A47 Blofield to North Burlingham Dualling

Scheme Number: TR010040

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APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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ENVIRONMENTAL STATEMENT APPENDICES
Appendix 8.3 2018 Bat survey report

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A47 Blofield to North Burlingham
Environmental Statement
Appendix 8.3
2018 Bat Survey Report

Date: September 2018

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1 Introduction

1.1 Background

1.1.1 In July 2017, WYG was commissioned by Amey to conduct bat surveys of the site known as A47 Blofield to North Burlingham and specifically with reference to the PCF Stage 3 preferred route option. WYG conducted surveys from July to October 2017, inclusive.

1.1.2 Sweco was commissioned to undertake further surveys at the site to add to the data obtained by WYG provide a full year's data set across spring, summer and autumn. The surveys carried out by Sweco largely followed the recommendations made in WYG's report (WYG, 2017). However, between the publication of the WYG report and the commencement of surveys by Sweco, the design of the Scheme had been amended.

1.2 The Scheme

1.2.1 The A47 from Blofield to North Burlingham, comprising a single carriageway is located approximately 9km to the east of Norwich and forms part of the main arterial highway route connecting Norwich and Great Yarmouth. The route currently experiences delays and high levels of congestion during peak hours. The situation is predicted to get worse with proposed growth in residential development.

1.2.2 It is proposed to upgrade the existing 2.6km section of single carriageway between Blofield and North Burlingham to dual carriageway. The new section of dual carriageway with junction improvements is proposed to be constructed to the south of the existing carriageway. This scheme will henceforth be referred to as the 'Proposed Scheme'.

1.2.3 The Proposed Scheme is considered to be a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008 and therefore requires a Development Consent Order (DCO), issued by the Secretary of State, before construction and operation can commence.

1.2.4 Subject to successfully passing through the DCO process, the key timescales for the Proposed Scheme are as follows:

- Start of construction work – 2020
- Open for traffic – 2021

1.3 Location

1.3.1 The Scheme encompasses a section of the A47, approximately 3.5km long, between OS grid reference TG 34222 09945 in the west and TG 37773 09907 in the east. The Scheme is located primarily amongst arable farmland, with some residential and light industrial developments to the north of the Scheme in North Burlingham.

1.4 Previous studies

1.4.1 Bat surveys were conducted at the site by WYG between July and October 2017, inclusive. This work comprised activity surveys, emergence/re-entry surveys of trees and buildings, static monitoring and bat roost potential assessments (WYG, 2017). The report issued by WYG can be found in Annex J.

1.5 Study area

1.5.1 The study area for trees and buildings that may support roosting bats was within 50m of the proposed works. For activity surveys the study area was widened up to 500m from the proposed works, to include areas of representative habitats within and adjacent to the site identified following PCF Stage 1 and 2 bat survey work and assessment of habitat suitability.

1.6 Scope of works

1.6.1 The following elements of work were included in the bat survey programme:

- Desktop study – a review of recent ecological surveys in the area.
- Field surveys – dusk and dawn activity surveys, emergence/re-entry surveys of trees and buildings, static monitoring and preliminary bat roost potential assessments.
- Ecological report – detailing the survey results, implications of the proposed scheme and recommendations.

1.7 Survey and report objectives

1.7.1 The main aim of dusk emergence and dawn re-entry bat surveys was to determine the presence/likely absence of roosting bats that would be impacted by the proposed development. If roosting bats are present, to:

- Identify the species and numbers of bats present.
- Where roosts are identified, to determine the type of roost (e.g. maternity roost, transitional roost, hibernation site, etc).

- Gain sufficient information to allow the potential impacts on bats of the proposed works to be assessed and for appropriate avoidance, mitigation and/or compensation measures to be designed.

1.7.2 The aim of the activity surveys is to gain information about bat activity, distribution and species composition across the site by sampling representative habitats including arable land, pasture land, hedgerows, grassland, woodland and built habitats (farm buildings, residential properties and churches). This information is then used to identify areas of high importance for foraging and commuting bats.

1.7.3 The aim of the automated surveys is to supplement the data obtained from the bat activity surveys. An average number of bat passes recorded per species was calculated per night to give an index of bat activity in the respective locations that the automated recorders were left. Raw data recorded provides data regarding bat species and number assemblages across the site.

1.7.5 The aim of the report presented is to:

- Outline the legislative protection afforded to bats (Annex I).
- Summarise the findings of the bat surveys and provide an assessment of the potential ecological constraints to the proposed works at the site.

2 Methodologies

2.1 Field surveys

2.1.1 The field surveys were designed with reference to Bat Surveys: Good Practice Guidelines 3rd Edition (Collins, 2016).

2.2 Preliminary bat roost assessments

2.2.1 All surveys followed methodologies outlined in Collins, (2016).

2.2.2 A daytime preliminary bat roost potential assessment was undertaken by Sweco on three buildings identified as being suitable to support bats within the current study area which had not been previously assessed by WYG. Hall Cottages was assessed on 04 May 2018, with NB01 and The Old College assessed on 12 June 2018. Locations of trees and buildings assessed by WYG and Sweco are provided in Annex B.

2.2.3 The preliminary assessments involved an external inspection of buildings with potential roosting features being inspected with a high-powered torch (Clulite CB2) and close focussing binoculars to search for evidence in places that could not be reached. Where safe access was provided, an interior inspection of buildings, including any roof voids, was also carried out.

2.2.4 All our British bat species will make use of buildings on occasion, but for some species, buildings are essential as roost sites. Different types of roost are used by bats throughout the year, and bat species may show preferences for certain types of locations. The broad categories of bat species according to roosting preferences adapted from Collins, (2016) are as follows:

- Crevice dwelling bat species (which tend to be hidden from view): common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, Nathusius' pipistrelle *Pipistrellus nathusii*, Brandt's bat *Myotis brandtii*, whiskered bat *Myotis mystacinus*, Alcathoe bat *Myotis Alcathoe* and Bechstein's bat *Myotis bechsteinii*.
- Roof-void dwelling bat species (that may or may not be visible on roof timbers): noctule *Nyctalus noctula*, serotine *Eptesicus serotinus*, Leisler's bat *Nyctalus leisleri*, Daubenton's bat *Myotis daubentonii* and Barbastelle *Barbastella barbastellus*.
- Bat species that need flight space in certain types of roost (that may or may not be visible on roof timbers): Natterer's bat *Myotis nattereri*, brown long-eared bat *Plecotus auritus* and grey long-eared bat *Plecotus austriacus*.

- Bat species that need flight space and flying access (and roost hanging freely in the open): greater and lesser horseshoe bats *Rhinolophus ferrumequinum* and *Rhinolophus hipposideros*.

2.2.5 The type of roost used may vary throughout the year. Roost types, as described in Collins, J. (2016) can be:

- Transitional/occasional Roost: Used by a few individuals or occasionally small groups for generally short periods of time on waking from hibernation or in the period prior to hibernation.
- Maternity Roost: Where female bats give birth and raise their young to independence.
- Satellite Roost: An alternative roost found in close proximity to the main nursery colony used by a few individual breeding females to small groups of breeding females throughout the breeding season.
- Mating: Sites Where mating takes place from late summer and can continue through the winter.
- Hibernation Roost: Where bats may be found individually or together during winter. They have a constant cool temperature and high humidity.
- Night Roost: A place where bats rest or shelter in the night but are rarely found in the day. May be used by a single individual on occasion or it could be used regularly by the whole colony.
- Day Roost: A place where individual bats, or small groups of males, rest or shelter in the day but are rarely found by night in the summer.
- Feeding Roost: A place where individual bats or a few individuals rest or feed during the night but are rarely present by day.
- Swarming sites: Where large numbers of males and females gather during late summer to autumn. Appear to be important mating sites.

2.2.6 During the preliminary assessment, features suitable for bats such as weatherboarding, hanging tiles, soffit boxes, gaps in brickwork, cracks and crevices, slipped or broken tiles, gaps around ridge tiles and lead flashing were noted. Any potential access points were identified and inspected for signs of bats such as:

- Bat droppings on the ground or stuck to walls.
- Suitable entry and exit points around eaves, soffits, flashing, under tiles or gaps in mortar.
- Live bats, bat corpses or skeletons.
- Oily marks (from fur) or localised clean spots around possible access points and roost areas.
- Lack of cobwebs along beams, roof timbers, or potential access points.
- Feeding remains (such as moth wings).

2.2.7 Buildings were assigned a roost potential of high, medium or low based on the features of the structure and its location. Table 2.2 - Categories of bat roost potential in buildings (taken from Collins, J. 2016) summarises the categories of bat roost potential in buildings.

Table 2.2: Categories of bat roost potential in buildings.

Suitability	Description
Negligible	Negligible habitat features on site likely to be used by roosting bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity of hibernation).
Moderate	A structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of conservation status, which is established after presence is confirmed).
High	A structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially longer periods of time due to their size, shelter, protection, conditions and surrounding habitats.

2.2.8 The trees on site were assessed for their potential to support roosting bats. Table 2.3 - Features of trees commonly used by bats for roosting or shelter (taken from Collins, J. 2016) summarises the features of trees that are commonly used by bats for roosting and shelter.

Table 2.3: Features of trees commonly used by bats for roosting or shelter

Features of Trees Used as Bat Roosts	Signs Indicating Possible Use by Bats
Natural/rot holes Woodpecker holes Cracks/splits in major limbs Knot holes caused naturally or by pruning Man-made holes Hazard beams Cankers Double-leaders forming forks Gaps between overlapping branches Loose/platey bark Hollows/cavities Dense epicormics growth (bats may roost within it) Bird, dormouse and bat boxes Partially detached ivy with stem diameters over 50mm	Tiny scratches around entry point Staining around entry point Bat droppings in, around or below entrance Audible squeaking at dusk or in warm weather Flies around entry point Distinctive smell of bats Smoothing of surfaces around cavity

2.2.9 Trees were assigned to categories following the inspection. Table 2.4 - Categories of bat roost potential in trees (taken from Collins, J. 2016) summarises the categories used to define tree roost potential.

Table 2.4: Categories of bat roost potential in trees.

Tree Category	Description
High	Trees with multiple highly suitable features capable of supporting larger roosts.
Moderate	Trees with definite bat potential, supporting fewer suitable features or with potential for use by single bats.
Low	Trees with no obvious potential, although the tree is of a size and age that elevated surveys may result in cracks or crevices being found; or the tree supports some features which may have limited potential to support bats.
Negligible	Trees with no potential to support bats.

2.3 Aerial bat roost potential assessments

2.3.1 Aerial bat roost potential assessments are used to better assess potential roost features (PRFs) in trees which have been identified from a ground level assessment. An aerial bat roost potential assessment was conducted by Sweco on 18 July 2018 on trees that were suitable and safe to climb. A climber uses ropes and harness to access the tree canopy. Once accessed, features are examined in detail using a bright torch, endoscope or mirror to inspect (where possible) the full extent of the features and search for bats or evidence of bat activity (e.g. droppings, urine stains, odour, feeding remains, scratch marks, grease stains, wear marks). Where necessary, trees were re-categorised following the aerial inspection (Table 2.4).

2.4 Activity surveys

2.4.1 Different bat species have different foraging methods and species specific preferred foraging habitats, summarised in Table 2.1 - The foraging habitat preferences of different UK bat species below (adapted from Collins, J. 2016).

Table 2.1: The foraging habitat preferences of different UK bat species.

Species	Foraging habitat preferences
Lesser horseshoe	Broadleaved woodland well connected by commuting routes such as hedges, woodland edge and riparian trees. Also recorded in coniferous woodland. Probably reluctant to cross open space.
Greater horseshoe	Ancient semi natural and deciduous woodland and cattle-grazed pastures. Probably reluctant to cross open space.
Daubenton's bat	Over water, favouring riverine habitats, but also known to forage in woodland.

Whiskered/Brandt's bat	Mixed woodland and riparian vegetation as core foraging habitat, with arable and rough grassland habitats also utilised. Whiskered bats select pasture with hedgerow, areas near rivers and more open habitats with hedges and more open habitats, whereas Brandt's bat favours woodland.
Natterer's bat	Semi natural broadleaved woodland, tree-lined river corridors and ponds. Also utilises mixed agricultural areas and grassland. Avoids coniferous plantation woodland.
Bechstein's bat	Ancient broadleaved woodland with a strong association with oak and ash. Also known to utilise mixed-age coppice, high forest with little understorey and unimproved grassland.
Noctule	Forages out in the open, often over trees, and with a strong affinity with water. Reported as selecting broadleaved woodland and pasture.
Leisler's bat	Woodland edge, scrub or woodland-lined roads and over pasture. Recorded as selecting parkland/amenity grassland, deciduous woodland edge and rivers/canals but avoiding improved grassland.
Common pipistrelle	Shows preference for deciduous woodland but is a generalist utilising a wide range of habitats.
Soprano pipistrelle	Selects riparian habitats over other available habitat types.
Nathusius' pipistrelle	Riparian habitats, broadleaved and mixed woodland and parkland, occasionally found in farmland but always near water. Found over lakes and rivers and lake-edge habitats.
Serotine	Cattle pasture, playing fields, village greens, white streetlights, tree-lined hedgerows and woodland edge.
Barbastelle	Forages over/in riparian zones, broadleaved woodland, unimproved grassland and field margins. Also, been recorded at an irrigation reservoir, ponds in woodlands, areas of set-aside, floodplain habitats, a sewage farm and a pumping station.
Brown long-eared	Strongly associated with tree cover, prefers woodland with cluttered understorey containing native species, particularly deciduous. Also forages in woodland edge and among conifers. Use of hedgerows increases through the active season.
Grey long-eared	Prefers more open or edge habitats, including unimproved lowland grassland (meadows and marshes), wooded riparian vegetation and broadleaved woodland. Forages along field margins, hedgerows and scattered trees in agricultural habitats.

2.4.2 Activity surveys were undertaken by WYG in July, August, September and October 2017 on the basis of the site having moderate quality habitat, as directed by Amey following PCF Stage 1 and 2 bat survey work and assessment of habitat suitability. Transect routes were designed to encompass the different range of habitats within the site, with those habitats determined to have moderate to high potential for bat use being the main focus of the transects.

2.4.3 The transect route locations are provided in Annex C.

2.4.4 Twenty-four (24) activity surveys were conducted by Sweco across six (6) transects in April, May and June 2018. Each transect followed the same route as the WYG transects and was subject to one survey visit per month, with one of those visits comprising both dusk and pre-dawn surveys. This was in accordance with Collins, (2016) guidelines for activity surveys on moderate quality habitat (one survey each month between April and October with one of those comprising a dusk and pre-dawn within a 24 hour period) and to complete a full survey season of activity surveys that was started by WYG in July 2017.

2.4.5 Two surveyors walked each transect route for health and safety reasons. They were equipped with a full spectrum bat detector (Anabat Walkabout) to aid detection of bats and made notes of the times and locations of bat calls and any bat activity that had been seen or heard (commuting, foraging or social calls). The locations of the origins of the bat calls were plotted on a map. Bat calls were recorded in full spectrum format using the Anabat Walkabout detector for later analysis using Anabat Insight analysis software. Surveyors walked at a constant speed along the transect line, stopping at predetermined listening points per transect for at least three minutes, to record bat activity and enable comparisons of bat activity levels throughout the site. The recordings and the field notes were used to help build a picture of bat use across the site and to identify areas of relatively higher use.

2.5 Automated surveys

2.5.1 With reference to Collins (2016), automatic bat detectors (Song Meter 2 and Anabat Swift) were left at twelve (12) locations across the site, i.e. two (2) locations per activity transect route, for five (5) consecutive nights during April, May and June 2018 in the same locations as were used by WYG in 2017.

2.5.2 The locations of the automated recorders were in positions away from disturbance from the public and secured to trees (Annex D). The detectors were set to record from 30 minutes before sunset until 30 minutes after dawn.

2.5.3 Recorded data were analysed using BatSound4 software for the Song Meter 2 and Anabat Insight for the Swifts.

2.6 Dusk emergence and dawn re-entry surveys

2.6.1 Dusk emergence and dawn re-entry surveys are used to determine the presence or likely absence of bat roosts in buildings or features when the preliminary roost assessment cannot reasonably rule out the presence of roosting bats. They are also used to identify the type of roost (see section 2.2.5) where a known roost is present. They can only be completed in the season when bats are most active (May to September with optimum bat activity between June and August).

2.6.2 Dusk emergence and dawn re-entry survey effort is dictated by the category of bat roost potential assigned to a structure or tree during the preliminary bat roost potential assessment (see tables 2.2 and 2.4).

2.6.3 Table 2.5 Recommended minimum number of survey visits for presence/likely absence surveys (taken from Collins, J. 2016) summarises the survey effort required for structures to give confidence in a negative result.

Table 2.5: Recommended minimum number of survey visits for presence/absence surveys.

Low roost suitability	Moderate roost suitability	High roost suitability
One survey visit. One dusk emergence or dawn re-entry survey (structures). No further surveys required (trees).	Two separate survey visits. One dusk emergence and a seperate dawn re-entry survey.	Three separate survey visits. At least one dusk emergence and a seperate dawn re-entry survey. The third visit could be either dusk or dawn.

2.6.4 One bat emergence/return survey was completed by WYG in 2017 for all trees and buildings identified as having low/moderate or higher suitability for roosting bats. The surveys conducted by Sweco in 2018 added to these surveys to ensure that each was given the recommended survey effort as specified in Table 2.5. The three buildings additionally assessed by Sweco in 2018 were also subject to presence/likely absence surveys. Three other buildings, (St Peter's Church, St Peter's Church ruin and St Andrew's Church) were scoped out from further survey as they were outside of the study area once the route option had been chosen (approximately 850m, 150m and 150m from the Scheme boundary respectively).

2.6.5 Notes were made on the times of bat calls and any bat activity seen or heard (commuting, foraging, roosting or social calls). Bat calls were simultaneously monitored and recorded using Titley Scientific Anabat Walkabout and Wildlife Acoustics EM3+ detectors. Recorded data were used to verify the survey notes and for analysis, using Analook Insight (for the Walkabout) and BatSound4 (for the EM3+) software, of the following information:

- Time and species of first and last bat call.
- Location of bats/proximity to the buildings.

- Number and species of bats present (where identification is possible).
- Number of bats recorded entering/exiting the buildings.
- Bat activity levels (foraging, commuting, social calls).
- Any bat calls recorded that were not identified on field notes.

2.6.1 All surveys were led by Diane Wood (Principal Ecologist, Sweco) who holds a level 2 Natural England bat class licence (registration number 2015-13155-CLS-CLS) or Adam West (Consultant Ecologist, Sweco) who holds a level 2 Natural England bat class licence (registration number 2016-24724-CLS-CLS) and assisted by Chelsea Edwards (Senior Ecologist, Sweco) who holds a level 2 Natural England bat class licence 2018-33927-CLS-CLS, Mike Youdale (Consultant Ecologist, Sweco), Ishbel Campbell (Consultant Ecologist, Sweco) Beth Mell (Graduate Ecologist, Sweco) Joss Wilson (Graduate Consultant, Sweco) and Harry Jarvis (Intern, Sweco).

2.7 Survey limitations

2.7.1 The comprehensiveness of any ecological assessment will be limited by the season in which surveys are undertaken. To determine presence or likely absence of a protected species and their status (i.e. the number of individuals present) usually requires multiple visits at suitable times of the year. The survey conditions and timings were suitable for surveying bats and therefore are not considered to be a limitation to the effectiveness of the surveys.

2.7.2 During the dusk activity survey of Transect Three on 16 April 2018 the surveyors experienced battery failure on their bat detector. However, the failure occurred approximately 150m from the end of the transect. This is not considered a limitation on the validity of this survey as it was almost complete and the transect route was surveyed a further twice in the following months.

2.7.3 During the dawn re-entry survey of Poplar Farm Location A on 20 June 2018 the surveyors experienced an unexpected shut down of their bat detector at 03:58, 33 minutes before sunrise. It was light enough to continue the survey observing bats visually. The purpose of the survey was to observe bats entering the building. This was not compromised by the lack of a detector, so the results of this survey are considered valid.

2.7.4 During the dusk emergence survey of Poplar Farm Location J on 31 July 2018 the surveyor experienced battery failure on their bat detector at 22:15, 7 minutes before the survey was scheduled to end. This was late enough that any emerging bats would have been detected, therefore the battery failure is not considered to have invalidated this survey's results.

2.7.5 The survey at T60 on 07 August 2018 was ended prematurely, 48 minutes after it had begun, due to rain. This survey was repeated in full on 09 August 2018.

2.7.6 During the dawn re-entry survey of Hall Cottages Location C on 03 August 2018. the surveyor experienced technical difficulties which rendered their bat detector unusable. Bat calls were not recorded but the purpose of this survey was to observe any bats which may enter roosts in the building for roosts. It was light enough to observe the species of bats which would be expected to roost in the type of structure being surveyed at the time they would typically enter roosts. Therefore, this survey was considered valid.

2.7.7 The automated surveys conducted at Location 4 (see Annex D – Static detector locations) in April and May 2018 detected a large amount of background noise. As a result, it was not possible to identify species in some recordings of bat calls, as some of the diagnostic characteristics were obscured by the noise in the recording.

2.7.8 The static detectors deployed in locations 2, 5, 7, 11 and 12 did not record any data in April.

2.7.9 The static detectors deployed in locations 7 and 8 did not record any data in May. The detector deployed at location 9 only recorded data for two nights. On the second night, 02 May 2018, the detector was overwhelmed by background noise and no bat calls were discernible in the recordings.

2.7.10 The static detector deployed in location 6 did not record any data in June.

2.7.11 The details of this report will remain valid until September 2020. Beyond this period, if the proposed works have not commenced, it is recommended that a new review of the ecological conditions is undertaken.

3 Results

3.1.1 Table 3.1 presents the full results of the preliminary bat roost potential assessments of the buildings and Table 3.2 categorises the results.

Table 3.1: Description of buildings and bat roost potential

Building Name	General External Description	Internal Description	Potential Roosting Features	Building Photograph
NB01	A two storey residential building. The building is of modern design, constructed from brick with pitched, gable-ended roof. The roof is covered with pan tiles. There is a conservatory attached to the eastern gable and a single storey extension on the western gable. Building is in good condition and in use as a dewlling. A single storey double garage, of similar construction to the house, but with weather boarding on the upper portion of the gable ends, was located approximately 5m to the south west of the house.	No internal access was gained at the time of the survey. Therefore an internal assessment and survey for evidence of roosting bats could not be undertaken.	Gaps under pan tiles on northern and southern elevations.	

Hall Cottages	A two storey residential building. The building is two conjoined traditional cottages, constructed from brick with pitched, gable-ended roof. The roof is covered with pan tiles. There is a single storey double garage, of more recent construction than the house, attached to the eastern gable via a single storey extension. There are two small, single storey outbuildings to the west of the cottages. The smaller of the two outbuildings has a pitched, gable-ended roof covered with pan tiles.	No internal access was gained at the time of the survey. Therefore an internal assessment and survey for evidence of roosting bats could not be undertaken.	Access under pan tiles on north and south elevations of cottages and all elevations of the garage. Access under fascia at south west corner of the main building. Access into soffit on south elevation of the main building. Gaps under tiles and fascia on the smaller of the two outbuildings	

The Old College	The Old College is a complex containing eight buildings used for light industrial and commercial trading, of varying ages and constructions. The majority of buildings are recently constructed of brick with sheet metal roofs. One two storey building (B6) was constructed of weather boards attached to a frame and featured a pitched gable ended roof with slate tiles. This building had a single storey extension to the north and south, both with flat roofs. The complex is illuminated at night with high powered security lighting.	No internal access was gained at the time of the survey. Therefore, an internal assessment and survey for evidence of roosting bats could not be undertaken.	One raised tile recorded on tiled roof of B6. Gaps under fascia boards and corners of soffits on western gable of B6. Gaps under fascia boards on eastern gable. Gap in fascia board on the southern extension of B6.	 

Table 3.2: Categories of bat roost potential in buildings

Building	Bat Roost Potential
NB01	Low
Hall Cottages	Moderate
The Old College (B6)	Low

3.1.1 Buildings assessed as having low bat roost potential require one dusk emergence survey. Buildings assessed as having moderate bat roost potential require one dawn re-entry survey and dusk emergence survey on separate days.

3.1.2 During a survey for barn owl *Tyto alba* undertaken by Sweco in July 2018, an internal inspection was conducted of the large, thatched barn at Poplar Farm. This inspection did not locate any individual bats but found abundant feeding remains and droppings consistent with use of the building by roosting bats, which were not identified to species level. Incidentally, during this survey a bat roost was discovered in a building at Church Farm, Main Road, North Burlingham. The roost was outside of the study area and would not be disturbed by the Scheme. The location of the roost is provided in Annex F.

3.2 Aerial bat roost potential assessments

3.2.1 T11, T57, T58, T67, T82 and T87 (Annex B) were identified in a ground level assessment by WYG (2017) as having features which may potentially be used by roosting bats. These trees were climbed on 18 July 2018, and the features inspected. Upon closer inspection, none of the features identified from the ground proved suitable as bat roosts.

3.3 Field surveys

Weather conditions during surveys

3.3.1 The weather conditions recorded during each activity survey are summarised in Table 3.3.

Table 3.3: Weather Conditions during each activity survey

Date and Time	Sunset/sunrise time	Weather conditions	Surveyors
16/04/18 19:55-21:48	19:55	Rain: none Cloud cover: 10% Wind (Beaufort): 0 Temperature: 12°C	Adam West Beth Mell

Date and Time	Sunset/sunrise time	Weather conditions	Surveyors
17/04/18 03:50-05:43	05:53	Rain: none Cloud cover: 30% Wind (Beaufort): 1 Temperature: 9°C	Adam West Beth Mell
17/04/18 19:55-22:05	19:57	Rain: none Cloud cover: 10% Wind (Beaufort): 1 Temperature: 16°C	Adam West Beth Mell
18/04/18 03:49-05:48	05:51	Rain: none Cloud cover: 10% Wind (Beaufort): 0 Temperature: 12°C	Adam West Beth Mell
18/04/18 20:02-21:40	19:59	Rain: none Cloud cover: 5% Wind (Beaufort): 1 Temperature: 18°C	Adam West Beth Mell
25/04/18 20:00-22:10	20:11	Rain: none Cloud cover: 30% Wind (Beaufort): 2 Temperature: 12°C	Mike Youdale Chelsea Edwards
25/04/18 20:05-21:45	20:11	Rain: none Cloud cover: 30% Wind (Beaufort): 2 Temperature: 12°C	Diane Wood Ishbel Campbell
26/04/18 20:05-21:35	20:12	Rain: none Cloud cover: 20% Wind (Beaufort): 1 Temperature: 10°C	Diane Wood Ishbel Campbell
08/05/18 20:25-21:53	20:33	Rain: none Cloud cover: 100% Wind (Beaufort): 0 Temperature: 20°C	Diane Wood Beth Mell
09/05/18 20:20-22:00	20:35	Rain: none Cloud cover: 50% Wind (Beaufort): 0 Temperature: 14°C	Diane Wood Beth Mell
10/05/18 20:14-22:06	20:36	Rain: none Cloud cover: 65% Wind (Beaufort): 0 Temperature: 13°C	Diane Wood Beth Mell

3.3.2 The weather conditions recorded during each emergence/re-entry survey are summarised in Table 3.4.

Table 3.4: Weather Conditions during each emergence/re-entry survey

Date and Time	Sunset/sunrise time	Weather conditions	Surveyors
19/04/18 04:20-05:52	05:51	Rain: none Cloud cover: 0% Wind (Beaufort): 0 Temperature: 12°C	Adam West Beth Mell
26/04/18 04:00-05:33	05:33	Rain: none Cloud cover: 0% Wind (Beaufort): 1 Temperature: 8°C	Diane Wood Ishbel Campbell Chelsea Edwards Mike Youdale
26/04/18 20:00-21:50	20:13	Rain: none Cloud cover: 20% Wind (Beaufort): 1 Temperature: 15°C	Chelsea Edwards Mike Youdale
09/05/18 03:50-05:08	05:08	Rain: none Cloud cover:5% Wind (Beaufort): 0 Temperature: 11°C	Diane Wood Beth Mell
10/05/18 04:00-05:10	05:08	Rain: none Cloud cover: 100% Wind (Beaufort): 0 Temperature: 11°C	Diane Wood Beth Mell
11/05/18 03:55-05:09	05:07	Rain: none Cloud cover: 100% Wind (Beaufort): 2 Temperature: 10°C	Diane Wood Beth Mell
17/05/18 20:39-22:19	20:48	Rain: none Cloud cover: 90% Wind (Beaufort): 2 Temperature: 10°C	Diane Wood Adam West Ishbel Campbell Beth Mell
18/05/18 03:27-04:54	04:54	Rain: none Cloud cover: 100% Wind (Beaufort): 2 Temperature: 6°C	Diane Wood Adam West Ishbel Campbell Beth Mell
06/06/18 21:00-22:45	21:19	Rain: none Cloud cover: 10% Wind (Beaufort): 1 Temperature: 14°C	Diane Wood Adam West Ishbel Campbell Beth Mell
07/06/18 02:52-04:33	04:33	Rain: none Cloud cover: 0% Wind (Beaufort): 1 Temperature: 11°C	Diane Wood Ishbel Campbell Beth Mell
13/06/18	21:19	Rain: none	Adam West

Date and Time	Sunset/sunrise time	Weather conditions	Surveyors
21:05-22:49		Cloud cover: 100% Wind (Beaufort): 2 Temperature: 17°C	Joss Wilson Ishbel Campbell Beth Mell
14/06/18 02:54-04:31	04:31	Rain: none Cloud cover: 0% Wind (Beaufort): 0 Temperature: 8°C	Adam West Joss Wilson Ishbel Campbell Beth Mell
18/06/18 21:17-22:48	21:22	Rain: none Cloud cover: 30% Wind (Beaufort): 2-3 Temperature: 20°C	Adam West Beth Mell
19/06/18 02:51-04:46	04:36	Rain: none Cloud cover: 100% Wind (Beaufort): 1 Temperature: 17°C	Adam West Beth Mell Harry Jarvis
19/06/18 21:12-22:52	21:22	Rain: none Cloud cover: 60% Wind (Beaufort): 1 Temperature: 23°C	Adam West Ishbel Campbell Beth Mell Harry Jarvis
20/06/18 02:51-04:31	04:31	Rain: none Cloud cover: 0% Wind (Beaufort): 0 Temperature: 17°C	Adam West Ishbel Campbell Beth Mell
20/06/18 21:05-22:51	21:21	Rain: none Cloud cover: 95% Wind (Beaufort): 1 Temperature: 17°C	Adam West Ishbel Campbell Beth Mell Harry Jarvis
21/06/18 02:56-04:30	04:30	Rain: none Cloud cover: 100% Wind (Beaufort): 2 Temperature: 13°C	Adam West Ishbel Campbell Beth Mell Harry Jarvis
05/07/18 20:50-22:36	21:19	Rain: none Cloud cover: 0% Wind (Beaufort): 0 Temperature: 21°C	Diane Wood Ishbel Campbell Beth Mell
17/07/18 20:48-22:39	21:09	Rain: none Cloud cover: 0% Wind (Beaufort): 0 Temperature: 22°C	Adam West Ishbel Campbell Harry Jarvis
18/07/18 03:22-04:55	04:53	Rain: none Cloud cover: 70%	Ishbel Campbell Harry Jarvis

Date and Time	Sunset/sunrise time	Weather conditions	Surveyors
		Wind (Beaufort): 1 Temperature: 16°C	
18/07/18 20:42-22:41	21:08	Rain: none Cloud cover: 70% Wind (Beaufort): 0 Temperature: 19°C	Ishbel Campbell Harry Jarvis
19/07/18 03:29-04:55	04:55	Rain: none Cloud cover: 40% Wind (Beaufort): 0 Temperature: 13°C	Ishbel Campbell Harry Jarvis
19/07/18 20:52-22:37	21:07	Rain: none Cloud cover: 10% Wind (Beaufort): 1 Temperature: 18°C	Adam West Ishbel Campbell Harry Jarvis
20/07/18 03:37-04:56	04:56	Rain: none Cloud cover: 0% Wind (Beaufort): 0 Temperature: 12°C	Adam West Ishbel Campbell Harry Jarvis
31/07/18 20:46-22:22	20:50	Rain: none Cloud cover: 10% Wind (Beaufort): 1 Temperature: 18°C	Diane Wood Adam West Ishbel Campbell Beth Mell
01/08/18 03:49-05:16	05:15	Rain: none Cloud cover: 5% Wind (Beaufort): 0 Temperature: 14°C	Diane Wood Adam West Ishbel Campbell Beth Mell
01/08/18 20:34-22:11	20:47	Rain: none Cloud cover: 95% Wind (Beaufort): 0 Temperature: 21°C	Diane Wood Adam West Ishbel Campbell Beth Mell
02/08/18 03:45-05:15	05:15	Rain: none Cloud cover: 70% Wind (Beaufort): 0 Temperature: 14°C	Diane Wood Adam West Ishbel Campbell Beth Mell
02/08/18 20:45-22:14	20:46	Rain: none Cloud cover: 0% Wind (Beaufort): 0 Temperature: 25°C	Diane Wood Adam West Ishbel Campbell Beth Mell
03/08/18 03:51-05:17	05:17	Rain: none Cloud cover: 0% Wind (Beaufort): 0	Diane Wood Adam West Ishbel Campbell

Date and Time	Sunset/sunrise time	Weather conditions	Surveyors
		Temperature: 17°C	Beth Mell
07/08/18 20:24-21:16	20:37	Rain: survey ended prematurely due to rain Cloud cover: 100% Wind (Beaufort): 0 Temperature: 26°C	Ishbel Campbell Beth Mell
08/08/18 20:20-22:05	20:35	Rain: none Cloud cover: 20% Wind (Beaufort): 0 Temperature: 21°C	Ishbel Campbell Beth Mell
09/08/18 03:57-05:27	05:27	Rain: none Cloud cover: 100% Wind (Beaufort): 0 Temperature: 17°C	Ishbel Campbell Beth Mell
09/08/18 20:18-22:03	20:33	Rain: light rain until 21:00 Cloud cover: 100% Wind (Beaufort): 0 Temperature: 13°C	Ishbel Campbell Beth Mell
10/08/18 04:00-05:28	05:28	Rain: none Cloud cover: 100% Wind (Beaufort): 0 Temperature: 13°C	Ishbel Campbell Beth Mell
26/09/18 18:26-20:02	18:44	Rain: none Cloud cover: 5% Wind (Beaufort): 0 Temperature: 21°C	Adam West Beth Mell

3.4 Field survey results

Activity surveys

3.4.1 The results of each survey are summarised below. Full results with locations of bats recorded and commuting routes are presented in Annex E.

16/04/18 Dusk activity survey - Transect Three

3.4.2 Thirteen (13) detections of bats were recorded during the survey. The first detection was made at 20:29, 19 minutes after sunset. Four (4) species were recorded: barbastelle, Leisler's bat, common pipistrelle and soprano pipistrelle. Commuting and foraging behaviour was recorded. Social calls were also detected.

17/04/18 Dawn activity survey - Transect Three

3.4.3 Two (2) detections of bats were recorded during the survey. The first detection was made at 04:57, 56 minutes before sunrise. One (1) species only was positively identified: common pipistrelle. One (1) bat was observed but not detected by the recording equipment, making species identification impossible. Commuting and foraging behaviour was recorded.

17/04/18 Dusk activity survey - Transect Two

3.4.4 Eight (8) detections of bats were recorded during the survey. The first detection was made at 20:16, 19 minutes after sunset. Three (3) species were recorded: common pipistrelle, soprano pipistrelle and Nathusius' pipistrelle. Commuting and foraging behaviour was recorded.

18/04/18 Dawn activity survey - Transect Two

3.4.5 No bats were detected during this survey.

18/04/18 Dusk activity survey - Transect One

3.4.6 Three (3) detections of bats were recorded during the survey. The first detection was made at 20:37, 56 minutes after sunset. Two (2) species were recorded: soprano pipistrelle and common pipistrelle. Commuting and foraging behaviour was recorded.

25/04/18 Dusk activity survey - Transect Five

3.4.7 No bats were detected during this survey.

25/04/18 Dusk activity survey - Transect Six

3.4.8 Nine (9) detections of bats were recorded during the survey. The first detection was made at 20:57, 46 minutes after sunset. One (1) species only was recorded: common pipistrelle. Commuting and foraging behaviour was recorded. Social calls were also detected.

26/04/18 Dusk activity survey Transect Four

3.4.9 Six (6) detections of bats were recorded during the survey. The first detection was made at 20:35, 23 minutes after sunset. Two (2) species were recorded: common pipistrelle and soprano pipistrelle. Commuting and foraging behaviour was recorded.

08/05/18 Dusk activity survey Transect One

3.4.10 No bats were detected during this survey.

09/05/18 Dusk activity survey Transect Two

3.4.11 Five (5) detections of bats were recorded during the survey. The first detection was made at 20:50, 15 minutes after sunset. Two (3) species were recorded: common pipistrelle and noctule. Commuting and foraging behaviour was recorded.

10/05/18 Dusk activity survey Transect Three

3.4.12 Five (5) detections of bats were recorded during the survey. The first detection was made at 21:11, 55 minutes after sunset. Three (3) species were recorded: common pipistrelle, soprano pipistrelle and an unidentified species of the genus *Myotis*. Commuting and foraging behaviour was recorded.

23/05/18 Dusk activity survey - Transect Four

3.4.13 Sixteen (16) detections of bats were recorded during the survey. The first detection was made at 21:05, 8 minutes after sunset. Three (3) species were recorded: noctule, common pipistrelle and soprano pipistrelle. Commuting and foraging behaviour was recorded.

24/05/18 Dawn activity survey - Transect Four

3.4.14 Eighteen (18) detections of bats were recorded during the survey. The first detection was made at 03:17, 1 hour and 29 minutes before sunrise. Three (3) species were positively identified: noctule, common pipistrelle and soprano pipistrelle. One (1) bat of the genus Nyctalus was recorded but could not be identified to species level. Commuting and foraging behaviour was recorded.

24/05/18 Dusk activity survey - Transect Five

3.4.15 Four (4) detections of bats were recorded during the survey. The first detection was made at 22:01, 1 hour and 4 minutes after sunset. Two (2) species were recorded: common and soprano pipistrelle. Commuting behaviour only was recorded.

24/05/18 Dusk activity survey - Transect Six

3.4.16 Six (6) detections of bats were recorded during the survey. The first detection was made at 20:57, 46 minutes after sunset. One (1) species only was recorded: common pipistrelle. Commuting and foraging behaviour was recorded.

29/05/18 Dusk activity survey - Transect Six

3.4.17 Four (4) detections of bats were recorded during the survey. The first detection was made at 21:36, 31 minutes after sunset. Two (2) species were recorded: common and soprano pipistrelle. Commuting and foraging behaviour was recorded.

04/06/18 Dusk activity survey - Transect One

3.4.18 Twelve (12) detections of bats were recorded during the survey. The first detection was made at 21:30, 18 minutes after sunset. Four (4) species were recorded: noctule, serotine, common pipistrelle and soprano pipistrelle. Commuting and foraging behaviour was recorded.

05/06/18 Dawn activity survey - Transect One

3.4.19 Four (4) detections of bats were recorded during the survey. The first detection was made at 02:45, 1 hour and 50 minutes before sunrise. One (1) species only was recorded: common pipistrelle. Commuting and foraging behaviour was recorded.

05/06/18 Dusk activity survey - Transect Five

3.4.20 Ten (10) detections of bats were recorded during the survey. The first detection was made at 21:48, 35 minutes after sunset. Two (2) species were positively identified: common and soprano pipistrelle. A single bat of the genus *Pipistrellus* was recorded but could not be identified to species level. A single bat of the genus *Nyctalus* was recorded but could not be identified to species level. Commuting and foraging behaviour was recorded.

06/06/18 Dawn activity survey - Transect Five

3.4.21 Ten (10) detections of bats were recorded during the survey. The first detection was made at 02:57, 1 hour and 37 minutes before sunrise. Two (2) species were positively identified: common and soprano pipistrelle. A single bat of the genus *Pipistrellus* was recorded but could not be identified to species level. Commuting and foraging behaviour was recorded.

07/06/18 Dusk activity survey - Transect Two

3.4.22 Three (3) detections of bats were recorded during the survey. The first detection was made at 22:11, 56 minutes after sunset. One (1) species was positively identified: common pipistrelle. A single bat of unidentified species, not detected by the bat detector, was also observed. Commuting and foraging behaviour was recorded.

11/06/18 Dusk activity survey - Transect Six

3.4.23 Fifteen (15) detections of bats were recorded during the survey. The first detection was made at 21:54, 36 minutes after sunset. Two (2) species were positively identified: common and soprano pipistrelle. Two bats of the genus *Pipistrellus* were recorded but could not be identified to species level. Commuting and foraging behaviour was recorded.

12/06/18 Dawn activity survey - Transect Six

3.4.24 Nineteen (19) detections of bats were recorded during the survey. The first detection was made at 02:31, 2 hours before sunrise. Three (3) species were positively identified: noctule, common pipistrelle and soprano pipistrelle. A single bat of the genus *Pipistrellus* was recorded but could not be identified to species level. Commuting and foraging behaviour was recorded.

12/06/18 Dusk activity survey - Transect Four

3.4.25 Twenty-one (21) detections of bats were recorded during the survey. The first detection was made at 21:44, 26 minutes after sunset. Four (4) species were positively identified: barbastelle, noctule, common pipistrelle and soprano pipistrelle. Commuting and foraging behaviour was recorded.

12/06/18 Dusk activity survey - Transect Four

3.4.26 Nineteen (19) detections of bats were recorded during the survey. The first detection was made at 21:33, 15 minutes after sunset. Five (5) species were positively identified: Leisler's bat, serotine, noctule, common pipistrelle and soprano pipistrelle. Commuting and foraging behaviour was recorded.

Emergence/re-entry surveys

3.4.27 The results of each survey are summarised below. Full results are presented in Annex E.

19/04/18 Dawn re-entry survey NT12

3.4.28 The last bat was noted at 05:20, thirty-one (31) minutes before sunrise. A total of nine (9) bat passes were recorded. Commuting behaviour only was observed. Two (2) species were identified in this survey: common and soprano pipistrelle.

19/04/18 Dawn re-entry survey T80 & 81

3.4.29 The last bat was noted at 05:12, thirty-nine (39) minutes before sunrise. A total of two (2) bat passes were recorded. Commuting behaviour only was observed. Two (2) species were identified in this survey: common and soprano pipistrelle.

26/04/18 Dawn re-entry survey NT09

3.4.30 No bats were detected during this survey.

26/04/18 Dawn re-entry survey T57 & 58

3.4.31 No bats were detected during this survey.

26/04/18 Dawn re-entry survey T84 & 85

3.4.32 No bats were detected during this survey.

26/04/18 Dusk emergence survey T88

3.4.33 The first bat was noted at 20:47, thirty-four (34) minutes after sunset. A total of two (2) bat passes were recorded, with the final bat detected at 21:01. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: common and soprano pipistrelle.

26/04/18 Dusk emergence survey T89

3.4.34 The first bat was noted at 21:09, fifty-six (56) minutes after sunset. A total of three (3) bat passes were recorded, with the final bat detected at 21:31. Commuting behaviour only was observed. Two (2) species were identified in this survey: common pipistrelle and an unidentified *Pipistrellus* species.

09/05/18 Dawn re-entry survey T43 & 44

3.4.35 The last bat was noted at 04:22, forty-six (46) minutes before sunrise. A total of four (4) bat passes were recorded. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: common pipistrelle and an unidentified *Pipistrellus* species.

09/05/18 Dawn re-entry survey T45

3.4.36 The last bat was noted at 04:32, thirty-six (36) minutes before sunrise. A total of seven (7) bat passes were recorded. Commuting and foraging behaviour was observed, although it was possible that roosting may have been observed but this could not be confirmed. Two (2) species were identified in this survey: common and soprano pipistrelle.

10/05/18 Dawn re-entry survey T75

3.4.37 No bats were detected during this survey.

10/05/18 Dawn re-entry survey T77 & 78

3.4.38 The only recorded bat was noted at 04:14, thirty-six (36) minutes before sunrise. A total of seven (7) bat passes were recorded. Commuting behaviour only was observed. One (1) species was identified in this survey: soprano pipistrelle.

10/05/18 Dawn re-entry survey T50 & 51

3.4.39 The only recorded bat was noted at 03:57-59, one (1) hour and two (2) minutes before sunrise. A total of one (1) bat pass was recorded. Foraging behaviour only was observed. One (1) species was identified in this survey: noctule.

