LONDON-WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFA7-15 | Colne Valley to Lower Boddington

Ecological baseline data: mammals (EC-003-002)

Ecology

November 2013

VOL 5

ES 3.5.2.7-15.3

LONDON-WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFA7-15 | Colne Valley to Lower Boddington

Ecological baseline data: mammals (EC-003-002)

Ecology

November 2013

Department for Transport

High Speed Two (HS2) Limited has been tasked by the Department for Transport (DfT) with managing the delivery of a new national high speed rail network. It is a non-departmental public body wholly owned by the DfT.

A report prepared for High Speed Two (HS2) Limited.

High Speed Two (HS2) Limited,
Eland House,
Bressenden Place,
London SW1E 5DU

Details of how to obtain further copies are available from HS2 Ltd.

Telephone: 020 7944 4908

General email enquiries: HS2enquiries@hs2.org.uk

Website: www.hs2.org.uk

Printed in Great Britain on paper
containing at least 75% recycled fibre.

Contents

List of tables

Volume 5: baseline report - EC-003-002

Ecological baseline data (CFA 7-15)

Mammals

1 Introduction

1.1.1 This document is an appendix which forms part of Volume 5 of the environmental statement (ES) for the Proposed Scheme It details ecological baseline data collected for the following ecological aspects and species:

- Bats;
- Otters;
- Water vole; and
- Hazel dormouse.

1.1.2 The ecological baseline data detailed within this document relates to community forum areas (CFA):

- CFA7: Colne Valley;
- CFA8: The Chalfonts and Amersham;
- CFA9: Central Chilterns;
- CFA10: Dunsmore, Wendover and Halton;
- CFA11: Stoke Mandeville and Aylesbury;
- CFA12: Waddesdon and Quainton;
- CFA13: Calvert, Steeple Claydon, Twyford and Chetwode;
- CFA14: Newton Purcell to Brackley; and
- CFA15: Greatworth to Lower Boddington.

1.1.3 The document should be read in conjunction with Volume 2 (community forum area reports), Volume 3 (route wide effects assessment) and Volume 4 (off-route effects assessment).

2 Bats

2.1 Introduction

2.1.1 This section of the appendix presents details of baseline information relating to the presence, activity and habitats of bats for the section of the land required for the construction of the Proposed Scheme that will pass through CFA 7 to 15 inclusive.

2.2 Methodology

2.2.1 Details of the standard methodology utilised for bat surveys are provided in the Technical Note HS2 Ecological Surveys: Field Survey Methods and Standards (FSMS), which is included as an appendix to Volume 1.

2.2.2 A desk study search was undertaken to identify bat records within 5km of the land required for construction of the Proposed Scheme. Records dated prior to 1 October 1997 were excluded from the desk study review. Desk study records relating to bats were obtained from the following sources:

- Buckinghamshire Biological Records Centre;
- North Bucks Bat Group (NBBG);
- Buckinghamshire Biological Records Centre;
- Northamptonshire Bat Group; and
- Greatmoor Energy for Waste Environmental Impact Assessment.

2.3 Deviations, constraints and limitations

Trees

Constraints and limitations

2.3.1 Surveys of trees with regard to bats included ground level inspections, climbed inspections and emergence/re-entry surveys over the survey season of 2012 and 2013.

2.3.2 The main constraint when undertaking all these types tree surveys was adverse weather which, over the survey seasons of 2012 and 2013, included snow, high winds, rain and cold temperatures. Adverse weather affected ground-level surveys by reducing visibility of features and impeded climbed inspections owing to health and safety concerns. These conditions are unsuitable to conduct bat emergence surveys in and therefore scheduled surveys were necessarily cancelled when conditions were adverse. This impeded completion of emergence surveys at sites across the land required for construction of the Proposed Scheme.

2.3.3 Surveys were also constrained by health and safety issues when trees were assessed as being unsafe to climb. To address this, ground assessments and emergence surveys were carried out to assess the potential of these trees to support roosting bats.

2.3.4 Access was not possible to all sites and accessibility was also intermittent. This resulted in inconsistent and incomplete survey sets of some features which required

emergence surveys. In addition, where landowners did not permit trees to be climbed or tagged, this prevented trees being fully assessed and/or identified as requiring further surveys.

2.3.5 The hybrid Bill programme imposed a time constraint on these already seasonally-confined and weather-dependent surveys, which meant that a full set of emergence surveys (which can involve up to three visits) on all 2,000 identified tree features was not possible.

2.3.6 Where surveys could not be fully completed owing to the above constraints, this limitation was addressed by ensuring that assessments based on incomplete survey data were conservative to account for gaps in information.

Deviations

2.3.7 The methodology states that every tree assessed from ground level inspections as having high or moderate potential to support roosting bats should be climbed and inspected; and subsequently three emergence surveys should be undertaken on each feature with high potential to support roosting bats and two emergence surveys carried out on each feature assessed as having moderate potential to support roosting bats.

2.3.8 Deviations from this tree climbing methodology were undertaken at sites where many trees assessed from ground level inspections as having high/moderate potential to support roosting bats were present. These included woodland sites.

2.3.9 At such sites, climbed inspections targeted trees in clusters. Where, for example, five trees with moderate/high roosting potential were clustered close together, data was gathered on these trees as a group. All five trees would be subjected to ground level inspections, with all tree features recorded and assessed. Those two or three trees within the group assessed as having the highest potential to support roosting bats were then subjected to a climbed inspection. This approach was undertaken for a whole site, enabling these usually complex habitats (usually woodlands) to be categorised into sections.

2.3.10 Climbed inspections were supplemented with back tracking bat surveys to establish which of these suitable trees were most likely to support bats. Back tracking bat surveys identified areas of high bat activity, which, t9ogether with data from climbed inspections, indicated where roosts were most likely to be located. These locations were then targeted by emergence surveys to determine the presence or likely absence of bat roosts and, where present, inform species and numbers of bats.

2.3.11 This survey method deviation was permitted in order to provide greatest understanding of the bats using and roosting in an area with many suitable potential roosting sites, without focussing on each feature individually for both climbed and emergence surveys, which would have been unfeasible at some sites, within the survey timeframe.

2.3.12 Sites where this deviation to the methodology was conducted comprise: Land and Buildings south-west of Tilehouse Lane (CFA7), Hartwell House (CFA11), Calvert Jubilee Local Nature Reserve LWS (CFA13), and Grebe Lake (CFA13).

Buildings and structures

Constraints and limitations

2.3.13 Surveys of buildings with regard to bats included external building inspections, internal building inspections (including roof voids where present) and emergence / re-entry surveys over the survey season of 2012 and 2013.

2.3.14 The main constraints to external and internal building surveys comprised restricted access to the site and/or declined access to building interiors and roof voids.

2.3.15 Heavy snowfalls impeded external building assessment at several sites within CFA11, CFA13 and CFA14, when visibility of features was obscured.

2.3.16 Where internal access was permitted, surveys of several sites was constrained by health and safety concerns. These included sites with hazards, including structural safety and the presence of asbestos, or where access was not physically possible. In these situations, interior inspections where not undertaken. A number of buildings had access permissions retracted part way through the season and, consequently, some buildings do not have a complete set of emergence survey data.

2.3.17 Adverse weather conditions (snow, high winds, and rain and cold temperatures) encountered over the survey seasons of 2012 and 2013 were unsuitable to conduct bat emergence surveys in and therefore scheduled surveys were necessarily cancelled when conditions were adverse. This impeded completion of emergence surveys at sites across the land required for construction of the Proposed Scheme.

2.3.18 Where surveys could not be fully completed owing to the above constraints, this limitation was addressed by ensuring that assessments based on incomplete survey data were conservative to account for gaps in information.

Deviations

2.3.19 There were no deviations within the building survey methodologies.

Activity surveys

2.3.20 This section covers activity transects (walked and driven), static detector monitoring and radio-tracking surveys. These surveys were undertaken in order to determine the areas with high bat activity and to identify important commuting routes across the Proposed Scheme.

2.3.21 Specialist activity surveys, such as radio-tracking were carried out in areas where previous data had indicated the presence of rare bats, high diversity of bat species or where the impact of the Proposed Scheme on the bat assemblage was considered likely to be significant. The specialist surveys were primarily undertaken to determine the effects of the Proposed Scheme with a higher level of confidence on more sensitive areas within the land required for the Proposed Scheme.

Constraints and limitations

2.3.22 The main constraint to activity transects was lack of access to the full and continuous 3km transect required by the methodology. This occurred with regard to the walked transects in CFA9, CFA10, CFA11 and CFA14. Driven transects were undertaken within

CFA9 and CFA10 in order to sample areas where access was particularly restricted and to supplement the data set for these areas.

2.3.23 The main limitations when undertaking driven transects was the sensitivity of the equipment in collecting data whilst moving at speed.

2.3.24 As with other bat surveys, adverse weather conditions caused surveys to be cancelled and interfered with the detection rate of the detectors for surveys within April and May 2013. However, the less-intensive volume of these surveys compared with the survey regime for emergence surveys allowed more flexibility in re-scheduling activity surveys when conditions were suitable. The constraint of adverse conditions on activity surveys was therefore relatively low.

2.3.25 Where surveys could not be fully completed owing to the above constraints, this limitation was addressed by ensuring that assessments based on incomplete survey data were conservative to account for gaps in information.

Deviations

2.3.26 Deviation from the survey methodology occurred for only one activity survey, at one site in CFA11. Access permission was intermittent at this location and was not granted during July 2013 only. In order to still obtain some survey data in this area for this month, a route was taken that deviated from the original transect route for this month only. The alternative route surveyed in July was along public bridle ways situated very close to the original route and around the site where access was refused.

Radio-tracking

2.3.27 Radio-tracking surveys were undertaken at three different locations within CFA7 to CFA15 inclusive. The largest of the radio-tracking surveys was undertaken in the Bernwood Forest area, within CFA12 and CFA13, in order to better define the use of the habitat by populations of Bechstein's bats within that region. Bechstein's bats are very rare[1] and are on the edge of their UK and European ranges. Therefore, it was important to determine the exact impacts the Proposed Scheme on these bats.

