A38 Derby Junctions

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6.3 Environmental Statement Appendices

Appendix 8.9f: Bat Roost and Activity Surveys in 2015 (incl. Bat Trapping Surveys at Little Eaton in 2015)

Regulation 5(2)(a)

Planning Act 2008

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6.3 Environmental Statement Appendices
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A38 Derby Junctions

Bat Survey Report

Report No: 47071319-URS-05-RP-EN-020
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1. INTRODUCTION

1.1 Background and Scope

1.1.1 On July 14, 2014, AECOM was awarded the contract by Highways England to provide design services for the A38 Derby Junctions Scheme (hereafter referred to as the proposed scheme). This proposed scheme concerns three junctions located along approximately 5.5 km of the A38 to the north and north-west of Derby (refer to Figure 1, Appendix A). These junctions are:

- A38/ A5111 Kingsway junction;
- A38/ A52 Markeaton junction; and
- A38/ A61 Little Eaton junction.

1.1.2 As there are two discrete sections of the proposed scheme, to aid contextualisation of data geographically, the two areas are referred to as i) Kingsway and Markeaton junction and ii) Little Eaton junction.

1.1.3 AECOM will be preparing an Environmental Assessment Report (EAR) which will assess whether the proposed scheme has the potential to result in significant environmental effects, taking into account impact avoidance measures that are embedded into the proposed scheme design, as well as standard management activities that will be adopted. In order to support the ecological impact assessment to be reported in the EAR, AECOM undertook an Extended Phase 1 Habitat survey along the route of the proposed scheme in January 2015. This Extended Phase 1 Habitat survey (AECOM 2016, report number 47071319-URS-05-RP-EN-003) identified trees and structures with potential to support roosting bats, and potential habitat features suitable for foraging and commuting bats. The results of these surveys were used to identify and scope further requirements for bat surveys.

1.1.4 Between May and September 2015, further surveys were conducted on trees and structures identified as having bat roost potential (BRP), to determine the presence or likely absence of bat roosts. Bat activity surveys, comprising walked transect and static detector surveys, and bat trapping surveys were also undertaken across the proposed scheme between May and September 2015. The results of the further bat survey work undertaken in 2015 are documented herein.

1.2 Study Area

1.2.1 The footprint of the proposed scheme compasses the Kingsway and Markeaton junctions, west of the City of Derby (Centroid SK 32801 36103) and the Little Eaton junction north of Derby (Centroid SK 36402 39990). In regards to bats, the study area covers an area up to 50 m from the proposed scheme boundary for bat roosts and notable foraging/ commuting routes (as shown on Figure 2 and 3, Appendix A). A distance of up to 30 km from the proposed scheme boundary for sites designated at an international level for bats was also considered as part of the Assessment of Implications on European Sites Report (AIES) (AECOM, 2016) – the AIES concluded that the proposed scheme would not have a significant effect on any protected European sites.

1.2.2 The A38 is an existing and busy arterial 'A' road carrying traffic around the west and north of the City of Derby. South of the Kingsway junction, the A38 enters a cutting supporting vegetation of semi-improved grassland and scrub. The central reservation south of Kingsway junction and the junction island in this location support a mosaic of habitat types, including semi-improved neutral grassland and native broadleaved woodland. Bramble Brook flows from the west of the proposed scheme in this location, through culverts located under the northbound carriageway and the central reservation before connecting with further culverts located between the junction islands. North of the Kingsway junction, there is an area of semi-mature mixed plantation on the embankment.

1.2.3 Markeaton junction is bordered to the east by residential properties and to the west by parkland with veteran trees. The outfall from Markeaton Lake and Markeaton Brook flows through culverts beneath the existing A38 at the northern extent of Markeaton junction.

1.2.4 The western boundary of the proposed scheme at Little Eaton junction borders the road bridge over the River Derwent. The existing A38 is on embankment in this location, with the embankments supporting vegetation of scrub and immature broadleaved plantation woodland. A variety of grassland habitats exist at the base of the embankments at this location.

1.3 Relevant Legislation and Biodiversity Strategies

1.3.1 All bats and any place used by bats for shelter (e.g. a roost) are legally protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 of the Conservation of Habitats and Species Regulations 2010 (as amended). When taken together this legislation makes it an offence to:

- Kill, injure, take or disturb a bat (note that disturbance in this context refers to actions that could inhibit a bat's ability to survive and reproduce);
- Destroy, damage, obstruct or otherwise interfere with a bat roost; and
- Sell, or offer for sale, a bat or any part thereof.

1.3.2 Seven species of bat are listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 as species of principle importance for nature conservation in England. These species are:

- Barbastelle (*Barbastella barbastellus*);
- Bechstein's bat (*Myotis bechsteinii*);
- Noctule (*Nyctalus noctula*);
- Soprano pipistrelle (*Pipistrellus pygmaeus*);
- Brown long-eared bat (*Plecotus auritus*);
- Greater horseshoe (*Rhinolophus ferrumequinum*); and
- Lesser horseshoe (*Rhinolophus hipposideros*).

1.3.3 The Section 41 list mentioned above is used to guide decision-makers such as public bodies, including Highways England, in implementing their duty under Section 40 of the NERC Act to have regard to the conservation of biodiversity in

England, when carrying out their normal functions. The species covered by the Section 41 list were originally identified as requiring nature conservation action under the (now withdrawn) UK BAP and continue to be regarded as conservation priorities under the UK Post-2010 Biodiversity Framework.

1.3.4 In addition to the UK Post-2010 Biodiversity Framework, local partnerships have been formed to produce Local Biodiversity Action Plans (LBAP). These identify species and habitats which are important at a local level e.g. by County or Local Authority Administrative Area, for the purposes of conserving and enhancing biodiversity. The Lowland Derbyshire Biodiversity Action Plan lists the following bat species which have been recorded in Derbyshire:

- Brown long-eared bat;
- Noctule bat; and
- Soprano pipistrelle bat

1.3.5 Bats are also listed as a local flagship species in the Derby 'Greenprint for Biodiversity'. This document provides a framework for the conservation of biodiversity by translating both the UK and Lowland Derbyshire Biodiversity Action Plans to a local level in order to make them more achievable by the council, local groups and communities.

1.3.6 Highways England, through the national Road Investment Strategy, has set an aspiration that the operation, maintenance, and enhancement of the Strategic Road Network (SRN) should move to a position that delivers no net loss of biodiversity; and, in the long term, Highways England should deliver a net gain in biodiversity across its broader range of works. Highways England has published a Biodiversity Action Plan (HEBAP) to show how it will work with service providers to halt overall biodiversity loss, and maintain and enhance habitats and ecological networks. The Government requires Highways England to demonstrate progress against the HEBAP, to secure an ongoing annual reduction in the loss of net biodiversity due to its activities. The HEBAP supersedes the preceding Highways Agency Biodiversity Action Plan (HABAP), which still carries some relevance as it lists specific species of conservation concern.

2. METHODOLOGY

2.1 Desk-based Study

2.1.1 A desk-based study was undertaken as part of the preceding Extended Phase 1 Habitat Survey (report number 47071319-URS-05-RP-EN-003, July 2015) to identify internationally, nationally and locally designated statutory sites, local designated non-statutory sites, sites of local interest and records of protected and/ or notable species of potential relevance to the proposed scheme.

2.1.2 As part of the desk-based study, data relating to bats was obtained from the Derbyshire Wildlife Trust (DWT) covering approximately 2 km from SK32801 36103 (Markeaton and Kingsway) and SK36402 39990 (Little Eaton), in order to inform the Extended Phase 1 Habitat Survey. Data was also obtained from the Derbyshire Bat Conservation Group (DBCG) in February 2015 for bat records covering 15 grid squares (SK 3135, 3136, 3235, 3236, 3237, 3336, 3337, 3436, 3437, 3539, 3540, 3639, 3640, 3739, 3740) giving an approximately 1 km cover from the proposed scheme boundary. See Figures 2 and 3 in Appendix A for coverage of the data search.

2.2 Bat Roost Potential (BRP) Assessment

2.2.1 During the Extended Phase 1 Habitat Survey in January 2015, trees and built structures across the study area (proposed scheme boundary plus 50 m) were screened for their potential to support roosting bats. Full bat roost potential (BRP) assessments were conducted by an experienced and licensed bat ecologist from AECOM holding a Natural England Bat Class License WML CL18 (Bat Survey Level 2) between May and June 2015. Each BRP assessment was conducted in line with the Bat Conservation Trust (BCT) survey guidelines (Hundt, 2012).

BRP Assessment: Trees (T)

2.2.2 During the assessment, trees were examined from the ground using close focusing binoculars for features such as loose bark, cavities and ivy that could be utilised by roosting bats. Trees were also checked for any signs of bats such as droppings, scratch marks, staining and feeding remains. Based on this inspection, each tree was classified as having negligible, low, moderate or high potential to support roosting bats (see Appendix B).

BRP Assessment: Buildings/ Structures (B)

2.2.3 Close focusing binoculars were used to conduct an external assessment of each building or structure. All potential bat access/ egress points and features with the potential to support roosting bats (e.g. cracks, crevices, roof voids) were identified and recorded along with any evidence which may have indicated the location of roosts, such as:

- Stains around entrance holes (resulting from the deposition of oil secretions in bat fur);
- Scratch marks around entrance holes (resulting from bat claw holds);
- Bat droppings;

- Feeding remains; and
- Odours or noise characteristics of bats

Based on the external survey, the overall potential of the building to support roosting bats was then classified using a scale of negligible, low, moderate, high or confirmed. This assessment was based on both the intrinsic suitability of the feature to support roosting bats and other evidence giving an indication of the likelihood of use (e.g. presence of droppings, cobwebs, or exposure to elements). The criteria used to determine the potential of a feature to support roosting bats is contained within Appendix B and assessment results in Appendix C.

2.3 Dusk/ Dawn Emergence/ Re-entry Surveys (including Thermal Imaging)

2.3.1 Dusk emergence and/ or dawn re-entry surveys were undertaken between May and September 2015 at those trees and structures identified by the preceding BRP survey as having potential to support roosting bats. All trees and buildings/ structures were surveyed using thermal imaging (full methods detailed below) with the exception of T3 (Figure 4, Appendix A).

2.3.2 Emergence surveys were undertaken from 15 - 30 minutes before sunset until up to two hours after sunset. Re-entry surveys were undertaken from 90 - 120 minutes before sunrise until sunrise. All surveys were undertaken in appropriate weather conditions (as detailed in Appendix D).

2.3.3 Survey of T3 did not employ the use of thermal imaging. This tree had only a single feature and the surrounding area was well-lit, negating the need for additional methods such as thermal imaging. This was subject to a single dusk emergence survey using standard survey methods. This involved two surveyors equipped with handheld bat detectors (BatBox Duet: Batbox Ltd., West Sussex, UK) and a Song Meter SM2BAT+ static acoustic bat detector (Wildlife Acoustics Inc., Maynard, MA, USA) which recorded throughout the survey.

2.3.4 Thermal imaging bat emergence/ re-entry surveys were led by an experienced bat ecologist and certified thermographer (Infrared Training Centre level 1). Recordings were made using a FLIR T650sc thermal imaging camera (FLIR Systems, Wilsonville, Oregon, United States) alongside a Song Meter SM2BAT+ static acoustic bat detector (Wildlife Acoustics Inc., Maynard, MA, USA) and an Elekon Batlogger M (Elekon Electronics, Luzern, Switzerland).

2.3.5 After the surveys, thermal imaging files were analysed by the lead surveyor and or a suitably qualified assistant, using FLIR ResearchIR MAX software (FLIR Systems, Wilsonville, Oregon, United States). The analytical process included checks of at least 5% of each analyst's files by another appropriately experienced analyst for quality assurance purposes.

2.3.6 Sound analysis was carried out post-survey by an experienced bat ecologist. Wav files were converted to zero crossing files using Kaleidoscope software (Wildlife Acoustics Inc., Maynard, MA, USA) and analysed using Analook software (Titley Scientific, Coppull, Lancashire, UK). The analytical process included checks of 10% of each analyst's files by another appropriately experienced analyst for quality assurance purposes.

2.4 Bat Activity Surveys: Static Detector Surveys

2.4.1 Static acoustic detectors were deployed to sample bat activity at several locations throughout the proposed scheme. Song Meter SM2BAT+ (Wildlife Acoustics Inc., Maynard, MA, USA) static detectors were deployed in May, June and July 2015. Detectors were set to record from 30 minutes before sunset until sunrise each night for five consecutive nights. One static detector was deployed per bat activity transect; the frequency and timing of automated surveys was generally based upon the minimum recommendations/ guidance for a low risk (i.e. low habitat quality), large sized (i.e. >15 ha) site (Hundt, 2012).

2.4.2 Static detectors locations were selected by an experienced ecologist with a good knowledge of the local area. As a largely urban site, care was taken to select locations where detectors were less likely to be subject to human interference which might lead to loss of data (theft/ vandalism). Where it was not possible to position detectors on or adjacent to the proposed scheme footprint, detectors were positioned along habitat features, which are likely to provide connectivity to the footprint area and may be impacted by the proposed scheme. Static detector locations are shown on Figures 8 and 9, Appendix A.