10/05/18 Dawn re-entry survey T75

3.4.40 No bats were detected during this survey.

11/05/18 Dawn re-entry survey T50 & 51

3.4.41 The last bat was noted at 04:17, fifty (50) minutes before sunrise. A total of three (3) bat passes were recorded. Commuting and foraging behaviour was observed, although it was possible that roosting may have been observed but this could not be confirmed. One (1) species was identified in this survey: common pipistrelle.

11/05/18 Dawn re-entry survey T90 & 91

3.4.42 No bats were detected during this survey.

17/05/18 Dusk emergence survey Poplar Farm Location B

3.4.43 The first bat was noted at 21:15, twenty-seven (27) minutes after sunset. A total of ten (10) bat passes were recorded, with the final bat detected at 22:08. Commuting and foraging behaviour was observed. One (1) species was identified in this survey: common pipistrelle.

17/05/18 Dusk emergence survey Poplar Farm Location B

3.4.44 The first bat was noted at 21:15, twenty-seven (27) minutes after sunset. A total of ten (10) bat passes were recorded, with the final bat detected at 22:17. Commuting behaviour only was observed. Two (2) species were identified in this survey: noctule and common pipistrelle.

17/05/18 Dusk emergence survey Poplar Farm Location C

3.4.45 No bats were detected during this survey.

17/05/18 Dusk emergence survey Poplar Farm Location D

3.4.46 The first bat was noted at 21:29, forty-one (41) minutes after sunset. A total of eleven (11) bat passes were recorded, with the final bat detected at 22:16. Commuting behaviour only was observed. Two (2) species were identified in this survey: soprano and common pipistrelle.

18/05/18 Dawn re-entry survey Poplar Farm Location E

3.4.47 The last bat was noted at 04:11, forty-three (43) minutes before sunrise. A total of three (3) bat passes were recorded. Commuting behaviour only was observed. One (1) species was identified in this survey: common pipistrelle.

18/05/18 Dawn re-entry survey Poplar Farm Location F

3.4.48 No bats were detected during this survey.

18/05/18 Dawn re-entry survey Poplar Farm Location G

3.4.49 The last bat was noted at 04:11, forty-three (43) minutes before sunrise. A total of two (2) bat passes were recorded. Commuting behaviour only was observed. Two (2) species were identified in this survey: noctule and common pipistrelle.

18/05/18 Dawn re-entry survey Poplar Farm Location H

3.4.50 The only recorded bat was noted at 03:44, one (1) hour and eleven (11) minutes before sunrise. A total of one (1) bat pass was recorded. Commuting behaviour only was observed. One (1) species was identified in this survey: common pipistrelle.

06/06/18 Dusk emergence survey The White House Location A

3.4.51 No bats were detected during this survey.

06/06/18 Dusk emergence survey The White House Location B

3.4.52 The only recorded bat was noted at 22:18, fifty-nine (59) minutes after sunset. A total of one (1) bat pass was recorded. Commuting behaviour only was observed. One (1) species was identified in this survey: common pipistrelle.

06/06/18 Dusk emergence survey The White House Location C

3.4.53 The first bat was noted at 21:49, thirty (30) minutes after sunset. A total of eight (8) bat passes were recorded, with the final bat detected at 22:27. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: brown long-eared bat and common pipistrelle.

06/06/18 Dusk emergence survey The White House Location D

3.4.54 The first bat was noted at 22:14, fifty-five (55) minutes after sunset. A total of two (2) bat passes were recorded, with the final bat detected at 22:24. Commuting behaviour only was observed. Two (2) species were identified in this survey: serotine and common pipistrelle.

07/06/18 Dawn re-entry survey The Lindens Location A

3.4.55 The last bat was noted at 04:01, thirty-two (32) minutes before sunrise. A total of nine (9) bat passes were recorded. Commuting and roosting behaviour was observed. Three (3) species were identified in this survey: noctule, soprano pipistrelle and common pipistrelle.

07/06/18 Dawn re-entry survey The Lindens Location B

3.4.56 The last bat was noted at 04:05, twenty-eight (28) minutes before sunrise. A total of thirteen (13) bat passes were recorded. Commuting, foraging and roosting behaviour was observed. Three (3) species were identified in this survey: Leisler's bat, soprano pipistrelle and common pipistrelle. A *Nyctalus* species, with call characteristics of Leisler's bat, was also recorded.

07/06/18 Dawn re-entry survey The Lindens Location C

3.4.57 The last bat was noted at 04:00, thirty-three (33) minutes before sunrise. A total of five (5) bat passes were recorded. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: soprano and common pipistrelle.

13/06/18 Dawn re-entry survey T3

3.4.58 No bats were detected during this survey.

13/06/18 Dawn re-entry survey T5

3.4.59 No bats were detected during this survey.

13/06/18 Dawn re-entry survey T39

3.4.60 The last bat was noted at 03:37, fifty-four (54) minutes before sunrise. A total of five (5) bat passes were recorded. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: soprano and common pipistrelle.

13/06/18 Dawn re-entry survey T41

3.4.61 The last bat was noted at 03:29, one (1) hour and two (2) minutes before sunrise. A total of five (5) bat passes were recorded. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: soprano and common pipistrelle.

13/06/18 Dusk emergence survey The Lindens Location A

3.4.62 The first bat was noted at 21:41, twenty-two (22) minutes after sunset. A total of ten (10) bat passes were recorded, with the final bat detected at 22:24. Commuting, foraging and roosting behaviour was observed. Two (20 species were identified in this survey: soprano and common pipistrelle.

13/06/18 Dusk emergence survey The Lindens Location B

3.4.63 The first bat was noted at 21:33, fourteen (14) minutes after sunset. A total of two (2) bat passes were recorded, with the final bat detected at 21:42. Commuting behaviour only was observed. Two (2) species were identified in this survey: noctule and common pipistrelle.

13/06/18 Dusk emergence survey The Lindens Location C

3.4.64 The first bat was noted at 21:33, fourteen (14) minutes after sunset. A total of three (3) bat passes were recorded, with the final bat detected at 22:10. Commuting behaviour only was observed. Two (2) species were identified in this survey: noctule and common pipistrelle. An unidentified bat species, not detected by the bat detector, was also observed.

13/06/18 Dusk emergence survey The Lindens Location D

3.4.65 The first bat was noted at 21:33, fourteen (14) minutes after sunset. A total of twelve (12) bat passes were recorded, with the final bat detected at 22:39. Commuting, foraging and roosting behaviour was observed. Three (3) species were identified in this survey: noctule, soprano pipistrelle and common pipistrelle.

14/06/18 Dawn re-entry survey The White House Location A

3.4.66 The last bat was noted at 03:14, one (1) hour and seven (7) minutes before sunrise. A total of three (3) bat passes were recorded. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: soprano and common pipistrelle.

14/06/18 Dawn re-entry survey The White House Location B

3.4.67 The only recorded bat was noted at 03:36, fifty-five (55) minutes before sunrise. A total of one (1) bat pass was recorded. Foraging behaviour only was observed. One (1) species was identified in this survey: common pipistrelle.

14/06/18 Dawn re-entry survey The White House Location C

3.4.68 The last bat was noted at 03:14, one (1) hour and seven (7) minutes before sunrise. A total of two (2) bat passes were recorded. Commuting behaviour only was observed. One (1) species was identified in this survey: common pipistrelle.

14/06/18 Dawn re-entry survey The White House Location D

3.4.69 The last bat was noted at 03:46, forty-five (45) minutes before sunrise. A total of two (2) bat passes were recorded. Commuting behaviour only was observed. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: brown long-eared bat and common pipistrelle. An unidentified bat species, not detected by the bat detector, was also observed.

18/06/18 Dusk emergence survey T52

3.4.70 The first bat was noted at 21:59, thirty-seven (37) minutes after sunset. A total of fourteen (14) bat passes were recorded, with the final bat detected at 22:42. Commuting behaviour only was observed. Two (2) species were identified in this survey: soprano and common pipistrelle. A *Nyctalus* species, with call characteristics of Leisler's bat, was also recorded.

18/06/18 Dusk emergence survey T53

3.4.71 No bats were detected during this survey.

19/06/18 Dawn re-entry survey T75

3.4.72 The last bat was noted at 03:42, fifty-four (54) minutes before sunrise. A total of seven (7) bat passes were recorded. Commuting behaviour only was observed. Three (3) species were identified in this survey: noctule, soprano pipistrelle and common pipistrelle.

19/06/18 Dawn re-entry survey T77

3.4.73 The only recorded bat was noted at 03:43, fifty-three (53) minutes before sunrise. A total of one (1) bat pass was recorded. Commuting behaviour only was observed. One (1) species was identified in this survey: noctule.

19/06/18 Dawn re-entry survey Poplar Farm Location D

3.4.74 No bats were detected in this survey.

19/06/18 Dusk emergence survey Poplar Farm Location I

3.4.75 The first bat was noted at 22:11, fifty (50) minutes after sunset. A total of eleven (11) bat passes were recorded, with the final bat detected at 22:52. Commuting behaviour only was observed. Three (3) species were identified in this survey: noctule, Leisler's bat and common pipistrelle. Two (2) bats, of unidentified bat species, not picked up on the bat detector, were observed.

19/06/18 Dusk emergence survey Poplar Farm Location J

3.4.76 The first bat was noted at 22:07, forty-six (46) minutes after sunset. A total of fifteen (15) bat passes were recorded, with the final bat detected at 22:50. Commuting, foraging and roosting behaviour was observed. Three (3) species were identified in this survey: noctule, soprano pipistrelle and common pipistrelle. Two (2) bats, of unidentified bat species, not picked up on the bat detector, were observed.

19/06/18 Dusk emergence survey Poplar Farm Location K

3.4.77 The first bat was noted at 22:11, fifty (50) minutes after sunset. A total of sixteen (16) bat passes were recorded, with the final bat detected at 22:52. Commuting behaviour only was observed. Three (3) species were identified in this survey: noctule, soprano pipistrelle and common pipistrelle. A bat, of unidentified bat species, not picked up on the bat detector, and a *Nyctalus* sp. with characteristics of Leisler's bat were observed.

19/06/18 Dusk emergence survey Poplar Farm Location M

3.4.78 The first bat was noted at 22:07, forty-six (46) minutes after sunset. A total of eight (8) bat passes were recorded, with the final bat detected at 22:50. Commuting behaviour only was observed. Two (2) species were identified in this survey: noctule and common pipistrelle. Two (2) bats, of unidentified bat species, not picked up on the bat detector, were observed.

20/06/18 Dawn re-entry survey Poplar Farm Location A

3.4.79 The last bat was noted at 03:38, fifty-three (53) minutes before sunrise. A total of thirteen (13) bat passes were recorded. Commuting and foraging behaviour only was observed. Two (2) species were identified in this survey: soprano and common pipistrelle. An unidentified species, not picked up by the detector, was observed.

20/06/18 Dawn re-entry survey Poplar Farm Location C

3.4.80 The last bat was noted at 04:12, nineteen (19) minutes before sunrise. A total of four (4) bat passes were recorded. Commuting behaviour only was observed. Two (2) species were identified in this survey: soprano and common pipistrelle. An unidentified species, not picked up by the detector, was observed.

20/06/18 Dusk emergence survey The Lindens Location A

3.4.81 The first bat was noted at 21:47, twenty-six (26) minutes after sunset. A total of thirteen (13) bat passes were recorded, with the final bat detected at 22:29. Commuting, foraging and roosting behaviour was observed. Two (2) species were identified in this survey: noctule and common pipistrelle. Two (2) bats, of unidentified bat species, not picked up on the bat detector, were observed.

20/06/18 Dusk emergence survey The Lindens Location B

3.4.82 The first bat was noted at 21:48, twenty-seven (27) minutes after sunset. A total of eleven (11) bat passes were recorded, with the final bat detected at 22:22. Commuting and roosting behaviour was observed. One (1) species only was identified in this survey: soprano pipistrelle.

20/06/18 Dusk emergence survey The Lindens Location C

3.4.83 The first bat was noted at 21:57, thirty-six (36) minutes after sunset. A total of seven (7) bat passes were recorded, with the final bat detected at 22:30. Commuting behaviour only was observed. Three (3) species were identified in this survey: noctule, soprano pipistrelle and common pipistrelle.

20/06/18 Dusk emergence survey The Lindens Location D

3.4.84 The first bat was noted at 22:09, forty-eight (48) minutes after sunset. A total of five (5) bat passes were recorded, with the final bat detected at 22:39. Commuting, foraging and roosting behaviour was observed. Two (2) species were identified in this survey: noctule and common pipistrelle. Two (2) bats, of unidentified species, not picked up on the bat detector, were observed.

21/06/18 Dawn re-entry survey Oaklands Location A

3.4.85 The last bat was noted at 03:24, one (1) hour and six (6) minutes before sunrise. A total of three (3) bat passes were recorded. Commuting behaviour only was observed. Two (2) species were identified in this survey: soprano and common pipistrelle.

21/06/18 Dawn re-entry survey Oaklands Location B

3.4.86 The last bat was noted at 03:19, one (1) hour and eleven (11) minutes before sunrise. A total of five (5) bat passes were recorded. Commuting behaviour only was observed. Two (2) species were identified in this survey: soprano and common pipistrelle.

21/06/18 Dawn re-entry survey Oaklands Location C

3.4.87 The last bat was noted at 03:47, forty-three (43) minutes before sunrise. A total of three (3) bat passes were recorded. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: serotine and soprano pipistrelle.

21/06/18 Dawn re-entry survey Oaklands Location D

3.4.88 The last bat was noted at 02:49, one (1) hour and forty-one (41) minutes before sunrise. A total of four (4) bat passes were recorded. Commuting and foraging behaviour was observed. One (1) species was identified in this survey: soprano pipistrelle. One (1) bat, of unidentified species, not picked up on the bat detector, was observed.

05/07/18 Dusk emergence survey The Old College Location A

3.4.89 The first bat was noted at 21:59, forty (40) minutes after sunset. A total of five (5) bat passes were recorded, with the final bat detected at 22:21. Commuting behaviour only was observed. Three (3) species were identified in this survey: noctule, soprano pipistrelle and common pipistrelle.

05/07/18 Dusk emergence survey The Old College Location B

3.4.90 The first bat was noted at 22:00, forty-one (41) minutes after sunset. A total of six (6) bat passes were recorded, with the final bat detected at 22:21. Commuting behaviour only was observed. Two (2) species were identified in this survey: noctule and soprano pipistrelle.

05/07/18 Dusk emergence survey The Old College Location C

3.4.91 The first bat was noted at 22:02, forty-three (43) minutes after sunset. A total of two (2) bat passes were recorded, with the final bat detected at 22:02. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: noctule and common pipistrelle.

13/07/18 Dawn re-entry survey T3

3.4.92 No bats were detected during this survey.

17/07/18 Dusk emergence survey Poplar Farm Location J

3.4.93 The first bat was noted at 21:29, twenty (20) minutes after sunset. A total of ten (10) bat passes were recorded, with the final bat detected at 22:38. Commuting behaviour only was observed. Three (3) species were identified in this survey: noctule, soprano pipistrelle and common pipistrelle. One (1) bat of the genus *Pipistrellus* was also recorded but could not be identified to species level.

17/07/18 Dusk emergence survey Poplar Farm Location K

3.4.94 The first bat was noted at 21:19, ten (10) minutes after sunset. A total of seven (7) bat passes were recorded, with the final bat detected at 22:38. Commuting behaviour only was observed. Four (4) species were identified in this survey: Leisler's bat, noctule, soprano pipistrelle and common pipistrelle. Three (3) bats, of unidentified species, not picked up on the bat detector, were observed.

17/07/18 Dusk emergence survey Poplar Farm Location L

3.4.95 The first bat was noted at 21:24, fifteen (15) minutes after sunset. A total of seven (7) bat passes were recorded, with the final bat detected at 22:12. Commuting, foraging and roosting behaviour was observed. Two (2) species were identified in this survey: noctule and common pipistrelle. One (1) bat, of unidentified species, not picked up on the bat detector, was observed.

18/07/18 Dawn re-entry survey Poplar Farm Location A

3.4.96 The last bat was noted at 03:38, one (1) hour and fifteen (15) minutes before sunrise. A total of three (3) bat passes were recorded. Commuting and foraging behaviour was observed. One (1) species was identified in this survey: common pipistrelle.

18/07/18 Dawn re-entry survey T80

3.4.97 The only recorded bat was noted at 04:10, forty-three (43) minutes before sunrise. A total of one (1) bat pass was recorded. Commuting behaviour only was observed. One (1) species was identified in this survey: common pipistrelle.

18/07/18 Dawn re-entry survey T81

3.4.98 The last bat was noted at 04:09, forty-four (44) minutes before sunrise. A total of four (4) bat passes were recorded. Commuting behaviour only was observed. One (1) species was identified in this survey: common pipistrelle.

18/07/18 Dusk emergence survey T75

3.4.99 The first bat was noted at 21:56, forty-eight (48) minutes after sunset. A total of fifteen (15) bat passes were recorded, with the final bat detected at 22:37. Commuting behaviour only was observed. Four (4) species were identified in this survey: Leisler's bat, noctule, soprano pipistrelle and common pipistrelle.

18/07/18 Dusk emergence survey T77

3.4.100 The first bat was noted at 21:54, forty-six (46) minutes after sunset. A total of twelve (12) bat passes were recorded, with the final bat detected at 22:36. Commuting behaviour only was observed. Four (4) species were identified in this survey: Leisler's bat, noctule, soprano pipistrelle and common pipistrelle.

19/07/18 Dawn re-entry survey T53

3.4.101 The last bat was noted at 04:14, forty-one (41) minutes before sunrise. A total of six (6) bat passes were recorded. Foraging and roosting behaviour only was observed. One (1) species was identified in this survey: soprano pipistrelle.

19/07/18 Dawn re-entry survey T52

3.4.102 The last bat was noted at 04:07, thirty-four (34) minutes before sunrise. A total of twelve (12) bat passes were recorded. Commuting and foraging behaviour was observed. Four (4) species were identified in this survey: barbastelle, noctule, soprano pipistrelle and common pipistrelle. One (1) bat, of unidentified species, not picked up on the bat detector, was observed.

19/07/18 Dusk emergence survey T1

3.4.103 The first bat was noted at 21:31, twenty-four (24) minutes after sunset. A total of eight (8) bat passes were recorded, with the final bat detected at 22:36. Commuting, foraging and roosting behaviour was observed. Two (2) species were identified in this survey: soprano and common pipistrelle. One (1) bat, of unidentified species, not picked up on the bat detector, was observed.

19/07/18 Dusk emergence survey T3

3.4.104 The first bat was noted at 21:50, forty-three (43) minutes after sunset. A total of seven (7) bat passes were recorded, with the final bat detected at 22:33. Commuting behaviour only was observed. Three (3) species were identified in this survey: noctule, soprano pipistrelle and common pipistrelle. One (1) bat of the genus *Pipistrellus* was also recorded but could not be identified to species level.

19/07/18 Dusk emergence survey T5

3.4.105 The first bat was noted at 21:56, forty-nine (49) minutes after sunset. A total of nine (9) bat passes were recorded, with the final bat detected at 22:37. Commuting and foraging behaviour was observed. Four (4) species were identified in this survey: serotine, noctule, soprano pipistrelle and common pipistrelle.

20/07/18 Dawn re-entry survey T85

3.4.106 The last bat was noted at 03:55, one (1) hour and one (1) minute before sunrise. A total of five (5) bat passes were recorded. Commuting behaviour only was observed. Two (2) species were identified in this survey: soprano and common pipistrelle.

20/07/18 Dawn re-entry survey T88

3.4.107 No bats were detected during this survey.

20/07/18 Dawn re-entry survey T92

3.4.108 The last bat was noted at 04:04, fifty-two (52) minutes before sunrise. A total of three (3) bat passes were recorded. Commuting behaviour only was observed. Two (2) species were identified in this survey: noctule and common pipistrelle.

31/07/18 Dusk emergence survey Poplar Farm Location I

3.4.109 The first bat was noted at 21:20, thirty (30) minutes after sunset. A total of twenty-four (24) bat passes were recorded, with the final bat detected at 22:21. Commuting behaviour only was observed. Three (3) species were identified in this survey: noctule, soprano pipistrelle and common pipistrelle. Two (2) bats of unidentified species, not picked up by the bat detector, were observed.

31/07/18 Dusk emergence survey Poplar Farm Location J

3.4.110 The first bat was noted at 21:21, thirty-one (31) minutes after sunset. A total of nineteen (19) bat passes were recorded, with the final bat detected at 22:12. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: noctule and common pipistrelle.

31/07/18 Dusk emergence survey Poplar Farm Location K

3.4.111 The first bat was noted at 21:21, thirty-one (31) minutes after sunset. A total of thirty-one (31) bat passes were recorded, with the final bat detected at 22:19. Commuting and foraging behaviour was observed. Three (3) species were identified in this survey: noctule, soprano pipistrelle and common pipistrelle. One (1) bat of the genus *Myotis* was also recorded but could not be identified to species level.

31/07/18 Dusk emergence survey Poplar Farm Location L

3.4.112 The first bat was noted at 21:27, thirty-seven (37) minutes after sunset. A total of six (6) bat passes were recorded, with the final bat detected at 22:17. Commuting and foraging behaviour was observed. Three (3) species were identified in this survey: noctule, soprano pipistrelle and common pipistrelle. Three (3) bats of the genus *Pipistrellus* were also recorded but could not be identified to species level.

01/08/18 Dawn re-entry survey Poplar Farm Location A

3.4.113 The last bat was noted at 04:37, thirty-eight (38) minutes before sunrise. A total of seven (7) bat passes were recorded. Commuting and foraging behaviour was observed. One (1) species was identified in this survey: common pipistrelle. Four (4) bats of unidentified species, not picked up by the bat detector, were observed.

01/08/18 Dawn re-entry survey Poplar Farm Location E

3.4.114 The last bat was noted at 04:35, forty (40) minutes before sunrise. A total of eleven (11) bat passes were recorded. Commuting and foraging behaviour was observed. Roosting behaviour was suspected but not definitively proven. Two (2) species were identified in this survey: soprano and common pipistrelle. One (1) bat of unidentified species, not picked up by the bat detector, was observed.

01/08/18 Dawn re-entry survey Poplar Farm Location M

3.4.115 The last bat was noted at 04:41, thirty-four (34) minutes before sunrise. A total of twelve (12) bat passes were recorded. Commuting, foraging and roosting behaviour was observed. Three (3) species were identified in this survey: brown long-eared bat, soprano pipistrelle and common pipistrelle. One (1) bat of the genus *Pipistrellus* was observed.

01/08/18 Dawn re-entry survey Poplar Farm Location N

3.4.116 The last bat was noted at 04:46, twenty-nine (29) minutes before sunrise. A total of sixteen (16) bat passes were recorded. Commuting and foraging behaviour was observed. One (1) species was identified in this survey: common pipistrelle.

01/08/18 Dusk emergence survey NB01 Location A

3.4.117 The first bat was noted at 21:30, forty-three (43) minutes after sunset. A total of two (2) bat passes were recorded, with the final bat detected at 21:32. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: soprano and common pipistrelle.

01/08/18 Dusk emergence survey NB01 Location B

3.4.118 The first bat was noted at 21:08, twenty-one (21) minutes after sunset. A total of ten (10) bat passes were recorded, with the final bat detected at 21:59. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: soprano and common pipistrelle. Two (2) bats of the genus *Myotis* were also recorded but could not be identified to species level.

01/08/18 Dusk emergence survey NB01 Location C

3.4.119 The first bat was noted at 21:11, twenty-four (24) minutes after sunset. A total of eleven (11) bat passes were recorded, with the final bat detected at 21:39. Commuting behaviour only was observed. Two (2) species were identified in this survey: soprano and common pipistrelle.

01/08/18 Dusk emergence survey NB01 Location D

3.4.120 The first bat was noted at 21:06, nineteen (19) minutes after sunset. A total of fourteen (14) bat passes were recorded, with the final bat detected at 21:39. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: soprano and common pipistrelle. One (1) bat of the genus *Myotis* was also recorded but could not be identified to species level.

02/08/18 Dawn re-entry survey Poplar Farm Location A

3.4.121 The last bat was noted at 04:28, forty-seven (47) minutes before sunrise. A total of six (6) bat passes were recorded. Commuting behaviour only was observed. One (1) species was identified in this survey: common pipistrelle. Four (4) bats of unidentified species, not picked up by the bat detector, were observed.

02/08/18 Dawn re-entry survey Poplar Farm Location I

3.4.122 The last bat was noted at 04:31, forty-nine (49) minutes before sunrise. A total of twelve (12) bat passes were recorded. Commuting behaviour only was observed. Two (2) species were identified in this survey: soprano and common pipistrelle. Three (3) bats of the genus *Myotis* was observed.

02/08/18 Dawn re-entry survey Poplar Farm Location L

3.4.123 The last bat was noted at 04:19, fifty-six (56) minutes before sunrise. A total of three (3) bat passes were recorded. Commuting behaviour only was observed. Two (2) species were identified in this survey: soprano and common pipistrelle.

02/08/18 Dawn re-entry survey T1

3.4.124 The only recorded bat was noted at 04:14, one (1) hour and one (1) minute before sunrise. A total of one (1) bat pass was recorded. Foraging behaviour only was observed. One (1) species was identified in this survey: common pipistrelle.

02/08/18 Dawn re-entry survey T44 &45

3.4.125 The last bat was noted at 04:24, fifty-three (53) minutes before sunrise. A total of ten (10) bat passes were recorded. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: soprano and common pipistrelle. Four (4) bats of unidentified species, not picked up by the bat detector, were observed.

02/08/18 Dusk emergence survey Oaklands Location A

3.4.126 The first bat was noted at 21:31, fifty-four (54) minutes after sunset. A total of nine (9) bat passes were recorded, with the final bat detected at 22:19. Commuting and foraging behaviour was observed. Three (3) species were identified in this survey: noctule, soprano pipistrelle and common pipistrelle.

02/08/18 Dusk emergence survey Oaklands Location B

3.4.127 The first bat was noted at 21:11, thirty-four (34) minutes after sunset. A total of eight (8) bat passes were recorded, with the final bat detected at 21:54. Commuting behaviour only was observed. Three (3) species were identified in this survey: noctule, soprano pipistrelle and common pipistrelle. One (1) bat of unidentified species, not picked up by the bat detector, was observed.

02/08/18 Dusk emergence survey Oaklands Location B

3.4.128 The first bat was noted at 21:11, thirty-four (34) minutes after sunset. A total of eight (8) bat passes were recorded, with the final bat detected at 21:54. Commuting behaviour only was observed. Two (2) species were identified in this survey: noctule and common pipistrelle.

03/08/18 Dawn re-entry survey Hall Cottages Location A

3.4.129 The last bat was noted at 04:34, forty-three (43) minutes before sunrise. A total of eleven (11) bat passes were recorded. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: noctule and common pipistrelle.

03/08/18 Dawn re-entry survey Hall Cottages Location B

3.4.130 The last bat was noted at 04:34, forty-three (43) minutes before sunrise. A total of four (4) bat passes were recorded. Commuting behaviour only was observed. Two (2) species were identified in this survey: noctule and common pipistrelle. Two (2) bats of the genus *Pipistrellus* were observed. One (1) bat of the genus *Pipistrellus* was observed possibly entering a roost at the south west corner of the building though the surveyor could not be certain that this bat entered the building.

03/08/18 Dawn re-entry survey Hall Cottages Location C

3.4.131 No bats were observed during this survey.

07/08/18 Dusk emergence survey T53

3.4.132 The first bat was noted at 20:45, eight (8) minutes after sunset. A total of three (3) bat passes were recorded, with the final bat detected at 20:56. Commuting behaviour only was observed. One (1) species was identified in this survey: noctule.

07/08/18 Dusk emergence survey T60

3.4.133 The first bat was noted at 20:48, eleven (11) minutes after sunset. A total of six (6) bat passes were recorded, with the final bat detected at 21:08. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: noctule and common pipistrelle.

08/08/18 Dusk emergence survey Poplar Farm Location E

3.4.134 The first bat was noted at 21:11, thirty-six (36) minutes after sunset. A total of fifteen (15) bat passes were recorded, with the final bat detected at 22:05. Commuting behaviour only was observed. Three (3) species were identified in this survey: Leisler's bat, soprano pipistrelle and common pipistrelle.

08/08/18 Dusk emergence survey Poplar Farm Location F

3.4.135 The first bat was noted at 21:05, thirty (30) minutes after sunset. A total of sixteen (16) bat passes were recorded, with the final bat detected at 22:04. Commuting and foraging behaviour was observed. Three (3) species were identified in this survey: Leisler's bat, soprano pipistrelle and common pipistrelle.

09/08/18 Dawn re-entry survey Hall Cottages Location A

3.4.136 The only recorded bat was noted at 04:21, one (1) hour and six (6) minutes before sunrise. A total of one (1) bat pass was recorded. Commuting behaviour only was observed. One (1) species was identified in this survey: noctule.

09/08/18 Dawn re-entry survey Hall Cottages Location B

3.4.137 The last bat was noted at 04:38, 49 minutes before sunrise. A total of four bat passes were recorded. Commuting behaviour only was observed. One species was identified in this survey: common pipistrelle. Two bats of the genus *Pipistrellus* were recorded.

09/08/18 Dusk emergence survey T1

3.4.138 The first bat was noted at 21:32, 59 minutes after sunset. A total of three bat passes were recorded, with the final bat detected at 21:53. Commuting behaviour only was observed. One species was identified in this survey: common pipistrelle. Two bats of the genus *Nyctalus,* with call characteristics of noctule, were recorded.

09/08/18 Dusk emergence survey T60

3.4.139 The first bat was noted at 20:55, 22 minutes after sunset. A total of 15 bat passes were recorded, with the final bat detected at 21:54. Commuting behaviour only was observed. Four species were identified in this survey: barbastelle, Leisler's bat, soprano pipistrelle and common pipistrelle.

10/08/18 Dawn re-entry survey Poplar Farm Location A

3.4.140 The only recorded bat was noted at 04:21, one hour and seven minutes before sunrise. A total of one bat pass was recorded. Commuting behaviour only was observed. One species was identified in this survey: Leisler's bat.

10/08/18 Dawn re-entry survey Poplar Farm Location N

3.4.141 No bats were detected during this survey.

26/09/18 Dusk emergence survey Hall Cottages Location A

3.4.142 The first bat was noted at 19:23, fifty-two (52) minutes after sunset. A total of fourteen (14) bat passes were recorded, with the final bat detected at 19:59. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: soprano pipistrelle and common pipistrelle.

26/09/18 Dusk emergence survey Hall Cottages Location B

3.4.143 The first bat was noted at 19:19, forty-eight (48) minutes after sunset. A total of fourteen (14) bat passes were recorded, with the final bat detected at 19:54. Commuting and foraging behaviour was observed. Two (2) species were identified in this survey: soprano pipistrelle and common pipistrelle.

Automated survey results

3.4.144 The following tables summarise the data obtained from the static detectors which were deployed at twelve (12) locations across the site (Annex D). The data are presented as the number of passes recorded by each species per night.

April

Location 1

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	*Pipistrellus* sp.	Barbastelle
21/04/18	253	26	1	7	2
22/04/18	67	-	-	-	-
23/04/18	29	-	-	1	-
24/04/18	33	2	-	-	-
25/04/18	4	-	-	-	-
Total	386	28	1	8	2

Location 2

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat	*Myotis* sp.	*Pipistrellus* sp.	Noctule	Barbastelle	Nathusius' pipistrelle
18/04/18	977	95	4	1	2	46	1	6	1
19/04/18	138	9	1	1	2	4	-	-	-
20/04/18	269	13	2	-	-	17	-	2	-
21/04/18	253	26	1	-	-	7	-	2	-
22/04/18	67	-	-	-	-	-	-	-	-
Total	1404	143	8	2	4	74	1	10	1

Location 3

Date	Common pipistrelle	Soprano pipistrelle	*Myotis* sp.
26/04/18	3	2	2
27/04/18	-	-	-
28/04/18	-	-	-
29/04/18	-	-	-
30/04/18	-	-	-
Total	3	2	2

Location 4

Date	Common pipistrelle	Soprano pipistrelle	Serotine	Leisler's bat	Brown long-eared bat	*Myotis* sp.	Barbastelle	Other
18/04/18	9	6	2	2	1	2	5	6
19/04/18	-	-	-	-	-	-	-	-
20/04/18	-	-	-	-	-	-	-	-
21/04/18	4	-	-	-	-	2	2	-
22/04/18	4	-	2	-	-	-	-	2
Total	17	6	4	2	1	4	7	8

Both Myotis species calls recorded on 18/04/18 had characteristics of Daubenton's bat. Both Myotis species calls recorded on 21/04/18 had characteristics of Natterer's bat.

The 8 bat recordings in the 'other' column could not be identified to species or genus level.

Location 5

No data

Location 6

Date	Common pipistrelle	Soprano pipistrelle	Serotine	Leisler's bat	Brown long-eared bat	*Myotis* sp.	*Pipistrellus* sp.	Noctule	Barbastelle	*Nyctalus* sp.
18/04/18	3	4	-	2	-	1	1	-	-	-
19/04/18	30	11	-	2	-	2	5	-	-	-
20/04/18		3	-	-	-	-	1	-	-	-
21/04/18	2	1	-	1	-	-	1	-	-	-
22/04/18	111	769	2	4	5	13	30	2	1	3
Total	146	788	2	9	5	16	38	2	1	3

Location 7

No data

Location 8

Date	Common pipistrelle	Soprano pipistrelle	Noctule
18/04/18	-	-	-
19/04/18	-	-	-
20/04/18	-	-	-

21/04/18	5	1	1
22/04/18	-	-	-
Total	5	1	1

Location 9

Date	Common pipistrelle	Soprano pipistrelle	*Pipistrellus* sp.	Noctule	*Nyctalus* sp.
24/04/18	-	-	-	-	-
25/04/18	8	4	1	1	-
26/04/18	28	6	1	1	-
27/04/18	16	-	-	2	-
28/04/18	-	-	-	-	1
Total	52	10	2	4	1

Location 10

Date	Common pipistrelle	Soprano pipistrelle	Serotine	Leisler's bat	Brown long-eared bat	*Myotis* sp.	*Pipistrellus* sp.	Noctule	Barbastelle
18/04/18	741	62	1	7	4	-	4	2	6
19/04/18	749	195	3	2	18	1	7	3	7
20/04/18	106	12	-	1	1	1	2	2	2
21/04/18	322	29	-	4	2	-	7	1	9
22/04/18	393	35	-	3	1	-	2	2	5
Total	2311	333	4	17	26	2	22	10	29

Location 10 (continued)

Date	Nathusius' pipistrelle	Serotine/Leisler's bat	Other
18/04/18	-	-	-
19/04/18	-	5	6
20/04/18	-	-	-
21/04/18	1	-	-
22/04/18	1	7	-
Total	2	12	6

The 6 bat recordings in the 'other' column could not be identified to species or genus level.

Location 11

No data

Location 12

No data

May

Location 1

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat	*Pipistrellus* sp.	Noctule	*Nyctalus* sp.
10/05/18	134	6	-	1	11	3	1
11/05/18	214	26	2	-	10	1	2
12/05/18	82	15	-	-	1	-	3
13/05/18	50	15	-	-	3	3	1
14/05/18	47	2	-	-	-	-	1
Total	527	64	2	1	25	7	8

Location 2

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat	*Myotis* sp.	*Pipistrellus* sp.	Noctule	Other	*Nyctalus* sp.
10/05/18	1	1	1	-	3	-	-	1	-
11/05/18	2	-	-	-	-	-	-	3	4
12/05/18	7	16	1	-	-	3	2	1	-
13/05/18	6	2	-	2	2	1	2	1	-
14/05/18	1	4	4	-	-	-	3	1	-
Total	17	23	6	2	5	4	7	7	4

The 7 bat recordings in the 'other' column could not be identified to species or genus level.

Location 3

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	*Myotis* sp.	*Pipistrellus* sp.	Noctule	Nathusius' pipistrelle
04/05/18	8	19	-	-	-	-	-
05/05/18	22	38	1	-	2	-	-
06/05/18	21	71	-	-	-	-	-
07/05/18	30	110	5	1	1	3	-
08/05/18	22	82	1	-	3	2	1
Total	103	320	7	1	6	5	1

Location 4

Date	Common pipistrelle	Soprano pipistrelle	Serotine/ Leisler's	Noctule	Pipistrellus sp.	Myotis sp.	Nathusius' pipistrelle	Other
10/05/18	61	76	7	-	-	-	-	3
11/05/18	885	261	8	7	3	3	1	-
12/05/18	34	31	2	-	-	-	-	-
13/05/18	33	35	2	16	-	-	-	-
14/05/18	2	3	-	7	-	-	-	-
Total	1015	406	19	30	3	3	1	3

The 3 bat recordings in the 'other' column could not be identified to species or genus level.

Location 5

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	Pipistrellus sp.
10/05/18	-	1	-	-
11/05/18	3	1	-	1
12/05/18	1	1	1	-
13/05/18	9	5	-	4
14/05/18	335	3	-	3
Total	348	11	1	8

Location 6

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat	*Myotis* sp.	*Pipistrellus* sp.	Noctule	Barbastelle	Nathusius' pipistrelle	*Nyctalus* sp.
04/05/18	21	6	1	1	-	16	-	2	1	-
05/05/18	17	7	2	2	-	5	-	-	-	-
06/05/18	113	17	2	-	-	88	-	-	-	-
07/05/18	71	44	1	2	1	65	1	-	-	3
08/05/18	18	-	-	-	-	22	2	-	-	-
Total	240	74	6	5	1	196	3	2	1	3

Location 7

No data

Location 8

Date	Common pipistrelle	Soprano pipistrelle	Noctule
18/05/18	-	-	-
19/05/18	-	-	-
20/05/18	-	-	-
21/05/18	5	1	1
22/05/18	-	-	-
Total	5	1	1

Location 9

Date	Common pipistrelle	Soprano pipistrelle	*Pipistrellus* sp.
01/05/18	43	7	7

Location 10

Date	Common pipistrelle	Soprano pipistrelle	Noctule	Serotine	Brown long-eared bat	Serotine/Leisler's	Barbastelle	Pipistrellus species	Nathusius' pipistrelle	Myotis species
18/05/18	655	49	2	5	3	4	7	1	-	
19/05/18	674	161	4	1	-	17	24	3	-	2

20/05/18	80	-	4	1	-	-	3	1	-	1
21/05/18	235	24	2	2	-	5	7	-	1	-
22/05/18	284	51	1	-	-	1	4	-	-	1
Total	1928	285	13	9	3	27	45	5	1	4

One recording from 19/05/18 of a Myotis species had characteristics of Daubenton's bat.

Location 11

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat	*Myotis* sp.	*Pipistrellus* sp.	Noctule	Barbastelle	Nathusius' pipistrelle
02/05/18	5	1	-	-	-	-	1	-	-
03/05/18	111	81	-	2	2	6	4	1	1
04/05/18	35	14	2	4	-	5	2	1	-
05/05/18	9	9	-	1	-	-	3	-	-
06/05/18	18	12	-	-	1	11	10	2	1
Total	178	117	2	7	3	22	20	4	2

Location 12

No data

June

Location 1

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	*Myotis* sp.	*Pipistrellus* sp.	Noctule	Barbastelle	Nathusius' pipistrelle
06/06/18	114	12	1	-	14	-	-	-
07/06/18	142	12	1	1	26	2	5	1
08/06/18	91	6	1	-	31	1	3	-
09/06/18	124	1	-	-	11	3	3	1
10/06/18	229	16	2	-	23	1	-	-
Total	700	51	5	1	105	7	11	2

Location 2

Date	Common pipistrelle	Soprano pipistrelle	Serotine	Serotine/Leisler's	Brown long-eared bat	*Myotis* sp.	Leisler's bat	*Pipistrellus* sp.
06/06/18	11	22	2	1	1	-	-	-
07/06/18	30	7	2	1	1	3	-	-
08/06/18	10	8	4	4	-	2	2	-
09/06/18	5	3	-	-	-	-	-	-
10/06/18	2	16	-	1	2	3	-	1
Total	58	56	8	7	4	8	2	1

Location 3

Date	Common pipistrelle	Soprano pipistrelle	Barbastelle	Noctule	*Nyctalus* sp.	*Pipistrellus* sp.	Leisler's bat	Other
13/06/18	77	117	5	1	2	21	2	10
14/06/18	86	28	-	1	1	11	1	2
15/06/18	146	75	1	-	1	6	-	2
16/06/18	156	498	2	10	4	69	3	23
17/06/18	98	425	-	-	2	117	2	6
Total	563	1143	8	12	10	224	8	43

The bat recordings in the 'other' column could not be identified to species or genus level.

Location 4

Date	Common pipistrelle	Soprano pipistrelle	Serotine/Leisler's	Leisler's bat	*Myotis* sp.	Noctule	Barbastelle
06/06/18	8	2	-	1	5	3	4
07/06/18	37	1	-	-	5	2	-
08/06/18	19	5	6	1	2	16	1
09/06/18	13	6	-	-	1	-	2
10/06/18	12	5	-	-	9	-	-
Total	89	19	6	2	22	21	7

Location 5

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat	*Myotis* sp.	*Pipistrellus* sp.	Barbastelle	Nathusius' pipistrelle	*Nyctalus* sp.

06/06/18	19	20	4	6	-	9	2	6	-
07/06/18	16	4	-	-	3	2	8	-	-
08/06/18	10	22	4	-	6	3	3	6	-
09/06/18	28	5	6	4	1	3	-	-	-
10/06/18	20	1	-	-	-	46	2	1	1
Total	93	52	14	10	10	63	15	13	1

Location 6

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Noctule
13/06/18	12	-	1	3
14/06/18	15	1	2	2
15/06/18	9	-	-	1
16/06/18	1	-	1	-
17/06/18	-	-	-	-
Total	37	1	4	6

Location 7

Date	Common pipistrelle	Leisler's bat	*Pipistrellus* sp.	Noctule	*Nyctalus* sp.
15/06/18	-	-	-	12	2
16/06/18	2	-	2	22	8
17/06/18	-	1	1	8	4

18/06/18	-	-	-	6	8
19/06/18	-	-	-	14	1
Total	2	1	3	62	23

Location 8

Date	Common pipistrelle	Soprano pipistrelle	Serotine/Leisler's	Brown long-eared bat
13/06/18	1	1	-	1
14/06/18	14	3	-	-
15/06/18	85	1	-	-
16/06/18	1	-	1	-
17/06/18	3	1	-	-
Total	104	6	1	1

Location 9

Date	Common pipistrelle	Soprano pipistrelle	Other	Leisler's bat	Brown long-eared bat	*Pipistrellus* sp.	Noctule	Nathusius' pipistrelle	*Nyctalus* sp.
13/06/18	180	52	1	-	-	5	4	-	-
14/06/18	113	64	-	1	-	11	5	-	-
15/06/18	86	30	-	-	1	8	63	-	3
16/06/18	189	33	-	-	1	-	34	1	1
17/06/18	150	30	-	-	-	2	9	-	5

Total	718	212	1	1	2	26	115	1	9

Location 10

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat	*Pipistrellus* sp.	Noctule	*Nyctalus* sp.
07/06/18	278	-	11	-	5	10	1
08/06/18	124	1	6	8	4	3	5
09/06/18	115	3	-	3	-	9	2
10/06/18	130	8	-	-	4	3	-
11/06/18	133	3	-	4	9	9	1
Total	780	15	17	15	22	34	9

Location 11

Date	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat	*Myotis* sp.	*Pipistrellus* sp.	Noctule	*Nyctalus* sp.
13/06/18	140	15	-	1	1	9	2	1
14/06/18	57	1	-	-	-	2	5	-
15/06/18	24	2	1	1	-	1	5	-
16/06/18	14	-	-	-	-	-	-	-
17/06/18	26	4	3	-	-	-	2	-
Total	261	22	4	2	1	12	14	1

Location 12

Date	Common pipistrelle	Soprano pipistrelle	*Pipistrellus* sp.	Noctule	Nathusius' pipistrelle	*Nyctalus* sp.

07/06/18	33	7	-	-	-	-
08/06/18	32	8	1	5	1	1
09/06/18	37	10	1	-	-	-
10/06/18	7	1	1	-	-	-
11/06/18	8	3	-	2	-	-
Total	117	29	3	7	1	1

3.4.145 The following table shows the total number of bat passes recorded at each location in each month of monitoring and the mean number of bat passes per night across the whole monitoring period.

