Appendix 8.3: Technical Report: Bat Survey

M11 Junction 7a

Essex County Council

Technical Report – Bat Survey

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Jacobs U.K. Limited

1180 Eskdale Road
Winnersh, Wokingham
Reading RG41 5TU
United Kingdom
T +44 (0)118 946 7000
F +44 (0)118 946 7001
www.jacobs.com

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1. Methods

1.1 Study Area

The Scheme has evolved between 2013 and 2016, with multiple options being considered and surveys undertaken in stages. To aid explanations, the Scheme is described as two separate sections: 'the Link Area', referring to the area between Sheering Road and the M11 subject to proposals for the new junctions and slip road; and, 'Gilden Way', referring to the section of Gilden Way subject to widening proposals.

In 2014, a study area was drawn up for the Link Area that covered a sufficiently large area to accommodate all route options under consideration at that time. A buffer of 100m around the combined construction footprint was used to produce the Study Area in relation to bats. As the Scheme evolved during 2015, the route became fixed and consequently the study area (based on the 100m buffer) contracted.

In 2016, further detail emerged relating to the widening of Gilden Way and the layout of the on and off slip roads for the proposed Junction 11a. This triggered the need for the expansion of the survey area to incorporate the Gilden Way, and for targeted update assessments of habitats directly affected by the proposals within the Link Area.

The 2014, 2015 and 2016 study areas are shown in Plan 1.

1.2 Desk Study

A desk study was undertaken in September 2013 to collate baseline ecological data from the scheme and surrounding areas. A request for all bat records within a 2 km radius of the scheme was submitted to Essex Ecology Services Limited (EECOS) (on behalf of the Essex Wildlife Trust) and The Essex Field Club. In addition, the Multi-Agency Geographical Information for the Countryside (MAGIC) website was searched for Natura 2000 sites within a 30km radius and Sites of Special Scientific Interest (SSSI) within 2km, that are designated for bat interest.

An update data request was sent to EECOS and The Essex Field Club in 2015 to cover the Gilden Way widening element. Records from within 2km of the scheme were requested.

In addition, the Environmental Statements for two large adjacent development schemes (New Hall Farm (Roger Evans Associates, 2004) and Harlowbury (LDA Design, 2011), were reviewed for relevant data.

1.3 Field Study

1.3.1 2014 Surveys of the Link Area

1.3.1.1 Inspection of Potential Roosts

Buildings

Buildings within 100m of the 2014 proposed route options were identified via aerial photography and Ordnance Survey (OS) maps and, where access permitted, were subject to an external visual inspection to inform an evaluation of their potential to support roosting bats. Plan 2 indicates the locations of the buildings within 100m.

The external inspection of the buildings at Mayfield Farm was led on 12th March 2014 by Lynsey Steele (MCIEEM) using a high powered torch, binoculars and, where necessary, an endoscope. During the inspection, the external elevations of the buildings were visually searched for potential bat access/ egress points, such as raised tiles, gaps above wall plates, holes in windows, and for potential roost features (PRFs) such as gaps behind barge/ fascia boards and crevices within masonry/ roofing timbers. The inspection included a search for evidence of bats such as cadavers, droppings, accumulations of invertebrate feeding remains and urine stains.

Due to access restrictions, an internal inspection was only conducted for Mayfield Farm Barn. Access into the other buildings at the Mayfield Farm site was not available at the time of survey. This is not considered to be a significant limitation to the project as neither the bakery nor the metal storage structures have high bat roost

potential. The level of survey effort conducted for the buildings is considered sufficient to conclude which buildings contain a bat roost.

The internal inspection of Mayfield Farm Barn was led on 28th August 2014 by Lynsey Steele to search for evidence of use by bats. The methods were as for the external inspection.

Following the inspection, the potential of the buildings to support roosting bats was evaluated according to the following categories:

- Negligible;
- Low;
- Moderate;
- High; and
- Confirmed roost.

Dusk emergence / dawn re-entry surveys were then scheduled for buildings with low or above potential to support roosting bats.

Trees

Ground-based visual inspection

All trees within the 2013 Study Area were subject to ground-based visual inspections for bats.

The inspections were undertaken between December 2013 and June 2014, with reference to best practice guidance current at that time (Hundt, 2012). A comprehensive visual search, using binoculars and high powered torches as required, was undertaken of each tree to identify PRFs such as:

- Knot holes (cavities with collar resulting from natural branch loss and fungal infection);
- Woodpecker holes and cavities created by fungal infection;
- Tear outs (cavities within an inverted tear shape wound created when a limb tears away from the main stem or other major limb);
- Butt rot (hollow section of main stem resulting from fungal infection); and
- Lifted bark (substantial areas of lifted bark typically resulting from fungal infection).

The information collected during the ground-based inspections was used to evaluate the potential of each tree to support roosting bats and to determine which trees might require further survey. Trees were assigned to the following categories, according to the classification outlined by Hundt (2012):

- 1* - very high roost potential;
- 1- high potential;
- 2 – moderate potential; or
- 3 - negligible roost potential.

The information also informed an assessment of which trees could safely be subject to tree-climbing surveys (based on health and safety considerations such as the condition of the tree and presence of nearby hazards such as power cables).

Tree-climbing inspection and endoscope survey

Trees identified through the ground-based visual inspections as having potential to support bat roosts (due to the presence of PRFs) were subject to one of the following surveys:

- Trees that had PRFs below 1.5m in height were subject to ground-based endoscope survey; and
- Trees with PRFs above 1.5m in height and that were considered safe to climb were subject to a tree climbing survey.

The tree climbing survey involved the close inspection of all PRFs within each tree by appropriately qualified and licensed ecologists (NPTC CS38 tree climbing and aerial rescue; Natural England Bat Licence Class 2). The purpose was to determine the extent and quality of such features, and to search for evidence of bats. Inspections were assisted by the use of a high powered torch and endoscope.

Tree climbing surveys took place between May and September 2014. The information collected during the tree climbing survey was used to revise, where appropriate, the overall assessment of bat roosting potential for each tree. The revised assessments were used to determine whether emergence/ re-entry surveys were necessary.

1.3.1.2 Emergence/ Re-Entry Surveys

Buildings

Dusk emergence/ dawn re-entry surveys were undertaken on those buildings categorised as having low or above potential to support roosting bats. The surveys were designed with reference to best practice guidance, and also considered local habitat quality, proximity to the scheme and the potential for impacts upon bats.

The number of dusk emergence/ dawn re-entry surveys undertaken for each building was based on the assessed potential of the building or structure to support bats. Structures with 'low' potential to support bats were subject to two survey visits and those with 'moderate' or greater potential were subject to three surveys.

The dusk emergence surveys commenced at least 15 minutes prior to sunset and continued for 1.5–2 hours after sunset. The dawn re-entry surveys started 1.5–2 hours prior to sunrise and ended at sunrise.

Surveyors were positioned to allow complete visual coverage of all PRFs. Surveyors recorded bats emerging from/ re-entering these features, as well as any commuting and foraging behaviour observed.

The surveyors were equipped with an AnaBat SD1 or SD2 bat detector, supplemented with a Batbox Duet used in heterodyne mode.

Trees – Emergence/ Re-Entry

All trees categorised as having moderate (Category 1) to high (Category 1*) potential for roosting bats following the climbing survey (or ground assessment where a climbing survey was not feasible) were subject to dusk emergence/ dawn re-entry surveys. No dusk emergence or dawn re-entry surveys were undertaken on trees with PRFs below 1.5 metres in height as these trees were subject to ground based endoscope survey only.

The overall tree category (updated following the climbing surveys) combined with the location of the tree (relative to the scheme) was used to determine the survey effort. This ensured the level of survey effort was proportionate to the likely impact of the scheme. The following approach was adopted:

- Category 2 trees were subject to one dusk emergence and dawn re-entry survey within a 24 hour period and an additional dusk emergence or dawn re-entry survey; and
- Category 1 or 1* trees were subject to one dusk emergence and dawn re-entry survey within a 24 hour period and two additional dusk emergence or dawn re-entry surveys.

All surveys were undertaken with reference to Hundt (2012) with dusk emergence surveys commencing 15 minutes before sunset until two hours after sunset. Dawn re-entry surveys began two hours before sunrise and finished shortly after sunrise.

Trees – Backtracking Survey

One woodland (south of Pincey Brook) was subject to a backtracking assessment during the 2014 survey period. This consisted of surveyors observing whether bats were leaving or returning to this block of woodland

during dusk emergence and dawn re-entry periods, thereby indicating the presence of roosts within trees within the woodland. Three surveys were undertaken during June, July and August 2014, with reference to Hundt (2012)

1.3.1.3 Transect Surveys

The transect survey was designed with reference to best practice guidance current at that time (Hundt, 2012) which suggests that the level of survey effort should be proportionate to study area size and habitat quality.

The 2014 study area was approximately 130ha and was assessed as being of moderate quality for bats due to the presence of mature broadleaved woodland, hedgerow habitats and running water which provide potential roosting, foraging and commuting habitat. Hundt (2012) suggests that, for large sites (sites >15ha) of medium quality, one visit per transect should be undertaken in each month between April to September.

Due to the large size of the 2014 study area, six transect routes (Transects 1- 6) were designed. Each route was subject to one visit per month May to September with at least one of the surveys comprising a dusk and pre-dawn survey within one 24 hour period. Access could not be arranged in time for an April transect. The transect routes were selected to encompass potential bat commuting and foraging habitats present across the scheme including, woodlands, hedgerows, rivers, and ponds.

The transects were walked at a steady pace by bat surveyors carrying Batbox Duet/ Magenta bat detectors and AnaBat SD1 detectors. Listening points were established at regular intervals along the route with surveyors stopping for 5 minutes at each. Observations relating to bat activity were noted on survey forms and plans. Any deviation from the predefined survey route was marked on plans.

Dusk surveys commenced 15-30 minutes before sunset until approximately 2 hours after sunset, and dawn surveys started two hours before sunrise until sunrise. Temperature, cloud cover, precipitation and wind speed were recorded at the start of each survey, and any major change in weather throughout the survey was noted.

1.3.1.4 Static Detector Monitoring

Paired static detector monitoring was undertaken at two locations along the scheme (SD1-4) positioned to record bats flying across either the M11 motorway or Sheering Lower Road (west or east), where there was potential for fragmentation of linear features. The locations are illustrated on Plan 3. Two AnaBat detectors were deployed at each location, one on each side of the motorway/ road. AnaBats were attached to trees, hedgerows or fence lines between 1.5m to 2m above ground level and deployed for a minimum of 5 nights per location per month surveyed, as per the best practice guidance current at that time (Hundt, 2012). The locations were monitored during the months of May, July and September 2014.

1.3.1.5 Sound Analysis

Sound recordings/ sonograms captured during the surveys were analysed in the office using the version of AnaLook current at that time, with reference to guidance current at that time (Russ, 2012).

Identification of *Myotis* sp. and *Plecotus* bats was largely to genus level only, due to the degree of overlap in the call characteristics of the associated species.

All *Plecotus* sp. were considered likely to be brown long eared bats based on the geographic location of the site and the distribution range of grey long-eared bats (Razgour, 2012).

Pipistrelle calls with a peak frequency of above 50kHz were labelled as soprano pipistrelle (*Pipistrellus pygmaeus)*. Pipistrelle calls between 50 and 41kHz were labelled as common pipistrelle (*Pipistrellus pipistrellus)*, and those below 41kHz were labelled as Nathusius' pipistrelle (*Pipistrellus nathusii)*.

Separation of noctule (*Nyctalus noctua*), Leisler's bat (*Nyctalus leisleri*) and serotine (*Eptesicus serotinus*) is often not possible due to the overlap in the call characteristics of these species. Where overlap occurred, the sonogram file was labelled as 'big bat'

1.3.1.6 Interpretation

Once labelled, sonograms were exported from AnaLook using the Count Labels function into an excel spreadsheet. Standard excel tools were used to interpret the data.

1.3.2 2015 Surveys of the Link Area

1.3.2.1 Tree-Climbing Inspections

Those trees not subject to a climbing inspection in 2014 (due to time constraints) were subject to climbing inspections undertaken in January 2015.

The methods used in 2015 were the same as those used in 2014.

1.3.2.2 Tree Emergence/ Re-Entry Surveys

Those trees for which dusk emergence/ dawn re-entry surveys could not be completed within the 2014 active season, were surveyed in 2015. The methods used in 2015 were the same as those used in 2014.

1.3.2.3 Static Detector Monitoring

In order to supplement the 2014 transect survey work, static detectors were deployed along key linear features during 2015 within the Link Area. The numbering of the static detector locations followed the transect numbers originated in 2014. For example, the 2014 Transect 3 included three discrete linear features, which were subject to static monitoring in 2015, and which were numbered Static 3a, 3b and 3c.

The static detectors locations were selected to enable a comparison of relative activity across the site, and to enable the assessment of the likelihood of blocks of woodland within the site to support roosts. The locations at which the static detectors were deployed are illustrated in Plan 4.

Static detectors were deployed for a minimum of three consecutive nights in each month from April to September 2015, as per best practice guidance current at that time (Hundt, 2012).

Static detectors locations in 2015 are described in Table 1.1 below.

Table 1.1 : Description of static detector location

Static Detector Reference	Habitat Description
1a	Treeline along Pincey Brook, west of Sheering Road
2a	Hedgerow orientated east to west, linking to embankment vegetation to east of M11
3a	Hedgerow linking The Mores Woodland to Sheering Road
3b	Woodland belt north of Mayfield Farm Bakery/ treeline along eastern edge of Sheering Road
3c	Woodland belt south of Mayfield Farm Bakery
4a	Treeline along Pincey Brook, east of Sheering Road
5a	The Mores Woodland, link between large block to west and smaller blocks to east
5b	M11 west embankment vegetation, northern section
6a	Ponds to south of Mores Woodland
6b	M11 west embankment vegetation, southern section

Recording Periods

The static detectors were set to record for the nights:

- 15th, 16th and 17th April 2015;
- 13th, 14th and 15th May 2015;
- 10th, 11th and 12th June 2015;
- 3rd, 4th and 5th July 2015;
- 24th, 25th and 26th August 2015; and
- 15th, 16th and 17th September 2015.

Relative Activity

The static detectors were deployed along all key linear features across the Link Area and set to record bat passes throughout the night period. A subsequent comparison of the number of passes recorded at different locations allowed the identification of those linear features important for bat movement across the site. For example, if a greater number and diversity of bat calls were recorded at Static 1a, than at Static 2a, it is likely that the linear feature upon which Static 1a was deployed is more important for bats, than the one upon which Static 2a was deployed. It is, however, acknowledged that bat passes do not equate to numbers of bats, only bat activity. For example, a particular location used for commuting, could provide lower numbers of bat passes than a location used for foraging (repeated passes), whereas in reality both sites could support the same actual number of bats.

Roosts within Woodland and Associated Flight Lines

Static detectors were also deployed on all flight lines leading to/ from the woodland blocks within the site. Analysis of the time at which sonograms were recorded, compared with known emergence and re-entry times for particular species of bats, allowed an assessment of the likelihood of the woodland blocks to contain bat roosts within the trees.

In 2015, this technique was used as a substitute for backtracking surveys, as the static detectors can provide a larger data set across the year (as compared with three, two hours visits by surveyors), which can then be interpreted to provide a more robust assessment of the likely presence of a roost.

1.3.3 2016 Surveys of Gilden Way and Link Area

1.3.3.1 Tree Surveys

Ground-Based Visual Inspection

During 2016, the Jacobs Arboriculture team surveyed trees along the Gilden Way and within the Link Area in woodland blocks near to the proposed motorway junction and links with Sheering Road. The plans of the trees and roosting zones, in combination with detailed construction plans, enabled the identification of trees that would be directly or partially impacted by the Scheme i.e. removed or pruned to make way for construction.

Subsequently, all trees identified as being directly or partially impacted by the Scheme along Gilden Way, were subject to a ground-based visual inspection to search for PRFs. The inspection method was similar to that used in 2014, with the assessment revised to take account of updated guidance (Collins, 2016).

All trees within the Link Area had previously been subject to visual inspections for roosts in 2014, however, given that roost features can be created over short periods of time by wind damage and woodpeckers for example, a targeted update assessment of trees directly or partially affected within the Link Area was undertaken in 2016.

Tree-Climbing Inspection and Endoscope Survey

Where it was safe to do so, tree-climbing inspections and endoscope surveys were undertaken on trees with moderate or above potential to support roosting bats. The method was very similar to that used in 2014 and 2015, but the assessment was undertaken in line with updated guidance (Collins, 2016).

Dusk Emergence/ Dawn Re-Entry Surveys

For those trees with moderate or above potential to support bats, and which could not be climbed for health and safety reasons, dusk emergence/ dawn re-entry surveys were undertaken. Survey effort and methods were determined in line with updated guidance (Collins, 2016). Those trees with moderate potential to support roosting bats were subject to two dusk emergence or dawn re-entry surveys, and those with high potential to three.

Dusk emergence surveys began 15 minutes before sunset and continued for 1.5 hours, and dawn re-entry surveys began 1.5 hours before sunrise, and finished shortly after sunrise.

1.3.3.2 Driven Transect of the Gilden Way

Guidance (Collins, 2016) suggests that transect surveys should be undertaken one per month between April–October (inclusive) for habitats of moderate suitability for bats, such as those along the Gilden Way. Due to equipment failure and cold weather early in the season and programme constraints towards the end, no transect surveys were undertaken in April or October (see limitations).

Due to the absence of footpaths from some sections of the Gilden Way, and the health and safety risks to surveyors posed by night-time working in close proximity to live traffic, walked transects were replaced by driven transects. It is acknowledged that driven transects may under-record quiet species of bats, however, this method was supplemented by the used of Vantage point or Crossing point surveys and so is considered an appropriate alternative (see limitations).

Driven transect surveys were undertaken in each month between May and September (inclusive). A car was driven along the Gilden Way/ Sheering Road, between the London Road roundabout and Mayfield Farm Bakery with the microphone of an AnaBat Express unit directed out of the passenger window. The route of the Driven Transect is shown on Plan 5. The Express unit was set to 'transect mode', such that recorded bat passes could be matched with a location. The route was driven constantly for two hours beginning at sunset (dusk survey), or for two hours beginning two hours prior to sunrise (dawn survey).

1.3.3.3 Vantage Point/ Crossing Point Surveys

In order to establish if there were any key crossing points along the Gilden Way, and to support the data collected during the driven transect, vantage point or crossing surveys were undertaken. Surveyors were positioned at five points along the Gilden Way where the road cuts through strong linear habitat features, such as tree lines and hedgerows. The survey positions are shown on Plan 6.

Dusk surveys began at sunset and continued for two hours, and dawn surveys began two hours before sunrise, and ended shortly after sunrise. Each surveyor recorded observations of time, species, flight path and height (<5m above ground level (AGL) or >5m AGL) and annotated a plan, with bat calls recorded using AnaBat Express units for subsequent verification of observations.

1.4 Limitations

1.4.1 Buildings

Due to access restrictions encountered during 2014, the only buildings subject to full bat surveys were those located at the Mayfield Farm site (Ordnance Survey Grid Reference: TL48898 12094).

Since 2014, the design of the Scheme has evolved such that no structures are proposed for removal and therefore no direct impacts to roosts that may be present within structures will result from the Scheme.

Without mitigation, the proposals could lead to isolation effects and indirect impacts upon bats using the Link Area for roosting, commuting or foraging. However, robust transect and static detector monitoring was undertaken in 2014 and 2015 of the linear features within the Link Area in order to identify those important to bats. Mitigation based upon the transect and static data will be designed to preserve key linear features and maintain site permeability for bats using the site, including those associated with any nearby roosts that may be

present. In this way, the absence of specific roost data is not considered to constrain the quality of the data or of the conclusions arising from it.

1.4.2 Walked Transect Survey

A transect survey was not completed in April 2014. The 2014 study area was very large and the transect data collected during the May to September period covered an area extending far beyond the current study area. It is considered that the benefit of this larger data set, lending context to results captured within the current study area, outweighs the missing data from one visit, at the very beginning of the active season, during which low levels of activity would be likely. In addition, the quality and robustness of the wider data set is not considered to be constrained significantly because the 2015 static detector monitoring recorded three night's data during April, which supplements the 2014 transect data.

1.4.3 2016 Emergence/ Re-Entry Survey

All high potential trees were subject to three emergence / re-entry surveys and moderate potential to two, except for New Tree 5, in the woodland south of Pincey Brook and adjacent to Sheering Road. It was not possible to schedule a second visit to this tree, due to seasonal constraints. It is acknowledged that it is not currently possible to confidently assess the presence or likely absence of a roost within this tree, however, all high potential trees will be subject to pre-works checks, and any with roosts will be subject to the conditions of an EPSL. Therefore the partial nature of the data for New Tree 5, will be supplemented by future surveys, and this is will safeguard against negative impacts upon bats.

Some surveys started slightly late and some finished slightly early, however, the majority of surveys were undertaken according to best practice guidance and therefore occasional slight variations are not considered to have constrained the quality of the results.

1.4.4 2016 Driven Transect Survey

No data was collected during April 2016; initially due to equipment failure and subsequently, cold weather thwarted attempts to reschedule another visit during this month. Additionally, no survey was programmed for October as the project timescales did not permit the inclusion of this month for baseline data collection.

The purpose of the driven transects was to identify crossing points along the Gilden Way. Vantage point or crossing surveys were also undertaken in order to supplement the driven transect data. Vantage point/ crossing surveys were undertaken in April, therefore, the absence of the April driven transect data is not considered to be a significant constraint to the quality of the data or any assessment based on it.

With regards to the absence of October data, in general, bat behaviour in September is very similar to that in October, mainly comprising activities such as mating, storing fat for winter and swarming (Collins, 2016). Activity in October is likely to be less intense than in the previous month due to reduced average temperatures and prey abundance. As driven (and vantage point/ crossing surveys) surveys were undertaken in September, it is considered that bat behaviour typical of that part of the year would have been recorded during that survey. Therefore, the absence of October data is not considered to significantly constrain the quality of the data set, or of any conclusion based upon it.

1.4.5 Data Analysis and Interpretation

Great care has been taken to analyse and interpret the data collected during the surveys. However, with such a large data set, it is acknowledged that minor errors may have occurred, as a result of interpreting data through the use of excel, where typing errors may have occurred unnoticed on large spreadsheets, or through the mislabelling of individual bat calls. However, given the size of the data set, it is considered unlikely that any such minor errors would not significantly change the assessment of bat activity across the Scheme.

See also Section 1.3.1.5 for details relating to bat sonogram analysis and overlap of call characteristics.

2. Results

2.1 Desk Study

2.1.1 2013 and 2015 Data Requests

The biological records received in 2013 and 2015 from EECOS and The Essex Field Club have been combined and presented as Plan 7.

No records were received originating from within the Study Area. The following species of bat have been recorded within 2km of the Scheme:

- Common pipistrelle;
- Soprano pipistrelle;
- Unidentified pipistrelle (*Pipistrellus* sp.).;
- Noctule;
- Leisler's bat;
- Brown long-eared bat (*Plecotus auritus)*; and
- Daubenton's bat (*Myotis daubentonii)*.

2.1.2 Newhall Farm Environmental Statement

In 2004, ground-based tree assessments and building inspections were undertaken to inform the Newhall Farm development, proposed for a large area immediately south of the Gilden Way. Trees with PRFs were identified, but no bats, or evidence of bats were identified within the buildings surveyed.

2.1.3 Harlowbury Environmental Statement

Ground-based tree assessments and transect surveys were undertaken to inform the Harlowbury development, proposed for the large arable fields immediately north of the Gilden Way and east Harlowbury Brook. In 2004 and 2010, trees with PRFs were identified and at least four species of bat were recorded during the transect surveys: common and soprano pipistrelle, noctule and *Myotis* bats.

2.2 Field Study

2.2.1.1 Bat Roost Surveys

Structures – Daytime Assessments

During the internal inspection of Mayfield Farm Barn in 2014, approximately 30 bat droppings (species not known) were found on the floor within the entrance to the barn, and a further scattering of droppings were found on furniture stored inside the barn.

No evidence of bats was recorded in any other building.

The full results are presented as Appendix A.

Structures – Emergence/ Re-entry Surveys

A non-breeding summer common pipistrelle bat roost was recorded within Mayfield Farm Barn. No bat roosts were recorded in any other structure.

The details of the Mayfield Farm Barn surveys are provided below in Table 2.1.

Table 2.1 : Mayfield Farm Barn Survey Results

Survey Details	Summary of Results
12th June 2014 Dusk emergence survey Sunset: 21:16 Start time: 20:50 / End time: 22:50 Temp: 19˚C / Wind: Light / Rain: None	Surveyor located on the northern side of the building observed a common pipistrelle bat emerging from a gap where the weatherboarding meets the roof tiles at the bottom of the roof valley at 21:33. The gap is located on the eastern side of the barn doors. Surveyor located on the southern side of the building recorded a common pipistrelle bat which possibly emerged from underneath the roof tiles at 22:03.
29th August 2014 Dawn re-entry survey Sunrise: 06:09 Start time: 04:30 / End time: 06:00 Temp: 13˚C / Wind: Light-Moderate / Rain: None	Surveyors located on the northern, western and eastern sides of the building observed one unknown species of bat foraging close to the building and then swarming at the northern end of the structure at approximately 05:20. The bat was not recorded echolocating on the AnaBat and the species could not be identified. The bat was observed entering the building at the same location as emergence occurred on 12th June 2014 at 05:25.
22nd September 2014 Dusk emergence survey Sunset: 18:58 Start time: 18:40 / End time: 20:40 Temp: 15˚C / Wind: Calm / Rain: None	Surveyor located on the northern side of the building recorded a common pipistrelle bat which possibly emerged from the western side of the building at 19:43. The exact roost location was not recorded.
23rd September 2014 Dawn re-entry survey Sunrise: 06:48 Start time: 05:17 / End time: 06:47 Temp: 8˚C / Wind: Light / Rain: None	Surveyor located on the western side of the building recorded an unknown species of bat swarming close to the building at 06:02. The bat was not echolocating. Bat was not observed entering the building.

Trees – Ground-Based and Tree-Climbing Inspections

2014 surveys

The ground-based assessment originally identified 61 trees that had low or above potential to support roosting bats. Due to the contraction of the Scheme footprint, 13 trees were scoped out of the requirement for further survey. Of the remaining 48 trees, 26 were assessed as requiring ground-based endoscope or tree climbing inspections. Fourteen of the tree inspections were completed in 2014 and the remaining 12 trees were scheduled for climbing in 2015.

The results of the 2014 ground-based and tree climbing assessments are presented as Plan 8. In summary, seven Category 3 trees were identified as well as seven Category 2 trees, 30 Category 1 trees and four Category 1* trees. The full results for the 2014 surveys are presented as Appendix B.

The 2014 tree climbing work identified one bat roost in a mature sycamore tree (Tree 61A) within The Mores Woodland. Two bat droppings characteristic of long-eared bats were observed within a tear out wound at 4.5m above ground level on the south-east aspect of Tree 61A.

No bats, or evidence of bats, were observed in any other trees during 2014.

2015 Surveys

In 2015, the trees remaining from the 2014 tree-climbing schedule were re-visited. Two trees (Trees 34 and 40) could not be climbed due to health and safety considerations. Due to further refinement of the Scheme, these trees were then located beyond the Study Area boundary and so it was not considered necessary to include these trees in the emergence/ re-entry survey schedule.

During the climbing surveys, an additional tree with bat roosting potential was recorded adjacent to Tree 36 and was named Tree 36B. This tree lay beyond the contracted Study Area and was subsequently scoped out of a requirement for further survey.

No further tree roosts (in addition to Tree 61a) were identified during the remainder of the tree climbing inspections which were completed in early 2015. The full results for the 2015 surveys are presented as Appendix C.