2.4.3 Sound files recorded by static acoustic detectors were analysed post-recording by an experienced bat ecologist. Wav files were converted to zero crossing files using Kaleidoscope software (Wildlife Acoustics Inc., Maynard, MA, USA) and analysed using Analook software (Titley Scientific, Coppull, Lancashire, UK). The analytical process included checks of 10% of each analyst's files by another appropriately experienced analyst for quality assurance purposes.

2.5 Bat Activity Surveys: Walked Transect Surveys

2.5.1 Walked transect surveys were conducted to sample bat activity at all three junctions. Transect routes are shown on Figures 10 to 15, Appendix A.

2.5.2 Transect surveys began 15 minutes prior to sunset and continued for up to two hours after sunset. Each of the two transects was carried out three times, with surveys undertaken in May, June and July 2015. Transect survey effort across the proposed scheme was 0.5 hrs/ha (based on a total approximate site area of 26 ha surveyed and 13.5 survey hours); the frequency and timing of activity surveys was generally based upon the minimum recommendations/ guidance for a low risk (i.e. low habitat quality), large sized (i.e. >15 ha) site (Hundt, 2012).

2.5.3 Transects were walked at a constant pace by an experienced surveyor accompanied by an assistant, and 5 minute listening point stops were made at regular intervals along the route of each transect. The surveyor carried a handheld bat detector (Batlogger: Elekon Electronics, Luzern, Switzerland /BatBox Duet: Batbox Ltd., West Sussex, UK) and additional recording equipment (Edirol: Roland, Dee Why, Australia) where detectors did not have direct recording capacity.

2.5.4 During the transect surveys notes were made detailing each bat pass, including: time of pass, likely bat species, behaviour (where visible) and location.

2.5.5 Sound files recorded during the survey were subsequently analysed by an experienced bat ecologist. Wav files were converted to zero crossing files using Kaleidoscope software (Wildlife Acoustics Inc., Maynard, MA, USA) and analysed using Analook software (Titley Scientific, Coppull, Lancashire, UK). The analytical process included checks of 10% of each analyst's files by another appropriately experienced analyst for quality assurance purposes.

2.6 Bat Trapping Surveys

2.6.1 Bat trapping surveys were carried out in order to enable species identification of Myotis bats and to determine sex and breeding status of species potentially affected by the proposed scheme.

2.6.2 Bat trapping surveys were carried out by an experienced bat ecologist licenced to mist net and harp trap bats (holder of Natural England CL19 Bat Survey Level 3 and CL20 Bat Survey Level 4 licences).

2.6.3 Three bat trapping surveys were conducted at Little Eaton junction on 7 July, 28 July and 3 September 2015. These surveys were undertaken, together with DNA analysis of bat droppings, to confirm to species level the whiskered bats identified at Little Eaton from desk study information. Three harp traps and mist nets were used in combination with acoustic bat lures (Sussex Autobat: University of Sussex, Brighton, UK) to increase the potential effectiveness of trapping. Survey objectives at Kingsway and Markeaton at that time could be met without bat trapping at these locations.

2.6.4 Full details of the bat trapping surveys are included in Appendix D.

2.7 Survey Limitations

2.7.1 All bat surveys were based upon the recognised optimal survey period for this species group and appropriate weather conditions, in accordance with the BCT Bat Survey Guidelines (Hundt, 2012).

2.7.2 Bat activity surveys were limited to spring and summer only. Bat activity surveys (including transect and static detector surveys) were limited to May, June and July. These surveys represent a sample of bat activity with seasonal bias towards spring and summer and activity patterns may differ in these areas at other times of the season. However, given the species recorded on site, it is considered that sufficient baseline information was gathered to inform the ecological impact assessment to be reported in the EAR and that this does not represent a constraint to the surveys.

2.7.3 Surveys were constrained by access restrictions associated with the assessment of residential properties within and adjacent to the proposed scheme in terms of their potential to support active bat roosts. A precautionary assessment would suggest that some of these properties have BRP and require further survey and assessment. Specific properties of concern in relation to roosting bats are indicated as B8 close to Markeaton junction (see Figure 6, Appendix A).

2.7.4 Surveys of structure B1, the railway bridge at Little Eaton Junction, were also constrained due to safety regulations and access restrictions. A survey plan and

safety package was compiled in agreement with Network Rail, and strict safety procedures were adhered to in order to carry out these surveys safely and adequately. Network Rail did not allow access for inspecting underneath the bridge structure, and so a full BRP assessment of the bridge prior to emergence/ re-entry surveys was not possible. However, emergence/ re-entry surveys were undertaken satisfactorily and did not limit the evaluation of the bridge for bats.

2.7.5 An SM2 static detector was stolen during the July deployment resulting in a loss of data on bat activity at Location 8 (see Figure 8). However, this is not considered to have affected the evaluation of survey results. Data has been recorded in the vicinity of Location 8 from hand held detectors on more than one survey occasion; it is considered that an accurate representation of bat species and bat activity levels in this area has been determined.

2.7.6 There is the potential that additional land parcels required for the proposed scheme will be identified as the design progresses e.g. the location of construction compounds and flood attenuation areas. Any such additional areas will need to be assessed for their bat potential.

3. RESULTS

3.1 Desk-based Study

3.1.1 The results returned by the desk-based study undertaken as part of the Extended Phase 1 Habitat Survey included records of six bat species (see Table 1), of which three species (brown long-eared bat, soprano pipistrelle, and common pipistrelle) are known to be roosting within 2 km of the proposed scheme in the last 10 years. No records were found within the proposed scheme boundary plus 50 m buffer. Table 1 shows the closest recorded bat species in relation to the proposed scheme.

Table 1: Biological Data Record for Bat Species from DWT and DBCG for the Last 10 Years

Common Name	Scientific Name	Description of Record	Location of Nearest Record (approx. km) and Bearing	Date of Record	Data Source	Status
Whiskered bat	*Myotis mystacinus*	Female grounded bat	0.7 km west of Kingsway and Markeaton junctions	2013	DBCG	Hab Regs, W&CA
		Grounded	0.8 km east of Kingsway and Markeaton junctions	2010	DBCG	
Brown long-eared bat	*Plecotus auritus*	Observation	0.2 km west of Kingsway and Markeaton junctions	2012	DWT	Hab Regs, W&CA
		Roost	0.5 km west of Kingsway and Markeaton junction	2012	DBCG	
		Roost	1 km east of Kingsway and Markeaton junctions	2006	DBCG	
Daubenton's bat	*Myotis daubentonii*	Observation	0.9 km west of Kingsway and Markeaton junctions	2008	DBCG	Hab Regs, W&CA
Noctule bat	*Nyctalus noctula*	Grounded	Within 2 km of Kingsway and Markeaton junctions	2010	DBCG	Hab Regs, W&CA, LBAP, NERC S41
Soprano pipistrelle bat	*Pipistrellus pygmaeus*	Observation	0.2 km west of Kingsway and Markeaton junctions	2012	DWT	Hab Regs, W&CA, LBAP,

Common Name	Scientific Name	Description of Record	Location of Nearest Record (approx. km) and Bearing	Date of Record	Data Source	Status
		Roost	0.5 km west of Kingsway and Markeaton junctions	2012	DBCG	NERC S41
		grounded	0.75 km east of Kingsway and Markeaton junctions	2012	DBCG	
Common pipistrelle bat	*Pipistrellus pipistrellus*	Roost	0.5 km west of Kingsway and Markeaton junctions	2012	DBCG	Hab Regs, W&CA, LBAP
		Observation	0.3 km north of Kingsway and Markeaton junctions	2014	DBCG	
		Observation	0.2 km east of Kingsway and Markeaton junctions	2009	DWT	
Pipistrelle bat	*Pipistrellus sp*	Roost	0.65 km west of Little Eaton junction	2006	DBCG and DWT	Hab Regs, W&CA,
Unknown bat	*Chiroptera*	Roost	1 km north east of Kingsway and Markeaton junctions	2006	DBCG	Hab Regs, W&CA

3.1.2 The location of all the bat data search records within 1 km of the proposed scheme and in the last 10 years are shown on Figures 2 and 3, Appendix A.

3.1.3 At a consultation meeting in November 2014, between A-One+ and AECOM, A-One+ confirmed a record of whiskered bats roosting at a bridge at Little Eaton, beneath the A38. No further details of the record were however provided. Bat Roost Potential (BRP) Assessment

3.1.4 The locations of those trees and structures within the study area which were identified as having potential to support bat roosts are shown on Figures 4 to 7, Appendix A. BRP ratings for all trees and structures assessed are provided in Appendix C. In summary:

- Twelve trees, or groups of trees, were identified within the study area at Kingsway and Markeaton junctions as having low to high BRP:
- One tree was identified with moderate BRP at Little Eaton junction;
- Four structures were identified with low to moderate BRP within the Kingsway and Markeaton junctions study area;
- Two structures were identified with moderate BRP at Little Eaton junction; and
- Structures B1 and B8 (see Figures 7 and 6, Appendix A respectively) were not subject to BRP assessment during the 2015 surveys due to access and/

or health & safety requirements and restrictions. B1 was surveyed on a precautionary basis as having a high BRP.

3.2 Bat Emergence/ Re-entry Surveys

Trees

3.2.1 The locations of those trees identified within the study area as having BRP are detailed in Figures 4 and 5, Appendix A. The results of the emergence/ re-entry surveys are presented in Appendix E.

3.2.2 Bat activity during the dusk/ dawn emergence/ re-entry surveys of the trees at T8 was notably high, with bats displaying roosting behaviour revealed by thermal imaging footage. Groups of bats circled one of the trees several times, and their behaviour was similar to that expected of bats prior to re-entering a roost. Although no bats were seen to re-enter the tree, it is suspected that this may be one of several roost trees used by bats in this area (see T8 marked in orange, Figure 4, Appendix A).

3.2.3 Thermal imaging analysis revealed that one common pipistrelle bat emerged from one of the trees within T9 (Figure 4, Appendix A). Bat activity was very high in this area (over and around the lake). It was noted during the surveys that several of the bat boxes that were fixed to the trees, were in poor condition and many had fallen apart/ down. It is likely that given the very high foraging activity in this area, the remaining boxes may be used by bats, but no bats were seen to emerge or enter them during the surveys.

3.2.4 Analysis of thermal imaging footage showed that one bat flew up to the hole in the main trunk of tree T13 (Figure 4) and hovered briefly within 30 cm of the feature. This bat appeared to be investigating the feature, but did not land on the tree or enter the hole. It is likely that the bat may have been exploring this feature as a new roost, or that it may represent one of a network of tree roosts in the area. As such, it is considered that this tree is likely to be used as a transient roost by bats, although was not occupied during the surveys.

3.2.5 Although no bats emerged from or re-entered trees T11 or T12 during the thermal imaging surveys, this area was recorded as representing a busy foraging area for common pipistrelle bats, soprano pipistrelle bats and Myotis bats. Activity patterns of bats in this area suggest that a roost may be located in the vicinity. See Figure 4, Appendix A.

3.2.6 Tree T1 was surveyed using thermal imaging methods. During the first dusk emergence survey, two barn owls (*Tyto alba*) emerged from a hole in the main trunk cavity. Jackdaws (*Corvus monedula*) were also observed to be roosting in a cavity in one of the tree limbs. Bats were observed foraging nearby, but no bats emerged or re-entered the tree during any of the surveys.

Buildings/ Structures

3.2.7 The locations of those buildings/ structures identified within the study area as having potential to support roosting bats are detailed in Figures 6 and 7,

Appendix A. Results of the emergence/ re-entry surveys are presented in Appendix E.

3.2.8 Two bat roosts were confirmed in built structures at the Little Eaton junction, namely B2 and B3 (Figure 7, Appendix A).

3.2.9 The presence of a bat roost at B2 was confirmed during the bat trapping surveys. Three brown long eared bats were recorded using the bridge as a night roost.

3.2.10 A bat roost was also confirmed at B3 during the emergence/ re-entry surveys. Two common pipistrelle bats were observed emerging from the abutment crevice on the north side of the bridge during the May dusk emergence survey. During the July surveys, Daubenton's bats were observed using the structure as a resting place/ feeding perch and one common pipistrelle bat was observed emerging from the concrete abutment on the north side of the bridge structure. The river underneath this bridge represents high quality foraging habitat for bats. Daubenton's bats were observed (and recorded using thermal imaging cameras) in very high numbers foraging over the river in this location.

3.2.11 The buildings at B8 were not subject to bat surveys at this stage. Inspection of aerial photographs of these buildings and surrounding habitat suggest that these houses require further bat surveys in relation to the proposed scheme. Activity patterns recorded during the emergence/ re-entry surveys of nearby trees and the presence of high quality foraging habitat surrounding these houses suggest that a roost is likely to be present in the area.

Notable Activity During Dusk/ Dawn Emergence/ Re-entry Surveys

3.2.12 Areas of relatively high bat activity were identified during the dusk/ dawn emergence/ re-entry surveys. These areas of high bat activity and notable flight lines are documented in Figures 16 and 17, Appendix A.