Location	April 2018	May 2018	June 2018	July 2017	August 2017	September 2017	October 2017	Total	Mean passes per night
1	425	634	882	392	300	67**	17	2650	88.3
2	1647	75	144	110	149	9**	258	2383	79.4
3	7	443	2011	54	0**	0**	81	2596	103.8
4	19	1480	166	34	259	0**	33	1991	66.3
5	0**	368	271	144	244	3**	19	1046	41.8
6	1010	314	48	57	95	3**	33	1557	51.9
7	0**	0**	91	267	113	392	168	1031	41.2
8	7	7	112	1206	846	452	349	2979	85.1
9	69	57	1085	105	66	49	**	1431	47.7

10	2774	2320	892	1013	1229	2027	2399	12654	361.5
11*	0**	356	317	-	-	-	-	724	48.2
12*	0**	0**	158	-	-	-	-	158	31.6

*These were not monitored in 2017, so not included in average

** Bat detector failed to record, so not included in average

4 Evaluation, impacts and recommendations

4.1 Evaluation

Bat roosts

4.1.1 The 2018 surveys identified a total of seven roosts at T1, T53, three buildings at Poplar Farm, The Lindens and Hall Cottages (Annex F) that would be either destroyed or disturbed by the Scheme. In addition to these roosts, WYG (2017) identified roosting activity at T5, T67, Oaklands, The White House barn and St Andrew's Church. No further surveys were conducted at St Andrew's Church following changes to the scheme design which put it beyond the zone where disturbance would occur. The roosts at T5, T67, Oaklands (one common pipistrelle) and The White House (one common pipistrelle) are characterised as day roosts as a further two surveys by Sweco in 2018 revealed no roosting activity at these locations.

Tree1

4.1.2 A single bat of unidentified species was observed to emerge from T1 during the dusk survey on 19 July 2018. Two further surveys of this tree were conducted in 2018 and one in 2017, but no other instances of roosting behaviour were observed. This roost is characterised as a day roost.

Tree 53

4.1.3 A single bat of unidentified species was observed to enter a roost in T53 during the dawn re-entry survey on 19 July 2018. Two further surveys of this tree were conducted in 2018 and one in 2017, but no other instances of roosting behaviour were observed. This roost is characterised as a day roost.

The Lindens

4.1.4 During the dawn re-entry survey on 07 June 2018, two soprano pipistrelles and one common pipistrelle were observed entering a roost behind weatherboards above the bay window on the western elevation of the building. During the dusk emergence survey on 13 June 2018, two common pipistrelles and one soprano pipistrelle were observed emerging from this roost. During the dusk emergence survey on 20 June 2018, a single soprano pipistrelle was observed to emerge from this roost. The September 2017 survey recorded no roosting bats, but brown long-eared bats could probably be roosting in the building. This roost is characterised as a day roost.

Poplar Farm

4.1.5 Four buildings at Poplar Farm were observed to be used by roosting bats in 2017 and 2018 combined surveys. Three of these buildings were confirmed as roosts by WYG in September 2017 during one emergence survey they undertook. Two of the three buildings were recorded as having roosts again in 2018 (The barn that forms the courtyard and the small building adjacent to the entrance to the farm yard at Poplar Farm). The third building was the barn to the south of the farm. The large thatched barn was recorded as a roost in 2018 only.

4.1.6 Two unidentified bats emerged at the rear of the large thatched barn on 19 June 2018. No bat echolocation calls were detected from either bat, despite both bats passing close to the surveyor. This is characteristic of brown long-eared bats as this species uses very low amplitude echolocation calls and often navigates using vision and passive sound detection. Two subsequent surveys of this location failed to record any bat roosting activity. This roost is characterised as a day roost where bats shelter in the day and also a night roost where bats return to feed during the night.

4.1.7 During the dusk emergence survey on 17 July 2018, a single bat of unidentified species was observed to emerge from the eastern elevation of the building at the north east corner of the courtyard. This bat was likely to be a species of *Pipistrellus*, given the relatively early emergence time in relation to the sunset time. Two subsequent surveys of this location in 2018 failed to record any bat roosting activity. This roost is characterised as a day roost.

4.1.8 During the dawn re-entry survey on 01 August 2018, a single bat of unidentified species was observed to enter a roost in a gap around a doorway at the western end of the single storey range that forms the northern side of the courtyard. This bat was observed by an experienced, licensed bat worker who identified it as a species of *Pipistrellus*. Two subsequent surveys of this location in 2018 failed to record any bat roosting activity. This roost is characterised as a day roost.

A single bat of unidentified species was observed to enter a roost in the small building adjacent to the entry to the farm yard at Poplar Farm from Lingwood Road on 01 August 2018. No echolocation calls were detected from this bat, making species identification impossible. Two subsequent surveys of this location in 2018 failed to record any bat roosting activity. This roost is characterised as a day roost.

Hall Cottages

4.1.9 During the dawn survey on 03 August 2018, a single soprano pipistrelle was observed flying close to the building and may have roosted here. The building was resurveyed on 09 August 2018 and 26 September 2018 but no roosting behaviour was observed. This building would be characterised as a day roost.

Church Farm, Main Road, North Burlingham

4.1.10 During a survey for barn owl undertaken by Sweco in July 2018, an incidental discovery of a roost was made in a building at Church Farm. The roost contained large amounts of *Pipistrelle* droppings. The roost was outside of the study area and would not be disturbed by the Scheme. Therefore, no further surveys were undertaken at this location.

St Peter's Church Ruin

4.1.11 During the barn owl survey (July 2018), bat droppings (unidentified species) were observed in the church ruin. The roost was outside of the study area and would not be disturbed by the Scheme. Therefore, no further surveys were undertaken at this location.

4.1.12 In total, recorded during both 2017 and 2018 there were twelve roosts T1, T5, T53, T67, four buildings at Poplar Farm, The Lindens, Oaklands, The White House and Hall Cottages that would be destroyed or disturbed by the Scheme.

Bat Activity

4.1.13 The activity surveys (see Annex C) have revealed a total of eight (8) species commuting and foraging across the site. The majority of these are common species (common and soprano pipistrelle, noctule, Leisler's and brown long-eared bats), but calls from bats of the rarer genus *Myotis* were also recorded but could not be identified to species level (one bat during Transect Three in May, with a further seven bats, all south of the existing A47 and to the west of Poplar Farm recorded during emergence surveys). The rare species barbastelle (two bats in Transect Three and three bats around the east of the Scheme in emergence surveys) and Nathusius' pipistrelle (one bat in April on Transect Two to the north east of the existing A47) were also recorded. Common pipistrelle was the most frequently recorded species.

4.1.14 Bat activity was recorded on all transects with three locations identified as high activity areas: arable fields to the north and south of the A47 at the western end of the scheme (Transect routes 5 and 6) where foraging was concentrated at the field margins; and to the south of the A47 around Lingwood Community Woodland (Transect route 3) where relatively large numbers of bats forage at the woodland edges and along the ride to the east of the woodland. The commuting routes which bats use to access these areas were not identified.

4.1.15 The automated surveys (see section 3.4.126 for full results) showed that Location 10 experienced the highest level of bat passes. This location is at a woodland edge, a preferred foraging habitat for many bat species, with unimpeded connectivity to the known bat roosts at Church Farm, St Andrew's Church and St Peter's Church Ruin, all of which are situated within 900m of this location.

4.1.16 WYG (2017) static data was analysed using only four species identified (common and soprano pipistrelle, brown long-eared and noctule) with any other passes classed as 'other'. In April, May and June 2018, Sweco analysed the data they recorded with a total of nine species identified giving a view of where the more species diverse areas of the Scheme were. The locations of all of the static detectors in 2018 had passes from the commoner species (common and soprano pipistrelle and noctule) during each month that they recorded. The lowest diversity was at Locations 7, 8, 9 and 12 with 3 or 4 species only recorded there. These locations were either close to the existing A47 or in the case of Location 7, only one month's data was obtained so may have skewed the result. The highest species richness was at Locations 2, 6, 10 and 11 where 8 or 9 species were recorded in a month's data. Three of these locations were south of the existing A47. At Locations 1, 3, 4 and 5, up to 6 or 7 species were recorded.

4.1.17 Locations 2 and 3; 4 and 5 or 6; 10 and 11 are on opposite sides of the existing A47, at existing junctions which are perpendicular to the road and may be used as linear features which bats may use to cross the A47. Comparisons of Locations 2 and 3 data suggest that a similar or the same number of species were recorded at them in May and June 2018. Locations 4 and 5 or 6 had a similar number of species in April, May and June 2018 and Locations 10 and 11 had high numbers of species in May and similar numbers in June. Locations 8 and 9 are also at opposite sides of the A47, but not where an existing perpendicular linear feature crosses it. The species numbers at Locations 8 and 9 were both low. As such, it would indicate that more bat species which would include rarer ones, are recorded near junctions of the A47 and these areas would be more likely to have impacts upon bats from traffic collisions. The activity surveys, and incidental observations made during emergence and re-entry surveys, showed that bat activity was concentrated around hedgerows, tree lines and standard trees.

4.1.18 The numbers of individual bats of commoner species occurring across the site in the walked activity surveys is not considered to be high and the populations of these species present within the Scheme footprint are assessed as valuable at the local level.

4.1.19 Data from Norfolk BAP (Norfolk County Council, 2011) and BTO (2018) show that the rare species barbastelle is found across Norfolk. This county is considered to be a stronghold for this species and is highly significant in the context of national distribution. The larger population centres are 25km to the north around Paston and 50km to the south west around Stanford. Zeale *et al* (2012) showed that this species travels between 1 and 20km to reach foraging grounds. Threats to this species include loss and fragmentation of woodland, hedgerows, riparian habitat, invertebrate rich pasture and trees. The numbers of bat passes recorded on the static detectors, although higher than Nathusius' pipistrelle and *Myotis* sp. were lower than other species with the exception of at Location 10, where a bat may have been foraging during April and May 2018. It is considered that the small number of barbastelle bat passes recorded during the surveys do not indicate that they are a critical part of the wider population and are valuable at the local level.

4.1.20 *Myotis* sp. were the second lowest recorded species of bat on the automated surveys. They are present in low numbers across the county and the majority of records are of these species foraging along rivers (Norwich Bat Group, 2012). These species are known to be light averse and all of the sightings during walked transects and emergence surveys were made at the unlit western end of the existing A47. The small numbers of *Myotis* recorded are considered to be of value at the local level.

4.1.21 The desk study conducted by Amey (2017) identified 123 records of the rare species Nathusius pipistrelle within 10km of the study area. None of these were records of roosts. This species has two distinct populations within the UK; one resident and one migratory. Maternity colonies of the resident population are known from Lancashire, Kent and Northumberland. It is likely that the low numbers of Nathusius pipistrelles detected around the Scheme during April 2018 belong to the migratory population due to the season they were recorded. The numbers of bat passes recorded during the automated surveys during April, May and June 2018 were of one or two passes each month and this species had the fewest passes overall. They have been valued at the local level.

Impact assessment

4.1.22 The trees labelled T1, T5 and T53 fall within the working zone and will need to be removed. These trees contain confirmed *Pipistrelle* sp. day roosts. The roosts identified at T67, Poplar Farm, Hall Cottages, White House barn, The Lindens and Oaklands, lie close enough to the working zone that they will experience significant disturbance.

4.1.23 The roosts at St Andrew's Church, Church Farm buildings and St Peter's Church ruin are considered sufficiently far from the working zone as to remain undisturbed by the proposed works.

4.1.24 Two of the three areas of high bat activity revealed by the activity surveys (see section 4.1.14) are likely to be impacted from the proposed works. The area around Lingwood Community Woodland is utilised as a foraging ground by bats most likely roosting to the north at Poplar Farm, the Lindens and Oaklands. The works will sever the commuting routes between the roosts and the foraging area.

4.1.25 The fields to the north of the A47, at the western end of the scheme (Transect route 5), are utilised as a foraging ground by bats. No commuting routes were identified within the Scheme to suggest these bats are roosting within domestic buildings in the village of Blofield and commuting across the A47.

4.1.26 The fields to the south of the A47, at the western end of the scheme (Transect route 6), are utilised as a foraging ground by bats most likely roosting within domestic buildings in the village of Blofield. The proposed work will not impact the ability of bats to access this resource, although the new junction at Hemblington Road would either divert bats south of the existing A47 or bats would cross the new junction.

4.1.27 Trees, hedgerows and invertebrate-rich pasture have been identified as an important foraging resource for all bats including the rarer species barbastelle. Removal of these habitats to facilitate work will reduce the availability of feeding opportunities for bats in the area.

4.1.28 Tree lines and hedgerows have been identified as important commuting routes for bats within the locality. Severance of these features will negatively impact bats' ability to navigate and commute between feeding grounds. This may also impact upon the migratory route of Nathusius' pipistrelle.

4.1.29 Increased lighting on the Scheme would impact the more light averse species, such as *Myotis* sp. from foraging near the road or crossing it.

4.1.30 The locations with the highest species assemblages at Locations 10 and 11 are unlikely to impacted significantly as these areas are a distance from the actual operational road and fewer vegetation is to be removed in these areas. The high species assemblages at Locations 2 and 6 are very close to or within the Scheme and would be impacted.

The loss of three trees (T1, T5 and T53) containing day roosts will not impact the favourable conservation status of bats in the area as a Natural England mitigation licence would need to be obtained in which alternative roosting provision, in the form of bat boxes, would likely need to be provided to mitigate for their loss.

Recommendations

4.1.31 The destruction of the roosts at T1, T5 and T53 will require a licence from Natural England. For a licence application to be successful, mitigation in the form of alternative roost provision, will be required. Installation of bat boxes within trees not affected by the works should meet this requirement.

4.1.32 Natural England licences to disturb the roosts at T67, Poplar Farm, The Lindens, Oaklands, Hall Cottages and The White House will be required. The licence application will require mitigation to minimise the disturbance resulting from the works. Full mitigation strategies, including methods of working, timings, compensation measures and post-construction monitoring will be detailed in the method statement for the licence applications.

4.1.33 The potential, but unconfirmed, roost at Hall Cottages would experience disturbance but may not require a Natural England mitigation licence. Given the single potential sighting of a common species roosting outside of the maternity season, and the indirect and temporary nature of the noise disturbance expected, it may be possible to do the works under a method statement agreed in advance with Natural England. However, if a licence is applied for which covers the site as a whole, this potential roost would be included in this application with the confirmed roost.

4.1.34 All trees removed to facilitate works should be replaced on at least a like-for-like basis with fast growing, semi-mature, native species. Trees planted along field margins will provide a feeding resource and aid in commuting. The siting of the trees at field margins will not impact the current use of the fields as arable farmland. The species-rich areas of arable field margins that contain the most invertebrates should be replaced with areas species-rich grassland to maintain biodiversity levels and provide alternative foraging resource for bats. Hedgerows to be removed should be replaced with species-rich hedgerows. The high species assemblage areas at Locations 2 and 6 and within Transect Three should have current levels of biodiversity maintained and improved upon if possible. Where severance of treelines and hedges by the new road and access roads is unavoidable, fast growing, semi-mature, native tree species should be planted at tree lines that are currently perpendicular to the existing A47 that bats may use to commute along and across the new A47.. This will create a 'hop over' point to guide commuting bats over the roads at a height sufficient to avoid collisions between bats and moving vehicles (an example is provided in Annex G). A hop over point located between at Lingwood Road will facilitate the movement of bats between known roosts at Poplar Farm, The Lindens and Oaklands, plus suspected roosts in the village, and known foraging grounds north of the A47 around Bullacebush Lane and the woodlands at North Burlingham. A second 'hop-over' located to the east would provide a safer cross-over for the high species assemblages at Locations 10 and 11

4.1.35 Lighting should be avoided at these points, as some bat species are deterred by light, or lighting may be used at lower heights to prevent bats from descending to road level. A wildlife sensitive lighting scheme should be designed in consultation with a suitably experienced ecologist to make sure that important foraging areas remain undisturbed during the construction and operational phases of the development. Where lighting is necessary, the following measures should be considered to reduce adverse effects:

- Consideration of hood design, lamp height, and angle, to reduce light spill particularly avoiding illuminating retained foraging and commuting habitat on the site such as mature trees, tree lines, and hedgerows;
- Use of less ultra violet (UV) light emitting bulbs, such as metal halide or high-pressure sodium; and
- Minimising hours of lighting to those absolutely necessary for security and safety purposes, where possible lighting should avoid key periods of bat activity (i.e. sunset and sunrise). Consider how new technologies can be used to control lighting levels (e.g. dimming lights at certain times).

4.1.36 Further technical details are given in the BCT and the institute of Lighting Engineers' Bats and lighting in the UK (2009) and Artificial lighting and Wildlife: Interim Guidance: Recommendations to help minimise the impact of artificial lighting (BCT, 2014). Both publications are available at http://www.bats.org.uk/pages/bats_and_lighting.html.

4.1.37 The landscaping should be designed to provide shelter, foraging opportunities and connected dark corridors within and throughout the site. It is recommended that a suitably qualified ecologist is consulted during the design of the landscaping scheme to advise on the creation and enhancement of habitats for bats (and other wildlife). A list of plant species which could be used to enhance the site for foraging bats is included in Annex H.

5 References

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Zeale, M.R.K., Davidson-Watts, I. and Jones, G. (2012) *Home range use and habitat selection by barbastelle bats (Barbastella barbastellus): implications for conservation*. *Journal of Mammalogy*, Volume 93, Issue 4, pp. 1110–1118.

Annex A – Site Map

Key to symbols

Proposed Scheme Area

References drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION

Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Scheme Overview

Scale	Designed	Drawn	Checked	Approved
1:17,500	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/06/18	24/08/18	01/09/18	10/09/18

Drawing Number: HE PIN HE551490 | Originator MMSJV | Volume EBD | Location 000 | Type DR | Role LB | Number 00022

Project Ref. No.: HE551490

Revision: P01

0 0.5 1 Kilometres

Annex B – Locations of buildings and trees assessed for bat roost potential

Key to symbols

- Assessed Building
- Assessed Tree
- Surveyed Building
- Surveyed Tree
- Proposed Scheme Area

References drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

Project Title: A47 - Blofield to North Burlingham

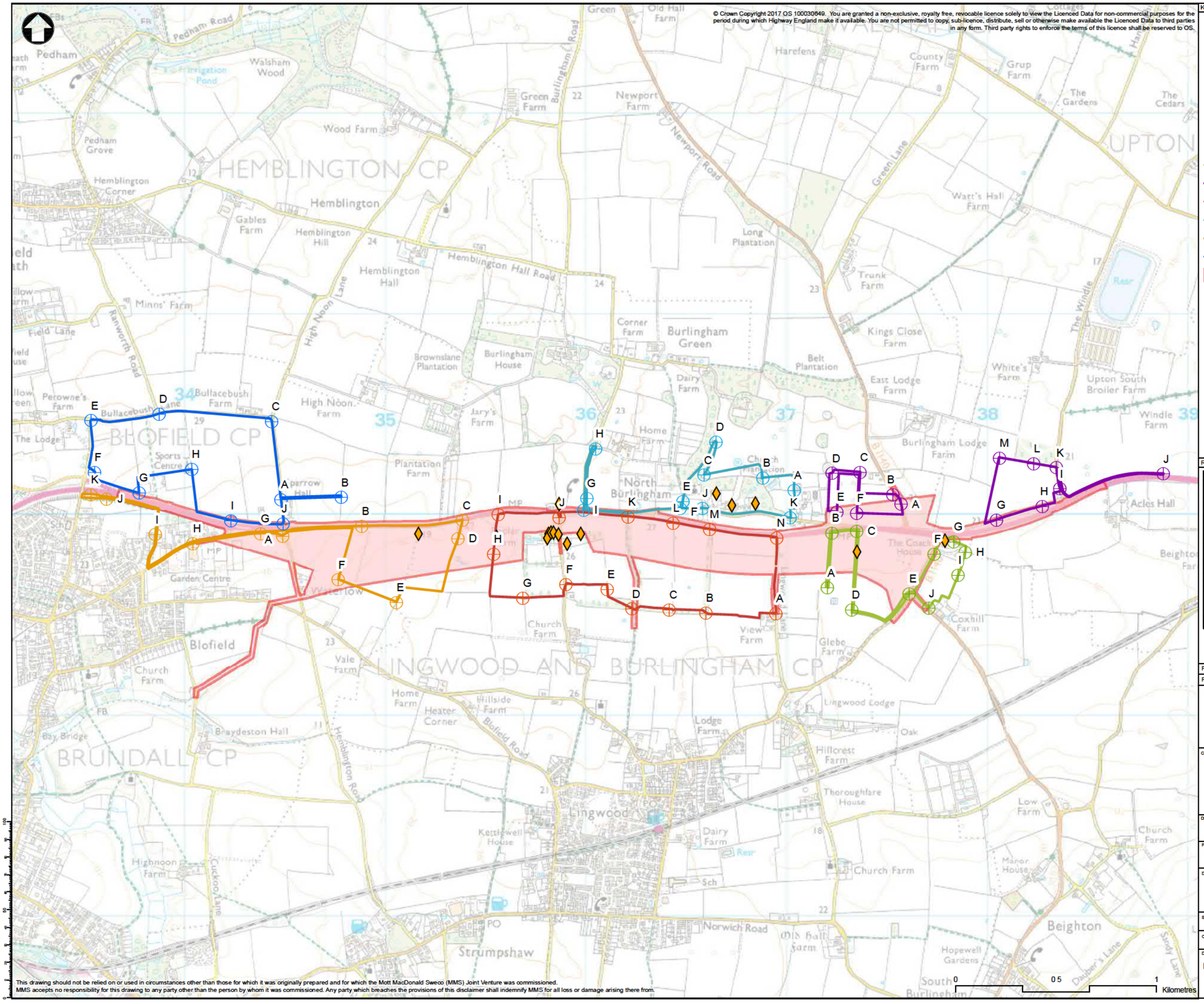
Drawing Title: Locations of Assessed and Surveyed Trees/Buldings

Scale	Designed	Drawn	Checked	Approved
1:17,500	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/06/18	24/08/18	01/09/18	10/09/18

Drawing Number: HE PIN HE551490 | Originator MMSJV | Volume EBD | Location 000 | Type DR | Role LB | Number 00023
Project Ref. No.: HE551490
Rev sion: P01

0 0.5 1 Kilometres

Annex C – Transect routes



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MMS accepts no responsibility for this drawing to any party other than the person by whom it was commissioned. Any party which breaches the provisions of this disclaimer shall indemnify MMS for all loss or damage arising there from.

Key to symbols

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6
- Proposed Scheme Area

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References drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Appendix C
Static Locations

Scale	Designed	Drawn	Checked	Approved
1:17,500	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size: A3	Date: 01/06/18	Date: 24/08/18	Date: 01/09/18	Date: 10/09/18

Drawing Number: HE551490 - MMSJV - EBD - 000 - DR - LB - 00026
(HE PIN | Originator | Volume | Location | Type | Role | Number)
Project Ref. No.: HE551490
Revision: P01

Annex D – Locations of static detectors used in automated surveys

L1 L2 L3 L4 L5 L6 L7 L8 L9 L10 L11 L12

Key to symbols

- Static Bat Dectector Locations
- Proposed Scheme Area

References drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Static Bat Detector Locations

Scale	Designed	Drawn	Checked	Approved
1:17,500	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size: A3	Date: 01/06/18	Date: 24/08/18	Date: 01/09/18	Date: 10/09/18

Drawing Number: HE PIN HE551490 | Originator MMSJV | Volume EBD | Location 000 | Type DR | Role LB | Number 00024
Project Ref. No.: HE551490
Revision: P01

0 0.5 1 Kilometres

Annex E – Full survey results

Activity survey results

16/04/18 Dusk activity survey - Transect Three

20:29: Leisler's bat commuting unseen.

20:29: barbastelle commuting from east to west at a height of ~3m.

20:33: barbastelle foraging in circles at a height of ~4m.

20:35: common pipistrelle foraging unseen.

20:39: common pipistrelle commuting unseen.

20:40-44: common and soprano pipistrelle foraging in a woodland clearing. At least six individual bats present. Social calls detected.

20:45-47: common pipistrelle foraging unseen.

20:48-49: common pipistrelle foraging unseen.

20:50: common pipistrelle foraging unseen.

20:59: common pipistrelle commuting unseen.

21:21: common pipistrelle commuting unseen. Faint pass detected.

21:41: common pipistrelle commuting unseen.

21:45: Leisler's bat commuting unseen.

17/04/18 Dawn activity survey - Transect Three

04:57-59: Single common pipistrelle foraging along woodland edge.

05:23: Single bat commuting along hedgerow. Species unknown.

17/04/18 Dusk activity survey - Transect Two

20:16-18: soprano pipistrelle foraging at a height of approximately 5m. Social calls recorded.

20:24: soprano pipistrelle foraging at a height of approximately 3.5m.

20:25: soprano pipistrelle foraging at a height of approximately 2m.

20:26: soprano pipistrelle commuting unseen.

20:29: soprano pipistrelle commuting unseen. Faint, distant call recorded.

20:30: 2 x common pipistrelles foraging along tree line at a height of 2-3m.

20:44: common pipistrelle commuting unseen. Faint, distant call recorded.

21:17: Nathusius' pipistrelle commuting unseen. Faint, distant call recorded.

18/04/18 Dawn activity survey - Transect Two

No bats were detected during this survey.

18/04/18 Dusk activity survey - Transect One

20:37: soprano pipistrelle commuting unseen.

20:41-43: common pipistrelle foraging north to south along tree line at a height of 2-3m.

21:44: common pipistrelle commuting unseen.

25/04/18 Dusk activity survey - Transect Five

No bats were detected during this survey.

25/04/18 Dusk activity survey - Transect Six

20:57: common pipistrelle commuting unseen.

20:58: soprano pipistrelle commuting unseen.

21:00-21:01: common and soprano pipistrelle commuting unseen. Social calls recorded.

21:01-21:03: common pipistrelle foraging unseen. Social calls recorded.

21:03: common pipistrelle commuting unseen.

21:04: 2 x common pipistrelle commuting unseen.

21:05-06: soprano pipistrelle foraging unseen.

21:07: common pipistrelle foraging and soprano pipistrelle commuting, both unseen.

21:24-26: soprano pipistrelle foraging unseen.

26/04/18 Dusk activity survey Transect Four

20:35: common pipistrelle foraging. Five (5) bats seen.

20:44: common and soprano pipistrelle commuting unseen. Three (3) passes detected.

20:48: common pipistrelle commuting. Single pass recorded.

21:00: common and soprano pipistrelle commuting unseen. Two (2) passes recorded.

21:07: common pipistrelle commuting unseen. Six (6) passes recorded.

21:14: common pipistrelle commuting unseen. Faint call recorded.

08/05/18 Dusk activity survey Transect One

No bats were detected during this survey.

09/05/18 Dusk activity survey Transect Two

20:50-52: noctule foraging at height, flying back and forth. Two (2) bats seen.

21:23-24: common pipistrelle foraging. Two (2) bats seen.

21:29: common pipistrelle commuting unseen.

21:45: common pipistrelle commuting unseen.

21:49: common pipistrelle foraging unseen. Faint calls recorded.

10/05/18 Dusk activity survey Transect Three

21:11: common pipistrelle foraging along top of tree line

21:25: soprano pipistrelle commuting unseen. Brief pass

21:45-51: common pipistrelle foraging unseen.

21:52: common pipistrelle foraging unseen.

21:54: *Myotis* sp. commuting unseen.

23/05/18 Dusk activity survey - Transect 4

21:05: noctule commuting unseen.

21:11: noctule commuting.

21:15: noctule commuting unseen.

21:20: soprano pipistrelle commuting.

21:23: common pipistrelle foraging.

21:31: common pipistrelle foraging.

21:33: common pipistrelle foraging unseen.

21:41: soprano pipistrelle foraging.

21:42: soprano pipistrelle commuting unseen.

21:46: soprano pipistrelle foraging.

21:46: common pipistrelle foraging.

21:50: common pipistrelle commuting.

21:53: soprano pipistrelle commuting.

21:55: soprano pipistrelle commuting.

22:00: common pipistrelle commuting.

22:01: soprano pipistrelle commuting.

24/05/18 Dawn activity survey - Transect 4

03:17: noctule commuting.

03:19: *Nyctalus* species commuting.

03:25: common pipistrelle commuting unseen.

03:35: common pipistrelle foraging unseen.

03:38: soprano pipistrelle foraging.

03:40: soprano pipistrelle foraging.

03:40: common pipistrelle commuting.

03:42: common pipistrelle commuting.

03:43: soprano pipistrelle commuting.

03:45: common pipistrelle foraging.

03:48: noctule commuting.

03:49: soprano pipistrelle foraging.

03:50: soprano pipistrelle foraging.

03:50: common pipistrelle foraging.

03:52: soprano pipistrelle foraging.

03:55: soprano pipistrelle foraging.

04:06: common pipistrelle commuting.

04:06: common pipistrelle foraging.

24/05/18 Dusk activity survey - Transect 5

22:01: common pipistrelle commuting unseen.

22:03: soprano pipistrelle commuting unseen.

22:09: soprano pipistrelle commuting unseen.

22:17: common pipistrelle commuting unseen.

24/05/18 Dusk activity survey - Transect 6

20:57: common pipistrelle commuting unseen.

20:59: common pipistrelle commuting and foraging unseen.

21:02: common pipistrelle foraging unseen.

21:05: common pipistrelle commuting unseen.

21:06: common pipistrelle foraging unseen. Two bats detected.

21:24: common pipistrelle commuting unseen.

29/05/18 Dusk activity survey - Transect 6

21:36: common pipistrelle foraging.

21:47: soprano pipistrelle commuting unseen.

21:56: common pipistrelle commuting unseen.

22:00: common pipistrelle commuting unseen.

04/06/18 Dusk activity survey - Transect 1

21:30: soprano pipistrelle commuting unseen.

21:54: common pipistrelle commuting unseen.

21:57: common pipistrelle commuting unseen.

21:58: common pipistrelle commuting unseen.

22:10: common pipistrelle foraging.

22:19: noctule commuting unseen.

22:23: noctule commuting unseen.

22:24: serotine commuting unseen.

22:30: common pipistrelle commuting unseen.

22:34: soprano pipistrelle commuting unseen.

22:53-55: common pipistrelle foraging.

22:59: common pipistrelle foraging.

05/06/18 Dawn activity survey - Transect 1

02:45: common pipistrelle foraging unseen.

02:49: common pipistrelle foraging.

03:19: common pipistrelle commuting unseen.

03:30: common pipistrelle foraging.

05/06/18 Dusk activity survey - Transect 5

21:48: common pipistrelle commuting.

21:51: common pipistrelle foraging.

21:51: soprano pipistrelle foraging.

21:54: common pipistrelle foraging.

22:00: common pipistrelle foraging.

22:06: common pipistrelle commuting unseen.

22:15: common pipistrelle foraging.

22:21: soprano pipistrelle commuting unseen.

22:28: *Pipistrellus* species commuting unseen.

23:26: *Nyctalus* species commuting unseen.

06/06/18 Dawn activity survey - Transect 5

02:57: common pipistrelle commuting unseen.

03:04: soprano pipistrelle foraging unseen.

03:04: common pipistrelle commuting unseen.

03:35: soprano pipistrelle foraging unseen.

03:39: soprano pipistrelle commuting unseen.

03:46: soprano pipistrelle foraging

03:46: common pipistrelle foraging

03:50: *Pipistrellus* species commuting unseen.

03:55: common pipistrelle commuting unseen.

04:00: soprano pipistrelle commuting unseen.

07/06/18 Dusk activity survey - Transect 2

22:11: unknown bat, not picked up by detector, commuting.

22:34: common pipistrelle commuting and foraging.

22:39: common pipistrelle commuting.

11/06/18 Dusk activity survey - Transect 6

21:54: soprano pipistrelle commuting.

21:55: *Pipistrellus* species commuting unseen.

21:58: common pipistrelle commuting unseen.

22:02: common pipistrelle foraging.

22:03-06: soprano pipistrelle foraging.

22:13: common pipistrelle commuting.

22:14: common pipistrelle commuting unseen.

22:19: common pipistrelle foraging.

22:23: *Pipistrellus* species commuting unseen.

22:34: common pipistrelle commuting. Two bats seen.

22:35: common pipistrelle commuting and foraging.

22:38-40: common pipistrelle foraging.

22:42: common pipistrelle commuting unseen.

22:50: common pipistrelle commuting unseen.

22:50: common pipistrelle commuting unseen.

12/06/18 Dawn activity survey - Transect 6

02:31: soprano pipistrelle commuting unseen.

02:59: common pipistrelle foraging.

03:02: common pipistrelle foraging.

03:04: common pipistrelle foraging unseen.

03:13: common pipistrelle commuting unseen.

03:15: common pipistrelle foraging unseen.

03:16: soprano pipistrelle commuting unseen.

03:19: common pipistrelle commuting unseen.

03:22: common pipistrelle commuting unseen.

03:23: noctule commuting unseen.

03:27: common pipistrelle commuting unseen.

03:29: common pipistrelle foraging.

03:35: common pipistrelle foraging unseen.

03:38: common pipistrelle foraging.

03:39: common pipistrelle commuting unseen.

03:43: *Pipistrellus* species commuting unseen.

03:46: common pipistrelle foraging.

03:47: common pipistrelle foraging.

03:57: soprano pipistrelle commuting unseen.

12/06/18 Dusk activity survey - Transect 4

21:44: common pipistrelle commuting.

21:45: common pipistrelle commuting.

21:46: common pipistrelle foraging.

21:48: common pipistrelle commuting unseen.

21:49: common pipistrelle commuting unseen.

21:50: common pipistrelle foraging.

21:50: common pipistrelle commuting.

21:56: common pipistrelle commuting.

21:58: common pipistrelle commuting.

21:59: noctule foraging.

22:01: common pipistrelle foraging.

22:04-07: common pipistrelle foraging unseen.

22:07: noctule foraging.

22:15: soprano pipistrelle foraging.

22:16: soprano pipistrelle commuting unseen.

22:26-33: common pipistrelle foraging.

22:36: soprano pipistrelle foraging.

22:59: barbastelle commuting unseen.

23:09: noctule commuting unseen.

23:26: common pipistrelle commuting unseen.

23:27: common pipistrelle foraging.

12/06/18 Dusk activity survey - Transect 4

21:33: soprano pipistrelle commuting unseen.

21:34: noctule foraging unseen.

21:35: soprano pipistrelle foraging.

21:37: soprano pipistrelle foraging unseen.

21:38: soprano pipistrelle foraging unseen.

21:40: common pipistrelle foraging unseen.

21:41: common pipistrelle commuting unseen.

21:43: common pipistrelle foraging unseen.

21:46: common pipistrelle foraging unseen.

21:50: common pipistrelle commuting unseen.

21:51: soprano pipistrelle commuting unseen.

21:53: common pipistrelle commuting unseen.

21:53: noctule foraging.

21:53: common pipistrelle commuting unseen.

21:58: soprano pipistrelle foraging.

22:01: soprano pipistrelle foraging.

22:02: common pipistrelle commuting unseen.

22:03: common pipistrelle foraging.

22:05-11: common pipistrelle foraging. Two bats seen.

22:08: serotine commuting.

22:10: common pipistrelle commuting.

22:15: common pipistrelle commuting. Two bats seen.

22:19: common pipistrelle commuting unseen.

22:24: common pipistrelle commuting unseen.

22:26: common pipistrelle commuting unseen.

22:31: Leisler's bat commuting unseen.

22:41: soprano pipistrelle commuting unseen.

22:45: common pipistrelle commuting unseen.

22:48: common pipistrelle commuting unseen.

22:50: common pipistrelle foraging unseen.

22:51: soprano pipistrelle commuting unseen.

22:52: common pipistrelle commuting unseen.

22:53: common pipistrelle commuting unseen.

22:55: common pipistrelle commuting unseen.

Emergence and re-entry survey results

19/04/18 Dawn re-entry survey NT12

04:22: common pipistrelle commuting unseen.

04:25: common pipistrelle commuting unseen.

04:27: common pipistrelle commuting unseen.

04:42: common pipistrelle commuting unseen.

04:48: common pipistrelle commuting unseen.

05:12: common pipistrelle commuting unseen.

05:16: common pipistrelle commuting unseen.

05:18: soprano pipistrelle flying over the crown of the tree.

05:20: soprano pipistrelle commuting unseen.

19/04/18 Dawn re-entry survey T80 & 81

04:22: common pipistrelle commuting unseen.

05:12: soprano pipistrelle commuting unseen.

26/04/18 Dawn re-entry survey NT09

No bats were detected during this survey.

26/04/18 Dawn re-entry survey T57 & 58

No bats were detected during this survey.

26/04/18 Dawn re-entry survey T84 & 85

No bats were detected during this survey.

26/04/18 Dusk emergence survey T88

20:47: common pipistrelle commuting from north to south passing to the east of the tree.

21:01: soprano pipistrelle foraging unseen.

26/04/18 Dusk emergence survey T89

21:09: common pipistrelle commuting unseen.

21:23: common pipistrelle commuting unseen.

21:31: *Pipistrellus* species commuting unseen.

09/05/18 Dawn re-entry survey T43 & 44

03:58: *Pipistrellus* species commuting unseen.

04:10: *Pipistrellus* species foraging and commuting unseen.

04:21: common pipistrelle commuting unseen.

04:22: common pipistrelle commuting unseen.

09/05/18 Dawn re-entry survey T45

04:02: common pipistrelle commuting unseen.

04:04: common pipistrelle forging unseen.

04:14: common pipistrelle commuting at approximately 4m in height.

04:16: common pipistrelle commuting unseen.

04:20: common pipistrelle commuting unseen.

04:20: common pipistrelle commuting unseen.

04:32: soprano pipistrelle commuting unseen.

10/05/18 Dawn re-entry survey T75

No bats were detected during this survey.

10/05/18 Dawn re-entry survey T77 & 78

04:14: soprano pipistrelle commuting unseen.

10/05/18 Dawn re-entry survey T50 & 51

03:57-59: noctule foraging unseen.

10/05/18 Dawn re-entry survey T3

No bats were detected during this survey.

10/05/18 Dawn re-entry survey T75

No bats were detected during this survey.

11/05/18 Dawn re-entry survey T50 & 51

03:59: common pipistrelle commuting unseen.

04:03-13: common pipistrelle foraging and commuting unseen.

04:17: common pipistrelle commuting from the north, passing to the east of T50.

11/05/18 Dawn re-entry survey T90 & 91

No bats were detected during this survey.

17/05/18 Dusk emergence survey Poplar Farm Location B

21:15: common pipistrelle foraging over gardens to the east of the building being surveyed.

21:29-31: common pipistrelle foraging back and forth at a height of approximately 3m to the north of the building being surveyed.

21:36: common pipistrelle commuting west to east passing to the north of the building being surveyed.

21:43: common pipistrelle foraging above the farmyard to the west of the building being surveyed.

21:49: common pipistrelle commuting west to east passing to the north of the building being surveyed.

21:51: common pipistrelle commuting east to west passing to the north of the building being surveyed.

21:54: common pipistrelle commuting west to east passing to the north of the building being surveyed.

21:58: common pipistrelle commuting unseen.

22:04: common pipistrelle commuting west to east passing to the north of the building being surveyed.

22:08: common pipistrelle commuting west to east passing to the north of the building being surveyed.

17/05/18 Dusk emergence survey Poplar Farm Location B

21:15: common pipistrelle commuting north east to south west at a height of approximately 3m.

21:29: common pipistrelle commuting west to east at a height of approximately 1.5m.

21:36: common pipistrelle commuting north east to south west at a height of approximately 3m.

21:48: noctule commuting unseen.

21:49: common pipistrelle commuting unseen.

21:54: common pipistrelle commuting unseen.

21:55: common pipistrelle commuting unseen.

21:58: common pipistrelle commuting unseen.

22:04: common pipistrelle commuting unseen.

22:17: common pipistrelle commuting unseen.

17/05/18 Dusk emergence survey Poplar Farm Location C

No bats were detected during this survey.

17/05/18 Dusk emergence survey Poplar Farm Location D

21:29: common pipistrelle commuting east to west.

21:31: soprano pipistrelle commuting unseen.

21:36: common pipistrelle commuting unseen.

21:43: common pipistrelle commuting unseen.

21:53: common pipistrelle commuting unseen.

21:54: common pipistrelle commuting unseen.

21:55: common pipistrelle commuting unseen.

21:58: common pipistrelle commuting unseen.

22:04: common pipistrelle commuting unseen.

22:08: common pipistrelle commuting unseen.

22:16: common pipistrelle commuting unseen.

18/05/18 Dawn re-entry survey Poplar Farm Location E

03:44: common pipistrelle commuting unseen.

03:55: common pipistrelle commuting unseen.

04:11: common pipistrelle commuting unseen.

18/05/18 Dawn re-entry survey Poplar Farm Location F

No bats were detected during this survey.

18/05/18 Dawn re-entry survey Poplar Farm Location G

04:11: common pipistrelle commuting west to east passing to the south of the building being surveyed.

04:51: noctule commuting northwards at height.

18/05/18 Dawn re-entry survey Poplar Farm Location H

03:44: common pipistrelle commuting unseen.

06/06/18 Dusk emergence survey The White House Location A

No bats were detected during this survey.

06/06/18 Dusk emergence survey The White House Location B

22:18: common pipistrelle commuting unseen.

06/06/18 Dusk emergence survey The White House Location C

21:49: common pipistrelle commuting unseen.

21:51: common pipistrelle foraging unseen.

22:08: common pipistrelle commuting unseen.

22:17: common pipistrelle commuting unseen.

22:18: brown long eared bat commuting south to north, passing to the east of the building being surveyed.

22:23: common pipistrelle commuting unseen.

22:26: common pipistrelle commuting unseen.

22:27: common pipistrelle commuting unseen.

06/06/18 Dusk emergence survey The White House Location D

22:14: serotine commuting unseen.

22:24: common pipistrelle commuting unseen.

07/06/18 Dawn re-entry survey The Lindens Location A

02:56: soprano pipistrelle commuting unseen.

03:10: noctule commuting unseen.

03:18: common pipistrelle commuting unseen.

03:20: common pipistrelle commuting unseen.

03:23: soprano pipistrelle commuting unseen.

03:33: soprano pipistrelle commuting unseen.

03:42: common pipistrelle commuting unseen.

03:57: common pipistrelle commuting east to west over garden to the south of the building being surveyed.

04:01: common pipistrelle entering roost above bay window on western elevation of the building being surveyed.

07/06/18 Dawn re-entry survey The Lindens Location B

02:55: soprano pipistrelle commuting unseen.

03:10: *Nyctalus* species, with call characteristics of Leisler's bat, commuting unseen.

03:18: common pipistrelle commuting unseen.

03:20: common pipistrelle commuting unseen.

03:24: soprano pipistrelle foraging unseen.

03:32: soprano pipistrelle commuting unseen.

03:38: Leisler's bat commuting unseen.

03:42: soprano pipistrelle commuting unseen.

03:56: soprano pipistrelle entering roost above bay window on western elevation of the building being surveyed.

04:01: common pipistrelle entering roost above bay window on western elevation of the building being surveyed.

04:02: soprano pipistrelle commuting unseen.

04:03: soprano pipistrelle commuting unseen.

04:05: soprano pipistrelle flying around to the west of the building being surveyed for approximately one minute before entering roost above bay window on western elevation.

07/06/18 Dawn re-entry survey The Lindens Location C

02:55: soprano pipistrelle foraging unseen.

03:20: common pipistrelle foraging around trees to the east of the building being surveyed.

03:22: soprano pipistrelle foraging around trees to the east of the building being surveyed.

03:32: soprano pipistrelle foraging unseen.

04:00: common pipistrelle commuting north to south passing to the east of the building being surveyed.

13/06/18 Dawn re-entry survey T3

No bats were detected during this survey.

13/06/18 Dawn re-entry survey T5

No bats were detected during this survey.

13/06/18 Dawn re-entry survey T39

03:10: common pipistrelle commuting unseen.

03:21: common pipistrelle foraging unseen.

03:24: common pipistrelle foraging unseen.

03:32: common pipistrelle commuting unseen.

03:37: common pipistrelle commuting unseen.

13/06/18 Dawn re-entry survey T41

03:00: soprano pipistrelle commuting unseen.

03:09: common pipistrelle commuting unseen.

03:12: common pipistrelle foraging unseen.

03:25: common pipistrelle commuting unseen.

03:29: soprano pipistrelle foraging unseen.

13/06/18 Dusk emergence survey The Lindens Location A

21:41: common pipistrelle emerged from roost above bay window on the western elevation of the building being surveyed.

21:41: soprano pipistrelle emerged from roost above bay window on the western elevation of the building being surveyed.

21:49: common pipistrelle emerged from roost above bay window on the western elevation of the building being surveyed.

21:49: soprano pipistrelle foraging over the garden to the west of the building being surveyed.

21:51: soprano pipistrelle commuting unseen.

21:53: soprano pipistrelle foraging unseen.

21:54: soprano pipistrelle commuting unseen.

22:05: common pipistrelle foraging over the driveway to the west of the building being surveyed.

22:09: common pipistrelle foraging over the driveway to the west of the building being surveyed.