2016 Surveys (Gilden Way and Link Area Update)

Link Area

In 2016, the targeted update ground-based visual inspections of trees directly or partially impacted by the Scheme within woodland in the Link Area identified eight trees with moderate or above potential to support roosting bats. The results are presented as Appendix D. Following the inspections, the eight trees were subject to dusk emergence/ dawn re-entry surveys.

Gilden Way

In 2016, the ground-based and climbing inspections of trees directly or partially impacted by the Gilden Way widening proposals identified ten trees/ groups of trees with moderate or above potential to support roosting bats and recommended them for dusk emergence/ dawn re-entry surveys. The results are presented as Appendix E.

Trees – Dusk Emergence/ Dawn Re-Entry Surveys

2014 Surveys

The ground-based assessments (as presented in Appendix B) identified 11 trees that required emergence and re-entry surveys. These trees included those listed in Table 2.2 below and also Trees 23, 24 and 26, which were subsequently removed from the survey schedule due to the contraction of the Study Area.

Trees subject to dusk emergence and dawn re-entry surveys in 2014 are set out in Table 2.2 below.

Table 2.2 : Trees subject to emergence / re-entry surveys in 2014

Tree Reference	Tree Category	Number of Surveys Conducted in 2014
2	1	1 (D/D* in 24hrs)
9	1*	1 (D/D in 24hrs)
60	1*	1 (D/D in 24hrs)
60A	1	1 (D/D in 24hrs)
61	1	1 (D/D in 24hrs)
61A	1* (Confirmed Roost)	1 (D/D in 24hrs)
61B	1*	1 (D/D in 24hrs)
64	1	1 (D/D in 24hrs)

*D/D = emergence/ re-entry survey (dusk/dawn)

No bats were recorded emerging from or re-entering PRFs within any of the trees surveyed in 2014. The full results of the dusk emergence/ dawn re-entry surveys of trees undertaken in 2014 are presented in Appendix F.

2015 surveys

The trees subject to dusk emergence/ dawn re-entry surveys in 2015 are set out in Table 2.3 below.

Table 2.3 : Trees subject to emergence / re-entry surveys in 2015

Tree Reference	Tree Category	Number of Surveys Conducted in 2015
2	1	2 x Dusk
9	1*	2 x Dawn
60	1*	1 x Dusk, 1 x Dawn
60A	1	2 x Dawn
61	1	1 x Dawn
61A	1* (Confirmed Roost)	1 x Dusk, 1 x Dawn
61B	1*	2 x Dawn
64	1	2 x Dusk

No bats were recorded emerging from or re-entering any PRFs on any of the trees surveyed.

The survey details are presented as Appendix G.

2016 surveys

Trees subject to dusk emergence/ dawn re-entry surveys in 2016 are set out in Table 2.4 below.

Table 2.4 : Trees subject to emergence/ re-entry surveys in 2016

Area	Tree/ Tree Group ID	Tree Category	Number of Surveys Conducted in 2016
Gilden Way	T42	High	3 x Ground endoscope
	G28	High	1 x Dusk, 2 x Dawn
	G103	High	1 x Dusk, 2 x Dawn
	W93	High	2 x Dusk, 1 x Dawn
	T2	High	1 x Dusk, 2 x Dawn
	T40	High	2 x Dusk, 1 x Dawn
	T46	High	2 x Dusk, 1 x Dawn
	T54	High	1 x Dusk, 2 x Dawn
	T75	High	2 x Dusk, 1 x Dawn
	T101	High	2 x Dusk, 1 x Dawn
Link Area – east of Mores Wood	'Extra oak'	Moderate	1 x Dusk, 1 x Dawn
	T150i	Moderate	1 x Dusk, 1 x Dawn
	T148i	Moderate	1 x Dusk, 1 x Dawn
	T153i	Moderate	1 x Dusk, 1 x Dawn

Area	Tree/ Tree Group ID	Tree Category	Number of Surveys Conducted in 2016
	T154i	Moderate	1 x Dusk, 1 x Dawn
Link Area – woodland south of Pincey Brook	New1	Moderate	1 x Dusk, 1 x Dawn
	New2	Moderate	1 x Dusk, 1 x Dawn
	New5	Moderate	1 x Dusk

The surveys identified the following bat roosts:

- G103 – *Pipistrellus* sp. possibly emerged from the group of trees during one survey. Tree categorised as occasional, non-breeding, summer roost for common species;
- T46 – single *Myotis* sp. and single soprano pipistrelle emerged during June survey, two soprano pipistrelles emerged during July survey. Tree categorised as non-breeding, summer roost for common species;
- T75 – unidentified bat emerged (at 21:38 on 29/06/2016, sunset at 21:22), timing indicative of pipistrelle species. Tree categorised as occasional non-breeding, summer roost for common species; and
- T101 – four common pipistrelles emerged during July survey. Tree categorised as occasional, non-breeding summer roost for common species.

The locations of the tree roosts are shown in Plan 9.

No bats were observed emerging from any of the trees surveyed within the Link Area in 2016.

2.2.1.2 Transect Surveys

2014 Walked Transects (Link Area)

The results of the 2014 transect surveys are presented as Plans 10.a – 10.e and the survey details are presented as Appendix I.

The 2014 transect surveys recorded common and soprano pipistrelle, noctule and unidentified *Nyctalus*/*Eptesicus* (grouped as 'big bat'), *Myotis* sp. bats and long-eared bats within the Link Area.

During May, June and August, the majority of activity was recorded along Transect 3 and 6, incorporating the treeline along Sheering Road, the periphery of The Mores Woodland and the hedgerow running due south from The Mores Woodland towards Moor Hall Road.

During July, the majority of activity was recorded along Transect 1, on land to the west of Sheering Road.

During September, the majority of activity was recorded along Transect 1 (land west of Sheering Road) and Transect 3 (treeline along Sheering Road).

2016 Driven transects (Gilden Way)

The results of the driven transects are presented as Plan 11 and the survey details are presented as Appendix J.

The driven transect recorded common pipistrelle, soprano pipistrelle, unidentified pipistrelle, noctule, *Nyctalus*, 'big bat' and a single barbastelle (*Barbastellus barbastellus)* bat.

Potential crossing points (key areas of activity) were recorded at the intersection between Gilden Way and Marsh Lane, the Gilden Way Roundabout, between Mulberry Green and Gilden Way Meadow Local Wildlife Site. Activity was also recorded in the vicinity of the London Road roundabout.

2.2.1.3 2016 Vantage Point/ Crossing Point Surveys (Gilden Way)

Vantage point/ crossing surveys were undertaken during April, May, June, July and September in 2016.

Bats were observed to cross the Gilden Way at four of the five survey locations (A, C, D and E). No bats were observed crossing the Gilden Way at position B.

Low numbers of bats were observed crossing the Gilden Way at a height<5mAGL (within the traffic swept zone) as follows:

- Position A – one common pipistrelle during June survey (bat at 22:52, sunset at 21:16), two common pipistrelle during July (bat at 03:10 and 03:19, sunrise at 04:55);
- Position C – one common pipistrelle during June surveys (bat at 22:30, sunset at 20:52), four common pipistrelle during July (bat at 02:55, 03:00. 03:15 and 04:14, sunrise at 04:55);
- Position D – two unidentified bats during April survey (bats at 20:21 and 20:38, sunset at 20:02), another two unidentified bats during August survey (bat at 21: 43 and 21:54, sunset at 20:32), and one common pipistrelle during September survey (bat at 05:04. sunrise 06:33). Regular passes by common pipistrelle and a big bat recorded at this location during September survey;
- Position E – two common pipistrelle bats recorded during August survey (bat at 21:04 and 21:45, sunset at 20:32), and two additional common pipistrelle observed foraging parallel to road at a height <5mAGL. Regular passes by common and soprano pipistrelles, and big bats at this location during all surveys.

In addition to this behaviour, common pipistrelle, noctule and unidentified bats were observed to cross the Gilden Way and forage above the height of the street lights, well above the traffic swept zone.

Occasional passes by noctule, *Nyctalus*, big bat and soprano pipistrelle were recorded, as well as single passes by a barbastelle (Position C, April) and a long-eared bat (Position E, July).

The full results are presented as Appendix K.

2.2.1.4 2014 Static Detector Crossing Point Surveys (Link Area)

The results of the 2014 static detector crossing point surveys are summarised in Table 2.5 below.

Table 2.5 : Summary of 2014 static detector crossing point data

	Bat Species Recorded				
Static Location	Leisler's bat	Noctule	Common Pipistrelle	Soprano Pipistrelle	Serotine
SD1	0	1	1333	80	0
SD2	0	0	1535	33	0
SD3	0	3	545	22	0
SD4	3	5	231	7	1
Total	3	9	3644	142	1

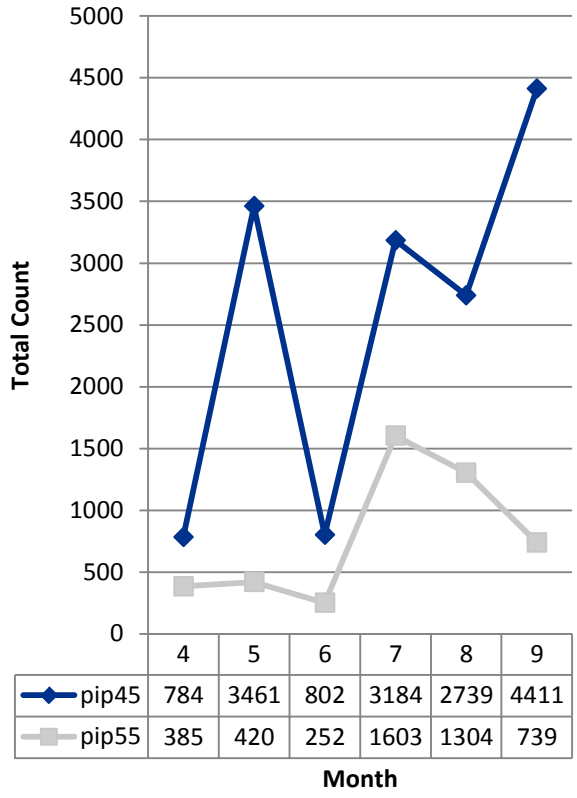
2.2.1.5 2015 Static Detector Monitoring

The static detector study undertaken in 2015 recorded at least eight species/ groups of bat within the Link Area. These were (in order of total passes recorded) common pipistrelle, soprano pipistrelle, big bat, noctule, *Myotis* sp., long-eared, barbastelle, and Nathusius' pipistrelle.

General Trend across 2015

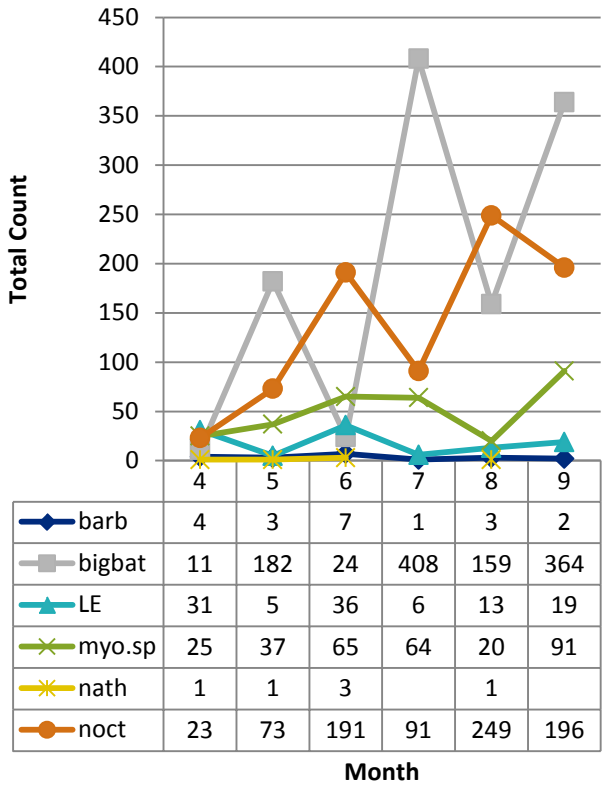
The annual trends in recorded numbers of bat passes are generally positive, with increases in total passes recorded across the year for most species, as shown in Chart 1 and 2. Common and soprano pipistrelle data are presented separately (Chart 1) due to the high number of passes for these species compared to the others (1-2 degrees of magnitude higher).

Chart 1: Annual trend in total passes



	4	5	6	7	8	9
pip45	784	3461	802	3184	2739	4411
pip55	385	420	252	1603	1304	739

Chart 2: Annual trend in total passes



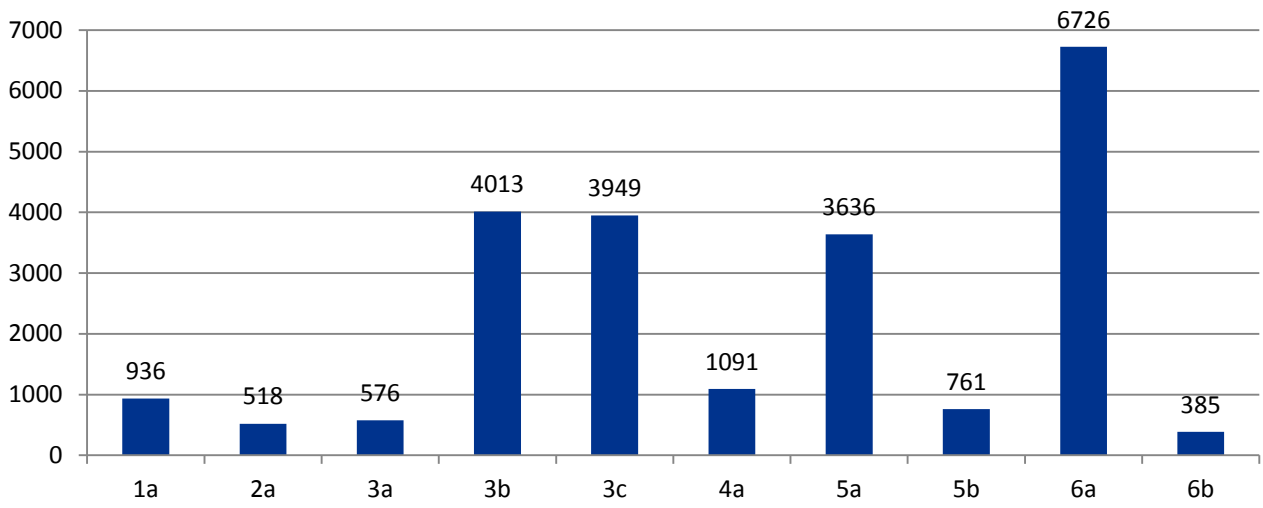
	4	5	6	7	8	9
barb	4	3	7	1	3	2
bigbat	11	182	24	408	159	364
LE	31	5	36	6	13	19
myo.sp	25	37	65	64	20	91
nath	1	1	3		1	
noct	23	73	191	91	249	196

pip45 = common pipistrelle / pip55 = soprano pipistrelle / barb = barbastelle / bigbat = *Eptesicus* or *Nyctalus* bats / LE = long-eared bat / myo.sp = *Myotis* bat / nath = Nathusius' pipistrelle / noct = noctule bat

Relative Activity

A comparison of total bat passes at each location is presented in Chart 3. Total activity was greatest at location 6a, near the ponds south of The Mores Woodland. High levels of activity were also recorded at locations 3b and 3c, woodland belts north and south of Mayfield Farm Bakery, and at location 5a, situated on a treeline linking parts of The Mores Woodland.

Chart 3: Total number of bat passes (all species) recorded for year per static



Comparatively low levels of activity were recorded along Pincey Brook (locations 1a and 4a).

The lowest levels of activity were recorded at locations 6b and 5b, along the M11 embankment, at location 2a along the hedge to the east of the M11, and location 3a, a hedge/ ditch within the Link Area.

The following paragraphs present the static detector results per species or species group.

Common Pipistrelle

Species Overview

A total of 15,381 common pipistrelle passes were recorded within the Link Area in 2015, 1,446 of which fell within the typical emergence/ re-entry periods for this species as described by the Bat Conservation Trust (2012) (30 minutes before dusk to 30 minutes after dusk and 30 minutes before sunrise to 30 minutes after sunrise).

The greatest numbers of passes (totalled for year) were recorded at 6a (4906), followed by 5a (2961), and then 3c (2648). The lowest numbers of passes were recorded at 3a (224), 6b (322) and 2a (224).

As illustrated in Chart 1, activity was greatest in September and May and lowest in April and June.

Location of Early Calls and Peak Activity

During the April and May deployments, the first common pipistrelle bats detected each evening were recorded along the Pincey Brook (1a), except for on 15th May (3c), between 19 - 29 minutes before sunset. Early (pre-sunset) passes were also recorded at 3b, 3c, 5b and 6a. Peak activity (across the whole deployment period) was recorded at 4a (346 passes – Pincey Brook) and at 6a in May (2174 – ponds south of The Mores Woodland).

During June and July, the location of the first recorded common pipistrelle bats shifted to the M11 embankment (5b and 6b), except for 10th June (6a), occurring 3-29 minutes before sunset. Early passes were also regularly recorded at 3a, 3b, 3c, and 6a. Peak activity (across the whole deployment period) was recorded at 5a (264 passes recorded on the link between The Mores Woodland) followed closely by 6b (250 passes – M11 embankment), and at 3b during July (1437 passes – Sheering Road).

During August, the location of the first recorded common pipistrelle bats varied; however this species was recorded prior to sunset on each night at locations 1a and 5b. Early passes were also recorded at 3a, 5a and 6b. On the 26th August, the majority of activity during the emergence period was recorded at 5a (link between

The Mores Woodland). Peak activity (across the whole deployment period) was recorded at 6a (1706 passes – ponds south of The Mores Woodland).

During September, the first recorded common pipistrelle bats were located at 5b (15th and 17th) and 2a (16th), 25-30 minutes before sunset. On 15th September the majority of activity recorded during the emergence period was at 4a (Pincey Brook) and 6a (ponds south of The Mores Woodland). On 16th September the majority of activity within the emergence period was recorded at 2a (hedgerow to east of M11). Peak activity (across the whole deployment period) was recorded at 5a (1809 passes - link between The Mores Woodland).

Indication of Roost Locations

The results indicate the presence of roosts for common pipistrelle within structures or trees near to Pincey Brook, along Sheering Road, and within The Mores Woodland.

Soprano pipistrelle

Species Overview

A total of 4703 soprano bat passes were recorded within the Link Area in 2015, 380 of which fell within the typical emergence/ re-entry periods for this species (30 minutes before dusk to 30 minutes after dusk and 30 minutes before sunrise to 30 minutes after sunrise).

The greatest numbers of passes (totalled for year) were recorded at 3b (1524), 6a (1395) and 3c (802), with the lowest numbers of passes recorded at 2a (11), 6b (17) and 3a (48).

As illustrated in Chart 1, the total numbers of passes recorded across the year generally increased April–July (aside from a dip in numbers in June), and then decreased between July and September.

Location of Early Calls and Peak Activity

On most nights during the April and May deployments, the first soprano pipistrelle bats were recorded at 1a (Pincey Brook), typically 30 minutes before sunset. Early (pre-sunset) passes were also recorded regularly at 3c (treeline south of Mayfield Bakery). Passes after sunset but still within the typical emergence period, were also recorded regularly at 6a (ponds south of The Mores Woodland). Peak activity in April was recorded at 4a (195 passes) on Pincey Brook (closely followed by 1a – 116 passes also Pincey Brook). In May, peak activity was recorded at 3b (170 passes - Sheering Road) followed closely by 6a (132 passes - ponds south of The Mores Woodland).

During the June and July deployments, the location of the first soprano pipistrelle bats varied, however early passes at 3a and 5b were recorded on the majority of nights within the deployment periods. In June, the majority of activity during the emergence period was recorded at 5b on all nights during the deployment period. Peak activity in June was recorded along the M11 embankment at 5b (157 passes), with peak activity at 3b (1062 passes – Sheering Road) in July.

During the August deployment, the location of the first recorded soprano pipistrelle bats varied, however early passes were recorded along Pincey Brook (1a and 4a) on all nights, 13–25 minutes before sunset. Early passes were also recorded at 3a (first bat on 24th August), and a pass was recorded near dawn at 6a (ponds south of The Mores Woodland) on 27th (05:35 / 06:04). Peak activity was recorded at 6a (1056 passes) in August.

During the September deployment, the location of the first recorded soprano pipistrelle bats varied, however early passes were recorded on each night at 6a, 3-23 minutes before sunset. Early passes were also recorded at 2a, 3a and 6b. Peak activity was recorded at 5a, the link between The Mores Woodland (263 passes, followed closely by 3c, treeline south of Mayfield Farm Bakery (232 passes) in September.

Indication of roost locations

The results indicate the presence of roosts for soprano pipistrelle within structures or trees near to Pincey Brook, Mayfield Farm, the M11 embankment and within The Mores Woodland.

Big bats

Species Group Overview

A total of 1148 big bats were recorded within the Link Area during 2015, 272 passes were recorded within the typical emergence/ re-entry periods for this group of bats (30 minutes before dusk to 30 minutes after dusk and 30 minutes before sunrise to 30 minutes after sunrise).

The greatest numbers of passes (totalled for year) were recorded at 3c (318), 6a (292) and 5a (246), with the lowest numbers recorded at 2a (12), 6b (13) and 5b (28).

As illustrated in Chart 1, the greatest activity was recorded in July and September with low activity recorded in June and August.

Location of Early Calls and Peak Activity

During the April and May deployment the first bats were largely recorded at 1a, on Pincey Brook, with early passes also recorded at 3c south of Mayfield Farm Bakery. Levels of activity were very low in April (total of 11 passes) and no notable location peak was discerned, however peak activity was recorded at 3c (121 passes) during May.

The June deployment recorded a total of 24 big bat passes, the majority of which were along Pincey Brook at 1a and 4a, including seven early passes.

During the July deployment, activity shifted to the south of the Link Area with the majority of passes recorded around 6a, the ponds south of The Mores Woodland, and 3c, the woodland belt south of Mayfield Farm Bakery. The first big bats recorded were at 6a on each night, between 17-28 minutes before sunset, with the majority of recorded passes occurring before sunset. Peak activity was 6a (150 passes) and 3c (107 passes).

During August, the first big bats were recorded at 5a and 5b, around 20 – 28 minutes before sunset. The majority of activity recorded on the 26th was at 5a and prior to sunset. Peak activity was recorded at 5a (71 passes).

During the September deployment, activity was more varied, but with early passes regularly recorded at 4a, along Pincey Brook, and 6a, ponds south of The Mores Woodland. On 15th September the first bat was recorded at 5b, 28 minutes before sunset, followed very closely by a bat recorded at 6a, 28 minutes before sunset. An early and a late pass (within 30 minutes of dawn) was recorded at 6b on 16th, and a late pass was recorded at 4a on 17th September. Peak activity was recorded at 5a (110 passes) and 6a (109 passes) in September, closely followed by 3c (84 passes).

Indication of Roost Locations

The results indicate the presence of roosts for big bats within structures or trees near to Pincey Brook and The Mores Woodland.

Noctule

Species Overview

A total of 823 noctule passes were recorded within the Link Area in 2015, 204 of which fell within the typical emergence/ re-entry periods for this species (30 minutes before dusk to 30 minutes after dusk, and 30 minutes before sunrise to 30 minutes after sunrise).

The greatest numbers of passes (totalled for the year) were recorded at 1a (309), 3a (170) and 5a (93), with the lowest numbers recorded at 5b (6), 6b (19) and 2a (23).

As illustrated in Chart 1, activity levels generally increased April–August and then decreased August–September, with a dip in activity in July.

Location of Early Calls and Peak Activity

Throughout the period April–August, during the majority of deployments, the first noctule bats were recorded at 1a, along Pincey Brook, ranging from one to 30 minutes before sunset (April and August, respectively). Early passes were also regularly recorded at 3a throughout this period, with occasional early passes also recorded at 3b (June), 3c (April, July) and 6a (April, May, July).

During the September deployment, the location of the first recorded noctule on each night varied (4a on 15th, 3a on 16th and 6a on 17th), but early passes were regularly recorded at 2a, 6a and 5a.

Peak activity per month was as follows: 1a in April (20 passes), 3c in May (121 passes), 1a in June (94 passes), 6a (157 passes) and 3c (152 passes) in July, 1a (147 passes) and 3a (116 passes) in August and 5a (200 passes) and 3a (133 passes) in September.

Indication of roost locations

The results indicate the presence of roosts for noctule within structures or trees near to Pincey Brook.

Myotis Bats

Species Overview

A total of 302 *Myotis* passes were recorded within the Link Area during 2015, 196 of which fell within the typical emergence/ re-entry time for this species group (30 minutes before dusk to 30 minutes after dusk, and 30 minutes before dawn to 30 minutes after dawn).

The greatest numbers of passes (totalled for the year) were recorded at 3b (95), 3a (74), 6a (36), with the lowest numbers recorded at 2a/ 5b (5) and 6b (7).

As illustrated in Chart 1, there was a slight increase in recorded *Myotis* activity across the season, except for a dip in August.

Location of Early Calls and Peak Activity

Throughout the period April to September, the first *Myotis* bats were typically recorded at 3a, the hedgerow linking The Mores Woodland to Shearing Road, between 27 minutes before sunset, to one minute after sunset. On June 10th the 1st *Myotis* recorded was at 3b, 29 minutes before sunrise.

Peak activity per month was as follows: 1a in April (13 passes), 6a in May (14 passes), 3a in June (41 passes), 3b in July (31 passes), 3b in August (six passes) and 3b in September (45 passes).

Indication of Roost Locations

The results indicate the presence of a *Myotis* roost within The Mores Woodland.

Long-Eared Bats

Species Overview

A total of 110 long-eared bat passes were recorded within the Link Area during 2015, 24 of which fell within the typical emergence / re-entry period for this species group (30 minutes before to 60 minutes after dusk, and 60 minutes before to 30 minutes after dawn).

The greatest number of passes was recorded at 6a (26), followed by 1a (19) and 3a (14), with the lowest numbers recorded at 5a (2), 3b (5) and 6b (7).

Insufficient data is available to discuss trends across the year.

Location of Early Calls and Peak Activity

Throughout the period April – September, early passes were recorded at 1a (April, May, June and August) and 3a (April, June, August and September) most frequently. An early pass was also recorded at 6a in June and at 6b during September.

Indication of Roost Locations

The results indicate the presence of a long-eared roost within structures or trees within or near to Pincey Brook and The Mores Woodland.

Barbastelle

Species Overview, Early Calls and Peak Activity

A total of 20 barbastelle passes were recorded within the Link Area during the 2015 surveys, two of which occurred at one location (3a) in June within the known emergence period for this species (20 – 60 minutes after sunset).

During April barbastelle passes were recorded at 1a, 3b and 3c, indicating commuting along Sheering Road. In May, two passes were recorded in the middle of the night at 6a. In June, seven passes were recorded at 3a, the first two in the known emergence period and the remainder in the middle of the night. During July, August and September individual passes were recorded at 5a (July), 5b and 6a (August) and 5b and 3c (September).

Indication of Roost Locations

Barbastelle fly rapidly and have large ranges. The first early pass recorded on June 10th 2015 at 3a, was recorded at 22:03. Sunset was at 21:16. The pass was recorded 47 minutes after sunset, well within the 20 – 60 minute after sunset emergence period. As the bat could have emerged 20 minutes after sunset, and commuted for 27 minutes to arrive at 3a, the location of the roost site cannot be predicted with a high level of confidence. The absence of other recordings within the site, within the emergence period for this species, suggests that barbastelle do not regularly roost within, or near to, the site.

Nathusius' Pipistrelle

A total of six passes by Nathusius' pipistrelle were recorded within the Link Area during the 2015 surveys. These passes were recorded at 1a, 2a, 3c, 5b and 6a. Only one call was recorded within the known emergence/ re-entry periods for this species (30 minutes before sunset to 30 minutes after, and 30 minutes before sunrise to 30 minutes after). This call was recorded at 3c in June.