3.2.13 Two bat activity hotspots were apparent during the surveys undertaken close to Markeaton junction: one immediately adjacent to the junction (including Earl of Harrington Lake and adjacent woodland) and one immediately adjacent to the west of the junction (woodland area along the miniature railway). Bat flyways were apparent within the woodland above the miniature railway and crossing the existing A38 carriageway where it passes through this woodland (see Figure 16, Appendix A).

3.2.14 At the Little Eaton junction, a single bat activity hotspot was identified during the surveys. This hotspot was located near the bridge at B3 (see Figure 7 and 17, Appendix A) and survey data suggests this is a locally important foraging area for pipistrelle and Myotis (likely Daubenton's) bats. Bat flyways were also documented within and around B2 where there is a confirmed bat roost (see Figures 7 and 17, Appendix A).

3.3 Bat Activity Surveys: Walked Transects

3.3.1 Bat activity was detected during the transect surveys undertaken for the Markeaton and Kingsway junctions (see Tables in Appendix F and Figures 10-12, Appendix A). The highest levels of bat activity were noted at the

northernmost point of the transect route, around the Markeaton Park and Earl of Harrington Lake areas which represent high quality foraging habitat. Common pipistrelle, soprano pipistrelle and Myotis bat species were found in these areas. Low levels of activity of common and soprano pipistrelle bats were also noted further south, including brief passes by common pipistrelles close to the Kingsway junction, and common and soprano pipistrelle and Myotis species in a residential area to the east of the proposed scheme.

3.3.2 Low but widespread bat activity was detected during the transect surveys undertaken at Little Eaton junction (see Figures 13 - 15, Appendix A). Species detected included common pipistrelle bat, soprano pipistrelle bat and Myotis bat species. Bat activity was low during the May 2015 transect in this section, with only three bat passes noted in total. During June and July 2015 activity was higher and more widespread.

3.4 Bat Activity Surveys: Static Acoustic Detectors

3.4.1 Bat echolocation calls were recorded on all static detectors deployed between May and July 2015, with the exception of SM2 8, which was stolen (July 2015). Static detector locations are detailed in Appendix A, Figures 8 and 9. Activity data recorded on static detectors are presented in Appendix G, Tables G1 to G10.

3.4.2 The majority of bat activity recorded by static acoustic detectors was attributed to pipistrelle species (including common pipistrelle bat, soprano pipistrelle bat and pipistrelle sp. bat). Leisler's bats and bats of the genus Myotis, and Eptesicus/ Nyctalus bats were also recorded.

3.4.3 The highest levels of bat activity at Kingsway and Markeaton junction were recorded within Markeaton Park (1,366 call sequences recorded by SM2 2) and around the Earl of Harrington Lake (390 call sequences recorded by SM2 7).

3.4.4 High levels of bat activity at Little Eaton junction were recorded close to the River Derwent overbridge, B3 (3,364 call sequences recorded by SM2 Location 10) and close to the railway overbridge, B1 (3,478 call sequences recorded by SM2 Location 9).

3.5 Bat Trapping Surveys

3.5.1 Fifteen bats representing three species were captured over the three nights of trapping. The majority of bats caught were common (four) and soprano (eight) pipistrelles. Three bats of the genus Myotis were also caught and it was subsequently possible to determine the species of two of these individuals using DNA fingerprinting techniques applied to droppings collected at the time of trapping. These individuals were confirmed to be whiskered bats *Myotis mystacinus*.

3.5.2 The presence of the breeding soprano pipistrelle and whiskered bats were confirmed in the vicinity of the proposed scheme. Lactating female soprano pipistrelle bats were caught in the traps, and identified in the hand, during the trappings surveys.

3.5.3 Full details of the results of the bat trapping surveys can be found in Appendix D.

4. SUMMARY

4.1.1 Extended Phase 1 habitat surveys carried out in January 2015 identified trees and structures with potential to hold bat roosts and foraging habitats for bats within or adjacent to the proposed scheme. This information was used to scope further survey requirements for bats.

4.1.2 These further surveys were carried out from May to September 2015 to determine whether bats were using the structures and habitats identified as part of the Extended Phase 1 Habitat Survey.

4.1.3 Bats were found to use two built structures as roosts or resting places, both of which are located at Little Eaton junction. B2 is a farm access overbridge and was shown to be used as a night roost by brown long eared bats. B3 is an overbridge spanning the River Derwent used as a day roost by common pipistrelle and also as a feeding perch/ resting place by Daubenton's bats.

4.1.4 Trees near Kingsway and Markeaton junctions have been highlighted as being of importance to bats, with one confirmed roost and two flagged as possible roosts. One tree within a group of trees at location T9, around the Earl of Harrington Lake, has been confirmed as a roost (thermal imaging surveys confirmed a single common pipistrelle bat emerging from a feature (crack or crevice) in a tree). Additionally, bats were seen to investigate BRP features in a group of veteran trees bordering the north east of the proposed scheme at T8 and a tree within Markeaton Park, to the west of the proposed scheme at T13. T8 and T13 may represent two of a number of roosts used by bats in the area.

4.1.5 Several bat activity hotspots were identified in three key areas along the proposed scheme: one to the east of the proposed scheme (around and including T8 and T9), one within Markeaton Park (including around T10, T11 and T12), and one at Little Eaton junction; under and surrounding the River Derwent overbridge (B3).

4.1.6 Static detector surveys recorded bat activity throughout the proposed scheme study area. Highest activity at Kingsway and Markeaton junctions was recorded in Markeaton Park and Earl of Harrington Lake areas. Highest activity at Little Eaton junction was close to the bridges over the River Derwent and the railway.

4.1.7 Recommendations for further bat surveys to be undertaken at an appropriate stage of proposed scheme progression are detailed in Table 2. These further surveys will inform subsequent ecological impact assessments as well as ecological mitigation activities, including Natural England mitigation licences, which may be required to facilitate and legitimise works on the proposed scheme. It should be noted that new guidance on bat surveys are expected in February 2016, and these might have implications for further surveys in relation to the proposed scheme.

4.1.8 Given the above, it is noted that the results are presented herein are subject to further development.

Table 2: Recommendations for Further Bat Surveys

Feature Number	Survey Recommendation	Rationale
B2	Further emergence/ re-entry/ overnight surveys (using thermal imaging)	The 2015 surveys confirmed this structure as a roost. Further surveys recommended to determine bat numbers and identify roost locations within the structure to inform proposed scheme design, mitigation design and Natural England mitigation licence application (where applicable).
B3	Further emergence/ re-entry/ overnight surveys (using thermal imaging)	The 2015 surveys confirmed this structure as a roost. Further surveys recommended to determine bat numbers and identify roost locations within the structure to inform proposed scheme design, mitigation design and derogation licence application (where applicable).
B8	Assessment for Bat Roost Potential (BRP)	The houses located at Markeaton junction were not accessible for survey during 2015. When access is available, these properties should be assessed in order to determine their BRP.
	Internal inspections of roof voids	Internal inspections to search for evidence of bats within these properties should be carried out during or following BRP assessments of B8.
	Dusk/ dawn emergence/ re-entry surveys and/ or thermal imaging surveys	Once BRPs are confirmed for B8, all properties assessed as having BRP should be surveyed. This technique provides a more cost-effective solution with greater accuracy than standard survey techniques alone.
Markeaton junction (including T8-T13)	Tree climbing surveys	To locate roost cavity entrances and roost locations within the known roost trees and search for further potential roosts at Markeaton junction. This would inform proposed scheme design, mitigation methods design and derogation licence application (where applicable).
Markeaton junction (including T8-T13)	Bat trapping and radio-tracking surveys	Further survey is required within the area of Markeaton junction in order to fully assess the value of this area to bats and to locate bat roosts (if present). Bat trapping surveys to determine sex, breeding status and separate Myotis bat species. This would allow the full assessment of the value of this area for bats. Radio-tracking surveys to investigate the potential network of roosts in the areas of Markeaton junction. This would allow a fully informed scheme design and necessary derogation licences and mitigation scheme for bats in relation to the proposed scheme.
Markeaton and Kingsway junctions	Autumn bat activity surveys (transects and static detectors)	Further survey is recommended at Markeaton junction in order to fully assess bat activity.
Little Eaton junction	Autumn bat activity surveys (transects and static detectors)	Further survey is recommended at Little Eaton junction in order to fully assess bat activity.
New areas as identified as being required	Extended Phase 1 Habitat survey following by bat surveys as applicable	To assess the potential for bats in additional land parcels indicated to be required by the proposed scheme.

5. REFERENCES

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Appendix A Figures

N

M1 JUNCTION 28

A38/A61 LITTLE EATON JUNCTION

A38/A6 PALM COURT JUNCTION

A38/A52 MARKEATON JUNCTION

A38/A5111 KINGSWAY JUNCTION

A50/A38 JUNCTION

2 0 2 4 6 8 Kilometres

Project Title/Drawing Title

A38 DERBY JUNCTIONS SCHEME LOCATION PLAN

Project Number 47071319		
Drawn GB	Checked SW	Approved SW
Date 04/02/2016	Scale @ A3 1:100,000	Purpose of issue FINAL
Drawing Number Figure 1		Rev oD

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File Name:\\ch-wip-001\CH_Roads\A38 Derby Jcns - PO1339\12 CAD\12.1 WIP\FIGURE 1.1 - LOCATION PLAN F1.mxd

Common pipistrelle - 2006

Bat - 2006

Common pipistrelle - 2014

Daubenton's bat - 2008

Common pipistrelle - 2012

Brown long-eared bat - 2012

Soprano pipistrelle - 2012

Common pipistrelle - 2009

Whiskered bat - 2010

The Orangery, Markeaton Park
Brown long-eared, Common and Soprano pipistrelle - 2012

Soprano pipistrelle - 2012

Cobden Street
Common pipistrelle - 2009

Common pipistrelle - 2011

Brown long-eared bat - 2006

Common pipistrelle - 2009

Whiskered bat - 2013

Reigate Primary School, Reigate Drive
Common pipistrelle - 2013

Legend

- Site boundary
- 50 m buffer
- 500 m buffer
- 1000 m buffer
- Bat roost records provided by DBCG
- Bat observation records provided by DBCG
- Veteran tree
- Bat roost records provided by DWT

100 0 100 200 300 400 500 Metres

Project Title/Drawing Title

A38 DERBY JUNCTIONS
MARKEATON AND KINGSWAY
DESK STUDY - BAT ROOST RECORDS FROM DWT AND BAT RECORDS FROM DBCG

Project Number
47071319

Drawn	Checked	Approved
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Date	Scale @ A3	Purpose of issue
23/03/2016	1:10,000	FINAL
Drawing Number		Rev
Figure 2		0D

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File Name:X:\Highways Agency\47071390 A38 Derby Jcns - Environment\TechnicalEcology\GIS_Chesterfield\project_files\KingswayBats\Fig 2_A38 Kingsway Desk study Bats 27012016.mxd

Legend

- Site boundary
- 50 m buffer
- 500 m buffer
- 1000 m buffer
- Bat roost records provided by DWT
- Bat roost records provided by DBCG
- Bat observation records provided by DBCG
- Veteran tree

225 Alfreton Road, Little Eaton
Common pipistrelle - 2007

Electricity Sub-station, Allestree
Brown Long-eared - 2007

Pipistrelle bats - 2006

18 Froggatt Close, Allestree
Pipistrelle bat - 2006

Hearing Support Teaching Service, Brookside, Breadsall
Pipistrelle bat - 2005

Common pipistrelle (45) - 2014

11 Amesbury Lane, Oakwood
Pipistrelle bat - 2008

92 Darley Abbey Drive, Darley Abbey
Pipistrelle bat - 2006

West Mill, Darley Abbey Mills, Darley Abbey
common pipistrelle - 2013

200 0 200 400 600 800 1000 Metres

N

File Name:X:\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_Chesterfield\project_files\Little Eaton\Bats\Fig 3_A38 Little Eaton bat records 27012016.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS
LITTLE EATON - DESK STUDY
BAT ROOST RECORDS FROM DWT AND BAT RECORDS FROM DBCG

Project Number 47071319		
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Date 23/03/2016	Scale @ A3 1:15,000	Purpose of issue FINAL
Drawing Number Figure 3		Rev 0D

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N

T9
T8
T10
T11
T12
T13
T7
T6
T5
T4
T3
T2

Legend

- Site boundary
- 50 m buffer
- 250 m buffer
- 500 m buffer
- Roost confirmed
- Possible bat roost present
- Bat roost potential but no roost confirmed

100 0 100 200 300 400 500 Metres

File Name:J:\Derby-Jobs\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_Chesterfield\project_files\Kingsway\Bats\Fig 4_A38 Kingsway Markeaton surveyed trees 27012015.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS MARKEATON AND KINGSWAY BAT SURVEY - TREES SURVEYED

Project Number 47071319		
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Date 27/01/2016	Scale @ A3 1:5,500	Purpose of issue FINAL
Drawing Number Figure 4		Rev 0D

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T1

100 0 100 200 300 400 500 Metres

Legend

- Site boundary
- 50 m buffer
- 250 m buffer
- 500 m buffer
- Bat roost potential but no roost confirmed