2.3.28 Further, smaller radio-tracking projects were also undertaken in CFA7 and CFA9. The Colne Valley falls within CFA7, where a viaduct is proposed, which places the land required for construction of Proposed Scheme within the flight height of noctule bats. It was considered important to undertake radio-tracking projects and static detector monitoring surveys to determine if there was any collision impact risk on high flying bats, predominantly noctules but also Leisler's and serotine bats.

2.3.29 Radio-tracking was also undertaken within CFA9 where the land required for construction of the Proposed Scheme will surface in an ancient replanted woodland. Access was restricted in this area, allowing trapping only around the edges of the woodland. Therefore, it was important to determine the bat assemblage and activity occurring at this site using radio-tracking.

[1] Bat Conservation Trust (2012), *The state of the UK's bats: National Bat Monitoring Programme Population Trends 2012*, BCT, London.

Constraints and limitations

2.3.30 The main constraints within this survey type were adverse weather conditions, access to the wider area at Bernwood Forest in 2012 and access limitations to railway infrastructure.

2.3.31 Further constraints within the scope of the survey and survey equipment were encountered, as tracking bats which travel large distances within a night at high speeds can be challenging. Equipment sensitivity, access and speed can all impede the success of this survey.

2.3.32 Additionally, gaining access to sites where bats are roosting was in some instances difficult. This was a particular issue with the radio-tagged Leisler's bat, which can travel up to 10km from its roost in a night. Picking up the signal for this wide-ranging bat was therefore difficult and, in certain terrain, the signal was not detectable. The Leisler's bat roost was not located for these reasons. The radio-tagged survey for the barbastelle bat was similarly difficult, however the barbastelle roost was identified as it was within range to be detected from a road side, although access to the site of the roost was not granted. These compounded constraints resulted in collection of limited information for Leisler's and barbastelle bats.

2.3.33 Radio-tracking surveys were further subject to time constraints. Under the Natural England licence agreement, 10 days per month was given to undertake the surveys at the agreed trapping locations. Where adverse weather occurred or access for trapping sites was revoked, this resulted in surveys necessarily being cancelled and/or fewer bats being trapped and tracked and therefore reduced the data obtained from this survey.

2.3.34 Where surveys could not be fully completed owing to the above constraints, this limitation was addressed by ensuring that assessments based on incomplete survey data were conservative to account for gaps in information.

Deviations

2.3.35 No deviations in methodology were undertaken for this survey type.

Static Detector surveys

Constraints and limitations

2.3.36 The main constraint of these surveys was equipment failure and malfunction whereby the recording devices failed to record. The incidence of this occurring was relatively low and affected approximately 5% of the surveys undertaken.

2.3.37 The revoking of access permissions at certain sites halfway through the sampling period resulted in inconsistent sampling across the CFAs.

2.3.38 Further, static devices were lost through damage caused by wildlife and livestock, and/or through theft. Examples of these occurrences were a static monitoring detector being stolen and microphone equipment being damaged by squirrels, both in the Bernwood Forest region (CFA12) and livestock damaging static detectors at Fleet Marston and Putlowes (CFA11). Additionally, four microphones were broken by adverse weather conditions across the route.

2.3.39 Land access for the Radstone area was permitted late in the 2013 survey season, resulting in surveys being undertaken over a significantly shorter period. Data from surveys is, therefore, likely to be representative of the bat assemblage and activity present in mid-summer only.

2.3.40 Brown long-eared bats were not recorded during the surveys. This is likely to be due to constraints in static detector methodology and the call characteristics of the species. As such, their presence and subsequent abundance is likely to be underestimated.

2.3.41 Where surveys could not be fully completed owing to the above constraints, this limitation was addressed by ensuring that assessments based on incomplete survey data were conservative to account for gaps in information.

Deviations

2.3.42 Deviations to the static detector surveys occurred in two locations during the 2013 sampling season. These areas were Bernwood Forest (CFA12 and CFA13) and the Colne Valley (CFA7) where the detector monitoring setup methodology was altered in order to be able to answer more specific questions with regards to those areas. The deviations specific to each area are discussed below.

Bernwood Forest

2.3.43 The deviation from the methodology in the Bernwood Forest region involved the implementation of an array sampling methodology. Arrays consisted of three static detectors set up in a line perpendicular to the proposed route and also perpendicular to the existing Aylesbury Link Railway. The arrays were set up in four static locations and two floating locations, this area was inclusive from the Fishing Lakes near Edgcott road northwards to the north end of the Mega Ditch, which is south of Calvert Landfill site and Sheephouse Wood in Calvert. Each static detector was set up with two microphone channels spaced at 16m from the detector. This distance was used as it is the optimum recording distance for *Myotis* species. The six locations were:

- Finemere Fishing lakes;
- Akeman Street Disused Railway;
- Grendon Junction;
- south of the Mega Ditch;
- between the north and south locations of the Mega Ditch; and,
- north of the Mega Ditch by Sheephouse Wood.

2.3.44 Sampling was undertaken with two floating arrays set up in May and moved to alternating locations every week until August 2013.

2.3.45 This methodological deviation was deemed necessary to determine how the landscape in the vicinity of the construction of the Proposed Scheme was being used by the bat assemblage present, to identify key foraging and commuting habitats and to identify crossing points of the land required for construction of the Proposed Scheme. These data would form the design specification of appropriate mitigation.

Colne Valley

2.3.46 At Colne Valley, deviation from the standard methodology involved sampling different heights at the same location using uni-directional microphones. This involved placing two static detectors on a tree, spaced 25m apart vertically. This was carried out on four trees at different locations in the Colne Valley. The four trees were located:

- on the periphery of the woodland at the base of the slopes edging onto Broadwater Lake;
- on the edge of the ridge within the woodland to the west;
- directly south of the Waterski Club at the edge of Broadwater Lake; and,
- to the south-eastern corner of Korda lake, north of Moorhall Road.

2.3.47 This methodology was designed to determine the proportion of bat activity and the species assemblages flying at different heights in order to better understand the potential collision risks of bats associated with the land required for construction of the Proposed Scheme. It was considered important to determine this, along with the risk to different bat species, as the land required for construction of the Proposed Scheme in this area would comprise a viaduct, which would pass through the south of the Colne Valley. Of particular interest, therefore, were the higher flying bats, namely *Nyctalus* species (Leisler's and noctules) and serotine bats, since these were most likely to fly at corresponding heights with the viaduct and therefore be at greatest risk of collision.

Radstone

2.3.48 The methodology deviated at Radstone as a significantly sized Natterer's maternity roost was identified in association with a significant commuting and foraging feature, the Helmdon Disused Railway. The Helmdon Disused Railway habitat comprises unimproved calcareous grassland and dense scrub and provides a linear habitat feature passing from the north to the south, linking other suitable habitat in the landscape. It is located to the east of Radstone church, which is the location of the Natterer's maternity roost.

2.3.49 The deviation to the survey methodology was required here to identify numbers and species assemblage of bats using the Helmdon Disused Railway and determine the proportions of bats moving northwards and southwards along Helmdon Disused Railway. The land required for the construction of the Proposed Scheme is located within 100m of this area and bisects Helmdon Disused Railway further south. This would sever the potential foraging resource and commuting link that was likely to serve the Natterer's maternity roost. It was therefore important to better understand the use of Helmdon Disused railway by bats and therefore determine the potential impact on the bat assemblage, including the Natterer's maternity colony, within this area.

2.3.50 The survey deviation therefore involved placing static detectors at four locations at Radstone. These locations comprised:

- Helmdon Disused Railway, to the north east of the Natterer's maternity roost at Radstone;
- Helmdon Disused Railway, to the south east of the Natterer's maternity roost at Radstone;
- a tributary of the River Ouse which connects to the Helmdon Disused Railway; and,
- in a small coppice area surround by arable field to the south west of the Natterer's maternity roost at Radstone.

2.3.51 This survey approach provided data to better understand how bats use the wider landscape around Radstone. Collectively, these data informed impact assessments and mitigation design for this area.

Reporting

Constraints and limitations

2.3.52 None apply.

Deviations

2.3.53 The main deviations when reporting have been the use the acronym 'ppn' which stands for 'passes per night'. This refers to the counts of bat species passes in one night collected from static detector surveys.

2.3.54 A 'pass' for the purposes of these bat data is defined as being one Analook sound file which contains at least one call from a bat species. For example, two passes per night of common pipistrelle would indicate that two Analook sound files each contained at least one common pipistrelle call per night.

2.3.55 In the context of these bat surveys, 'peak counts' are defined as the highest number of passes per night recorded at one static detector location within a defined sampling period. For example, if the sampling period comprised three nights in June when bats were recorded by a static detector, and data recorded was as follows: 10 common pipistrelle ppn, 11 common pipistrelle ppn and 100 common pipistrelle ppn, the peak count would be taken as 100ppn of common pipistrelles for that sampling period.

2.3.56 Activity levels have been defined in terms of low, moderate and high, and are described in relation to the activity of that particular species. For example; common pipistrelles activity of 200-500 passes per night (ppn) would be considered moderate, as activity can peak at 2-3000ppn which would be classified as very high. However, Nathusius' pipistrelle activity is considered high if 100-200ppn are recorded, as they are rare and have more restricted habitat requirements. Numbers of other species rarely reach the same levels of common pipistrelles. Therefore, comparing activity levels of less common or rare species with each other rather than with common pipistrelles provides greater insight into the relative value of these species in the area.

2.4.26 Common and soprano pipistrelle bats, and undetermined pipistrelles, were the most common species recorded at this location. Common pipistrelles were recorded in all sampling periods with the peak count of 31ppn recorded in August 2012. However, soprano pipistrelles were more abundant overall with peak counts of 38 and 22ppn in July and August/September 2012 respectively. High levels of Daubenton's bat passes were recorded during June 2012 with potential peak counts of 52ppn when taking into account numbers of undetermined *Myotis* species recorded during this time, which could also be attributed to this species. Low counts of whiskered/Brandt's bats were recorded during July and October 2012 and similarly low counts of noctule and Leisler's bats were recorded during July and August/September 2012. A moderate level of *Nyctalus/Eptesicus* bats was recorded during July 2012 with a peak count of 25ppn during this sampling period. October is comparatively under recorded for all species. A single, rare barbastelle bat was recorded during June 2012.