The data suggests that the site does not support a Nathusius' pipistrelle roost; rather that this species occasionally commutes across the site in very low numbers.

3. References

Collins, J (2016) *Bat Surveys for Professional Ecologists: Good Practice Guideline.* 3rd Edition. London: The Bat Conservation Trust

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

LDA Design (2011) *Land North of Gilden Way Environmental Statement*

Razgour, O. (2012) *From genes to landscapes: conservation biology of the grey long-eared bat, Plecotus austriacus, across spatio-temporal scales*. Phd thesis, University of Bristol, UK.

Roger Evans Associates (2004) *Newhall Phase II Environmental Statement*

Plan 1: Study Areas

Sheering Lower Road

Pincey Brook

Proposed Junction 7a

Sheering Road

Gilden Way

Moor Hall Road

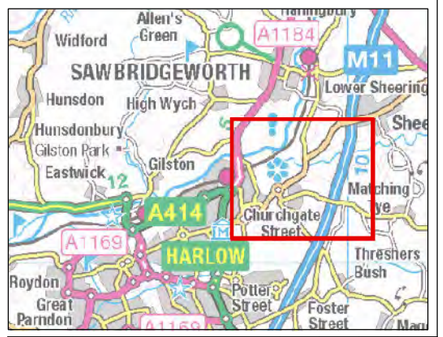
100 50 0 100 200
metres

Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- 2014 500m study area
- 2015 100m study area
- 2016 20m Study Area



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	11/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	SK

Drawing Status

PRELIMINARY DESIGN

RINGWAY JACOBS integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

M11 JUNCTION 7A

Drawing Title

PLAN 1 - BAT SURVEY AREA 2016

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
10/11/2016	10/11/2016	10/11/2016	10/11/2016	10/11/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm)
1:11,000

DRAWING NO.
B3553F05-0000-DR-0127

REV.
P0

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Plan 2: Location of Buildings

Sheering Road Property

Mayfield Farm Bakery

Mayfield Farm Storage 1

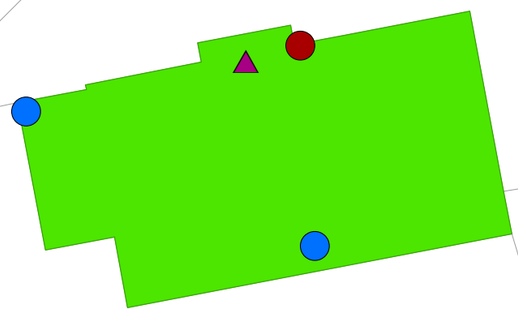
Mayfield Farm House

Mayfield Farm Storage 2

Mayfield Farm Barn

25 12.5 0 25 50
metres

Mayfield Farm Barn (1:350)
Showing locations of bat roost entry points

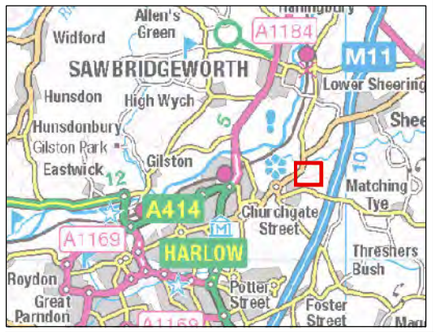


Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- Confirmed bat roost
- Moderate bat roost potential
- Low to moderate bat roost potential
- Negligible to low bat roost potential
- No access at time of survey
- Location of bat droppings
- Confirmed bat roost entry point
- Possible bat roost entry point



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	11/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	SK

Drawing Status
PRELIMINARY DESIGN

RINGWAY JACOBS integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title
M11 JUNCTION 7A

Drawing Title
PLAN 2 - BAT ROOST ASSESSMENT OF BUILDINGS AND ROOST LOCATIONS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
10/11/2016	10/11/2016	10/11/2016	10/11/2016	10/11/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm)
1:2,000

DRAWING NO.
B3553F05-0000-DR-0134

REV.
P0

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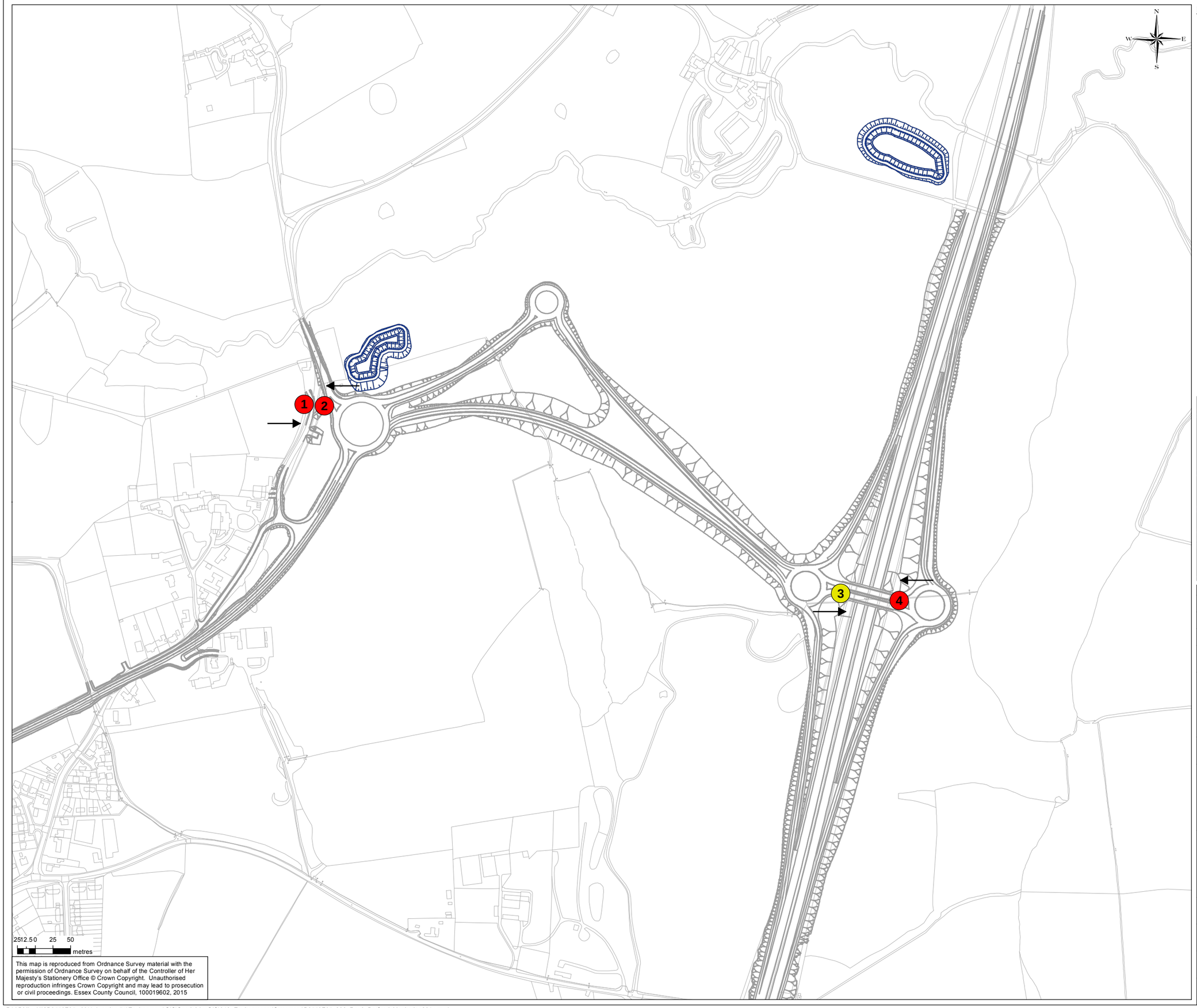
Plan 3: Location of Crossing Point Detectors (2014)

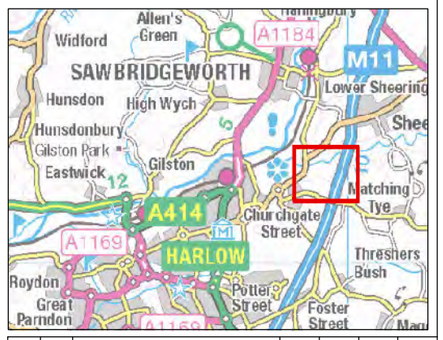


Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- Static monitoring location - providing high value habitat
- Static monitoring location - providing moderate value habitat
- Direction of AnaBat



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	11/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	SK

Drawing Status

PRELIMINARY DESIGN

RINGWAY JACOBS integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

M11 JUNCTION 7A

Drawing Title

PLAN 3 - BAT STATIC MONITORING LOCATIONS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
14/11/2016	14/11/2016	14/11/2016	14/11/2016	14/11/2016

DRAWING UNITS U.N.O.	SCALE AT A3 (420 x 297 mm)
	1:5,000

DRAWING NO.	REV.
B3553F05-0000-DR-0136	P0

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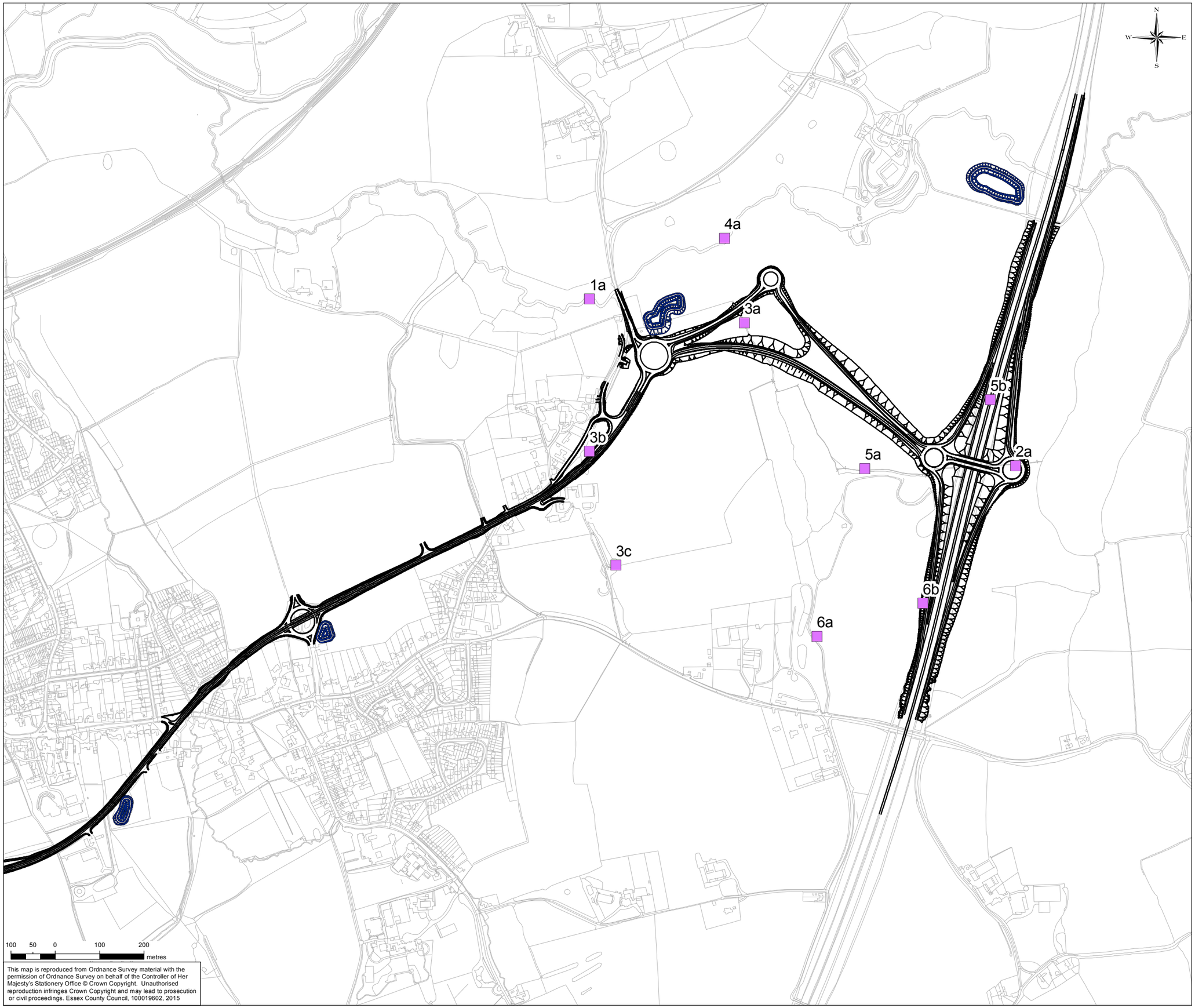
Plan 4: Location of Static Detectors (2015)

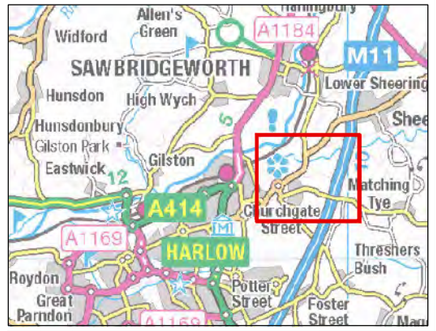


Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- Static Detector



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	11/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	SK

Drawing Status

PRELIMINARY DESIGN

RINGWAY JACOBS integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

M11 JUNCTION 7A

Drawing Title

PLAN 4 - BAT STATIC DETECTOR LOCATIONS 2015

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
14/11/2016	14/11/2016	14/11/2016	14/11/2016	14/11/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm)
1:8,000

DRAWING NO.
B3553F05-0000-DR-0135

REV.
P0

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Plan 5: Gilden Way – Route of Driven Transect

Gilden Way

N
W
E
S

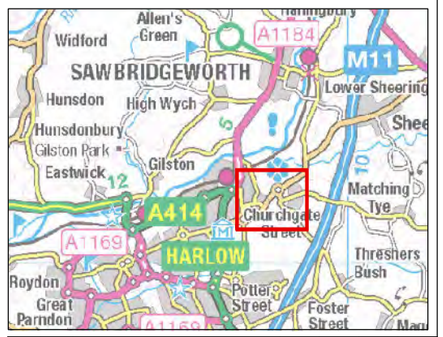
60 30 0 60 120 180 240
Metres

Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- Route of Driven Transect (2016)



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	10/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	SK

Drawing Status

PRELIMINARY DESIGN

RINGWAY JACOBS integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

M11 JUNCTION 7A

Drawing Title

PLAN 5 - ROUTE OF DRIVEN TRANSECT (2016)

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
31/10/2016	31/10/2016	31/10/2016	31/10/2016	31/10/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm)
1:5,467

DRAWING NO.
B3553F05-0000-DR-0115

REV.
P0

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Plan 6: Gilden Way – Vantage Point Surveyor Locations

Sheering Road

Gilden Way

A

B

C

D

E

Moor H

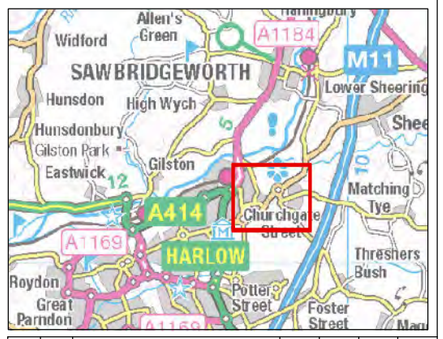
100 50 0 100 200 metres

Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- 2016 20m Study Area
- Bat Vantage Point/Crossing Survey Locations



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	11/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	SK

Drawing Status

PRELIMINARY DESIGN

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Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

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Drawing Title

PLAN 6 – BAT VANTAGE POINT / CROSSING SURVEY LOCATIONS 2016

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
10/11/2016	10/11/2016	10/11/2016	10/11/2016	10/11/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm)

1:6,000

DRAWING NO.

B3553F05-0000-DR-0128

REV.

P0

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Plan 7: Results of Desk Study

Sheering Lower Road

Pincey Brook

Proposed Junction 7a

Sheering Road

Gilden Way

Moor Hall Road

M11 Motorway

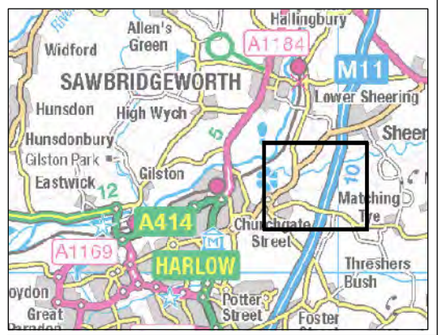
100 50 0 100 200 300 400 Metres

Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- 2015 100m study area
- Brown long-eared
- Common pipistrelle
- Noctule



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	10/16	ISSUED FOR PLANNING APPLICATION	EW	SK	SK	SG

Drawing Status

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Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

M11 JUNCTION 7A

Drawing Title

PLAN 7 - BAT BIOLOGICAL RECORDS REQUEST RESULTS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	EW	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
31/10/2016	31/10/2016	31/10/2016	31/10/2016	31/10/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm) 1:8,000

DRAWING NO. B3553F05-0000-DR-0116

REV. P0

Plan 8: Link Area – 2014 Ground-Based and Tree-Climbing Results

Woodland 4

Woodland 4

South of Pincey Brook

The Moores North

Mayfield Farm North A

The Moores East A

The Moores East B

The Moore's North

Moor Hall Woodland

The Moore's East A and B

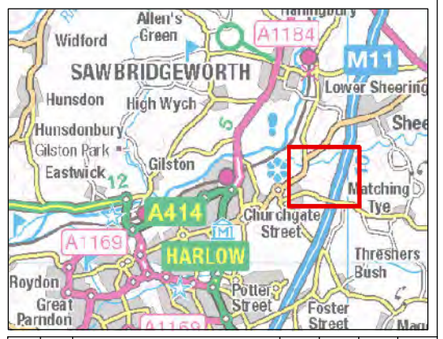
60 30 0 60 120 180 240 Metres

Notes

1. Do not scale
2. Category for trees to be climbed / endoscoped in 2015 may be amended following the further survey work.

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- 100m buffer around proposed route options
- Confirmed Roost
- Category 1* tree
- Category 1 tree
- Category 2 tree
- Category 3 tree
- Trees outside of survey area
- Backtracking surveys conducted in 2014
- Areas requiring backtracking surveys in 2015



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	10/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	SK

Drawing Status: PRELIMINARY DESIGN

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Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title: M11 JUNCTION 7A

Drawing Title: PLAN 8 - BAT ROOST ASSESSMENT OF TREES

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
31/10/2016	31/10/2016	31/10/2016	31/10/2016	31/10/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm): 1:5,500

DRAWING NO.: B3553F05-0000-DR-0117

REV.: P0

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Plan 9: Gilden Way – Tree Roost Locations

Sheering Lower Road

Pincey Brook

Proposed Junction 7a

Sheering Road

Gilden Way

G103

T101

T75

T46

Moor Hall Road

M11 Motorway

125 62.5 0 125 250 375 500 Metres

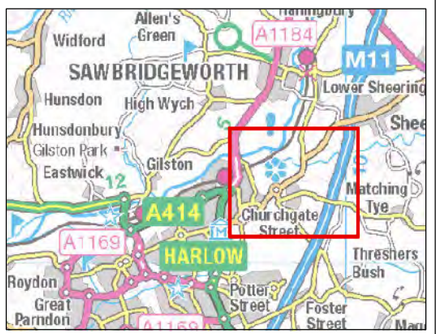
Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- Bat Tree Roost

G103 - pipistrelle bat (Pipistrellus sp.) possibly emerged from the group of trees during one survey, categorised as occasional, non-breeding, summer roost for common species
T46 – single Myotis (Myotis sp.) and single soprano pipistrelle emerged during June survey, two soprano pipistrelle emerged during July survey, categorised as non-breeding, summer roost for common species
T75 - unidentified bat emerged (21:38 on 29/06/2016, sunset at 21:22), timing indicative of pipistrelle species, categorised as occasional non-breeding, summer roost for common species
T101 - 4 x common pipistrelle emerged during July survey, categorised as occasional, non-breeding summer roost for common species.



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	10/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	SK

Drawing Status

PRELIMINARY DESIGN

RINGWAY JACOBS integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

M11 JUNCTION 7A

Drawing Title

PLAN 9 - BAT TREE ROOST LOCATIONS (GILDEN WAY)

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
31/10/2016	31/10/2016	31/10/2016	31/10/2016	31/10/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm) 1:10,000

DRAWING NO. B3553F05-0000-DR-0118

REV. P0

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Plans 10a – 10e: Link Area – 2014 Walked Transect Results

Pincey Brook

B183 Sheering Lower Road

M11

The Moores Woodland

Mayfield Farm

Moor Hall Road

Moor Hall Woodland

Notes

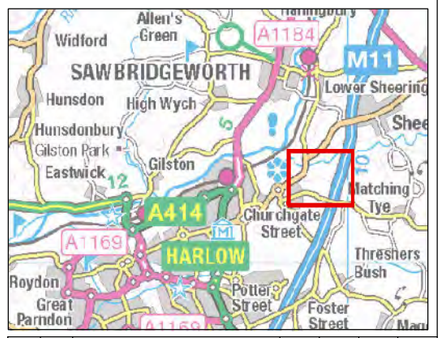
1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- Transect 1 06-05-14 - Dusk
- Transect 2 08-05-14 - Dusk
- Transect 3 08-05-14 - Dawn
- Transect 4 07-05-14 - Dawn
- Transect 5 08-05-14 - Dusk for bats
- Transect 6 14-05-15 - Dusk

Multiple Pass	Single Pass	Species
		Soprano Pipistrelle
		Common Pipistrelle
		Noctule
		Myotis species
		Big bat
		Long eared species
	▲	Unknown

60 30 0 60 120 180 240 Metres



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	10/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	SK

Drawing Status: PRELIMINARY DESIGN

RINGWAY JACOBS integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title: M11 JUNCTION 7A

Drawing Title: PLAN 10 A - BAT ACTIVITY MAY 2014 TRANSECT LOCATIONS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
31/10/2016	31/10/2016	31/10/2016	31/10/2016	31/10/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm): 1:5,000

DRAWING NO.: B3553F05-0000-DR-0119

REV.: P0

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Pincey Brook

B183 Sheering Lower Road

M11

The Moores Woodland

Mayfield Farm

Moor Hall Road

Moor Hall Woodland

Multiple Pass	Single Pass	Species
●	•	Soprano Pipistrelle
●	•	Common Pipistrelle
●	•	Noctule
●	•	Myotis species
●	•	Big bat
●	•	Long eared species
	▲	Unknown

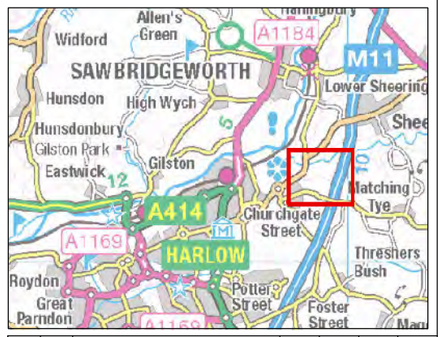
60 30 0 60 120 180 240 Metres

Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- Transect 1 13-06-14 - Dawn
- Transect 2 11-06-14 - Dawn
- Transect 3 13-06-14 - Dawn
- Transect 4 13-06-14 - Dawn
- Transect 5 17-06-14 - Dawn
- Transect 6 10-06-14 - Dusk



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	10/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	SK

Drawing Status: PRELIMINARY DESIGN

RINGWAY JACOBS integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title: M11 JUNCTION 7A

Drawing Title: PLAN 10B - BAT ACTIVITY
JUNE 2014 TRANSECT LOCATIONS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
31/10/2016	31/10/2016	31/10/2016	31/10/2016	31/10/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm): 1:5,000

DRAWING NO.: B3553F05-0000-DR-0120

REV.: P0

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Pincey Brook

B183 Sheering Lower Road

M11

The Moores Woodland

Mayfield Farm

Moor Hall Woodland

Moor Hall Road

Multiple Pass	Single Pass	Species
●	•	Soprano Pipistrelle
●	•	Common Pipistrelle
●	•	Noctule
●	•	Myotis species
●	•	Big bat
●	•	Long eared species
	▲	Unknown

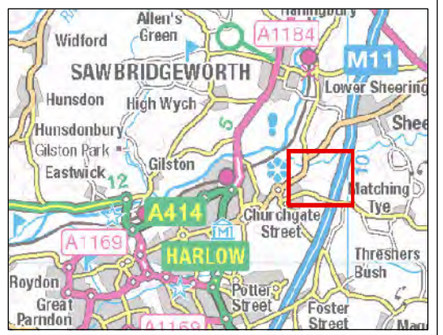
60 30 0 60 120 180 240 Metres

Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- Transect 1 14-07-14 - Dusk
- Transect 2 15-07-14 - Dawn
- Transect 3 26-07-14 - Dusk
- Transect 4 15-07-14 - Dawn
- Transect 5 15-07-14 - Dusk
- Transect 6 17-07-14 - Dawn



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	10/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	SK

Drawing Status

PRELIMINARY DESIGN

RINGWAY JACOBS integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

M11 JUNCTION 7A

Drawing Title

PLAN 10C - BAT ACTIVITY
JULY 2014 TRANSECT LOCATIONS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
31/10/2016	31/10/2016	31/10/2016	31/10/2016	31/10/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm) 1:5,000

DRAWING NO.