Project Title/Drawing Title

A38 DERBY JUNCTIONS
LITTLE EATON
BAT SURVEY - TREES SURVEYED

Project Number 47071319		
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Date 27/01/2016	Scale @ A3 1:6,500	Purpose of issue FINAL
Drawing Number Figure 5		Rev 0D

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File Name:J:\Derby-Jobs\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_Chesterfield\project_files\Little Eaton\Bats\Fig 5_A38 Little Eaton Trees surveyed 27012016.mxd

N

B8

B7

B5

B4

B6

Legend

- Site boundary
- 50 m buffer
- 250 m buffer
- 500 m buffer
- Unknown bat roost potential (to be assessed)
- Bat roost potential but no roost confirmed

100 0 100 200 300 400 500 Metres

File Name:J:\Derby-Jobs\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_Chesterfield\project_files\KingswayBats\Fig 6_A38 Kingsway Markeaton surveyed buildings 2015 27012016.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS
MARKEATON AND KINGSWAY
BAT SURVEY - BUILDINGS SURVEYED

Project Number 47071319		
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Date 27/01/2016	Scale @ A3 1:5,500	Purpose of issue FINAL
Drawing Number Figure 6		Rev 0D

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N

B1

B2

B3

100 0 100 200 300 400 500 Metres

Legend

- Site boundary
- 50 m buffer
- 250 m buffer
- 500 m buffer
- Roost confirmed
- Bat roost potential but no roost confirmed

File Name:J:\Derby-Jobs\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_Chesterfield\project_files\Little Eaton\Bats\Fig 7_A38 Little Eaton Building surveyed 27012016.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS
LITTLE EATON
BAT SURVEY - BUILDINGS SURVEYED

Project Number
47071319

Drawn	Checked	Approved
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27/01/2016	1:6,500	FINAL
Drawing Number		Rev
Figure 7		0D

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N

7
1
8
2
4
3

Legend

- Site boundary
- 50 m buffer
- 250 m buffer
- 500 m buffer

SM2

- May 2015
- June 2015
- July 2015

100 0 100 200 300 400 500 Metres

File Name:J:\Derby-Jobs\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_Chesterfield\project_files\KingswayBats\Fig 8_A38 Kingsway Markeaton SM2 locations 27012016.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS
MARKEATON AND KINGSWAY
STATIC BAT DETECTORS (SM2) LOCATIONS

Project Number 47071319		
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Date 27/01/2016	Scale @ A3 1:7,000	Purpose of issue FINAL
Drawing Number Figure 8		Rev 0D

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N

6
10
5
9

100 0 100 200 300 400 500 Metres

Legend

- Site boundary
- 50 m buffer
- 250 m buffer
- 500 m buffer

SM2 locations

- June 2015
- July 2015

Project Title/Drawing Title

A38 DERBY JUNCTIONS
LITTLE EATON
STATIC BAT DETECTORS (SM2) LOCATIONS

Project Number 47071319		
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Date 27/01/2016	Scale @ A3 1:6,500	Purpose of issue FINAL
Drawing Number Figure 9		Rev 0D

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Legend

- Site boundary
- 50 m buffer
- 250 m buffer
- 500 m buffer

Transect

- Stop point
- Bat activity transect route

Bats

- Common pipistrelle (Pip 45)
- Soprano pipistrelle (Pip 55)
- Daubenton
- *Myotis* species
- x2 Number of bats
- Flight path

Habitats

- Semi-natural broad-leaved woodland
- Coniferous woodland
- Mixed plantation woodland
- Dense scrub
- Parkland
- Semi-improved grassland
- Tall ruderal
- Open water
- Amenity grassland
- Introduced shrub
- Building
- Bare ground
- Hard standing
- Invasive non-native species
- No access

Start
End
1
2
3
4
5
6
7
8
9
10
x 2 Pip 55
Daub
x 2 Pip 45
Pip 45
Pip 45
Pip 55
x 2 Pip 55
Pip 45
Pip 55
Myo

100 0 100 200 300 400 500 Metres

File Name: J:\Derby-Jobs\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_Chesterfield\project_files\Kingsway\Bats\Fig 10_A38 Kingsway Markeaton Transect 270515_27012016.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS MARKEATON AND KINGSWAY BAT ACTIVITY TRANSECT 1 - 27/05/2015

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Date 27/01/2016	Scale @ A3 1:7,000	Purpose of issue FINAL
Drawing Number Figure 10		Rev 0D

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N

Pip 45
Pip 45
6
Pip 45
Myo
Pip 45
7
5
8
4
3
Pip 45
Start
Pip 45
9
1
End
10
2

Legend

- Site boundary
- 50 m buffer
- 250 m buffer
- 500 m buffer

Transect

- Stop point
- Bat activity transect route

Bats

- Common pipistrelle (Pip 45)
- *Myotis*

Habitats

- Semi-natural broad-leaved woodland
- Coniferous woodland
- Mixed plantation woodland
- Dense scrub
- Parkland
- Semi-improved grassland
- Tall ruderal
- Open water
- Amenity
- Introduced
- Building
- Bare ground
- Hard standing
- Invasive non-native species
- No access

100 0 100 200 300 400 500 Metres

File Name: J:\Derby-Jobs\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_Chesterfield\project_files\Kingsway\Bats\Fig 11_A38 Kingsway Markeaton Transect 180615_27012016.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS
MARKEATON AND KINGSWAY
BAT ACTIVITY TRANSECT 2 - 18/06/2015

Project Number 47071319		
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Date 27/01/2016	Scale @ A3 1:7,000	Purpose of issue FINAL
Drawing Number Figure 11		Rev 0D

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N

Start

End

Legend

- Site boundary
- 50 m buffer
- 250 m buffer
- 500 m buffer

Transect

- Stop point
- Bat activity transect route

Bats

- Common pipistrelle (Pip 45)
- Soprano pipistrelle (Pip 55)
- *Myotis* species

Habitats

- Semi-natural broad-leaved woodland
- Coniferous woodland
- Mixed plantation woodland
- Dense scrub
- Parkland
- Semi-improved grassland
- Tall ruderal
- Open water
- Amenity grassland
- Introduced shrub
- Building
- Bare ground
- Hard standing
- Invasive non-native species
- No access

100 0 100 200 300 400 500 Metres

File Name:J:\Derby-Jobs\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_Chesterfield\project_files\Kingsway\Bats\Fig 12_A38 Kingsway Markeaton Transect 220715_27012016.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS MARKEATON AND KINGSWAY BAT ACTIVITY TRANSECT 3 - 22/07/2015

Project Number 47071319		
Drawn GSB	Checked KF	Approved PB
Date 27/01/2016	Scale @ A3 1:7,000	Purpose of issue FINAL
Drawing Number Figure 12		Rev 0D

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N

Legend

- Site boundary
- 50 m buffer
- 250 m buffer
- 500 m buffer

Transect

- Stop point
- Transect route
- Drive

Bats

- Common pipistrelle (Pip 45)
- *Myotis* species

Habitats

- Plantation broad-leaved woodland
- Dense scrub
- Semi-improved grassland
- Improved grassland
- Open water
- Boulders
- Arable
- Amenity grassland
- Building
- Bare ground
- Hard standing
- Invasive non-native species

Start

End

100 0 100 200 300 400 500 Metres

File Name:X:\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_Chesterfield\project_files\Little Eaton\Bats\Fig 13_A38 Little Eaton Bat transect 110515_27012016.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS
LITTLE EATON
BAT ACTIVITY TRANSECT 1 - 11/05/2015

Project Number 47071319		
Drawn GSB	Checked KF	Approved PB
Date 23/03/2016	Scale @ A3 1:3,500	Purpose of issue FINAL
Drawing Number Figure 13		Rev 0D

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N

Legend

- Site boundary
- 50 m buffer
- 250 m buffer
- 500 m buffer

Transect

- Stop point
- Bat activity transect route

Bats

- Common pipistrelle (Pip 45)
- Soprano pipistrelle (Pip 55)
- Daubenton
- *Myotis* species

Habitats

- Plantation broad-leaved woodland
- Dense scrub
- Semi-improved grassland
- Improved grassland
- Open water
- Boulders
- Arable
- Amenity grassland
- Building
- Bare ground
- Hard standing
- Invasive non-native species

Start
1
2
3
4
5
6
7
8
End
Pip 45
Pip 55
Daub
Myo

100 0 100 200 300 400 500 Metres

File Name:X:\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_Chesterfield\project_files\Little Eaton\Bats\Fig 14_A38 Little Eaton Bat transect 080615_27012016.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS
LITTLE EATON
BAT ACTIVITY TRANSECT 2 - 08/06/2015

Project Number 47071319		
Drawn GSB	Checked KF	Approved PB
Date 23/03/2016	Scale @ A3 1:3,500	Purpose of issue FINAL
Drawing Number Figure 14		Rev 0D

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Legend

- Site boundary
- 50 m buffer
- 250 m buffer
- 500 m buffer

Transect

- Stop point
- Bat activity transect route

Bats

- Common pipistrelle (Pip 45)
- Soprano pipistrelle (Pip 55)
- *Myotis* species
- Flight path

Habitats

- Plantation broad-leaved woodland
- Dense scrub
- Semi-improved grassland
- Improved grassland
- Open water
- Boulders
- Arable
- Amenity grassland
- Building
- Bare ground
- Hard standing
- Invasive non-native species

Start
End
1
2
3
4
5
6
7
8
Pip 45
Pip 55
Myo

100 0 100 200 300 400 500 Metres

File Name:X:\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_Chesterfield\project_files\Little Eaton\Bats\Fig 15_A38 Little Eaton Bat transect 080715_27012016.mxd

Project Title/Drawing Title A38 DERBY JUNCTIONS LITTLE EATON BAT ACTIVITY TRANSECT 3 - 08/07/2015	Project Number 47071319	
	Drawn GSB	Checked KF
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	Date 23/03/2016	Scale @ A3 1:3,500
	Purpose of issue FINAL	
Drawing Number Figure 15	Rev 0D	

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Legend

- Site boundary
- 50 m buffer
- 250 m buffer
- 500 m buffer
- Bat activity hotspots
- Notable flyway

100 0 100 200 300 400 500 Metres

File Name:J:\Derby-Jobs\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_Chesterfield\project_files\Kingsway\Bats\Fig 16_A38 Kingsway Markeaton Notable activity 2015_27012016.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS MARKEATON AND KINGSWAY BAT SURVEY - NOTABLE ACTIVITY DURING EMERGENCE/RE-ENTRY SURVEYS

Project Number 47071319		
Drawn GSB	Checked KF	Approved PB
Date 27/01/2016	Scale @ A3 1:5,500	Purpose of issue FINAL
Drawing Number Figure 16		Rev 0D

Highways England
Major projects
Piccadilly Gate
Store Street
Manchester
M1 2WD

AECOM
Royal Court
Basil Close, Chesterfield
Derbyshire. S41 7SL
+44 (0) 1246 209221
+44 (0) 1246 209229
www.aecom.com

N

50 0 50 100 150 200 250 Metres

Legend

- Site boundary
- 50 m buffer
- 250 m buffer
- 500 m buffer
- Bat activity hotspots
- Notable flyway

File Name:J:\Derby-Jobs\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_Chesterfield\project_files\Little Eaton\Bats\Fig 17_A38 Little Eaton Notable activity_27012016.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS
LITTLE EATON
BAT SURVEY - NOTABLE ACTIVITY DURING EMERGENCE/RE-ENTRY SURVEYS

Project Number 47071319		
Drawn GSB	Checked KF	Approved PB
Date 27/01/2016	Scale @ A3 1:3,500	Purpose of issue FINAL
Drawing Number Figure 17		Rev 0D

Highways England
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Piccadilly Gate
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Appendix B Bat Roost Potential Criteria

Table B1: Criteria used to describe 'Bat Roost Potential'

Define the Level of Bat Roost Potential (BRP) for the feature, where possible in relation to the likely type of roost. If unknown type of roost then just state overall level of BRP for the feature.			
	Type of Roost		
Level of Bat Roost Potential	**Summer or Transitional Roost used by Non-breeding Bats**	**Maternity Roost**	**Hibernation Roost**
CONFIRMED	Presence of bats or evidence of bats. Confirmation of roost status may require further survey.		
HIGH	Feature with multiple roosting opportunities for one or more species of bat. With good connectivity to high quality foraging habitat.	Feature with multiple roosting opportunities for breeding bats (size, temperature). With proximity and connectivity to high quality foraging habitat.	Large site that offers cool stable conditions with multiple roosting opportunities. With proximity and connectivity to high quality foraging habitat.
MODERATE	Feature with some roosting opportunities. With connectivity to moderate or high quality foraging habitat.	Feature providing some roosting opportunities. With some connectivity and proximity to moderate or high quality foraging habitat.	Medium sized feature with some roosting opportunities. With some connectivity and proximity to moderate or high quality foraging habitat.
LOW	Feature with a limited number of roosting opportunities. With poor connectivity to foraging habitat.	Feature with a limited number of roosting opportunities for breeding bats. With low proximity and connectivity to low or moderate quality foraging habitat.	Small sized feature or feature which may be subject to disturbance or environmental variations, with a limited number of roosting opportunities. With poor connectivity to foraging habitat.
NEGLIGIBLE	Feature with no or very limited roosting opportunities for bats or where the feature is isolated from foraging habitat.	Feature with no suitable roosting opportunities for breeding bats.	Feature with no suitable roosting opportunities for hibernating bats.