22:24: soprano pipistrelle commuting unseen.

13/06/18 Dusk emergence survey The Lindens Location B

21:33: noctule commuting unseen

21:42: common pipistrelle commuting unseen.

13/06/18 Dusk emergence survey The Lindens Location C

21:33: noctule hovering around trees to the east of the building being surveyed.

21:42: common pipistrelle commuting west to east passing to the south of the building being surveyed.

22:10: unidentified bat species, not detected by the bat detector, commuting north to south passing to the east of the building being surveyed.

13/06/18 Dusk emergence survey The Lindens Location D

21:33: noctule foraging around trees to the east of the building being surveyed.

21:42: common pipistrelle emerged from roost above bay window on the western elevation of the building being surveyed. This bat then foraged over the garden south of the building.

21:44: soprano pipistrelle commuting unseen.

21:46: soprano pipistrelle commuting unseen.

21:50: common pipistrelle emerged from roost above bay window on the western elevation of the building being surveyed. This bat then foraged over the garden west of the building.

21:51: soprano pipistrelle foraging unseen.

21:52: soprano pipistrelle foraging over the garden west of the building.

21:54: soprano pipistrelle commuting north to south passing over the building.

21:59: soprano pipistrelle commuting unseen.

22:11: common pipistrelle foraging unseen.

22:24: soprano pipistrelle commuting unseen.

22:39: common pipistrelle foraging unseen.

14/06/18 dawn re-entry survey The White House Location A

03:03: common pipistrelle foraging unseen.

03:12: common pipistrelle commuting unseen.

03:14: common pipistrelle foraging unseen.

14/06/18 dawn re-entry survey The White House Location B

03:36: common pipistrelle foraging unseen.

14/06/18 dawn re-entry survey The White House Location C

03:03: common pipistrelle commuting unseen.

03:14: common pipistrelle commuting unseen.

14/06/18 dawn re-entry survey The White House Location D

02:57: common pipistrelle commuting unseen.

02:59: brown long-eared bat commuting unseen.

03:03: common pipistrelle commuting unseen.

03:06: unidentified bat species, not detected by the bat detector, commuting west to east passing to the south of the building being surveyed.

03:11: brown long-eared bat and soprano pipistrelle commuting unseen.

03:14: common pipistrelle commuting east to west passing to the south of the building being surveyed.

03:16: common pipistrelle commuting unseen.

03:26: common pipistrelle commuting east to west passing to the south of the building being surveyed.

03:37: common pipistrelle commuting west to east passing to the south of the building being surveyed.

03:38: common pipistrelle foraging over the garden to the east of the building being surveyed.

03:46: common pipistrelle commuting west to east before turning to the north, flying over the building being surveyed.

18/06/18 Dusk emergence survey T52

21:59: common pipistrelle commuting unseen.

22:01: common pipistrelle commuting unseen.

22:09: common pipistrelle commuting unseen.

22:11: *Nyctalus* species, with call characteristics of Leisler's bat, commuting from south to north over the A47.

22:15: soprano pipistrelle commuting unseen.

22:17: soprano pipistrelle commuting unseen.

22:18: common pipistrelle commuting from north to south along Lingwood Lane.

22:20: soprano pipistrelle commuting from north west to south east across Lingwood Lane.

22:22: common pipistrelle commuting unseen.

22:23: common pipistrelle commuting unseen.

22:31: common pipistrelle commuting unseen.

22:32-33: common pipistrelle commuting unseen.

22:40: common pipistrelle commuting unseen.

22:42: soprano pipistrelle commuting unseen.

18/06/18 Dusk emergence survey T53

No bats were detected during this survey.

19/06/18 Dawn re-entry survey T75

03:05: common pipistrelle commuting unseen.

03:09: common pipistrelle commuting unseen.

03:10: common pipistrelle commuting unseen.

03:16: common pipistrelle commuting from north to south passing to the west of the tree.

03:17: common pipistrelle commuting from east to west passing to the south of the tree.

03:23: soprano pipistrelle commuting unseen.

03:42: noctule commuting from north east to south west passing to the west of the tree.

19/06/18 Dawn re-entry survey T77

03:43: noctule commuting unseen.

19/06/18 Dawn re-entry survey Poplar Farm Location D

No bats were detected in this survey.

19/06/18 Dusk emergence survey Poplar Farm Location I

22:11: noctule commuting unseen.

22:14: common pipistrelle commuting unseen.

22:26: common pipistrelle commuting south to north out of the courtyard in front of the large barn.

22:27: common pipistrelle commuting from the west before turning south over the courtyard in front of the large barn.

22:28: unidentified bat species, not picked up on the bat detector, commuting south to north out of the courtyard in front of the large barn.

22:33: common pipistrelle commuting unseen.

22:41: common pipistrelle commuting north east to south west over the large barn.

22:43: unidentified bat species, not picked up on the bat detector, commuting south to north out of the courtyard in front of the large barn.

22:48: common pipistrelle commuting north to south over the courtyard in front of the large barn.

22:50: Leisler's bat commuting unseen.

22:52: common pipistrelle commuting unseen.

19/06/18 Dusk emergence survey Poplar Farm Location J

22:07: unidentified bat species, not picked up on the bat detector, emerged from the western end of the building being surveyed.

22:10: unidentified bat species, not picked up on the bat detector, emerged from the western end of the building being surveyed.

22:11: noctule commuting unseen.

22:14: common pipistrelle commuting from the east before turning south over the courtyard in front of the large barn.

22:26: common pipistrelle foraging from north to south into the courtyard in front of the large barn before flying away to the north.

22:29: common pipistrelle foraging from north to south into the courtyard in front of the large barn before flying away to the south.

22:31: common pipistrelle commuting unseen.

22:34: common pipistrelle foraging over the field to the north of the farm buildings.

22:40: soprano pipistrelle foraging unseen.

22:43: common pipistrelle foraging unseen.

22:46: common pipistrelle commuting unseen.

22:48: common pipistrelle commuting unseen.

22:49: noctule commuting unseen.

22:50: noctule commuting unseen.

22:50: common pipistrelle commuting unseen.

19/06/18 Dusk emergence survey Poplar Farm Location K

22:11: noctule commuting unseen.

22:13-14: common pipistrelle commuting east to west then reversing direction. Social calls also recorded.

22:17: common pipistrelle commuting unseen.

22:20: unidentified bat species, not picked up on the bat detector, commuting northwards before turning to the south at a height of approximately 3m.

22:23: common pipistrelle commuting east to west at a height of ~2m.

22:25: common pipistrelle commuting east to west before turning northwards.

22:29: common pipistrelle commuting north to south before turning westwards.

22:34: common pipistrelle commuting unseen.

22:37: common pipistrelle commuting unseen.

22:40: common pipistrelle commuting unseen.

22:40: soprano pipistrelle commuting unseen.

22:41: soprano pipistrelle commuting unseen.

22:46: common pipistrelle commuting unseen.

22:50: *Nyctalus* sp. with characteristics of Leisler's bat commuting unseen.

22:50: common pipistrelle commuting unseen.

22:51: common pipistrelle commuting unseen.

19/06/18 Dusk emergence survey Poplar Farm Location M

22:07: unidentified bat species, not picked up on the bat detector, commuting west to east at a height of 2-3m.

22:12: noctule commuting unseen.

22:16: unidentified bat species, not picked up on the bat detector, commuting west to east at a height of 2-3m.

22:20: common pipistrelle commuting unseen.

22:26: common pipistrelle commuting unseen.

22:38: common pipistrelle commuting unseen.

22:44: unidentified bat species, not picked up on the bat detector, commuting east to west at a height of 2-3m.

22:50: noctule commuting unseen.

20/06/18 Dawn re-entry survey Polar Farm Location A

03:00: Unidentified species, not picked up by the detector, commuting west to east passing close to the surveyor.

03:02: common pipistrelle commuting unseen.

03:03: common pipistrelle commuting unseen.

03:07: common pipistrelle commuting unseen.

03:11: common pipistrelle commuting unseen.

03:12: common pipistrelle commuting unseen.

03:15: common pipistrelle commuting south to north at a height of approximately 3m.

03:16: common pipistrelle commuting north to south at a height of approximately 3m.

03:17: soprano pipistrelle commuting north to south at a height of approximately 3m.

03:19: common pipistrelle commuting westwards along the north side of the building before turning around, flying eastwards and turning south.

03:20-31: common pipistrelle foraging over the grass to the east of the building before departing northwards.

03:28: common pipistrelle commuting westwards to the north of the building being surveyed.

03:38: common pipistrelle foraging over the grass to the east of the building before departing northwards.

20/06/18 Dawn re-entry survey Polar Farm Location C

03:00: common pipistrelle commuting unseen.

03:03: soprano pipistrelle commuting unseen.

03:11: common pipistrelle commuting unseen.

04:12: bat observed commuting north to south after the unexpected shutdown of the bat detector, making accurate species identification impossible.

20/06/18 Dusk emergence survey The Lindens Location A

21:47: Faint soprano pipistrelle calls detected from the previously identified roost on the west elevation of the building being surveyed.

21:48: soprano pipistrelle emerged from roost on the west elevation of the building and headed south.

21:50: social calls detected from the roost on the west elevation of the building.

21:57: social calls detected from the roost on the west elevation of the building.

21:59: soprano pipistrelle commuting west to east before reversing direction. Flying at a height of approximately 3m.

22:02: soprano pipistrelle commuting unseen.

22:04: soprano pipistrelle commuting unseen.

22:09: common pipistrelle commuting west to east at a height of approximately 3m, passing to the north of the building.

22:10: soprano pipistrelle foraging over the garden to the west of the building at a height of approximately 3m.

22:17: soprano pipistrelle commuting west to east before reversing direction. Flying at a height of approximately 3m.

22:23: two common pipistrelles commuting in tandem from east to west over the building.

22:27: common pipistrelle commuting unseen.

22:29: common pipistrelle commuting from north to south over the building.

20/06/18 Dusk emergence survey The Lindens Location B

21:48: soprano pipistrelle emerged from roost on the west elevation of the building and headed south.

21:50: soprano pipistrelle commuting unseen.

21:55: soprano pipistrelle commuting unseen.

21:56: soprano pipistrelle commuting unseen.

21:59: soprano pipistrelle commuting west to east, turning north, before departing to the west.

22:01: soprano pipistrelle commuting unseen.

22:01: soprano pipistrelle commuting unseen.

22:08: soprano pipistrelle commuting unseen.

22:09: soprano pipistrelle commuting west to east before turning south over the garden to the west of the building being surveyed.

22:16: soprano pipistrelle commuting unseen.

22:22: soprano pipistrelle commuting unseen.

20/06/18 Dusk emergence survey The Lindens Location C

21:57: soprano pipistrelle commuting unseen.

22:02: soprano pipistrelle commuting unseen.

22:05: noctule commuting unseen.

22:08: common pipistrelle commuting unseen.

22:22: common pipistrelle commuting unseen.

22:26: common pipistrelle commuting east to west before reversing direction over the building being surveyed.

22:30: common pipistrelle commuting unseen.

20/06/18 Dusk emergence survey The Lindens Location D

22:09: common pipistrelle commuting unseen.

22:22: common pipistrelle commuting unseen.

22:25: common pipistrelle foraging unseen.

22:30: common pipistrelle commuting unseen.

22:39: brown long-eared bat commuting unseen.

21/06/18 Dawn re-entry survey Oaklands Location A

02:56: soprano pipistrelle commuting unseen.

03:18: common pipistrelle commuting unseen.

03:24: common pipistrelle commuting unseen.

21/06/18 Dawn re-entry survey Oaklands Location B

03:19: common pipistrelle commuting south to north at a height of approximately 5m, passing to the west of the building being surveyed.

03:21: soprano pipistrelle commuting north to south at a height of approximately 5m, passing to the west of the building being surveyed.

03:25: soprano pipistrelle commuting unseen.

03:27: common pipistrelle commuting unseen.

03:25: soprano pipistrelle commuting unseen.

21/06/18 Dawn re-entry survey Oaklands Location C

03:14: serotine commuting unseen.

03:28: soprano pipistrelle foraging unseen.

03:47: soprano pipistrelle commuting unseen.

21/06/18 Dawn re-entry survey Oaklands Location D

02:24: soprano pipistrelle commuting unseen.

02:47-48: soprano pipistrelle foraging unseen.

02:48: unidentified bat species commuting north to south, passing to the east of the large outbuilding.

02:49: soprano pipistrelle commuting south to north, passing to the east of the large outbuilding.

05/07/18 Dusk emergence survey The Old College Location A

21:59: noctule commuting north east to south west, crossing the A47, at a height of approximately 30m.

22:03: soprano pipistrelle commuting unseen.

22:12: common pipistrelle commuting unseen.

22:19: noctule commuting unseen.

22:21: soprano pipistrelle commuting from the south, turning east over the yard to the east of the building being surveyed.

05/07/18 Dusk emergence survey The Old College Location B

22:00: noctule commuting unseen.

22:02: soprano pipistrelle commuting unseen.

22:03: noctule commuting unseen.

22:19: noctule commuting unseen.

22:20: soprano pipistrelle commuting unseen.

22:21: soprano pipistrelle commuting unseen.

05/07/18 Dusk emergence survey The Old College Location C

22:02: noctule commuting and foraging to the west of the building being surveyed at a height of 8-10m.

22:20: common pipistrelle commuting unseen.

17/07/18 Dusk emergence survey Poplar Farm Location J

21:29: noctule commuting unseen.

21:40: common pipistrelle commuting unseen.

22:09: *Pipistrellus* species commuting unseen.

22:12: common pipistrelle commuting unseen.

22:15: soprano pipistrelle commuting unseen.

22:16: soprano pipistrelle commuting unseen.

22:19: common pipistrelle commuting unseen.

22:34: noctule commuting unseen.

22:36: noctule commuting unseen.

22:38: soprano pipistrelle commuting unseen.

17/07/18 Dusk emergence survey Poplar Farm Location K

21:19: noctule commuting unseen.

21:41: common pipistrelle commuting east to west passing to the north of the building being surveyed.

22:04: unidentified bat species, not detected by the bat detector, commuting west to east passing to the north of the building being surveyed.

22:06: unidentified bat species, not detected by the bat detector, commuting east to west passing to the north of the building being surveyed.

22:32: unidentified bat species, not detected by the bat detector, commuting east to west passing to the north of the building being surveyed.

22:36: Leisler's bat commuting unseen.

22:38: soprano pipistrelle commuting unseen.

17/07/18 Dusk emergence survey Poplar Farm Location L

21:24: unidentified bat species, not detected by the bat detector, emerged from eastern elevation of the building being surveyed.

21:29: noctule foraging from north to south passing to the east of the building.

22:05: common pipistrelle commuting unseen.

22:12: noctule commuting unseen.

22:16: common pipistrelle foraging unseen.

22:32: common pipistrelle commuting unseen.

22:12: noctule commuting unseen.

18/07/18 Dawn re-entry survey Poplar Farm Location A

02:53: common pipistrelle commuting unseen.

03:02: common pipistrelle commuting unseen.

03:38: common pipistrelle foraging to near the south west corner of the building being surveyed.

18/07/18 Dawn re-entry survey T80

04:10: common pipistrelle commuting unseen.

18/07/18 Dawn re-entry survey T81

03:56: common pipistrelle commuting unseen.

04:02: common pipistrelle commuting unseen.

04:05: common pipistrelle commuting unseen.

04:09: common pipistrelle commuting unseen.

18/07/18 Dusk emergence survey T75

21:56: soprano pipistrelle commuting from west to east passing to the north of the tree.

22:06: noctule commuting unseen.

22:07: Leisler's bat commuting unseen.

22:15: common pipistrelle commuting unseen.

22:16-17: common pipistrelle commuting unseen.

22:18: Leisler's bat commuting unseen.

22:19: common pipistrelle commuting unseen.

22:21: soprano pipistrelle commuting unseen.

22:24: noctule commuting unseen.

22:25: soprano pipistrelle commuting unseen.

22:25: common pipistrelle commuting unseen.

22:30: common pipistrelle commuting unseen.

22:33: common pipistrelle commuting unseen.

22:35: common pipistrelle commuting unseen.

22:37: common pipistrelle commuting unseen.

18/07/18 Dusk emergence survey T77

21:54: noctule commuting unseen.

21:59: Leisler's bat commuting unseen.

22:03: soprano pipistrelle commuting unseen.

22:17: common pipistrelle commuting unseen.

22:19: common pipistrelle commuting unseen.

22:21: common pipistrelle commuting unseen.

22:22: soprano pipistrelle commuting unseen.

22:23: Leisler's bat commuting unseen.

22:26: common pipistrelle commuting unseen.

22:27: common pipistrelle commuting unseen.

22:34: Leisler's bat commuting unseen.

22:36: Leisler's bat commuting unseen.

19/07/18 Dawn re-entry survey T52

03:29: noctule commuting unseen.

03:32: soprano pipistrelle commuting unseen.

03:32: common pipistrelle commuting unseen.

03:39: soprano pipistrelle commuting unseen.

03:43: soprano pipistrelle commuting unseen.

03:43: noctule commuting unseen.

03:46: barbastelle commuting unseen.

03:47: common pipistrelle commuting unseen.

03:48: common pipistrelle commuting unseen.

03:50: unidentified bat seen foraging over hedgerow. No calls detected.

03:51: common pipistrelle commuting unseen.

04:07: common pipistrelle commuting from north to south, passing to the west of the tree.

19/07/18 Dawn re-entry survey T53

03:35: soprano pipistrelle foraging unseen.

03:39: soprano pipistrelle foraging unseen.

03:47: soprano pipistrelle foraging over the field to the west of the tree.

03:55: soprano pipistrelle foraging next to the tree line to the west.

04:03: soprano pipistrelle foraging around the canopy of T53.

04:14: soprano pipistrelle foraging around the canopy before roosting in T53.

19/07/18 Dusk emergence survey T1

21:31: unidentified bat species, not picked up on the bat detector, emerged from western branch of the tree at a height of approximately 5m.

22:08: soprano pipistrelle commuting unseen.

22:15: common pipistrelle foraging unseen.

22:20-25: common pipistrelle foraging over the field to the west of the tree.

22:25: common pipistrelle foraging unseen.

22:26-34: common pipistrelle foraging over the field to the west of the tree.

22:30: common pipistrelle commuting unseen.

22:36: common pipistrelle commuting unseen.

19/07/18 Dusk emergence survey T3

21:50: noctule commuting unseen.

22:00: soprano pipistrelle commuting unseen.

22:15: soprano pipistrelle commuting unseen.

22:22: *Pipistrellus* species with call characteristics of common pipistrelle.

22:28: common pipistrelle commuting unseen.

22:28: soprano pipistrelle commuting unseen.

22:33: soprano pipistrelle commuting unseen.

19/07/18 Dusk emergence survey T5

21:56: serotine commuting unseen.

21:58: common pipistrelle commuting unseen.

22:00-05: common pipistrelle foraging in circles around the tree. Two bats seen. One bat departed east, the other bat not seen leaving.

22:05: common pipistrelle commuting unseen.

22:09: noctule commuting unseen.

22:12-31: common pipistrelle foraging in circles around the tree.

22:16: soprano pipistrelle commuting unseen.

22:32: soprano pipistrelle commuting unseen.

22:33-37: common pipistrelle foraging unseen.

20/07/18 Dawn re-entry survey T85

03:41: soprano pipistrelle commuting unseen.

03:51: common pipistrelle commuting unseen.

03:52: common pipistrelle commuting unseen.

03:53: common pipistrelle commuting unseen.

03:55: common pipistrelle commuting unseen.

20/07/18 Dawn re-entry survey T88

No bats were detected during this survey.

20/07/18 Dawn re-entry survey T92

03:36: common pipistrelle commuting unseen.

03:56: noctule commuting unseen.

04:04; noctule commuting unseen.

31/07/18 Dusk emergence survey Poplar Farm Location I

21:20: common pipistrelle commuting unseen.

21:27: noctule commuting unseen.

21:28: common pipistrelle commuting unseen.

21:30: common pipistrelle commuting south to north through courtyard.

21:41: unidentified bat species, not detected by the bat detector, commuting north west to south east over the large barn.

21:44: unidentified bat species, not detected by the bat detector, over the large barn before reversing direction.

21:52: common pipistrelle commuting unseen.

21:54: soprano pipistrelle commuting unseen.

21:56: soprano pipistrelle commuting unseen.

21:58: common pipistrelle commuting north to south through courtyard.

22:00: common pipistrelle commuting unseen.

22:01: common pipistrelle commuting unseen.

22:04: common pipistrelle commuting north to south through courtyard.

22:06: common pipistrelle commuting north to south through courtyard.

22:07: common pipistrelle commuting unseen.

22:09: common pipistrelle commuting north to south through courtyard.

22:11: common pipistrelle commuting north to south through courtyard.

22:12: common pipistrelle commuting unseen.

22:12: common pipistrelle commuting west to east through courtyard. A second common pipistrelle was heard through the bat detector but was unseen.

22:15: common pipistrelle commuting unseen.

22:18: common pipistrelle commuting unseen.

22:19: common pipistrelle commuting north to south through courtyard.

22:20: soprano pipistrelle commuting north to south through courtyard.

22:21: two common pipistrelles commuting unseen.

31/07/18 Dusk emergence survey Poplar Farm Location J

21:21: common pipistrelle swooping over roof of small barn along the southern side of the courtyard.

21:23: common pipistrelle swooping over roof of small barn along the southern side of the courtyard.

21:23: common pipistrelle commuting south to north through courtyard at rear of large barn.

21:23: common pipistrelle commuting west to east across courtyard before reversing direction.

21:27: common pipistrelle commuting northwards into the courtyard before turning west then south, departing the courtyard to the south.

21:30: common pipistrelle commuting northwards into the courtyard before turning west then south, departing the courtyard to the south.

21:33: common pipistrelle commuting unseen.

21:41: common pipistrelle and noctule foraging around courtyard before departing to the south west.

21:52: common pipistrelle commuting west to east over barns.

21:54: common pipistrelle commuting unseen.

21:58: common pipistrelle commuting unseen.

22:00: common pipistrelle commuting unseen.

22:01: common pipistrelle commuting unseen.

22:02: common pipistrelle commuting unseen.

22:04: common pipistrelle commuting unseen.

22:07: common pipistrelle commuting unseen.

22:08: common pipistrelle commuting unseen.

22:10: common pipistrelle commuting unseen.

22:12: common pipistrelle and noctule commuting unseen.

31/07/18 Dusk emergence survey Poplar Farm Location L

21:27: noctule commuting unseen.

21:31: common pipistrelle commuting unseen.

22:12: soprano pipistrelle commuting unseen.

22:13: *Pipistrellus* species unseen. Social calls only detected.

22:15: *Pipistrellus* species unseen. Social calls only detected.

22:17: *Pipistrellus* species unseen. Social calls only detected.

31/07/18 Dusk emergence survey Poplar Farm Location K

21:21: common pipistrelle commuting west to east, at a height of 2-3m, passing to the north of the building being surveyed. The bat turned south at the end of the building.

21:22: common pipistrelle foraging over the farmyard to the west of the building before flying away along the northern side of the building, turning south at the end. Flying at a height of 2-3m.

21:24: common pipistrelle commuting from the west before turning north into the courtyard in front of the large barn. Flying at a height of 2-3m.

21:25: common pipistrelle foraging over the farmyard to the west of the building, having flown in from the east along the northern side of the building. Flying at a height of 2-3m.

21:26: common pipistrelle commuting from the east before turning north into the courtyard in front of the large barn. Flying at a height of 2-3m.

21:27: noctule commuting unseen.

21:28: common pipistrelle commuting from the east before turning north into the courtyard in front of the large barn. Flying at a height of 2-3m.

21:30; common pipistrelle commuting unseen.

21:31-32: common pipistrelle foraging along the north ern side of the building, entering from the east before reversing direction. Flying at a height of approximately 2m.

21:33: common pipistrelle commuting from the east before turning north into the courtyard in front of the large barn. Flying at a height of 2-3m.

21:41: unidentified *Myotis* species commuting unseen.

21:41: common pipistrelle commuting unseen.

21:41: soprano pipistrelle commuting unseen.

21:43-51: two soprano pipistrelles in tandem flight circling around over the farmyard to the west of the building before flying away along the western side of the building.

21:52: common pipistrelle foraging unseen.

21:53: common pipistrelle commuting unseen.

21:54: common pipistrelle commuting unseen.

21:55: soprano pipistrelle commuting unseen.

21:56: soprano pipistrelle commuting unseen.

21:59: soprano pipistrelle commuting unseen.

22:01: common pipistrelle commuting unseen.

22:03: common pipistrelle commuting unseen.

22:04: common pipistrelle commuting unseen.

22:06: common pipistrelle commuting east to west at a height of approximately 2m, passing to the north of the buildings.

22:07: common pipistrelle commuting unseen.

22:10: common pipistrelle commuting unseen.

22:12: common pipistrelle commuting unseen.

22:14: common pipistrelle commuting unseen.

22:16: common pipistrelle commuting unseen.

22:18: common pipistrelle commuting unseen.

22:19: common pipistrelle commuting unseen.

01/08/18 Dawn re-entry survey Poplar Farm Location A

03:51: unidentified bat species, not picked up by the bat detector, commuting north to south over the large barn.

04:09: unidentified bat species, not picked up by the bat detector, commuting south east to north west over the large barn.

04:15: common pipistrelle commuting north east to south west over the building being surveyed.

04:19: unidentified bat species, not picked up by the bat detector, commuting north to south passing to the east of the building being surveyed.

04:25: unidentified bat species, not picked up by the bat detector, foraging over the farmyard to the east of the building being surveyed.

04:28: common pipistrelle commuting north east to south west, passing to the east of the building being surveyed.

04:37: common pipistrelle commuting unseen.

01/08/18 Dawn re-entry survey Poplar Farm Location E

03:51: common pipistrelle commuting unseen.

04:03: soprano pipistrelle commuting unseen.

04:04: common pipistrelle commuting unseen.

04:06: common pipistrelle commuting unseen.

04:11: common pipistrelle foraging over the farmyard to the north of the building being surveyed.

04:17: common pipistrelle foraging around a tree to the north of the building being surveyed.

04:20: common pipistrelle foraging unseen.

04:22: common pipistrelle foraging unseen.

04:09: unidentified bat seen by surveyor but not detected by bat detector. The bat was observed to fly immediately in front of the building being surveyed and not observed to fly beyond it. It is suspected, but not certain, that this bat roosted within the building.

04:29: common pipistrelle commuting unseen.

04:35: common pipistrelle foraging unseen.

01/08/18 Dawn re-entry survey Poplar Farm Location M

03:58: common pipistrelle commuting unseen.

04:03: common pipistrelle commuting unseen.

04:04: common pipistrelle commuting unseen.

04:07: common pipistrelle commuting unseen.

04:11: soprano pipistrelle commuting unseen.

04:12: common pipistrelle foraging at the south west corner of the courtyard.

04:17: two common pipistrelles in tandem flight circling around at the south west corner of the courtyard.

04:18: common pipistrelle commuting west to east across the courtyard at a height of approximately 3m.

04:26: brown long-eared bat commuting west to east across the courtyard at a height of approximately 3m.

04:30: common pipistrelle commuting unseen.

04:36: common pipistrelle commuting unseen.

04:41: unidentified *Pipistrellus* species entered roost around a doorway at the western end of the single storey range that forms the northern side of the courtyard.

01/08/18 Dawn re-entry survey Poplar Farm Location N

03:52: common pipistrelle commuting unseen.

03:55: common pipistrelle commuting unseen.

03:57: common pipistrelle foraging unseen.

03:59: common pipistrelle foraging unseen.

04:01: common pipistrelle foraging unseen.

04:05: common pipistrelle foraging unseen.

04:06: common pipistrelle foraging unseen.

04:08: common pipistrelle foraging unseen.

04:10: common pipistrelle foraging unseen.

04:12: common pipistrelle foraging over the garden to the east of the building being surveyed.

04:14: common pipistrelle foraging over the garden to the east of the building being surveyed.

04:17: common pipistrelle foraging over the garden to the east of the building being surveyed.

04:19: two common pipistrelles in tandem flight circling over the courtyard to the north east of the building being surveyed.

04:30: common pipistrelle foraging over the garden to the east of the building being surveyed.

04:36: common pipistrelle commuting south west to north east, passing to the east of the building being surveyed.

04:46: common pipistrelle circling over the houses to the east of the building being surveyed.

01/08/18 Dusk emergence survey NB01 Location A

21:30: common pipistrelle commuting unseen.

21:32: soprano pipistrelle foraging unseen.

01/08/18 Dusk emergence survey NB01 Location B

21:08: soprano pipistrelle commuting north to south passing over the building being surveyed.

21:14-18: unidentified *Myotis* species commuting unseen.

21:18: common pipistrelle commuting unseen.

21:22: unidentified *Myotis* species commuting unseen.

21:23: soprano pipistrelle foraging unseen.

21:28: soprano pipistrelle commuting unseen.

21:30: common pipistrelle commuting over the garden to the north of the building.

21:32: common pipistrelle foraging unseen.

21:38-41: common pipistrelle commuting unseen.

21:57-59: common pipistrelle commuting unseen.

01/08/18 Dusk emergence survey NB01 Location C

21:11: common pipistrelle commuting unseen.

21:12: soprano pipistrelle commuting unseen.

21:18: soprano pipistrelle commuting unseen.

21:19: common pipistrelle commuting unseen.

21:24: soprano pipistrelle commuting unseen.

21:25: common pipistrelle commuting unseen.

21:27: soprano pipistrelle commuting from west to east before turning south, passing to the east of the building being surveyed.

21:29: common pipistrelle commuting unseen.

21:28: soprano pipistrelle circling over the building.

21:35: soprano pipistrelle commuting unseen.

21:39: common pipistrelle commuting unseen.

01/08/18 Dusk emergence survey NB01 Location D

21:06: common pipistrelle commuting south to north passing to the east of the building being surveyed.

21:11: common pipistrelle commuting south to north passing to the east of the building being surveyed.

21:11: soprano pipistrelle commuting unseen.

21:19: common pipistrelle commuting unseen.

21:22: soprano pipistrelle commuting west to east passing over the garage to the south east of the building being surveyed.

21:25: common pipistrelle commuting unseen.

21:29: soprano pipistrelle commuting unseen.

21:30: common pipistrelle commuting west to east passing over the north east corner of the building being surveyed.

21:31: common pipistrelle commuting unseen.

21:31: unidentified *Myotis* species commuting unseen.

21:35: soprano pipistrelle commuting south to north passing to the east of the building being surveyed.

21:38: soprano pipistrelle commuting unseen.

21:31: common pipistrelle foraging over the garden to the east of the building being surveyed.

21:47: soprano pipistrelle commuting unseen.

02/08/18 Dawn re-entry survey Poplar Farm Location A

03:51: unidentified bat seen by surveyor but not detected by bat detector. Commuting north to south over farm buildings.

04:09: unidentified bat seen by surveyor but not detected by bat detector. Commuting south to north over farm buildings.

04:15: common pipistrelle commuting north east to south west over the building being surveyed.

04:19: unidentified bat seen by surveyor but not detected by bat detector. Commuting south to north over farm buildings.

04:25: unidentified bat seen by surveyor but not detected by bat detector. Circling over farmyard to the west of the building being surveyed.

04:28: common pipistrelle commuting north east to south west over farmyard to the west of the building being surveyed.

02/08/18 Dawn re-entry survey Poplar Farm Location I

03:56 *Myotis* species commuting unseen.

03:57: common pipistrelle commuting unseen.

04:01: *Myotis* species commuting unseen.

04:01: common pipistrelle commuting unseen.

04:05: common pipistrelle commuting unseen.

04:08: common pipistrelle commuting north to south, flying out of the courtyard in front of the large barn before reversing direction and departing southward.

04:16: *Myotis* species commuting unseen.

04:20: common pipistrelle commuting northward out of the courtyard, turning to the west, flying along the side of the barn and turning south.

04:21: soprano pipistrelle commuting unseen.

04:21: soprano pipistrelle commuting north to south into the courtyard to the rear of the large barn.

04:25: common pipistrelle commuting north to south into the courtyard in front of the large barn.

04:31: common pipistrelle commuting east to west to the north of the barns.

02/08/18 Dawn re-entry survey Poplar Farm Location L

03:51: soprano pipistrelle commuting unseen.

03:57: common pipistrelle commuting unseen.

04:19: common pipistrelle commuting north to south over the building being surveyed before turning west into the courtyard.

02/08/18 Dawn re-entry survey T1

04:14: common pipistrelle foraging unseen.

02/08/18 Dawn re-entry survey T44 & 45

03:52: soprano pipistrelle foraging unseen.

03:58: common pipistrelle foraging and commuting unseen.

04:01: common pipistrelle foraging and commuting unseen.

04:03-04: common pipistrelle foraging and commuting unseen.

04:08: common pipistrelle foraging and commuting unseen.

04:10: common pipistrelle foraging and commuting unseen.

04:15: common pipistrelle foraging and commuting unseen.

04:16: soprano pipistrelle foraging and commuting unseen.

04:22: common pipistrelle foraging and commuting unseen.

04:24: common pipistrelle foraging and commuting unseen.

02/08/18 Dusk emergence survey Oaklands Location A

21:31: common pipistrelle foraging to the north of the house.

21:36: common pipistrelle commuting unseen.

21:53: noctule commuting unseen.

21:55: common pipistrelle commuting unseen.

21:58: common pipistrelle commuting unseen.

22:07: soprano pipistrelle commuting unseen.

22:08: common pipistrelle commuting unseen.

22:10: common pipistrelle commuting unseen.

22:12: soprano pipistrelle commuting unseen.

02/08/18 Dusk emergence survey Oaklands Location B

21:11: soprano pipistrelle commuting unseen.

21:24: common pipistrelle commuting unseen.

21:26: common pipistrelle commuting unseen.

21:31: unidentified species of bat, not detected by the bat detector, commuting south to north passing to the east of the house.

21:38: common pipistrelle commuting unseen.

21:40: common pipistrelle commuting unseen.

21:44: noctule commuting unseen.

21:54: noctule commuting unseen.

02/08/18 Dusk emergence survey Oaklands Location B

21:31: common pipistrelle commuting unseen.

21:37: common pipistrelle commuting unseen.

21:54: noctule commuting unseen.

22:00: common pipistrelle commuting unseen.

03/08/18 Dawn re-entry survey Hall Cottages Location A

04:01: common pipistrelle commuting unseen.

04:04: common pipistrelle commuting south to north passing over the buildings being surveyed.

04:06: common pipistrelle commuting unseen.

04:08: common pipistrelle commuting unseen.

04:10: common pipistrelle commuting unseen.

04:12: common pipistrelle commuting unseen.

04:15: common pipistrelle commuting unseen.

04:19: common pipistrelle commuting unseen.

04:21: common pipistrelle foraging unseen.

04:24: common pipistrelle foraging over the gardens to the north of the buildings being surveyed.

04:34: noctule foraging unseen.

03/08/18 Dawn re-entry survey Hall Cottages Location B

03:53: *Pipistrellus* species commuting unseen. Social calls only recorded.

04:06: common pipistrelle commuting and foraging east to west before turning north at the western end of the building being surveyed.

04:31: *Pipistrellus* species possibly entering a roost. Social calls only recorded.

04:34: noctule commuting unseen.

03/08/18 Dawn re-entry survey Hall Cottages Location C

No bats were observed during this survey.

07/08/18 Dusk emergence survey T53

20:45: noctule commuting from east to west passing south of T53.

20:53: noctule commuting unseen.

20:56: noctule commuting unseen.

07/08/18 Dusk emergence survey T60

20:48-49: noctule foraging at great height to the west of the tree being surveyed.

20:51: noctule foraging at great height to the south east of the tree being surveyed.

20:53: noctule commuting unseen.

20:55: noctule commuting unseen.

21:04: common pipistrelle commuting unseen.

21:08: common pipistrelle commuting unseen.

08/08/18 Dusk emergence survey Poplar Farm Location E

21:11: Leisler's bat commuting west to east at a height of approximately 5m passing to the south of the building being surveyed.

21:15: common pipistrelle commuting west to east passing over the building.

21:22: common pipistrelle commuting unseen.

21:22: common pipistrelle commuting west to east passing to the north of the building.

21:37: common pipistrelle commuting unseen.

21:39: soprano pipistrelle commuting unseen.

21:39-40: Leisler's bat commuting unseen.

21:54: common pipistrelle commuting unseen.

21:55: soprano pipistrelle commuting unseen.

21:56: soprano pipistrelle commuting unseen.

21:57: soprano pipistrelle commuting unseen.

21:58: soprano pipistrelle commuting unseen.

22:00: common pipistrelle commuting unseen.

22:01: common pipistrelle commuting unseen.

22:05: common pipistrelle commuting unseen.

08/08/18 Dusk emergence survey Poplar Farm Location F

21:05: common pipistrelle commuting unseen.

21:10: Leisler's bat commuting unseen.

21:13: common pipistrelle commuting unseen.

21:14: Leisler's bat commuting unseen.

21:15: common pipistrelle commuting west to east passing just over the building being surveyed.

21:17: common pipistrelle commuting unseen.

21:18: soprano pipistrelle commuting unseen.

21:23: common pipistrelle commuting east to west.

21:29: common pipistrelle commuting unseen.

21:33: common pipistrelle commuting unseen.

21:36: common pipistrelle commuting unseen.

21:53: common pipistrelle foraging unseen.

21:55: soprano pipistrelle commuting unseen.

21:59: common pipistrelle foraging unseen.

22:01: soprano pipistrelle foraging unseen.

22:04: common pipistrelle foraging unseen.

09/08/18 Dawn re-entry survey Hall Cottages Location A

04:21: noctule commuting unseen.

09/08/18 Dawn re-entry survey Hall Cottages Location B

04:02: common pipistrelle commuting unseen.

04:19: *Pipistrellus* species commuting unseen. Social calls only recorded.

04:23: common pipistrelle commuting unseen.

04:38: *Pipistrellus* species commuting unseen. Social calls only recorded.

09/08/18 Dusk emergence survey T1

21:32: common pipistrelle commuting unseen.

21:48: *Nyctalus* species with call characteristics of noctule commuting unseen.

21:53: *Nyctalus* species with call characteristics of noctule commuting unseen.

09/08/18 Dusk emergence survey T60

20:55: soprano pipistrelle commuting unseen.

21:04: common pipistrelle commuting unseen.

21:15: soprano pipistrelle commuting unseen.

21:17: common pipistrelle commuting unseen.

21:19: barbastelle commuting unseen.

21:24: common pipistrelle commuting unseen.

21:27: common pipistrelle commuting unseen.

21:29: common pipistrelle commuting unseen.

21:30: Leisler's bat commuting unseen.

21:31: common pipistrelle commuting unseen.

21:38: barbastelle commuting unseen.

21:40: common pipistrelle commuting unseen.

21:46: soprano pipistrelle commuting unseen.

21:53: Leisler's bat commuting unseen.

21:54: common pipistrelle commuting unseen.

10/08/18 Dawn re-entry survey Polar Farm Location A

04:21: Leisler's bat commuting unseen.

10/08/18 Dawn re-entry survey Polar Farm Location N

No bats were detected during this survey.

26/08/18 Dusk emergence survey Hall Cottages Location A

19:23: common pipistrelle commuting unseen.

19:25: soprano pipistrelle foraging over the garden to the north of the building.

19:26: soprano pipistrelle foraging unseen.

19:27: common pipistrelle foraging south to north over the building being surveyed.

19:28: common pipistrelle foraging unseen.

19:29: common pipistrelle and soprano pipistrelle foraging unseen.

19:30: common pipistrelle foraging over the garden to the north of the building.

19:37: soprano pipistrelle commuting unseen.

19:40: common pipistrelle foraging unseen.

19:45-49: common pipistrelle foraging unseen.

19:49: soprano pipistrelle commuting unseen.

19:50: soprano pipistrelle commuting unseen.

19:55: common pipistrelle commuting unseen.

19:50: soprano pipistrelle commuting unseen.

26/08/18 Dusk emergence survey Hall Cottages Location B

19:19: soprano pipistrelle commuting unseen.

19:23: common pipistrelle commuting unseen.

19:26: soprano pipistrelle commuting unseen.

19:27: common pipistrelle commuting unseen.

19:28: common pipistrelle commuting unseen.

19:29: common pipistrelle commuting unseen.

19:30: common pipistrelle foraging east to west along the south aspect of the building being surveyed.

19:35: common pipistrelle commuting unseen.

19:40: common pipistrelle commuting unseen.

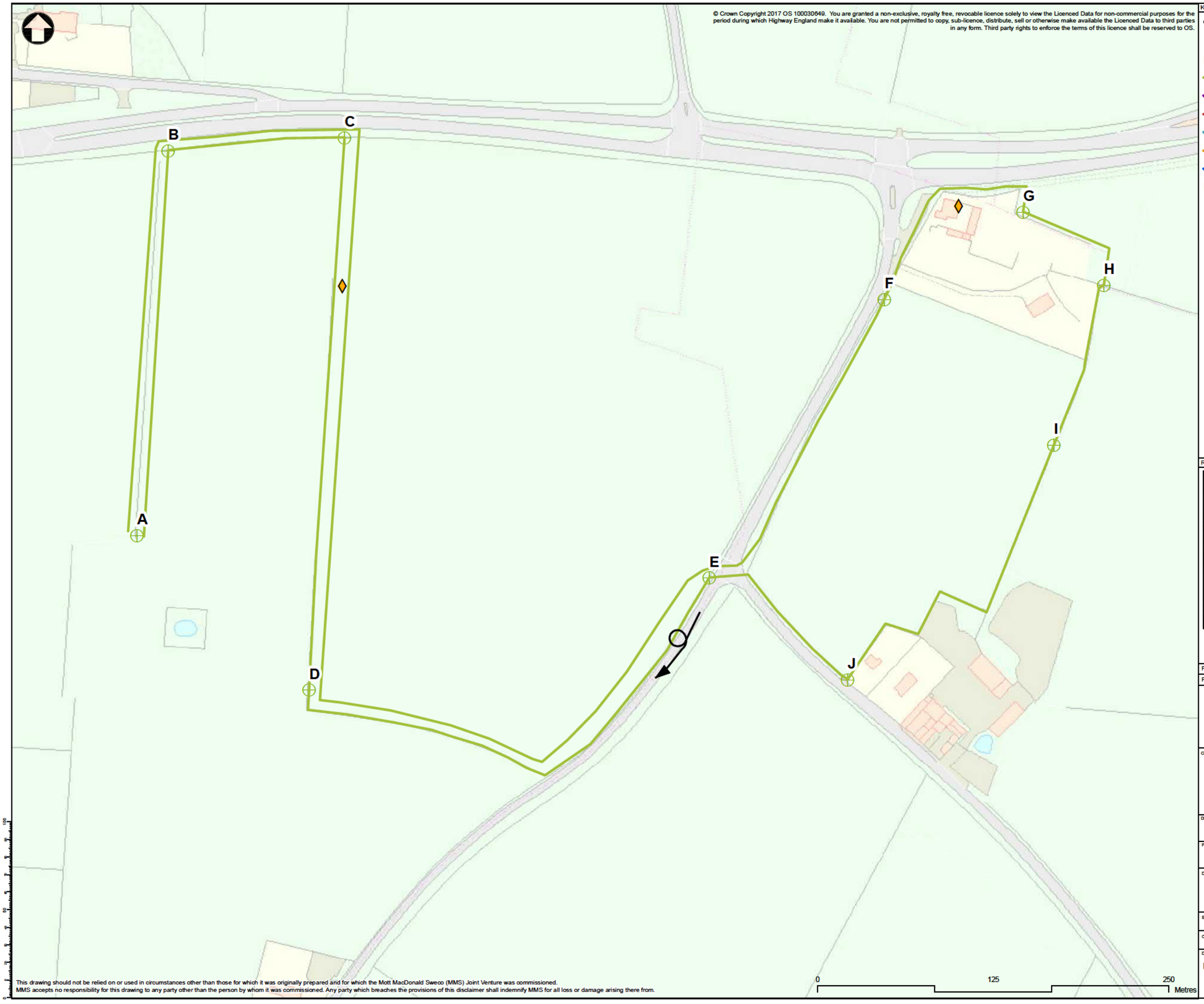
19:42: common pipistrelle foraging unseen.

19:46: common pipistrelle commuting unseen.

19:47: common pipistrelle commuting unseen. Social calls also detected.

19:48: common pipistrelle commuting unseen. Social calls also detected.

19:54: common pipistrelle commuting unseen.