REV. P0

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Pincey Brook

B183 Sheering Lower Road

M11

The Moores Woodland

Mayfield Farm

Moor Hall Road

Moor Hall Woodland

Multiple Pass	Single Pass	Species
●	•	Soprano Pipistrelle
●	•	Common Pipistrelle
●	•	Noctule
●	•	Myotis species
●	•	Big bat
●	•	Long eared species
	▲	Unknown

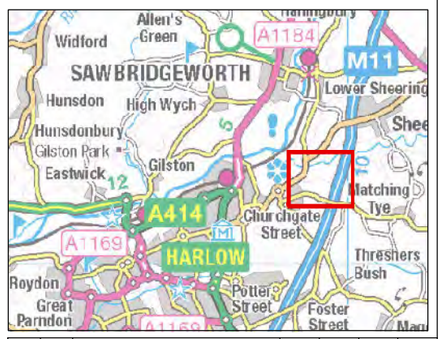
60 30 0 60 120 180 240 Metres

Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- Transect 1 12-08-14 - Dawn
- Transect 2
- Transect 3 28-08-14 - Dusk
- Transect 4 28-08-14 - Dusk
- Transect 5 04-08-14 - Dusk
- Transect 6 28-08-14 - Dusk



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	10/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	SK

Drawing Status

PRELIMINARY DESIGN

RINGWAY JACOBS integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

M11 JUNCTION 7A

Drawing Title

PLAN 10D - BAT ACTIVITY
AUGUST 2014 TRANSECT LOCATIONS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
31/10/2016	31/10/2016	31/10/2016	31/10/2016	31/10/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm)
1:5,000

DRAWING NO.
B3553F05-0000-DR-0122

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Pincey Brook

B183 Sheering Lower Road

M11

The Moores Woodland

Mayfield Farm

Moor Hall Road

Moor Hall Woodland

Multiple Pass	Single Pass	Species
●	•	Soprano Pipistrelle
●	•	Common Pipistrelle
●	•	Noctule
●	•	Myotis species
●	•	Big bat
●	•	Long eared species
	▲	Unknown

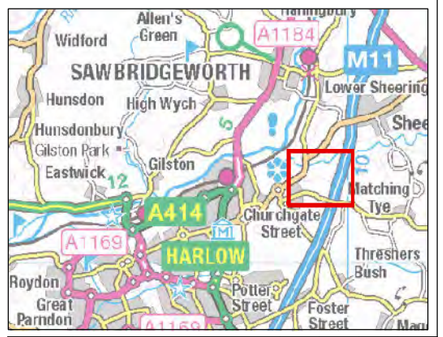
60 30 0 60 120 180 240 Metres

Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- Transect 1 08-05-14 - Dawn
- Transect 2 11-09-14 - Dusk
- Transect 3 09-09-14 - Dawn
- Transect 4 09-09-14 - Dusk
- Transect 5 09-09-14 - Dawn
- Transect 6 10-09-14 - Dawn



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	10/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	SK

Drawing Status: PRELIMINARY DESIGN

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Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title: M11 JUNCTION 7A

Drawing Title: PLAN 10E - BAT ACTIVITY SEPTEMBER 2014 TRANSECT LOCATIONS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
31/10/2016	31/10/2016	31/10/2016	31/10/2016	31/10/2016

DRAWING UNITS U.N.O. | SCALE AT A3 (420 x 297 mm): 1:5,000

DRAWING NO.: B3553F05-0000-DR-0123 | REV.: P0

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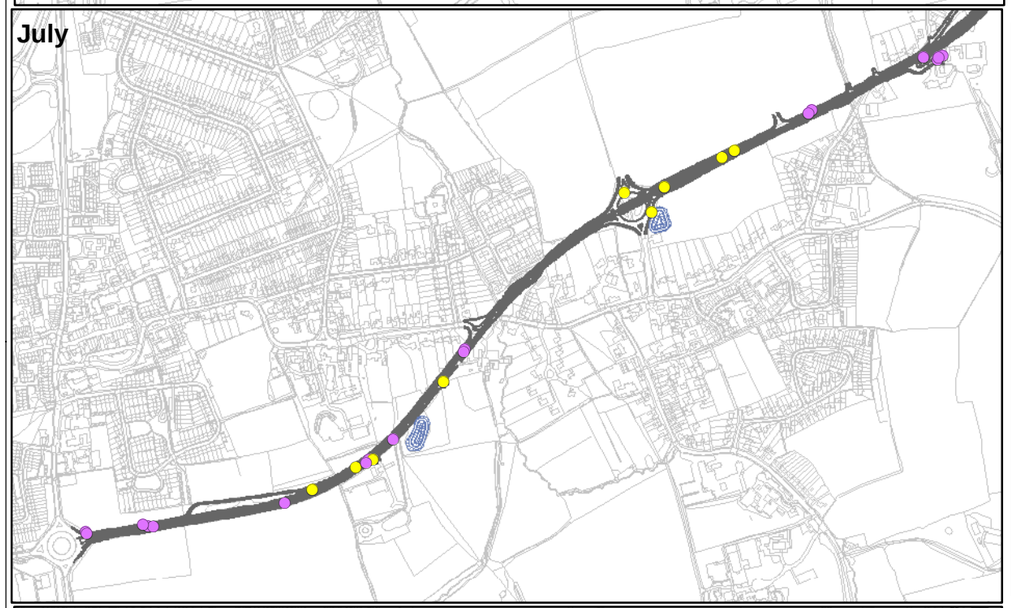
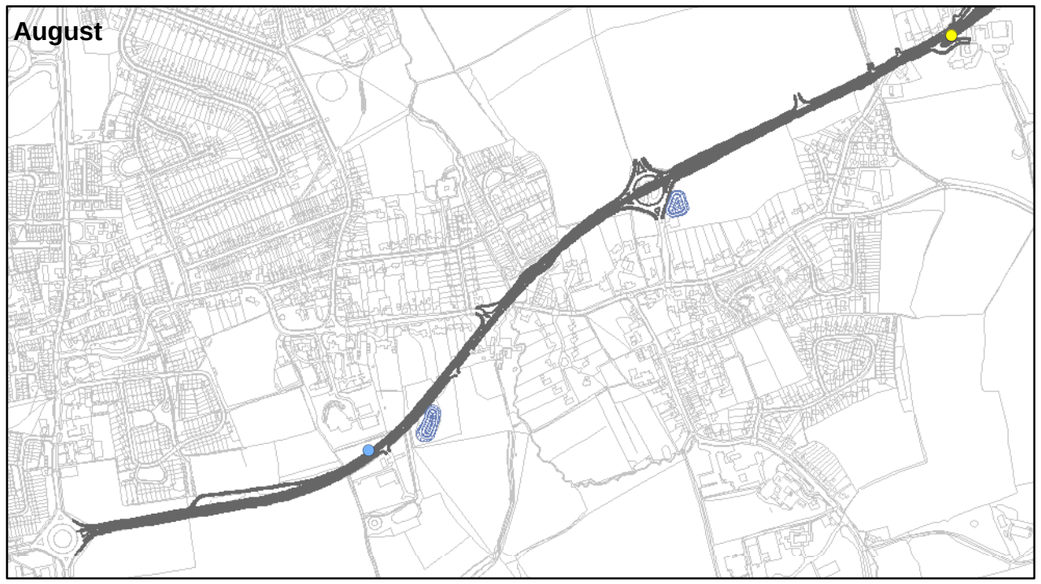
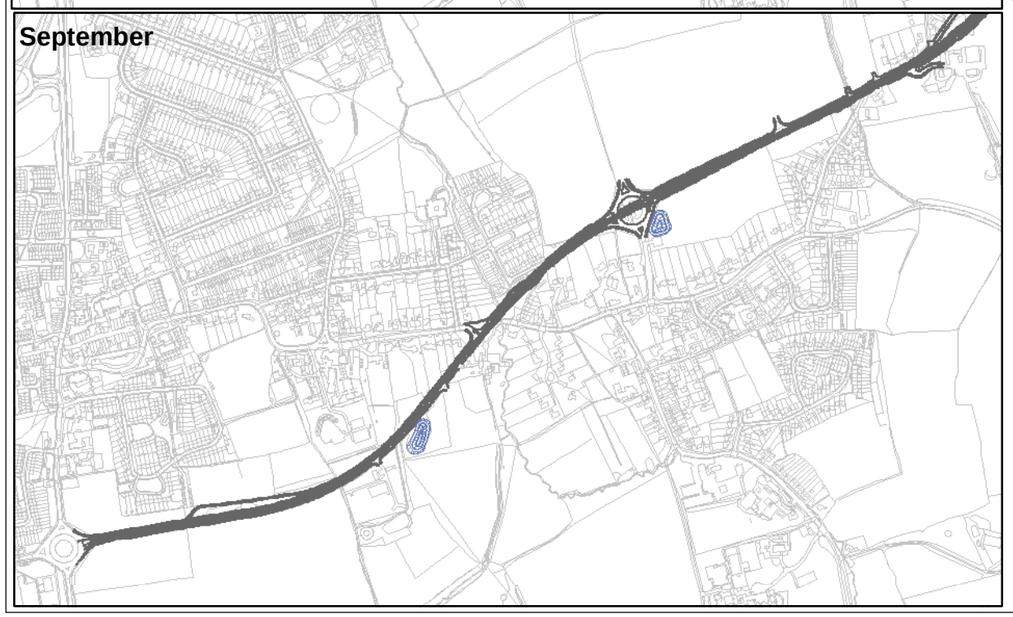
Plan 11: Gilden Way – 2016 Driven Transect Results







Notes

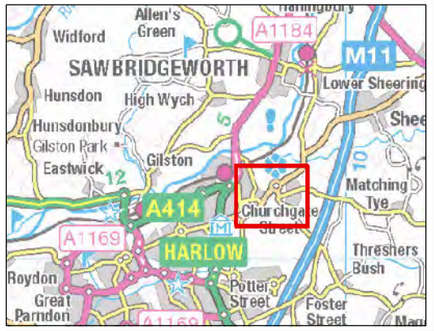
1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond

Bat Species

- Nyctalus
- barb
- bigbat
- noct
- pip.sp
- pip45
- pip55



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	10/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	SK

Drawing Status

PRELIMINARY DESIGN

RINGWAY JACOBS integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

M11 JUNCTION 7A

Drawing Title

PLAN 11 - BAT DRIVEN TRANSECT (GILDEN WAY)

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
31/10/2016	31/10/2016	31/10/2016	31/10/2016	31/10/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm)

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DRAWING NO.

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Appendix A. Results of 2014 Internal/External Inspection of Structures

Building Reference	Date of Assessment	Assessment Complete Y/N?	Description of Features	Roost Potential
Mayfield Farm Barn	External: 12th March 2014 Internal: 28th August 2014	Yes	**External Assessment** Mayfield Farm Barn is a large, two storey wooden structure. It was found to be in a state of general disrepair with numerous missing and broken roof tiles and weatherboarding. The garage doors to the east of the building and main entrance door to the north had gaps at the top where bats could enter the building. Many of the windows were broken providing further entry points into the building (see Photographs 1, 2, 3 and 4). **Internal Assessment** The inside of Mayfield Farm Barn is separated into three areas by wooden boards. The main area is currently being used for storage of household items and clothing. The further two areas are used as workshops. No evidence of bat activity was recorded in any of the three separated areas. The entrance into the barn by the large door to the north of the building contained approximately 30 bat droppings in a pile on the floor. Several bat droppings were also identified scattered across the furniture (see Appendix A for locations of droppings). Moth/butterfly wings were also recorded in the entrance way, these could provide evidence of use by another species of bat such as brown long-eared which are known to predate larger invertebrates and leave their wings. However, spiders are also known to predate moths and butterflies so this is not conclusive evidence of use by brown long-eared bats. The loft space was well sealed at the time of survey and could therefore not be accessed.	Confirmed Roost
Mayfield Farm Bakery	External: 12th March 2014	Yes	**External Assessment** Mayfield Farm Bakery is a one storey brick structure with a tiled roof. The structure consists of a series of three attached buildings built in a horseshoe shape. The ends of the buildings have large holes where historically an entrance into a hayloft may have been located. These hayloft windows have since been filled with small bricks which provide ideal crevices and holes for bats to roost within (see photographs 6 and 7). The roof contains several raised tiles and there are small gaps under the ridge tiles.	Moderate
Mayfield	External:	Yes	**External Assessment**	Low/ Moderate

Farm House	12th March 2014		Mayfield Farm House is a two storey brick structure with a tiled roof. The building is considered to be generally well sealed and in an excellent state of repair. Several tiles were missing from the roof which may provide an access point into the loft for bats or a small crevice for species of bats such as brown long-eared bats (see Photograph 5).	
Concrete and Metal Storage Buildings (1 and 2)	External: 12th March 2014	Yes	**External Assessment** The two storage buildings located to the rear of the Mayfield Farm site are two storey structures, found to be generally well sealed and in a good state of repair. The buildings are concrete structures with corrugated metal panelling and roofs. Bats could potentially utilise the corrugated metal structure of the roof and walls as a roosting site (see Photographs 8 and 9).	Negligible/Low
Residential Property on Sheering Road	Not applicable	No	No access at time of survey	Unknown

Appendix B. 2014 Ground-based and tree-climbing Tree Roost Assessments

Tree ID	Tree Species	Age	Location	Safe to Climb	PRF	Height (m)	Aspect	Description	Bat Roost Category	Tree Climbed/ Endoscope Yes / No	Emergence/ Re-entry Survey/ Backtrack Required Yes / No	Overall Roost Category
1	Oak	M	Within hedgerow to south of Pincey Brook	Yes	Dense ivy cover.	-	-	Dense ivy cover covering majority of tree stem.	3	No	No	3
2	Oak	M	Within hedgerow to south of Pincey Brook	Yes	Impact shatter	6	South	Cavity faces down. 25cm long and goes in 10cm. 2cm wide tapering to a point.	1	Yes	Yes – Emergence / re-entry	1
					Impact shatter	6	West	Potential splits and fissures with loose bark covering a snag. Downward gap behind bark 35cm deep, 2cm wide.	1			
					Loose bark.	7.5	North	Potential loose bark at base on underside. Exposed with only narrow gaps.	3			
					Impact shatter	8.5	East	Potential cavity leading horizontally into limb. Cavity may be hollow.	3			
3	Oak	M	Within hedgerow to south of Pincey Brook	Yes	Dense ivy cover.	-	-	Dense ivy cover covering majority of tree stem.	3	No	Yes – Emergence / re-entry	3

Tree ID	Tree Species	Age	Location	Safe to Climb	PRF	Height (m)	Aspect	Description	Bat Roost Category	Tree Climbed/ Endoscope Yes / No	Emergence/ Re-entry Survey/ Backtrack Required Yes / No	Overall Roost Category
4	Oak	M	Within hedgerow to south of Pincey Brook	Yes	Knot hole	7	South	Knot at elbow of the limb. Superficial cavity	3	Yes	No	3
					Suspended dead limb.	7	West	Large cavity at snapped end leading to an exposed hollow with no protection or crawl space. Superficial.	3			
5	Oak	M	Within tree line to north of Pincey Brook	Yes	Split	-	South	Split down the centre of the stem. May have been hit by lightning.	2	No	No	2
6	Ash	M	Along Pincey Brook	Yes	Dense ivy cover.	-	-	Dense ivy cover covering majority of tree stem.	3	No	No	3
7	Ash	M	Along Pincey Brook	Yes	Dense ivy cover.	-	-	Dense ivy cover covering majority of tree stem.	3	No	No	3
8	Ash	M	Along Pincey Brook	Yes	Crack/split	-	North	On rotten branch overhanging Pincey Brook.	2	No	No	2
9	Oak	M	Woodland along Sheering Road. To south west of Mayfield	Yes	Tear out	2.5	South west	Feature leads to a rot column in trunk and extends upwards 1m and approximately 10cm wide. Narrows to a dome. Dry and dusty.	1*	Yes	Yes – Emergence / re-entry	1*
					Hazard	1	East	Open and exposed. No cavity.	3			

Tree ID	Tree Species	Age	Location	Safe to Climb	PRF	Height (m)	Aspect	Description	Bat Roost Category	Tree Climbed/ Endoscope Yes / No	Emergence/ Re-entry Survey/ Backtrack Required Yes / No	Overall Roost Category
			Farm.		beam							
					Tear out	8-10	South east and north west	Split in main stem. Open and exposed at the top of the split. Lots of bird's nest material.	2			
					Tear out	15	East	No cavity	-			
					Impact shatter	8	West	-	1			
10	Oak	M	Within woodland to the north of Mayfield Farm.	No	Split limbs	-	East and west	Split limb to the east (viewed from bridge of public footpath). Split limb with loose bark to the west.	2	No	Yes - Backtrack	2
11	Horse chestnut	M	Edge of woodland to the north of Mayfield Farm.	Yes	Knot hole	3.5	North east	Hole goes in and to the left 7cm. Narrow cavity. Full of water.	2	Yes	Yes - Backtrack	2
					Knot hole	3	South	Hole goes in 40cm then upwards 15cm. Water at the base.	2			
11A	Sycamore	M	Edge of woodland to the north of Mayfield Farm.	Yes	Tear out	7	East	Located on underside of limb. No cavity.	3	Yes	Yes - Backtrack	1
					Knot hole	6.5	East	Located on dead limb. Hole goes in and slightly upwards. Approximately 30cm long, 3cm wide tapering off at the end.	1			

Tree ID	Tree Species	Age	Location	Safe to Climb	PRF	Height (m)	Aspect	Description	Bat Roost Category	Tree Climbed/ Endoscope Yes / No	Emergence/ Re-entry Survey/ Backtrack Required Yes / No	Overall Roost Category
								Many cobwebs.				
12	Field maple	M	Edge of woodland to the north of Mayfield Farm.	Yes	Butt rot	-	-	Tree rot extends up 1m. Clean and dry inside but no evidence of bats. Only 40cm high and opens above the ground.	1	Yes	Yes - Backtrack	1
13	Horse chestnut	M	Edge of woodland to the north of Mayfield Farm.	Yes	Knot hole	3	South	No upward development. Wet at the base. Superficial.	3	Yes	Yes - Backtrack	3
14	U/K	Outside of survey area - no survey										
15	U/K	Outside of survey area - no survey										
16	Horse Chestnut	Outside of survey area - no survey										
Group 17 (17, 18, 19)	Ash (1 dead)	Outside of survey area - no survey										
20	Ash	Outside of survey area - no survey										
21	Ash	Outside of survey area - no survey										
22	Ash	Outside of survey area - no survey										
23	Oak	M	Within	Yes	Dead limb	-	West	No cavity. Obscured by ivy.	2	No	Yes –	2

Tree ID	Tree Species	Age	Location	Safe to Climb	PRF	Height (m)	Aspect	Description	Bat Roost Category	Tree Climbed/ Endoscope Yes / No	Emergence/ Re-entry Survey/ Backtrack Required Yes / No	Overall Roost Category
			hedgerow to east of M11		with knot hole						Emergence / re-entry	
24	Oak	M	Within hedgerow to east of M11	Yes	Knot hole	5	East	Located on east side of the limb pointing south. Narrow cavity	2	Yes	Yes – Emergence / re-entry	2
					Knot hole	4.8	East	Hole contains dead wood. Cavity goes in 10cm and 4cm wide at opening. Birds been living in the hole.	2			
					Knot hole	9	South	Located on the main stem. No upward cavity. Cavity goes down 3cm.	3			
					Impact shatter	3.5	South west	Snag with large void going in 40cm. Open and exposed with no crawl space.	3			
					Impact shatter	3	East	Large void with a birds nest. Large, open and exposed void.	3			
					Loose bark	-	-	On numerous limbs. Many obscured by ivy.	2			
25	Oak	M	Within hedgerow to east of M11	Yes	Minor cracks and loose bark. Dense ivy cover.	-	East	Dense ivy covering most of tree trunk. Features unsuitable for bats.	3	No	No	3
26	Oak	M	Within	No	Cavity	-	East	Gnarled oak stump with	2	No	Yes –	2

Tree ID	Tree Species	Age	Location	Safe to Climb	PRF	Height (m)	Aspect	Description	Bat Roost Category	Tree Climbed/ Endoscope Yes / No	Emergence/ Re-entry Survey/ Backtrack Required Yes / No	Overall Roost Category
			hedgerow to east of M11					collapsed crown. Large cavity to east.			Emergence / re-entry	
27	Oak	M	Within hedgerow to east of M11	Yes	Dense ivy cover.	-	-	Dense ivy covering most of tree trunk. Features unsuitable for bats.	3	No	No	3
28	Outside of survey area - no survey											
29	Oak	M	Moor Hall Woodland west	Yes	Rot holes	-	-	Features unsuitable for bats.	3	No	No	3
30	Ash	M	Woodland 4	Yes	Woodpecker hole.	20	South west	-	1	No	No –not affected	1
31	Ash	M	Woodland 4	Yes	Woodpecker hole	6	South	-	1	No	No –not affected	1
32	Ash	M	Woodland 4	Yes	Woodpecker hole.	12	South	-	1	No	No –not affected	1
33	Ash	M	Woodland 4	Yes	Rot holes.	3	South	-	1	No	No –not affected	1
34	Ash	M	Woodland 4	Yes	Rot holes.	3	East	-	1	No	No –not affected	1
35	Horse chestnut	M	Woodland 4	Yes	Woodpecker holes.	12	East	-	1	No	No –not	1

Tree ID	Tree Species	Age	Location	Safe to Climb	PRF	Height (m)	Aspect	Description	Bat Roost Category	Tree Climbed/ Endoscope Yes / No	Emergence/ Re-entry Survey/ Backtrack Required Yes / No	Overall Roost Category
											affected	
36	Ash	M	Woodland 4	Yes	Woodpecker holes.	12	East	-	1	No	No –not affected	1
37	Oak	M	Woodland 4	Yes	Split limb	8	East	-	1	No	No –not affected	1
38	Ash	M	Woodland 4	No	Woodpecker holes.	10	South west	-	1	No	No –not affected	1
39	Ash	M	Woodland 4	No	Woodpecker holes.	20	South east	-	1	No	No –not affected	1
40	Ash	M	Woodland 4	No	Woodpecker and rot holes.	20	South east	-	1	No	No –not affected	1
41	Ash	M	Access track to Woodland 4	Yes	Cavity	3	North east	Large cavity.	1	No	No –not affected	1
					Crack	3	South east	Crack in limb	1			
50	Dead	D	The Mores Woodland East B	No	Natural holes. Woodpecker holes. Rot holes / cavities.	-	-	-	1	No	Yes - Backtrack	1

Tree ID	Tree Species	Age	Location	Safe to Climb	PRF	Height (m)	Aspect	Description	Bat Roost Category	Tree Climbed/ Endoscope Yes / No	Emergence/ Re-entry Survey/ Backtrack Required Yes / No	Overall Roost Category
51	Dead	D	The Mores Woodland East B	No	Natural holes. Woodpecker holes. Rot holes / cavities.	-	-	-	1	No	Yes - Backtrack	1
52	Ash	M	The Mores Woodland East B	No	Woodpecker holes	8	East and west	-	1	No	Yes - Backtrack	1
53	Ash (dead)	D	The Mores Woodland East B	No	Woodpecker holes	-	South west	-	1	No	Yes - Backtrack	1
54	Ash	M	The Mores Woodland East B	Yes	4 x woodpecker holes	4 - 7	West	No nesting bird material. 3 x trial holes with no cavity. 1 hole 10cm diameter leading to downward nest bowl approximately 30cm deep.	1	Yes	Yes - Backtrack	1
55	Ash	M	The Mores Woodland East B	Yes	Woodpecker hole	5	West	Large opening leading to downward cavity. Nesting material. 10cm diameter and goes down 15cm	1	Yes	Yes - Backtrack	1
					Woodpecker hole	6	West	-	1			
56	U/K	M	The Mores Woodland	Yes	Numerous woodpeck	-	-	-	1	No	Yes - Backtrack	1

Tree ID	Tree Species	Age	Location	Safe to Climb	PRF	Height (m)	Aspect	Description	Bat Roost Category	Tree Climbed/ Endoscope Yes / No	Emergence/ Re-entry Survey/ Backtrack Required Yes / No	Overall Roost Category
			East A		er and natural holes around trunk.							
57	U/K	M	The Mores Woodland East A	Yes	Cracks and splits. Loose bark. Dense ivy cover.	-	-	-	2	No	Yes - Backtrack	2
58	Dead	D	The Mores Woodland East A	No	Loose / peeling bark. Rot holes all around the trunk.	-	-	-	1	No	Yes - Backtrack	1
59	U/K	D	The Mores Woodland East A	No	Woodpecker and rot holes all around the trunk. Cracks and splits.	-	-	-	1	No	Yes - Backtrack	1
60	Ash	M	The Mores Woodland	Yes	Tear out	7	South	Opening at 80cm tall by 45cm wide and goes back 50cm and	1*	Yes	Yes – Emergence	1*

Tree ID	Tree Species	Age	Location	Safe to Climb	PRF	Height (m)	Aspect	Description	Bat Roost Category	Tree Climbed/ Endoscope Yes / No	Emergence/ Re-entry Survey/ Backtrack Required Yes / No	Overall Roost Category
			(north)					up. Owl / raptor use – presence of pellet and small bones.			/ re-entry	
					Cavity	-	South	Opening on south side of tree and also opens up half way up the eastern side. Clean and smooth inside.	1*			
60A	Field maple	M	The Mores Woodland (north)	Yes	2x tear outs	1.5	West	Both tear outs lead upwards approximately 30cm. Cobwebs.	1	Yes	Yes – Emergence / re-entry	1
61	Dead	D	The Mores Woodland (north)	No	Dense ivy cover. Numerous split limbs.	-	West	Not safe to climb and inspect.	1	No	Yes – Emergence / re-entry	1
61A	Sycamore	IM	The Mores Woodland (north)	Yes	Tear out	4.5	South east	Opening is 30cm long and leads to an upward rot cavity 1m long. Clean inside. Two droppings observed on side wall.	1*	Yes	Yes – Emergence / re-entry	1*
61B	Ash	M	The Mores Woodland (north)	Yes	Canker	1.8-4	North	Large opening at 3.5m. Upward cavity 40cm high, 5cm wide. Cobwebs and rotting wood.	1	Yes	Yes – Emergence / re-entry	1
62	Ash	M	The Mores Woodland (north	No	2x large woodpecker holes.	-	-	-	1	No	Yes - Backtrack	1
63	Ash	M	The Mores	No	2x large	-	North	-	1	No	Yes -	1

Tree ID	Tree Species	Age	Location	Safe to Climb	PRF	Height (m)	Aspect	Description	Bat Roost Category	Tree Climbed/ Endoscope Yes / No	Emergence/ Re-entry Survey/ Backtrack Required Yes / No	Overall Roost Category
			Woodland (north		splits. Numerous woodpecker holes.						Backtrack	
64	Beech	M	The Mores Woodland (north)	Yes	Tear out	15m	East	Approximately 2m long with an upward cavity extending beyond the length of an endoscope. Large cavity 30cm wide. Squirrel dray at top of trunk wound.	1*	Yes	Yes – Emergence / re-entry	1*
					Lightning strike	2.5-3.5	South	Central column of the trunk is rotten with a split on the south side. Birds nest present. Many cobwebs.	1			
					Lightning strike	0-3.5m	West	Split with upwards cavity approximately 30cm high and 30cm wide.	1*			
					Lightning strike	7m	South	Large hollow leading to open rot pocket in the stem. Large and open.	2			
65	Ash	M	The Mores Woodland (north)	Yes	Small natural cavity on northern side of tree.	-	North	Small natural cavity. Very high up in tree.	1	No	Yes - Backtrack	1

Appendix C. 2015 Tree climbing results

Date	Weather	Tree ID	Species	Age	DBH (cm)	Safe to climb	PRF Type	Height (m)	Aspect	Description	PRF Grade	Overall Grade
14/01/15	Sunshine, dry, 6°C, moderate breeze (3-4 BFS), clear skies.	30	Ash	Semi-mature	Unknown	Yes	Woodpecker hole	12	SW	Woodpecker hole at elbow of south west vertical limb of first major fork. Cavity extends downwards at 45° for 20cm. Entrance 8cm diameter. Due to size of entrance and angle of cavity significant light spill and quite open. Considered unsuitable for bats.	3	3
13/01/15	Sunshine, 11°C, damp, light breeze (2-3)	31	Ash	Semi-mature	41	Yes	Woodpecker hole	2.5	SE	Woodpecker hole into rot column. Entrance 4cm diameter. Cavity diameter 10cm, extends upward 15cm and downward 10cm, damp, fungi,	1	1*
							Woodpecker hole	2.8	SE	Woodpecker hole. 3cm diameter entrance. Extends upwards 20cm and 3cm diameter leading to central rot column. Dirty, not been used as an entrance.	2	
							Woodpecker hole	3.3	SE	Woodpecker trial hole on main stem.	3	
							Woodpecker hole	4	SE	Woodpecker hole with 8cm diameter entrance. Extends 40cm downwards into a rot column with a 8cm diameter. Extends 15cm upwards. Dry, clean. Large void.		
13/01/15	Sunshine, 11°C, damp, light breeze (2-3)	32	Ash	Semi-mature	42	Yes	Woodpecker hole	9	SW	Woodpecker hole joined with knot hole on main stem. Extends 15cm horizontally, 7cm downwards and upwards is open knot hole. Cavity full of water.	2	2

