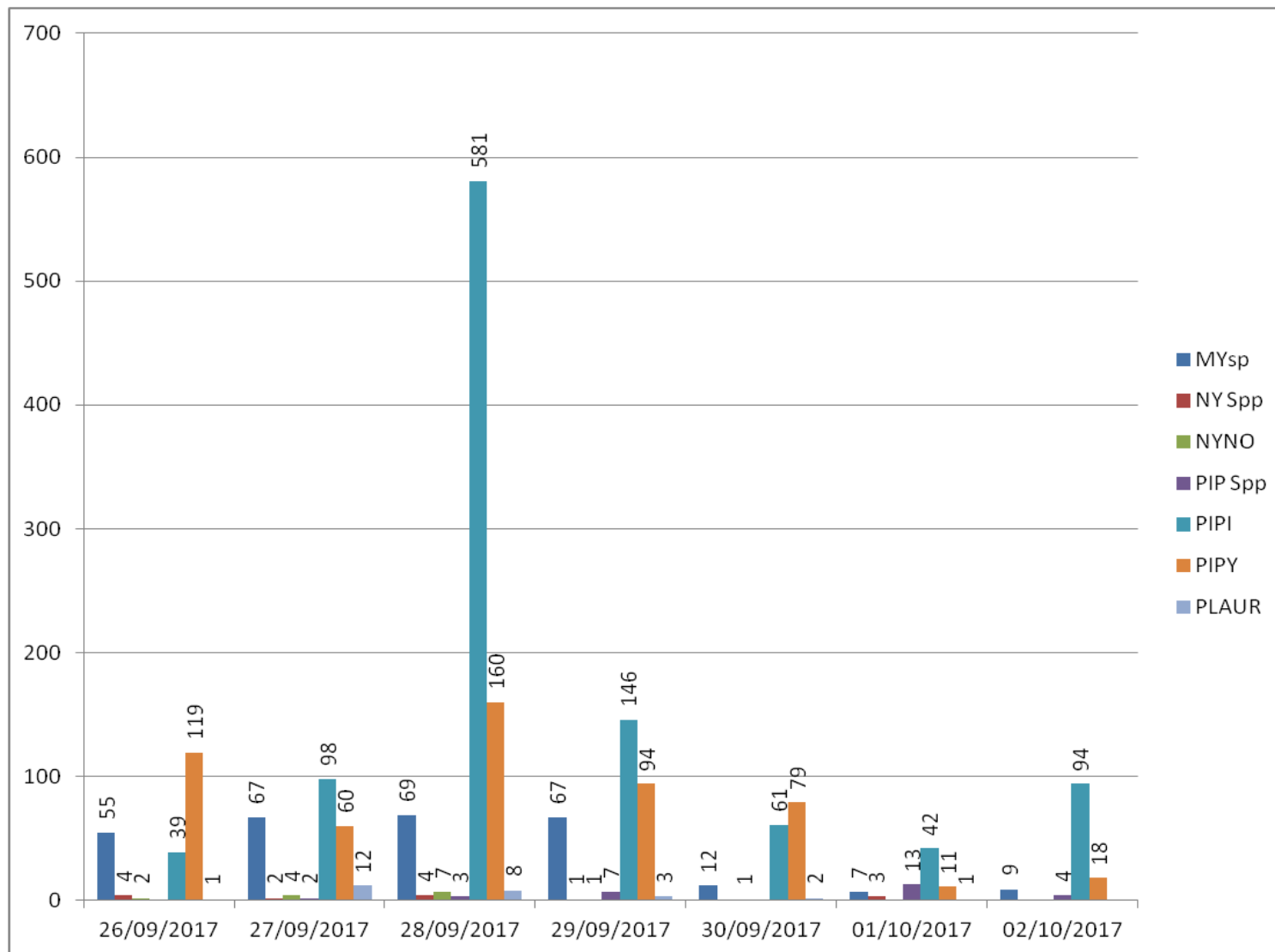


**Table E2.17 - Static Bat Detector Results SM2+ 26.09.2017 – 02.10.2017**

	Myotis sp	Nyctauls sp	Noctule	Pipistrell sp	Common Pipistrelle	Soprano pipistrelle	Brown long-eared bat	Grand Total
26/09/2017	55	4	2		39	119	1	220
27/09/2017	67	2	4	2	98	60	12	245
28/09/2017	69	4	7	3	581	160	8	832
29/09/2017	67	1	1	7	146	94	3	319
30/09/2017	12		1		61	79	2	155
01/10/2017	7	3		13	42	11	1	77
02/10/2017	9			4	94	18		125
<b>Grand Total</b>	<b>286</b>	<b>14</b>	<b>15</b>	<b>29</b>	<b>1061</b>	<b>541</b>	<b>27</b>	<b>1973</b>