Key to symbols

- Bat FIgihts
- Bat Roost Location

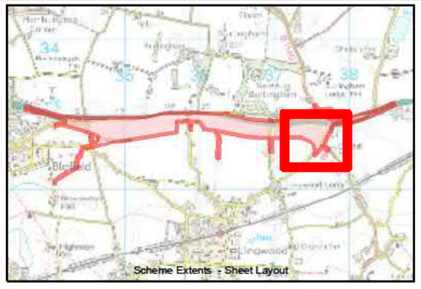
Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

References drawings



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

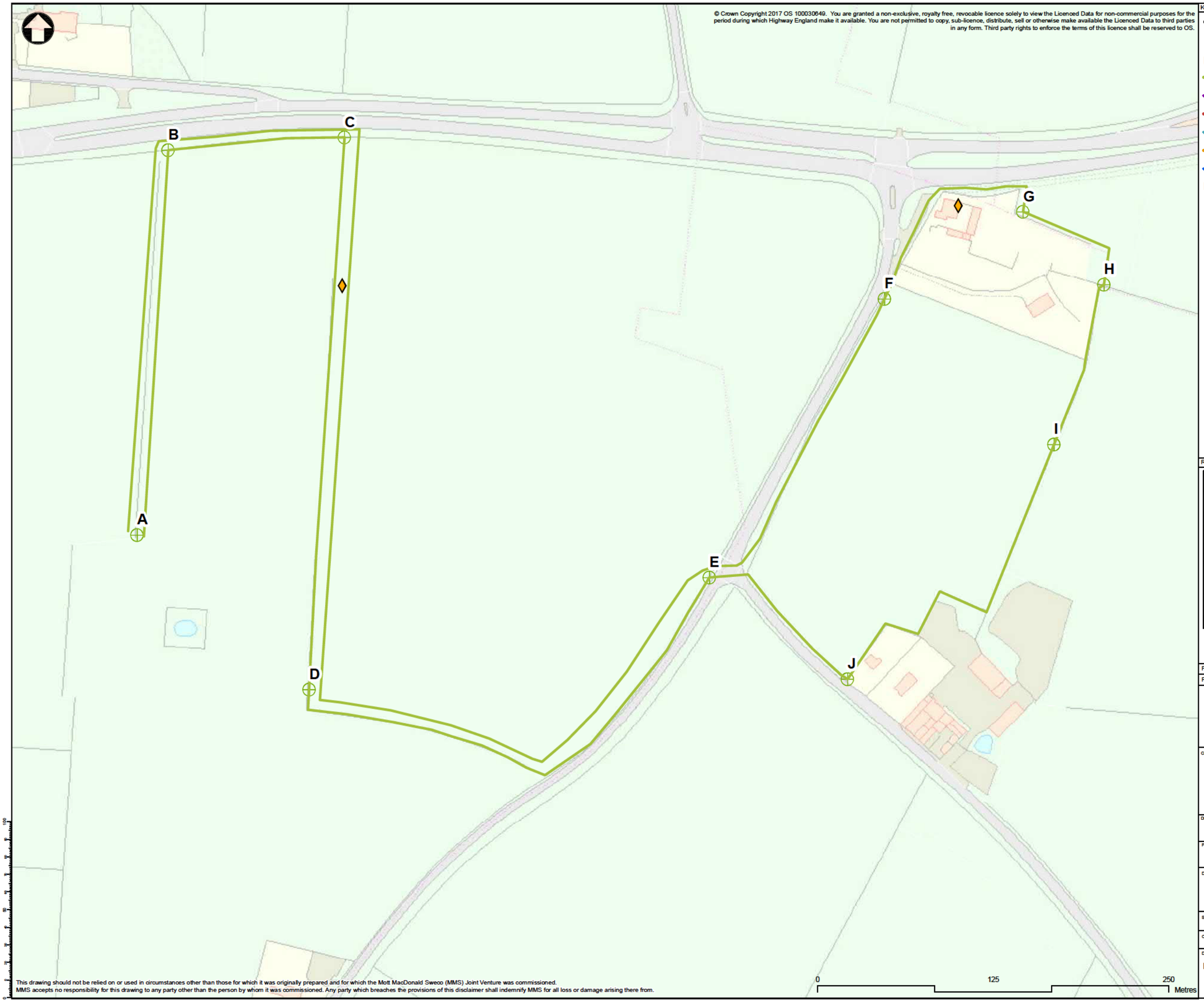
Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 1
18/04/2018 - Dusk

Scale	Designed	Drawn	Checked	Approved
1:2,500	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/06/18	24/08/18	01/09/18	10/09/18

Drawing Number: HE PIN | Originator | Volume
HE551490 - MMSJV - EBD -
000 (Location) - DR - LB - 00021 (Type | Role | Number)

Project Ref. No.: HE551490
Revision: P02



Key to symbols

- Bat FIghts
- Bat Roost Location

Bat Survey Transects

- 1
- 2
- 3
- 4
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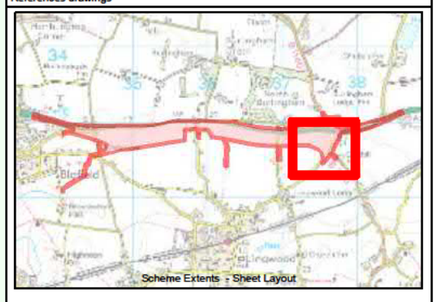
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

References drawings



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/09/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

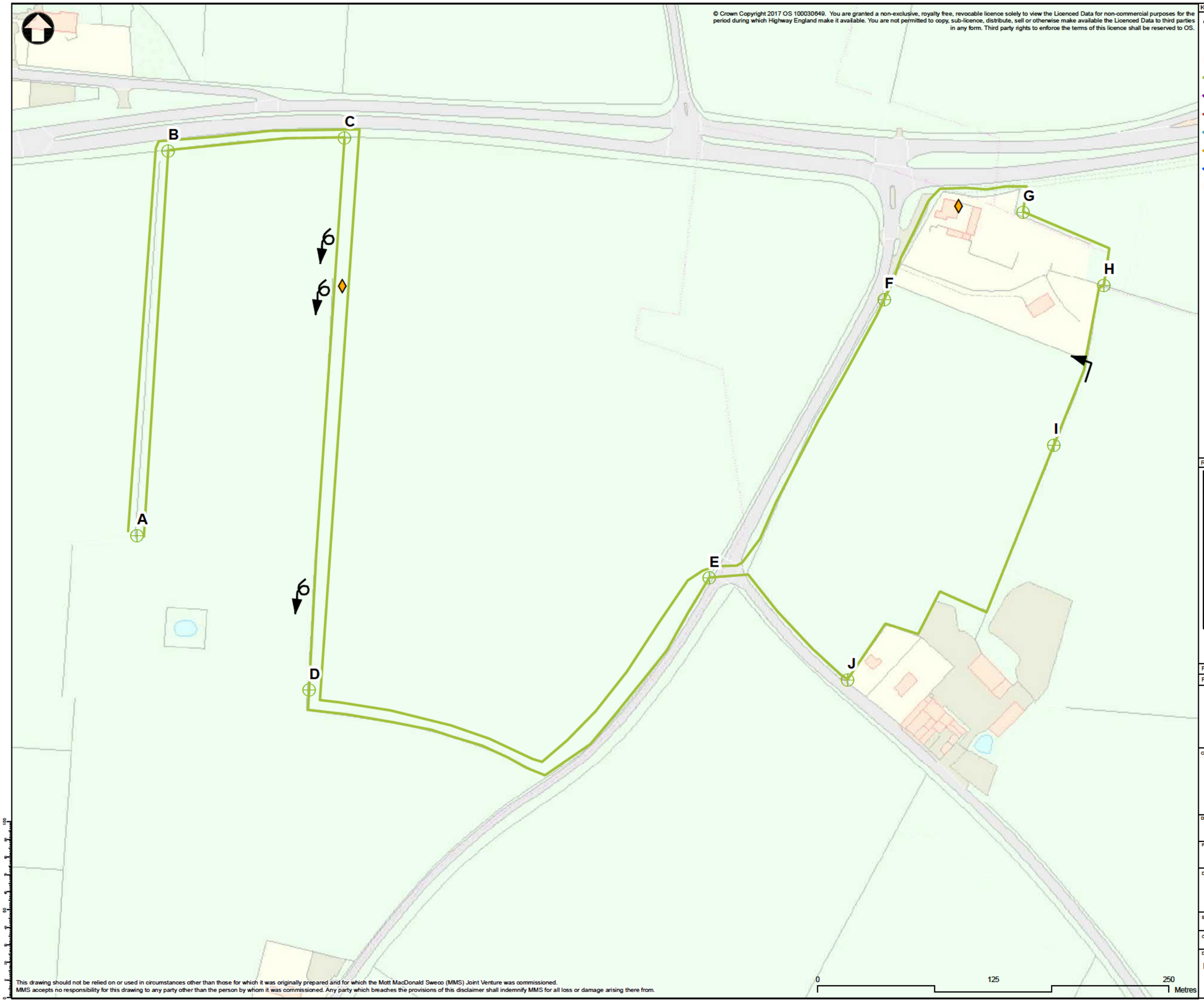
Drawing Status: FOR INFORMATION
Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 1
08/05/2018 - Dusk

Scale	Designed	Drawn	Checked	Approved
1:2,500	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size: A3	Date: 01/06/18	Date: 24/08/18	Date: 01/09/18	Date: 10/09/18

Drawing Number: HE551490 _ MMSJV _ EBD _ 000 _ DR - LB - 00032
(HE PIN | Originator | Volume | Location | Type | Role | Number)
Project Ref. No.: HE551490
Revision: P01



Key to symbols

- Bat FIghts
- Bat Roost Location

Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

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References drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

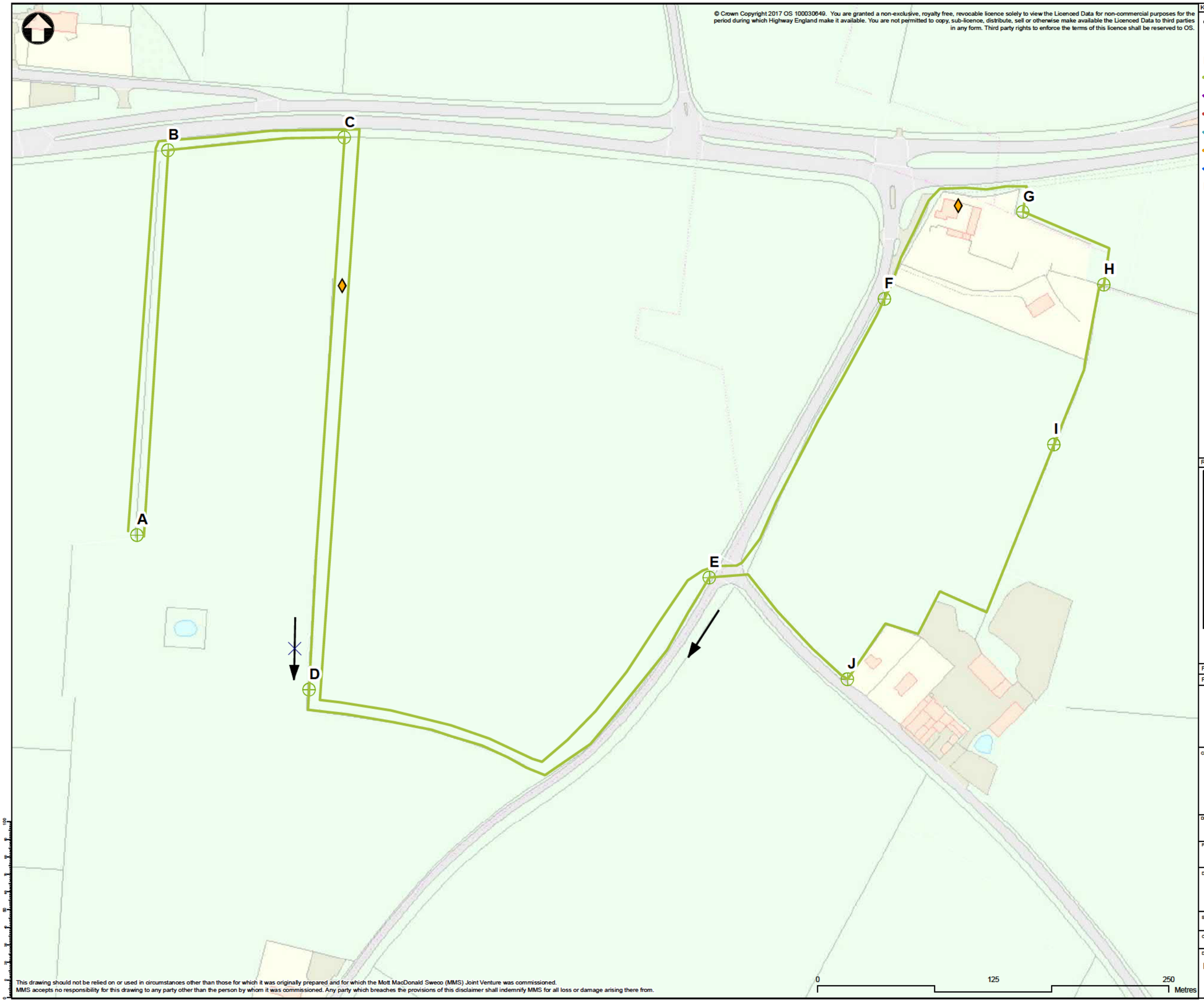
Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 1
04/06/2018 - Dusk

Scale	Designed	Drawn	Checked	Approved
1:2,500	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/06/18	24/08/18	01/09/18	10/09/18

Drawing Number: HE PIN | Originator | Volume
HE551490 - MMSJV - EBD -
000 (Location) - DR - LB - 00002 (Type | Role | Number)

Project Ref. No.: HE551490
Revision: P01



Key to symbols

- Bat FIghts
- Bat Roost Location

Bat Survey Transects

- 1
- 2
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Bat Survey Locations (Transects)

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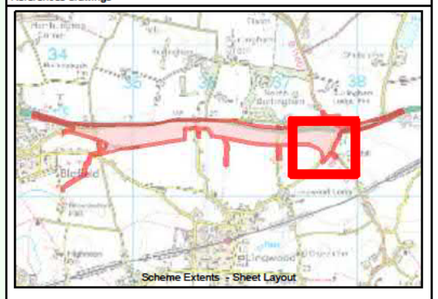
- 5

References drawings



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/09/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
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LS7 4DN
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Client: highways england

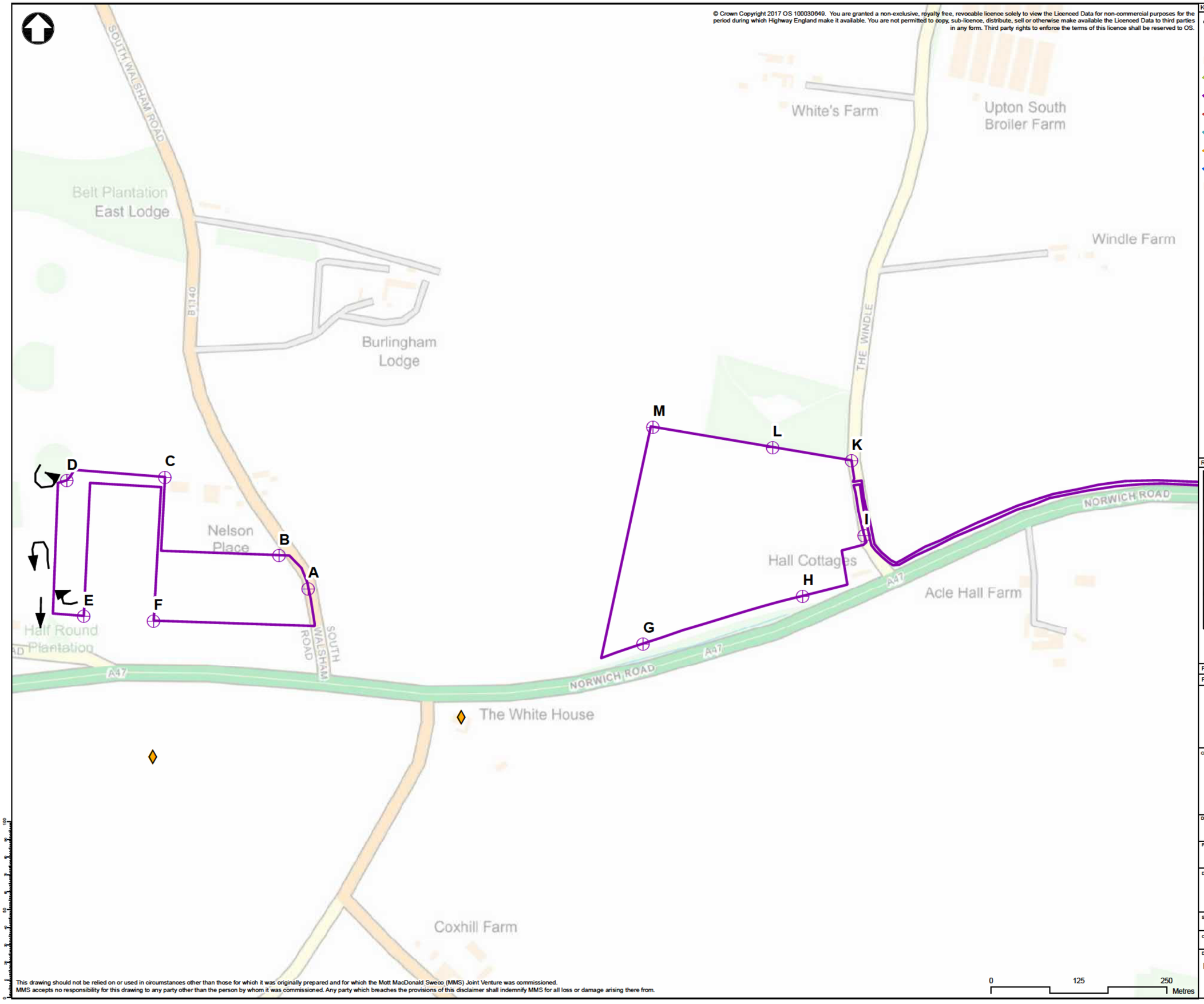
Drawing Status: FOR INFORMATION
Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 1
05/06/2018 - Dawn

Scale	Designed	Drawn	Checked	Approved
1:2,500	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/06/18	24/08/18	01/09/18	10/09/18

Drawing Number: HE551490 _ MMSJV _ EBD _ 000 - DR - LB - 00003
(HE PIN | Originator | Volume | Location | Type | Role | Number)
Project Ref. No.: HE551490
Revision: P01



Key to symbols

- Bat FIghts
- Bat Roost Location

Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

References drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION

Suitability: S2

Project Title: A47 - Blofield to North Burlingham

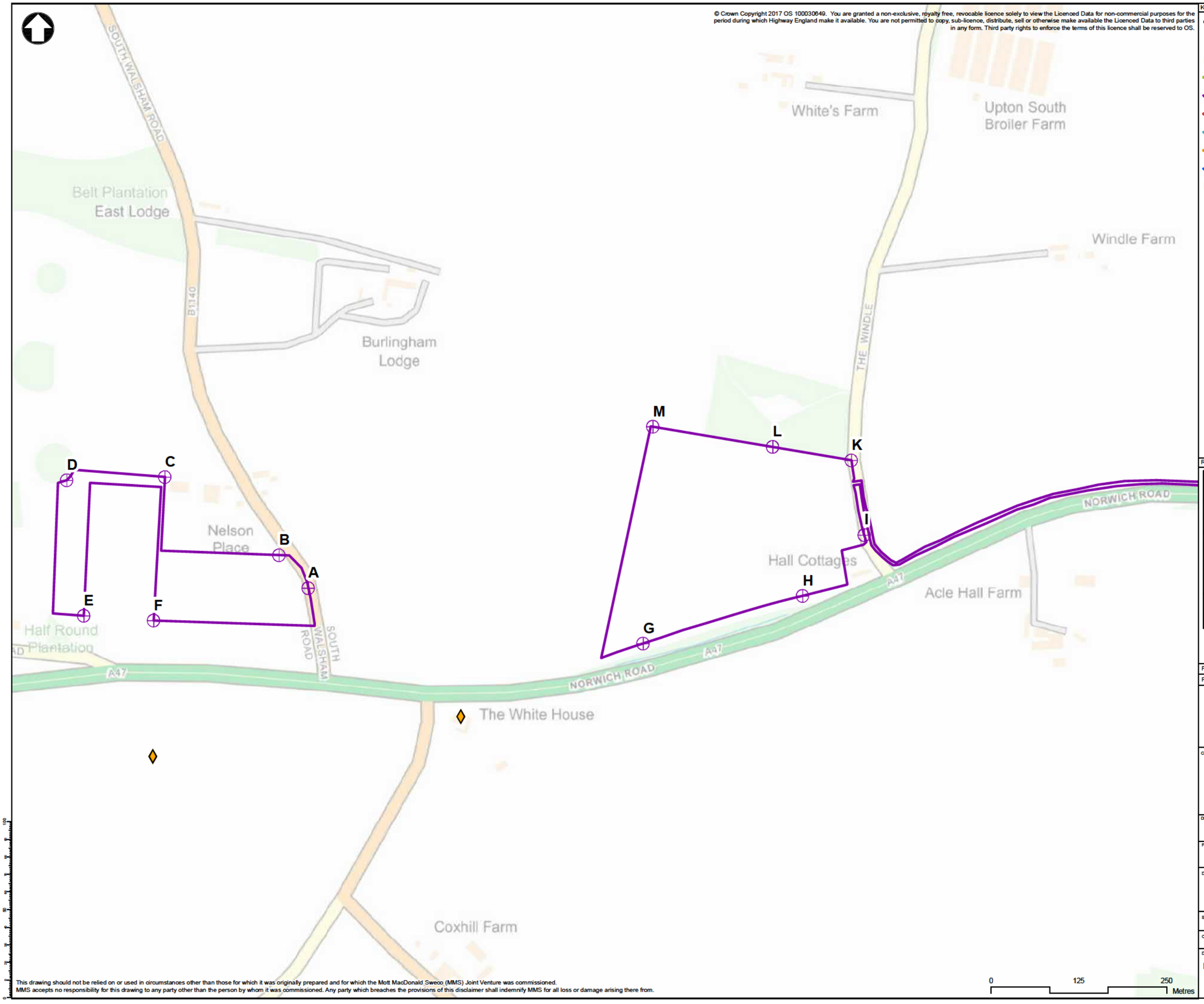
Drawing Title: Bat Survey - Transect 2
17/04/2018 - Dusk

Scale	Designed	Drawn	Checked	Approved
1:5,000	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/06/18	24/08/18	01/09/18	10/09/18

Drawing Number: HE PIN | Originator | Volume
HE551490 - MMSJV - EBD -
000 (Location) - DR (Type) - LB (Role) - 00005 (Number)

Project Ref. No.: HE551490

Revision: P01



This drawing should not be relied on or used in circumstances other than those for which it was originally prepared and for which the Mott MacDonald Sweco (MMS) Joint Venture was commissioned. MMS accepts no responsibility for this drawing to any party other than the person by whom it was commissioned. Any party which breaches the provisions of this disclaimer shall indemnify MMS for all loss or damage arising there from.

Key to symbols

- Bat FIghts
- Bat Roost Location

Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

References drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/09/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION

Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 2
18/04/2018 - Dawn

Scale	Designed	Drawn	Checked	Approved
1:5,000	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/06/18	24/08/18	01/09/18	10/09/18

Drawing Number: HE PIN | Originator | Volume
HE551490 - MMSJV - EBD -
000 - DR - LB - 00033
Location | Type | Role | Number

Project Ref. No.: HE551490

Revision: P01

SOUTH WALSHAM ROAD
B1140
Belt Plantation
East Lodge
Burlingham Lodge
White's Farm
Upton South Broiler Farm
Windle Farm
THE WINDLE
Nelson Place
Hall Cottages
Acle Hall Farm
Round ...ntation
SOUTH WALSHAM ROAD
A47
NORWICH ROAD
The White House
Coxhill Farm

A
B
C
D
E
F
G
H
I
J
K
L
M

0 125 250 Metres

This drawing should not be relied on or used in circumstances other than those for which it was originally prepared and for which the Mott MacDonald Sweco (MMS) Joint Venture was commissioned. MMS accepts no responsibility for this drawing to any party other than the person by whom it was commissioned. Any party which breaches the provisions of this disclaimer shall indemnify MMS for all loss or damage arising there from.

Key to symbols

- Bat FIghts
- Bat Roost Location

Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

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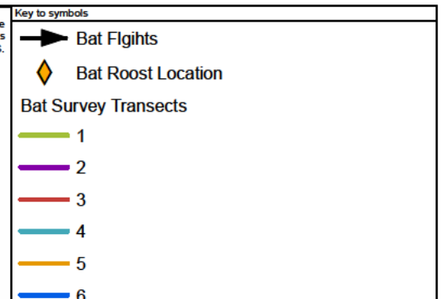
References drawings



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 2
09/05/2018 - Dusk

Scale	Designed	Drawn	Checked	Approved
1:5,000	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/06/18	24/08/18	01/09/18	10/09/18

Drawing Number: HE PIN HE551490 | Originator MMSJV | Volume EBD | Location 000 | Type DR | Role LB | Number 00004
Project Ref. No.: HE551490
Revision: P01

SOUTH WALSHAM ROAD
B1140
Belt Plantation
East Lodge
Burlingham Lodge
White's Farm
Upton South Broiler Farm
THE WINDLE
Windle Farm
Nelson Place
Hall Cottages
Acle Hall Farm
Round ...ntation
SOUTH WALSHAM ROAD
A47
NORWICH ROAD
The White House
Coxhill Farm

A
B
C
D
E
F
G
H
I
J
K
L
M

0 125 250 Metres

This drawing should not be relied on or used in circumstances other than those for which it was originally prepared and for which the Mott MacDonald Sweco (MMS) Joint Venture was commissioned. MMS accepts no responsibility for this drawing to any party other than the person by whom it was commissioned. Any party which breaches the provisions of this disclaimer shall indemnify MMS for all loss or damage arising there from.

Key to symbols

- Bat FIghts
- Bat Roost Location

Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

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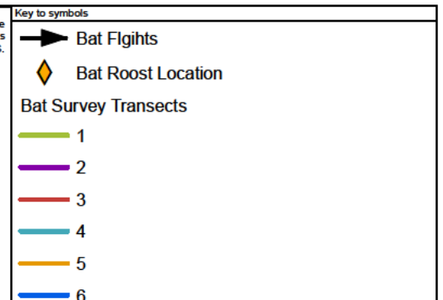
References drawings



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

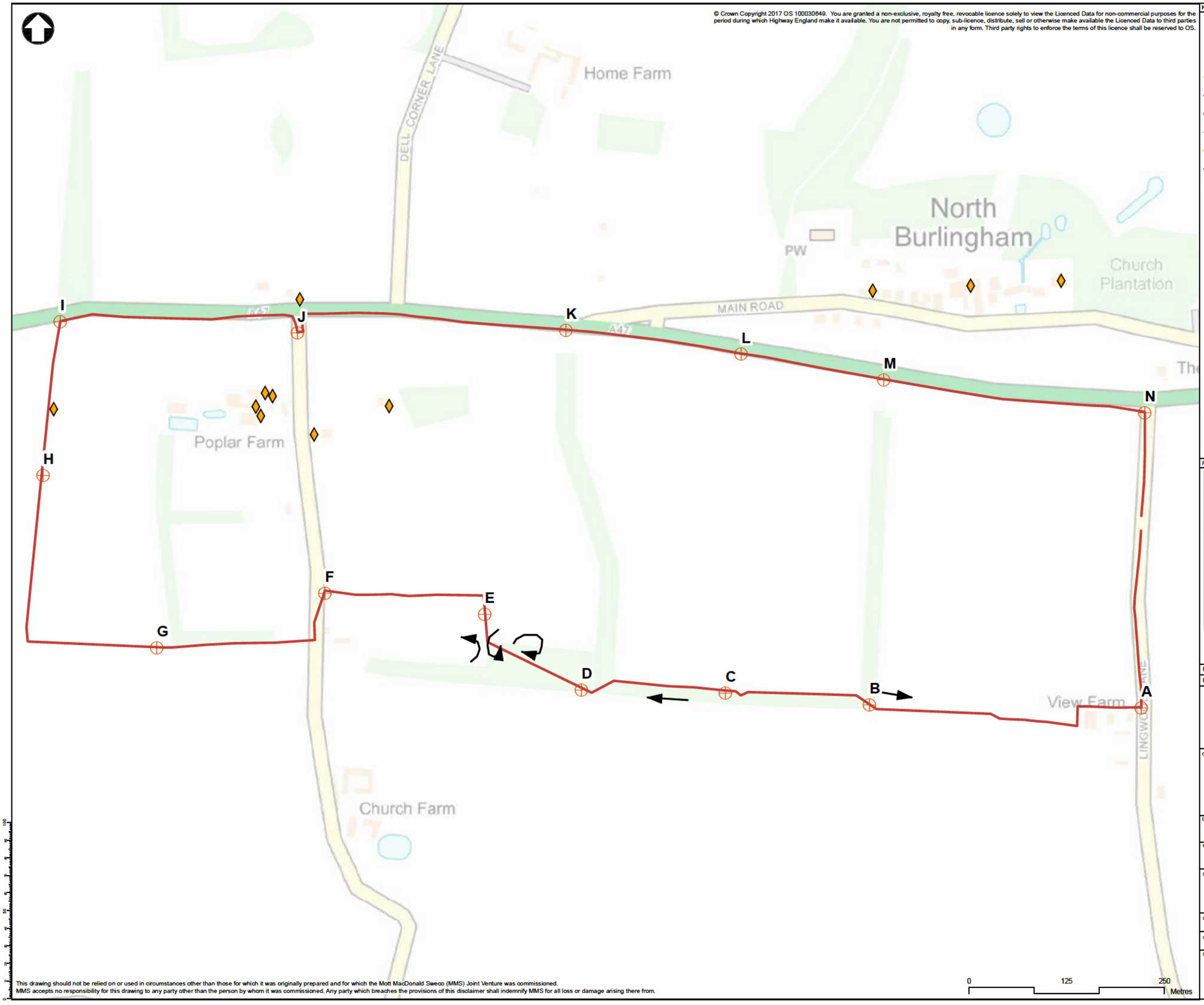
Drawing Status: FOR INFORMATION
Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 2
07/06/2018 - Dusk

Scale	Designed	Drawn	Checked	Approved
1:5,000	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/06/18	24/08/18	01/09/18	10/09/18

Drawing Number: HE PIN HE551490 | Originator MMSJV | Volume EBD | Location 000 | Type DR | Role LB | Number 00005
Project Ref. No.: HE551490
Revision: P01



Key to symbols

- Bat FIghts
- Bat Roost Location

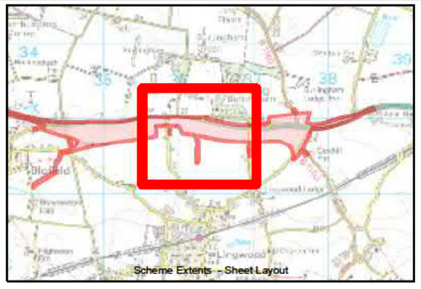
Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

References drawings



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

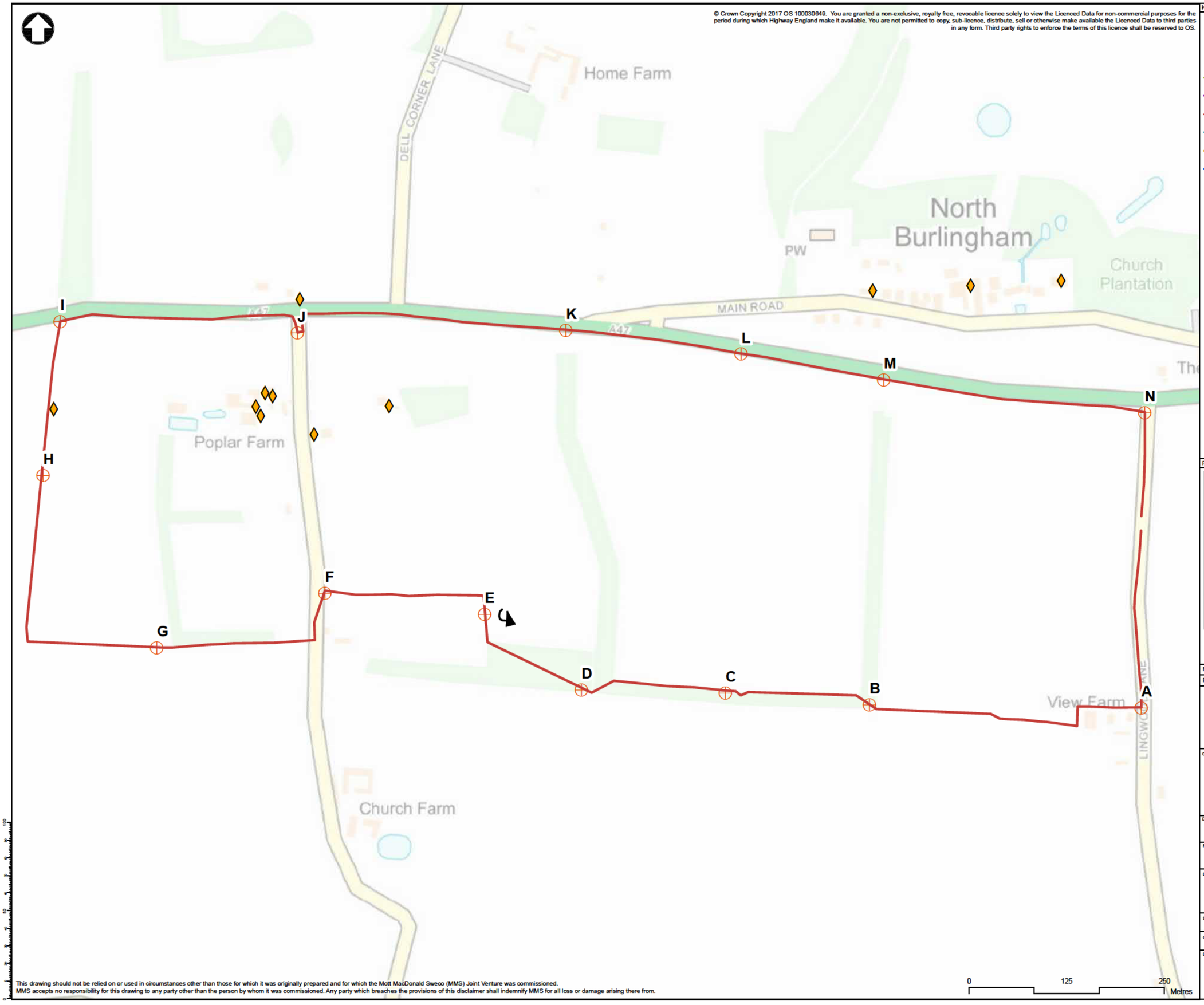
Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 3
16/04/2018 - Dusk

Scale	Designed	Drawn	Checked	Approved
1:4,500	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size: A3	Date: 01/06/18	Date: 24/08/18	Date: 01/09/18	Date: 10/09/18

Drawing Number: HE PIN HE551490 | Originator MMSJV | Volume EBD | Location 000 | Type DR | Role LB | Number 00007
Project Ref. No.: HE551490
Revision: P01

0 125 250 Metres



Key to symbols

- Bat FIghts
- Bat Roost Location

Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

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References drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION

Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 3
17/04/2018 - Dawn

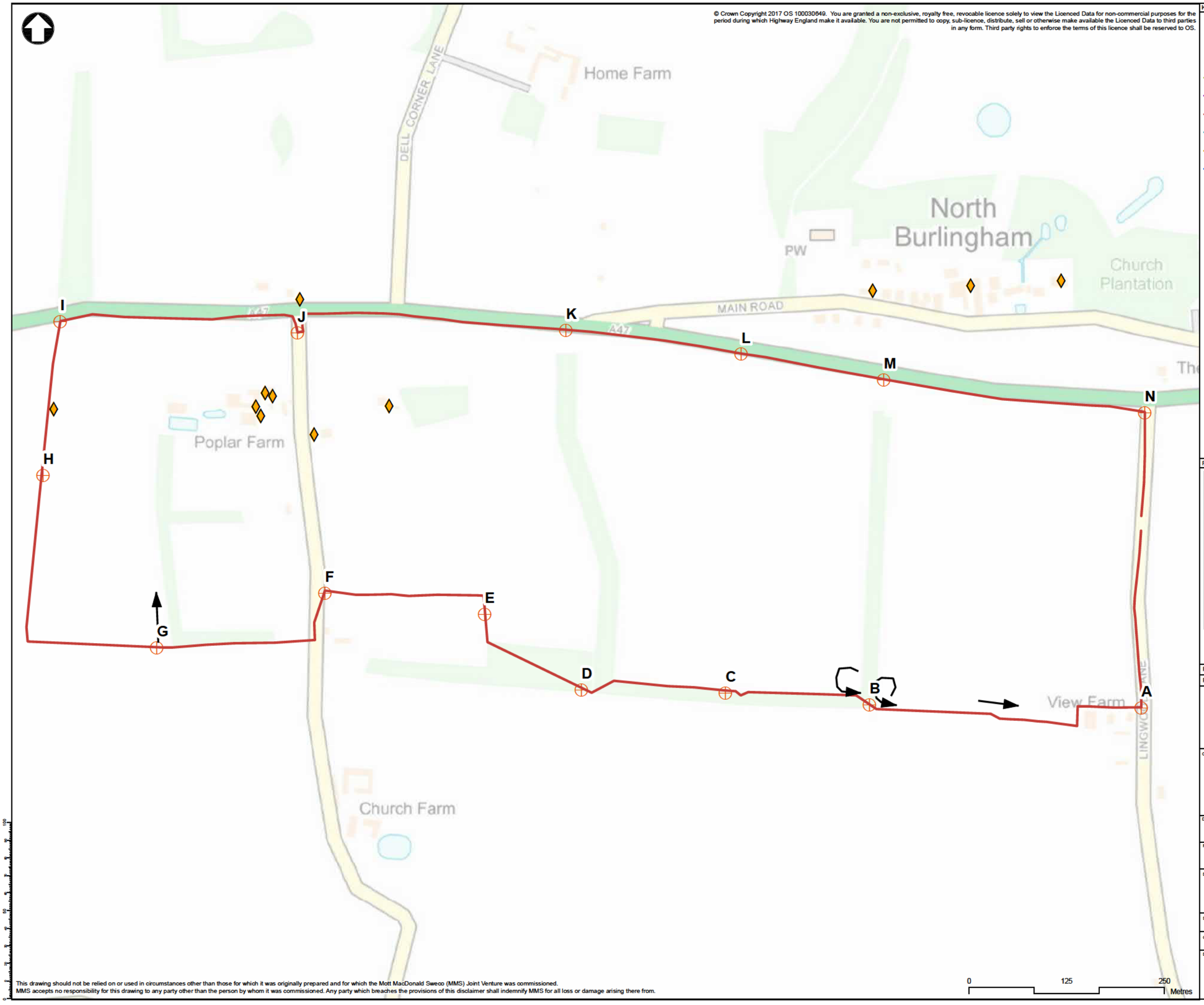
Scale	Designed	Drawn	Checked	Approved
1:4,500	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size: A3	Date: 01/06/18	Date: 24/08/18	Date: 01/09/18	Date: 10/09/18

Drawing Number: HE PIN HE551490 | Originator MMSJV | Volume EBD | Location 000 | Type DR | Role LB | Number 00008

Project Ref. No.: HE551490

Revision: P01

0 125 250 Metres



Key to symbols

- Bat FIghts
- Bat Roost Location

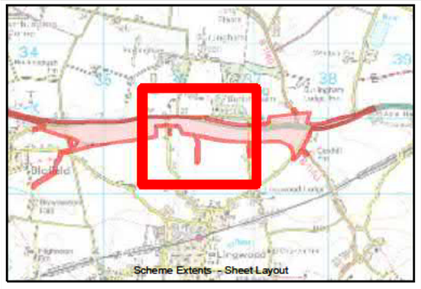
Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

References drawings



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION

Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 3
10/05/2018 - Dusk

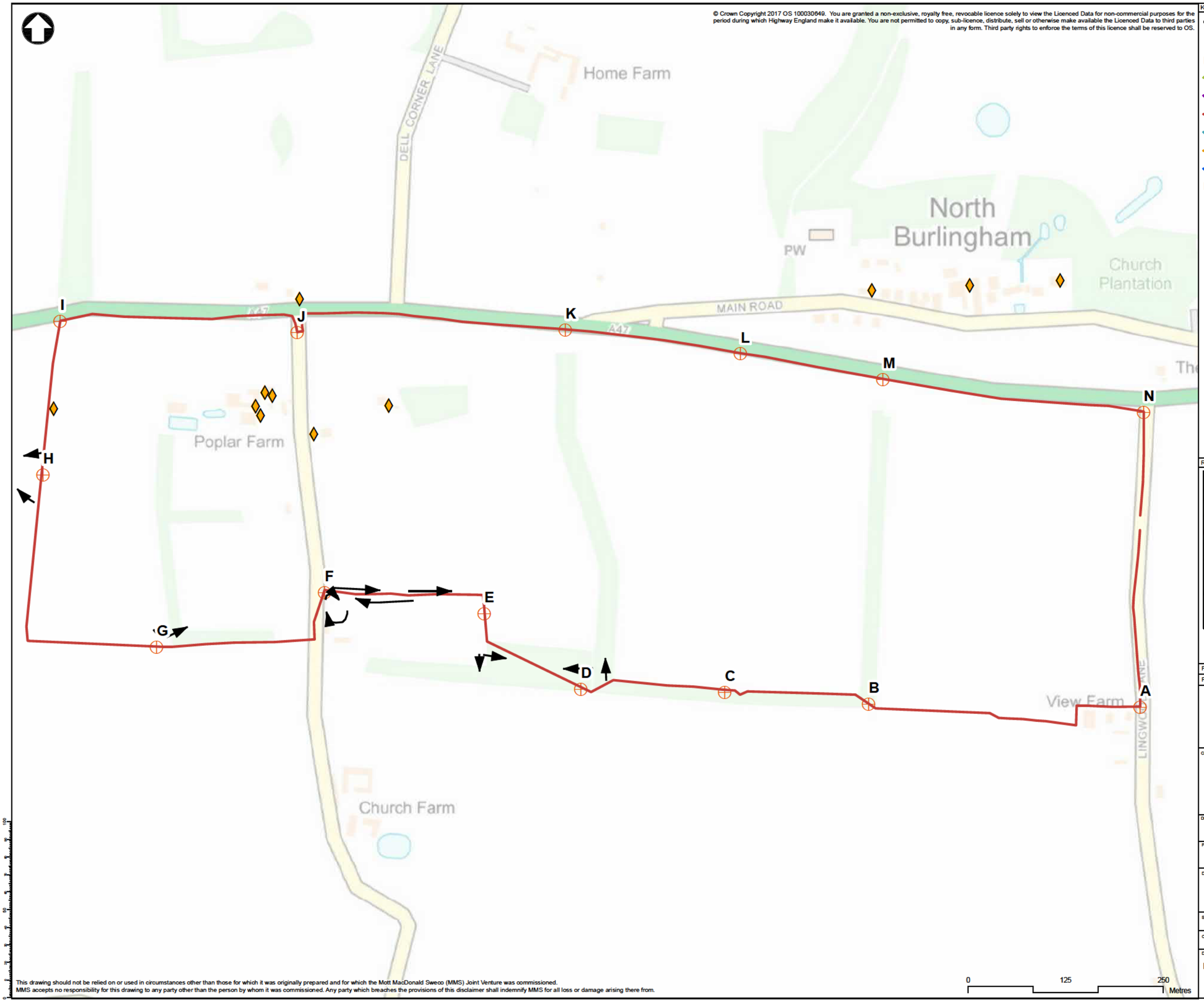
Scale	Designed	Drawn	Checked	Approved
1:4,500	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size: A3	Date: 01/06/18	Date: 24/08/18	Date: 01/09/18	Date: 10/09/18

Drawing Number: HE PIN HE551490 | Originator MMSJV | Volume EBD | Location 000 | Type DR | Role LB | Number 00009

Project Ref. No.: HE551490

Revision: P01

0 125 250 Metres



Key to symbols

- Bat FIghts
- Bat Roost Location

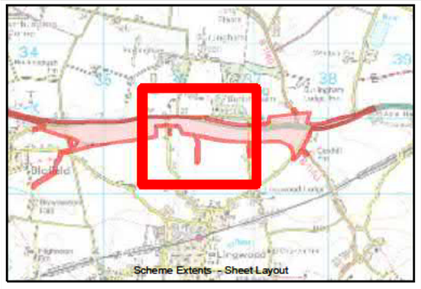
Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