Discussion

Bat Assemblage

2.4.27 Field surveys carried out in 2012 and 2013 confirmed the presence of 13 bat species in this area, including rare, uncommon and less common species; barbastelle, serotine, Brandt's bat, whiskered bat, Leisler's bat, noctule and Nathusius' pipistrelle.

2.4.28 Common and widespread species including common pipistrelle, soprano pipistrelle were abundant with high levels of activity recorded roosts were located within the Mid-Colne Valley SSSI and in the area south-west of Tilehouse Lane. Common and soprano pipistrelle were the most abundant species recorded during field surveys in the area with peak counts of 3,195 and 2,842ppn respectively recorded by a single detector on one survey night. Daubenton's bat, which are commonly associated with habitats found within the area such as broadleaved woodland and standing water, were also recorded in high numbers with ppn of 651.

2.4.29 Scarce species such as Leisler's, uncommon species such as serotine, noctule and rare species including Nathusius' pipistrelles, whiskered bat and Brandt's bat were recorded in high numbers from field surveys (which included radio tracking and trapping) in this area. These species are classified as less common, uncommon and rare because of restricted distributions and/or low to moderate populations.

2.4.30 Low activity levels of barbastelle bat, which are classified as very rare and have a restricted range, were recorded during April, June and July with a peak count of 14ppn.

2.4.31 It was not possible to undertake tree-climbing assessments or emergence surveys on some of the land between the River Colne and the A412 as the ground is uneven and covered in dense scrub making it unsafe for survey. Access was not granted for the area between Buckinghamshire Golf Club and Moorhall Road. The lack of access may have resulted in some roosts going unrecorded, however, the areas that could not be fully surveyed were limited and are likely to support similar populations to adjacent land parcels where access was possible. Access was also possible in areas with high quality. As a result, the lack of access is not considered to be a significant constraint.

Roosts

2.4.32 Roosts of common pipistrelle, soprano pipistrelles and *Myotis* species bats, some of which were confirmed as Daubenton's bat, were identified from tree roosts and bat boxes located within the Mid-Colne Valley SSSI. A total of nine roosts at eight different trees were confirmed from climbed inspections and emergence surveys. Four roosts were located within woodland to the west of Broadwater Lake. The other four trees which contained roosts were located within woodland surrounding Korda Lake. All roosts are located within (six roosts within, one partially within) or adjacent to (five roosts within 150m) of land required for the construction of the Proposed Scheme. High levels of foraging and commuting activity from each of these species were recorded during activity transect and static monitoring surveys.

2.4.33 A total of four roosts were confirmed in buildings and structures in the area. These included a *Myotis* sp. roost in a residential building located to the west of the Broadwater Lake and transitional roosts for brown long-eared bat, common pipistrelle and serotine confirmed within the area south-west of Tilehouse Lane. This site is partially located within the 100m buffer zone of the land required for the construction of the Proposed Scheme.

Foraging Habitat

2.4.34 Land within the extent of and adjacent to the Proposed Scheme is dominated by several large lakes, associated marginal habitat and semi-natural broadleaved woodland around the lakes and in Ranston Covert and Battlesford Wood. It also comprises a section of the River Colne. The wider landscape comprises farmland, broadleaved woodland, mature hedgerows and flooded gravel pits. Each of these habitats are of potential value to foraging bats in the area.

2.4.35 High levels of foraging activity were recorded at several locations during transect surveys; in particular the woodland which slopes over the ridge on the western edge of the Mid-Colne Valley SSSI. This area featured particularly high levels of activity for soprano, common and Nathusius' pipistrelles, as well as *Nyctalus* and *Myotis* species bats. High activity of *Myotis* species bats and Nathusius' pipistrelles were also recorded along the lake complexes, in particular Korda Lake and Broadwater Lake where multiple Daubenton's bats were recorded foraging. Trapping surveys further determined the presence of whiskered, Brandt's and Natterer's bats foraging between the River Colne, Broadwater Lake and the woodland to the west.

2.4.36 There was a notable difference in numbers of passes per night amongst species and between the static detectors that were placed at different elevations on the same tree. At a tree located adjacent to Broadwater Lake (Location one), the ground level detector recorded peak counts of 2,935 and 2,662 common and soprano pipistrelles and 672 Nathusius' pipistrelles. Higher numbers of noctule bats were recorded in the canopy level with a peak count of 93ppn compared with ground level records, which had a peak count of 45ppn from noctule bats. Furthermore, at the canopy level higher numbers of common and Nathusius' pipistrelles were recorded with 3,195 and 835ppn respectively, compared with 2,935 and 672ppn recorded at ground level. Both Leisler's bats and serotines were also recorded in higher numbers at canopy level with a peak count of 46ppn for Leisler's (at Location two; a tree located on the ridge at the

western aspect of the Mid-Colne Valley) compared with 16 at ground level. This pattern was replicated for noctules (peak count of 164ppn at Location two (the edge of the ridge within the woodland to the west) compared with 84ppn at ground level) and serotine bats.

2.4.37 High levels of *Nyctalus/Eptesicus* species bats were also recorded during the static detector monitoring surveys. Activity from these genera was concentrated between Location one (the periphery of the woodland at the base of the sloped edging onto Broadwater Lake) and Location two (the edge of the ridge within the woodland to the west). Field surveys identified that noctule, serotine and Leisler's bats were mostly foraging above the tree canopy. Nathusius' and common pipistrelles, some *Myotis* species and barbastelle bats were recorded foraging at canopy height but also frequently at the height of understorey vegetation. Soprano pipistrelles, Daubenton's and whiskered bats were recorded foraging predominantly at the height of understorey vegetation and over open water. The survey methodology, where by static detectors were placed at different heights, suggests that structural diversity is very important in supporting bats that use the understorey and those which forage at canopy level. The four detector locations were all placed within 25m of land required for the construction of the Proposed Scheme where a viaduct is proposed.

2.4.38 Barbastelle bats were recorded in low numbers across Location one (the periphery of the woodland at the base of the sloped edging onto Broadwater Lake) and Location two (the edge of the ridge within the woodland to the west) three (directly south of the Waterski Club at the edge of Broadwater Lake), and four (south-eastern corner of Korda Lake, north of Moorhall Road) with a peak count of 14ppn at Location four; the tree on the south east corner of Korda Lake. There were low numbers of ppn from barbastelle bats, but activity was consistent throughout the sampling period. Barbastelle bats are classified as nationally rare and have a restricted population within England. This habitat is likely to forms part of a wider home range for this species which is known to travel several kilometres from a roost to forage.

2.4.39 Back tracking surveys at the area south-west of Tilehouse Lane found high levels of activity from common and soprano pipistrelles and moderate numbers of serotine, *Nyctalus* and *Myotis* species and brown long-eared bats. This indicates that the site has suitable habitat that supports moderate to high numbers of bats and provides roosting sites and foraging areas for local bats.

2.4.40 The prevalence of less common species and a nationally classified rare species in and around the Mid Colne Valley SSSI suggests that the overall quality of the habitat present is able to support populations of large numbers of bats and a high diversity of species, which contributes to the importance of foraging habitat in this area.

Commuting Habitat

2.4.41 Semi-natural and ancient woodland connected by water bodies associated within the Mid Colne Valley SSSI, and hedgerows, provide suitable habitat to support the bat assemblage present in the area.

2.4.42 High numbers of bats were recorded at Location one (the periphery of the woodland at the base of the sloped edging onto Broadwater Lake), Location two (the edge of

the ridge within the woodland to the west) and Location four (south-eastern corner of Korda Lake, north of Moorhall Road). Low to moderate bat activity was recorded at Location three (directly south of the Waterski Club at the edge of Broadwater Lake). This indicates that commuting routes along the woodland ridge on the western edge of the Mid-Colne Valley SSSI, the River Colne and associated vegetation, and the edge of the lake complex in this area, provide a network that supports high numbers of commuting bats. High levels of activity were recorded for common pipistrelles at Location one, which is on the ridge to west of Broadwater Lake. Noctule bats were the most abundant species, with moderate numbers of Leisler's bat recorded at Location one and lower numbers of both Leisler's and serotine recorded throughout.

2.4.43 High levels of *Nyctalus/Eptesicus* species bats were also recorded during the static monitoring surveys, which suggest bats were commuting at canopy height over lower ground at Location two to the east and being recorded by the understorey detector at Location one in the west. Peak night counts of these genera reached 370ppn at Location two and 119ppn at Location one.

2.4.44 Activity transects recorded high levels of *Myotis* species bat, Daubenton's bat and common and soprano pipistrelles commuting along the western boundary of the lake, where it meets the River Colne watercourse and adjacent mature semi-natural broadleaved woodland. Common and soprano pipistrelles were also recorded commuting along the lakes and the sand and gravel works in the east. The continuity of mature woodland habitats, which bound and cross Broadwater Lake, together with the standing water itself provide an extensive network of habitat features suitable for commuting bats.

2.4.45 The levels of bat activity and diverse species composition recorded in this area indicate that the extent and quality of commuting habitat in this area are of fundamental importance to bats commuting across the landscape in this area.

CFA8 The Chalfonts and Amersham

Overview of bat species status in the vicinity of CFA8

2.4.46 Habitats suitable for roosting, foraging and commuting bats in this area, including within land required for the construction of the Proposed Scheme, comprise mixed arable and pasture farmland bounded by hedgerows. The wider landscape includes further habitat suitable to support bats, including Hodgemoor Wood SSSI which contains large tracts of semi-natural broadleaved woodland, as well as several areas of ancient woodland including Pollards Wood, Bailey Wood and Hales Wood. Tree lined roads and hedgerows are abundant in the area, which are likely to function as habitat features for commuting bats. The River Misbourne, a spring fed chalk steam, runs through the area. The Proposed Scheme passes close to the villages of Chalfont St Peter and Chalfont St Giles as well as several isolated dwellings that provide potential roost sites for bats. The Proposed Scheme in this area runs in part through a bored tunnel and, where this is the case, the land required for the construction of the Proposed Scheme is confined to that at three vent shafts and associated satellite construction sites.

2.4.47 Field surveys recorded at least six species of bat[4] in this area:

- noctule (*Nyctalus noctula*);
- Daubenton's bat (*Myotis daubentonii*);
- Natterer's bat *(Myotis natteri*);
- soprano pipistrelle (*Pipistrellus pygmaeus*);
- common pipistrelle (*Pipistrellus pipistrellus*); and,
- brown long-eared bat (*Plecotus auritus*).