Date	Weather	Tree ID	Species	Age	DBH (cm)	Safe to climb	PRF Type	Height (m)	Aspect	Description	PRF Grade	Overall Grade
13/01/15	Sunshine, 11°C, damp, light breeze (2-3)	33	Ash	Semi-mature	43	Yes	Rot hole	1	S	Rot hole in exposed heartwood of main stem. Small hole, shallow, unsuitable	3	1
							Rot hole	1.5	S	Rot hole in exposed heartwood of main stem. Extends 4cm upwards and 8 cm downwards, shallow, unsuitable.	3	
							Rot hole	2.5	S	Rot hole in exposed heartwood of main stem. Extends upwards 12cm, 10cm horizontally, 40cm downwards. Dry.	1	
							Hollow stem	2.5	NE	Hollow stem of collapsed vertical limb leaning in SW direction. Cavity extends 60cm horizontally, 6cm diameter cavity.	1	
14/01/15	Sunshine, 6°C, moderate breeze (3-4), clear skies.	34	Ash	Semi-mature	Unknown	No	Butt rot	1.5	N	Twin-stem ash with light ivy cover. Extensive but rot resulting in hollow main stem beyond reach of endoscope. Dusty, dry, cavity. Entrance at 2.5m.	1*	1*
14/01/15	Sunshine, 6°C, moderate breeze (3-4), clear skies.	35	Horse chestnut	Semi-mature	Unknown	Yes	Woodpecker hole	8	SE	Woodpecker hole in main stem. 10cm diameter entrance. 10cm diameter rot column in main stem. Extends 12cm downwards (bird droppings) and 40cm upwards. Clean and dry.	1*	1*
14/01/15	Sunshine, 6°C, moderate breeze (3-	36	Ash	Semi-mature	33	Yes	Woodpecker hole	8	SE	Woodpecker hole in main stem. 8cm diameter entrance. Extends 15cm horizontally and 15cm downwards. Clean.	1	1

Date	Weather	Tree ID	Species	Age	DBH (cm)	Safe to climb	PRF Type	Height (m)	Aspect	Description	PRF Grade	Overall Grade
	4), clear skies.						Woodpecker hole	7.5	NW	Woodpecker hole in main stem. 8cm diameter entrance. Extends 12cm horizontally and 15cm downwards.	1	
							Woodpecker hole	7	W	Woodpecker hole in main stem. 8cm diameter entrance. Extends horizontally 15cm, upwards 10cm into narrow spire and downwards 25cm. Nest material at base.	1	
							Woodpecker hole	4.5	SW	Woodpecker trial hole. 7cm diameter entrance. Extends 7cm horizontally only. Unsuitable.	3	
							Woodpecker hole	4.2	SW	Woodpecker hole in main stem. 7cm diameter entrance. Extends 15cm horizontally and 25cm downwards. Clean, old bird nest material present.	1	
14/01/15	Sunshine, 6°C, moderate breeze (3-4), clear skies.	36b	Ash	Semi-mature	Unknown	No	Woodpecker hole	5	S	Multi-stem ash 8m north of Tree 36. Woodpecker hole on broken dead stem.	1	1
14/01/15	Sunshine, 6°C, moderate breeze (3-4), clear skies.	37	Oak	Semi-mature	56	Yes	Hazard beam	4	S	Hazard beam on east pointing limb. Cavity is open, does not extend more than 5cm beyond edge of opening. Low suitability.	2	2

Date	Weather	Tree ID	Species	Age	DBH (cm)	Safe to climb	PRF Type	Height (m)	Aspect	Description	PRF Grade	Overall Grade
13/01/15	Sunshine, 11°C, damp, light breeze (2-3)	38	Ash	Semi-mature	43	Yes	Woodpecker hole	9	W	Woodpecker hole on underside of west pointing limb, close to main stem. Extends upward 15cm, horizontally 15cm and downward 18cm. 8cm diameter entrance and cavity 10cm diameter. Dry, clean.	1*	1*
							Woodpecker hole	4	NW	Multiple woodpecker holes in dead upward angled west pointing limb. Holes are upward angled, shallow or open/exposed. Dry, clean.	2	
13/01/15	Sunshine, 11°C, damp, light breeze (2-3)	39	Ash	Semi-mature	53	Yes	Woodpecker hole	13	E	Woodpecker hole in northern most co-dominant stem. Shallow unsuitable.	3	3
							Knot hole	14	S	Knot hole on northernmost co-dominant stem. Shallow, unsuitable.	3	
							Woodpecker hole	10	SE	Woodpecker hole in southernmost co-dominant stem. Shallow, unsuitable.	3	
14/01/15	Sunshine, 6°C, moderate breeze (3-4), clear skies.	40	Ash	Semi-mature	unknown	No	Woodpecker hole	15	SE	Woodpecker holes (x2) in dead section at top of main stem.	1	1
15/01/14	Sunshine, 6°C, moderate breeze (3-4), clear skies.	41	Ash	Mature	76	Yes	Butt rot	0-3	NE	Butt rot and large tear out resulted in hollow main stem. Cavity 30cm diameter and open at top and bottom.	2	1*
							Rot hollow	3	NE	Hollow section of east pointing vertical limb extends upwards 80cm with 8cm diameter	1*	

Date	Weather	Tree ID	Species	Age	DBH (cm)	Safe to climb	PRF Type	Height (m)	Aspect	Description	PRF Grade	Overall Grade
										and is clean, dry.		
							Rot hollow	3	SE	Hollow section of NW pointing horizontal limb. 15cm diameter at entrance and throughout length for 1.5m. Very open, unsuitable.	3	
							Knot hole	2.5	NW	Large knot hole on underside of NW pointing horizontal limb. Small crevice opening (2cm wide) leading NW for 20cm with 3cm diameter cavity.	2	

Appendix D. 2016 Link Area - Targeted Update Ground-Based Visual Inspections of Trees Directly or Partially Impacted by the Scheme

Tree Details					Feature (Mark 'Y' Where Present)												Assessment		
Tree No.	Grid reference	Species	Height (m)	Diameter Breast Height (cm)	Woodpecker hole	Rot hole	Limb cavity	Trunk cavity	Crack	Loose bark	Dense ivy	Other:	Aspect	Height (mAGL)	Extent / Diameter (cm)	Evidence of bats? (Y/N)	Category (see below)	Further survey required?	Notes
'Extra Oak'	TL 49722 12028	Oak	18	52		Y							NE	8m	8cm	N	Moderate	Yes	Knot hole in thick stem of ivy
											Y		All	N/A	N/A	N	Moderate	Yes	Very thick ivy creating several crevices with potential for bat use
										Y			All	N/A	N/A	N	Moderate	Yes	Potential near crown
T150i	TL 49692 12116	Ash	18	39		Y						Small knot hole	E	14m	5	N	Low to moderate	Yes	Most of the tree in good condition
										Y			E	N/A	N/A	N	Low to moderate	Yes	Small canker with fissured bark
T148i	TL 49702 12142	Field Maple	14	22, 21,41							Y		All	N/A	N/A	N	Unknown – ivy obscuring tree	Yes	Ivy to mid crown possibly covering potential

Tree Details					Feature (Mark 'Y' Where Present)												Assessment		
Tree No.	Grid reference	Species	Height (m)	Diameter Breast Height (cm)	Woodpecker hole	Rot hole	Limb cavity	Trunk cavity	Crack	Loose bark	Dense ivy	Other:	Aspect	Height (mAGL)	Extent / Diameter (cm)	Evidence of bats? (Y/N)	Category (see below)	Further survey required?	Notes
																			features
T153i	TL 49692 12116	Oak	18	33	Y								N	10	8	N	Low to moderate	Yes	
T154i	TL 49703 12089	Oak	18	57		Y						Small amou nt of ivy.	N	8	15	N	Low to moderate	Yes	Knot hole developed from broken limb
New1	TL 49015 12529	Horse chestnut	12	46		Y							N	3	10	N	Moderate	Yes	Rotten entrance leads up to void
	TL 49015 12529	Horse chestnut	12	46		Y					Y		NE	2	20	N	Moderate	Yes	
New2	TL 49017 12521	Horse chestnut	12	40			Y						E	2.5	15	N	Moderate	Yes	Possibly a rot hole instead of limb cavity
	TL 49017 12521	Horse chestnut	12	40		Y							E	3.5	3	N	Moderate	Yes	Several small holes/ fissures around the tree, particularly on southern limb

Tree Details					Feature (Mark 'Y' Where Present)												Assessment		
Tree No.	Grid reference	Species	Height (m)	Diameter Breast Height (cm)	Woodpecker hole	Rot hole	Limb cavity	Trunk cavity	Crack	Loose bark	Dense ivy	Other:	Aspect	Height (mAGL)	Extent / Diameter (cm)	Evidence of bats? (Y/N)	Category (see below)	Further survey required?	Notes
	TL 49017 12521	Horse chestnut	12	40						Y	Y		NE	3.5	7	N	Moderate	Yes	
New5	TL 49021 12491	Field maple	18	19,23, 51				Y					SE	0-3	3	N	Moderate	Yes	Large straight wound in base of tree which seems to open up into void within the tree

Appendix E. 2016 Gilden Way Ground-Based Results

Tree details					Feature (tick as appropriate)												Assessment		
Wood/ Tree/Group No.	Grid reference	Species	Height (m)	DBH (cm)	Woodpecker hole	Rot hole	Limb cavity	Trunk cavity	Crack	Loose bark	Dense ivy	Notes	Aspect	Height (mAGL)	Extent / Diameter (cm)	Evidence of bats?	Category of feature	Overall category	Further survey required
W93	TL 48004 11620	Sycamore	18	40							Y	Not safe to climb	All	All	N/A	No	unk	1	Emergence/ re-entry
		Cherry	8	20							Y		All	All	N/A	No	2		
		Hazel	6	M	No features								N/A	N/A	N/A	No	3		
		Poplar	20+	60							Y		All	All	N/A	No	1		
		Willow	6	M							Y		All	All	N/A	No	2		
G88	TL 47918 11497	Elder	4	OBS	OBS	OBS	OBS	OBS	OBS	OBS	OBS		-	-	-	-	-	-	Ground-based assessment
		Ash	14	OBS	OBS	OBS	OBS	OBS	OBS	OBS	Y		All	All	N/A	-	-		
		Yew	6	OBS	OBS	OBS	OBS	OBS	OBS	OBS	OBS		-	-	-	-	-		
		Holly	6	OBS	OBS	OBS	OBS	OBS	OBS	OBS	OBS		-	-	-	-	-		
		Hazel	4	OBS	OBS	OBS	OBS	OBS	OBS	OBS	OBS		-	-	-	-	-		
T86	TL 47886 11462	Poplar	20+	OBS	OBS	OBS	OBS	OBS	OBS	OBS	Y		All	All	N/A	-	-	-	Climb – to search for features beneath ivy

Tree details					Feature (tick as appropriate)												Assessment		
Wood/ Tree/Group No.	Grid reference	Species	Height (m)	DBH (cm)	Woodpecker hole	Rot hole	Limb cavity	Trunk cavity	Crack	Loose bark	Dense ivy	Notes	Aspect	Height (mAGL)	Extent / Diameter (cm)	Evidence of bats?	Category of feature	Overall category	Further survey required
G85	TL 47879 11450	Alder	10	30	OBS	OBS	OBS	OBS	OBS	OBS	Y		All	All	N/A	-	-	-	Ground-based assessment
G82	TL 47860 11427	Sycamore	08 - 14	15 - 70	OBS	OBS	OBS	OBS	OBS	OBS	Y		-	-	-	-	-	-	Ground-based assessment
G80	TL 47838 11400	Oak	12	60	OBS	OBS	OBS	OBS	OBS	OBS	OBS		-	-	-	-	-	-	Ground-based assessment
		Ash	10	2X30	OBS	OBS	Y	OBS	OBS	OBS	OBS		-	-	-	-	-	-	
T75	TL 47723 11318	Oak	18	200			Y						E	4	150	No	1*	1*	Climb
						Y						On low branch	S	4	15	No	1		
							Y						NW	9	200	No	1		
T72	TL 47664 11285	Oak	15	100							Y	ivy obscuring trunk	All	All	N/A	No	unk	unk	Climb – to check for features
T54	TL 47557 11234	Oak	12	120			Y					x 2 upwards	N	3	100-200	No	1*	1*	Climb
						Y						x2 holes	SW	2-2.5	15 / 20	No	1		

Tree details					Feature (tick as appropriate)												Assessment		
Wood/ Tree/Group No.	Grid reference	Species	Height (m)	DBH (cm)	Woodpecker hole	Rot hole	Limb cavity	Trunk cavity	Crack	Loose bark	Dense ivy	Notes	Aspect	Height (mAGL)	Extent / Diameter (cm)	Evidence of bats?	Category of feature	Overall category	Further survey required
							Y			Y		large limb hollow	S	3-6	Whole limb	No	1		
						Y	Y					possibly a nest inside	E	4	25	No	1		
G45	TL 47834 11371	Elm	6	20-30	Y	Y							NW	4	5	No	1-2	1-2	Climb (using ladder)
		Sycamore	8	30	No features								n/a	n/a	n/a	No	-	Neg	None
T46	TL 47843 11367	Oak	20	125							Y	ivy obscures canopy	All	All	n/a	No	unk	unk	Climb – to check for features
T42	TL 47904 11451	Crack willow	18	M (40)		Y			Y			rot hole blank , crack close to ground	S	1	150	No	2	2	Emergence/ re-entry
T40	TL 47910 11457	Willow	8	30							Y	Ivy obscures trunk. Not safe to climb	All	All	n/a	No	unk	unk	Emergence/ re-entry
T2	TL 48762 12055	Field maple	10	2x40							Y	Ivy obscures trunk - canopy visible. Not safe to climb	All	0-6	n/a	No	unk	unk	Emergence/ re-entry

Tree details					Feature (tick as appropriate)												Assessment		
Wood/ Tree/Group No.	Grid reference	Species	Height (m)	DBH (cm)	Woodpecker hole	Rot hole	Limb cavity	Trunk cavity	Crack	Loose bark	Dense ivy	Notes	Aspect	Height (mAGL)	Extent / Diameter (cm)	Evidence of bats?	Category of feature	Overall category	Further survey required
T18	TL 48189 11750	Black poplar	20	60	OBS	OBS	OBS	OBS	OBS	OBS	OBS	Obscured by fence - in private garden	-	-	-	-	-	-	Ground-based assessment
G28	TL 48063 11636	Cherry	8-12	20-60	No features								n/a	n/a	n/a	No	-	Neg	None
		Cherry	12	60							Y	Not safe to climb. Tree nearest road	All	All	n/a	No	unk	unk	Emergence/ re-entry
T101	TL 48128 11731	Lombardy poplar	20+	2x60							Y	Not safe to climb	All	All	n/a	No	unk	unk	Emergence/ re-entry
G103	TL 48152 11751	Sycamore	15	30-40							Y	Ivy obscures canopy. Not safe to climb	All	All	n/a	No	unk	unk	Emergence/ re-entry

Y = feature present; OBS = feature obscured from view; Category of tree: Neg=negligible, Low=low, Mod=moderate, Hi=high, unk =where dense ivy present tree category not assigned as could not see if features present or not.

Appendix F. 2016 Gilden Way Climbing Survey Results

Tree details					Feature (tick as appropriate)												Assessment		
Wood/Tree/Group No.	Grid reference	Species	Height (m)	DBH (cm)	Woodpecker hole	Rot hole	Limb cavity	Trunk cavity	Crack	Loose bark	Dense ivy	Notes	Aspect	Height (mAGL)	Extent / Diameter (cm)	Evidence of bats?	Post climb category of feature	Post-climb category of tree	Further survey required
T86	TL 47886 11462	Poplar	20+	-							Y	No features	All	All	n/a	No	N/A	Neg	No
G85	TL 47879 11450	Alder	10	30							Y	No features	All	All	n/a	No	N/A	Neg	No
G82	TL 47860 11427	Sycamore	08 - 14	15 - 70							Y	No features	-	-	-	-	-	Neg	No
G80	TL 47838 11400	Oak	12	60								No suitable features, when accessed	-	-	-	-	-	Neg	No
		Ash	10	2x30									-	-	-	-	-	Neg	No
T75	TL 47723 11318	Oak	18	200			Y					Open, but tapering, with laminated heart wood	E	4	150	No	High	High	Emergence/ re-entry
							Y						NW	9	200	No	Mod - High		
						Y						On low branch – feature blank	S	4	15	No	Low		

Tree details					Feature (tick as appropriate)												Assessment		
Wood/Tree/Group No.	Grid reference	Species	Height (m)	DBH (cm)	Woodpecker hole	Rot hole	Limb cavity	Trunk cavity	Crack	Loose bark	Dense ivy	Notes	Aspect	Height (mAGL)	Extent / Diameter (cm)	Evidence of bats?	Post climb category of feature	Post-climb category of tree	Further survey required
						Y						On branch above low branch, extending towards Gilden Way	S	6	15	unk – could not be accessed	unk - could not be accessed		
T72	TL 47664 11285	Oak	15	100							Y	No features	All	All	n/a	No	Low	Neg	No
T54	TL 47557 11234	Oak	12	120			Y					x 2 opening upwards and exposed	N	3	100 & 200	No	Mod	High	Emergence/ re-entry
						Y						x2 rot holes	SW	2-2.5	15 & 20	No	Mod		
										Y		Not hollow, loose bark quite extensive	S	3-6	Area 50 x 50	No	Low - Mod		
						Y	Y					Bird's nest inside	E	4	25	No	Mod		
										Y		At base of western stem	W	3-4	Area 100x 200	No	Mod - High		

Tree details					Feature (tick as appropriate)												Assessment		
Wood/Tree/Group No.	Grid reference	Species	Height (m)	DBH (cm)	Woodpecker hole	Rot hole	Limb cavity	Trunk cavity	Crack	Loose bark	Dense ivy	Notes	Aspect	Height (mAGL)	Extent / Diameter (cm)	Evidence of bats?	Post climb category of feature	Post-climb category of tree	Further survey required
G45	TL 47834 11371	Sycamore	6	20-30	Y	Y							NW	4	5	No	Low	Neg	No
T46	TL 47843 11367	Oak	20	125							Y	Ivy obscures canopy	All	All	N/A	unk	unk	High	Emergence/ re-entry

Y = feature present , Category of tree: Neg=negligible, Low=low, Mod=moderate, Hi=high, ? = feature couldn't be accessed and assessed.

Appendix G. 2014 Tree Emergence / Re-entry Survey Details and Results

Tree No.	Grade	Number Activity Surveys Required	Date	Start / End Time	Emergence / Re-entry Observed	Temp (°C)	Cloud Cover (%)	Precipitation	Wind Speed	Bat Activity Recorded
2	1	3	15/09/14	19:00 – 21:00	No	17	30	Dry	Light	Occasional commuting soprano pipistrelle. Numerous common pipistrelle bats recorded commuting and foraging along the hedgerow. Several commuting *Myotis* bats and noctule passes. Two Daubenton's passes.
			16/09/14	05:10 – 06:35	No	11	Misty	Dry	Light	Occasional common pipistrelle and soprano pipistrelle commuting activity. Several noctule passes.
			Survey 2 to be conducted 2015							
			Survey 3 to be conducted 2015							
9	1	3	15/09/14	19:00 – 21:00	No	16	40	Dry	Calm	Numerous foraging noctule passes along the tree line beside the road. Occasional common pipistrelle passes.
			16/09/14	05:00 – 06:35	No	10	100	Dry	Calm	No bat activity recorded.
			Survey 2 to be conducted 2015							
			Survey 3 to be conducted 2015							
60	1	3	10/09/14	19:15 – 20:55	No	17	80	Dry	Calm	Numerous foraging common pipistrelle passes.
			11/09/14	05:00 –	No	10	100	Dry	Calm	No bat activity recorded.

Tree No.	Grade	Number Activity Surveys Required	Date	Start / End Time	Emergence / Re-entry Observed	Temp (°C)	Cloud Cover (%)	Precipitation	Wind Speed	Bat Activity Recorded
				06:26						
			Survey 2 to be conducted 2015							
			Survey 3 to be conducted 2015							
60A	1	3	10/09/14	19:20 – 21:00	No	18	80	Dry	Light	Occasional commuting and foraging common pipistrelle.
			11/09/14	05:00 – 06:26	No	10	100	Dry	Calm	One commuting noctule.
			Survey 2 to be conducted 2015							
			Survey 3 to be conducted 2015							
61	2	2	01/08/14	19:19 – 21:19	No	19	100	Dry	Light	Numerous common pipistrelle bats foraging and commuting along the woodland edge Occasional soprano pipistrelle commuting along the woodland edge.
			02/08/14	04:47 – 06:13	No	14	90	Dry	Calm	Occasional commuting common pipistrelle and soprano pipistrelle. Two brief commuting *Myotis* passes. Thirteen noctule passes.
			Survey 2 to be conducted 2015							
			Survey 3 to be conducted 2015							
61A	1* Roost	3	23/09/14	18:38 – 20:27	No	15	70	Dry	Light	Two commuting common pipistrelle and noctule bats.

Tree No.	Grade	Number Activity Surveys Required	Date	Start / End Time	Emergence / Re-entry Observed	Temp (°C)	Cloud Cover (%)	Precipitation	Wind Speed	Bat Activity Recorded
			24/09/14	05:18 – 06:48	No	13	100	Dry	Moderate	Several commuting soprano pipistrelle bats.
			Survey 2 to be conducted 2015							
			Survey 3 to be conducted 2015							
61B	1	3	23/09/14	18:40 – 20:27	No	15	50	Dry	Calm	Several commuting common pipistrelle bats.
			24/09/14	05:18 – 06:48	No	13	-	Dry/light	Light	Two brief commuting soprano pipistrelle bats.
			Survey 2 to be conducted 2015							
			Survey 3 to be conducted 2015							
64	1	3	23/09/14	18:40 - 20:30	No	15	60	Dry	Calm	Numerous common pipistrelle and soprano pipistrelle passes. Eight *Myotis* passes and one Daubenton's pass.
			24/09/14	05:28 - 06:48	No	12	100	Dry	Light	Numerous common pipistrelle and soprano pipistrelle passes. One brief *Myotis* pass.
			Survey 2 to be conducted 2015							
			Survey 3 to be conducted 2015							
23	2	2	Survey 1 to be conducted 2015							
			Survey 2 to be conducted 2015							
24	2	2	Survey 1 to be conducted 2015							

Tree No.	Grade	Number Activity Surveys Required	Date	Start / End Time	Emergence / Re-entry Observed	Temp (°C)	Cloud Cover (%)	Precipitation	Wind Speed	Bat Activity Recorded
			Survey 2 to be conducted 2015							
26	2	2	Survey 1 to be conducted 2015							
			Survey 2 to be conducted 2015							

Appendix H. 2015 Tree Emergence / Re-entry Details and Results

Date	Tree Number	Sunset / Sunrise	Start time	End time	Temperature (˚C)	Cloud Cover (%)	Wind	Precipitation	Emergence/ Re-entry
08/06/2015	2	21:15	20:50	22:45	11 - 7	50	None	None	No
09/06/2015	9	04:42	03:00	04:42	9	0	None	None	No
09/06/2015	60A	21:16	20:53	22:46	10	90	None	None	No
15/06/2015	61A	21:19	20:50	22:50	15	0	None	None	No
16/06/2015	64	21:19	21:25	23:20	17	20	Light	None	No
16/06/2015	61B	04:40	03:10	04:40	6	5	None	None	No
17/06/2015	61	04:40	03:10	04:40	12	10	None	None	No
19/06/2015	60	21:16	20:45	22:45	10	90	None	None	No
22/07/2015	60A	05:07	03:30	05:10	16	0	None	None	No
22/07/2015	60	05:07	03:30	05:07	16	0	None	None	No
22/07/2015	2	21:04	20:30	22:35	17	30	None	None	No
23/07/2015	9	05:10	03:38	05:10	12	90	None	None	No
29/07/2015	61A	05:17	03:47	05:17	11	0	None	None	No
29/07/2015	61B	05:17	03:50	05:18	11	0	None	None	No
29/07/2015	64	20:54	20:40	22:26	16	60	None	None	No

Appendix I. 2016 Tree Emergence/ Re-entry Survey Details and Results

Date	Tree ref	Sunrise/ sunset time	Start time	End time	Temp °C	Cloud cover (%)	Wind (beaufort scale)	Precipitation	Emergence/Re-entry
29.06.16	G28	04:44	03:05	05:00	12-10	85	2-0	None	No
28.07.16	G28	05:20	03:50	05:35	18-14	90	1-2	None	No
10.08.16	G28	20:28	21:17	21:58	19-14	30	0-0	None	No
01.07.16	G103	04:42	03:00	05:00	16-14	100	3-1	None	No
14.07.16	G103	04:58	03:28	05:13	12-11	30	1-1	None	No
11.08.16	G103	20:30	20:28	21:56	22-16	50	2-2	None	2 x likely emergence
28.06.16	W93	21:35	21:05	22:45	15-16	80	1-0	Light rain 22:10, heavy by 22:20, light by 22:30	No
26.07.16	W93	20:57	20:43	22:27	24-22		2-2	None	
10.08.16	W93	05:58	04:08	05:53	11-8	0-30	0-0	None	No
28.06.16	T2	21:22	21:00	22:45	15-16	90	1-0	Light at 22:20 for 15 minutes	No
14.07.16	T2	04:58	03:28	05:13	12-10	35	0-0	None	No
10.08.16	T2	05:37	04:07	05:52	11-8	0	0-0	None	No
29.06.16	T40	04:45	03:15	05:00	12-10	85	2-0	None	No
27.07.16	T40	20:56	20:41	22:26	23-23	60	1-1	None	No
11.08.16	T40	20:26	20:20	21:54	22-16	<5	0-0	None	No
30.06.16	T46	21:22	21:00	22:45	18-16	80	2-1	Light at 22:46	Yes – 2 x bats
13.07.16	T46	21:13	21:58	22:43	16-18	40-0	2-0	None	Possible emergence

Date	Tree ref	Sunrise/ sunset time	Start time	End time	Temp °C	Cloud cover (%)	Wind (beaufort scale)	Precipitation	Emergence/Re-entry
12.08.16	T46	05:39	04:09	05:49	18-14	90	0-0	None	No
30.06.16	T54	04:41	03:10	05:00	15-13	80	1-1	None	No
27.07.16	T54	05:16	03:42	05:16	20-17		3-3	None	
10.08.16	T54	20:28	20:13	21:58	19-14	25	0-0	None	No
29.06.16	T75	21:22	21:00	22:45	17-15	80	3-1	Number of light showers	Yes – 1 x bat
11.07.16	T75	21:13	20:58	22:43	14-12	<5	4-0	None	No
11.08.16	T75	05:39	04:09	05:53	15-15	40-80	1-2	Very light shower before start of survey (approx. 03:45) and then from 05:20 until end of survey.	No
29.06.16	T101	21:22	21:05	22:21	17-15	80	3-1	Light rain 21:17-21:29 and 21:39-29:34	No
16.07.16	T101	21:13	20:58	22:43	13-11	40	2-0	None	Yes – 3 x bats
11.08.16	T101	05:39	04:09	05:54	14-14	100	3-3	None	No