Appendix C Bat Roost Potential Assessment Results Summary

Table C1 Summary of Bat Roost Potential Assessment Results

Feature Number	Grid Reference	Description	BRP Rating
Trees			
T1	SK 36002 39901	Twin stemmed ash located to the south of Little Eaton junction situated within habitat of potential value to foraging and commuting bat species	Moderate
T2	SK 32494 35879	A group of three willow trees located to the south-west of the Kingsway junction.	Moderate
T3	SK 33041 35921	Chestnut tree with a single feature (hole), which is heavily lit. Situated by the roadside to the east of the Kingsway junction.	Low
T4	SK 32968 36025	A group of ivy covered trees located within 50 m of the proposed scheme.	Low (collectively)
T5	SK 32926 36098	A hawthorn tree with a single feature (hole) situated to the northeast of the Kingsway junction adjacent to a busy walkway.	Moderate
T6	SK 32918 36187	A group of ivy covered trees, which are located within 50 m of the proposed scheme, to the north-east of the Kingsway junction.	Low (collectively)
T7	SK 33087 36562	A line of trees located 50 m to the east of the Kingsway and Markeaton junction study area. The trees are located alongside a footpath, which is heavily lit.	Low
T8	SK 33732 37117	Comprises 20 veteran oak trees within a small area of oak woodland adjacent to the Kingsway and Markeaton study area. All trees have potential roost features (holes/ branch/ trunk cavities/ loose bark). Following notable activity associated with one of the trees during the second (dawn) survey, this feature was upgraded to having high BRP and an additional dawn survey was carried out to further explore whether these trees may support roosting bats.	Moderate / High
T9	SK 33777 37191	Five veteran willows located around the small fishing lake controlled by the Earl of Harrington Estate, located to the east of Markeaton Park and the existing A38 carriageway, adjacent to the proposed scheme. Trees support multiple potential roost features (including bat boxes) and are location within high quality foraging habitat.	High
T10	SK 33592 37155	A large mature oak tree with a large cavity located within Markeaton Park, 50 m to the west of the proposed scheme.	High
T11	SK 33554 37103	A line of mature trees alongside the Markeaton Park Miniature Railway, adjacent to the proposed scheme.	Moderate (collectively)
T12	SK 33518 37084	A line of mature trees alongside the Markeaton Park Miniature Railway, adjacent to the proposed scheme.	Moderate (collectively)
T13	SK 33294 37031	A large oak tree within Markeaton Park, to the east of the proposed scheme. Tree supports several holes within the main trunk and prior to January 2015 supported a substantial crack, which has given way.	Moderate

Feature Number	Grid Reference	Description	BRP Rating
Buildings			
B1	SK 36184 39988	A large railway over-bridge for the A38 carriageway west of the Little Eaton junction. Access to assess the interior structure of the bridge was not permitted by Network Rail; therefore a precautionary BRP assessment was made based on photographs and consideration of surrounding habitat quality.	High
B2	SK 36097 39982	A farm access track bridge supporting the A38 carriageway, west of the Little Eaton junction. The bridge spans a concrete underpass providing farm vehicle access between the north and south sides of the carriageway.	Moderate
B3	SK 35871 39946	A large road bridge supporting the A38 carriageway west of Little Eaton junction which spans the River Derwent.	Moderate
B4	SK 32941 36380	A road bridge which carries' the A38 carriageways over Brackensdale Avenue. This structure supports heavy traffic and bright lighting suggesting that the bridge is unlikely to provide suitable roosting conditions for bats.	Low
B5	SK 32894 36394	A road bridge which carries' the A38 carriageways over Brackensdale Avenue. This structure supports heavy traffic and bright lighting suggesting that the bridge is unlikely to provide suitable roosting conditions for bats.	Low
B6	SK 32914 36130	A disused old railway viaduct bridge, which lies in the vicinity of the Kingsway junction.	Moderate
B7	SK 33355 37008	An electricity substation on the north side of the Markeaton junction, west of the entrance to Markeaton Park. A brick building with a well maintained tiled roof, and a ventilated ridge tile providing potential access for bats to the roof space. This structure is located in the vicinity of good foraging habitat	Moderate
B8	SK 33595 37020	A row of sixteen large detached houses and outbuildings along the eastern side of Queensway to the north-east of Markeaton junction. Due to access restrictions, these properties could not be assessed for BRP, but from distant observation and inspection of aerial photographs, these houses were given a precautionary assessment.	Moderate to high (precautionary)

Appendix D Bat Trapping Report

A38 Derby
Bat Trapping Surveys
For AECOM
04 February 2016

davidson-watts ecology ltd

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(REGISTERED ADDRESS)
Sunnymead
Watery Lane
Minsterworth
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3 Hillside
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CONTENTS

1 Introduction

1.1 BACKGROUND

1.1.1 This report presents the findings of bat trapping surveys of land around the Abbey Hill roundabout/junction on the A38 near Derby (the 'Site'). The site is centred on ordnance survey grid reference SK361399, located north of Derby and comprises of road carriage, agricultural land adjacent to a railway line and the River Derwent (Figure 1).

1.1.2 The bat trapping surveys form part a wide range of investigations of the ecological baseline of the land immediately adjacent to the Abbey Hill Junction to inform the proposed road (A38) improvement works.

1.1.3 The bat trapping surveys were commissioned by AECOM and undertaken by Dr Ian Davidson-Watts of Davidson-Watts Ecology Ltd, licensed ecologist to mist net and harp trap bats in England (Registration numbers: 2015-12287-CLS-CLS (CL19 Bat Survey Level 3) & 2015-12289-CLS-CLS (CL20 Bat Survey Level 4).

1.2 AIMS AND OBJECTIVES

1.2.1 The bat trapping survey aimed to determine the species (i.e. which *Myotis* species), sex and breeding status of bats using the area potentially affected by the proposed road improvement works from which a more informed evaluation and impact assessment can be made.

2 Methodology

2.1 BAT TRAPPING SURVEYS

2.1.1 Three bat trapping surveys were undertaken on the 7th July, 28th July and 3rd September 2015 using three harp traps, and one mist net, in combination with acoustic bat lures (Sussex Autobat) – to increase the effectiveness of trapping. The primary aim of these techniques is to determine the presence of quiet echolocating species, and to determine the species, sex and breeding status of bats using the site by being able to examine bats in the hand.

2.1.2 Trapping surveys commenced two hours before dusk to enable adequate set up time and continued for at least four hours after sunset, with approximately 1.5-2 hours of dismantling/packing up time.

2.1.3 Trapping locations are shown in Figure 3 for each survey. Trap sites were positively selected to increase the chance of capturing bats. Therefore habitats most likely to support foraging or commuting bats such as woodlands, treelines or single mature trees and otherwise cluttered habitats were chosen for trap deployment.

2.1.4 All bats caught were identified to species level, sexed, aged and breeding status was determined e.g. breeding female, non-breeding female, sexually active male etc

2.1.5 Bats were released immediately following examination.

2.1.6 Identification of cryptic small *Myotis* bat species (e.g. whiskered and Brandt's) is challenging. Therefore any bats from these species were held in a cotton bag for a short period to obtain a dropping which was collected in a sterile vial and sent to Warwick University for DNA analysis to confirm the exact species.

2.2 ECOLOGICAL EVALUATION

2.2.1 Ecological features and resources have been evaluated based on the approach described in 'Guidelines for Ecological Impact Assessment in the United Kingdom' published by the Institute of Ecology and Environmental Management (2006) whereby the value of an ecological feature or resource is determined within a defined geographical context using the following criteria:

- International;
- National (England);
- Regional (East Midlands);
- County (or Metropolitan) (Derbyshire);
- District (or Unitary Authority, City or Borough) (City of Derby);
- Local (or Parish) (Allestree); and
- At the site level only.

3 Results

3.1 BAT TRAPPING SURVEYS

3.1.1 A total of 15 bats of three species were captured over three nights of trapping. The dominant species were common and soprano pipistrelle bats. In addition it was possible to confirm the identification of two of the three *Myotis* species as whiskered bat. The DNA analysis of the first captured whiskered or Brandt's bat failed therefore it was not possible to confirm identification of this male bat captured in July to other than a whiskered or Brandt's bat.

3.1.2 Female breeding soprano and whiskered bats were confirmed using the site.

3.1.3 Table 3.2.2 provides full details of the trapping data which should be crossed referenced with Figure 2:

Table 3.2.2 Trapping data

7th July 2015. Trapping commenced at 2115. 20□C. Wind BF2, showers and 40%. Sunset 2030					
Time	**Species**	**Sex**	**Age**	**Location**	**Remarks**
2210	Soprano pipistrelle	Female	Adult	Trap 1	Lactating
2210	Soprano pipistrelle	Female	Adult	Trap 1	Lactating
2220	Whiskere/Brandt's	Male	Adult	Trap 2	Failed/No DNA confirmation
2245	Soprano pipistrelle	Female	Adult	Trap 4	Lactating
2330	Whiskered	Female	Adult	Trap 2	Pregnant ID DNA Confirmation
0045	Soprano pipistrelle	Female	Adult	Trap 4	Lactating
28th July 2015. Trapping commenced at 2100. 18□C. Still, dry and clear skies. Sunset 2107					
2120	Soprano pipistrelle	Female	Adult	Trap 1	Non breeding
2215	Common pipistrelle	Male	Adult	Trap 1	
2245	Common pipistrelle	Male	Adult	Trap 2	
3rd Sep 2015. Trapping commenced at 2000. 16□C. Still, dry and clear skies. Sunset 1951					
2035	Common pipistrelle	Female	Juvenile	Trap 2	
2045	Soprano pipistrelle	Female	Adult	Trap 1	Non breeding
2225	Common pipistrelle	Male	Juvenile	Trap 2	
2335	Soprano pipistrelle	Male	Adult	Trap 2	
2335	Soprano pipistrelle	Male	Adult	Trap 2	
0001	Whiskered	Female	Juvenile	Trap 2	DNA confirmation

3.2 OTHER OBSERVATIONS

3.2.1 On the evening of the 7th July 2015 there was high levels of foraging activity from noctule bats south of the A38 over the field immediately east of the River Derwent (Talbot Turf land). This activity continued for over 70 minutes.

3.2.2 Following the end of the trapping survey during the packing up phase on the 28 July 2015. Four brown long-eared bats were observed flying in the large underpass under the A38 situated between the railway bridge and the bridge over the River Derwent.

3.2.3 The long-eared bats were observed roosting on the concrete ceiling of the underpass at various points, suggesting night roosting activity. This activity was continuous during the packing up stage of the trapping survey (approx. 1.5 hours).

4 Evaluation

4.1 SPECIES ASSEMBLAGE

4.1.1 The trapping surveys were able to confirm the presence of three bat species including common pipistrelle, soprano pipistrelle and whiskered bat. In addition the surveys visually observed activity from brown long-eared and noctule bats confirming the presence of five species using the site. However it should be noted that as the latter species were not captured it is not possible to determine their breeding status or sex.

4.1.2 Common and soprano pipistrelle bats were recorded/captured during all three surveys and activity from both species was generally considered continuous. Although known to roost in trees it is likely that the breeding soprano pipistrelle bats using the site are from roosts in houses/buildings in nearby suburban areas.

4.1.3 Only non-breeding common pipistrelle bats were captured, whereas during the peak breeding period the majority of soprano pipistrelle bats were lactating females indicating the importance of the riparian nature of the site to this species. These results are consistent with Davidson-Watts et al (2006), who found riparian woodland to be the preferred habitat of breeding soprano pipistrelle bats.

4.1.4 The main aim of the study was to determine the exact species of *Myotis* using the site. The capture data did confirm the presence of whiskered bat on the site and one of the captures was of a pregnant individual of this species in early July and a juvenile bat in September which suggests that a breeding population is in the vicinity of the site. However it is considered that the capture rate would have been higher for this species if a significant breeding roost were on or very near the site.

4.1.5 However the surveys did commence in the mid-part of the breeding season (July) and bats are known to switch roosts when nearing the end of pregnancy, therefore the presence of greater numbers of breeding bats on the site during May and June cannot be ruled out.

4.2 SPECIES EVAULATION

4.2.1 Common pipistrelle bats are considered locally abundant and increasing in population (BCT 2014). Although captured during every survey, none of the bats were breeding females indicating the site is not used regularly by a breeding population. Therefore on the basis of the current surveys the site is valued at the 'site' level for common pipistrelles.

4.2.2 Soprano pipistrelle bats are generally considered locally abundant and stable in population (BCT 2014). This breeding bats of this species were confirmed to be using the site especially in the early lactation period and therefore the riverine habitats are likely to support individuals from a breeding population. Therefore the site is valued at the local level for soprano pipistrelle bats.