2.4.48 There was a desk study record of a serotine bat, but this is not considered to be relevant to the assessment as it was an individual bat in flight noted approximately 1.2km from the route.

Roosting (Trees)

2.4.49 A total of 33 trees were subject to an initial assessment in line with the methods described in the Field Survey Methods and Standards (FSMS) document. These included ground based survey and a subsequent climbed inspection where appropriate resulting in the following:

- no confirmed bat roosts were identified;
- ten trees were assessed as having high potential to support roosting bats;
- 13 trees were assessed as having moderate potential to support roosting bats; and
- the remaining ten trees were assessed as having low or negligible potential; these trees were subsequently scoped out of further survey.

2.4.50 Of the 23 trees assessed that were assessed as having confirmed roosts or moderate or high potential to support roosting bats:

- a total of 21 trees were subject to tree climbing surveys and no bat roosts were identifed;
- none were re-assessed as being of low or negligible potential;
- the remaining two trees were considered unsuitable for climbing surveys;
- five trees were subject to a total of five emergence surveys; and
- the remaining 18 trees were not subjected to further emergence surveys for reasons discussed in Section 1.4.

2.4.51 No back tracking surveys were undertaken in this area.

[4] Certain species could only be identified to genus level on the basis of sound recordings; therefore, the figure of 12 relates to species which have been unambiguously confirmed in this area.

2.4.52 No tree roosts were identified in this area. A large proportion of trees identified as having potential to support bats were assessed through climbed inspections. As a result, the majority of roosts are likely to have been recorded where survey access was granted.

Roosting (building and structures)

2.4.53 A total of eight buildings were subject to an initial assessment and further internal inspections, resulting in the following:

- two confirmed roosts were identified;
- one building was assessed as having high potential to support roosting bats;
- five buildings/structures were assessed as having moderate potential to support roosting bats; and
- no buildings were assessed as having low or negligible potential to support roosting bats.

2.4.54 Of the eight buildings with confirmed roosts or assessed as having high or moderate potential to support roosting bats:

- two were subject to a more detailed internal inspection. This resulted in the two buildings being confirmed as supporting roosting bats;
- detailed internal inspection was not possible on the remaining five buildings for reasons listed in Section 1.5;
- four buildings were subject to a total of four emergence surveys.

2.4.55 No backtracking surveys were undertaken within this study area. Details of confirmed roosts in buildings/structures in this area of the route are provided in Table 15.

Table 15: Confirmed bat roosts in buildings/structures in CFA8 The Chalfonts and Amersham

Ecology survey code	Location	OS grid reference	Building/ structure type	Species confirmed utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Distance from the Proposed Scheme
020-BS2-041002	Lower Park House	SP 494 197	Residential	Brown long-eared bat	Internal building inspection, 4 July 2013	Feeding Perch	Open corrugated structure with skylights and wooden sarking. Identified through feeding remains present.	8	Within 450m of land required for the Proposed Scheme
020-BS3-034001	Ashwell's Farm	SP 500 193	Other (ore)	Brown long-eared bat	Emergence Survey, 23 May 2013	Transitional	Old Granary, now workshop. Pitched, tiled roof with two skylight windows on roof. Walls un-insulated weatherboards, generally all tightly fitted.	8	Within 200m of land required for the Proposed Scheme

Bat activity surveys

2.4.56 No activity transects were undertaken in CFA8 due to limited extent of habitats suitable for bats within the above ground elements of the Proposed Scheme.

2.4.57 A total of six static detector surveys were undertaken within this area at two locations, both at Ashwell's Farm.

2.4.58 At least six species of bats were recorded during these surveys in this area, as follows:

- common pipistrelle;
- soprano pipistrelle;
- noctule;
- Leisler's bat;
- *Myotis* sp;
- Daubenton's bat; and
- Natterer's bat.

Table 16: Bat activity surveys conducted within CFA 8 The Chalfonts and Amersham

Ecology survey code	Transect/Static location	Number of surveys conducted	First survey date	Final survey date	Map Reference
020-BA2-056001	Ashwell's Farm 1	4	30 April 2012	22 July 2013	TQ 001 931
020-BA2-056-002	Ashwell's Farm 2	2	30 April 2012	8 May 2013	TQ 001 931

Table 17: Summary of static detector monitoring results for 020-BA2-034001 The Chalfonts and Amersham

Ecology survey code	Location	OS Grid	Description of habitat
020-BA2-034001	Ashwell's Farm (CFA 8)	TQ 001, 931	Corner of field, chained to a holly and hawthorn tree - stands apart from other vegetation

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/ Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny /Ep
Visit 1 - 30 April 2013	1	42	11	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0
Visit 2- 01 May 13 to 03 May 2013	2	57	10	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Visit 3 - 01 June 2013- 09 June 2013 and 14 June 2013 - 24 June 2013	18	2269	236	0	4	0	10	0	0	0	0	42	0	0	0	1	0	1
Visit 4 - 12 July 2013-22 July 2013	10	0	0	0	2936	0	0	0	0	0	0	57	0	0	0	0	0	14

Pp - common pipistrelle, P py - soprano pipstrelle, Pn - Nathusius' pipistrelle, P sp - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus/ Eptesicus* bat.

2.4.59 Low to moderate levels of common pipistrelle activity were recorded during April and June 2013. High levels of activity were observed during June 2013. Soprano pipistrelle activity was low during April and June 2013, with a notable peak in activity in June 2013. High bat activity (2,936ppn) of pipistrelle species were recorded during July 2013. *Myotis* species were recorded in low numbers during April and May 2013 and moderate numbers in June and July, with Daubenton's bats only being recorded in June 2013. No *Nyctalus/ Eptesicus* activity was recorded during April or May 2013, and low levels of activity were noted in June and July. A single pass for a Leisler's bat was recorded during April and again in June 2013.

Table 18: Summary of static detector monitoring results for 020-BA2-034002 Chalfonts and Amersham

Ecology survey code	Location	OS Grid	Description of habitat
020-BA2-034002	Ashwell's Farm 2 (CFA8)	TQ 001 931	Adjacent rural Chesham Ln. and group of trees/spinney. Northern most holly tree within the hedge, next to farm gate

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/ Ep
Visit 1 - 30 April 2013- 31 April13	2	165	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Visit 2 - 01 May 2013 - 08 May 2013	7	1310	76	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2

Pp - common pipistrelle, P py - soprano pipstrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus*/ *Eptesicus* bat.

2.4.60 Common pipistrelle activity was moderate in April, but peaked during May 2013 when high numbers of ppn were recorded with a peak count of 1,310. Moderate levels of soprano pipistrelle activity were recorded in April 2013 and May 2013. No other bat species were observed during the April recording period. A peak count of one *Myotis* species pass and two *Nyctalus/ Eptesicus* passes were observed during May.

Discussion

Bat Assemblage

2.4.61 The bat assemblage in this area includes species that are common and widespread in Buckinghamshire. The static surveys at Ashwell's Farm identified common and soprano pipistrelles as being the most abundant species. *Myotis* species and *Nyctalus/Eptesicus* were also recorded, but in low numbers. Brown long-eared bats were not recorded during the surveys, although this is likely to be due to constraints in static detector methodology and the quiet call characteristics of the species. As such, their presence and subsequent abundance is likely to be under recorded.

2.4.62 Survey access was not possible around Bottom House Farm Lane, and access to the north-west of Amersham was not granted until late spring 2013. As a result, no data was collected at these locations. Although these areas may contain bat populations, the extent of habitat within the land required for construction of the Proposed Scheme is limited and the bat assemblage is likely to be similar to adjacent areas where surveys were possible. This is therefore not considered to be a significant constraint.

Roosts

2.4.63 Two brown long-eared bat roosts were recorded during field surveys, one a transitional (day) roost and the other a feeding perch. Both roosts are considered to be of a low conservation status. The desk study did not identify the presence of any roosts within 100m of land required for the Proposed Scheme.

2.4.64 The bat assemblage largely consists of species that are considered to be common and widespread in the area. No rare or locally notable species were identified. The species composition and activity levels recorded through both desk study and field surveys indicate that the bat assemblage is likely to be representative of similar landscapes throughout the area.

Foraging Habitat

2.4.65 Habitats used by for foraging bats identified in this area include woodland, hedgerows, tree-lined roads and watercourses. The foraging activity of bats in these habitats was typically at low to moderate levels. Foraging activity of six species was recorded at Ashwell's Farm. These habitats are of value to local populations of foraging bats.

Commuting Habitat

2.4.66 Bat commuting habitat identified in this area is similar to the woodland, hedgerows, tree-lined roads and watercourses identified as being used by foraging bats. Commuting activity of bats in these habitats was typically at low-moderate levels. Commuting activity of seven species was recorded at Ashwell's Farm. These habitats are of value to populations of bats commuting across the landscape in this area.

CFA9 Central Chilterns

Overview of bat species status in the vicinity of CFA 9

2.4.67 Habitats present within this area suitable to support roosting, foraging and commuting bats consists of arable, pasture and isolated woods, some of which are wholly or partly ancient woodland. This is typical habitat for this part of the Chilterns Hills. The largest of the woodland blocks are Mantle's Wood, and Hedgemoor and Farthings Wood, which are located at or adjacent to the northern portal of the Chilterns Tunnel.

2.4.68 Field survey and desk top studies have found three common and widespread bat species in low numbers and two uncommon species (noctule and serotine bats) in very low numbers within this area, with relatively low levels of bat activity recorded overall. The bat assemblage within this area are as follows:

- noctule bat (*Nyctalus noctula*);
- serotine bat (*Eptesicus serotinus*);
- Natterer's bat *(Myotis natteri*);
- Daubenton's bat (*Myotis daubentonii*);
- soprano pipistrelle (*Pipistrellus pygmaeus*);
- common pipistrelle (*Pipistrellus pipistrellus)* and;
- brown long-eared bat (*Plecotus auritus*).