Appendix J. 2014 Transect Survey Details

Transect Number	Date	Sunrise/ Sunset Time	Start/ End Times	Temp (°C)	Wind Speed	Cloud Cover (%)	Precipitation
1	06/05/2014	20.32	20:30 - 22:25	15.3	Light	30	Dry
	13/06/2014	04:40	02:40 - 04:40	13	None	0	Dry
	14/07/2014	21:13	20:45 - 22:45	20	Moderate	90	Dry
	12/08/2014	05:39	04:05 - 05:40	14	Moderate	<5	Dry
	08/09/2014	19:31	19:12 - 21:13	14	Light	20	Dry
2	09/05/2014	05:17	03:19 - 05:17	12	Light / Moderate	95	Dry
	11/06/2014	04:40	02:40 - 04:40	12	Light	0	Dry
	14/07/2014	21:13	20:35 - 22:45	20	Moderate	80	Dry
	15/07/2014	04:58	02:57 - 05:00	16	Light	100	Dry
	11/08/2014	20:30	20:30 - 22:00	17	Moderate	10	Dry
	11/09/2014	19:23	19:05 - 20:53	16	Moderate	100	Dry
3	07/05/2014	20:33	20:00 - 22:00	13	Moderate	30	Dry
	08/05/2014	05:18	03:18 - 05:20	11	Moderate	80	Dry
	13/06/2014	04:40	02:33 - 04:20	14	Calm	0	Dry
	16/07/2014	21:11	20:50 - 22:40	22	Light	80	Dry
	28/08/2014	19:56	19.30 - 21:30	16	Light	40	Dry
	12/09/2014	06:27	05:55 - 06:30	10	Moderate	100	Dry
4	17/05/2014	05:22	03:19 - 05:09	12	Light	50	Dry
	12/06/2014	21:18	20:50 - 22:50	14	Light	10	Dry
	13/06/2014	04:41	02:41 - 04:41	9	Light	5	Dry
	15/07/2014	04:58	03:05 - 04:50	18	Light	80	Dry
	28/08/2014	19:56	19.30 - 21:30	16	Light	80	Dry
	09/09/2014	19:29	19:10 - 21:10	15	Moderate	20	Dry
5	08/05/2014	20:34	20:05 - 22:05	13	Moderate	20 - 100	Dry
	17/06/2014	04:40	02:40 - 05:10	13	Calm	5	Dry
	15/07/2014	21:12	20:40 - 22:50	17.5	Light	20-30	Dry
	04/08/2014	20:45	20:15 - 22:15	20.5	Light	60	Light
	05/08/2014	05:26	03:55 - 05:30	12	Light	60	Dry
	09/09/2014	06:24	04:54 - 06:23	9	Light	20	Dry
6	14/05/2014	20:44	20:45 - 22:30	13	Light	10	Dry
	10/06/2014	21:16	20:45 - 22:45	14	Moderate	0	Dry
	17/07/2014	05:01	03:30 - 05:00	17	Calm	100	Dry

Transect Number	Date	Sunrise/ Sunset Time	Start/ End Times	Temp (°C)	Wind Speed	Cloud Cover (%)	Precipitation
	28/08/2014	19:56	19:15 - 21:30	16	Light	30	Dry
	09/09/2014	19:29	19:15 - 21:00	18	Light	0	Dry
	10/09/2014	06:27	04:54 - 06:30	10	Light	90	Dry

Transect Number	Date	Species Recorded	Activity Type	Summary of Activity	No. of Bat Recordings
1	06/05/2014	Noctule	Commuting	-	1
		Common pipistrelle	Commuting	Bats recorded commuting along the woodland edge to the south of the lake and by the access track to the lake.	36
2	09/05/2014	Common pipistrelle	Commuting Foraging	Bats recorded commuting and foraging along the northern and western edge of Moor Hall Woodland.	15
		Soprano pipistrelle	Commuting Foraging	Bats recorded commuting and foraging along the northern and western edge of Moor Hall Woodland. Brief pass along the eastern embankment of the M11.	1
3	07/05/2014	*Myotis sp.*	-	-	1
		Common pipistrelle	Foraging Commuting	Bats recorded along the extent of the transect. Activity primarily along the hedgerow adjacent to Sheering Lower Road.	98
		Soprano pipistrelle	Foraging	Bats recorded foraging along the thick belt of woodland to the south of Mayfield Farm and along the hedgerow adjacent to Sheering Lower Road.	41
3	08/05/2014	Common pipistrelle	Foraging	Bat activity primarily recorded along the hedgerow adjacent to Sheering Lower Road.	30
		Soprano pipistrelle	Foraging	Bats recorded foraging along the hedgerow adjacent to Sheering Lower Road.	27
4	17/05/2014	Common pipistrelle	Foraging Commuting	Occasional brief calls along the Pincey Brook.	13
		Soprano pipistrelle	-	-	4
5	08/05/2014	Leisler's bat	-	-	1
		Noctule	-	-	1

		Common pipistrelle	Foraging Commuting	Bats recorded commuting and foraging along the ditch within The Mores Woodland and along the eastern edge of the woodland.	10
		Soprano pipistrelle	-	-	3
6	14/05/2014	Common pipistrelle	Commuting Foraging	Lots of foraging activity over the ponds located at Morgan's Farm on the western side of the transect. Occasional pass along the southern edge of The Mores Woodland and along Moor Hall Road.	97
		Soprano pipistrelle	Foraging	Lots of foraging activity over the ponds located at Morgan's Farm on the western side of the transect. Occasional pass along the southern edge of The Mores Woodland.	38
1	13/06/2014	Leisler's bat	-	-	1
		Noctule	-	-	3
		Common pipistrelle	Foraging	Bats recorded foraging within the woodland to the west of the lake.	11
		Soprano pipistrelle	Foraging	Bats recorded foraging within the woodland to the west of the lake.	5
2	11/06/2014	Common pipistrelle	Commuting Foraging	Foraging activity along the eastern embankment of the M11 and along the northern boundary of Moor Hall Woodland. Occasional commuting bat recorded to the south of Moor Hall Woodland and along the M11 embankment.	32
3	13/06/2014	*Myotis sp.*	-	-	2
		Noctule	Commuting Swarming	Commuting activity recorded near the woodland south of Pincey Brook. Brief commuting and possible swarming activity near a large sycamore within the woodland to the north of Mayfield Farm.	4
		Common pipistrelle	Commuting Foraging	Foraging activity recorded adjacent to the block of woodland to the south of Mayfield Farm and along the hedgerow to the north of the transect. Commuting activity recorded along the hedgerow adjacent to Sheering Road and in the south west corner of the Mores Woodland.	60
		Soprano pipistrelle	-	-	4
4	12/06/2014	Common pipistrelle	Commuting	Bats not recorded on AnaBat. Occasional commuting activity along the Pincey Brook.	0

4	13/06/2014	Common pipistrelle	Commuting	Occasional commuting activity along the Pincey Brook. One bat recorded along the eastern embankment of M11 flying in a northerly direction.	3
5	17/06/2014	Common pipistrelle	Foraging Commuting	Bats recorded commuting and foraging along the ditch within The Mores Woodland and along the eastern edge of the woodland. Occasional pass along the M11 motorway embankment.	30
		Soprano pipistrelle	Foraging Commuting	Bats recorded commuting and foraging along the ditch within The Mores Woodland.	2
6	10/06/2014	Leisler's bat	-	-	3
		Myotis sp.	-	-	1
		Common pipistrelle	Foraging Commuting	Lots of foraging activity over the ponds located at Morgan's Farm on the western side of the transect and along the hedgerow leading south towards Moor Hall Road. Occasional pass along Moor Hall Road and to the south of The Mores Woodland.	80
		Soprano pipistrelle	Foraging	Lots of foraging activity over the ponds located at Morgan's Farm on the western side of the transect and occasional foraging activity to the south of The Mores Woodland.	21
1	14/07/2014	Leisler's bat	-	-	1
		Noctule	-	-	2
		Common pipistrelle	Foraging	Bats recorded foraging along the extent of the transect.	68
		Soprano pipistrelle	Foraging	Bats recorded foraging within the woodland to the west of the lake.	37
2	14/07/2014	Noctule	-	-	2
		Common pipistrelle	Foraging Commuting	Foraging and commuting activity primarily recorded along the western and eastern edges of Moor Hall Woodland. Occasional recording along the eastern and northern hedgerows.	31
		Soprano pipistrelle	Foraging Commuting	Foraging and commuting activity primarily recorded along the western and eastern edges of Moor Hall Woodland. Occasional recording along the eastern and northern hedgerows.	7
2	15/07/2014	Common pipistrelle	Foraging	Lots of foraging activity throughout the survey area. Activity centred on the northern and eastern edges of Moor Hall Woodland, the hedgerow to the east and M11 embankments.	16

		Soprano pipistrelle	Foraging	Lots of foraging activity throughout the survey area. Activity centred on the northern and eastern edges of Moor Hall Woodland, the hedgerow to the east and M11 embankments.	4
3	16/07/2014	Daubenton's bat	-	-	3
		Myotis sp.	-	-	1
		Common pipistrelle	Foraging Commuting	Foraging and commuting activity recorded along the hedgerow adjacent to Sheering Lower Road and along the hedgerow to the north of the transect. Bats recorded foraging along the southern boundary of the transect and into the arable field.	11
		Soprano pipistrelle	Foraging	Bats recorded foraging over the arable field to the south of the scheme and along the hedgerow to the north of the transect.	3
4	15/07/2014	Unknown bat sp.	-	-	1
		Noctule	-	-	1
		Common pipistrelle	Foraging Commuting	Occasional foraging and commuting activity recorded along the Pincey Brook and on the western side of the M11 underpass.	27
		Soprano pipistrelle	Foraging Commuting	Occasional foraging and commuting activity recorded along the Pincey Brook.	9
5	15/07/2014	Daubenton's bat	-	-	4
		Myotis sp.	-	-	2
		Common pipistrelle	Foraging Commuting	Bats recorded commuting and foraging along the ditch within The Mores Woodland and along the eastern and northern edges of the woodland. Occasional pass along the M11 motorway embankment.	6
		Soprano pipistrelle	-	-	3
6	17/07/2014	Common pipistrelle	Foraging Commuting	Foraging activity recorded along Moor Hall Road and to the south of The Mores Woodland. Occasional commuting activity recorded along the northern boundary of the transect.	12
		Soprano pipistrelle	Foraging Commuting	Foraging and commuting activity recorded along the southern edge of The Mores Woodland.	2

1	12/08/2014	Daubenton's bat	Commuting	Bat recorded commuting along the Pincey Brook.	1
2	11/08/2014	Leisler's bat	-	-	2
		Noctule	-	-	4
		Common pipistrelle	Foraging Commuting	Bats recorded foraging and commuting along the southern, eastern and northern edge of Moor Hall woodland.	27
		Soprano pipistrelle	Foraging	Bats recorded foraging along the northern edge of Moor Hall Woodland.	7
3	28/08/2014	Common pipistrelle	Commuting Foraging	Bats recorded commuting and foraging along the extent of the transect.	16
		Soprano pipistrelle	Foraging	Bats recorded foraging along the hedgerow adjacent to Sheering Lower Road.	3
4	28/08/2014	Common pipistrelle	Commuting Foraging	Foraging activity recorded to the south of the Pincey Brook by the small area of woodland and along the eastern embankment of the M11. One bat also recorded commuting by the access track to the M11 underpass.	32
		Soprano pipistrelle	-	-	9
5	04/08/2014	Daubenton's	-	-	1
		Myotis sp.	Foraging	Bat observed foraging along the eastern and northern edges of The Mores Woodland.	2
		Noctule	Foraging	Bat observed foraging along the eastern edge of The Mores Woodland.	3
		Common pipistrelle	Foraging	Bats recorded foraging along the ditch within The Mores Woodland and along the eastern and northern edges of the woodland.	14
		Soprano pipistrelle	-	-	2
5	05/08/2014	Noctule	-	-	1
		Common pipistrelle	Foraging	Bats recorded foraging along the ditch within The Mores Woodland and along the eastern and northern edges of the woodland.	3
		Soprano pipistrelle	-	-	3
6	28/08/2014	Leisler's bat	Commuting	Bat recorded briefly commuting along the western hedgerow.	2
		Myotis sp.	-	-	1
		Common pipistrelle	Foraging Commuting	Foraging activity recorded over the ponds located at Morgan's Farm on the	57

				western side of the transect and along the hedgerow leading south towards Moor Hall Road. Occasional pass along Moor Hall Road and to the south of The Mores Woodland	
		Soprano pipistrelle	Commuting	Bats recorded in the north east corner of the transect to the south of The Mores Woodland.	6
1	08/09/2014	Daubenton's bat	-	-	1
		Myotis sp.	-	-	1
		Noctule	-	-	138
		Common pipistrelle	Foraging Commuting	Bats recorded along the access track to the lake and into the woodland to the west of the lake.	10
		Soprano pipistrelle	Foraging Commuting	Bats recorded along the access track to the lake and into the woodland to the west of the lake.	
2	11/09/2014	Noctule	Foraging	Bat recorded foraging above the hedgerow to the west of the transect.	1
		Common pipistrelle	Foraging	Bats recorded along the extent of the transect but primarily along the edges of Moor Hall Woodland. Occasional recordings along the hedgerow to the east and north and along the M11 embankment.	66
		Soprano pipistrelle	Foraging	Bats recorded along the extent of the transect but primarily along the edges of Moor Hall Woodland. Occasional recordings along the hedgerow to the east and north and along the M11 embankment.	1
3	12/09/2014	Leisler's bat	-	-	11
		Myotis sp.	-	-	1
		Noctule	-	-	2
		Common pipistrelle	Foraging	Bats recorded foraging along the western boundary of Moor Hall Woodland.	10
		Soprano pipistrelle	-	-	1
4	09/09/2014	Leisler's bat	-	-	3
		Noctule	-	-	1
		Common pipistrelle	Commuting	Bats recorded commuting along the extent of the transect.	22
		Soprano pipistrelle	Foraging	Bats recorded to the east of the M11 underpass.	7

5	09/09/2014	Long-eared bat	-	-	1
		Noctule	-	-	1
		Common pipistrelle	Commuting	Only three bats recorded during the survey. Two calls recorded along the M11 motorway embankment and the third along the eastern edge of The Mores Woodland.	3
6	09/09/2014	Noctule	Foraging	Bats recorded foraging to the south of The Mores Woodland.	17
		Common pipistrelle	Foraging Commuting	Lots of foraging activity over the ponds located at Morgan's Farm on the western side of the transect. Occasional pass along Moor Hall Road, to the south of The Mores Woodland and along the M11 motorway embankment.	65
		Soprano pipistrelle	-	-	17
6	10/09/2014	Noctule	-	-	1
		Common pipistrelle	Foraging	Bats observed foraging over the ponds located at Morgan's Farm and to the south of The Mores Woodland.	6
		Soprano pipistrelle	Foraging	Bat observed foraging over the ponds located at Morgan's Farm.	1

Appendix K. 2016 Driven Transect Survey Details

Date	Sunrise/ sunset time	Start time	End time	Temp °C	Cloud cover (%)	Wind (Beaufort scale)	Precipitation
18.05.16	20:51	19:35	21:40	12 - 12	25	1-2	None
30.06.16	21:22	21:22	23:22	17-16	80	2-1	Light rain shower 22:00-23:00
11.07.16	21:15	21:15	23:15	17-15	<5	4-0	None
09.08.16	05:35	03:35	05:35	11-11	0	1-2	None
13.09.16	19:20	19:20	21:20	25-22	5-0	1-0	None

Appendix L. 2016 Gilden Way Vantage Point Survey Data

Month	Date	Metadata	Position	Visual observations			Height @ crossing
				Time	Species	Behaviour	
April	19/04/2016	Sunset: 20:02 Start time: 20:00 Finish time: 22:00 Temperature: 9-5˚C Wind (Beaufort): 0-1 Rain: None Cloud cover: 0-5%	A	No bats seen crossing			
			B	No bats seen crossing			
			C	22:05	P45	Commuting parallel to road	>5mAGL
			D	20:21	Bat	Crossed road	<5mAGL
				20:38	Bat	Crossed road	<5mAGL
				20:48	Bat	Crossed road	>5mAGL
			E	20:20	P45	Crossed road	>5mAGL
				20:30	P45	Foraging above street lights	>5mAGL
				20:33	P45	Foraging above street lights	>5mAGL
				21:06	Bat	Foraging above street lights	>5mAGL
				21:30	P45	Foraging above street lights	>5mAGL
May	19/05/2016	Sunset: 20:53 Start time: 20:45 Finish time: 22:45 Temperature: 15-13˚C Wind (Beaufort): 2-3 Rain: Light shower 20:30-20:35 Cloud cover: 20-20	A	No bats seen crossing			
			B	No bats seen crossing			
			C	22:30	P45	Crossed road	<5mAGL
			D	No bats seen crossing			
			E	No bats seen crossing			
June	09/06/2016	Sunset: 21:17 Start time: 20:45 Finish time: 22:45 Temperature: 17-14˚C Wind (Beaufort): 3-1 Rain: None	A	22:52	Pip	Crossed road	<5mAGL
			B	No bats seen crossing			
			C	21:55	P45	Crossed road	<5mAGL
			D	21:59	Bat	Crossed road	>5mAGL
			E	21:55	P45	Crossed road	>5mAGL
				22:04	P55	Crossed road	>5mAGL
July	12/07/2016	Sunrise: 04:55 Start time: 02:55 Finish time: 04:55 Temperature: 14-13˚C Wind (Beaufort): 0-1	A	03:09	P45	Crossed road	<5mAGL
				03:11	P45	Crossed road	<5mAGL
				03:19	Nyctalus	Crossed road	<5mAGL
				04:30	Noctule	Crossed road	>5mAGL
			B	04:20	P45	Crossed road	<5mAGL

Month	Date	Metadata	Position	Visual observations			Height @ crossing
				Time	Species	Behaviour	
		Rain: None Cloud cover: 50-60%	C	02:55	P45	Crossed road	<5mAGL
				03:00	P45	Crossed road	<5mAGL
				03:15	P45	Crossed road	<5mAGL
				04:14	P45	Crossed road	<5mAGL
			D	No bats seen crossing			
			E	No bats seen crossing			
August	09/08/2016	Sunset: 20:32 Start time: 20:32 Finish time: 22:32 Temperature: 15-15˚C Wind (Beaufort): 0-0 Rain: None Cloud cover: 70-0%	A	No bats seen crossing			
			B	No bats seen crossing			
			C	20:54	Bat	Crossed road	>5mAGL
			D	20:55	Pip	Crossed road	<5mAGL
				21:00	Bat	Crossed road	<5mAGL
				21:45	Bat	Crossed road	<5mAGL
				21:54	Pip	Crossed road	<5mAGL
			E	21:04	P45	Crossed road	<5mAGL
				21:16	P45	Foraging parallel to road	<5mAGL
				21:26	P45	Foraging parallel to road	<5mAGL
September	14/09/2016	Sunrise: 06:33 Start time: 04:33 Finish time: 06:30 Temperature: 19-17˚C Wind (Beaufort): 1-1 Rain: None Cloud cover: 0-0%	A	No bats seen crossing			
			B	No bats seen crossing			
			C	No bats seen crossing			
			D	No bats seen crossing			
			E	No bats seen crossing			

P45 = common pipistrelle; P55 = soprano pipistrelle; Bat = unidentified bat species

Appendix 8.4: Technical Report: Dormouse Survey

M11 Junction 7a

Essex County Council

Technical Report - Dormouse Survey

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December 2016

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Jacobs U.K. Limited

1180 Eskdale Road
Winnersh, Wokingham
Reading RG41 5TU
United Kingdom
T +44 (0)118 946 7000
F +44 (0)118 946 7001
www.jacobs.com

Contents

1. Methods

1.1 Study Area

The study area adopted for the dormouse (*Muscardinus avellanarius*) presence/ likely absence surveys undertaken in 2014 is illustrated in Plan 1, and was based on a 100m buffer applied to the combined footprints of the various route options under consideration at that time i.e. around the Link Area.

Throughout the evolution of the Proposed Scheme, including the selection of a single option and the addition of the Gilden Way widening element, regular reviews of the survey scope have been undertaken. Due to the fact that the 2014 study area covered a very large area and recorded no dormice, and that the habitats likely to be affected by the Gilden Way widening proposals have very low potential to support dormice, the need for further dormice survey was scoped out.

1.2 Desk Study

A desktop survey was undertaken in September 2013, and updated in 2015, to obtain baseline ecological information relating to the site and its surroundings. Dormouse records within 1km of the site were requested from Essex Ecology Services Limited (EECOS) on behalf of the Essex Wildlife Trust, and The Essex Field Club.

In addition, the internet was searched for publicly available information concerning large developments within the local area, namely Newhall Farm (Roger Evans Associates, 2004) and Harlowbury (LDA Design, 2004).

1.3 Field Study

The purpose-built nest tubes used to record the presence of dormouse are constructed from black plastic, approximately 30cm long, with a plywood tray inside designed to simulate hollow branches. A total of 382 nest tubes were attached to trees and scrub within the Study Area that would be affected by the Proposed Scheme. Where possible, the best available positions were selected in terms of habitat quality and connectivity to wider suitable areas; the location of the dormouse tubes is shown in Plan 1. Surveys were undertaken in accordance with the Dormouse Conservation Handbook (Bright *et al.,* 2006).

The nest tubes were subsequently checked for presence of dormouse (animals or nests). In accordance with the national dormouse monitoring programme (administered by the Peoples Trust for Endangered Species (PTES)), all checks were conducted during dry weather conditions only (dormice are sensitive to damp conditions), by ecologists holding Natural England dormouse survey licences. Since the survey objectives were simply to record presence, no attempt to obtain data on sex ratios, weight and breeding condition was made.

In accordance with the Dormouse Conservation Handbook, each month during the dormouse survey season was assigned a value indicating the probability of finding dormice present in nest tubes (Bright *et al.*, 2006) (see Table 1.1). This score was devised to indicate how thorough the survey effort should be and to give confidence in the results obtained. A minimum total score of 20 is required at the end of a dormouse survey to provide confidence in the survey results and to assume likely absence.

Searches for field signs, such as natural nests and hazel nuts characteristically opened by dormice, were undertaken in suitable habitat.

Table 1.1 : Index of probability of finding dormice present in nest tubes in any one month (Bright et al, 2006).

Month	Index of Probability
April	1
May	4
June	2
July	2
August	5
September	7
October	2
November	2

1.4 Limitations

With regard to the desk study results, an absence of a species record within an area does not necessarily reflect an absence of that species from the same area, it can merely reflect a lack of recording activity. Similarly, the distribution of species records could reflect survey effort rather than an accurate distribution of that species. As such, historic records could add useful context, but should not be used to infer absence of a species from an area.

During several of the surveys, a small number of the dormouse tubes could not be located due to the growth of dense vegetation such as bramble (*Rubus fruticosus* agg.) or blackthorn (*Prunus spinosa*). This limitation is not considered to have been a significant constraint to the survey results as only a small percentage of the total number of tubes could not be found during any one survey.

2. Results

2.1 Desk study

2.1.1 Biological Data Requests

No dormouse records were received from either The Essex Field Club or EECOS, within 1km of the site.

2.1.2 Environmental Statements

No surveys for dormice were undertaken to inform the proposals for either the Harlowbury or the Newhall Farm developments.

The desk study undertaken for the Harlowbury development did not return any records of dormice from the local area. Based on this, the need for further survey for this species was scoped out.

2.2 Field Study

2.2.1 Survey Results

Dormouse nest tubes were checked for the presence of individuals or nests on five occasions during the survey period from May to October 2014. Surveys were carried out on the following dates and the survey achieved a score of 20 points:

- Installation of nest tubes: 28th and 29th April 2014;
- 15th and 16th May 2014;
- 1st and 2nd July 2014;
- 18th and 19th August 2014;
- 23rd and 24th September 2014; and,
- 29th – 31st October 2014 (final check and collection of nest tubes).

No dormice or evidence of dormice were recorded during any of the surveys. It is therefore assumed that dormice are likely absent from the Study Area.

A number of tubes contained evidence of wood mice (*Apodemus sylvaticus*), yellow-neck mice (*Apodemus flavicollis*) and birds using the tubes to nest.

3. References

Bright, P., Morris, P., Mitchell-Jones, T. (2006). *The Dormouse Conservation Handbook – 2nd Edition.* English Nature, Peterborough.

Essex Biodiversity Project (2007) [online] Accessed 1st October 2014 http://www.essexbiodiversity.org.uk/species-and-habitats/mammals/dormouse.

LDA Design (2011) *Land North of Gilden Way Environmental Statement*

Roger Evans Associates (2004) *Newhall Phase II Environmental Statement*

Plan 1: 2014 Dormouse Survey Areas (showing 2014 study area)

Row 4
Row 7
Row 2
Row 3
Row 6
Row 22
Row 1
Row 21
Row 8
Row 19
Row 18
Row 20
Row 15
Row 16
Row 14
Row 13
Row 5
Row 11
Row 12
Row 17
Row 10
Row 9

0 100 200 400 600 800 Meters

Legend

Dormouse survey rea

N

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
0	Nov 14	For Information	LHS	DJ	DJ	PM

JACOBS
Jacobs House, 1180 Eskdale Road, Winnersh, Wokingham, RG41 5TU
Tel:+44(0)118 946 7000 Fax:+44(0)118 946 7001
www.jacobs.com

Client: Essex Highways

Project: **M11 Junction 7A**

Drawing title: **Dormouse Survey Area**

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Appendix 8.5: Technical Report: Riparian Mammal Survey

M11 Junction 7a

Essex County Council

Technical Report - Riparian Mammal Survey

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December 2016

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Author:	Stephanie Boocock
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Jacobs U.K. Limited

1180 Eskdale Road
Winnersh, Wokingham
Reading RG41 5TU
United Kingdom
T +44 (0)118 946 7000
F +44 (0)118 946 7001
www.jacobs.com

Contents

1. Methods

1.1 Study Area

1.1.1 Main Site

The Pincey Brook has been surveyed for riparian mammals (otter (*Lutra lutra)* and water vole (*Arvicola amphibious*)) from approximately 250m east of the M11 corridor to approximately 250m west of where it runs below Sheering Road. The extent of the surveyed area is shown on Plan 1.

1.1.2 Gilden Way

The Harlowbury Brook has been surveyed for riparian mammals, as described above, for approximately 250m to the north and south of its crossing point with Gilden Way. The extent of the surveyed area is shown on Plan 2.

A small surface water channel runs parallel to the Harlowbury Brook, approximately 150m to the west, forming (in combination with a line of mature trees) the border between a large arable field and a residential area. This surface water channel was formally assessed for suitability for riparian mammals on 20th April 2016, and was scoped out of the need for further survey due to the fact that it had contained a very low flow, had recently been re-profiled/ cleaned out, supported virtually no vegetation along the banks and no aquatic/ emergent vegetation. It was also heavily shaded by trees.

1.2 Desk Study

A desk study was undertaken in September 2013, and updated in 2015, to collate baseline ecological data from the Proposed Scheme and surrounding areas. A request for all riparian mammal records within a 2km radius of the Scheme was submitted to Essex Ecology Services Limited (EECOS) (on behalf of the Essex Wildlife Trust) and The Essex Field Club.

In addition, the internet was searched for publicly available information regarding large developments within the local area, namely Newhall Farm (Roger Evans Associates, 2004) and Harlowbury (LDA Design, 2004).

1.3 Field Study

The riparian mammal surveys followed the standard methodology for water voles as detailed in the *Water Vole Conservation Handbook* (Strachan, 2006). Signs of otter activity in the form of footprints, spraints and holts were searched for according to the standard method (Ward, 1994).

1.3.1 Pincey Brook (Main Site)

The first survey of the Pincey Brook was conducted by experienced Jacobs' ecologists on 23rd June 2014 in suitable weather conditions. The survey was undertaken from the northern bank of the Pincey Brook as access into the watercourse was safest from this location. Due to the steep profile of the banks and the presence of dense stands of vegetation, a sampling strategy was adopted, with five sections, each approximately 10m in length, surveyed along the 500m stretch.

It was not possible to complete a second survey in 2014 due to health and safety concerns regarding safe access to the watercourse.

During 2016, a sighting of a kingfisher *Alcedo atthis* led to a survey of the Pincey Brook for suitable habitat for this species. The survey for kingfisher habitat was undertaken on 6th October 2016 along the Pincey Brook 250m to the west and 250m to the east of where it passes beneath the M11. The surveyors also searched for evidence of riparian mammals, including revisiting the site of the 2015 otter latrine. No evidence of water vole or otter was recorded.

1.3.2 Harlowbury Brook (Gilden Way)

The first survey of the Harlowbury Brook was undertaken over two days 20th - 21st April 2016, by experienced Jacobs' surveyors. The location and extent are illustrated on Plan 2. Due to the largely shallow nature of the channel at the time of the survey, it was possible for the surveyors to walk the entire 500m length and undertake the survey from within the channel.

The second survey was undertaken in the same manner as the first on the 10th August 2016.