4.2.3 Whiskered bats were confirmed using the site in July and September, and one of the captured individuals was confirmed as breeding. There is currently uncertainty as to the population status of this species due to the challenges of differentiating it from Brandt's bat which is morphologically very similar. In addition the discovery of another morphologically similar small *Myotis* species *Myotis Alcathoe* undermines the existing dataset of the distribution and abundance of all three small *Myotis* species. Currently BCT (2014) consider whiskered/Brandt's to be stable in population from hibernation counts, however there is no differentiation between the species. Wray et al (2010) consider these species to be 'rarer' than common species such as pipistrelle and brown long-eared bats.

4.2.4 With the current information it is considered that the presence of breeding whiskered bats on the site is of District/County importance.

5 Recommendations

5.1.1 As stated in the evaluation the surveys were undertaken in the latter part of the breeding season which was useful in determining late summer activity and potential male mating sites on the site. However riparian habitats often provide key prey items in the earlier part of the summer/later spring. Therefore bat use of the site may be different, perhaps more intense during this time.

5.1.2 It is therefore recommended that further trapping surveys are undertaken in May and June to complete the dataset and seasonal coverage.

5.1.3 The presence of breeding whiskered bats on the site is also significant and information on the location of the breeding roost for this species would be of great value to any impact assessment of the proposed works given the higher value of this species.

5.1.4 It is therefore recommended that breeding individuals of whiskered bat if captured during the recommended trapping surveys in May and June are fitted with radio transmitters and tracked to locate their roost(s) and determine activity patterns and thus place the proposed development area into context.

6 References

Bat Conservation Trust (2014). National Bat Monitoring Programme Report. London.

Davidson-Watts, I., Walls, S, & Jones, G. (2006). Differential habitat selection by *Pipistrellus pipistrellus* and Pipistrellus pygmaeus identifies distinct conservation needs for cryptic species of echolocating bats. Biological Conservation 133: 118-127

Hundt, L (2012) Bat Surveys: Good Practice Guidelines, 2nd Edition, Bat Conservation Trust.

Wray, S., Wells, D. and Mitchell-Jones, A.M. (2010). Valuing Bats in Ecological Impact Assessment. In: In Practice, 70. Institute of Ecology and Environmental Management. Winchester.

Figure 1 Survey location

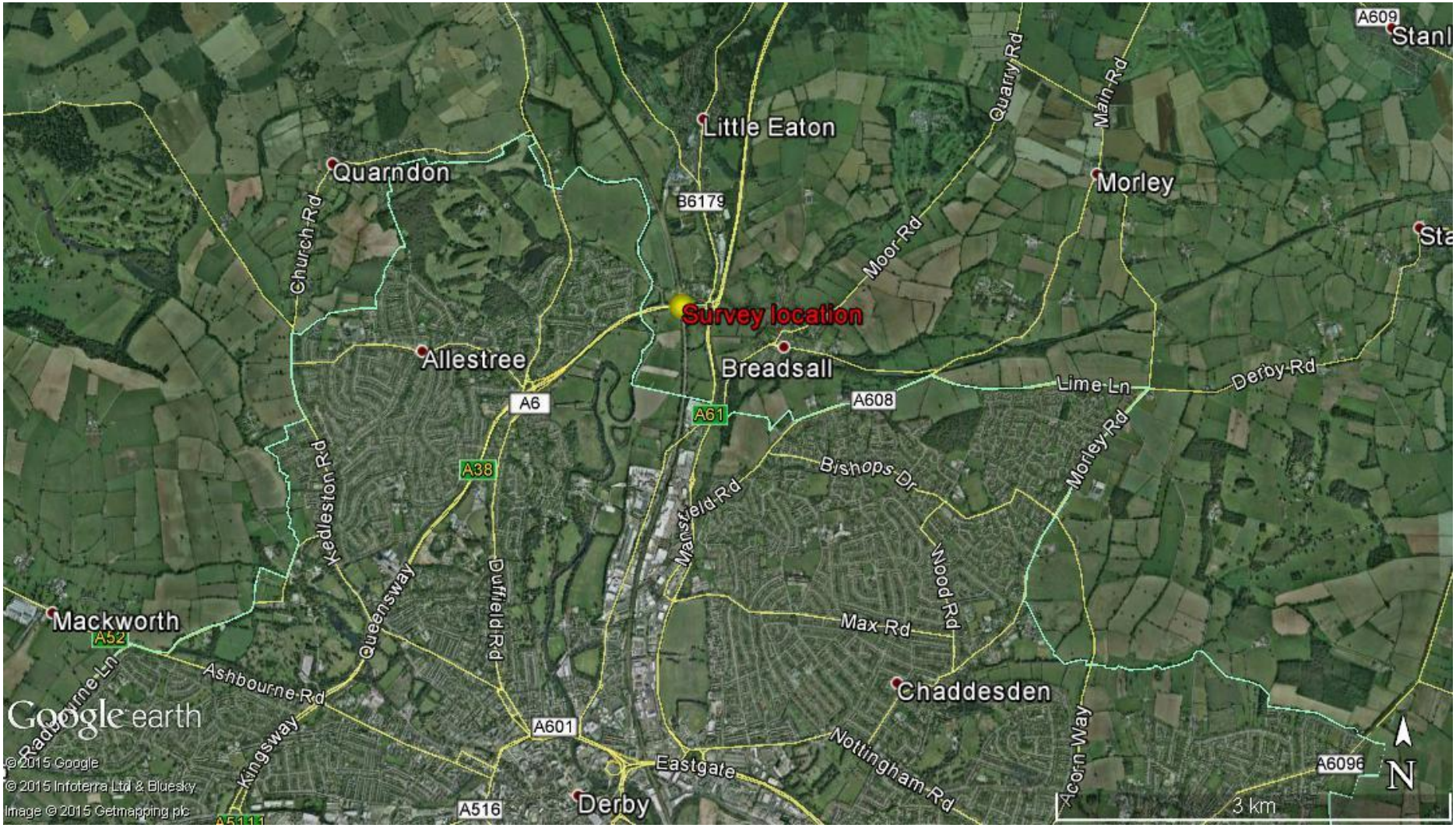

Figure 2 Trapping Locations

7th July 2015

28th July 2015

3rd September 2015

Appendix B Bat dropping DNA results

THE UNIVERSITY OF WARWICK

CooWarwicker
Ecological Forensics

22nd September 2015

Re: Bat Identification Results for Ian Davidson Watts, davidson-watts ecology.

Ref:

Bat job number 006020 received 11/09/2015
Sample labelled: A38 WBA 2
PCR amplification successful. DNA sequence:
TAGTATTAGGCAGATTCCTAAAAGAGATCCGAAATTTCATCAAGATGAGATATTTGAT
GGGGCAGGAAGGTCGATAAATGAGCTATTAATAATTTTTACTAAGGGGTGGGATTTT
CGAATGTTGGTCAT
Phylogenetic analysis identification: *Myotis mystacinus*

Confirmed by maximum likelihood, maximum parsimony, bootstrap 100%.

Best regards,

Robin Allaby
Associate Professor.

The results and conclusions in this report are based on an investigation of mtDNA sequence analysis. The results obtained have been reported with accuracy. The interpretation represents the most probable conclusion for the DNA sequence obtained rather than the sample provided given current levels of species data. It should be borne in mind that different circumstances might produce different results. Therefore, care must be taken with interpretation of the results especially if they are used as the basis for commercial recommendations.

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Email: r.g.allaby@warwick.ac.uk

THE UNIVERSITY OF WARWICK

22nd September 2015

Re: Bat Identification Results for Ian Davidson Watts, davidson-watts ecology.

Ref:

Bat job number 006021 received 11/09/2015
Sample labelled: A38 WBA 3
PCR amplification successful. DNA sequence:
AATTTCATCAAGATGAGATATTTGATGGGGCAGGAAGGTCGATAAATGAGCTATTAAT
AATTTTTACTAAGGGGTGGGATTTTCGAATGTTGGTCAT
Phylogenetic analysis identification: *Myotis mystacinus*

Confirmed by maximum likelihood, maximum parsimony, bootstrap 100%.

Best regards,

Robin Allaby
Associate Professor.

The results and conclusions in this report are based on an investigation of mtDNA sequence analysis. The results obtained have been reported with accuracy. The interpretation represents the most probable conclusion for the DNA sequence obtained rather than the sample provided given current levels of species data. It should be borne in mind that different circumstances might produce different results. Therefore, care must be taken with interpretation of the results especially if they are used as the basis for commercial recommendations.

Dr Robin Allaby

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Appendix E Dusk/Dawn Emergence/ Re-entry Survey Results

Table E1: Dusk/ Dawn Emergence/ Re-entry Survey Results

Tree/ Structure	Grid Reference	Date	Survey Conditions	Survey Start Time	Sunset/ Sunrise	Survey Comments	Roost Confirmed (Y/N*)
T1	SK 36002 39901	14/05/15	10°C Very Cloudy and Humid	20:25	20:55	Two barn owls (*Tyto alba*) emerged from a hole in the main trunk cavity. Jackdaws (*Corvus monedula*) were also observed to be roosting in a cavity in one of the tree limbs.	N
		10/07/15	14°C Very Cloudy and slight wind	02:52	04:52	No bats were recorded re-entering the structure. Common and soprano pipistrelle bats and two noctule passes were recorded commuting and foraging within the area.	
T2	SK 32494 35879	27/05/15	12°C Slight Windy and Clear	21:00	21:15	No bats were recorded emerging from the structure. Common pipistrelle, Myotis species and brown long-eared bats were recorded commuting and foraging in the area.	N
		09/07/15	16°C Very still	20:59	21:29	No bats were recorded emerging from the structure. No bats recorded during the survey.	
T3	SK 33041 35921	28/05/15	10°C Slight Wind	21:03	21:17	No bats were recorded emerging from the structure. No bats recorded during the survey.	N
T4	SK 32968 36025	29/05/15	7°C Slight Wind	21:04	21:18	No bats were recorded emerging from the structure. A single common pipistrelle bat pass was recorded 63 minutes after sunset.	N
T5	SK 32926 36098	22/07/15	15.4°C Cool, with a light breeze and overcast	03:04	05:07	No bats were recorded emerging from the structure. Common pipistrelle bats recorded commuting only.	N
		02/06/15	13°C dry with partial cloud cover and a light breeze.	20:49	21:18	No bats were recorded emerging from the structure. Brief pipistrelle bat passes were recorded only.	
T6	SK 32918 36187	02/06/15	13°C dry with partial cloud cover and a light breeze.	20:49	21:18	No bats were recorded emerging from the structure. Brief pipistrelle bat passes were recorded only.	N
T7	SK 33087 36562	03/05/15	14°C mild, with a light air wind and partial cloud cover.	20:52	21:23	No bats were recorded emerging from the structure. Common pipistrelle bats recorded commuting only.	N
T8	SK 33732 37117	08/06/15	10.3°C overcast with a light breeze.	20:54	21:27	No bats were recorded emerging from the trees. Common pipistrelle bat activity recorded within the vicinity.	N *but possible roost
		11/06/15	8°C cool dry with a light air wind.	02:40	04:40	No bats re-entered the trees. Common pipistrelle and Brown long-eared bats were recorded commuting and foraging in the area. Notable behaviour; multiple bats circled one of the mature oak trees on several occasions, suggestive of possible roost tree but no re-entry.	
		14/07/15	17°C, mild, dry with a light air breeze	02:52	04:56	No bats were recorded re-entering the trees. Common and soprano pipistrelle and noctule bats were recorded foraging and commuting in the area.	
T9	SK 33777 37191	09/06/15	8°C mild with a gentle breeze	20:57	21:27	No bats were recorded emerging the structure. Common and soprano pipistrelle bats and noctule bat species were recorded foraging and commuting in the area. Very high levels of bat activity at this site.	Y
		03/08/15	14°C mild, dry and overcast	20:27	20:57	A single common pipistrelle bat emerged from a mature willow tree at 82 minutes past sunset Common and soprano pipistrelle bats were recorded commuting and foraging. Very high levels of bat activity at this site.	
T10	SK 33592	10/06/15	10°C mild, dry with a gently	21:06	21:27	No bats were recorded emerging from the structure.	N