2.4.69 Three common pipistrelle roosts were present in the north of this area. The bat assemblage consists of common and soprano pipistrelle, unidentified pipistrelle species, *Myotis* species, Daubenton's bats, noctule, serotine and unidentified large bat species. Desk study data also confirms the presence of low levels of commuting activity of brown long-eared bats and Natterer's bats. The greatest bat activity was recorded in association with the three roosts, located in the north of the area, with less activity and fewer species recorded in the south of the area.

Roosting (Trees)

2.4.70 A total of 49 trees were subject to an initial assessment in-line with the methods described in the Field Survey Methods and Standards (FSMS) document. These included ground based survey and subsequent climbing inspection where appropriate.

2.4.71 Of the 49 trees subjected to the initial assessment:

- no bat roosts were identified;
- two trees were assessed as having high potential to support roosting bats;
- 24 trees were assessed as having moderate potential to support roosting bats; and
- the remaining 23 trees were assessed as having low or negligible potential; these trees were subsequently scoped out of further survey.

2.4.72 Of the 26 trees assessed as having moderate or high potential to support roosting bats:

- a total of three trees were subject to tree climbing surveys;
- as result, no confirmed bat roosts were identified and none of the trees were re-assessed as being of low or negligible potential;
- the remaining 23 trees could not be climbed due to the constraints listed in section 1.4.1 and 1.4.2;
- two trees were subjected to two emergence surveys;
- the remaining trees were not surveyed due to access and time constraints.

2.4.73 No back tracking surveys were carried out at this area.

2.4.74 Desk study records identified no tree roosts within this area, despite the ancient and semi-natural woodland habitat present, and indicated that low levels of bat activity have been recorded within this area previously.

Roosting (building and structures)

2.4.75 A total of nine buildings were subject to an initial assessment and further internal inspections resulting in the following:

- no confirmed roosts were identified within buildings during initial assessments
- two buildings/structures were assessed as having high potential to support roosting bats;
- four buildings/structures were assessed as having moderate potential to support roosting bats; and
- the remaining three buildings were assessed as having low or negligible potential to support roosting bats; these trees were subsequently scoped out of further survey.

2.4.76 Of the seven buildings assessed as having roosts or high or moderate potential to support roosting bats:

- three were subject to a more detailed internal inspection. This resulted in no roosts being identified and none of the buildings being downgraded to low or negligible potential to support roosting bats; and
- four buildings were subject to a total of six emergence surveys which resulted in three buildings being confirmed as supporting roosts. As discussed in the constraints section; 1.4.1-1.4.6, not all features were subject to a full set of emergence surveys due to intermittent access to sites and adverse weather conditions affect the survey schedule.

2.4.77 No back tracking surveys were undertaken within this area.

2.4.78 Details of confirmed roosts in buildings/structures in this area of the route are provided in Table 19.

Table 19 Confirmed bat roosts in buildings/structures in CFA 9

Ecology survey code	Location	OS grid reference	Building/ structure type	Species confirmed utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Approximate Distance from the Proposed Scheme
020-BS3-047001	Mulberry Park Hill	SP 490 202	Residential	*Common pipistrelle (1)*	Emergence survey – 26 June 2013	Daytime/transitional	Converted barn structure.	9	Within the Proposed Scheme
020-BS2-047003	Mulberry Park Hill	SP 490 202	Residential	*Common pipistrelle (50)*	Emergence survey – 26 June 2013	Maternity	Large manor house Residential building- several roof voids with good bat potential.	9	Within the Proposed Scheme
020-BS2-047002	Mulberry Park Hill	SP 490 202	Garage	*Common pipistrelle (2)*	Emergence survey – 26 June 2013	Daytime/transitional	Outhouse for swimming pool.	9	Within the Proposed Scheme

Bat activity surveys

2.4.79 The predominant species recorded from activity transect and static monitoring surveys was common pipistrelle, along with low numbers of soprano pipistrelle, pipistrelle species, *Myotis* species, Daubenton's bat, noctule and serotine. Desk studies further showed the presence of a Natterer's bat commuting at Wendover (within 540m of the Land required for construction of the Proposed Scheme) and Daubenton's bat foraging at Weston Turville Reservoir (which is within 1.4km of the Land required for construction of the Proposed Scheme).

2.4.80 The total bat assemblage for this area identified through a combination of desk top studies and field surveys is as follows:

- noctule bat (*Nyctalus noctula*);
- serotine bat (*Eptesicus serotinus*);
- Natterer's bat (*Myotis natererii*);
- Daubenton's bat (*Myotis daubentonii*);
- common pipistrelle (*Pipistrellus pipistrellus*); and
- soprano pipistrelle (*Pipistrellus pygmaeus*).

Table 20 Bat activity surveys conducted within CFA 9 inclusive

Ecology survey code	Transect location	Number of surveys conducted	First survey date	Final survey date	CFA	Map Reference
020-BA1-043-045-002	Driven transect CFA9 (starting at Broome Farm the end point is Spring field Farm, via Leather Lane, where Potter's Row turns in to King's Lane)	4	25 April 2013	27 July 2013	9	Start SU 923 993, finish SU 932 991
020-BA1-044-001	Activity transect CFA9 (starting at Mantle's Wood ending near Keepers Wood)	4	22 April 2013	22 July 2013	9	Start SU 923 993, finish SU 932 991
020-BA2-047001	Mulberry Park Hill	2	01 May 2013	24 May 2013	9	SP900 024
020-BA2-044001	Mantle's Farm	3	07 May 2013	17 July 2013	9	SP 922 000

Table 21 Bat activity transect survey results - Transect 020-BA1-045(-043)-001

Ecology survey code	**Transect location**			**Description of habitats covered by transect**																	
020-BA1-045-001	Start at Mantle's Wood along chalk lane finishing at Keepers Wood			Mostly arable and pastoral land bordered by intact and well-connected hedgerows surrounding fragments of ancient semi-natural and re-planted woodland mixture.																	
Visit number and date	**Weather conditions**			**Total species passes during transect survey**																	
	Temp (°C)	**Cloud (0-8)**	**Rain (0-5)**	**Wind (0-12)**	**Pp**	**Ppy**	**Pn**	**P sp.**	**Mb**	**Md**	**Mn**	**Mm**	**Mbr**	**Mm/ Mb**	**M sp.**	**Pa**	**Bb**	**Nn**	**Nl**	**Es**	**Ny/ Es**
Visit 1 Dusk 17 April 2013	14	8	0	7	24																
Visit 2: Dusk 22 May 2013	9.9 (start)- end 7.6	0	0	2	17	1															
Visit 2: Dawn 23 May 2013	5.6 (start)- 5.1 (ended)	0	0	5	5																
Visit 3: Dusk 11 June 2013	15.6	2	0	2	12																
Visit 3: Dawn 12 June 2013	13.8	3	0	8	6																
Visit 4: Dusk 22 July 2013	27	5	0	1	11																2
Visit 4: Dawn 23 July 2013	18	8	2-5	2	8																1

Pp - common pipistrelle, P py - soprano pipstrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus*/ *Eptesicus* bat.

Cloud cover on a scale of 0-8 where 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy.

Precipitation intensity on scale of 0-5 where 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.

Wind speed score of 0-12 against Beaufort scale where 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane

2.4.81 The dominant species observed during activity transects was common pipistrelle, with peak counts occurring in April and May (24 and 17ppn respectively), which was recorded across the transect route. With the exception of one soprano pipistrelle pass in May, and three large bat passes in July. The only regularly occurring species, albeit at low density, was common pipistrelle.

Table 22 Driven activity transect survey results - Transect 020-BA1-045(-043)-002

Ecology survey code	**Transect location**				**Description of habitats covered by transect**															
020-BA1-045(-043)-002	Start point is at Broome Farm, to the west of Hedgemoor Wood. Route then head north to Hyde End and north-west past Sibleys Coppice and along Potter Row to Springfield Farm.				Tree-lined roads through arable and pastoral fields with isolated ancient and semi-natural woodland															
Visit number and date	**Weather conditions**				**Total species passes during transect survey and principle behaviour**															
	Temp (°C)	**Cloud (0-8)**	**Rain (0-5)**	**Wind (0-12)**	**Pp**	**Ppy**	**Pn**	**P sp.**	**Mb**	**Md**	**Mn**	**Mm**	**Mbr**	**Mm /Mb**	**M sp.**	**Pa**	**Bb**	**Nn**	**Nl**	**Es**	**Ny/ Es**
Visit 1 Dusk 17 April 2013	14	8	0	7	24															
Visit 1 Dawn 18 April 2013 - No records- survey cancelled	7	8	3	9																
Visit 2: Dusk 22 May 2013- No data	9	7	1	6																
Visit 3: Dusk 17 June 2013	15°C	8	2	4	25										2			5			
Visit 4: Dawn 24 June 2013	12°C	8	1	1	4	1														

Ecology survey code	Transect location				Description of habitats covered by transect															
020-BA1-045(-043)-002	Start point is at Broome Farm, to the west of Hedgemoor Wood. Route then head north to Hyde End and north-west past Sibleys Coppice and along Potter Row to Springfield Farm.				Tree-lined roads through arable and pastoral fields with isolated ancient and semi-natural woodland															
Visit number and date	**Weather conditions**				**Total species passes during transect survey and principle behaviour**															
	Temp (°C)	**Cloud (0-8)**	**Rain (0-5)**	**Wind (0-12)**	**Pp**	**Ppy**	**Pn**	**P sp.**	**Mb**	**Md**	**Mn**	**Mm**	**Mbr**	**Mm /Mb**	**M sp.**	**Pa**	**Bb**	**Nn**	**Nl**	**Es**	**Ny/ Es**
Visit : Dusk 23 July 2013	20°C	4	0	1	27										1						
Visit : Dawn 24 July 2013	20°C	4	0	1	5	1															

Pp - common pipistrelle, P py - soprano pipstrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus*/ *Eptesicus* bat.

Cloud cover on a scale of 0-8 where 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy.

Precipitation intensity on scale of 0-5 where 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.

Wind speed score of 0-12 against Beaufort scale where 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane

2.4.82 Very low levels of *Myotis* and noctule activity were recorded on the driven transect, with only 5ppn for noctules and 2ppn, and 1ppn for *Myotis* in June and July respectively. There was consistently low activity of common pipistrelle bats across the months (peak count of 27ppn in July). Occasional soprano pipistrelles passes were recorded, with one pass in the dawn transects undertaken in both June and July. Activity was concentrated around Hyde Lane and King's Lane.