**Chart E2.4 - Static Bat Detector Results SM2+ 26.09.2017 – 02.10.2017**



## 4 EVALUATION AND CONCLUSIONS

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### 4.1 Roost Potential

#### 4.1.1 Bridges

All of the three bridges were assessed as having high potential for roosting bats (*Table E2.8*). The two road bridges that carry the A34 (Bridges 1 and 3) have extensive deep cavities between the various panels that make up the bridge section. It was not possible to inspect these cavities due to their inaccessible position to identify if they had been used as roosts by bats historically.

The bridge carrying the M1 (Bridge 2) could be referred to as a tunnel because of its width (c. 50 m) compared with both A34 bridges at 20 m.

#### 4.1.2 Trees

No evidence of roosting bats was observed within any of the trees during the surveys and it is considered that these trees are not used by roosting bats.

### 4.2 Foraging and Commuting

#### 4.2.1 Bridges

All three of the road bridges were found to be important for foraging bats of all species. The bridges offer shelter from the weather for large numbers of flying insects the principle prey item of all UK bats. It was noted during one of the emergence surveys and observed on the infra red cameras that moths were emerging from cavities within the bridge structures and bats were observed catching these moths.

#### 4.2.2 Canal and Surrounding Area

The canal and the surrounding fields, small woodland areas and the River Nene were all used by foraging and commuting bats. The area under and around the road bridges and the area where the canal passed over the River Nene were clearly identifiable as foraging and commuting hotspots and this is shown by the number of detections of all bats except *Barbastelle* bats during all of the transect surveys (*Figures E7-E12*).

Detections of *Myotis* spp. bats were sparse in the southern section of the canal and this is probably attributable to the large number of locks present between the bridges and the southern extremity of the transect. *Daubentons* bats rely on large lengths of flat open water flying close to the water surface catching insect prey which is present in the northern section but the locks act as a barrier to this method of foraging.

## 4.3 Overall Appraisal

### 4.3.1 Status of the Species at the site

The records from the bat group indicate that bats at or close to the site are sparsely known and this is probably as a result of under recording.

The transect and static bat detector results have indicated large numbers of bats using the canal for foraging and commuting with dominant species being Common Pipistrelle, Soprano Pipistrelle, Myotis spp.; although not confirmed to species level are most probably Daubentons bats based on visual observations during the transect surveys and identified from foraging behaviour flying close to the surface of the water. Noctule bats were noted during most transect surveys and also recorded on the static detectors. These were probably single bats making repeated passes over the site generally whilst foraging. Occasional Brown Long-eared bats were also recorded at the site where the static recorder was positioned, although their occurrence was infrequent.

Wray *et al.* (2010) was used to appraise the value of the site for commuting and foraging bats as per section 2.11 above. *Tables E2.18 and E2.19* show the scores for the commuting value of the site and the foraging value respectively.

One 'rare' bat species, the Barbastelle bat, was recorded using the site. 88 passes were attributable to this species across a combined total of 12 nights of automated monitoring, and transects, and so it is a reasonable assumption that the site is used only by individuals of this species. Otherwise, the monitoring indicated that either small or moderate numbers of bats or individuals of each species were using the site, except for 'large' numbers of Common and Soprano Pipistrelles as these species dominated the recorded bat activity. Given that there are only a total of six nearby roosts (see section 2.8) known in close proximity to the site which consist of four Common Pipistrelle and two Whiskered/Brandt's roosts it was assumed that 'a moderate number of roosts were nearby. In terms of commuting habitat for bats, the site was deemed to support 'Complex network of mature well-established hedgerows, small fields and rivers/streams' primarily because of the Grand Union Canal and the River Nene. For evaluating foraging habitat the site (and surrounding landscape) was also assessed as supporting 'Complex network of mature well-established hedgerows, small fields and rivers/streams'.