Tree/ Structure	Grid Reference	Date	Survey Conditions	Survey Start Time	Sunset/ Sunrise	Survey Comments	Roost Confirmed (Y/N*)
	37155		breeze.			Noctule, common and soprano pipistrelle and a Myotis species were recorded commuting and foraging.	
		05/08/15	14°C mild, overcast and dry with a gentle breeze	20:23	20:53	No bats were recorded emerging from the structure. Pipistrelle species were recorded commuting only.	
		11/08/15	8°C cool, dry and calm.	03:38	05:38	No bats were recorded emerging form the tree. Noctule, pipistrelle species and Myotis species recorded commuting in the area.	
T11	SK 33554 37103	11/06/15	11°C mild, dry with a gentle breeze	21:15	21:30	No bats were recorded emerging from the structure. Common and soprano pipistrelle and Myotis bats were recorded foraging and commuting within the area.	N
		05/08/15	12°C mild, dry and overcast	03:30	05:30	No bats were recorded emerging from the structure. Common and soprano pipistrelle and Myotis bats recorded foraging and commuting within the area.	
T12	SK 33518 37084	29/06/15	17°C mild, dry with a light air breeze.	21:05	21:35	Common and soprano pipistrelle as well as Myotis species (likely daubenton's) was recorded foraging and commuting in the area.	N
		06/08/15	15°C warm, dry and overcast	03:27	05:30	No bats were recorded re-entering the structure. Common and soprano pipistrelle bats and Myotis species were recorded foraging and commuting in the area.	
T13	SK 33294 37031	30/06/15	23.8°C warm, dry with a light breeze.	21:05	21:35	No bats were recorded re-entering the structure. Common and soprano pipistrelle bats and Myotis species were recorded foraging and commuting in the area	N * bats investigating feature potential roost
		07/08/15	11°C Clear, dry and overcast	03:31	05:31	No bats were recorded re-entering the tree. Bat was observed hovering close to hole in main trunk, appeared to investigate feature. Common and soprano pipistrelle, bat species were recorded foraging and commuting within the area. Bats were observed around the tree until 34 minutes before sunrise.	
B1	SK 36184 39988	10/08/15	18°C Clear, calm and dry with a light air wind	20:14	20:44	No bats emerged from the structure. Common and soprano pipistrelle, noctule and Myotis species were recorded foraging and commuting within the area. The first bat was a noctule recorded 33 minutes after sunset.	N
		19/08/15	14°C Warm, dry with a light breeze and partial cloud cover	03:42	05:51	Common and soprano pipistrelle bats were recorded foraging and commuting only, no bats emerged. The last bat recorded was a common pipistrelle 38 minutes before sunrise. Single passes only were recorded.	
		04/09/15	14°C Clear and warm	19:18	19:48	No bats emerged from the structure. Common, soprano and unknown pipistrelle, as well as a single Myotis species was recorded foraging and commuting within the area. The first bat recorded was a soprano pipistrelle 16 minutes after sunset.	
B2	SK 36097 39982	13/05/15	11°C Clear and Cold	20:23	20:53	No bats emerged from the structure. Common and soprano pipistrelle, noctule bats were recorded foraging and commuting only.	Y
		01/07/15	28°C Hot and overcast	21:04	21:34	No bats were recorded re-entering the structure. Common and soprano pipistrelle bats were recorded foraging and commuting within the area.	
B3	SK 35871 39946	15/05/15	13°C Clear and Cold	20:23	20:53	Two common pipistrelle bats were recorded emerging form the structure at 7 minutes and 32 minutes past sunset from abutment crevice. Common and soprano pipistrelle bats, noctule's and Myotis species likely daubenton's were recorded foraging and commuting within close proximity of the structure.	Y
		07/07/15	15°C Windy and Humid	21:01	21:31	Two Daubenton's bats entered and emerged from the voids within bridge structure indicating that this bridge may be utilised as a feeding perch/night roost. A common pipistrelle bat emerged from the structure 25 minutes after sunset. Common pipistrelle, soprano pipistrelle, Myotis species (likely daubenton's) and noctule's were recorded foraging and commuting in the area. Daubenton's observed foraging over the River Derwent throughout the survey.	

Tree/ Structure	Grid Reference	Date	Survey Conditions	Survey Start Time	Sunset/ Sunrise	Survey Comments	Roost Confirmed (Y/N*)
B4	SK 32941 36380	09/07/15	16°C Warm and Cloudy	20:58	21:28	No bats emerged from the structure. No bats were seen or heard near the structure.	N
B5	SK 32894 36394						
B6	SK 32914 36130	21/07/15	15.6°C Dry and humid with a light air breeze	03:05	05:05	No bats emerged from the structure. Pipistrelle species and Myotis species were recorded commuting and foraging in the area. The last bat pass was recorded 20 minutes before sunrise.	N
		04/08/15	19°C Cloudy and Dry	20:25	20:55	No bats emerged from the structure. A total of four common pipistrelle commuting passes were recorded only.	
B7	SK 33355 37008	26/05/15	9°C Clear and Slight wind	20:50	21:13	No bats emerged from the structure. Common pipistrelle bats were recorded commuting only. The first bat pass was recorded 28 minutes past sunset.	N
		23/07/15	10°C Clear and cold with a light air, no cloud cover	03:08	05:08	No bats emerged from the structure. Common and soprano pipistrelle bats were recorded commuting and foraging only.	
B8	SK 33595 37020					Row of houses not surveyed during 2015 due to access. Survey required in 2016.	

Appendix F Walked Bat Activity Transect Survey Results

Table F1: Walked Bat Activity Transect Survey Results

Structure	Date	Survey Conditions	Survey Start Time	Sunset/ Sun Rise	Survey Comments
Transect A	11/05/15	13°C mild, dry and clear	20:20	20:50	The first bat recorded was at 24 minutes after sunset at T3. A second common pipistrelle was recorded between T5-T6 and a single Myotis pass was detected at T7. Very little activity recorded during the transect.
	08/06/15	15°C mild, clear sky with a light air breeze	21:00	21:27	The first bat recorded was at 24 minutes after sunset by a common pipistrelle between T1-T2. The second bat recorded was also a common pipistrelle bat 54 minutes after sunset at T3. Individual common and soprano pipistrelle bat passes and a single Myotis pass was recorded between T3 - T4. Multiple feeding passes of soprano pipistrelle were recorded between T4 and T6. A single Myotis species was recorded foraging at T6 with common and soprano pipistrelles foraging between T6 and T7. Multiple bat passes of common and soprano pipistrelle and Myotis species (likely daubenton's) were recorded at T8.
	08/07/15	12°C mild with a gentle breeze	21:00	21:30	The first bat activity was recorded 23 minutes after sunset, where multiple bat passes of common pipistrelle and soprano pipistrelle were recorded foraging under the road bridge at T2. The second bat activity was recorded 34 minutes after sunset at T3 where common and soprano pipistrelle were observed foraging east over the hedge line. A single Myotis species pass was recorded 60 minutes after sunset at T5 which was observed foraging along the hedge line and across the field. Single passes of common and soprano pipistrelles only were recorded between T6 - T7 and T9. No activity was observed 90 minutes after sunset.
Transect B	27/05/15	10°C cool with a gentle breeze.	20:48	21:14	The first bat was recorded 39 minutes after sunset, by a common pipistrelle at T4-T5. Between T4-T5 multiple bat passes were recorded by common pipistrelle, soprano pipistrelle and Myotis species (likely daubenton's). Myotis species, common pipistrelle and soprano pipistrelle were also recorded at T7. No bat activity was recorded around T1-T4 or T8-T10.
	18/06/15	13°C mild, dry with a gentle breeze.	21:04	21:34	The first bat recorded was a common pipistrelle at 29 minutes after sunset at T9-T8, a second common pipistrelle was also recorded three minutes later. High foraging activity was observed at around T5 where common pipistrelle and Myotis species were observed.
	22/07/15	11°C mild with a light air breeze and wispy clouds	21:12	21:12	The first bat activity was recorded 52 minutes after sunset, where multiple bat passes of common pipistrelle, soprano pipistrelle and Myotis species were recorded between T4 and T5. Individual common and soprano pipistrelle bat passes were recorded only between T8-T10 all bats were recorded foraging.

Appendix G Bat Activity: Static Acoustic Detector Results

Table G1: SM2 Location 1 May 2015 (Target Note 1, Figure 8) - Number of Recorded Bat Passes, Time and Species[1]

Night date	Sunset	Bat	First call	[21:00 - 22:00]	[22:00 - 23:00]	[23:00 - 00:00]	[00:00 - 01:00]	[01:00 - 02:00]	[02:00 - 03:00]	[03:00 - 04:00]	[04:00 - 05:00]	Last call	Sunrise	Total passes per night (species specific)	Number of passes per night
Night of the 22/05/2015	21:08	Pip45	21:26	3	2	1	2		6	5		03:38	04:57	19	44
		Pip55	22:19	1	1	5	5	3	2			02:45		17	
		Pip	22:11		4	3			1			02:36		8	
Night of the 23/05/2015	21:09	Pip45	22:03		2	1	3	3		2		03:39	04:56	11	27
		Pip55	22:06		1	6	3			2		03:37		12	
		Pip	22:06		2	2						23:47		4	
Night of the 24/05/2015	21:10	Pip45	21:42	3	1	3						23:11	04:55	7	16
		Pip55	22:11		6	1						23:01		7	
		Pip	22:12		1	1						23:52		2	
Night of the 25/05/2015	21:12	Pip45	21:53	3	15							22:57	04:53	18	27
		Pip55	21:35	3	3			1			2	04:19		9	
Night of the 26/05/2015	21:13	Pip45	21:40	8	10		3	2				01:59	04:52	23	26
		Pip55	21:59	1	1	1						23:51		3	
Night of the 27/05/2015	21:15	Pip45	21:36	14	5		3	13	1	18	2	04:04	04:51	56	68
		Pip55	21:55	2	2		2			1		03:50		7	
		Pip	21:33	1	1			1		2		03:27		5	
Night of the 28/05/2015	21:16	Pip45	22:03		4	3						03:43	04:50	7	18
		Pip55	22:10		3	5	2			1		23:31		11	

[1] Pink shading is relative to the level of bat activity on that survey occasion i.e. low, moderate, high bat activity/passes = light, medium, dark colour shade of pink respectively

Table G2: SM2 Location 2 May 2015 (Target Note 2, Figure 8) - Number of Recorded Bat Passes, Time and Species

Night date	Sunset	Bat	First call	[21:00 - 22:00]	[22:00:0 - 23:00]	[23:00 - 00:00]	[00:00 - 01:00]	[01:00 - 02:00]	[02:00 - 03:00]	[03:00 - 04:00]	[04:00 - 05:00]	Last call	Sunrise	Total passes per night (species specific)	Number of passes per night
Night of the 22/05/2015	21:08	Pip45	21:24	1	2	6	10	31	41	11	14	04:08	04:57	116	228
		Pip55	21:27	1	3		1	3	1	2		03:36		11	
		Pip	21:44	1	2	3	16	1	9	2		03:18		34	
		Myotis	23:40			7	22	25	13			02:51		67	
Night of the 23/05/2015	21:09	Pip45	23:28			8	4	2		7	3	04:11	04:56	24	76
		Pip55	23:39			3			1			02:05		4	
		Pip	23:38			6						23:39		6	
		Myotis	21:54	7	4	12	18	1				01:06		42	
Night of the 24/05/2015	21:10	Pip45	21:42	1	29	2					6	04:09	04:55	38	50
		Pip55	21:48	1								21:48		1	
		Pip	22:14		7	1						23:09		8	
		Myotis	00:56				2			1		03:27		3	
Night of the 25/05/2015	21:12	Pip45	21:53	2	11		3	1		2	3	04:11	04:53	22	59
		Pip55	21:41	6		1	2					00:22		9	
		Pip	22:23		23		1					00:40		24	
		Myotis	02:03						3	1		03:02		4	
Night of the 26/05/2015	21:13	Pip45	21:40	31	4							22:19	04:52	35	54
		Pip55	21:47	2								21:36		2	
		Pip	22:14		14	2						22:55		16	
		Myotis	00:32				1					00:32		1	
Night of the 27/05/2015	21:15	Pip45	22:28		30	72	16	158	87	54	2	04:14	04:51	419	741
		Pip55	22:51		4	5	16		8			02:11		33	
		Pip	22:39		16	14	12	62	41	127		03:59		272	
		Myotis	23:15			5	1	3	5	3		03:03		17	
Night of the 28/05/2015	21:16	Pip45	22:12		31	4			2	12	1	04:00	04:50	50	158
		Pip55	22:03		17	17				4		03:53		38	
		Pip	22:16		44	5						23:56		49	
		Myotis	23:34			13	6	1	1			02:09		21	

Table G3: SM2 Location 3 June 2015 (Target Note 3, Figure 8) - Number of Recorded Bat Passes, Time and Species

Night date	Sunset	Bat	First call	[21:00 - 22:00]	[22:00:0 - 23:00]	[23:00 - 00:00]	[00:00 - 01:00]	[01:00 - 02:00]	[02:00 - 03:00]	[03:00 - 04:00]	[04:00 - 05:00]	Last call	Sunrise	Total passes per night (species specific)	Number of passes per night
Night of the 11/06/2015	21:30	Pip45	22:25		13	5	2	1	1			02:40	04:41	22	32
		Pip55	22:20		2	1			1	1		03:03		5	
		Pip	22:16		4							22:41		4	
		Leis	23:30			1						23:30		1	
Night of the 12/06/2015	21:31	Pip45	22:34		4			2	1	1	1	04:12	04:40	9	14
		Pip	22:45		1						1	04:12		2	
		Leis	22:00		2					1		03:21		3	
Night of the 13/06/2015	21:32	Pip45	22:23		1					3		03:49	04:40	4	4

Table G4: SM2 Location 4 June 2015 (Target Note 4, Figure 8) - Number of Recorded Bat Passes, Time and Species