Table 23 Summary of static detector monitoring results at 020-BA2-048001

Ecology survey code	Location	OS Grid	Description of habitat
020-BA2-048001	Mulberry Park Hill	SP900 024	Large garden, well-kept grass with large trees

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/ Ep
April 2013- No Data Recorded	7																	
01 May 2013 to 07 May 2013	6	201	3		22							2			1		1	
24 May 2013 to 30 May 2013	6	262	3									2			6			
June 2013- No Data- access refused	0																	
17 July 2013 -23 July 2013	6	206	1		20							1			1			

Pp - common pipistrelle, P py - soprano pipstrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus*/ *Eptesicus* bat.

2.4.83 Moderate numbers of common pipistrelles calls were recorded at this location. The highest peak count was noted during late May (262ppn). Similar levels of activity for this species were recorded in May and July. Very low levels of *Myotis*, serotine and noctule calls were detected at this site, with only 1-2ppn recorded in May and July for *Myotis*, and single serotine and noctule passes in May. A peak count of 6ppn for noctules was recorded in late May.

Table 24 Summary of static detector monitoring results for 020-BA2-044001

Ecology survey code	Location	OS Grid	Description of habitat
020-BA2-044001	Mantle's Farm	SP 922 000	Grassland and hedgerow

Date (night monitoring commenced to	Number of	Species peak night count during monthly monitoring

night monitoring ceased)	nights detector deployed	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/ Ep
07 May 2013 to 13 May 2013 -No records	7																	
17 May 2013 to 22 May 2013-No records	7																	
11 June 2013 to 18 June 2013-No records	7																	
17 July 2013 to 24 July 2013	7	206	1		20							2			1			

Pp - common pipistrelle, P py - soprano pipstrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus*/ *Eptesicus* bat.

2.4.84 No bats were recorded during the first three recording periods in May and June 2013. Moderate levels of common pipistrelle activity were recorded in July, along with low numbers of *Myotis* sp., noctule and soprano pipistrelle with peak passes per night of 2,1 and 2ppn respectively.

Discussion

Bat Assemblage

2.4.85 From field surveys, at least five bat species have been recorded within this area. These comprise three common species, namely common and soprano pipistrelles and Daubenton's bats, and two uncommon species, namely noctule and serotine bats. Bats unidentified to species level comprised pipistrelle species, *Myotis* species, and unidentified large bats (*Eptesicus*/*Nyctalus*).

2.4.86 Desk top studies confirm the presence of two further bat species, namely brown long-eared bat and Natterer's bat.

Roosts

2.4.87 One maternity roost of common pipistrelle containing approximately 50 bats and two day/transitional roosts with one to three individuals were identified at Mulberry Park Hill during field surveys. This site falls within the land required for construction of the Proposed Scheme and the buildings will be demolished, resulting in the loss of all three roosts.

2.4.88 No tree roosts were identified through desktop or field surveys, although trees with potential to support roosting bats were identifed.

Foraging Habitat

2.4.89 The landscape in this area comprises arable and pasture farmland, and isolated ancient and semi-natural woodland, with intact hedgerows and multiple tree-lined roads.

2.4.90 Low levels of bat foraging activity were noted in several locations along Chalk Lane and Keeper's Lane, Hyde Lane and near Sibley's Coppice. The dominant species recorded at these locations was common pipistrelle. Very low levels of foraging activity were detected around Mantle's Wood, with each transect detecting less than 10 bat ppn, and only the occasional common pipistrelle. Parts of Mantle's Wood are within land required for the construction of the Proposed Scheme. Low activity from common pipistrelles was recorded at this site along with very low levels for soprano pipistrelle, noctule and *Myotis* species. The highest numbers of bat passes were recorded near the roosts identified at Mulberry Park Hill.

Commuting Habitat

2.4.91 The hedgerow network throughout this area is well established and has good connectivity to other habitats that may support bats, but which were not surveyed due to limited access. Together with tree-lined roads, hedgerows provide a network for commuting bats.

2.4.92 During field surveys commuting activity was prevalent near Mulberry Park Farm. The common pipistrelle commuting activity is likely to be associated with the three roosts recorded at the site. Low levels of commuting activity, including that for *Myotis*, serotine and noctule bats, were recorded from transect surveys carried out to the south near Mantle's Wood. This area contains linear strips of woodland and hedgerow that provide suitable bat commuting habitat. The results of driven transect

undertaken to the south of South Heath indicate low levels of activity for common and soprano pipistrelle, noctule bats and *Myotis* species. The higher speeds at which driven transects are undertaken compared to walked surveys means that bat passes recorded during driven transects can become distorted and thus harder to detect accurately. This is accounted for when directly comparing the results from the two survey methods.

CFA10 Dunsmore, Wendover and Halton

Overview of bat species status in the vicinity of CFA 10

2.4.93 Suitable habitat for roosting, foraging and commuting bats within and adjacent to the land required for the construction of Proposed Scheme was present in this area. This includes arable, pasture, intact hedgerows, tree-lined roads, orchards, lowland calcareous grassland and semi-natural broadleaved woodland. Farm buildings in the south and residential properties in Wendover, situated adjacent to the route in the north of the area, provide potential roosting sites for bats.

2.4.94 The bat assemblage in this area comprises at least seven species identified through field surveys and desk studies. These are as follows:

- Nathusius' pipistrelle (*Pipistrellus nathusii*);
- whiskered bat (*Myotis mystacinus*);
- noctule (*Nyctalus noctula*);
- serotine (*Eptesicus serotinus*)
- common pipistrelle (*Pipistrellus pipistrellus*);
- soprano pipistrelle (*Pipistrellus pygmaeus*); and
- brown long-eared bat (*Plecotus auritus*).
- *Nyctalus/ Eptesicus* species.
- Myotis species.

2.4.95 Habitats within this area support foraging and roosting bats including two rare species; Nathusius' pipistrelle and whiskered bat and two uncommon species; noctules and serotines. Site access was restricted within this area however survey data and desk studies indicate bat activity was more prevalent within the northern section of this area with five roosts and moderate levels of bat activity recorded at sites north of Ellesborough Road.

Roosts within trees

2.4.96 A total of 101 trees were subject to an initial assessment in line with the methods described in the Field Survey Methods and Standards (FSMS) document. These included ground based survey and a subsequent climbed inspection where appropriate. Of the 101 trees were subject to an initial assessment:

- No confirmed tree roosts were identified in the initial assessment (four roosts

were later identified in emergence surveys);

- 18 trees were assessed as having high potential to support roosting bats;
- 36 trees had features assessed as having moderate potential to support roosting bats; and,
- 47 trees were assessed as having low or negligible potential; these trees were subsequently scoped out of further survey.

2.4.97 Of the 54 trees assessed as having moderate or high potential to support roosting bats:

- 19 were subject to climbing surveys;
- as a result, no trees were re-assessed as having of low or negligible potential to support roosting bats;
- the remaining trees were not climbed owing to the constraints listed in sections 1.41 and 1.42.

2.4.98 Six trees of the 19 trees climbed were subject to a total of six emergence surveys resulting in four confirmed roosts being identified. The remaining 12 trees could not be climbed due to access restrictions at some sites and trees which were not safe to be climbed as discussed in sections 1.4.1 to 1.4.5 in the constraints and limitations section.

2.4.99 No backtracking surveys were undertaken in this area.

2.4.100 Details of confirmed roosts in trees in this area of the route are provided in Table 25.

Table 25 Confirmed tree roosts within CFA 10

Ecology survey code	Location	OS grid reference	Tree species	Species confirmed as utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Approximate distance from the Proposed Scheme
020-BT3-056001	Wellwick Farm	SP 850 086	Pedunculate oak	Common pipistrelle (3)	5 June 2013, Emergence survey	Day	Callus roll in an oak tree which was located in a well-established hedge.	10	Within land required for the construction of the Proposed Scheme
020-BT3-056002	The Orchard	SP 847 090	Cherry species	Noctule (1)	10 October 2012, Emergence survey	Transitional	Woodpecker hole in a tree located in the hedgerow surrounding an old unmaintained orchard.	10	Within land required for the construction of the Proposed Scheme
020-BT3-056004	The Orchard	SP 847 090	Ash	Common pipistrelle (1)	11 October 2012, Emergence survey	Transitional	Large ash tree with a crevice, the tree was located in the hedgerow on the perimeter of an old orchard.	10	Within land required for the construction of the Proposed Scheme
020-BT3-056003	The Orchard	SP 846 090	Cherry species	Common pipistrelle (1)	12 October 2012, Emergence survey	Transitional	Tree crevice in a *Prunus* sp. within The Orchard.	10	Within land required for the construction of the Proposed Scheme

Roosts within building and structures

2.4.101 A total of 24 buildings were subject to an initial assessment and further internal inspections, resulting in the following:

- five buildings were confirmed to support a total of six bat roosts;
- four buildings/structures were assessed as having high potential to support roosting bats;
- seven buildings/structures were assessed as having moderate potential to support roosting bats; and
- eight buildings were assessed as having low or negligible potential for roosting bats. These were subsequently scoped out of further survey.

2.4.102 Of the 16 buildings confirmed as having roosts or assessed as having high or moderate potential to support roosting bats:

- five buildings were subject to a more detailed internal inspection, this resulted in five buildings being confirmed as supporting six roosts;
- no buildings were reassessed as low or negligible potential to support roosting bats;
- Four buildings/structures with roosts were subject to a total of 13 emergence surveys, which confirmed one of the roosts described above; and
- Of the 16 buildings the remaining 12 were also not subject to further emergence surveys due to land owner restrictions (as discussed in the constraints Section 1.5).

2.4.103 No backtracking surveys were undertaken within this area.

2.4.104 The six confirmed roosts were identified using a mixture of internal building inspections and emergence surveys. They comprised one soprano pipistrelle, four brown long-eared and one whiskered bat roost (identified from dropping DNA). Details of confirmed roosts in buildings/structures in this area are provided in Table 34.