References drawings



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

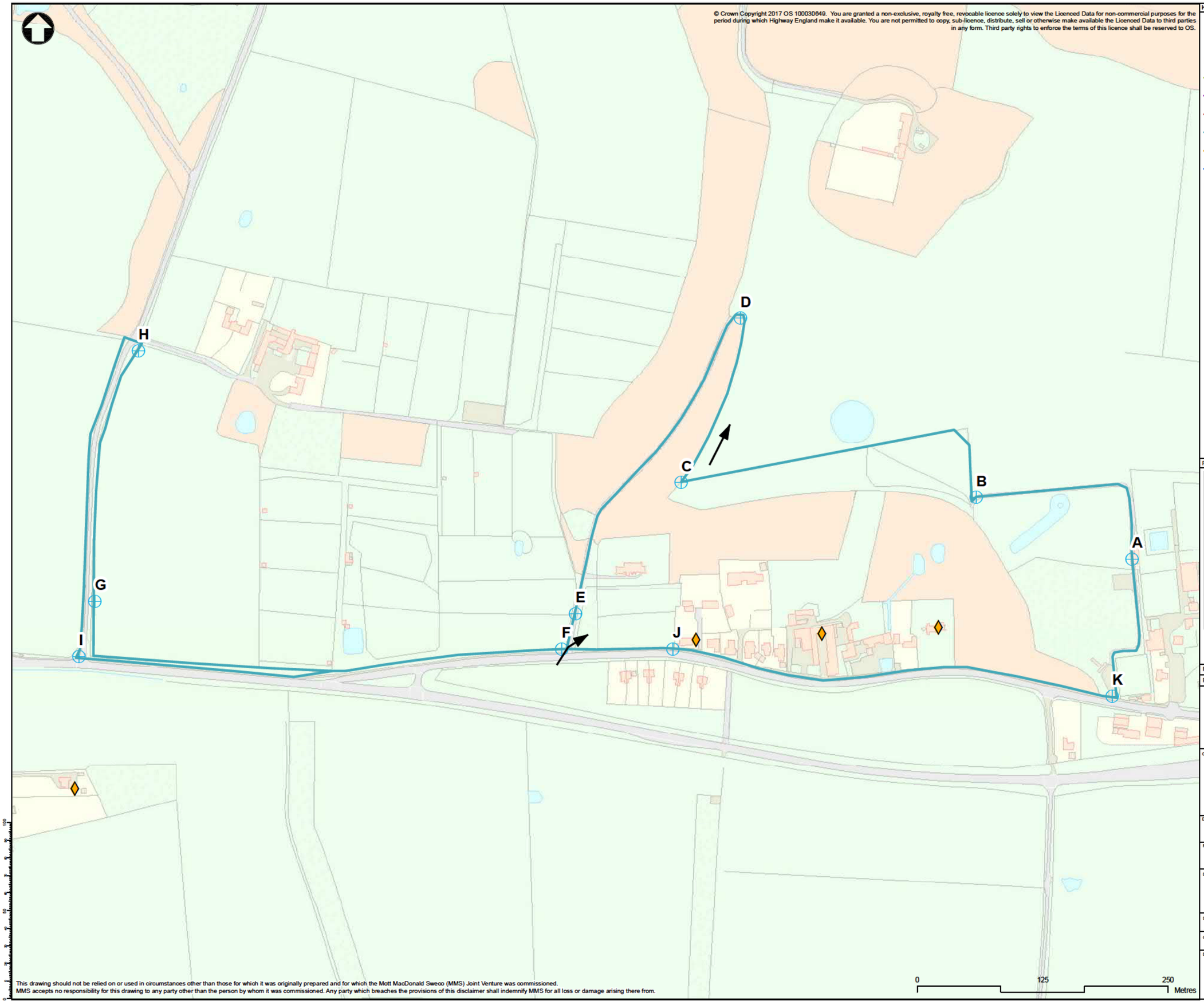
Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 3
12/06/2018 - Dusk

Scale	Designed	Drawn	Checked	Approved
1:4,500	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size: A3	Date: 01/06/18	Date: 24/08/18	Date: 01/09/18	Date: 10/09/18

Drawing Number: HE PIN HE551490 | Originator MMSJV | Volume EBD | Location 000 | Type DR | Role LB | Number 00010
Project Ref. No.: HE551490
Revision: P01

0 125 250 Metres



Key to symbols

- Bat FIghts
- Bat Roost Location

Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

References drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/08/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

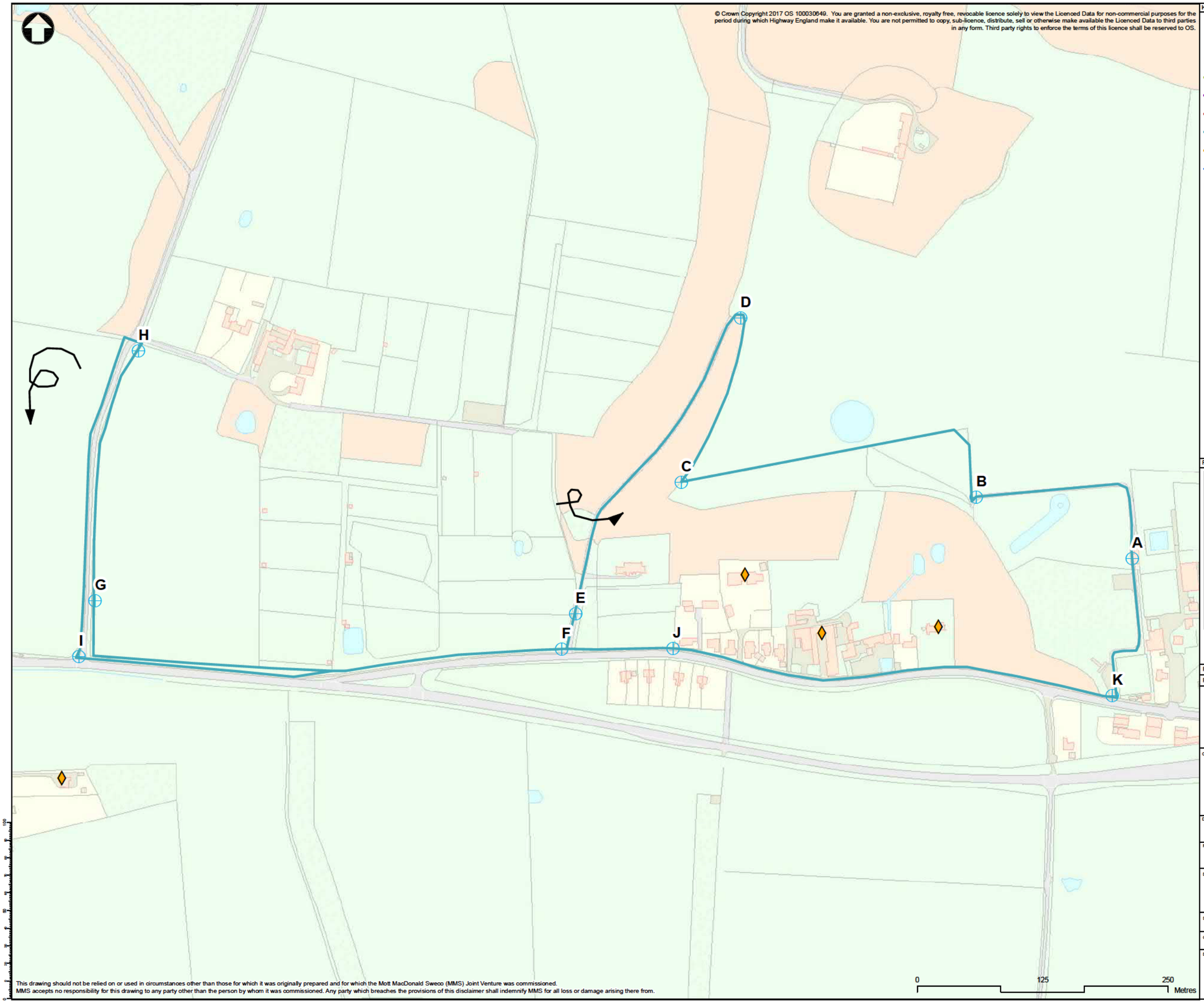
Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 4
26/04/2018 - Dusk

Scale	Designed	Drawn	Checked	Approved
1:3,500	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size: A3	Date: 01/06/18	Date: 24/08/18	Date: 01/09/18	Date: 10/09/18

Drawing Number: HE551490 _ MMSJV _ EBD _ 000 - DR - LB - 00013
(HE PIN | Originator | Volume | Location | Type | Role | Number)
Project Ref. No.: HE551490
Revision: P01

0 125 250 Metres



Key to symbols

- Bat FIghts
- Bat Roost Location

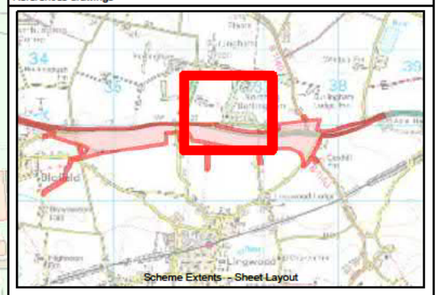
Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

References drawings



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 4
24/05/2018 - Dawn

Scale	Designed	Drawn	Checked	Approved
1:3,500	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/06/18	24/08/18	01/09/18	10/09/18

Drawing Number: HE PIN HE551490 | Originator MMSJV | Volume EBD | Location 000 | Type DR | Role LB | Number 00011
Project Ref. No.: HE551490
Revision: P01

0 125 250 Metres

H
D
C
B
A
G
E
F
J
K
I

Key to symbols

Bat FIghts

Bat Roost Location

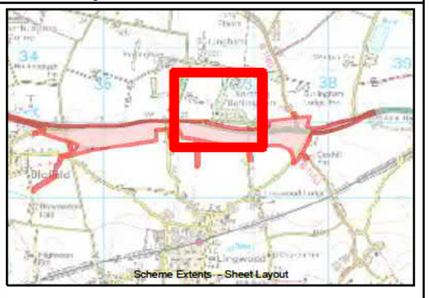
Bat Survey Transects

1
2
3
4
5
6

Bat Survey Locations (Transects)

1
2
3
4
5

References drawings



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION

Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 4
24/05/2018 - Dusk

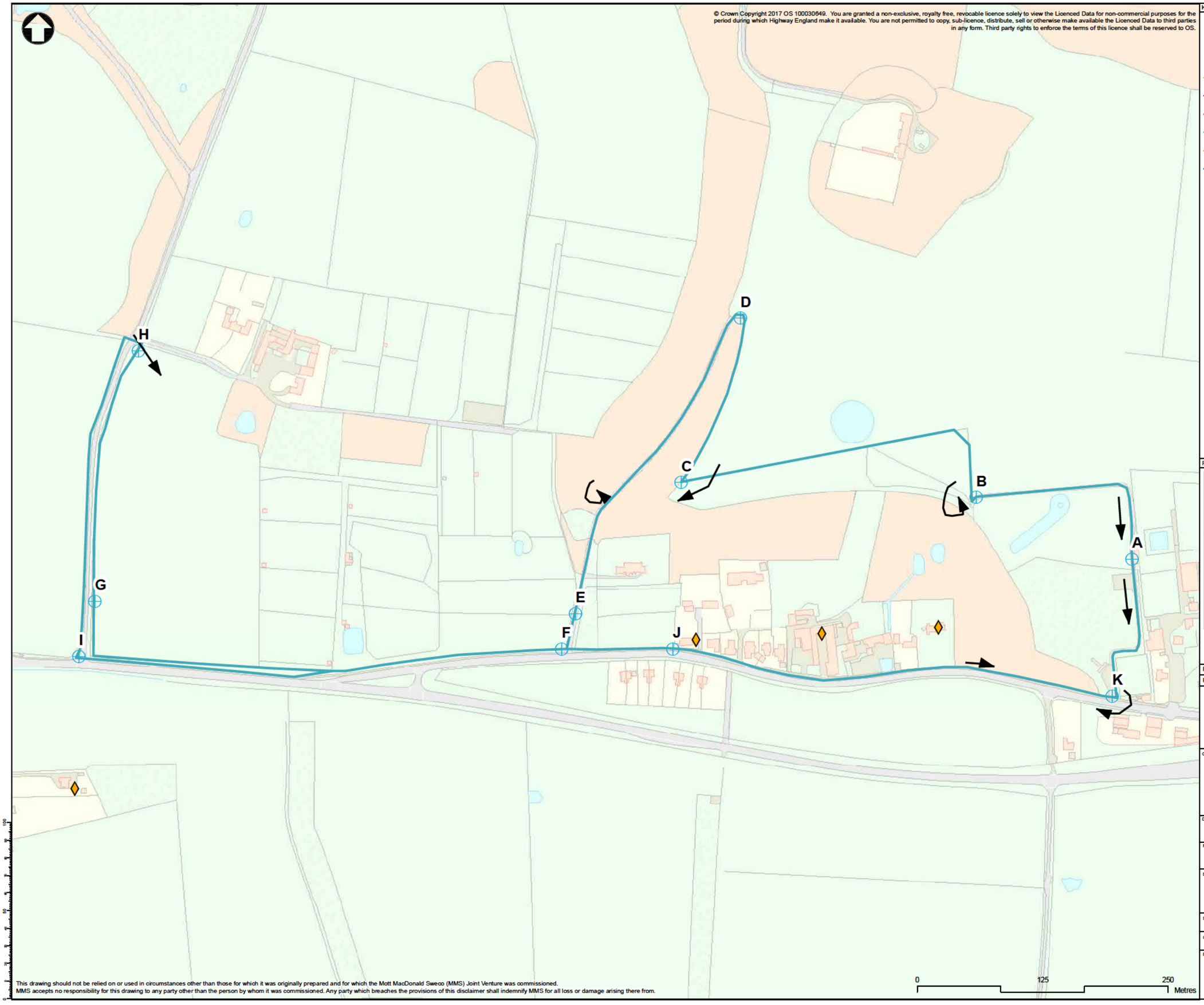
Scale	Designed	Drawn	Checked	Approved
1:3,500	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size: A3	Date: 01/06/18	Date: 24/08/18	Date: 01/09/18	Date: 10/09/18

Drawing Number: HE551490 _ MMSJV _ EBD _ 000 - DR - LB - 00012
(HE P/N | Originator | Volume | Location | Type | Role | Number)

Project Ref. No.: HE551490

Revision: P01

0 125 250 Metres



Key to symbols

- Bat FIghts
- Bat Roost Location

Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

References drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 4
12/06/2018 - Dusk

Scale	Designed	Drawn	Checked	Approved
1:3,500	West, Adam	Corcoran, Ant	Adam, West	Adam, West
Original Size	**Date**	**Date**	**Date**	**Date**
A3	01/06/18	24/08/18	01/09/18	10/09/18

Drawing Number: HE PIN | Originator | Volume
HE551490 - MMSJV - EBD -
000 (Location) - DR (Type) - LB (Role) - 00013 (Number)

Project Ref. No.: HE551490
Revision: P01

0 125 250 Metres

Bullacebush Farm
BULLACEBUSH LANE
HIGH NOON LANE
Jary's Farm
Plantation Farm
Progress House
PLANTATION ROAD
A47
Sparrow Hall Bungalow
YARMOUTH ROAD
MANOR RDS
Education Facility
FARMAN WAY
LYNES CL
SYMONDS CL
WYNGATES
LIBRARY CLOSE
Blofield
DOCTORS ROAD
YARMOUTH ROAD
NURSERY GARDENS
FOX LANE
LINGWOOD ROAD
DANESBOWER CLOSE
DANESBOWER LANE
THE CHASE
SHILLITO ROAD
POUND LANE
CHURCH ROAD
PW
Pound Lane Cottage
Mill House
HEMBLINGTON ROAD
BLOFIELD ROAD
Hillside

A
B
C
D
E
F
G
H
I
J
K

0 125 250 Metres

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Key to symbols

- Bat FIghts
- Bat Roost Location

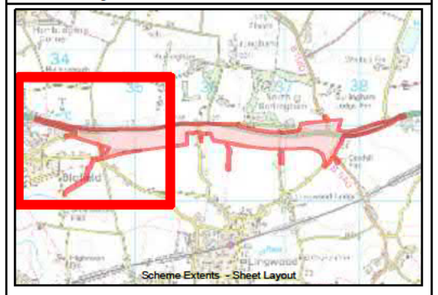
Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

References drawings



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 5
25/04/2018 - Dusk

Scale	Designed	Drawn	Checked	Approved
1:6,000	West, Adam	Corcoran, Ant	Adam, West	Adam, West
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Drawing Number: HE551490 - MMSJV - EBD - 000 - DR - LB - 00035
(HE PIN | Originator | Volume | Location | Type | Role | Number)

Project Ref. No.: HE551490
Revision: P01

Bullacebush Farm
BULLACEBUSH LANE
HIGH NOON LANE
Jary's Farm
Plantation Farm
Progress House
PLANTATION ROAD
A47
YARMOUTH ROAD
Sparrow Hall Bungalow
MANOR RDS
Education Facility
FARMAN WAY
LYNES CL
SYMONDS CL
WYNGATES
LIBRARY CLOSE
Blofield
DOCTORS ROAD
YARMOUTH ROAD
NURSERY GARDENS
FOX LANE
LINGWOOD ROAD
DANESBOWER CLOSE
DANESBOWER LANE
THE CHASE
SHILLITO ROAD
POUND LANE
CHURCH ROAD
PW
Pound Lane Cottage
Mill House
HEMBLINGTON ROAD
BLOFIELD ROAD
Hillside

A
B
C
D
E
F
G
H
I
J
K

0 125 250 Metres

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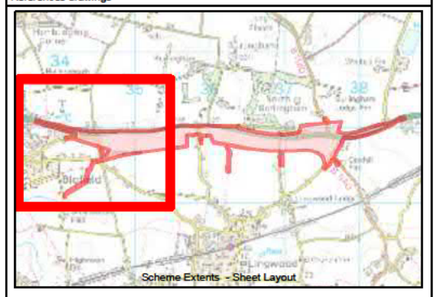
Key to symbols

Bat FIghts
Bat Roost Location

Bat Survey Transects
1
2
3
4
5
6

Bat Survey Locations (Transects)
1
2
3
4
5

References drawings



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P01	07/06/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 5
24/05/2018 - Dusk

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HE PIN | Originator | Volume | Location | Type | Role | Number
Project Ref. No.: HE551490
Revision: P01

Key to symbols

- Bat FIghts
- Bat Roost Location

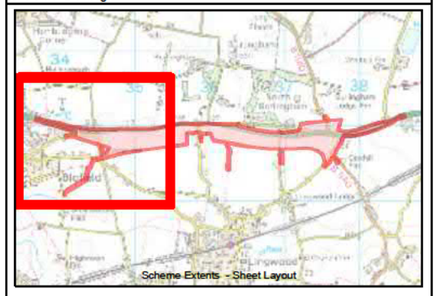
Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

References drawings



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Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 5
05/06/2018 - Dusk

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Project Ref. No.: HE551490
Revision: P01

0 125 250 Metres

Key to symbols

- Bat FIghts
- Bat Roost Location

Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5

References drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/09/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION

Suitabl ity: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 5
06/06/2018 - Dawn

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000 Locat on - DR - LB - 00016 | Type | Role | Number
Rev sion: P01

0 125 250 Metres

Key to symbols

- Bat FIghts
- Bat Roost Location

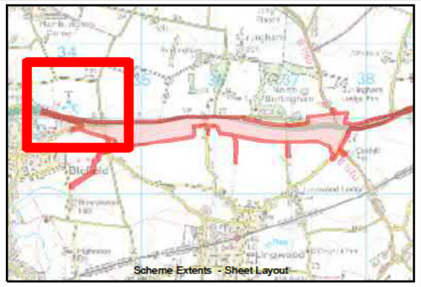
Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5
- 6

References drawings



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Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 6
25/04/2018 - Dusk

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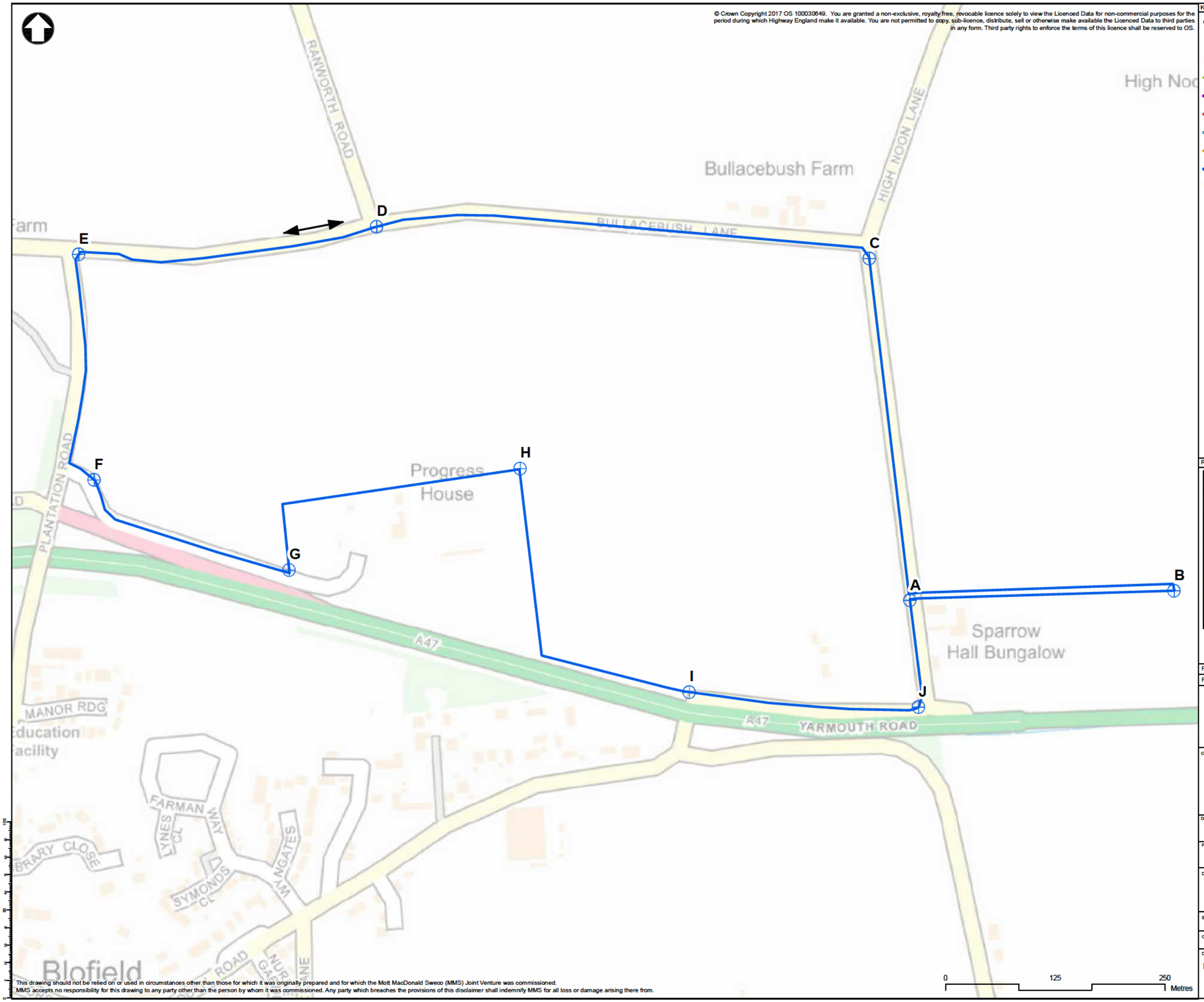

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Key to symbols

- Bat FIghts
- Bat Roost Location

Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5
- 6

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References drawings

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Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

Project Title: A47 - Blofield to North Burlingham

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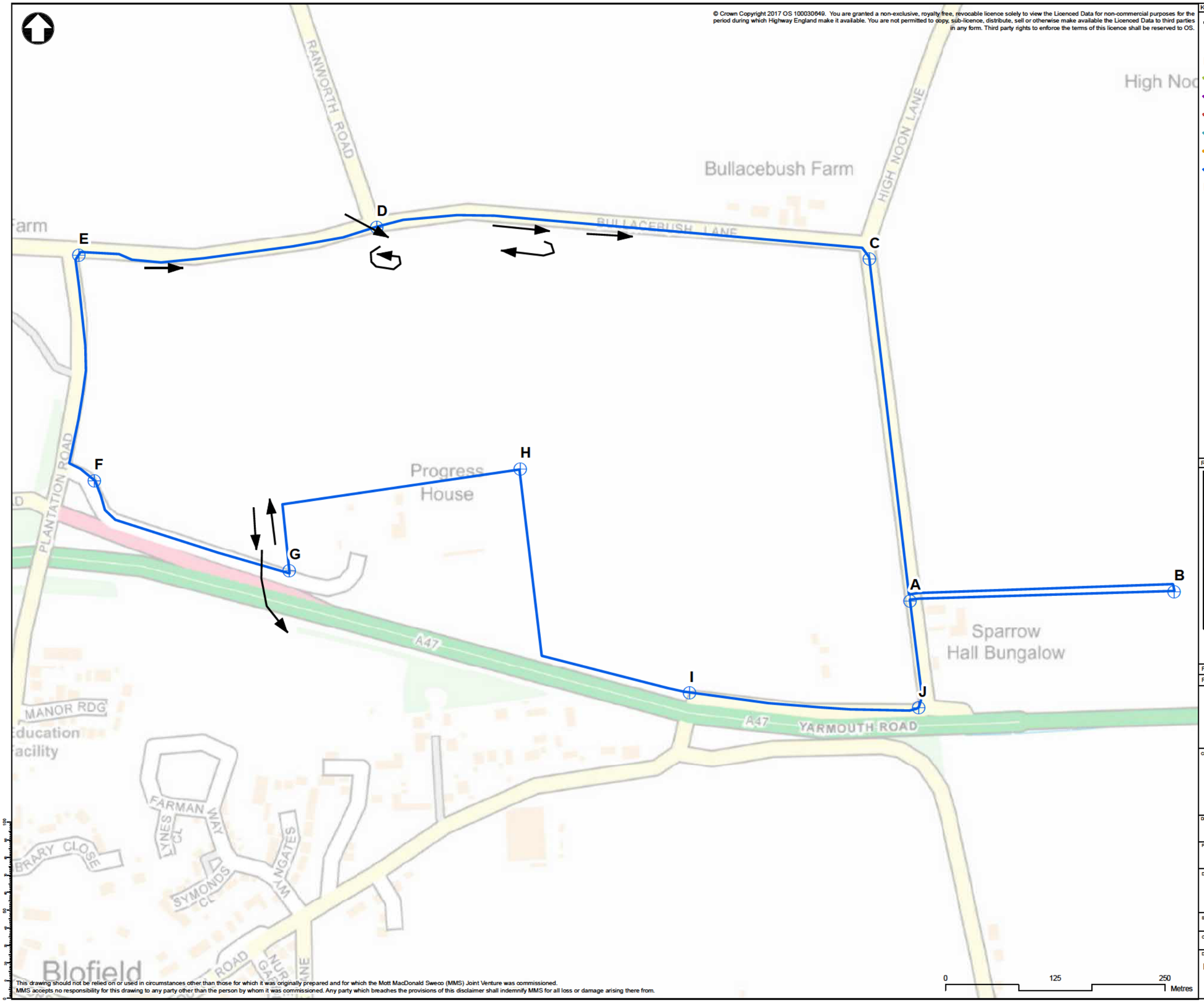
Revision: P01



Key to symbols

- Bat FIgihts
- Bat Roost Location

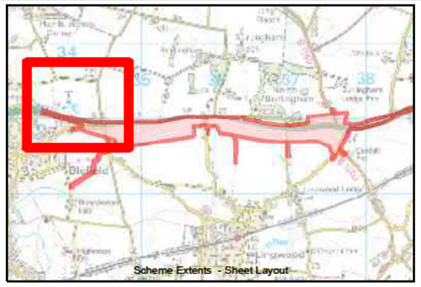
Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5
- 6

References drawings



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Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 6
11/06/2018 - Dusk

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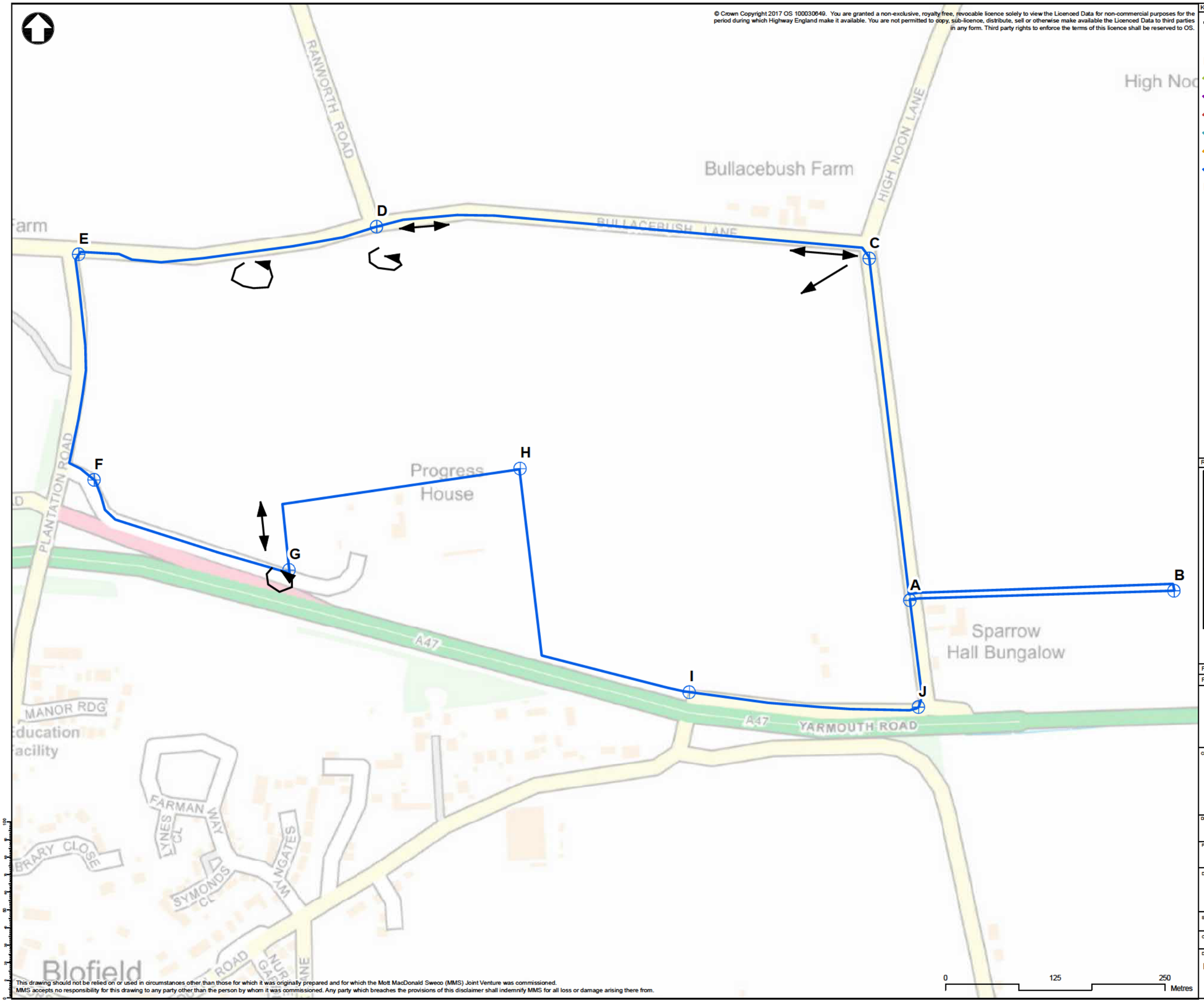

Key to symbols

- Bat FIghts
- Bat Roost Location

Bat Survey Transects

- 1
- 2
- 3
- 4
- 5
- 6

Bat Survey Locations (Transects)

- 1
- 2
- 3
- 4
- 5
- 6

References drawings

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P01	07/09/18	FOR INFORMATION	AC	AW	AW

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION
Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Survey - Transect 6
12/06/2018 - Dawn

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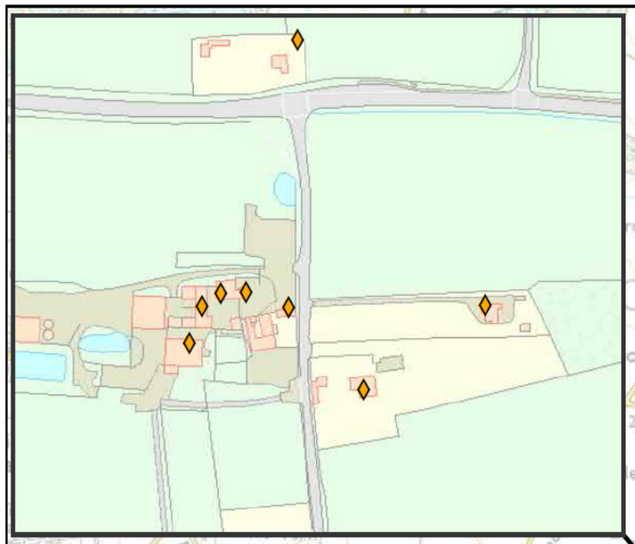
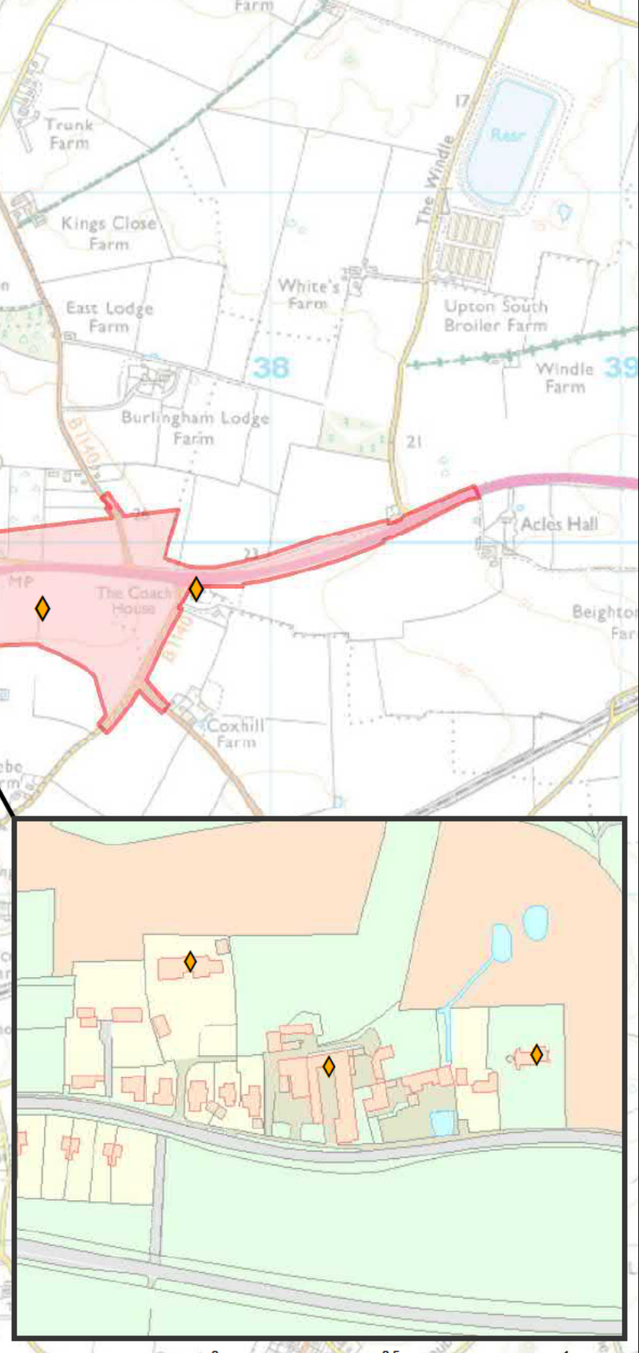
Drawing Number: HE551490 - MMSJV - EBD - 000 - DR - LB - 00020
(HE PIN | Originator | Volume | Location | Type | Role | Number)

Project Ref. No.: HE551490
Revision: P01

Annex F – Locations of confirmed roosts





Key to symbols

- Bat Roost Location
- Proposed Scheme Area

References drawings

Scheme Extents - Sheet Layout

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Leeds
LS7 4DN
Tel +44 (0)113 262 0000

Client: highways england

Drawing Status: FOR INFORMATION

Suitability: S2

Project Title: A47 - Blofield to North Burlingham

Drawing Title: Bat Roost Locations

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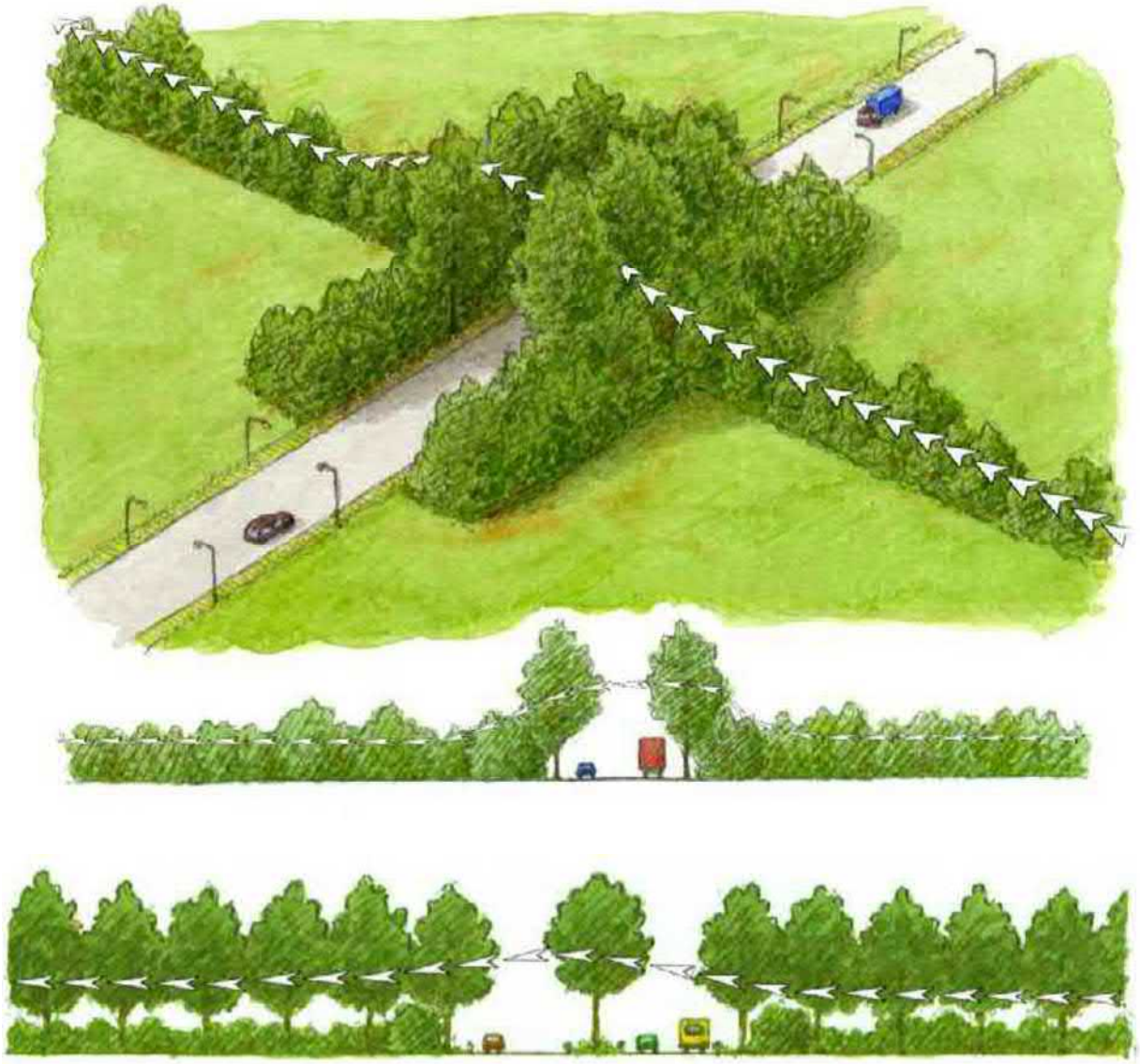
Project Ref. No.: HE551490

Revision: P01

0 0.5 1 Kilometres

Annex G – Example of a bat ‘hop-over’ road crossing



Taken from *Interim Advice Note 116/08 - Nature conservation in relation to bats.* (Highways Agency, 2008)

Annex H – Plant species beneficial to bats

Table A1: Trees, shrubs and climbers

Common name	Scientific name
Bramble	*Rubus fruticosus*
Common alder	*Alnus glutinosa*
Dog rose	*Rosa canina*
Elder	*Sambucus sp.*
English oak	*Quercus robar*
Guelder rose	*Viburnum opulus*
Hawthorn	*Crataegus sp.*
Hazel	*Corylus sp.*
Honeysuckle	*Lonicera periclymenum*
Hornbeam	*Carpinus sp.*
Ivy	*Hedera sp.*
Jasmine	*Jasminum sp.*
Rowan	*Sorbus sp.*
Silver birch	*Betula pendula*

Table A2: Flowers for borders

Common name	Scientific name
Corncockle	*Agrostemma githago*
Cornflower	*Centaurea cyanus*
Corn marigold	*Glebionis segetum*
Corn poppy	*Papaver rhoeas*
English Bluebell	*Hyacinthoides non-scripta*
Field poppies	*Papaver rhoeas*
Knapweed	*Centaurea sp.*
Mallow	*Malva sp.*
Ox-eye daisy	*Leucanthemum vulgare*
Primrose	*Primula vulgaris*
Red campion	*Silene dioica*
Scabious	*Scabiosa sp.*
St John's wort	*Hypericum perforatum*

Annexe I - Legislation

European and domestic legislation

1.1.1 All bats in the UK are protected under UK and European law as follows:

- Included in Annex II and IV of EC Directive 92/43/EEC on the Conservation of Natural Habitats and of the Wild Fauna and Flora (the Habitats Directive 1992) as obligated by the Bern Convention (1979) which implements the Conservation of Habitats and Species Regulations 2017 making it a European protected species (listed under Schedule 2).
- Schedule 5 of the Wildlife and Countryside Act (1981) (as amended by the Countryside Rights of Way Act 2000).
- Appendix II on the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).
- Section 41 of the Natural Environment and Rural Communities Act (2006).

1.1.2 Under these statutes, it is an offence to:

- Damage or destroy a bat roost (whether or not occupied by bats at the time).
- Intentionally or recklessly obstruct access to a bat roost.
- Intentionally or recklessly disturb a bat in its roost, or deliberately disturb a group of bats.
- Deliberately kill, injure or take any bat.

1.1.3 With specific reference to the offence of disturbance, Regulation 39(1) of the Conservation of Habitats and Species (Amendment) Regulations 2012 states that a person commits an offence if he:

"*deliberately disturbs wild animals of any such species [i.e. a European Protected Species] in such a way as to be likely significantly to affect:*

(i) the ability of any significant group of animals of that species to survive, breed, or rear or nurture their young; or

(ii) the local distribution or abundance of that species".

1.1.4 Where development will result in damage to, or obstruct access to, any bat roost (whether occupied or not) or risks harming or significantly disturbing bats, a European Protected Species Licence (EPSL) is required from Natural England to allow the development to proceed.

1.1.5 Bats are also afforded more general protection in England (and Wales) within the Natural Environment and Rural Communities Act (NERC) 2006. This imposes a duty on all public bodies, including local authorities and statutory bodies, in exercising their functions, "*to have due regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity*" [Section 40 (1)]. It notes that "*conserving biodiversity includes restoring or enhancing a population or habitat*" [Section 40 (3)]. Consequently, attention should be given to dealing with the modification or development of an area if aspects of it are deemed important to bats, such as roosts, flight corridors and foraging areas.

1.1.6 Section 41 (S41) of this Act requires the Secretary of State to publish a list (in consultation with Natural England) of habitats and species which are of principal importance for the conservation of biodiversity in England. The S41 list is used to guide decision-makers such as public bodies including local and regional authorities, when carrying out their normal (e.g. planning) functions. The S41 list includes 65 habitats of principal importance and 1,150 species of principal importance.

1.1.7 Seven species of bats (soprano pipistrelle *Pipistrellus pygmaeus*, brown long-eared bat *Plecotus auritus*, greater horseshoe bat *Rhinolophus ferrumequinum*, lesser horseshoe bat, *Rhinolophus hipposideros*, barbastelle *Barbastella barbastellus*, Bechstein's bat *Myotis bechsteinii* and noctule *Nyctalus noctula*) are listed under Section 41 of the NERC Act 2006.