1.4 Limitations

With regard to the desk study results, an absence of a species record within an area does not necessarily reflect an absence of that species from the same area, it can merely reflect a lack of recording activity. Similarly, the distribution of species records could reflect survey effort rather than an accurate distribution of that species. As such, historic records can add useful context, but should not be used to infer absence of a species from an area.

Parts of the Pincey Brook could not be surveyed during the 2014 survey for health and safety reasons, and only one survey was undertaken of the watercourse during that year. Access was obstructed by tall, dense vegetation and the banks were extremely steep in places. Consequently a full survey was not completed and therefore, evidence of riparian mammal activity (in addition to what was recorded), could have been missed.

During the kingfisher survey of Pincey Brook in 2016, surveyors had similar difficulties in accessing the banks due to dense vegetation in areas. Consequently, evidence of water vole or otter could have been present but not recorded.

However, this has not been a significant constraint to the assessment of impacts upon riparian mammals using the Pincey Brook, as otter activity was detected and therefore otters have been scoped into the impact assessment. Otters are sensitive to broadly the same impacts as water voles, and therefore it is anticipated that all relevant impacts will have been taken into consideration.

2. Results

2.1 Desk Study

2.1.1 Records Requests

Two records of otter were received, both originating from the River Stort in 2011, approximately 1.5 km to the north of the Gilden Way (see Table 2.1).

Two records of water vole were received, the nearest located approximately 300m southeast of Gilden Way, recorded in 1998, and the second located approximately 1.5km south of the Main Site, recorded in 1997 (see Table 2.1).

Table 2.1 : Record request results

Species	Species	Grid Reference	Number of Records	Date
Arvicola amphibius	Water vole	TL482114	2	1998
Arvicola amphibius	Water vole	TL492102	1	1997
Lutra lutra	Otter	TL472129	1	2011
Lutra lutra	Otter	TL472129	1	2011

2.1.2 Environmental Statement Review

As part of the baseline data collection to inform the Harlowbury development, a short section of the Pincey Brook was surveyed for otter in October 2004. No evidence of this species was recorded, but due to the presence of suitable habitat, the brook was identified as having potential to support otters on an occasional basis. In addition, update surveys of Harlowbury Brook were undertaken in September 2010. No signs of otter or water vole were recorded during the 2010 surveys and a mink (*Neovision vison*) scat was incidentally recorded on Harlowbury Brook (LDA Design, 2011).

The Harlowbury Brook was surveyed in 2004 for water voles to inform the proposals for the Newhall Farm development. Old water vole burrows were recorded, but no fresh evidence was observed (Roger Evans Associates, 2004).

2.2 Field Study

2.2.1 Main Site

Pincey Brook was surveyed on 23rd June 2014 during warm, sunny weather conditions with a maximum temperature of 23°C. No heavy rainfall was recorded during the survey or immediately prior to the survey.

At that time the Pincey Brook was found to be surrounded by arable crops and the northern and southern banks of the watercourse contained mature trees with dense areas of hawthorn (*Crataegus monogyna)* and blackthorn (*Prunus spinosa)* hedgerow. Where shading was less significant, dense aquatic vegetation was found to be present.

The width of the watercourse ranged from 1m to 10m wide with a depth of between 0.5m and 2m. The majority of the banks were recorded as steep (<45 degrees) earth banks. The western end of the brook had a sluggish water flow and the eastern end of the brook (adjacent to Sheering Hall) was almost static.

No direct observations, or evidence, of water vole activity was recorded during the survey.

One fresh otter spraint was found on a rock to the west of the bridge at Sheering Hall (Ordnance Survey Grid Reference TL 49665 12883). The location of the spraint is illustrated in Plan 1.

A North American signal crayfish (*Pacifastacus leniusculus)* was incidentally observed and several brown rat (*Rattus norvegicus)* burrows and droppings were recorded within the earth banks.

On the 6th October 2016, the Pincey Brook was searched for evidence of water vole and otter during a kingfisher habitat survey. None were recorded, although access was limited by dense vegetation.

Incidentally, many North American signal crayfish were observed within the Brook during the 2016 visit.

2.2.2 Gilden Way

The first survey visit to Harlowbury Brook was undertaken during the 20th and 21st of April 2016, during warm, sunny weather with a maximum temperature of 13°C and 14°C respectively. There had not been heavy rainfall prior to the survey, and flow within the channel was noted as shallow and slow for the majority of the stretch surveyed.

The second survey visit was undertaken on 10th August 2016, during warm and sunny weather with a maximum temperature of 20°C. There had not been heavy rainfall prior to the survey and the in-channel flow was similar to that recorded during the first survey.

The width of the watercourse was found to vary from approximately 1–3m, with banks varying in slope and vegetation depending on the location. The channel to the south of the Gilden Way had a noticeably natural appearance, with shallower, more vegetated banks, whereas the channel to the north of the Gilden Way was observed to be modified where it passes through a residential area, and has steeper less vegetated banks, with garden debris and other waste deposited on the bankside.

No direct observations or evidence of, otter or water voles were recorded during either survey visit.

Brown rat prints and burrows were observed along the Harlowbury Brook and a North American signal crayfish was observed during the second survey visit.

3. References

Essex Biodiversity Project (2007). [Online] Accessed 1st October 2014 http://www.essexbiodiversity.org.uk/species-and-habitats/mammals/water-vole.

LDA Design (2011) *Land North of Gilden Way Environmental Statement*

Roger Evans Associates (2004) *Newhall Phase II Environmental Statement*

Strachan, R. (2006). Water Vole Conservation Handbook. Second Edition, English Nature / Environment Agency / Wildlife Conservation Research Unit.

Ward, D., Holmes, N., José, P. (1994*). The New Rivers and Wildlife Handbook.* RSPB, Bedfordshire.

Plan 1: 2014 Survey Area and Location of Otter Spraint

Sheering Lower Road

Pincey Brook

Proposed Junction 7a

Sheering Road

Moor Hall Road

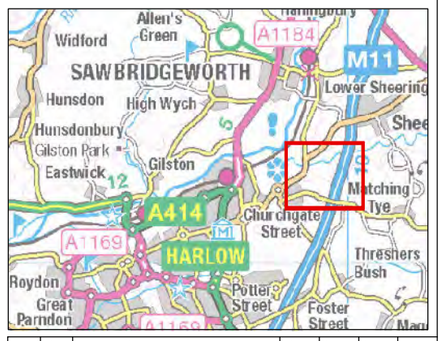
100 50 0 100 200
metres

Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- Otter spraint
- Signal crayfish
- Pincey Brook



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	11/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	SK

Drawing Status

PRELIMINARY DESIGN

RINGWAY JACOBS integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

M11 JUNCTION 7A

Drawing Title

PLAN 1 - REPARIAN MAMMALS SURVEY 2014

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
14/11/2016	14/11/2016	14/11/2016	14/11/2016	14/11/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm)
1:6,000

DRAWING NO.
B3553F05-0000-DR-0133

REV.
P0

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Plan 2: 2016 Survey Area

Sheering Road

Gilden Way

N
W
E
S

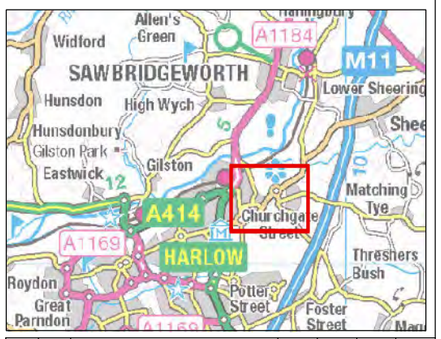
100 50 0 100 200
metres

Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- Riparian Mammals Survey Areas



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	11/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	SK

Drawing Status

PRELIMINARY DESIGN

RINGWAY JACOBS integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

M11 JUNCTION 7A

Drawing Title

PLAN 2 - REPARIAN MAMMALS SURVEY 2016

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	SK
DATE	DATE	DATE	DATE	DATE
14/11/2016	14/11/2016	14/11/2016	14/11/2016	14/11/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm)
1:6,000

DRAWING NO.
B3553F05-0000-DR-0129

REV.
P0

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Appendix 8.6: Technical Report: Great Crested Newt Survey

M11 Junction 7a

Essex County Council

Technical Report - Great Crested Newt Survey Report

B3553F05-3000-REP-0045 | 0

December 2016

Document history and status

Revision	Date	Description	By	Review	Approved
0	Dec 2016	Tech report – GCN report	Stephanie Boocock	Victoria Hooper	Paul Manamike

Distribution of copies

Revision	Issue approved	Date issued	Issued to	Comments

M11 Junction 7a

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File name:	B3553F05-3000-REP-0045

Jacobs U.K. Limited

1180 Eskdale Road
Winnersh, Wokingham
Reading RG41 5TU
United Kingdom
T +44 (0)118 946 7000
F +44 (0)118 946 7001
www.jacobs.com

Contents

1. Methods

1.1 Study Area

The study area adopted for the 2015 (Link Area) and 2016 (Gilden Way) great crested newt (GCN) (*Triturus cristatus)* surveys was determined by applying a 500m buffer around the Scheme footprint. The Study Areas and the aquatic feature locations are illustrated in Plan 1.

1.2 Desk Study

A desk study was undertaken in September 2013, and updated in 2015, to collate baseline ecological data from the scheme footprint and surrounding areas. A request for all GCN records within a 2km radius of the scheme was submitted to Essex Ecology Services Limited (EECOS) (on behalf of the Essex Wildlife Trust) and The Essex Field Club in 2015.

In addition, the Environmental Statements for two large adjacent development schemes, New Hall Farm (Roger Evans Associates, 2004) and Harlowbury (LDA Design, 2011) were reviewed for relevant data.

1.3 Field Study

1.3.1 Habitat Suitability Index Assessment

All ponds within the study area were assessed for their potential to support GCN using the Habitat Suitability Index (HSI) methodology (Oldham *et al.*, 2000). Ponds that were isolated from the site by the presence of significant barriers to GCN dispersal e.g. major roads, railways, or large areas of urban development, were scoped out of the need for assessment and subsequent surveys.

The HSI is a numerical index between 0 and 1, where 0 indicates unsuitable habitat and 1 represents optimal habitat. A score is calculated based on the results of ten suitability indices, all of which relate to factors that affect GCN presence. The resulting score categorises the pond based on its 'suitability' to support GCN and can be used to inform a decision as to whether further detailed survey work is required, as shown by Table 1.1.

Table 1.1 : Habitat Suitability Index scoring system

HSI score	Suitability for GCN
<0.5	Poor
0.5 – 0.59	Below average
0.6 – 0.69	Average
0.7 – 0.79	Good
>0.8	Excellent

In accordance with HSI methodology the following features were assessed:

- Geographical location;
- Pond area;
- Pond permanence;
- Water quality;
- Pond shading;
- Occurrence of waterfowl;
- Occurrence of fish;

- Pond density / other ponds within 1km that are not isolated by significant barriers;
- Terrestrial habitat quality; and,
- Macrophyte (aquatic plant) cover.

1.3.2 Presence/ Likely Absence Surveys and Population Assessments

Presence/ likely absence surveys were undertaken using the methodology within standard best practice guidelines (English Nature, 2001). Surveys of each pond were undertaken between mid-March and mid-June, at least two of which fell between mid-April and mid-May. For the standard techniques, four surveys are required to establish presence/ absence, and where GCN are detected a further two are required in order to estimate the population size. Where eDNA indicates the absence of GCN, no further surveys are required. The surveys were led by experienced, licensed ecologists. During the pond surveys, at least three of the survey techniques described below were adopted.

1.3.3 Bottle Trapping

Traps, made from 2-litre plastic bottles, were set at intervals of approximately 2m around the accessible margins of each pond. Traps were set out during the evening, left overnight and collected in the morning. Any trapped amphibians were recorded and released back into the pond.

1.3.4 Torchlight Survey

Each pond was searched at night with the use of high-powered torches (1,000,000 candlepower). Where accessible, the perimeter of each waterbody was walked slowly whilst the beam of the torch was shone into the water. All amphibians observed within the water were recorded.

1.3.5 Egg Searching

Submerged vegetation within the waterbodies was inspected for GCN eggs, which are typically enveloped within folded leaves by the females.

1.3.6 eDNA

eDNA is DNA that is collected from the environment in which an animal lives. GCN DNA can enter the environment via their urine, faeces, skin cells etc. Natural England now accepts eDNA test results as evidence of presence or likely absence of GCN within a breeding pond.

The eDNA survey for GCN involves the collection of 20 water samples taken around the perimeter of a pond, these samples are subsequently analysed by an accredited laboratory. Samples must be collected between April 15th and June 30th. The survey followed the methodology described by Biggs (2014), both in the field and in the lab, with water samples collected by suitably trained and licensed ecologists.

1.4 Limitations

1.4.1 Access

Landowner permission could not be obtained to gain access to Pond 10 and Pond 12. On review of readily available web-based planning information, it was established that the two ponds support a carp *Cyprinus* sp. nursery. As carp are known to predate GCN and the ponds are likely to be heavily stocked, it is assumed that GCN are not present within these ponds.

1.4.2 Environmental Conditions

The surveys of 14th-15th April 2015 and 27th–28th April 2015 were conducted when there were overnight lows of 2˚C. Daytime temperatures were much higher (highs of 16˚C and 12˚C respectively) and, as a consequence, the temperature of the water within the ponds are not expected to have dropped as low as the air temperature. Numbers of amphibians recorded during those surveys are consistent with numbers recorded during other 2015 surveys (when conditions were optimal) and therefore the low temperature is not thought to be a significant constraint to the quality of the data.

Approximately 40% of the shoreline of Pond 6 could be searched visually due to steep banks and a fence lining the western edge of the pond preventing surveyor access. Although this may have reduced the effectiveness of torching or bottle trapping, the negative result obtained through the eDNA test, is unlikely to have been constrained by the limited access.

High levels of vegetation cover were present in Pond 7 which reduced the effectiveness of torching as a survey technique. Egg searching and bottle trapping (survey methods that are not affected by vegetation cover) did not establish the presence of GCN, and the eDNA test for this pond came back as negative, therefore this slight limitation is not considered to have significantly constrained the quality of the data or the conclusions drawn from it.

The water within Pond 18 was consistently quite turbid, making torching beyond 1m from the bank difficult. In addition, some bottle-traps had been removed from the northern shoreline during surveys 5 and 6, reducing the number of traps within the pond. The presence of large numbers of fish (both carp (*Cyprinus carpio*) and sticklebacks (*Gasterosteidae*)) and the negative result of the eDNA testing, strongly suggest that GCN are absent from this pond. Therefore, turbidity and public interference are not considered to have constrained the assessment of this pond.

1.4.3 Technical Limitations

With regard to eDNA, a negative result for GCN does not preclude the presence of GCN at a level below the limits of detection.

2. Results

2.1 Desk Study

2.1.1 Records Request

A total of 70 records of GCN were received through the combined returns for 2013 and 2015 from The Essex Field Club and EECOS. See Appendix A for full results.

The records originate from between 1997 and 2004 from seven locations. There is one record of GCN from within 500m of the scheme located at Gilden Way Meadow Local Wildlife Site, near the Gilden Way. The remaining records are associated with sites >500m from the Scheme.

The locations of the nearest records are illustrated in Plan 2, and the raw data can be made available on request.

2.1.2 Environmental Statement Review

Harlowbury

Two ponds were surveyed in 2004 to inform the Harlowbury development (LDA Design, 2011). No GCN were recorded during the surveys.

Newhall Farm

Seven ponds/ wetlands located to the south of Gilden Way were surveyed for GCN in 2004 to inform the proposals for the Newhall Farm development (Roger Evans Associates, 2004). GCN were recorded in six of the seven ponds/ wetlands, and breeding was established in four ponds.

2.2 Field Study

2.2.1 Habitat Suitability Index Survey

In 2015, seventeen ponds (one a large lake referred to as Pond 5) and a large area of wet ground were identified within 500m of the proposed route options under consideration at that time. The locations of these waterbodies can be found in Plan 1. An initial scoping visit to thirteen of these waterbodies and the area of wet ground was completed in 2014. A HSI assessment was completed for ten of these water bodies, the remainder were either dry or inaccessible at the time. A follow-up HSI assessment was completed early in 2015.

During 2015, Pond 13 was scoped out of further consideration due it being located beyond the 500m buffer, and Pond 11 was found not to be a pond at all, rather an equestrian training area.

In 2016, a further ten waterbodies (labelled 18–27) were identified within 500m of Gilden Way using the relevant Ordnance Survey map. During the HSI survey visit, seven waterbodies were scoped out; one was a swimming pool, two ponds had dried out, one ditch had dried out, and three ditches had rapidly flowing water, not considered suitable for GCN.

The combined results of the 2015 and 2016 HSI assessments are presented in Table 2.1 overleaf.

Table 2.1 : Results of the HSI assessment

Pond number	HSI score/ Suitability class	Scoped in/out Date	Justification for scoping out from further survey / description of limitation to presence/ likely absence survey
Pond 1	0.70 Average	Out 2014	No further survey work required as the pond is located to the north of the Pincey Brook which is considered a significant barrier to potential newt movement into the working area from this location.
Pond 2	0.77 Good	Out 2014	No further survey work required as the pond is located to the north of the Pincey Brook which is considered a significant barrier to potential newt movement into the working area from this location.
Pond 3	0.75 Good	Out 2014	No further survey work required as the pond is located to the north of the Pincey Brook which is considered a significant barrier to potential newt movement into the working area from this location.
Pond 4	0.68 Average	Out 2014	No further survey work required as the pond is located to the north of the Pincey Brook which is considered a significant barrier to potential newt movement into the working area from this location.
Pond 5	0.44 Poor	Out 2014	No further survey work required as the pond is a fishing lake and so unsuitable for GCN.
Pond 6	0.46[1] < Average	In	N/A
Pond 7	0.54[2] Good	In	N/A
Pond 8	Dry	Out 2015	No further survey work required as pond is very nearly dry – only approximately 2cm deep. Has been assessed as 'unsuitable' for GCN in both 2014 and 2015.
Pond 9	Dry	Out 2015	No further survey work required as pond no longer holds water. Was assessed as dry and therefore 'unsuitable' for GCN in 2014 and 2015.
Pond 10	No access	In 2015	No access permitted for HSI surveys in 2015.
Pond 12	No access	In 2015	No access permitted for HSI surveys in 2015.
Pond 13	N/A	Out 2015	No further survey work required due to its distance (>500m) from the scheme.
Pond 14	0.48 Poor	Out 2014	No further survey work required as pond is a shallow scrape that is only likely to hold water during times of heavy rain or flood. It provides poor habitat suitability for GCN.
Pond 15	Dry	Out 2014	Pond was identified as dry in 2014 surveys therefore unsuitable for GCN.
Pond 16	0.22 Poor	Out 2014	No further survey work required as the pond is located to the north of the Pincey Brook which is considered a significant barrier to potential newt movement into the working area from this location.
Pond 17	0.22 Poor	Out 2014	No further survey work required as the pond is located to the north of the Pincey Brook which is considered a significant barrier to potential

[1] Pond scored as 0.73 'good' in 2014. Score reduced in 2015 due to major presence of carp (*Cyprinus* sp.) Quality of terrestrial habitat was also downgraded. Percentage of macrophyte cover greater in 2015.

[2] Pond scored as 0.75 'good' in 2014. Score reduced in 2015 due to presence of carp *Cyprinus* sp., and signal crayfish (*Pacifastacus leniusculus*) within the pond.

Pond number	HSI score/ Suitability class	Scoped in/out Date	Justification for scoping out from further survey / description of limitation to presence/ likely absence survey
			newt movement into the working area from this location.
Area A	Dry	Out 2015	Area identified as dry in 2015 surveys therefore unsuitable for GCN.
Pond 18	0.28 Poor	In	N/A
Pond 19	-	Out 18/04/2016	Pond dried out, now a densely grassy hollow beneath mature trees
Pond 20	-	Out 18/04/2016	Pond dried out, now a densely grassy hollow beneath mature trees
Ditch 21	-	Out 18/04/2016	Ditch contains rapidly flowing water, not considered suitable for GCN
Pond 22	0.84 Excellent	In	N/A
Pond 23	-	Out 18/04/2016	This is a swimming pool.
Pond 24	0.64 Average	In	N/A
Ditch 25	-	Out 18/04/2016	Ditch contains rapidly flowing water, not considered suitable for GCN
Ditch 26	-	Out 18/04/2016	Ditch contains rapidly flowing water, not considered suitable for GCN
Ditch 27	-	Out 18/04/2016	Ditch could not be found – dried out.

2.2.2 Presence/ Likely Absence Surveys

The location of ponds with GCN presence confirmed in 2015 and 2016 are illustrated on Plan 3.

Based on the results of the HSI surveys, seven ponds were identified as requiring presence/ likely absence surveys, although access to only five of them (Ponds 6, 7, 18, 22 and 24) could be secured. Access to Ponds 10 and 12 could not be arranged as no response could be obtained from the landowners.

No GCN were recorded during the presence/ likely absence surveys undertaken in 2015 (Ponds 6 and 7), however the 2016 surveys identified GCN presence within Pond 22 (no evidence of GCN was identified in Ponds 18 and 24). The results of the surveys are presented in Tables 2.2 and 2.3 below.

Only three visits were made to the ponds surveyed in 2015, because the results of the eDNA test were received prior to the planned date of the fourth, and indicated that GCN were not present, removing the requirement for the last visit.

Table 2.2 : 2015 presence/ likely absence survey results

Survey number	Date	Weather	Pond Ref	Bottle trap	Torch	Egg search	Notes
1	14/04/15 - 15/04/15	No precipitation No wind 7˚C min overnight temperature	6	-	-	Frog (*Rana temporaria)*	Signal crayfish and carp present within the pond.
			7	Smooth 1 x ♂	Toad (*Bufo bufo*) x 1 Frog x 1	Frog	Carp present within the pond.
2	20/04/15 - 21/04/15	No precipitation No wind; 2˚C min overnight temperature	6	-	-	-	Signal crayfish and carp present within the pond.
			7	-	Frog x 1	-	Carp and mallard (*Anas platyrhynchos*) present within the pond.
3	27/04/15 - 28/04/15	No precipitation during survey however rain overnight. No wind 5˚C min overnight temperature	6	-	-	-	Signal crayfish and carp present within the pond.
			7	-	-	-	Mallard on eggs present within the pond.

Key: Smooth – smooth newt *Lissotriton vulgaris*

Table 2.3 : 2016 presence/ likely absence survey results

Survey number	Date	Weather	Pond Ref	Bottle trap	Torch	Egg search	Notes
1	18/04/16-19/04/16	No precipitation Slight breeze 7˚C min overnight temperature	18	Frog tadpoles & sticklebacks	Sticklebacks & aquatic inverts	None	eDNA kit GCN000822 Water is turbid
			22	GCN – 2 x ♀, 2 x ♂ Palmate – 1 x ♀ Smooth – 1 x ♂	GCN – 3 x ♀, 1 x ♂ plus possible additional ♂ (tail stripe) Small newts including palmate – 48	None	eDNA kit GCN000823 4 x grass snake (*Natrix natrix*) observed mating during collection of bottle-traps on 19th April 1 x bat observed during torching – very pale underside, possible *Myotis* sp.
			24	Frog tadpoles	Sticklebacks	None	eDNA kit GCN000717
2	05/05/16-06/05/16	No precipitation No wind 9-11˚C	18	160+ sticklebacks Frog	Smooth- 1 x ♂ Frog	None	Turbidity - 4 Vegetation - 1
			22	Frog	GCN- 2 x ♀, 2 x ♂ Smooth- 13 x ♀, 9 x ♂	None	Turbidity - 3 Vegetation - 2
			24	Frog Sticklebacks	Sticklebacks, Frog	None	Turbidity - 4 Vegetation - 2
3	10/05/16-11/05/16	Rained prior to survey, ground wet. No wind 14.8 - 15.7°C	18	Smooth- 1 x ♀ Frog tadpoles & sticklebacks	Frog tadpoles & sticklebacks	None	Turbidity - 4/5 Vegetation - 0 Lots of bats
			22	GCN- 4 x ♀, 4 x ♂ Smooth- 2 x ♀	GCN- 7 x ♀, 10 x ♂ Smooth- 21	GCN & small newt found	Turbidity - 3 Vegetation - 1
			24	Frog tadpoles & sticklebacks	Sticklebacks, Frog tadpoles	None	Turbidity - 0 Vegetation - 2
4	18/05/16-19/05/16	Light showers Light air 10.5°C min overnight	18	Frog tadpoles & sticklebacks	1x small newt Frog tadpoles & sticklebacks	None	Turbidity - 4/5 Vegetation - 0 2 x *Myotis* bats

		temperature	22	Frog tadpoles	8 x small newts	None	1 x grass snake Mallard and ducklings
			24	Frog tadpoles	Sticklebacks 1 x frog	None	
5	26/05/16-27/05/16	No precipitation No wind 13.8˚C min overnight temperature	22	GCN 2 x ♀	GCN 1 x ♂ Smooth - 3 x ♀	N/A	Many aquatic invertebrates observed
6	06/06/16-07/06/16	No precipitation No wind 13°C min overnight temperature	22	GCN-1x♀ Small- 1x♀	GCN- 2x♀ Smooth- 2x♀, 2x♂	N/A	Turbidity - 2 Vegetation - 1 Traps tampered with before torching

Key: Smooth – smooth newt *Lissotriton vulgaris*; Palmate - palmate newt *Lissotriton helveticus*; small – unidentified smooth or palmate newt; Water turbidity – scored 0 – 5, 0 = clear, 5 = very turbid; Vegetation cover – scored 0 - 5, 0 = no vegetation, 0 = lots of vegetation; N/A – survey method not undertaken

2.2.3 eDNA Survey

2015 Survey (Ponds 6 and 7)

The eDNA survey results were received on 6th June 2015 and were negative for both ponds, indicating the absence of GCN. See Appendix B for full results.

2016 Survey (Ponds 18, 22 and 24)

The eDNA survey results were received on 13th June 2016 and were positive for Pond 22, but negative for Ponds 18 and 24. See Appendix B for full results.

3. References

Biggs, J., Ewald, N., Valentini, A., Gaboriaud, C., Griffiths, R.A., Foster, J., Wilkinson, J., Arnett, A., Williams, P., Dunn, F. (2014) *Analytical and methodological development for improved surveillance of the Great Crested Newt. Defra Project WC1067.* Freshwater Habitats Trust: Oxford.