Table 26 Confirmed bat roosts in buildings/structures in CFA 10

Ecology survey code	Location	OS grid reference	Building/ structure type	Species confirmed utilising roost and (peak count)	Date of peak count and nature of survey	Roost type	Roost description	CFA	Approximate distance from the Proposed Scheme
020-BS2-051001	Hartley Farm	SP 880 057	Residential	Brown long-eared bat (droppings)	Internal building inspection 26 March 2013	Day/Night	Crevice behind timber at gables, gap in soffit. Scattered droppings throughout. Small concentrated pile near south east end.	10	Within 25m of land required for the Proposed Scheme
020-BS2-051002	Hartley Farm	SP 880 057	Barn	Brown long-eared bat (droppings)	Internal building inspection 26 March 2013	Day/Night	Crevices under corrugated roof and within walls. Scattered droppings.	10	Within 25m of land required for the Proposed Scheme
020-BS2-053001	Grove Farm	SP 869 069	Residential	Brown long-eared bat (estimated 10-15 bats from droppings)	Internal building inspection 20 March 2013	Maternity	Gaps at gable end, apex, behind beam near Western chimney, under ridge tiles, behind final rafter, under soffit box and under lead flashing. Several areas of loose felt.	10	Within 25m of land required for the Proposed Scheme
020-BS3-053001	Grove Farm	SP 869 069	Residential	Soprano pipistrelle (1)	Emergence survey 06 June 2013	Day/Summer	Gap at the end of the guttering/ soffit boards on the north-west aspect.	10	Within 25m of land required for the Proposed Scheme
020-BS2-054006	Ellesborough road	SP 865 076	Residential	Brown long-eared bat (around 30 droppings)	Internal building inspection 13 February 2013	Day	Bitumen felt roof, insulation between joists. Crevice behind loose bitumen felt. Crevices between beams and ridge boards throughout.	10	Within of land required for the Proposed Scheme
020-BS2-054002	Residential building on Ellesborough Road	SP 865 090	Residential	Whiskered bat (5-10 droppings)	Internal building inspection 13 March 2013	Transitional	Crevices between beams and ridge boards throughout.	10	Within 20m of land required for the Proposed Scheme

Bat activity surveys

2.4.105 The following bat species were recorded during the range of bat activity surveys carried out in this area:

- common pipistrelle (*Pipistrellus pipistrellus*);
- soprano pipistrelle (*Pipistrellus pygmaeus*);
- Nathusius' pipistrelle (*Pipistrellus nathusii*);
- *Myotis* species;
- serotine bat (*Eptesicus serotinus*);
- noctule bat (*Nyctalus noctula*); and
- *Nyctalus/ Eptesicus* species.

Table 27 Bat activity surveys conducted within CFA 10

Ecology survey code	Transect location	Number of surveys conducted	First survey date	Final survey date	CFA	Map Reference
020-BA1-050001	Walked Transect Strawberry Hill Farm and Hartley Farm, Wendover	8	24 April 2013	9 July 2013	10	Start-SP 887 053, End-SP 885 043
020-BA1-050002	Driven Transect Hartley Farm, Strawberry Hill Farm finishing at Cottage Farm on Leather Lane	8	24 April 2013	9 July 2013	10	Start-SP 890 031, End- SP875 058
020-BA2-050001	Strawberry Hill Farm	3	17 April 2013	10 June 2013	10	SP 888 042
020-BA2-051001	Hartley Farm	4	25 April 2013	22 July 2013	10	SP 881 055
020-BA2-055001	Wellwick Farm	4	24 April 2013	9 July 2013	10	SP 853 085

Table 28 Bat activity transect survey results - Transect 020-BA1-050-001-Strawberry Hill Farm and Hartley Farm

Ecology survey code	**Transect location**				**Description of habitats covered by transect**															
020-BA1-050001	Strawberry Hill Farm and Hartley Farm, Wendover				The transect covers mixed farmland predominantly consisting of arable fields, semi-improved grassland, species rich hedgerows with trees and areas of semi-natural broadleaved woodland.															
Visit number and date	**Weather conditions**				**Total species passes during transect survey principle behaviour**															
	Temp (°C)	**Cloud (0-8)**	**Rain (0-5)**	**Wind (0-12)**	**Pp**	**Ppy**	**Pn**	**P sp.**	**Mb**	**Md**	**Mn**	**Mm**	**Mbr**	**Mm /Mb**	**M sp.**	**Pa**	**Bb**	**Nn**	**Nl**	**Es**	**Ny/ Es**
Visit 1: Dusk 24 April 2013	15	8	1	1	4															
Visit 2: Dawn 25 April 2013	12	8	0	1																
Visit 3: Dusk 23 May 2013	6-7	4	0	3																
Visit 4: Dawn 24 May 2013	4-6	0	0	5	3															
Visit 5: Dusk 12 June 2013	14	8	2	6	6															
Visit 6: Dawn 13 June 2013	12.5	7	0	3-5	6			1												
Visit 7: Dusk 8 July 2013	17	4	0	0	71	55														1
Visit 8: Dawn 9 July 2013	11 – 15	0	0	2-3	72															

Pp - common pipistrelle, P py - soprano pipstrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - *Myotis* bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus*/ *Eptesicus* bat.

Cloud cover on a scale of 0-8 where 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy.

Precipitation intensity on scale of 0-5 where 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.

Wind speed score of 0-12 against Beaufort scale where 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane

2.4.106 Common pipistrelles were observed during every month and in six of the eight visits. Activity levels were low during April, May and June 2013. The peak activity for this species was observed in July 2013 when moderate activity levels were recorded with a peak count of 72ppn on the final dawn visit. Soprano pipistrelles were only recorded on one of the eight visits; this was the dusk survey in July 2013 when a peak of 55ppn was recorded. A single, unidentified pipistrelle bat species was recorded on visit six in June 2013. On the dusk visit in July 2013 an individual serotine bat was observed.

2.4.107 Jones' Hill Wood to the south-west of Strawberry Hill Farm was identified as a common pipistrelle foraging area. This habitat was also used by commuting common pipistrelle bats during the dusk survey in April 2013. Common and soprano pipistrelles were recorded foraging along a hedgerow to the north of Strawberry Hill Farm that lies 200m west and parallel to King's Lane. Common pipistrelles were also observed foraging around the trees that line the junction of King's Lane and Chesham Lane. The woodland to the west of this junction, north of Chesham Lane, was identified as an important foraging and commuting habitat for both common and soprano pipistrelle. The buildings at Hartley Farm and the surrounding trees were also used for foraging by both these species. The trees lining Rocky Lane were used as a commuting corridor by three species of bat on the dusk survey in July 2013, including common pipistrelle, soprano pipistrelle and a serotine bat. Common and soprano pipistrelle were also observed commuting and foraging along the wooded area either side of the A413, north-west of Rocky Lane.

Table 29: Bat activity driven transect survey results – transect 020-BA1-050-002-Strawberry Hill Farm and Hartley Farm

Ecology survey code	Transect location	Description of habitats covered by transect
020-BA1-050-002	Strawberry Hill Farm and Hartley Farm, Wendover	The transect covers mixed farmland predominantly consisting of arable fields, semi-improved grassland, species rich hedgerows with trees and areas of semi-natural broadleaved woodland.

Visit number and date	Weather conditions				Total species passes during transect survey and principle behaviour															
	Temp (°C)	Cloud (0-8)	Rain (0-5)	Wind (0-12)	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/ Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/ Es
Visit 1: 18 April 2013 dusk	8	0	0	3	67	148		21							11			3		1	13
Visit 2:26 April 2013 dusk	7-3	1	0	2																	
Visit 3: 17 May 2013 dusk	8	8	0	2	73	1		7							2						
Visit 4: 18 May 2013	Cancelled due to weather																				
Visit 5: 18 June 2013 dusk	16	4	0	0	45																1
Visit 7:25 June 2013 dusk	14	2	1	0	169	2		6													
Visit 9: 24 July 2013 dusk	19	4	0	2																	
Visit 10: 25 July 2013	Cancelled due to weather																				

Pp - common pipistrelle, P py - soprano pipstrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus*/ *Eptesicus* bat.

Cloud cover on a scale of 0-8 where 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy.

Ecology survey code	**Transect location**				**Description of habitats covered by transect**															
020-BA1-050-002	Strawberry Hill Farm and Hartley Farm, Wendover				The transect covers mixed farmland predominantly consisting of arable fields, semi-improved grassland, species rich hedgerows with trees and areas of semi-natural broadleaved woodland.															
Visit number and date	Weather conditions				Total species passes during transect survey and principle behaviour															
	Temp (°C)	Cloud (0-8)	Rain (0-5)	Wind (0-12)	Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm/ Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/ Es
Precipitation intensity on scale of 0-5 where 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.																				
Wind speed score of 0-12 against Beaufort scale where 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane																				

2.4.108 The driven transect picked up low levels of activity across the route, with the assemblage consisting largely of common and soprano pipistrelles. Both these species were recorded in low to moderate numbers with peak counts of 169ppn for common pipistrelle in June and of 148ppn for soprano pipistrelle in April 2013. *Myotis* species, noctules and unidentified *Nyctalus/Eptesicus* were recorded in low numbers with peak counts of 11, 3 and 13ppn respectively.

Table 30: Summary of static detector monitoring results for 020-BA2-050001-Strawberry Hill Farm

Ecology survey code	**Location**	**OS Grid**	**Description of habitat**
020-BA2-050001	Strawberry Hill Farm	SP 888 042	Arable field bordered by hedgerow

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/ Ep
17 April 2013– 22 April 2013	6		1									1						
7 May 2013– 13 May 2013	7	9			1													
4 June 2013– 10 June 2013	7	68	3		5							3					1	

Pp - common pipistrelle, P py - soprano pipstrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus*/ *Eptesicus* bat.

2.4.109 Common pipistrelles were recorded during May and June 2013 in low to moderate numbers, with a peak count of 68ppn recorded in June. Low levels of soprano pipistrelle activity were noted during April and June 2013. Low numbers of unidentified pipistrelle species were also recorded in May and June 2013. *Myotis* sp. bats were recorded in low numbers during April and June 2013, whilst a single unidentified serotine was recorded in June 2013.