1.1.8 Local Biodiversity Action Plans (LBAP) identify habitat and species conservation priorities at a local level (typically at the County level),and are usually drawn up by a consortium of local government organisations and conservation charities. soprano pipistrelle *Pipistrelleistrellus pygmaeus*, brown long-eared bat *Plecotus auritus*, barbastelle *Barbastella barbastellus* and noctule *Nyctalus noctula* are included in the Norfolk Biodiversity Action Plan Strategy[1].

[1] Norfolk County Council (2011) *Species Action Plans*. Available at: http://www.norfolkbiodiversity.org/actionplans/speciesactionplans/#Mammals (accessed September 2018).

Annex J – Previous survey report

A47 Blofield

Bat Surveys

For Amey

27th November 2017

Executive Park, Avalon Way, Anstey, Leicester, LE7 7GR

Tel: [redacted]

Email: ecology@wyg.com

Document Control

Project:	A47 Blofield
Client:	Amey
Job Number:	A090648-4-1
File Origin:	N:\Projects\Projects A090000 on\A090648-4-1 Blofield & Tuddenham\REPORTS\Blofield reports

Issue 1	**27th November**	**Final**
Prepared by:	[redacted]	Elizabeth Sanders MCIEEM **Senior Ecologist**
Checked By:		Ian Stephens **Project Ecologist**
Verified By:		Tim Bradford CEnv MCIEEM **Associate Ecologist**

Rev:	Date:	Updated by:	Verified by:	Description of changes:

Contents

Executive Summary

Contents	Summary
Site Location	The site is located along the A47 in Blofield, Norfolk and is located between Ordnance Survey National Grid Reference TG 3349 1012 to the west and TG 3887 1019 to the east and measures approximately 5.5km in length. The survey area comprised the proposed route of the new road and a buffer of 50m although assessment of features of interest e.g. churches outside of 50m were considered. Land within the site boundary comprises the existing A47 road, agricultural land with associated hedgerows and trees, farm buildings and residential properties.
Proposals	The development proposal is to convert the existing single carriageway road between Blofield and North Burlingham to dual carriageway, altering some of the junctions onto the dual carriageway from the existing country road network and adding additional ancillary roads and infrastructure to accommodate the proposed dualling.
Existing Site Information	Existing baseline information on the site was collected by Amey and is available in the PCF Stage 1 and Stage 2 Environmental Assessment Reports.
Scope of this Survey(s)	Further to initial surveys undertaken at Stage 2 by Amey Stage 3 bat surveys were requested gather baseline information specific to the preferred route option and surrounding area. The survey work aimed to identify bat roosts within the buildings and trees located in close proximity of the preferred route option and to identify the usage of the land within 50m of the realignment by bats for foraging and commuting.
Results	Bat roosts were identified in: The Lindens, St Andrews Church North Burlingham, Oaklands, Poplar Farm, The White House and Trees 5 and 67. Bat activity was generally considered to be low during the walked transect surveys with the most bat activity identified during Transect 4 which was on land surrounding St Andrews Church and St Peters Church Ruins in North Burlingham. The static surveys identified Location 10, as having the highest number of bat passes in October, this was located behind farm buildings to the north of the A47 and the west of South Walsham Road. Location 8 on the corner of Lingwood Lane and the A47 had the highest recorded number of noctule passes in August and September.
Recommendations	**Roosting Bats:** All buildings and trees identified within the site as having suitability to support roosting bats will require additional surveys to be undertaken between May and August 2018. **Roosting Bats:** Detailed daytime assessments should be undertaken of NB01-NB11 to identify features suitable for roosting bats, internal access should be gained where possible. **Foraging Bats:** all transect routes will require surveys between April and July to provide a full years worth of bat activity data and to identify the key routes used by foraging and commuting bats at different times of the year.

Glossary

BCT	Bat Conservation Trust
CEnv	Chartered Environmentalist
CIEEM	Chartered Institute of Ecology & Environmental Management
EcIA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
EMP	Ecological Management Plan
EPS	European Protected Species
EPSL	European Protected Species Licence
Habitat Regulations	Conservation of Habitats and Species Regulations 2010 (as amended)
HPI	Habitat(s) of Principal Importance
HRA	Habitats Regulations Assessment
MCIEEM	Member of Chartered Institute of Ecology & Environmental Management
NE	Natural England
NERC Act	Natural Environment and Rural Communities Act 2006
NPPF	National Planning Policy Framework
PEA	Preliminary Ecological Appraisal
SPI	Species of Principal Importance
SSSI	Site(s) of Special Scientific Interest

1.0 Introduction

1.1 Background

WYG was commissioned by Amey on 3rd July 2017 to undertake bat surveys of the site known as A47 Blofield and specifically with reference to the Stage 3 preferred route option.

This report has been prepared by Senior Ecologist Elizabeth Sanders MCIEEM.

1.2 Site Location

The site is located along the A47 in Blofield, Norfolk and is located between Ordnance Survey National Grid Reference TG 3349 1012 to the west and TG 3887 1019 to the east and measures approximately 5.5km in length. The survey area comprised the proposed route of the new road and a buffer of 50m although assessment of features of interest e.g. churches outside of 50m were considered. Land within the site boundary comprises the existing A47 road, agricultural land with associated hedgerows and trees, farm buildings and residential properties.

1.3 Development Proposals

The development proposal is to convert the existing single carriageway road between Blofield and North Burlingham to dual carriageway, altering some of the junctions onto the dual carriageway from the existing country road network and adding additional ancillary roads and infrastructure to accommodate the proposed dualling.

1.4 Purpose of the Report

The aims of the survey work and the subsequent report presented here are to:

- Outline the legislative protection and planning policy given to bats;
- Identify habitats and features within the site that have the potential to be used by bats;
- Summarise the findings of the bat surveys and report on the presence or otherwise of bat species at the site; and
- Provide an assessment of the potential ecological constraints to the proposed works at the site and recommendations, avoidance, mitigation and enhancement where appropriate.

Note that, where possible, common names for bats have been used throughout this report for ease of reading.

2.0 Methodology

2.1 Field Surveys

The following methodologies have been used to identify the ecological receptors present on or near the site, which are relevant to the proposed development.

All buildings and trees located within 50m of the road were assessed by WYG in 2017 for their suitability to support roosting bats.

Roosting bats – Buildings/structures/trees

Any suitable buildings, structures or trees on site were assessed from the ground for their suitability to support breeding, resting and hibernating bats using survey methods based on the BCT *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd ed, 2016) – hereafter referred to as the 'BCT Guidelines'. The following system has therefore been used to categorise the bat roost suitability of any features found:

Table 1 Categories of Bat Roost Suitability (BCT Guidelines)

Suitability	Typical Roosting Features
Negligible	Negligible habitat feature on site likely to be used by roosting bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation). A tree of sufficient size and age to contain potential roost features but with none seen from the ground or features seen with only very limited roosting potential.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis & potentially for longer periods of time due to their size, shelter, protection, conditions & surrounding habitat.

All buildings and trees were assessed externally and from the ground during the surveys although visibility was restricted to some buildings due to access constraints. The buildings were assessed for their potential to be utilised by bats due to the presence of access points and features such as lifted tiles, missing tiles, open eaves, open barn doors and lifted lead flashing.

Foraging/commuting bats

The BCT Guidelines use the following criteria to categorise the potential value of habitats and features for use by foraging and commuting bats and these have been used to characterise the value of this site:

Table 2 Categories of Habitat Suitability (BCT Guidelines)

Suitability	Typical Foraging & Commuting Features
Negligible	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	Continuous high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.

Equipment

Bat surveys were conducted using Elekon Batlogger detectors with built in GPS receivers, Batbox Duets with Roland Edirol MP3 devices to record bat calls and EM Touch with built in GPS receivers.

Personnel

The following WYG surveyors undertook the surveys at the site during 2017:

- Senior Ecologists, Elizabeth Sanders MCIEEM Class 2 Natural England Bat Licence holder 2015-10986-CLS-CLS and David Goddard MCIEEM.
- Project Ecologist, Ian Stephens
- Assistant Ecologist, Amy Dowers
- Ecologists, Paul Moon Class 2 Natural England Bat Licence Holder 2015-11814-CLS-CLS, Marc Kipling, Chris Rhodes, Adam Sela, Imogen Mason-Brown, Neil Smith and Brendan Noone.

Scoping

WYG were requested to scope additional buildings and trees not considered by Amey at Stage 1 or Stage 2. Additional buildings and trees scoped by WYG between July and August 2017 were identified as having negligible or low suitability and as such were not surveyed during 2017 due to time constraints.

Emergence/Return Surveys

One bat emergence/return survey was completed for all trees and buildings identified as having moderate or high suitability for roosting bats. The dusk emergence survey commenced 15 minutes before sunset and continued for 1.5 hours after sunset. The pre-dawn re-entry survey commenced

1.5 hours before sunrise and continued until 15 minutes after sunrise. Emergence/return surveys of buildings used a minimum of three surveyors for simple buildings and a minimum of four surveyors for complex buildings such as farm/agricultural buildings. This enabled all features suitable for use by bats as access points to be visible by the surveyors. All tree emergence/return surveys were undertaken by one or two surveyors depending upon the location of features.

Activity Surveys

Activity surveys were undertaken on the basis of moderate quality habitat, as directed by Amey following Stage 1 and 2 bat survey work and assessment of habitat suitability.

In accordance with BCT guidance for activity surveys on land of moderate suitability monthly transect surveys were conducted. This comprised five transect survey routes which were designed and conducted across the site between July and October 2017. A sixth transect route could not be undertaken due to access not being permitted to the land. The transect routes were designed to sample representative habitats within the site including arable land, pasture land, hedgerows, grassland, woodland and built habitats (farm buildings, residential properties and churches).

The surveyor walked at a steady pace starting at sunset and continuing for up to 2 hours after sunset. Any bats recorded were identified to species (where possible) and recorded on a field map. The calls were recorded on the detectors and were later analysed by an experienced bat ecologist using BatExplorer or BatSound software to allow identification to species or genus level. A pre-dawn transect survey was not undertaken in 2017, and will therefore need to be completed in 2018 during the April, May or June surveys.

Static detector surveys were also undertaken using two Anabat Express detectors per transect route to sample bat activity, distribution and species across the site. A static detector was placed at each location before dusk and was retrieved during the daytime after at least five consecutive nights recording.

2.2 Limitations

The optimal period to undertake bat surveys is April-September. The surveys were completed in July, August, September and October which is inside the optimal survey window. Although this is not considered to be a limitation to the accurate assessment of the presence/absence of bats within the site BCT guidance recommends monthly surveys should be undertaken April – October for sites assessed to present moderate quality habitat. Therefore, the absence of surveys April – June is considered a significant limitation to the findings of this report.

To determine presence or likely absence of protected species usually requires multiple visits at suitable times of the year. As a result, this survey focuses on assessing the potential of the site to support species of note, which are considered to be of principal importance for the conservation of biodiversity with reference to those given protection under UK or European wildlife legislation. This report cannot therefore be considered a comprehensive assessment of the ecological interest of the site. However, it does provide an assessment of the ecological interest present on the day the site was visited and highlights areas where further survey work may be recommended.

Access to the south-eastern portion of the site was not provided and therefore no assessments were undertaken in this area. Access to a section of land in the central southern portion of the site was

also not possible as contact details were not provided for land owners, therefore no access could be arranged (see Figure 1). Access was not possible to land to the north-west of the A47 for the surveys in July and August, however the land owner then agreed that surveys could be undertaken.

The access restrictions are considered to be a limitation to the assessment of some buildings and trees, as they could not be fully viewed from the neighbouring land (see Figure 1 for access restrictions).

Access restrictions to land north of the A47 are not considered to provide a limitation to the survey, as the walked transect routes covered the habitat adjacent to the restricted land to the east and west. The habitats within the restricted land also are considered to be represented within the transect routes to the east and west and it. is considered, these transects provided enough information to identify the use of this land by bats for foraging and commuting. . The land to the north of the A47 also falls outside the 50m buffer for the scheme, reducing the possible impacts upon these habitats.

A sixth transect route could not be undertaken as no access was available to all of the land south-east of the A47 (See Figure 1), this is considered to be a limitation to the results of the survey as no information on bat foraging and commuting was obtained for this area. The area contained a linear feature (line of trees) within the middle of the field, which could be utilised by bats for foraging and commuting. One static bat detector was damaged during the surveys, data was retrieved however this led to static surveys being repeated to make sure data was collected for each location in the designated period. Equipment failures due to battery life also occurred in September. These failures are not considered to be a constraint to the results of the survey as data was gathered in August and October to support the surveys.

A thunderstorm with heavy rain and hail occurred at the start of the July transect survey, surveyors waited for the storm to pass before commencing the survey. The survey commenced within 20 minutes after sunset when the storm had passed, bats were recorded during this survey and therefore this is not considered to be a constraint to the results of the survey.

During the emergence and return surveys light rain or drizzle was experienced. This is not considered to be constraint to the results as bats were recorded emerging from features, or in flight during the surveys. Surveys were cancelled if the rain became heavy and bats were recorded returning to roosts. The results of these surveys may not provide an accurate assessment of numbers of individuals present within the roosts as some bats may not have emerged during the inclement weather. However, it does provide information that confirms roosts are present as some individuals emerged and/or returned to roosts.

Sound analysis

Sound analysis was undertaken following the surveys. the static bat detectors recorded very large quantities of noise at the frequency for pipistrelles (40-60khz) which meant that this noise could not be filtered out without also filtering out the bat calls. This is not considered a limitation as all files were analysed.

Bat calls such as those which were distant, quiet or possible social calls, could not be analysed to species and therefore were classed as 'other' and the number of these each calls per night was noted. Bats of the *Myotis* genus were not identified to species due to the similarity of the calls. This is not

considered to be a limitation to the results of the survey as the number of calls assigned to Myotis sp. and other, were a low proportion of the total calls recorded.

The details of this report will remain valid for a period of **18 months** from the date of the survey, after which the validity of this assessment should be reviewed to determine whether further updates are necessary. Note that the recommendations within this report should be reviewed (and reassessed if necessary) should there be are any changes to the red line boundary or development proposals upon which this report was based.

3.0 Baseline Conditions

3.1 Daytime Bat Assessment

3.1.1 Personnel

The daytime assessment of buildings and trees was undertaken by WYG Ecologist Paul Moon Natural England Class 2 bat licence number 2015-11814-CLS-CLS. All buildings and trees identified within the 50m road corridor were surveyed.

3.1.2 Building Assessment Results

Table 3 below details the summary of findings for the buildings which were surveyed in August 2017.

Table 3 Summary of Daytime Assessment of Buildings

Building	Summary of Details	Suitability for Roosting Bats
St Andrews Church, North Burlingham	**External**: Stone building with pitched and slate roof. Access points present below roof tiles, at eaves and through windows present on the tower. **Internal:** Wooden sarking present with gaps between sarking and walls providing potential access points. Scattered bat droppings present resembling those of pipistrelle, brown long-eared bat and a *Myotis* species possibly natterers bat.  	Confirmed roost
St Peters Church Ruins, North Burlingham	**External**: Stone building with pitched slate roof. **Internal:** No internal access provided.	High – WYG.
St Peters Church, Lingwood	**External:** Stone building with pitched slate roof. Some gaps present below slates, gaps at eaves and access through tower windows. **Internal:** No evidence of bat droppings found.	Moderate to High - WYG

		
The White House	**External:** Site comprises a two-storey brick farm house with pitched slate roof, two brick chimneys sealed with lead and wooden window frames which were tightly sealed. Other buildings (barns/stables) were present to the rear of the property these were also of brick construction with pitched tiled roofs and open doors. **Internal:** no internal access provided at the time of the survey.	High WYG
Poplar Farm	**External:** Several farm outbuildings with asbestos roofs gaps present below the asbestos roofs. Two barns with thatched roofs were also present which were considered to provide limited potential. **Internal:** No internal access provided at the time of the survey.	High WYG Suspected roost - Amey
The Lindens	**External:** Single-storey brick built bungalow with plastic fascias and soffits. **Internal:** No internal access provided at the time of the survey, owner informed surveyor that they had seen bats emerge from the hanging tiles previously.	High WYG Confirmed Roost - Amey
Oaklands	**External:** A large two-storey brick building with a pitched and tiled roof, gaps noted at the eaves below roof tiles or behind weather board. **Internal:** No internal access provided at the time of the survey.	High – WYG
NB01	**External:** Modern new brick built house, no features noted. **Internal:** No internal access provided at the time of the survey.	Negligible/low WYG
NB02	**External:** 117 Yarmouth Road modern brick built house, no features noted. **Internal:** No internal access provided at the time of the survey.	Negligible/low WYG
NB03	**External:** 113 Yarmouth Road, rendered building with pitched tiled roof, some gaps below tiles which could allow bat access. **Internal:** No internal access provided at the time of the survey.	Low
NB04	**External:** 107a Old Orchard House, modern brick building.	Low

	Internal: No internal access provided at the time of the survey.	
NB05	**External:** Bungalow with pitched tiled roof and dormer windows present. Also has a detached garage building, single-storey brick with pitched tiled roof. **Internal:** No internal access provided at the time of the survey.	Low
NB06	**External:** Bungalow with pitched tiled roof. Single-storey garage buildings also present with a flat roof. **Internal:** No internal access provided at the time of the survey.	Low
NB07	**External:** Detached house with slate roof **Internal:** No internal access provided at the time of the survey.	Low
NB08	**External:** Water Low Cottage, brick built cottage with slates, some gaps under slates **Internal:** No internal access provided at the time of the survey.	Low
NB09	**External:** Garden Lodge brick built with flat roof **Internal:** No internal access provided at the time of the survey.	Low
NB10	**External:** Hall Cottages, brick building with garages and outbuildings **Internal:** No internal access provided at the time of the survey.	Low
NB11	**External:** Acle Hall Farm, outbuildings and derelict barn, potential access points present **Internal:** No internal access provided at the time of the survey.	Moderate/high

The locations of the buildings previously confirmed as bat roosts by Amey are provided in Figure 2.

3.1.3 Tree Assessment Results

Table 4 below details the summary of the findings of the tree assessments which were surveyed by WYG in August 2017.

Table 4 Summary of Tree Assessment

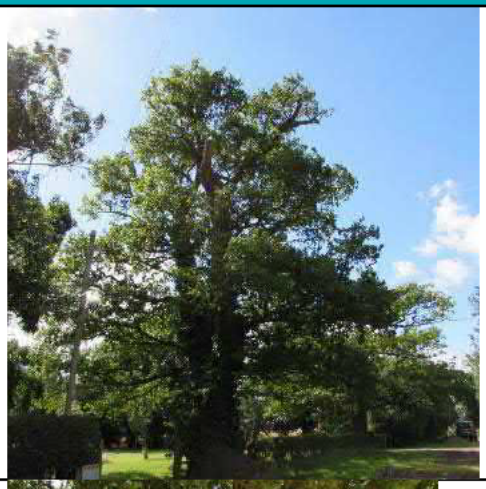
Tree Number	Summary of Details and Grid Reference	Photographs	Suitability for Roosting bats
T1 Oak	Loose bark and knot/rot holes present and ivy covering. TG 35151 09905		Moderate
T3 Oak	Loose bark and cavities present. TG 35329 09794		High
T4	No longer standing. TG 35543 09904		N/A
T5 Oak	Mature oak with loose bark and dense ivy cover. TG 35541 09893		Moderate

Tree Number	Summary of Details and Grid Reference	Photographs	Suitability for Roosting bats
T11 Oak	Oak with broken limbs and a large cavity. Suitability for use by owls. TG 35131 09791		Moderate
T39 Oak	Oak covered with ivy. TG 36191 09854	-	Moderate
T41	Oak with two cavities. TG 36056 09877	-	Moderate
T43 Oak	Numerous cavities present in limbs, peeling bark also present. TG 35875 09870		High
T44 Oak	Crevices present. TG 35875 09864		High

Tree Number	Summary of Details and Grid Reference	Photographs	Suitability for Roosting bats
T45 Oak stump	Surrounded by ivy and ash with large cavities present. Cavities potentially upward facing and therefore exposed to weather. TG 35867 09930		High
T50 Oak	Dense ivy and cavities. TG 36950 09780		Low/moderate
T51 Oak	Dense ivy present. TG 36947 09786		Low/moderate
T52 Sycamore	Dense ivy. TG 36948 09856	-	Low/moderate
T53 Oak	Dense ivy. TG 37340 09813	-	Low/Moderate

Tree Number	Summary of Details and Grid Reference	Photographs	Suitability for Roosting bats
T57 Ash	Mature ash with crack along trunk. TG 37223 09977		Moderate
T58 Ash	Hollow in trunk. TG 37229 09976		Moderate
T60 Oak	Dense ivy cover. TG 36629 09948		Moderate
T67 Oak	Few broken branches, no cavities seen. TG 35872 10045		Low/moderate

Tree Number	Summary of Details and Grid Reference	Photographs	Suitability for Roosting bats
T75 Oak	Cracks in limbs, missing bark and cavities present. TG 35271 09981		High
T77 Oak	Some dead branches noted, dense ivy cover. TG 34986 09997		Moderate/High
T78 Oak	Multiple cracks in branches and some loose bark present. TG 34988 10010		Low/Moderate
T80 Oak Outside 50 m buffer zone	Dead branch and cavities. TG 37754 09841		High

Tree Number	Summary of Details and Grid Reference	Photographs	Suitability for Roosting bats
T81 Oak	Snapped upper trunk & dead branches. TG 37747 09831		High
T82 Oak	Broken branches. TG 38490 10204		Moderate
T84 Oak	Ivy cover and loose bark. TG 36625 09845		Moderate

Tree Number	Summary of Details and Grid Reference	Photographs	Suitability for Roosting bats
T85 Oak	Crack, dead branches, cavities and some ivy cover present. TG 36621 09795		High
T87 Oak	Cavities, holes and loose bark. TG 36662 09804		High
T88 Oak	Knuckle holes, loose bark and cavities present. TG 36683 09805		High
T89 Oak	Dense ivy, knot holes and loose bark. TG 36719 09803		Moderate

Tree Number	Summary of Details and Grid Reference	Photographs	Suitability for Roosting bats
T90 Oak	Crevices and knot holes present. TG 36868 09796		Moderate
T91 Oak	Dead oak stump with splits and cavities. TG 36894 09794		Low/Moderate

Table 5 below details the additional trees which were not surveyed as part of the Amey surveys. which have now been included due to additional roundabouts and side road works.

Table 5 Summary of Additional Trees Surveyed

Tree Number	Grid Reference	Summary of Details	Suitability for Roosting bats
NT01	TG 34407 09902	Line of poplar trees	Negligible
NT02	TG 34201 09927	Small copse with immature oak, poplar and pine	Negligible
NT03	TG 34176 09982	Line of poplar trees along A47	Negligible
NT04	TG 33931 10049	Line of leylandii	Negligible
NT05	TG 37125 09972	Poplar	Negligble
NT06	TG 37168 09942	Scots Pine	Negligible
NT07	TG 37207 09947	Willow	Negligible
NT08	TG 37313 09952	Line of poplars	Negligible
NT09	TG 37568 10043	Mature poplar with some ivy cover but no other features	Low
NT10	TG 38631 10126	Willow, ash and beech	Negligble

Tree Number	Grid Reference	Summary of Details	Suitability for Roosting bats
NT11	TG 37850 09857	Some ivy coverage	Negligible/low
NT12	TG 37771 09805	Dead branches and ivy cover	Low
NT13	TG 37712 09795	Pollarded poplar trees (5 trees)	Negligible
NT14	TG 37699 09772	Poplar	Negligible
NT15	TG 37689 09749	Poplar	Negligible
NT16	TG 37692 09729	Poplar	Negligible
NT17	TG 37677 09732	Poplar	Negligible
NT18	TG 37647 09672	Three poplars	Negligible
NT19	TG 37617 09606	Two poplar trees	Negligible
NT20	TG 37602 09593	Two poplar trees	Negligible
NT21	TG 37613 09581	One poplar Three immature oak One ash	Negligible
NT22	TG 36130 09993	Mix of poplar and ash	Negligible

Figure 3 below, only identifies the location of the trees with any bat roost potential. The location of the trees with negligible potential can be identified through the grid references listed above.

3.2 Bat Emergence/Return Surveys of Buildings/Trees

3.2.1 Personnel

Senior Ecologist Elizabeth Sanders (Natural England Class 2 bat licence 2015-10986-CLS-CLS), Project Ecologist Ian Stephens, Assistant Ecologist Amy Dowers, Paul Moon, Brendan Noone, Mark Kipling, Imogen Mason-Brown and Chris Rhodes,

3.2.2 Weather Conditions

Table 6 below identifies a summary of the weather conditions for the emergence/return surveys of the buildings and trees undertaken in 2017.

Table 6 Summary of the Weather Conditions for the Building and Tree Surveys

Date / Survey	Buildings / Trees Surveyed	Survey Times		Sunset /rise	Temperature (°C)		Wind speed (Beaufort scale)		Cloud Cover (%)	
		Start	End		Start	End	Start	End	Start	End
29/08/2017	Tree 91, 92, 51, 52, 90	19:25	21:20	19:50	14	12	2	2	100	100
30/08/2017	Tree 89, 85, 87, 84, 88	04:20	06:05	06:01	14	14	1	2	100	100
06/09/2017	The Lindens, St Andrews Church	19:15	21:00	19:32	18	16	1-2	1-2	100	100
07/09/2017	St Peters Church Ruin, Tree 57, 58, 60	04:20	06:15	06:14	15	13	1	1-2	100	50
07/09/2017	Oaklands, Poplar Farm	19:15	21:00	19:29	15	14	1-2	1-2	100	100
13/09/2017	Tree 39, 41, 45, 43, 44	19:00	20:50	19:19	15	10	2	2	30	100
14/09/2017	Tree 1, 77, 78, 11	04:30	06:26	06:26	9	10	2-3	1-2	0	0
14/09/2017	Tree 5, 31 75	19:00	21:15	19:16	12	10	0-1	1-2	85	100
15/09/2017	Tree 53, 50	04:15	06:30	06:28	8	7	0-1	0-1	0	0
21/09/2017	Tree 40, 67	18:41	20:15	18:58	17	16	1	3	60	100
22/09/2017	St Peters Church. The Coach house, Tree 80, 81	05:00	06:39	06:39	9	9	0-1	0-1	0	0

3.2.3 Bat Emergence/Return Survey Results – Buildings

Table 7 Summary of Emergence/Return Surveys of Buildings

Building	Date of Survey	Bat Activity Identified	Roost present
The Lindens	06/09/17 Sunset: 19:32	At 19:40 a common pipistrelle was observed flying in the courtyard although it was not observed emerging from the buildings. Brown long-eared bats were recorded at 19:54 (22 minutes after sunset) feeding around a tree. It is considered probable that the bats had emerged from the building based on the discussions with the	Probable – common pipistrelle and brown long-eared bats

Building	Date of Survey	Bat Activity Identified	Roost present
		resident and the times at which bats were observed. Common pipistrelle bats were recorded foraging along hedgerows and wooded areas within the site for the duration of the survey.	
St Andrews Church	06/09/17 Sunset 19:32	Bats were already in flight at the start of the survey (19:15) and therefore could not be confirmed to have emerged from the building. Common pipistrelle bats were recorded foraging between the church and the woodland edge to the west and the east from the start of the survey. A noctule was recorded flying from the north-east to the south-west at 19:47 (15 minutes after sunset). A possible natterers bat was recorded at 20:41 (69 minutes after sunset). This bat was heard and not seen by the surveyor. Two surveyors on the north-eastern and north-western corners observed common pipistrelle bats flying away from the church, three from the bell tower towards the north-east (between 19:30 and 19:40) and one out of the church roof from the north-western corner adjacent to the tower at 20:24. Common and soprano pipistrelle bats were observed and detected foraging within the grounds of the church and the woodland edge habitat for the duration of the survey.	Yes – common pipistrelle (4)
St Peters Church Ruin, North Burlingham	07/09/17 Sunrise: 06:14	Noctule, brown long-eared and soprano pipistrelle bats were detected foraging within the grounds of the church ruins, no bats were observed entering the building. A barn owl was observed flying within the grounds of the ruins at 05:30. No bats were detected after 05:57, the last bats detected were pipistrelles flying towards the woodland in a north-easterly direction.	No
Oaklands	07/09/17 Sunset: 19:29 Light rain at beginning of survey, turned to heavy drizzle at 20:00	A common pipistrelle was observed emerging from the south-western corner of the roof at 19:51 at 20:04 this bat gestured towards the south-western corner of the building and entered the building below a tile. Common pipistrelle bats were observed and detected to the north and east of the building foraging during the survey. Survey abandoned at 20:10 due to heavy drizzle and bats returning to roosts.	Yes – common pipistrelle
Poplar Farm	07/09/17 Sunset 19:29	Common pipistrelle observed emerging from corner of barn adjacent to access gate at 19:40, exited site to east. Two bats were observed flying over the northern barn to the south-east at 19:38 and 20:00	Yes - common pipistrelle

Building	Date of Survey	Bat Activity Identified	Roost present
		At 19:43 a common pipistrelle was observed flying high away from the farmhouse over the access gate to the east (considered likely that this bat emerged from the farmhouse). Common pipistrelle bats were also recorded flying over the northern barn and heading in a north-easterly direction away from the site at 19:49 and 19:53. At 19:59 a common pipistrelle flew from the barn to the north of the site in an easterly direction.	
St Peter's Church, Lingwood	22/09/17 Sunrise 06:39	Common pipistrelle, soprano pipistrelle and *Myotis* bats were detected during the survey. Common and soprano pipistrelle bats were observed and detected foraging within the grounds of the church, flying from the western hedge over the church and continuing to the east away from the site. At 06:00 a myotis bat was observed flying towards the eaves of the northern elevation of the roof, this bat gestured towards the eaves before flying over the roof and continuing away from the church to the south-east. At 06:20 two soprano pipistrelle bats were observed flying over the roof of the church and exiting the site to the south-east and south-west.	No
The White House	22/09/17	Noctule bats were detected foraging above the two oak trees between 05:19 and 05:32, these bats were not observed returning to a roost but were also not seen exiting the site. At 05:59 a common pipistrelle was observed emerging form the barn and flying within the courtyard between the barn and the house until 06:06 when the bat disappeared from view, no other surveyors detected this bat and it is considered likely that the bat returned to the barn.	Yes – common pipistrelle

3.2.4 Bat Emergence/Return Survey Results – Trees

Table 8 Summary of Bat Emergence/Return Surveys of Trees

Tree Number	Date of Survey	Bat Activity Identified	Roost present
Tree 91	29/08/17 Sunset 19:50	Common pipistrelle bats were recorded between 20:19 and 20:51 foraging from west to east and back and occasionally observed entering the site from the A47 to the north and foraging within the field.	No

Tree Number	Date of Survey	Bat Activity Identified	Roost present
Tree 92	29/08/17 Sunset: 19:50	Between 20:11 to 21:21 common pipistrelle bats were observed and detected foraging every few minutes from east to west and back again.	No
Tree 51	29/08/17 Sunset: 19:50	Common pipistrelle bats were observed and detected between 20:12 and 21:22 foraging along Lingwood Lane from north to south. Two bats were observed passing the tree from the north which is the direction of residential properties at 20:12.	No
Tree 52	29/08/17 Sunset 19:50	Common pipistrelle bats were detected between 20:30 and 21:16 none of the bats were observed by the surveyor and are considered likely to have been the same bats as detected at T51 foraging along Lingwood Lane.	No
T90	29/08/17 Sunset: 19:50	Four common pipistrelle bats were detected foraging from east to west and back along the hedge line.	No
Tree 89	30/08/17 Sunrise 06:01	Two common pipistrelle bats were detected at 04:51 and 05:21.	No
T85	30/08/17 Sunrise: 06:01	Two common pipistrelle bats were detected at 05:12and 05:57.	No
T87	30/08/17 Sunrise: 06:01	No bats recorded.	No
T84	30/08/17 Sunrise: 06:01	No bats recorded.	No
T88	30/08/17 Sunrise: 06:01	Two brief common pipistrelle passes were detected at 04:53 and 04:55.	No
T40	02/09/17 Sunset: 18:56	Two common pipistrelle bats were detected by the surveyor at 19:16 and 19:48. No bats were seen emerging from the tree.	No
T57 & 58	07/09/17 Sunrise: 06:14	Three brief common pipistrelle passes were detected along Main Street at 04:50, 04:55 and 05:18 from east to west towards the residential properties.	No
T60	07/09/17 Sunrise: 06:14	Four common pipistrelle bat passes were recorded at 04:21, 05:12, 05:34 and 05:56.	No
T39	13/09/17 Sunset: 19:15	One soprano pipistrelle bats was detected in this location. This bat was not observed by the surveyor. light rain throughout the duration of the survey becoming heavier at 20:00.	No
T41	13/09/17 Sunset: 19:19	Eight common pipistrelle passes were recorded in this location between 19:44 and 20:01. The bats were observed flying along the hedge line and between T32 and the road.	No
T45	13/09/17 Sunset: 19:19	Common pipistrelle, noctule and a myotis were detected foraging and commuting in close proximity to this tree between 19:56 and 20:48.	No
T43 & 44	13/09/17 Sunset: 19:19	Common pipistrelle bats were detected in this location between 19:42 and 20:44. No bats were observed during the survey and it is therefore considered that they were foraging along	No

Tree Number	Date of Survey	Bat Activity Identified	Roost present
		surrounding features such as roads, hedgerows and buildings.	
Tree 1	14/09/17 Sunrise: 06:26	No bats detected	No
T5	14/09/17 Sunset: 19:16	At 19:51 a common pipistrelle was observed emerging from the tree. At 20:22 intermittent showers were present for the duration of the survey period. No other bats were observed or detected.	Yes – common pipistrelle
T3	14/09/17 Sunset: 19:16	Between 19:45 and 20:18 common pipistrelle, soprano pipistrelle and noctule bats were detected. No bats were observed emerging from the tree.	No
T75	14/09/17 Sunset: 19:45	Common and soprano pipistrelle bats were detected between 19:45 and 20:15. Flying from the road (A47 to the south) and from the farm (to the north).	No
T77 & 78	14/09/17 Sunrise: 06:26	No bats were recorded in this location.	No
T11	14/09/17 Sunrise: 06:26	No bats were seen or detected during this survey.	No
T53	15/09/17 Sunrise: 06:28	A soprano pipistrelle was observed and detected flying from the field towards T53 at 05:18. No other bats were observed or detected.	No
T50	15/09/17 Sunrise: 06:28	One myotis bat was detected at 05:29, this bat was not observed.	No
T67	21/09/17 Sunset: 19:56	Common and soprano pipistrelle bats were detected between 19:10 and 19:26. At 19:10 a common pipistrelle bat emerged from the tree and then foraged along the hedgerow in a north/south and east/west direction.	Yes – common pipistrelle
T80 & 81	22/09/17 Sunrise: 06:39	Noctule bats were recorded flying around these trees between 05:19 and 05:47 with a soprano pipistrelle bat detected at 05:54. No bats were recorded entering roost features within the trees	No

3.3 Transect surveys

3.3.1 Personnel

Elizabeth Sanders, Paul Moon, Ian Stephens, Imogen Mason-Brown, Adam Sela, Mark Kipling, Chris Rhodes, Brendan Noone and Neil Smith.

3.3.2 Transect Routes

Six transect routes were designed for the site, Transect 1 could not be completed as the landowner denied access. The summary of the weather conditions for each transect can be identified on Table 9 below and the summary of the transect routes location and habitats can be found within Table 10 below and the routes are detailed on Figures 4 and 5

3.3.3 Weather Conditions

Table 9 Summary of the Weather Conditions for the Walked Transect Surveys

Date / Survey	Transect	Survey Times		Sunset /rise	Temperature (°C)		Wind speed (Beaufort scale)	
		Start	End		Start	End	Start	End
27/07/2017	1.	20:54	22:24	20:54	14	13	1-2	1-2
14/08/2017	2.	20:39	22:09	20:39	19	18	2	2
21/09/2017	3.	18:54	20:24	18:54	18	15	2	1-2
17/10/2017	4.	17:52	19:22	17:52	13	11	0-1	0-1

Table 10 Summary of the Walked Transect Routes

Transect Route	Location	Features
2	Located to the eastern side of the new A47 route on the northern side of the existing A47.	The walked route comprises arable crop fields and pasture fields grazed by cows with hedgerow and tree boundaries.
3	Located to the eastern side of the new A47 route on the southern side of the existing A47.	The walked route comprises arable crop fields with hedgerow and tree boundaries.
4	Located to the eastern side of the new A47 route on the northern side of the existing A47.	The walked transect route comprises broadleaved woodland with arable crop fields, with standing water bodies and hedgerow and tree boundaries. Part of the route also is located between a plant nursery and a caravan and camping site with amenity grassland.
5	Located to the western side of the new A47 route on the northern side of the existing A47.	The walked transect route comprises an arable crop field with hedgerow boundaries and is mainly located along the Yarmouth road to the south of the A47. Along the road is residential houses with gardens, an allotment, commercial shops and lines of trees.
6	Located to the western side of the new A47 route on the southern side of the existing A47.	The walked route comprises arable crop fields with hedgerow and tree boundaries with one amenity grassland playing field with line of tree boundaries.

3.3.4 Walked Transect Survey Results

July

A thunderstorm with heavy rain and hail occurred at the very start of the survey and therefore the surveyors waited for the thunderstorm to pass before starting the survey. The thunderstorm lasted between 20:45 and 21:15, sunset was at 20:59 and all surveyors had commenced transect routes by 21:20, 20 minutes after sunset.

Table 11 Summary of July Walked Transect Survey

Transect Route	Date	Bat Activity
2	27/07/17	Common and soprano pipistrelle bats were detected during this survey. Activity was recorded to the west of the route in close proximity to the farm buildings to the north of the transect and along South Walsham Road and The Windle.
3	27/07/17	Common and soprano pipistrelle bats were recorded during this transect. The main activity was recorded along a hedgerow located to the south and east of the transect route (east of Water Low) and along Yarmouth Road, the most activity was recorded along Yarmouth Road between 22:21 and 23:00.
4	27/07/17	Common pipistrelle, soprano pipistrelle, *Myotis* and noctule bats were detected along this transect route. Foraging common pipistrelle bats were recorded flying from south to north along the hedgerow to the east of the transect route. Several individual bats were recorded foraging over the two ponds located to the north of the transect route. Several passes were recorded along the woodland edge habitats within the transect route.
5	27/07/17	Common pipistrelle and noctule bats were recorded. the most activity was recorded along Lingwood Lane.
6	27/07/17	Common and soprano pipistrelle bats were detected during the survey. Bats were recorded using the field edge to the north of the transect route along Bullacebush Lane. Up to five individuals were observed feeding below a tree along High Noon Lane.

August

Table 12 Summary of August Walked Transect Survey

Transect Route	Date	Bat Activity
2	14/08/17	Common pipistrelle bats were detected during this transect route. Only a small number of bats were recorded. two individual bats were recorded to the west of the transect route in close proximity to the woodland and the southern hedgerow. One individual was recorded to the north of the eastern section of the transect along the woodland edge.
3	14/08/17	Common and soprano pipistrelle and noctule bats were recorded along this transect route, all boundaries with the exception of the northern boundary along the A47 were considered to have good levels of foraging and commuting activity. No bats were recorded along the A47.
4	14/08/17	Common and soprano pipistrelle, noctule and a *Myotis* bat sp. were recorded during the transect. The highest level of activity was recorded to the east and north of the church in close proximity to the ponds.
5	14/08/17	Common and soprano pipistrelle bats and brown long-eared bats were recorded during this transect. The highest

Transect Route	Date	Bat Activity
		activity was recorded to the south of the eastern portion of the route and along Yarmouth Road.
6	14/08/17	Common and soprano pipistrelle bats and noctule bats were recorded throughout this transect route. The highest level of activity was recorded along High Noon Lane to the east of the transect route.

September

Table 13 Summary of September walked Transect Survey

Transect Route	Date	Bat Activity
2	21/09/17	Common pipistrelle bats were recorded during this transect with up to four individuals recorded in flight close to the barns to the north-west of the transect route. These bats were observed within 10 minutes of sunset and therefore it is possible that these bats are roosting within the barns present. Up to two individual common pipistrelle bats were observed foraging along the hedgerow to the west of South Walsham Road. No bats were recorded in the east of the site.
3	21/09/17	Pipistrelle bats were recorded during this survey with less activity noted than in previous surveys. the most activity was recorded along the southern boundary of the route.
4	21/09/17	Pipistrelle bats were the only bats recorded during this transect route. Previously bats were predominantly recorded in close proximity to the ponds to the north and east of the site. during this transect bats were predominantly recorded to the south and west of the route and along the woodland edge habitat.
5	21/09/17	Common pipistrelle bats were detected during the survey, predominantly along the southern boundary of the route with high levels of activity along Yarmouth Road.
6	21/09/17	Common and soprano pipistrelle bats were recorded during this survey. All boundaries recorded bats with the exception of the southern boundary (A47). The majority of the activity during this transect was along the northern boundary with Bullacebush Lane. A kestrel was observed to the west of this transect route.

October

Table 14 Summary of October Walked Transect Survey

Transect Route	Date	Bat Activity
2	17/10/17	Common pipistrelle bats were recorded to the west of South Walsham Road and to the north of the transect route by the farm buildings (20 minutes after sunset). More pipistrelle activity was recorded to the east of the site than

Transect Route	Date	Bat Activity
		previous surveys, with activity located along the southern transect boundary adjacent to the layby, between the two fields heading northward towards the woodland and along The Windle, an individual bat was also detected along the south of the route adjacent to the A47, north of Acle Hall Farm.
3	17/10/17	Very little bat activity was recorded during this survey with an individual soprano pipistrelle recorded on the south-eastern corner adjacent to the woodland strip and a further few passes to the east close to Lingwood Road
4	17/10/17	Activity again during this survey was pipistrelle and predominantly located along the southern transect route boundary. With one or two individual pipistrelle bats along the northern portion of the route by the ponds and the woodland edge habitat.
5	17/10/17	Common pipistrelle bats were detected during the survey with similar levels of activity to previous surveys, all activity was recorded along the southern transect boundary and along Yarmouth Road.
6	17/10/17	Much less bat activity identified along this route than previous. Pipistrelle bats were observed and detected close to Bullacebush Farm to the north and in the north-eastern corner. A barn owl was observed flying from north to south across the A47 close to the building to the west of High Noon Lane in the south of the transect route.

3.4 Static Bat Detector Surveys

3.4.1 Static Bat Detector Survey Results

The static bat detectors were placed out in July, the locations of the static detectors can be found on Figure 6. Table 15 below provides a summary of the location of each static detector. Tables 15 to 53 provides a summary of the number of bat passes per night per location per month.

Table 15 Anabat Locations

Static Location	Grid Reference	Habitat Description
L1	TG 3377 1010	Leylandii tree on edge of field
L2	TG 3449 0989	Under cherry tree adjacent to layby
L3	TG 3448 1018	By solitary oak on east side of road
L4	TG 3598 1011	Under oak on west of road opposite parking place
L5	TG 3593 0965	Under field maple behind fallen branch
L6	TG 3619 0992	In hazel tree on east of track
L7	TG 3650 1014	Under ivy clad holly tree in north-west of graveyard
L8	TG 3692 0988	By maple tree in north-east corner of field
L9	TG 3701 0998	Behind (north) of scots pine at a break in hedge

Static Location	Grid Reference	Habitat Description
L10	TG 3735 1021	At base of an oak tree by cherry/plum north of pig sty.