**Table E2.18: Valuing commuting routes for each of the bat species recorded on the site during the bat activity monitoring.**

Species	Rarity	(Likely) 'Number' of Bats	Roosts / Potential Roosts Nearby	Type and Complexity of Linear Features	Score
Common Pipistrelle	Common (2)	Small no. of bats (10) for	Moderate number / Not	Complex network of mature well-	34

Soprano Pipistrelle		all species except for Common and Soprano Pipistrelle and Myotis spp bats (20)	known (4)	established hedgerows, small fields and rivers/streams (5)	34
Brown Long-Eared Bat*					21
Noctule	Rarer (5)	Individual bats (5)			19
Myotis Spp					34
Barbastelle	Rare (10)				24

**Table E2.19: Valuing foraging areas for each of the bat species recorded on the site during the bat activity monitoring surveys.**

Species	Rarity	(Likely) ‘Number’ of Bats	Roosts / Potential Roosts Nearby	Type and Complexity of Linear Features	Score
Common Pipistrelle	Common (2)	Small no. of bats (10) for all species except for Common and Soprano Pipistrelle and Myotis spp bats (20)	Moderate number / Not known (4)	Complex network of mature well- established hedgerows, small fields and rivers/streams’(5)	31
Soprano Pipistrelle					31
Brown Long-Eared Bat*					21
Noctule	Rarer (5)				24
Myotis spp					34
Barbastelle	Rare (10)				29

Overall, the results tables above show a maximum score of 34 for the value of the commuting habitats on the site for bats, and a maximum score of 34 for the value of the foraging habitat. Therefore, based on *Table 5*, these values indicate that the site is

considered to be of 'Regional' value for commuting and foraging bats. However, given that a score of 34 is only four points above a site valued at 'County' importance, and that less bat activity has been recorded in the areas north and south of the road bridges where there are less favourable habitat types for bats, it could reasonably be argued that the majority of the site is indeed of reduced 'County' importance for bats.

In terms of species, according to Wray *et al.* (2010) the site is most important for assemblages of Common Pipistrelle, Soprano Pipistrelle and Myotis bats. However, it may also be important for Barbastelle bats as this species is only rarely recorded in the county. There could also be relatively regular undetected activity by Barbastelle Bats, which is a 'quiet' echolocating species.

Clearly the site is important for a range of species but principally as a commuting corridor for bats where its Regional importance is clear.

## **4.4 Mitigation and Compensation**

### **4.4.1 General Mitigation**

To complement available roosting for bats a barn currently within the identified within the mitigation area that currently has Low potential for roosting bats will be renovated so that new roosting opportunities for bats will be created.

Additionally new hedgerow planting along with a range of habitats including wetland, scrub and rough grassland will be incorporated into the mitigation area re-enforcing the existing commuting and foraging areas/corridors across the site. New trees will be planted providing over time re-enforcing existing foraging opportunities adjacent to the canal.

The existing trees that are between the A43 and the M1 will be retained throughout construction providing screening from the existing lighting on the roads.

### **4.4.2 Bridges**

It is important that during construction of the new roads lighting of the bridges particularly the undersides of the bridges does not occur.

No works will be carried out on the existing bridges that cross the canal so that existing roosting opportunities for bats are retained.

### **4.4.3 Canal**

The canal has been identified as a regionally important commuting corridor for bats and throughout construction the following precautions will be taken.

- No lighting will be erected on or adjacent to the canal that illuminates the waterway so that this important commuting and foraging corridor is retained as a dark corridor through the site;
- All lighting on the construction compound will be directed away from the canal and where necessary hoods and cowls will be used to direct lighting away;

- All lighting on the new roads will be designed so that light although complying with the required lighting standards for the roads will be directed away from the canal and any light spill will be controlled with hoods and cowls where appropriate; and
- The new bridge across the canal will have bat boxes of an appropriate design attached to it to complement the existing potential in the other three bridges. The Design Manual for Roads and Bridges Chapter 10 Section 4 details where such bat boxes should be used and this will be followed in deciding where boxes will be erected. The boxes will be appropriate for a range of species.

## 5 REFERENCES

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Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn).

Wray, S., Wells, D., Long, E., Mitchell-Jones, T. (2010) Valuing Bats in Ecological Impact

The Design Manual for Roads and Bridges Chapter 10

Draft Lighting ES Chapter Issued by Hoare Lee Ltd

Conservation of Habitats and Species Regulations 2010

## APPENDIX A – SURVEY DETAILS

**Table E2.20 – Weather conditions and personnel for Bridge inspections**

Date of Survey Visit	Structure Reference	Equipment Used	Weather -
10.07.2017	Bridges 1, 2 and 3	Hand Held Lamps, Endoscope, Mirrors and Ladders	Temp: 11°C Precipitation: 1 Wind: None

**Table E2.21 - Weather Conditions and Equipment for Transect Surveys**

Date of Survey Visit	Dusk or Dawn Transect	Equipment Used	Weather -
23.05.2017	Dusk	BatLogger M	Temp Start: 16°C Temp End: 14°C Precipitation: 0 Wind: 1
31.05.2017	Dusk	BatLogger M	Temp Start: 17°C Temp End: 15°C Precipitation: 0 Wind: 1
20.06.2017	Dusk	BatLogger M	Temp Start: 22°C Temp End: 19 °C Precipitation: 0 Wind: 1 – 2
17.07.2017	Dusk	BatLogger M	Temp Start: 22°C Temp End: 15°C Precipitation: 0