Night date	Sunset	Bat	First call	[21:00 - 22:00]	[22:00:0 - 23:00]	[23:00 - 00:00]	[00:00 - 01:00]	[01:00 - 02:00]	[02:00 - 03:00]	[03:00 - 04:00]	[04:00 - 05:00]	Last call	Sunrise	Total passes per night (species specific)	Number of passes per night
Night of the 11/06/2015	21:30	Pip45	22:06		19		2					00:46	04:41	21	27
		Pip55	22:34		2		1					00:59		3	
		Pip	22:41		1				1	1		03:52		3	
Night of the 12/06/2015	21:31	Pip45	22:08		2							22:24	04:40	2	2
Night of the 13/06/2015	21:32	Pip45											04:40	0	0
		Pip55												0	
Night of the 14/06/2015	21:32	Pip45	22:23			7	3	7				01:25	04:40	17	18
		Pip	23:57			1						23:57		1	
Night of the 15/06/2015	21:33	Pip45	21:56	1	2					2	1	04:07	04:40	6	9
		Pip	22:02		3							22:28		3	
Night of the 16/06/2015	21:33	Pip45	22:25		1							22:25	04:40	1	4
		Pip	22:12		2					1		03:58		3	

Table G5: SM2 Location 5 June 2015 (Target Note 5, Figure 9) - Number of Recorded Bat Passes, Time and Species

Night date	Sunset	Bat	First call	[21:00 - 22:00]	[22:00 - 23:00]	[23:00 - 00:00]	[00:00 - 01:00]	[01:00 - 02:00]	[02:00 - 03:00]	[03:00 - 04:00]	[04:00 - 05:00]	Last call	Sunrise	Total passes per night (species specific)	Number of passes per night
Night of the 02/06/2015	21:22	Pip45	22:07		1		2		3	2		03:38	04:46	8	13
		Pip55	21:51	1							3	04:10		4	
		Pip	03:13							1		03:13		1	
Night of the 03/06/2015	21:23	Pip45	22:11		27	3						23:34	04:45	30	40
		Pip55	21:45	2	4		2				1	04:00		9	
		Pip	00:33				1					00:33		1	
Night of the 04/06/2015	21:24	Pip45	21:55	1	2	5	19	8	49	8		03:21	04:44	92	122
		Pip55	21:56	1	5	4	4		2		1	04:00		17	
		Pip	22:23		3	2	6	1	1			02:08		13	
Night of the 05/06/2015	21:25	Pip45	22:02		4	12				2		03:57	04:43	18	28
		Pip55	22:01		5	2				1		03:58		8	
		Pip	22:50		1			1				01:29		2	
Night of the 06/06/2015	21:26	Pip45	22:37		37	6						23:46	04:43	43	51
		Pip55	22:03		8							22:32		8	
Night of the 07/06/2015	21:27	Pip45	22:27		6							22:46	04:42	6	8
		Pip55	21:54	1								21:54		1	
		Pip	22:27		1							22:27		1	
Night of the 08/06/2015	21:28	Pip45	22:04		3							22:07	04:42	3	11
		Pip55	21:51	2	2							22:10		4	
		Pip	21:56	1	2			1				01:08		4	
Night of the 09/06/2015	21:29	Pip45	21:45	2	147							22:51	04:41	149	154
		Pip55	21:57	1								21:57		1	
		Pip	21:23		4							22:34		4	

Table G6: SM2 Location 6 June 2015 (Target Note 6, Figure 9) - Number of Recorded Bat Passes, Time and Species

Night date	Sunset	Bat	First call	[21:00 - 22:00]	[22:00:0 - 23:00]	[23:00 - 00:00]	[00:00 - 01:00]	[01:00 - 02:00]	[02:00 - 03:00]	[03:00 - 04:00]	[04:00 - 05:00]	Last call	Sunrise	Total passes per night (species specific)	Number of passes per night
Night of the 02/06/2015	21:22	Pip45	22:14		6	7	7	6	4	2	2	04:03	04:46	34	86
		Pip55	22:21		2	2	6	1	4	1		03:58		16	
		Pip	00:03				2	1	1	2		03:49		6	
		Ny/Ep	21:37	10								21:47		10	
		Leis	21:35	19	1							22:04		20	
Night of the 03/06/2015	21:23	Pip45	21:49	1	74	51	41	4				02:42	04:45	171	287
		Pip55	21:59	1	44	46	2					00:10		93	
		Pip	22:32		14	9						23:30		23	
		Leis	21:37	11								21:52		11	
Night of the 04/06/2015	21:24	Pip45	22:24		6	30	109	50	8	4		03:31	04:44	207	840
		Pip55	22:32		2	45	138	308	82	15		03:56		590	
		Pip	22:35		2	15	8	9	7	2		03:24		43	
		Ny/Ep	04:09								1	04:09		1	
		Leis	03:05							1		03:05		1	
Night of the 05/06/2015	21:25	Pip45	21:51	1	11	27	40	33	27	12		03:41	04:43	151	517
		Pip55	22:47		41	185	10	2	1			03:27		239	
		Pip	22:24		3	35	1	6	1			02:54		46	
		Ny/Ep	21:53	2	8					1	1	04:03		12	
		Leis	21:54	25	43					1		03:37		69	
Night of the 06/06/2015	21:26	Pip45	23:07			21	35	62	3	9		03:32	04:43	130	221
		Pip55	22:44			59		2	1			23:46		62	
		Pip	22:42		12	17						23:41		29	
		Ny/Ep	21:58	1	37					2		03:31		40	
		Leis	22:01		16							22:14		16	
Night of the 07/06/2015	21:27	Pip45	22:09		7	46	20		2			02:54	04:42	75	111
		Pip55	22:42		2	30	1					23:59		33	
		Pip	22:39		1	2						23:30		3	
		Ny/Ep	21:47	9	5							22:05		14	
		Leis	21:49	5								21:55		5	
Night of the 08/06/2015	21:28	Pip45	22:14		7	15				1		03:37	04:42	23	28
		Pip	22:30		3	2						23:24		5	
		Ny/Ep	21:55	3	1							22:00		4	
		Leis	22:09		2							22:10		2	
Night of the 09/06/2015	21:29	Pip45	22:02		7	3	1					00:41	04:41	11	23
		Pip55	22:05		1	3						23:07		4	
		Pip	23:00			4						23:05		4	
		Ny/Ep	21:52	1	2							22:17		3	
		Leis	22:02		1							22:02		1	

Table G7: SM2 Location 7 July 2015 (Target Note 7, Figure 8) - Number of Recorded Bat Passes, Time and Species

Night date	Sunset	Bat	First call	[21:00 - 22:00]	[22:00:0 - 23:00]	[23:00 - 00:00]	[00:00 - 01:00]	[01:00 - 02:00]	[02:00 - 03:00]	[03:00 - 04:00]	[04:00 - 05:00]	Last call	Sunrise	Total passes per night (species specific)	Number of passes per night
Night of the 10/07/2015	21:29	Pip45	21:38	10	4	5	3	4	5	1	5	04:32	04:54	37	48
		Pip55	21:36	2	1		1	1	1			02:46		6	
		Pip	21:58	1					1	3		03:54		5	
Night of the 11/07/2015	21:28	Pip45	21:36	23	17	10	17	8	36	20	10	04:32	04:55	141	159
		Pip55	21:49	2	2	1	2	3	1	1		03:02		12	
		Pip	21:41	3	2							22:21		5	
		Npi/Pip45	02:52						1			02:52		1	
Night of the 12/07/2015	21:27	Pip45	21:55	2		1	19		9	7	4	04:39	04:56	42	49
		Pip55	21:46	2								21:53		2	
		Pip	22:26		1				2		2	04:38		5	
Night of the 13/07/2015	21:26	Pip45	21:52	3	1	2	1	2	2	4		03:48	04:57	15	17
		Pip55	22:12								2	04:34		2	
Night of the 14/07/2015	21:25	Pip45	21:38	3	2	1	11	40	40	1	1	04:33	04:59	99	117
		Pip55	22:12	1	1	1	2	1	1	1		03:44		8	
		Pip	22:18		2	1	1	1	3	2		03:49		10	
Night of the 15/07/2015	21:24	Pip45											05:00	0	0
		Pip55												0	

Table G8: SM2 Location 8 July 2015 (Target Note 8, Figure 8) – Note: No data for this SM2 (stolen) - Refer to Limitations Section 2.7

Table G9: SM2 Location 9 July 2015 (Target Note 9, Figure 9) - Number of Recorded Bat Passes, Time and Species

Night date	Sunset	Bat	First call	[21:00 - 22:00]	[22:00:0 - 23:00]	[23:00 - 00:00]	[00:00 - 01:00]	[01:00 - 02:00]	[02:00 - 03:00]	[03:00 - 04:00]	[04:00 - 05:00]	Last call	Sunrise	Total passes per night (species specific)	Number of passes per night
Night of the 10/07/2015	21:29	Pip45	21:48	5	59	115	171	126	73	34	2	04:07	04:54	585	707
		Pip55	22:00		11	13	20	2	10	6		03:59		62	
		Pip45/55	21:49	1	4	6	32	7	3	3		03:47		56	
		Npi/Pip45	22:26		1							22:26		1	
		Big bat	02:39						1			02:39		1	
		Noct	04:21								2	04:23		2	
Night of the 11/07/2015	21:28	Pip45	21:37	1	132	235	42	67	69	27	11	04:22	04:55	584	886
		Pip55	21:53	3	9	137	66	4	17	2	1	04:00		239	
		Pip45/55	21:55	2	3	32	4	8	12	2		03:53		63	
Night of the 12/07/2015	21:27	Pip45	21:43	5	104	165	258	116	9	33	21	04:30	04:56	711	762
		Pip55	22:05	1	3		2	1		4	3	04:13		14	
		Pip45/55	21:52	1	5	4	10	2	1	6	2	04:11		31	
		Noct	21:57	3	1						1	04:12		5	
		Leis	22:10		1							22:10		1	
Night of the 13/07/2015	21:26	Pip45	21:51	1	39	40	71	17	102	12	10	04:26	04:57	292	467
		Pip55	21:58	1	8	22	34	27	10	5	1	03:58		108	
		Pip45/55	21:59	1	14	3	23	14	10		1	04:26		66	
		Noct	23:27			1						23:27		1	
Night of the 14/07/2015	21:25	Pip45	21:48	3	54	50	395	78	19	2		03:46	04:59	601	656
		Pip55	21:47	3	4	7	3	2		4	3	04:16		26	
		Pip45/55	21:53	1	9	2	10	4			1	04:02		27	
		Npi/Pip45	22:38		1			1				01:39		2	
Night of the 15/07/2015	21:24	Pip45											05:00	0	0
		Pip55												0	

Table G10: SM2 Location 10 July 2015 (Target Note 10, Figure 9) - Number of Recorded Bat Passes, Time and Species

Night date	Sunset	Bat	First call	[21:00 - 22:00]	[22:00:0 - 23:00]	[23:00 - 00:00]	[00:00 - 01:00]	[01:00 - 02:00]	[02:00 - 03:00]	[03:00 - 04:00]	[04:00 - 05:00]	Last call	Sunrise	Total passes per night (species specific)	Number of passes per night
Night of the 10/07/2015	21:29	Pip45	22:08		80	82	81	74	97	59	3	04:22	04:54	476	948
		Pip55	21:54		13	52	152	41	29	5		03:39		292	
		Pip45/55	22:25		18	54	56	13	12	5	1	04:16		159	
		Npi/Pip45	22:36		1		1	1	1			02:37		4	
		Big bat	22:12		1							22:12		1	
		Noct	22:07		7					5	3	04:14		15	
		Myotis	23:17			1								1	
Night of the 11/07/2015	21:28	Pip45	21:42	3	95	53	96	32	13	10	6	04:38	04:55	308	515
		Pip55	22:06		30	26	33	26	15	6		03:53		136	
		Pip45/55	22:31		20	2	6	3	1	2		03:34		34	
		Npi/Pip45	01:10					1				01:10		1	
		Big bat	22:06		3							22:18		3	
		Noct	22:03		31						1	04:27		32	
		Unsure	00:15				1					00:15		1	
Night of the 12/07/2015	21:27	Pip45	21:49	1	125	165	64	120	45	14	5	04:34	04:56	539	1264
		Pip55	22:21		12	132	396	55	62	3	2	04:12		662	
		Pip45/55	22:58		1	17	11	11		1		03:28		41	
		Npi/Pip45	22:24		1		3			1		03:14		5	
		Big bat	22:24		1		1					00:40		2	
		Noct	22:06		6						7	04:32		13	
		Myotis	01:45					1				01:45		1	
		Unsure	01:45					1				01:45		1	
Night of the 13/07/2015	21:26	Pip45	21:44	2	75	52	94	77	19	9	1	04:23	04:57	329	473
		Pip55	22:37		6	11	61	7	5	3		03:18		93	
		Pip45/55	22:28		19	3	1		4			02:37		27	
		Big bat	22:13		2							22:25		2	
		Noct	22:08		16	1					5	04:23		22	
Night of the 14/07/2015	21:25	Pip45	21:57	1	98	31						23:31	04:59	130	164
		Pip55	22:09		8	11						23:33		19	
		Pip45/55	22:32		3	7						22:25		10	
		Noct	22:03		3							22:33		3	
		Myotis	22:44		1	1						23:08		2	
Night of the 15/07/2015	21:24	Pip45											05:00	0	0
		Pip55												0	
		Noct												0	