July

Location 1

Table 16July Static Data for Location 1

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other.
26/07/17	33	3	2	4	-
27/07/17	14	3	-	-	-
28/07/17	17	3	-	-	-
29/07/17	73	17	1	-	-
30/07/17	46	21	7	6	-
31/07/17	83	53	6	-	
Total	**266**	**100**	**16**	**10**	**-**

Location 2

Table 17July Data for Location 2

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
26/07/17	11	26	1	2	
27/07/17	-	-	-	-	-
28/07/17	-	-	-	-	-
29/07/17	4	5	3	-	-
30/07/17	7	15	8	1	-
31/07/17	18	5	4	-	-
Total	**40**	**51**	**16**	**3**	**-**

Location 3

Table 18 July Static Data for Location 3

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
26/07/17	-	-	-	-	-
27/07/17		-	-	-	-
28/07/17	1	-	-	-	-
29/07/17	10	12	1	-	-
30/07/17	4	6	2	-	-
31/07/17	14	4	-	-	-
Total	**29**	**22**	**3**	**-**	**-**

Location 4

Table 19 July Static Data for Location 4

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
26/07/17	6	1	6	-	-
27/07/17	-	-	-	-	-
28/07/17	4	-	2	-	-
29/07/17	2	-	-	-	-
30/07/17	3	-	1	-	-
31/07/17	5	-	4	-	-
Total	**20**	**1**	**13**	**-**	**-**

Location 5

Table 20July Static Data for Location 5

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
26/07/17	4	-	4	-	-
27/07/17	-	-	-	-	-
28/07/17	-	-	2	-	-
29/07/17	17	5	5	2	-
30/07/17	-	-	1	-	-
31/07/17	94	2	7	1	-
Total	**115**	**7**	**19**	**3**	**-**

Location 6

Table 21 July Static Data for Location 6

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
26/07/17	26	-	-	10	-
27/07/17	-	-	-	-	-
28/07/17	-	-	1	1	-
29/07/17	-	-	-	-	-
30/07/17	3	4	-	1	-
31/07/17	3	6	1	1	-
Total	**32**	**10**	**2**	**13**	**-**

Location 7

Table 22July Static Data for Location 7

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
26/07/17	4	3	9	49	-

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
27/07/17	6	12	-	-	-
28/07/17	1	9	-	39	-
29/07/17	2	12	7	12	-
30/07/17	5	14	4	10	-
31/07/17	5	35	7	21	1
Total	**23**	**85**	**27**	**131**	**1**

Location 8

Table 23July Static Data for Location 8

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
26/07/17	159	5	-	26	-
27/07/17	No data recorded				
28/07/17	229	2	-	-	-
29/07/17	275	4	-	9	-
30/07/17	292	5	-	15	-
31/07/17	177	-	-	8	-
Total	**1,132**	**16**	**0**	**58**	**0**

Location 9

Table 24 July Static Data for Location 9

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
26/07/17	20	0	0	12	0
27/07/17	3	0	0	0	0
28/07/17	0	0	0	1	0
29/07/17	0	0	0	0	0
30/07/17	6	2	0	18	0
31/07/17	2	3	0	38	0
Total	**31**	**5**	**0**	**69**	**0**

Location 10

Table 25July Static Data for Location 10

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
26/07/17	187	7	-	21	1
27/07/17	32	5	-	3	-
28/07/17	148	6	-	161	2
29/07/17	89	9	-	22	-
30/07/17	137	17	-	19	-

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
31/07/17	123	14	-	10	-
Total	**716**	**58**	**-**	**236**	**3**

August

Location 1

Table 26 August Static Data for Location 1

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
01/08/17	101	44	-	3	-
02/08/17	39	2	3	1	-
03/08/17	20	14	10	-	-
04/08/17	13	13	7	-	-
05/08/17	27	2	-	1	-
Total	**200**	**75**	**20**	**5**	**-**

Location 2

Table 27 August Static Data for Location 2

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
01/08/17	24	7	6	-	-
02/08/17	-	17	1	-	-
03/08/17	23	22	6	-	-
04/08/17	19	9	8	-	-
05/08/17	4	2	1	-	-
Total	**70**	**57**	**22**	**-**	**-**

Location 3

No data available

Location 4

Table 28 August Static Data for Location 4

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
01/08/17	43	12	3	-	-
02/08/17	-	-	4	-	-
03/08/17	1	5	-	-	-
04/08/17	102	9	5	-	-
05/08/17	65	7	3	-	-
Total	**211**	**33**	**15**	**-**	**-**

Location 5

Table 29 August Static Data for Location 5

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
01/08/17	85	4	7	-	-
02/08/17	-	-	-	-	-
03/08/17	1	1	1	-	-
04/08/17	115	5	17	1	-
05/08/17	4	1	2	-	-
Total	**205**	**11**	**27**	**1**	**-**

Location 6

Table 30August Static Data for Location 6

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
01/08/17	7	9	-	-	-
02/08/17	-	-	-	-	-
03/08/17	1	-	-	-	-
04/08/17	9	4	-	-	-
05/08/17	17	37	-	1	-
Total	**44**	**50**	**0**	**1**	**-**

Location 7

Table 31 August Static Data for Location 7

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
01/08/17	2	8	6	12	1
02/08/17	2	8	1	2	-
03/08/17	1	5	1	9	-
04/08/17	8	11	-	14	1
05/08/17	6	5	9	1	-
Total	**19**	**37**	**17**	**38**	**2**

Location 8

Table 32 August Static Data for Location 8

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
23/08/17	327	20	4	23	-
24/08/17	67	28	1	22	1
25/08/17	41	29	3	61	-
26/08/17	50	23	7	29	2

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
27/08/17	23	17	-	34	-
Total	**508**	**117**	**15**	**203**	**3**

Location 9

Table 33 August Static Data for Location 9

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
23/08/17	4	-	2	4	-
24/08/17	5	2	-	3	-
25/08/17	8	6	4	3	-
26/08/17	11	5	2	-	-
27/08/17	6	1	-	-	-
Total	**34**	**14**	**8**	**10**	**-**

Location 10

Table 34 August Static Data for Location 10

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
23/08/17	47	44	3	6	2
24/08/17	6	26	2	1	-
25/08/17	56	64	-	12	4
26/08/17	26	37	2	5	2
27/08/17	-	-	-	-	-
28/08/17	796	47	8	32	1
Total	**931**	**218**	**15**	**56**	**9**

September

Location 1

Table 35 September Static Data for Location 1

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
07/09/17	60	4	-	2	-
08/09/17	1	-	-	-	-
09/09/17	Battery failures, no further recordings				
10/09/17					
11/09/17					
Total	**61**	**4**	**-**	**2**	**-**

Location 2

Table 36 September Static Data for Location 2

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
07/09/17	4	5	-	-	-
08/09/17	Battery failures				
09/09/17					
10/09/17					
11/09/17					
Total	**4**	**5**		**-**	**-**

Location 3

Table 37 September Static Data for Location 3

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
07/09/17	Battery failure and no data recorded for the short duration the detector operated.				
08/09/17					
09/09/17					
10/09/17					
11/09/17					
Total	**-**	**-**	**-**	**-**	**-**

Location 4

No data

Location 5

Table 38 September Static Data for Location 5

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
07/09/17	-	3	-	-	-
08/09/17	No further recordings battery failures				
09/09/17					
10/09/17					
11/09/17					
Total	**-**	**3**	**-**	**-**	**-**

Location 6

Three common pipistrelle passes. Anabat destroyed when hedge flailed.

Location 7

Table 39 September Static Data for Location 7

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
26/07/17	33	3	2	4	-
27/07/17	14	3	-	-	-
28/07/17	17	3	-	-	-
29/07/17	73	17	1	-	-
30/07/17	46	21	7	6	-
31/07/17	83	53	6	-	
Total	**266**	**100**	**16**	**10**	**-**

Location 8

Table 40 September Static Data for Location 8

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
01/09/17	34	19	2	59	-
02/09/17	10	6	-	7	-
03/09/17	26	19	3	43	-
04/09/17	26	15	2	74	-
05/09/17	29	22	4	51	1
Total	**125**	**81**	**11**	**234**	**1**

Location 9

Table 41 September Static Data for Location 9

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
01/09/17	5	3	2	1	-
02/09/17	4	4	2	-	-
03/09/17	3	1	2	3	-
04/09/17	3	-	-	6	-
05/09/17	6	1	-	3	-
Total	**21**	**9**	**6**	**13**	**-**

Location 10

Table 42 September Static Data for Location 10

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
01/09/17	16	15	1	8	-
02/09/17	31	23	4	8	-
03/09/17	165	60	6	20	-

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
04/09/17	1,035	69	8	14	2
05/09/17	490	43	4	5	-
Total	**1,737**	**210**	**23**	**55**	**2**

October

Location 1

Table 431 October Static Data for Location 1

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
04/10/17	2	3	-	-	1
05/10/17	1	11	-	-	-
Total	**3**	**14**	**0**	**0**	**1**

Location 2

Table 44 October Static Data for Location 2

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
02.10.17	4	1	0	0	0
03.10.17	5	6	0	1	0
04.10.17	0	45	0	0	1
05.10.17	82	97	0	0	3
06.10.17	7	2	0	1	3
Total	**98**	**151**	**0**	**2**	**7**

Location 3

Table 45 October Static Data for Location 3

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
09/10/17	-	63	-	1	4
10/10/17	-	7	-	-	-
11/10/17	-	1	-	-	-
12/10/17	-	3	-	1	-
13/10/17	1	-	-	-	-
Total	**1**	**74**	**0**	**2**	**4**

Location 4

Table 46 October Static Data for Location 4

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
01/10/17	No Recordings				
02/10/17	4	0	-	-	-
03/10/17	5	6	-	1	-
09/10/17	11	5	-	-	-
10/10/17	1	-	-	-	-
Total	**21**	**11**	**0**	**1**	**0**

Location 5

Table 47 October Static Data for Location 5

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
04/10/17	2	10	-	3	-
05/10/17	1	3	-	-	-
Total	**3**	**13**	**0**	**3**	**0**

Location 6

Table 48 October Static Data for Location 6

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
01/10/17	-	9	-	-	-
02/10/17	-	5	-	-	-
03/10/17	-	20	-	-	1
Total	**0**	**32**	**0**	**0**	**1**

Location 7

Table 49October Static Data for Location 7

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
09/10/17	1	3	0	42	6
10/10/17	0	7	0	13	
11/10/17	1	17	0	22	10
12/10/17	0	1	0	8	0
13/10/17	4	0	0	20	13
Total	**6**	**28**	**0**	**105**	**29**

Location 8

Table 50 October Static Data for Location 8

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
01/10/17	1	-	-	-	-
02/10/17	-	-	-	-	-
03/10/17	1	1	-	-	-
09/10/17	61	17	-	44	-
10/10/17	-	-	-	-	-
11/10/17	5	2	-	-	-
12/10/17	79	4	-	-	-
13/10/17	125	9	-	-	-
Total	**272**	**33**	**0**	**44**	**0**

Location 9

Table 51 October Static Data for Location 9

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
04/10/17	Recording Files Corrupted				
05/10/17					
06/10/17					

Location 10

Table 52 October Static Data for Location 10

Date	Common pipistrelle	Soprano pipistrelle	Brown long-eared	Noctule	Other
01/10/17	1,603	21	-	5	-
02/10/17	42	23	-	1	1
03/10/17	17	11	-	-	4
10/10/17	328	10	-	1	2
11/10/17	50	24	-	1	-
12/10/17	43	26	-	5	1
13/10/17	171	7	-	-	2
Total	**2,254**	**122**	**0**	**13**	**10**

Table 53 Summary of Bat Passes per Month for Each Location

Location	July	August	September	October
1	392	300	67	17
2	110	149	9	258
3	54	0	0	81
4	34	259	0	33

5	144	244	3	19
6	57	95	3	33
7	267	113	392	168
8	0	846	452	349
9	105	66	49	0
10	0	1229	2027	2399
Total	**1163**	**3301**	**3002**	**3357**

4.0 Relevant Planning Policy & Legislation

4.1 National Planning Policy Framework

The NPPF was adopted in March 2012. Section 11 of the NPPF, *Conserving and Enhancing the Natural Environment* replaces *Planning Policy Statement 9 (PPS9): Biodiversity and Geological Conservation*. However, government Circular *06/2005, Biodiversity and Geological Conservation: Statutory Obligations and their Impact within the Planning System*, which relates to PPS9 remains valid and is referenced within Paragraph 113 of the NPPF.

Circular 06/2005 states that the presence of protected species is a material consideration in the planning process. The NPPF also states that '*planning policies should promote the protection of priority species populations linked to national and local targets*'.

Furthermore, central and local government policy now points towards ecological enhancement on development sites. The NPPF considers enhancement in the statement '*The planning system should contribute to and enhance the natural and local environment by protecting and enhancing valued landscapes….and minimising impacts on biodiversity and providing net gains in biodiversity*'.

4.2 Biodiversity 2020: A strategy for England's wildlife & ecosystem services

Biodiversity 2020 replaces the previous UK Biodiversity Action Plan and sets national targets to be achieved. The intent of Biodiversity 2020, however, is much broader than the protection and enhancement of less common species, and is meant to embrace the wider countryside as a whole.

The priority species and habitats considered under Biodiversity 2020 are the SPI & HPI detailed under NERC Act (see Appendix A for further details).

4.3 The Greater Norwich Development Partnership

The Greater Norwich Development Partnership (2014) – Environmental Adoption Statement has the following environmental objectives as part of the local plan:

- To reduce the effect of traffic on the environment (ENV 1).
- To improve the quality of the water environment.
- To maintain and enhance biodiversity and geodiversity (ENV 4).
- To maintain and enhance the quality of landscapes, townscapes and the historic environment (ENV 5).

4.4 Legislation

All British bat species are given special protection within England by their inclusion on Schedule 2 of the Conservation of Habitats and Species Regulations 2010 (as amended) and Schedule 5 of the Wildlife and Countryside Act 1981 (as amended).

As a result, it is an offence to:

- Deliberately capture, injure or kill a bat;
- Intentionally or recklessly disturb a bat in its roost or deliberately disturb a group of bats;
- Damage or destroy a bat's roosting place (even if bats are not occupying a roost at the time);
- Possess or advertise, sell or exchange a bat (dead or alive) or any part of a bat; and
- Intentionally or recklessly obstruct access to a bat roost

With specific reference to the offence of disturbance, Regulation 41(1) of the Conservation of Habitats and Species Regulations 2010 (as amended) states that a person commits an offence if they:

"*...deliberately disturb wild animals of any such species [i.e. a European Protected Species] in such a way as to be likely significantly to affect*:

(i) the ability of any significant group of animals of that species to survive, breed, or rear or nurture their young; or

(ii) the local distribution or abundance of that species".

Where development will result in damage to, or obstruct access to, any bat roost (whether occupied or not) or risks harming or significantly disturbing bats, a European Protected Species Licence (EPSL) is required from Natural England to allow the development to proceed.

Bats are also afforded more general protection in England (and Wales) within the Natural Environment and Rural Communities Act (NERC) 2006. This imposes a duty on all public bodies, including local authorities and statutory bodies, in exercising their functions, "*to have due regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity*" [Section 40 (1)]. It notes that "*conserving biodiversity includes restoring or enhancing a population or habitat*" [Section 40 (3)]. Consequently, attention should be given to dealing with the modification or development of an area if aspects of it are deemed important to bats, such as roosts, flight corridors and foraging areas.

Section 41 (S41) of this Act requires the Secretary of State to publish a list (in consultation with Natural England) of habitats and species which are of principal importance for the conservation of biodiversity in England. The S41 list is used to guide decision-makers such as public bodies including local and regional authorities, when carrying out their normal (e.g. planning) functions. The S41 list includes 65 habitats of principal importance and 1,150 species of principal importance.

Seven species of bats soprano pipistrelle, brown long-eared bat, greater horseshoe bat, lesser horseshoe bat, barbastelle, Bechstein's bat and noctule are listed under Section 41 of the NERC Act 2006. The Norfolk Biodiversity Partnership lists Species Action Plans for barbastelle, brown long-eared bat, noctule and soprano pipistrelle.

5.0 Discussion

5.1 Potential Impacts

Roosting Bats

Buildings

Bat roosts were identified in the following buildings during the surveys undertaken by WYG in 2017:

- The White House
- Poplar Farm
- St Andrews Church
- The Lindens
- Oaklands

Trees

Bat roosts were identified in the following trees during the WYG 2017 surveys:

- T5
- T67

The works to dual the existing carriageway are unlikely to directly impact any of the buildings identified as containing bat roosts due to their distance, however indirect impacts through lighting, removal of vegetation and increase in traffic could impact those roosts identified.

Trees T5 and T67 fall within the 50m buffer for the road scheme and therefore could be removed as a result of the works. If these trees are to be removed a licence from Natural England will be required.

Foraging and Commuting Bats

The walked transect surveys undertaken have identified a large number of common bat species utilising the surrounding land for foraging and commuting. The land immediately adjacent/parallel to the A47 were the least utilised features by bats on all transect routes. Bats favoured the hedgerows away from the A47 for foraging and commuting, and were identified close to the A47 only where they were likely to pass over the A47, where hedgerows were present perpendicular to the A47 providing some connectivity to additional foraging habitats.

The results of the static surveys identified Location 10 as the location with the highest number of bat passes in August, September and October, with October having the highest number of bat passes recorded including 2,254 common pipistrelle passes.

Common pipistrelle bats were the most frequently recorded bats across the site and at all locations. Location 8, on the corner of Lingwood Lane and the A47 had the highest number of noctule passes recorded in August, 203 and September, 234 with far lower noctule passes recorded at all other locations.

The widening of the A47 may result in severing foraging and commuting routes which are currently being utilised, bats were recorded foraging/commuting along the hedgerows which are perpendicular

to the existing A47 and are likely to have crossed over the A47 to additional habitats. The loss of large sections of hedgerow perpendicular to the A47 could fragment/isolate foraging and commuting habitats.

5.2 Mitigation

5.2.1 Roosting bats

A licence from Natural England will be required prior to any trees being removed which contain bat roosts, T5 and T67 were identified as containing pipistrelle day roosts during the 2017 nocturnal emergence/return surveys.

Whilst several buildings within the site have been confirmed as containing bat roosts during the 2017 emergence/return surveys, additional survey work is required to fully assess the impacts of the realignment of the A47 to these bat roosts, it may be necessary to apply for a EPS licence from Natural England if disturbance to these roosts is to occur or if foraging and commuting routes will be severed and therefore the roost indirectly impacted.

A brief external assessment of buildings NB01-NB011 was undertaken during 2017, these buildings were not subject to emergence/return surveys due to them being predominantly classed as having low suitability. A more detailed assessment of these buildings should be undertaken in 2018 with internal access provided where possible to fully assess the potential impacts of the realignment of the road and any bat roosts which may be present. Nocturnal emergence/return surveys should also be undertaken between May and August, the number of which is to be determined following a detailed daytime assessment of the buildings.

To obtain an EPS licence from NE further surveys will be required to inform on the usage of the trees for roosting and the numbers and species of bats identified.

An EPS licence application will need to include an appropriate mitigation strategy for both species and for all buildings or trees to be impacted by the works to include avoidance and compensatory measures, a detailed programme and methods of working, and an outline of the post-works monitoring.

Mitigation for roosting bats will need to be provided which will be detailed in the Method Statement for the bat licence application should one be required.

NE typically take up to 30 working days to provide a decision on the licence application. However NE have been known to extend this time frame depending upon the level of demand for licences.

5.2.2 Foraging and Commuting Bats

Lighting Strategy

A wildlife sensitive lighting scheme should be designed in consultation with a suitably experienced ecologist to make sure that important commuting routes and foraging areas remain undisturbed during the construction and operational phases of the development. Where lighting is necessary, the following measures should be considered to reduce adverse effects:

- Consideration of hood design, lamp height, and angle, to reduce light spill particularly avoiding illuminating retained foraging and commuting habitat on the site such as mature trees, tree lines, and hedgerows;
- Use of less ultra violet (UV) light emitting bulbs, such as metal halide or high pressure sodium; and
- Minimising hours of lighting to those absolutely necessary for security and safety purposes, where possible lighting should avoid key periods of bat activity (i.e. sunset and sunrise). Consider how new technologies can be used to control lighting levels (e.g. dimming lights at certain times)

Further technical details are given in the BCT and the institute of Lighting Engineers' *Bats and lighting in the UK* (2009) (refer to Appendix C) and *Artificial lighting and Wildlife: Interim Guidance: Recommendations to help minimise the impact of artificial lighting* (BCT, 2014). Both publications are available at http://www.bats.org.uk/pages/bats_and_lighting.html.

Connectivity measures

Woodland strips and hedgerows on the site boundaries should be retained within the development masterplan where possible. Where points of severance (e.g. for access roads) occur, it is recommended that fast growing semi-mature trees are planted and encouraged to create a 'canopy bridge' over the gap, where possible. Limpens *et al.* (2005) advocate creating a 'hop over', by managing existing or planting new trees where the road is narrow enough for the crowns to almost touch one another, as shown in Illustration 1 below. Ideally, to prevent bats crossing the road at relatively low heights, the sides of the road at crossing locations should be protected by dense thickets, forcing bats to fly higher over the road.

Illustration 1 Example of a hop-over which creates a flight path at a safe height above the road taken from Limpens et al. (2005)

Lighting should be avoided in these areas, or if lighting is required, this will be designed in a way to minimise light spill and avoid disturbance to foraging and commuting bats.

5.3 Enhancement

Landscaping design

The landscaping should be designed to provide shelter, foraging opportunities and connected dark corridors within and through the site. It is recommended that a suitably qualified ecologist is consulted during the design of the landscaping scheme to advise on the creation and enhancement of habitats for bats (and other wildlife). A list of plant species which could be used to enhance the site for foraging bats is included in Appendix A.

6.0 Summary

6.1 Roosting Bats

Bat roosts have been identified within buildings and trees within the 50m buffer of the road. Any bat roosts which have been identified and are to be destroyed, modified or disturbed (including the severing or foraging and commuting routes) as a result of the road works will require a licence from Natural England.

Two additional surveys are required for buildings and trees classified as having high suitability to support roosting bats.

One additional survey is required for building and trees classified as moderate suitability to support roosting bats.

Additional buildings NB01 to NB11 were assessed following an update to the proposed road layout option, these buildings were assessed from land where access had been granted and external surveys were undertaken. A full assessment of these buildings including detailed external and internal assessments should be undertaken to fully determine the impacts of the road scheme to any bat roosts which may be present.

6.2 Foraging Bats

Vegetation clearance to facilitate the construction of the road could result in severing and fragmenting foraging and commuting features. Soft landscaping should seek to enhance the development to allow bats to continue to use features identified and cross the A47 to additional foraging and commuting habitats.

The lighting of the A47 should be sensitive to bats and should therefore be of low levels and directed away from foraging/commuting features present.

Transect surveys should be completed in April, May and June 2018 to provide a full years worth of data and to understand how bats are utilising the site for foraging and commuting between roost locations.

6.3 Other (Owls)

Barn owls were recorded within the site during surveys and were recorded flying across the A47, Tawny owls were also recorded during the bat surveys within the site. Barn owl and tawny owl must therefore be considered within the designs of the road scheme and mitigation provided where appropriate.

7.0 References

- Bat Conservation Trust (2014) Artificial Lighting and Wildlife, Interim Guidance : Recommendations to help minimise the impact artificial lighting. http://www.bats.org.uk/pages/bats_and_lighting.html.
- Bat Conservation Trust (2009) Bats and Lighting in the UK, Bats and the Built Environment Series. V3. https://www.theilp.org.uk/documents/bats-and-lighting-in-the-uk/.
- Collins, J. (ed.) (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd ed.). The Bat Conservation Trust, London.
- Communities and Local Government (2012) National Planning Policy Framework.
- Limpens, H.J.G.A., Twisk, P. & Veenbaas, G. (2005). Bats and Road Construction. Dienst Weg – en Waterbouwkunde, Delft.

FIGURES

Figure 1 – Site Location and Access Plan

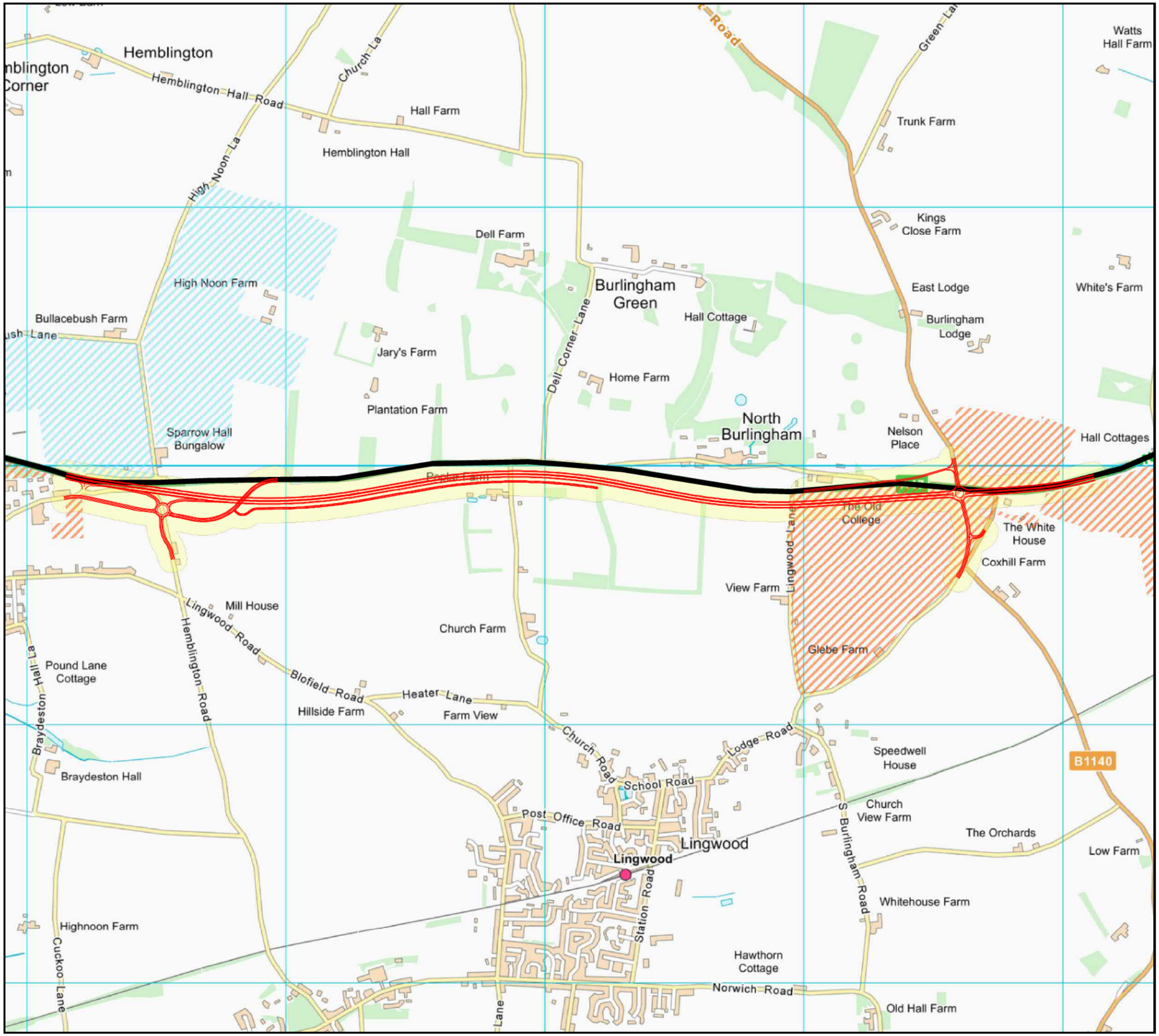
Figure 2 – Building Location Plan and Survey Results

Figure 3 – Tree Location Plan and Survey Results

Figure 4 – Transect Routes and Survey Results

Figure 5 – Transect Routes and Survey Results

Figure 6 – Static Detector Location



Rev	Date	Notes
A	07/11/17	Initial map production

Legend

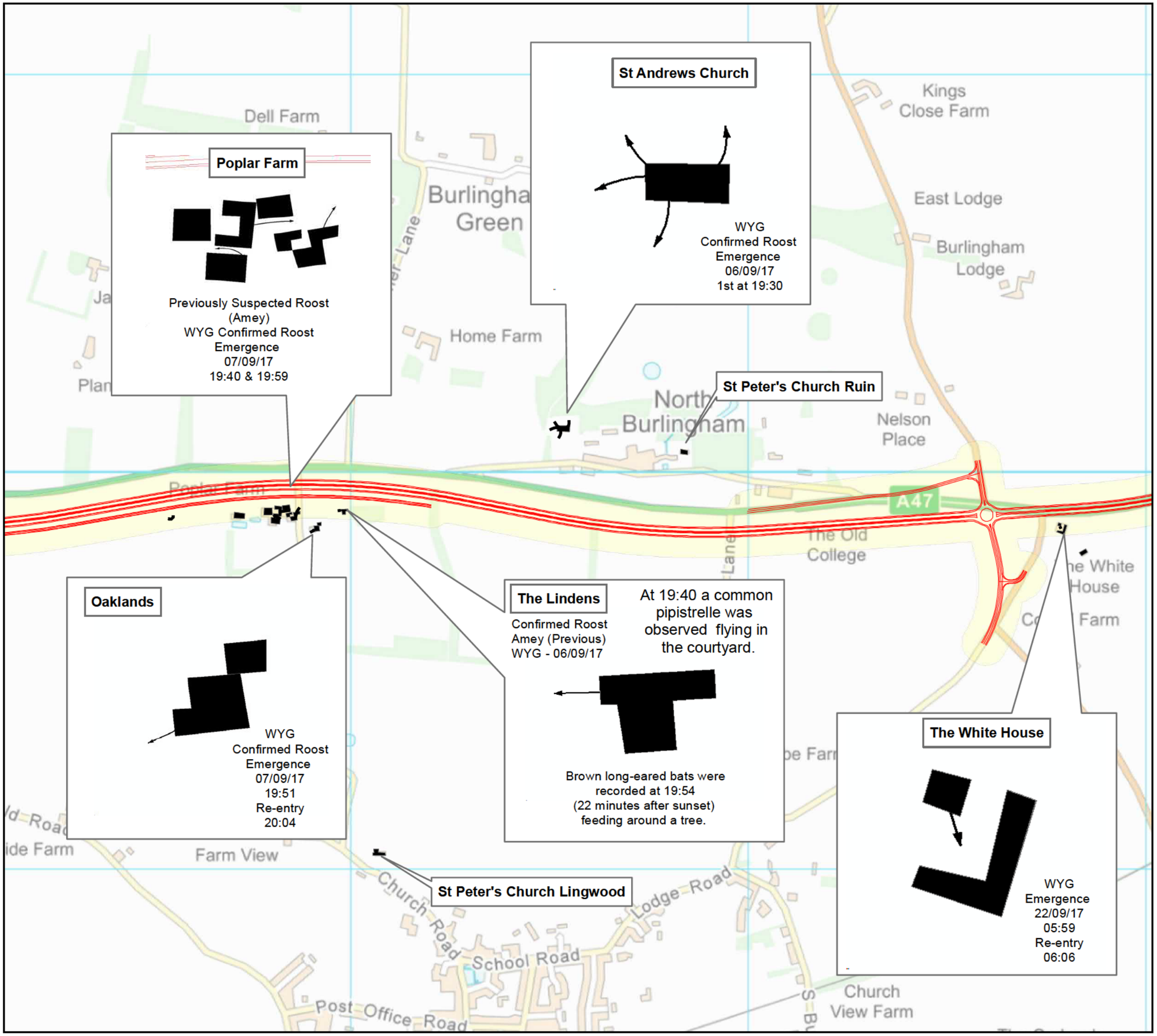
- New A47 Proposed Route
- Exisitng A47 Layout
- A47 Proposed Route 50 m Buffer
- Access Granted After July Survey
- No Access

0 125 250 500 750 Metres

Site Location and Access Plan

A47 Blofield
Amey

Scale at A3:	Project No:	Drawing No:	Revision:
1:14,000	A090648-4-1	Figure 1	A
Drawn by:	**Drawn date:**	**Approved by:**	
Amy Dowers	21/11/2017	Elizabeth Sanders	



Rev	Date	Notes
A	07/11/17	Initial map production
B	24/11/17	Minor amendments

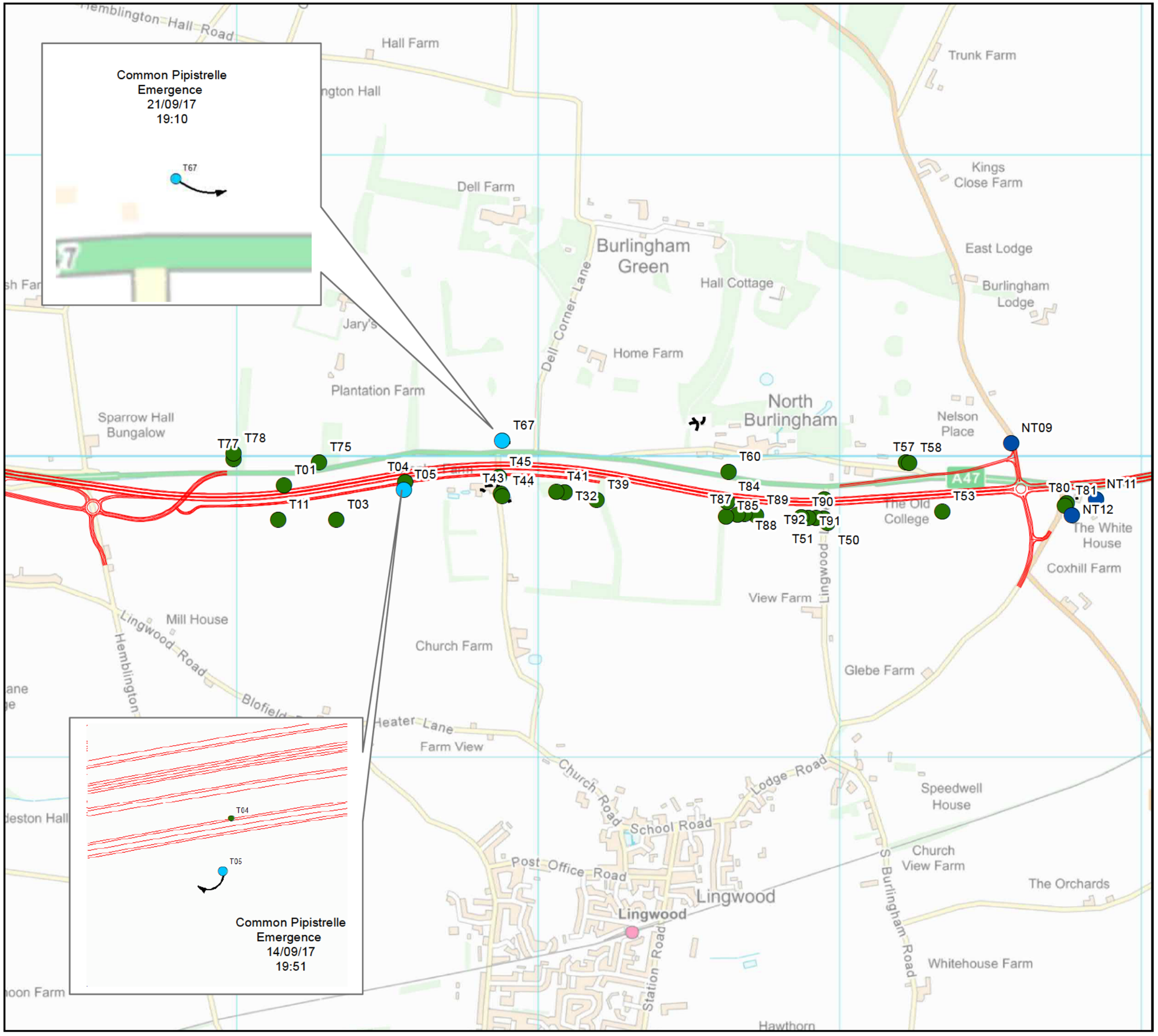
Legend

- New A47 Proposed Route
- Bat Emergence / Re-entry
- A47 Proposed Route 50 m Buffer
- Buildings

Building Location Plan and Bat Survey Results

A47 Blofield
Amey

Scale at A3:	Project No:	Drawing No:	Revision:
1:9,108	A090648-4-1	Figure 2	B
Drawn by:	**Drawn date:**	**Approved by:**	
Amy Dowers	24/11/2017	Elizabeth Sanders	



Rev	Date	Notes
A	07/11/17	Initial map production

Legend

- New A47 Proposed Route
- Bat Emergence / Re-entry
- Confirmed Roost
- Tree Assessed as Low BRP
- Tree Surveyed

0 100 200 400 600 800 Metres

N

Tree Location and Survey Results Plan

A47 Blofield
Amey

Scale at A3:	Project No:	Drawing No:	Revision:
1:12,000	A090648-4-1	Figure 3	A
Drawn by:	**Drawn date:**	**Approved by:**	
Amy Dowers	21/11/2017	Elizabeth Sanders	

Rev	Date	Notes
A	07/11/17	Initial map production

Legend

New A47 Proposed Route

Bat Activity

Transect Routes

5

6

0 50 100 200 300 400 Metres

Transect Routes and Survey Results Plan (West)

A47 Blofield
Amey

Scale at A3:	Project No:	Drawing No:	Revision:
1:7,000	A090648-4-1	Figure 4	A

Drawn by:	Drawn date:	Approved by:
Amy Dowers	08/11/2017	Elizabeth Sanders

Rev	Date	Notes
A	07/11/17	Initial map production

Legend

New A47 Proposed Route

Bat Activity

Transect Routes

2

3

4

Eastern Section of Transect 2

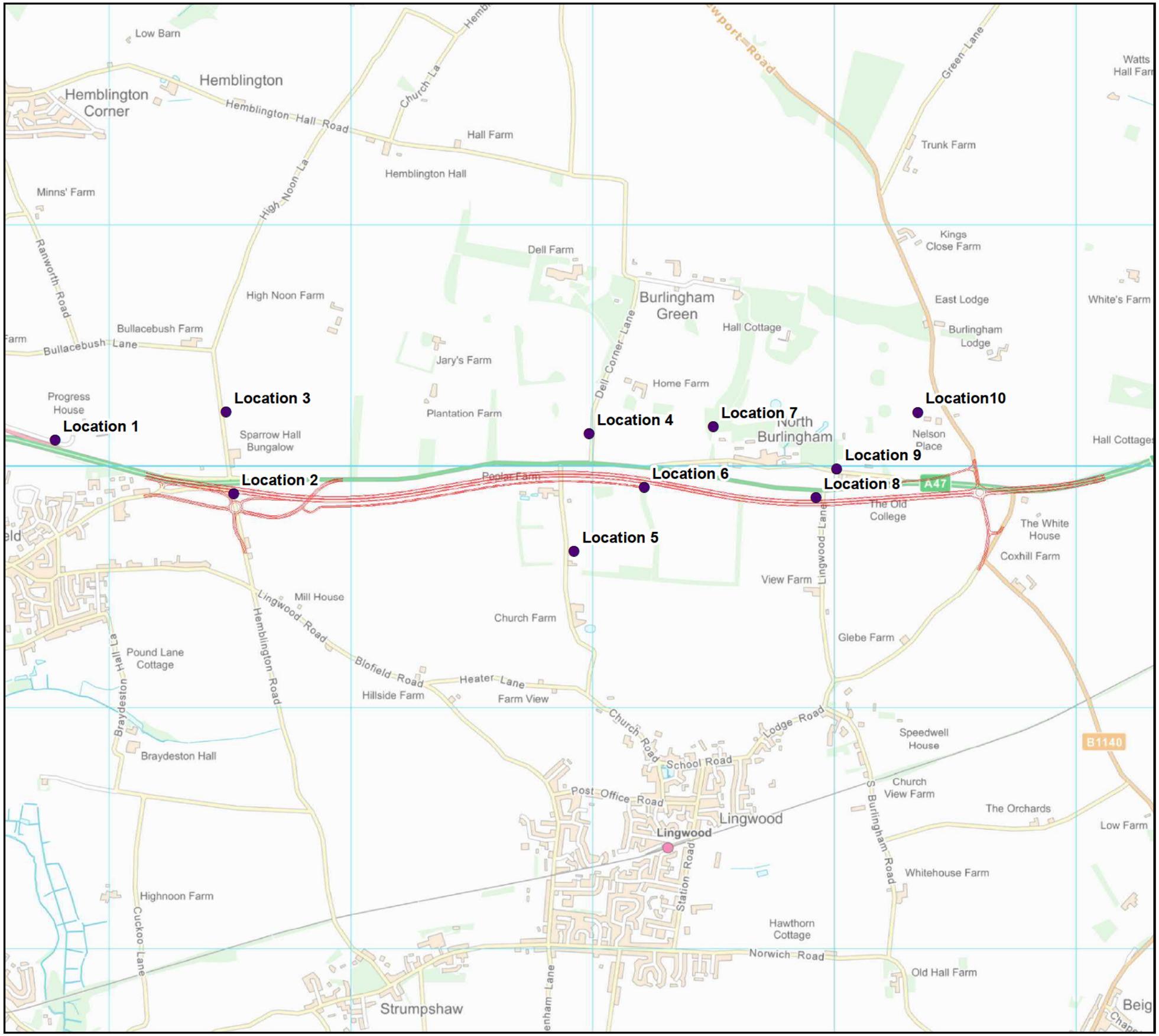
0 50 100 200 300 400 Metres

Transect Routes and Survey Results Plan (East)

A47 Blofield Amey

Scale at A3:	Project No:	Drawing No:	Revision:
1:7,000	A090648-4-1	Figure 5	A

Drawn by:	Drawn date:	Approved by:
Amy Dowers	08/11/2017	Elizabeth Sanders



Rev	Date	Notes
A	07/11/17	Initial map production

Legend

- New A47 Proposed Route
- Static Detector Locations

0 100 200 400 600 Metres

Static Detector Location Plan

A47 Blofield
Amey

Scale at A3:	Project No:	Drawing No:	Revision:
1:15,000	A090648-4-1	Figure 6	A

Drawn by:	Drawn date:	Approved by:
Amy Dowers	08/11/2017	Elizabeth Sanders

Appendix A – Wildlife Attracting Plant Species

Table A1: Trees, shrubs and climbers

Common name	Scientific name
Bramble	*Rubus fruticosus*
Buddleia	*Buddleja sp.*
Common alder	*Alnus glutinosa*
Dog rose	*Rosa canina*
Elder	*Sambucus sp.*
English oak	*Quercus robar*
Gorse	*Ulex sp.*
Guelder rose	*Viburnum opulus*
Hawthorn	*Crataegus sp.*
Hazel	*Corylus sp.*
Honeysuckle	*Lonicera periclymenum*
Hornbeam	*Carpinus sp.*
Ivy	*Hedera sp.*
Jasmine	*Jasminum sp.*
Rowan	*Sorbus sp.*
Silver birch	*Betula pendula*

Table A2: Flowers for borders

Common name	Scientific name
Aubretia*	*Aubrieta sp.*
Candytuft*	*Iberis sp.*
Cherry pie*	*Heliotropium arborescens*
Corncockle	*Agrostemma githago*
Cornflower	*Centaurea cyanus*
Corn marigold	*Glebionis segetum*
Corn poppy	*Papaver rhoeas*
Echinacea*	*Echinacea sp.*
English Bluebell	*Hyacinthoides non-scripta*
Evening primrose*	*Oenothera sp.*
Field poppies	*Papaver rhoeas*
Honesty*	*Lunaria annua*
Ice plant 'Pink lady'*	*sedum spectabile*
Knapweed	*Centaurea sp.*
Mallow	*Malva sp.*
Mexican aster*	*Cosmos bipinnatus*
Michaelmas daisy*	*Aster novi-belgii*
Night-scented stock*	*Matthiola longipetala*
Ox-eye daisy	*Leucanthemum vulgare*
Phacelia*	*Phacelia tanacetifolia*
Poached egg plant*	*Limnanthes douglasii*
Primrose	*Primula vulgaris*
Red campion	*Silene dioica*
Red valerian*	*Centranthus ruber*
Scabious	*Scabiosa sp.*
St John's wort	*Hypericum perforatum*
Sweet William*	*Dianthus barbatus*

Tobacco plant*	*Nicotiana*
Verbena*	*Verbena sp.*
Wallflowers*	*Erysimum sp.*
Wood forget-me-not	*Myosotis sylvatica*
Yarrow	*Achillea millefolium*

Plants marked * are hybrids or exotics

Table A3: Herbs

Common name	Scientific name
Angelica	*Angelica sp.*
Bergamot	*Monarda sp.*
Borage	*Borago officinalis*
Coriander	*Caroiandrum sp.*
English marigolds	*Calendula officinalis*
Fennel	*Foenicululm sp.*
Feverfew	*Tanacetum parthenium*
Hyssop	*Hyssopus officinalis*
Lavenders	*Lavandula*
Lemon balm	*Melissa officinalis*
Marjoram	*Origanum majorana*
Rosemary	*Rosmarinus officinalis*
Sweet cicely	*Myrrhis odorata*
Thyme	*Thymus vulgaris*

Table A4: Wildflowers for pond edges and marshy areas

Common name	Scientific name
Bog bean	*Menyanthes sp.*
Bugle	*Ajuga sp.*
Creeping Jenny	*Lysimachia nummularia*
Flag iris	*Iris pseudacorus*
Hemp agrimony	*Eupatorium cannabinum*
Lady's smock	*Cardamine pratensis*
Marsh mallow	*Althaea officinalis*
Marsh marigold	*Caltha palustris*
Marsh woundwort	*Stachys palustris*
Meadowsweet	*Filipendula ulmaria*
Purple loosestrife	*Lythrum salicaria*
Water avens	*Geum rivale*
Water forget-me-not	*Myosotis scorpioides*
Water mint	*Mentha citrata*

(Source: *'Encouraging bats – Gardening for bats'*, Bat Conservation Trust, 2015)