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Plan 1: Location of Ponds and 500m Buffer

Pond 1
Pond 2
Pond 3
Sheering Lower Road
Pond 4
Pincey Brook
Pond 16
Pond 17
Pond 5
Proposed Junction 7a
Pond 15
Sheering Road
Pond 6
Pond 7
Pond 14
Gilden Way
Pond 27
Area 1
Pond 9
Pond 8
Pond 10
Pond 11
Pond 12
Pond 13
Pond 25
Pond 26
Moor Hall Road
Pond 23
Pond 24
Pond 22
Pond 21
Pond 20
Pond 19
Pond 18

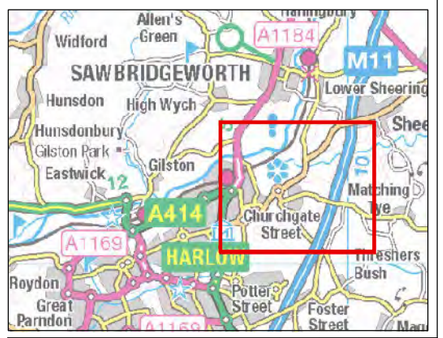
100 50 0 100 200 300 400 metres

Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- 2016 500m Study Area
- Ponds



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
0	11/16	ISSUED FOR PLANNING APPLICATION	KK	CB	SB	HK

Drawing Status

PRELIMINARY DESIGN

RINGWAY JACOBS integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

M11 JUNCTION 7A

Drawing Title

PLAN 1 - POND LOCATIONS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	HK
DATE	DATE	DATE	DATE	DATE
08/11/2016	08/11/2016	08/11/2016	08/11/2016	08/11/2016

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SCALE AT A3 (420 x 297 mm)
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B3553F05-0000-DR-0104

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Plan 2: Records of GCN in the Local Area

Sheering Lower Road

Pincey Brook

Proposed Junction 7a

Sheering Road

Gilden Way

Moor Hall Road

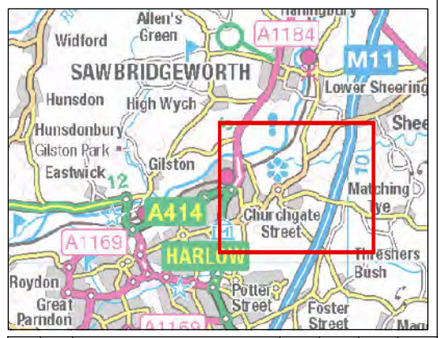
100 50 0 100 200 300 400
metres

Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- 2016 500m Study Area
- Great Crested Newt Records



Rev.	Date	Description of revision	Drawn	Checked	Review'd	Approv'd
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Drawing Status

PRELIMINARY DESIGN

RINGWAY JACOBS integrated expertise

Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

M11 JUNCTION 7A

Drawing Title

PLAN 2 - GREAT CRESTED NEWT - BIOLOGICAL RECORDS REQUEST RESULTS

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	HK
DATE	DATE	DATE	DATE	DATE
04/11/2016	04/11/2016	04/11/2016	04/11/2016	04/11/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm)
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DRAWING NO.
B3553F05-0000-DR-0105

REV.
P0

Plan 3: Location of GCN Ponds

Sheering Lower Road

Pincey Brook

Proposed Junction 7a

Sheering Road

Gilden Way

Moor Hall Road

Confirmed GCN Pond

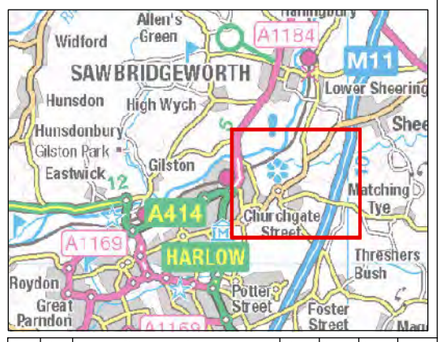
100 50 0 100 200 300 400 metres

Notes

1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- Construction Boundary
- Confirmed GCN Pond
- GCN Pond Buffer 100m
- GCN Pond Buffer 250m
- GCN Pond Buffer 500m



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Drawing Status

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Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

M11 JUNCTION 7A

Drawing Title

PLAN 3 - POND WITH CONFIRMED GCN PRESENCE

DESIGNED	DRAWN	CHECKED	REVIEWED	APPROVED
EW	KK	CB	SB	HK
DATE	DATE	DATE	DATE	DATE
10/11/2016	10/11/2016	10/11/2016	10/11/2016	10/11/2016

DRAWING UNITS U.N.O.

SCALE AT A3 (420 x 297 mm)

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DRAWING NO.

B3553F05-0000-DR-0106

REV.

P0

Appendix A. Results of Records Request

Species	Species	Grid reference	Number of records	Date
Triturus cristatus	Great crested newt	TL504137	1	1997
Triturus cristatus	Great crested newt	TL504137	1	1997
Triturus cristatus	Great crested newt	TL4712	1	1997
Triturus cristatus	Great crested newt	TL504137	1	1997
Triturus cristatus	Great crested newt	TL467102	1	2001
Triturus cristatus	Great crested newt	TL467102	Present	24/05/2001
Triturus cristatus	Great crested newt	TL467102	Present	24/05/2001
Triturus cristatus	Great crested newt	TL477107	2	2004
Triturus cristatus	Great crested newt	TL478112	9	2004
Triturus cristatus	Great crested newt	TL478112	1	2004
Triturus cristatus	Great crested newt	TL476101	2	2004
Triturus cristatus	Great crested newt	TL481104	4	2004
Triturus cristatus	Great crested newt	TL478112	1	2004
Triturus cristatus	Great crested newt	TL476101	2	2004
Triturus cristatus	Great crested newt	TL481104	4	2004
Triturus cristatus	Great crested newt	TL477107	2	2004
Triturus cristatus	Great crested newt	TL478112	1	2004
Triturus cristatus	Great crested newt	TL476101	2	2004
Triturus cristatus	Great crested newt	TL481104	4	2004
Triturus cristatus	Great crested newt	TL477107	2	2004
Triturus cristatus	Great crested newt	TL476101	2	2004
Triturus cristatus	Great crested newt	TL482099	5	2004
Triturus cristatus	Great crested newt	TL478112	1	2004
Triturus cristatus	Great crested newt	TL477107	2	2004
Triturus cristatus	Great crested newt	TL483099	8	2004
Triturus cristatus	Great crested newt	TL481104	4	2004
Triturus cristatus	Great crested newt	TL482099	3	01/04/2004
Triturus cristatus	Great crested newt	TL483099	7	01/04/2004
Triturus cristatus	Great crested newt	TL482099	3	01/04/2004
Triturus cristatus	Great crested newt	TL483099	7	01/04/2004
Triturus cristatus	Great crested newt	TL483099	3	02/04/2004

Triturus cristatus	Great crested newt	TL482099	3	02/04/2004
Triturus cristatus	Great crested newt	TL481104	5	02/04/2004
Triturus cristatus	Great crested newt	TL482099	3	02/04/2004
Triturus cristatus	Great crested newt	TL483099	3	02/04/2004
Triturus cristatus	Great crested newt	TL481104	5	02/04/2004
Triturus cristatus	Great crested newt	TL477107	1	20/04/2004
Triturus cristatus	Great crested newt	TL477107	1	20/04/2004
Triturus cristatus	Great crested newt	TL481104	1	26/04/2004
Triturus cristatus	Great crested newt	TL476101	3	26/04/2004
Triturus cristatus	Great crested newt	TL483099	7	26/04/2004
Triturus cristatus	Great crested newt	TL483099	7	26/04/2004
Triturus cristatus	Great crested newt	TL476101	3	26/04/2004
Triturus cristatus	Great crested newt	TL481104	1	26/04/2004
Triturus cristatus	Great crested newt	TL483099	3	27/04/2004
Triturus cristatus	Great crested newt	TL482099	3	27/04/2004
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Triturus cristatus	Great crested newt	TL481104	1	04/05/2004
Triturus cristatus	Great crested newt	TL476101	2	04/05/2004
Triturus cristatus	Great crested newt	TL483099	4	04/05/2004
Triturus cristatus	Great crested newt	TL481104	1	04/05/2004
Triturus cristatus	Great crested newt	TL476101	2	04/05/2004
Triturus cristatus	Great crested newt	TL483099	4	04/05/2004
Triturus cristatus	Great crested newt	TL483099	5	05/05/2004
Triturus cristatus	Great crested newt	TL483099	5	05/05/2004
Triturus cristatus	Great crested newt	TL483099	1	10/05/2004
Triturus cristatus	Great crested newt	TL482099	4	10/05/2004
Triturus cristatus	Great crested newt	TL481104	9	10/05/2004
Triturus cristatus	Great crested newt	TL483099	1	10/05/2004
Triturus cristatus	Great crested newt	TL482099	4	10/05/2004
Triturus cristatus	Great crested newt	TL481104	9	10/05/2004
Triturus cristatus	Great crested newt	TL482099	1	11/05/2004
Triturus cristatus	Great crested newt	TL483099	2	11/05/2004
Triturus cristatus	Great crested newt	TL477107	8	11/05/2004

Triturus cristatus	Great crested newt	TL478112	9	11/05/2004
Triturus cristatus	Great crested newt	TL483099	2	11/05/2004
Triturus cristatus	Great crested newt	TL482099	1	11/05/2004
Triturus cristatus	Great crested newt	TL477107	8	11/05/2004
Triturus cristatus	Great crested newt	TL478112	9	11/05/2004

Appendix B. eDNA Survey Results

NatureMetrics
DNA based monitoring

Report: 16063-Jac21RW-1

Great Crested Newt eDNA Results

Company: Jacobs UK Ltd

Address: 1180 Eskdale Road, Winnersh, Wokingham, RG41 5TU

Contact: Robyn Walton

Project No: B3553F05

Date of Report: 13th June 2016

Number of samples: 3

Thank you for sending your samples for analysis by NatureMetrics. Your samples have been processed in accordance with the protocol set out in Appendix 5 of Biggs *et al*. (2014).

DNA was precipitated via centrifugation at 14,000g and then extracted using Qiagen Blood and Tissue extraction kits.

qPCR amplification was carried out in 12 replicates per sample using the primers and probe described by Biggs *et al*. (2014) in the presence of both positive and negative controls.

Results indicate GCN presence in 1 sample (GCN000823 – Pond 22) and GCN absence in both other samples. Sample GCN00822 (Pond 18) showed some qPCR inhibition in the initial analysis, but this was successfully overcome by repeating the analysis using diluted DNA. Conclusive results are therefore returned for all samples. All controls performed as expected.

Sample	Pond ID	Date arrived	GCN Status	eDNA Score	Inhibition	Degradation
GCN000717	24	22/04/2016	Negative	0/12	No	No
GCN000822	18	22/04/2016	Negative	0/12	Some	No
GCN000823	**22**	**22/04/2016**	**Positive**	**1/12**	**No**	**No**

Note that a negative result does not preclude the presence of Great Crested Newts at a level below the limits of detection.

Appendix 8.7: Technical Report: Reptile Survey

M11 Junction 7a

Essex County council

Technical Report – Reptile Survey

B3553F05-3000-REP-0046 | 0

December 2016

Document history and status

Revision	Date	Description	By	Review	Approved
0	Dec 2016	Technical Report – Reptile Survey	Stephanie Boocock	Victoria Hooper	Paul Manamike

Distribution of copies

Revision	Issue approved	Date issued	Issued to	Comments

M11 Junction 7a

Project no:	B3553F05
Document title:	Technical Report – Reptile Survey
Document No.:	B3553F05-3000-REP-0046
Revision:	0
Date:	December 2016
Client name:	Essex County Council
Project manager:	Paul Manamike
Author:	Stephanie Boocock
File name:	B3553F05-3000-REP-0046

Jacobs U.K. Limited

1180 Eskdale Road
Winnersh, Wokingham
Reading RG41 5TU
United Kingdom
T +44 (0)118 946 7000
F +44 (0)118 946 7001
www.jacobs.com

Contents

1. Methods

1.1 Study Area

The areas subject to reptile surveys are illustrated on Plan 1 (2014) and Plan 2 (2016). These comprised habitats identified within the Phase 1 Habitat Surveys, undertaken by Jacobs in 2013 (Link Area) and 2016 (Gilden Way), such as semi-improved grassland and woodland/ grassland interfaces with potential to support reptiles.

1.2 Desk Study

A desktop survey was undertaken in September 2013, and updated in 2015, in order to obtain baseline ecological information relating to the site and its surroundings. Reptile records within 2km of the site were requested from Essex Ecology Services Limited (EECOS) (on behalf of the Essex Wildlife Trust), and The Essex Field Club.

1.3 Field Study

In accordance with best practice guidelines, seven visits were carried out in order to ascertain the presence or likely absence of reptiles (presence/ likely absence surveys). If presence was confirmed, a further eight visits were undertaken in order to generate a population estimate (Foster and Gent, 1996). An estimate of the size of the reptile population and/ or the relative importance of the site for reptiles can made based on the maximum number of adults recorded during one survey visit, for each species (HGBI, 1998). Fifteen visits were conducted by two ecologists between April and September 2014 for the Link Area and May and September 2016 for the Gilden Way. All reptiles were identified to species level and, where possible, their life stage and sex was determined.

Two survey methods were used to determine the presence or likely absence of reptiles:

Artificial Refuge Survey

Artificial refugia, comprising bituminous roofing felt, were placed in suitable reptile habitat at approximately 10m intervals. They were placed dark-side-up and positioned so that they were in contact with the ground and exposed to sunlight. The dark side enables a reptile under the refuge to achieve a favourable body temperature more quickly, which is advantageous to survival success. Once reptiles find such 'hot-spots' they will typically use it as part of its daily routine.

Such refuges are a reliable way of determining the presence of reptiles on a site provided there is a reasonable population present, thus increasing the chance of the individual reptiles finding a refuge (JNCC, 2003).

Visual Survey

The visual survey involved looking for reptiles or signs of reptile activity (such as sloughed skins), at the same time as the refuge survey, but in the surrounding habitat rather than under the artificial refuges. In general the aim was to search for basking animals in sunny, open habitats.

1.4 Limitations

An absence of desktop records within an area does not necessarily reflect an absence of a species from that same area. Similarly the distribution of records may more accurately reflect survey effort rather than a distribution of a species. Historic records should therefore be assessed with caution when seeking to determine the presence or absence of a species.

There is no standard methodology available for accurately estimating a reptile population size with population classes varying between best practice literature (for example, Froglife (1999) states that a low population of common lizard *Zootoca vivipara* is '<5 per site', whereas HGBI (1998) states that '<20 per hectare' is a low population). In this study, Froglife guidance was used to predict the population size.

1.4.1 2014 Survey Visits

The vegetation around Section 11 of the survey area grew progressively taller throughout the survey period so that eventually access into this area was not possible. As such, the tiles in this location were not checked from the beginning of July until the end of the survey season (i.e. visits 7 – 15). This is not considered to be a significant constraint to the project as there was a good coverage of tiles throughout the rest of the site, the vast majority of which were checked for the full survey period.

The spreading of lime for agricultural purposes posed a health and safety constraint on the eleventh survey visit. Consequently, sections 10, 12 and 13 were not surveyed. This is not thought to be a constraint to the overall results of the survey as no reptiles were found in these areas during any other of the survey visits.

The temperature on six of the survey visits was above the recommended 18˚C (ranging from 19˚C – 21˚C). This is not considered to be a significant limitation as reptiles were recorded on three of the six surveys. As such, it was not deemed necessary to undertake additional visits during more suitable weather conditions.

1.4.2 2016 Survey Visits

Some visits were undertaken in slightly sub-optimal conditions. However, given the number of visits undertaken, the density of the refugia and the good seasonal spread of these visit, the quality of the results are not likely to have been significantly constrained.

2. Results

2.1 Desk Study

2.1.1 Record Request

No reptile records were returned from either The Essex Field Club or EECOS.

2.2 Field study

2.2.1 2014 Surveys of the Link Area

During the 2014 surveys of the Link Area, seven reptile presence/ likely absence surveys were undertaken between 6th May 2014 and 25th June. A further eight reptile surveys were undertaken between 2nd July and 10th September in order to determine a population estimate for the site.

The surveys identified grass snake *Natrix natrix* to be present within Areas 5, 8 and 12 and common lizard within Area 8. A common lizard was also recorded on 2nd October in Area 16 during the installation of static anabats for bat monitoring surveys.

Full results of each survey visit, including any reptile sightings or observations and weather conditions are provided in Appendix A: Table A.1. Table 2.1 below provides a summary of the maximum counts of reptiles found within each survey area and Plan 1 shows the distribution of reptiles recorded across the survey area.

Table 2.1 : Summary of the maximum number of reptiles recorded within the Link Area during 2014

Area	Maximum number of common lizard	Maximum number of grass snake
5	0	1 adult 1 sub-adult 2 juvenile
8	0	1 adult
12	1 adult	1 adult (dead)
16	1 adult	0

A peak count of one common lizard and two grass snakes was recorded for the Link Area.

2.2.2 2016 Survey of Gilden Way

During the 2016 survey of the Gilden Way, seven reptile presence/ likely absence surveys were undertaken between 6th May and 28th June 2016. A further eight reptile surveys were undertaken between 30th June and 9th September 2016 in order to determine a population estimate for the site.

Full results of each survey visit, including reptile sightings and weather conditions are presented in Appendix A:Table A.2 . Table 2.2 below provides a summary of the maximum counts of reptiles found within each survey area and Plan 2 shows the distribution of reptiles recorded across the survey area.

Table 2.2 : Summary of the Maximum number of reptiles recorded within the Gilden Way survey area during 2016

Refugia	Maximum number of common lizard	Maximum number of grass snake
118	0	1 adult
22 &35	1	0

2.2.3 Reptile Populations within the Scheme

Using the peak count data, the 2014 and 2016 results indicate that the Scheme contains a 'low' (<2 adults / ha) population of grass snakes, and a 'low' (<20 adults / ha) population of common lizards (Froglife, 1999).

3. References

Froglife (1999) *Reptile Survey: An introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife Advice Sheet 10.* Froglife, Halesworth.

Herpetofauna Groups for Britain and Ireland (HGBI) (1998) *Evaluating local mitigation/translocation programmes: Maintaining Best Practice and lawful standards*. HGBI c/o Froglife, Halesworth.

Jacobs (2013). *M11 Junction 7a: Phase 1 Habitat Survey*.

Joint Nature Conservation Committee (JNCC) (2003). *Herpetofauna workers' manual*. JNCC, Peterborough.

Plan 1: 2014 Link Area Survey Areas and Results

Sheering Lower Road

Pincey Brook

Proposed Junction 7a

Sheering Road

Gilden Way

Moor Hall Road

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

100 50 0 100 200 300 400 metres

Notes

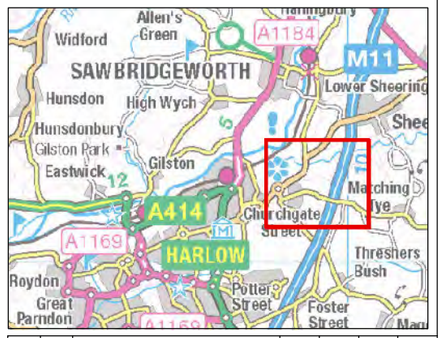
1. Do not scale

Key

- Design Iteration 1 PCF Stage 3
- Attenuation Pond
- Reptile Survey Areas

Reptile Survey 2014

- Common Lizard
- Grass Snake
- Dead Grass Snake



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Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

M11 JUNCTION 7A

Drawing Title

PLAN 1 - REPTILE SURVEY 2014

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EW	KK	CB	SB	HK
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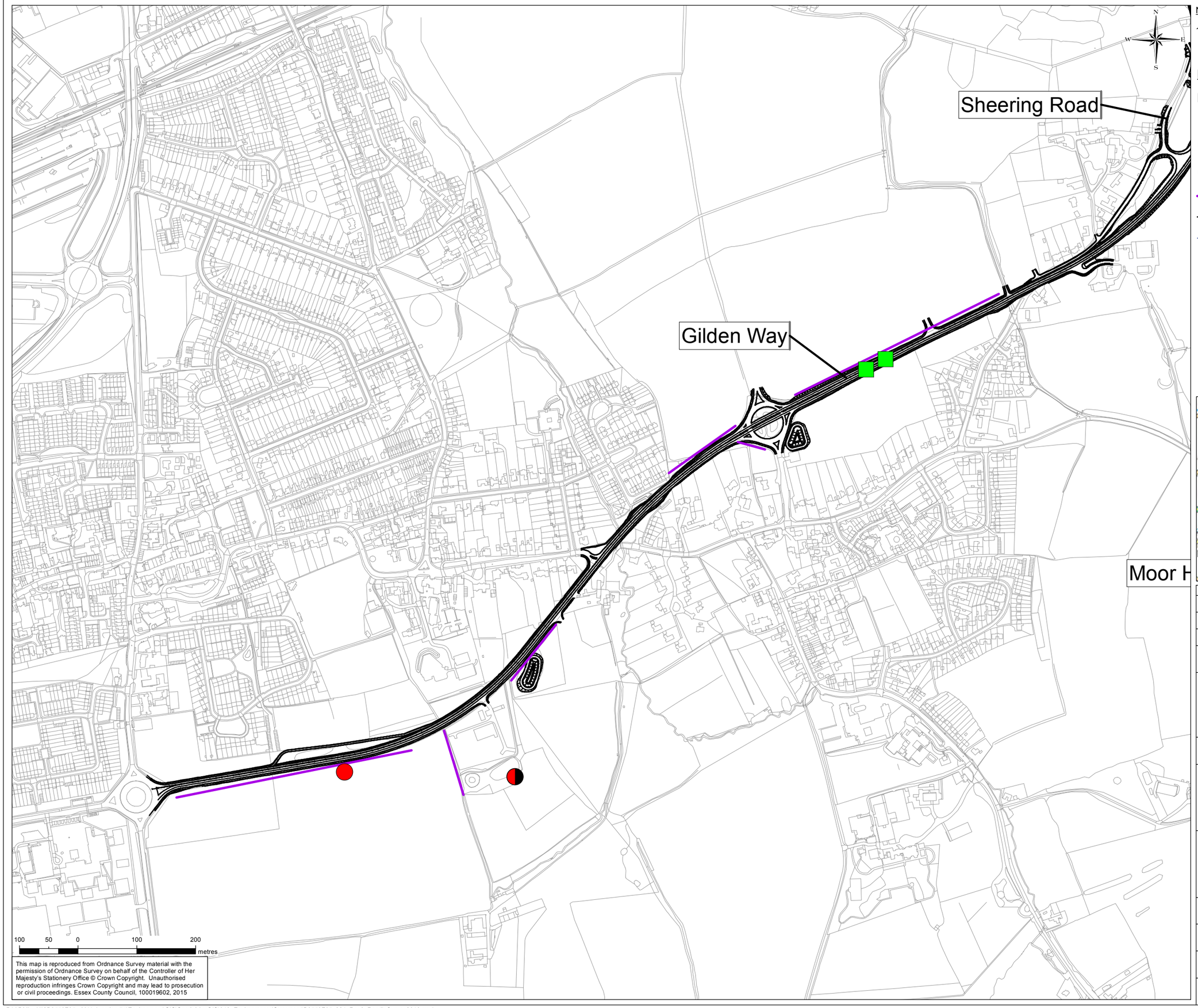
Plan 2: 2016 Gilden Way Survey Areas and Results



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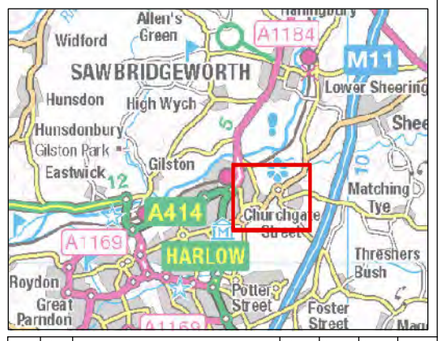
1. Do not scale

Key

Reptile Survey 2016

- Common Lizard
- Grass Snake
- Grass Snake - Incidental Record
- Reptile Survey Areas
- Design Iteration 1 PCF Stage 3
- Attenuation Pond



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Essex County Council

Mark Rowe, Service Director, Highways
Seax House, Victoria Road South, Chelmsford, CM1 1QH
Tel: 0845 6037631

Scheme Title

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Drawing Title

PLAN 2 - REPTILE SURVEY 2016

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Appendix A. Reptile survey results

Table A.1 : 2014 Link Area reptile survey results

Survey Number	Date	Start Time	End Time	Weather Conditions	Area	Reptile	Other Observations
1	06/05/14	10:30	13:30	15°C, light to moderate wind, dry.	13	0	9x Juvenile Bb
					14	0	1x Juvenile Bb
					18	0	1x Juvenile Bb
2	14/05/15	14:00	18:00	17°C, light wind, dry.	14	0	2x Juvenile Bb
					15	0	5x Juvenile Bb
					15	0	1x Adult Rt
					20	0	1x Adult Bb
3	23/05/14	09:30	14:45	15°C, light wind, dry.	5	2x Juvenile Nn	0
4	02/06/14	09:30	15:30	21°C, light wind, dry. Very humid and overcast with sunny spells.	3	0	4x Juvenile Bb
					12	1x Zv	
					0		
					14	0	2x Juvenile Bb
					15	0	8x Juvenile Bb
5	12/06/14	09:15	11:30	18°C, light wind, dry.	No reptiles/incidental species recorded		
6	17/06/14	12:55	17:00	21°C, light wind, dry.	3	0	1 Bb
					5	0	1x Juvenile Bb
					14	0	1x Juvenile Bb
					15	0	1x Bb
7	25/06/15	14:00	17:30	15°C, still to light wind, dry.	14	0	1x Juvenile Bb
8	01/07/14	10:30	13:30	21°C, still to light wind, dry.	No reptiles/incidental species recorded		
9	14/07/14	08:30	11:45	20°C, light wind, dry	15	0	1x Juvenile Bb
10	07/08/14	07:10	11:00	17°C, warm, dry, sunny	5	1x Juvenile Nn	0
11	15/08/14	09:45	13:00	18°C, light wind, dry	15	0	1x Adult Bb
					16	0	1x Adult Bb
12	26/08/14	11:30	14:15	19°C, light wind, damp from overnight rain	5	1x Sub-adult Nn	
					10	0	1x Adult Bb
					15	0	1x Juvenile Bb
13	28/08/14	11:30	15:00	18°C, light wind ground wet from	5	1x Adult Nn	0
					10	0	2x Adult Bb

Survey Number	Date	Start Time	End Time	Weather Conditions	Area	Reptile	Other Observations
				overnight rain			1x Adult Rt
					12	0	2x Adult Bb
14	09/09/14	10:40	14:00	17°C, dry, warm	5	1x Sub-adult Nn	0
					12	1x Adult Nn (dead)	0
					14	0	2x Adult Bb
					21	0	2x Adult Bb
15	10/09/14	11:00	15:30	19°C, warm, dry	5	1x Sub-adult Nn	0
					8	1x Adult Nn	0
					12	0	1x Adult Bb

Zv: common lizard; Nn: grass snake; Bb: common toad; Rt: common frog

Table A.2 : 2016 Gilden Way survey results

Survey Number	Date	Start Time	End Time	Weather Conditions	Refugia	Reptile	Other Observations
1	06/05/16	10:00	12:00	18°C, no precipitation, 1% cloud, light wind		0	2 x As
2	19/05/16	09:00	11:30	13°C, no precipitation, 25% cloud, light wind		0	None
3	27/05/16	09:30	10:30	16°C, no precipitation, 60% cloud, no wind		0	None.
4	06/06/16	17:00	18:05	21°C, no precipitation, 0% cloud, no wind	118	1 x Adult Nn	None
5	07/06/16	08:45	10:00	18°C, no precipitation, 20% cloud, no wind		0	1 x Adult Bb
6	10/06/16	09:00	10:25	18°C, no precipitation, 100% cloud, no wind	22	1 x Adult Zv	1 x Adult Bb 2 x As
7	28/06/16	16:45	17:40	12°C, no precipitation at start, survey stopped due to rain, 90% cloud, no wind	35	1 x Adult Zv	None
8	30/06/16	17:00	18:00	18°C, no precipitation at start, survey stopped due to heavy rain, light wind		0	None
9	12/07/16	07:00	09:00	15°C, no precipitation, 10% cloud, no wind		0	None
10	13/07/16	08:00	10:00	15°C, no precipitation, 60% cloud, no wind		0	None
11	14/07/16	07:00	09:00	12°C, no precipitation,		0	None

Survey Number	Date	Start Time	End Time	Weather Conditions	Refugia	Reptile	Other Observations
				30% cloud, light wind			
12	09/08/16	14:00	16:00	16-18°C, no precipitation, 60% cloud, light wind		0	None
13	12/08/16	08:00	09:30	20-22°C, no precipitation, 10% cloud, light wind		0	None
14	13/09/16	12:00	14:00	27°C, no precipitation, 0% cloud, moderate wind		0	None
15	14/09/16	06:30	07:00	19°C, no precipitation, 0% cloud, light wind		0	1 x Cg

Zv: common lizard; Nn: grass snake; Bb: common toad; Rt: common frog; As: wood mouse, CG: bank vole