18.07.2017	Dawn	Batlogger M	Wind: 1 – 2 Temp Start: 17°C Temp End: 15°C Precipitation: 0
25.07.2017	Dusk	BatLogger M	Wind: 1 – 2 Temp Start: 20°C Temp End: 18°C Precipitation: 0
26.07.2017	Dawn	BatLogger M	Wind: 1 – 2 Temp Start: 17°C Temp End: 14°C Precipitation: 0
03.08.2017	Dusk	BatLogger M	Wind: 1 – 2 Temp Start: 18°C Temp End: 16°C Precipitation: 0
23.08.2017	Dusk	BatLogger M	Wind: 2 – 3 Temp Start: 19°C Temp End: 16°C Precipitation: 0
06.09.2017	Dusk	BatLogger M	Wind: 1 – 2 Temp Start: 18°C Temp End: 13°C Precipitation: 0
19.09.2017	Dusk	BatLogger M	Wind: 1 – 2 Temp Start: 12°C Temp End: 10°C Precipitation: 0
			Wind: 1 – 2

**Table E2.22 - Weather Conditions, and Equipment for Static Surveys**

Dates of Survey	Equipment Used	Weather -	Comments
20.06.2017 – 26.06.2017	BatLogger A+		Unit failed after 2 days recording only on 20.06.2017 and 21.06.2017
29.06.2017 – 06.07.2017	BatLogger A+		Full recording
July 2017	BatLogger A+		Unit total failure
August 2017	BatLogger A+		Unit total Failure
24.08.2017 – 30.08.2017	SM2 +		Full Recording
26.09.2017 – 02.10.2017	SM2 +		Full Recording

**Table E2.23 - Weather Conditions, Survey Timings and Equipment for Emergence Surveys**

Dates of Survey	Survey Type	Location	Sunset or Sunrise Times and Start and Finish Times of surveys	Equipment Used	Weather – Temp Start and End Wind (Beaufort) Cloud (Octas) Precipitation	Comments
10.07.2017	Dusk Emergence	Bridge 1 – A43 North, Bridge 2 – M1 and Bridge 3 – A43 South	Sunset: 21:29 Start: 21:15 Finish: 23:15	BatLogger, BatBox Baton XD		Good weather throughout survey
09.08.2017	Dusk Emergence	Bridge 1 – A43 North	Sunset: 20:46 Start: 20:30 Finish: 22:30	BatLogger, Infra Red Video Cameras	Temp Start: 16°C Temp End 16°C Wind – 1 Cloud – 3 Precipitation - Nil	Good weather throughout survey
10.08.2017	Dawn re-entry	Bridge 3 – A43 South	Sunrise: 05:41 Start: 03:40 Finish: 05:45	BatLogger, Infra Red Video Cameras	Temp Start: 14°C Temp End 14°C Wind – 1	Good weather throughout survey

Cloud – 3  
Precipitation - Nil

10.08.2017	Dusk Emergence	Bridge 1 – M1	Sunset: 20:45 Start: 20:30 Finish: 22:30	BatLogger, Infra Red Video Cameras	Temp Start: 19°C Temp End 14°C Wind – 2 Cloud – 2 Precipitation - Nil	Good weather throughout survey
21.08.2017	Dusk Emergence	Bridge 1 – A43 North	Sunset: 20:22 Start: 20:15 Finish: 22:15	BatLogger, Infra Red Video Cameras	Temp Start: 21°C Temp End 21°C Wind – 0 Cloud – 5 Precipitation - Nil	Good weather throughout survey
22.08.2017	Dawn Re-entry	Bridge 2 – M1	Sunrise: 06:01 Start: 04:00 Finish: 06:15	BatLogger, Infra Red Video Cameras	Temp Start: 20°C Temp End 19°C Wind – 0 Cloud – 5 Precipitation - Nil	Good weather throughout survey
22.08.2017	Dusk Emergence	Bridge 3 – A43 South	Sunset: 20:20 Start: 20:15 Finish: 22:15	BatLogger, Infra Red Video Cameras	Temp Start: 22°C Temp End 21°C Wind – 0 Cloud – 4 Precipitation - Nil	Good weather throughout survey
04.09.2017	Dusk Emergence	Bridge 3 – A43 South	Sunset: 19:50 Start: 19:40 Finish: 21:40	BatLogger, Infra Red Video Cameras	Temp Start: 22°C Temp End 20°C Wind – 1	Good weather throughout survey