Table 31: Summary of static detector monitoring results for 020-BA2-051001-Hartley Farm

Ecology survey code	**Location**	**OS Grid**	**Description of habitat**
020-BA2-051001	Hartley Farm	SP 881 055	Arable field with mixed hedgerows and trees (small copse)

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/ Ep
25 April 2013– 30 April 2013	6	4																
17 May 2013– 27 May 2013	11	38	1									4						
11 June 2013– 17 June 2013	7	8	2	1								1						
16 July 2013– 22 July 2013	7																	

Pp - common pipistrelle, P py - soprano pipstrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus*/ *Eptesicus* bat.

2.4.110 Common pipistrelles were recorded in low numbers throughout surveys from April to July 2013, with a peak count of 38ppn recorded in May 2013. Soprano pipistrelle activity was limited to a single pass in May 2013 and two ppn in June 2013. A single Nathusius' pipistrelle was recorded during June 2013 on two separate nights. *Myotis* sp. bat were recorded in low numbers during May and June 2013. No bat passes were recorded during July 2013 at this location indicating low levels of activity during this period.

Table 32: Summary of static detector monitoring results for 020-BA2-055001-Wellwick Farm

Ecology survey code	**Location**	**OS Grid**	**Description of habitat**
020-BA2-055001	Wellwick Farm	SP 853 084	Arable field bordered by hedgerow

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring																
		Pp	Ppy	Pn	P sp.	Mb	Md	Mn	Mm	Mbr	Mm /Mb	M sp.	Pa	Bb	Nn	Nl	Es	Ny/ Ep
24 April 2013 – 29 April 2013	6	9	3		3													
22 May 2013 – 27 May 2013 (recording malfunction)	6																	
25 June 2013 – 01 July 2013	7	216	20		1												1	1
02 July 2013 – 09 July 2013	8	531	40	2								3			1		1	2

Pp - common pipistrelle, P py - soprano pipstrelle, Pn - Nathusius' pipistrelle, P sp. - Pipistrelle bat species, Mb - Bechstein's bat, Md - Daubenton's bat, Mn - Natterer's bat, Mm - whiskered bat, Mbr - Brandt's bat, Mm/Mb -whiskered/ Brandt's bat, M sp - Myotis bat species, Pa -brown long-eared bat, Bb - barbastelle bat, Nn - noctule bat, Nl - Leisler's bat, Es - serotine bat, Ny/Ep - *Nyctalus*/ *Eptesicus* bat.

2.4.111 High levels of activity were recorded for common pipistrelle during June and July 2013 with peak activity occurring in July with 531ppn. Low levels of activity were recorded for this species during April 2013. Low to moderate numbers of soprano pipistrelle were logged during June and July, with July recording the most activity. Only low numbers of this species were recorded during April 2013. Unidentified pipistrelle species were also noted in low quantities during April and June 2013; in July 2013 the rare Nathusius' pipistrelle was also recorded. Serotine and undetermined *Nyctalus/ Eptesicus* bats were recorded in small numbers in June and July 2013. *Myotis* species and a single noctule bat were recorded during July 2013.

Discussion

Bat Assemblage

2.4.112 From field surveys and desktop studies, seven species of bat have been confirmed within CFA10. Seven species of bat were identified through field surveys alone. These included two rare species, Nathusius' pipistrelle and whiskered bat; two uncommon species, noctule and serotine bats; and three common species, common and soprano pipistrelle, and brown long-eared bat. In addition, unidentified *Myotis* and *Nyctalus/Eptesicus* species were recorded. Desk study data from Buckinghamshire Biological Records Centre (BBRC) identified further records of Leisler's bat, as well as the common Daubenton's and Natterer's bats.

2.4.113 In total, this assemblage contains two species classified as rare (Nathusius' pipistrelle and whiskered bat), one scarce species (Leisler's) and two uncommon species (serotine and noctule). These species are classified as such because of their smaller or declining population sizes and/or restricted ranges.

2.4.114 Greater species richness was recorded in the north of this area, compared to the south. This may be associated with the greater habitat complexity noted in the north of this area compared to the south, and that included woodlands, hedgerows and water bodies. Rarer species (Nathusius' pipistrelle and whiskered) and uncommon species (serotines) were recorded in higher numbers within the north of this area.

Roosts

2.4.115 Four tree roosts and six building roosts were identified from field surveys within the survey area. These roosts include a whiskered bat roost and a brown long-eared roost at Ellesborough Road, both of which are located within or adjacent to (within 50m) land required for construction of the Proposed Scheme. Two brown long-eared bat roosts were found at Hartley Farm, located 15m from land required for construction of the Proposed Scheme. One further brown long-eared roost and a soprano pipistrelle roost were found at Grove Farm, and these are located within 25m of land required for construction of the Proposed Scheme. A noctule and two common pipistrelle tree roosts were located in The Orchard at Nash Lee Road; this site is partially within land required for the construction of the Proposed Scheme with the farthest roost located only 80m from the land required for the construction of the Proposed Scheme. A further common pipistrelle tree roost was located within Wellwick Farm, located 50m from land required for construction of the Proposed Scheme.

2.4.116 The most pertinent desk study records include a brown long-eared bat roost in a residential property on Bacombe Lane to the south of Wendover, within 20m of land required for the construction of the Proposed Scheme. There is a record for a further brown long-eared roost in a property on Rocky Lane to the east of the A413, 30m from land required for the construction of the Proposed Scheme. There are also records for a brown long-eared and a pipistrelle bat roost at a property on Nash Lee Lane, west of the existing railway line. This is situated 50m from land required for the construction of the Proposed Scheme. Several other records for brown long-eared roosts also exist between 150m and 1km from land required for the construction of the Proposed Scheme in this area.

2.4.117 Brown long-eared and pipistrelle bats are considered to have stable and unrestricted populations, and roosts of these species of a small size in Buckinghamshire are considered common.

2.4.118 In the northern part of the area, where habitats were typically more complex compared to the landscape in the south, more diverse bat assemblages were recorded including rarer species. These comprised a whiskered bat maternity roost and a noctule transitory roost which are species with more restricted distributions and or smaller/declining populations.

Foraging Habitat

2.4.119 The landscape in this area comprises largely agricultural fields, orchards, calcareous grasslands and semi-natural broadleaved woodlands, with intact hedgerows and multiple tree lined roads. Watercourses, providing foraging habitat, are present in the north of the area. The Stoke Brook and its tributaries south of Stoke Mandeville are adjacent to land required for the construction of the Proposed Scheme and are likely to be used by the bat roosts found directly to the south of these watercourses.

2.4.120 During the driven and walked activity surveys, foraging activity was noted at several locations along Rocky Lane and King's Lane leading into Bowood Lane. Foraging was recorded in low levels between Leather Lane and Rocky Lane in the vicinity of Strawberry Hill Farm and Hartley Farm. Common and soprano pipistrelles were the dominant species recorded during these driven and walked transects to the south of this area.

2.4.121 Driven activity transects were undertaken as walked transects were non-continuous in this area due to access restrictions, as discussed in section 1.6.2. In particular, driven activity transects were undertaken in order to supplement data for the southern section of this area.

2.4.122 Despite the suitable habitat and well established hedgerows in the southern section of the area, foraging and commuting numbers from static monitoring devices were low compared to activity and foraging records in the north of the area at Wellwick Farm. The bat assemblage to the north of this area comprised moderate numbers of common species (common pipistrelle), and low numbers of rare species (Nathusius' pipistrelle) and uncommon (noctule and serotine) as well as *Myotis* species. Higher levels of activity recorded in the north also indicate that habitats here are important in supporting foraging communities of rarer species and contribute to the overall ecological value of this area.

Commuting Habitat

2.4.123 The hedgerow network throughout this area is well established and connected, and, in combination with tree-lined roads, provides an extensive network for commuting bats.

2.4.124 Commuting activity was more prevalent within the northern part of the area, with comparatively higher levels of pipistrelle activity recorded near Wellwick Farm than those recorded in the south at Strawberry Hill or Hartley Farm. Fewer records of *Myotis* and larger bats were recorded at Strawberry Hill and Hartley Farm compared

to records near Wellwick Farm. The connected hedgerows and their proximity to Bacombe and Coombe Hills SSSI south of Ellesborough Road provides important commuting habitat between roosts and foraging habitat in the northern section of this area.

CFA11 Stoke Mandeville and Aylesbury

Overview of bat species status in the vicinity of CFA 11

2.4.125 Habitat suitable to support roosting, foraging and commuting bats within and adjacent to the Proposed Scheme in this area consists of farmland bounded by hedgerows and woodland. Lowland mixed deciduous woodland and pasture is present to the south-west of Aylesbury. A number of potential commuting and foraging features were identified from Phase 1 Habitat Survey data and aerial photography. This includes several hedgerows at Stoke Brook to the south of Aylesbury, hedgerows and tree-lines on the Hartwell Estate, and hedgerows, linear strips of broadleaved woodland and the River Thame, all within mixed use farmland, at Putlowes Farm to the north of Aylesbury.

2.4.126 Bat activity levels were relatively consistent across the area with particularly high levels of activity recorded at Hartwell House for Myotis species, common and soprano pipistrelles. Furthermore, moderate to high activity of noctules and serotines were recorded, both of which are classified as uncommon species within the UK. Two rare bat species (barbastelle bats and Nathusius' pipistrelle) were also recorded in low numbers at this site. High levels of activity were also recorded from 2013 data at Putlowes, Fleet Marston Spinney and Moat Farm. Common pipistrelles were recorded in high numbers and soprano pipistrelles and Myotis species were recorded in moderate numbers.

2.4.127 Field surveys identified the presence of two rare bat species (namely barbastelle bats and Nathusius' pipistrelles), two uncommon species (noctule and serotine bats), one scarce species (Leisler's bat) and three common species, namely common and soprano pipistrelles and brown long-eared bats. Myotis species, unidentified to species level, were also recorded.

2.4.128 Desk studies confirmed the presence of four Myotis species, two of which are rare (Brandt's bat and whiskered bat),two of which are common (Natterer's bat and Daubenton's bat).

2.4.129 Overall, a total of twelve bat species were recorded in this area from field surveys and desk studies, as follows:

- barbastelle bat (*Barbastella barbastellus*);
- Nathusius' pipistrelle (*Pipistrellus nathusii*);
- whiskered bat (*Myotis mystacinus*);
- Brandt's bat (*Myotis brandtii*);
- Leisler's bat (*Nyctalus leisleri*);
- noctule (*Nyctalus noctula*);