					Cloud – 7 Precipitation - Nil	
05.09.2017	Dawn Re-entry	Bridge 1 – A43 North	Sunrise: 06:25 Start: 04:25 Finish: 06:30	BatLogger, Infra Red Video Cameras	Temp Start: 19°C Temp End 18°C Wind – 3 Cloud – 4 Precipitation - Nil	Good weather throughout survey
05.09.2017	Dusk Emergence	Bridge 2 – M1	Sunset: 19:48 Start: 19:40 Finish: 22:40	BatLogger, Infra Red Video Cameras	Temp Start: 21°C Temp End 17°C Wind – 2 Cloud – 8 Precipitation – Early shower at start and heavier shower towards end of survey	An early rain shower at the start of the survey with another shower at the end of the survey. Bats were present throughout the survey

**Table E2.24 – Surveyor Details for Surveys**

Surveyor	Licence Details or experience	Emergence Survey/Video Survey	Transect Surveys
David Cove	2015-14432-CLS-CLS	X	X
Matt Cook	2015-10167-CLS-CLS		X
Iain Hysom	2015-15350-CLS-CLS	X	
Tom Coyne	2018-33242-CLS-CLS	X	X
Alice Clarke	Trained and competent for Emergence surveys and Transect surveys	X	X

Thomas Wright	Trained and competent for Emergence surveys and Transect surveys	X	X
James Pattenden	2015-10680-CLS-CLS		X
Ruth Gregory	Trained and competent for Transect surveys		X
Ben Lappage	Trained and competent for Transect surveys		X
Dean Lefeuvre	2017-31316-CLS-CLS	X	X
Sarah Kitchen	Trained and competent for Emergence surveys	X	
Jessica Hysom	Trained and competent for Emergence surveys	X	

## APPENDIX B – PHOTOGRAPHIC PLATES

Plate No. and Description	Plate
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**Plate 1** – Bridge 1  
View of bridge  
over A43 north  
side.



**Plate 2** – Bridge 1  
Underside of  
bridge deck  
showing gaps  
between road  
sections.



**Plate 3** – Bridge 2  
– Bridge over  
canal carrying M1



**Plate 4** – Bridge 2  
– Bridge carrying  
M1 showing  
drainage pipe in  
wall of bridge





**Plate 5** – Bridge 3  
– South bridge  
over canal  
carrying A43.



**Plate 6** – Bridge 3  
– Underside of  
bridge showing  
gaps between  
deck sections.





# APPENDIX C – RELEVANT LEGISLATION

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## General

This section briefly describes the legal protection afforded to the protected species referred to in this report. It is for information only and is not intended to be comprehensive or to replace specialised legal advice. It is not intended to replace the text of the legislation, but summarises the salient points.

## Bats

All species of British bat are protected by *The Wildlife and Countryside Act 1981* (as amended), extended by the *Countryside and Rights of Way Act 2000*. This legislation makes it an offence to:

- intentionally kill, injure or take;
- possess or control;
- intentionally or recklessly damage, destroy or obstruct access to a breeding site or resting place; and
- intentionally or recklessly disturb whilst the animal occupies a breeding site or resting place.

Bats are also European Protected Species listed on *The Conservation of Species and Habitats Regulations 2010* (as amended). This legislation makes it an offence to:

- deliberately capture, injure or kill;
- deliberately disturb, including in particular any disturbance which is likely (a) to impair their ability - (i) to survive, to breed or reproduce, or to rear or nurture their young; or (ii) hibernate or migrate, where relevant; or (b) to affect significantly the local distribution or abundance of the species to which they belong;
- damage or destroy a breeding site or resting place; and
- possess, control, transport, sell, exchange, or offer for sale or exchange.

## APPENDIX D – FIGURES

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Figure E1	Location Maps
Figure E2	Site Plans
Figure E3	Bat Records
Figure E4	Phase 1 Habitat Maps
Figure E5.1	Bat Buildings
Figure E5.2	Initial Bat Survey of bridges plan
Figure E6	Transect Map Plan and Location of Static Detectors
Figure E7	Bat Transects May
Figure E8	Bat Transects June
Figure E9	Bat Transects July
Figure E10	Bat Transects August
Figure E11	Bat Transects September
Figure E12	Bat Transect October
Figure E13	Overall Tree Maps showing all trees surveyed
Figure E14	Tree Map showing all trees with Low, Medium and High PRFs and Veteran Trees
Figure E15	All trees with negligible potential
Figure E16	Tree map showing all trees with no access