BT-NG-020621-545-0084

Bramford to Twinstead Reinforcement

Volume 6: Environmental Information

Document 6.3.7.7: ES Appendix 7.7 – Bat Survey Report

Final Issue A
April 2023

Planning Inspectorate Reference: EN020002

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 Regulation 5(2)(a)

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1. Introduction

1.1 Overview

1.1.1 National Grid Electricity Transmission plc (here on referred to as National Grid) is making an application for development consent to reinforce the transmission network between Bramford Substation in Suffolk, and Twinstead Tee in Essex. The Bramford to Twinstead Reinforcement ('the project') would be achieved by the construction and operation of a new electricity transmission line over a distance of approximately 29km comprising of overhead lines, underground cables and grid supply point substation. It also includes the removal of 25km of the existing distribution network and various ancillary works.

1.1.2 For a full description of the project reference should be made to Chapter 4 of the Environmental Statement (ES): Project Description (**application document 6.2.4**).

1.1.3 This Bat Survey Report will be submitted to support the application for development consent and the accompanying ES under the Planning Act 2008. It has also been produced to support the draft European Protected Species (EPS) licence application for bats, which can be found in Annex A of this report.

1.2 Structure of this Report

1.2.0 This report collates the results of a desk study and a programme of bat field surveys which comprise the following:

- Results of the ground-based assessment of trees and buildings for bat roosting potential;
- The subsequent bat roost surveys of trees and buildings undertaken in 2022;
- Habitat Suitability Modelling (HSM) to identify key area and linear features of importance for bats; and
- Activity surveys and bat trapping at Hintlesham Woods with focus on barbastelle bat (*Barbastella barbastella*).

1.2.1 Chapter 2 describes the methodology and criteria used to undertake the desk study and field surveys. Survey limitations are also detailed. Chapter 3 sets out the results of the desk study and field survey. Chapter 4 provides some interpretation and evaluation of the results.

1.3 Legislation and Policy

1.3.1 All British bat species are protected under the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2017 (as amended). The combined effect of the legislation makes it an offence to:

- Deliberately capture, injure or kill a bat;
- Deliberately disturb a bat, in such a way as to be likely to impair their ability to survive, breed or reproduce or rear or nurture their young or hibernate or migrate;
- Affect significantly the local distribution or abundance of that bat species;

- Damage or destroy a breeding site or resting place of any bat; or
- Intentionally or recklessly obstruct access to any place that a bat uses for shelter or protection (this is taken to mean all bat roosts whether bats are present or not).

1.3.2 In addition, four British bat species are listed on Annex II of the Habitats Directive (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora) which can have Special Areas for Conservation (SAC) designated for their roosts to ensure that their populations are maintained at a favourable conservation status:

- Greater Horseshoe bat (*Rhinolophus ferrumequinum*);
- Lesser Horseshoe bat (*Rhinolophus hipposideros*);
- Bechstein's bat (*Myotis bechsteinii*); and
- Barbastelle bat (*Barbastella barbastellus*).

1.3.3 The Department for Environmental and Rural Affairs (Defra) has policy 4 (Natural England, 2022c) that applies to Natural England's EPS mitigation licences which allows ecologists to amend their approach to field survey, mitigation or compensation methods if sufficient evidence and justification is provided to meet the requirements of the policy which states:

'Natural England will be expected to ensure that licensing decisions are properly supported by survey information, taking into account industry standards and guidelines. It may however accept a lower than standard survey effort where all the following apply:

- *costs or delays associated with carrying out standard survey requirements would be disproportionate to the additional certainty that it would bring*
- *ecological impacts of development can be predicted with sufficient certainty*
- *mitigation or compensation will ensure that the licensed activity does not detrimentally affect the conservation status of the local population of any EPS (European protected species*

You can use this policy to reduce the need for survey data. Instead, you'll need to use other sources of information to provide confidence for your approach.

You can use alternative sources of evidence and your expert judgement to not meet standard survey requirements. You'll need to show all of the following:

- *the cost or delay of a standard survey is disproportionate to the benefit or certainty it would provide;*
- *you can confidently predict the impact of development on the species; and*
- *mitigation or compensation measures will maintain or improve the species' conservation status.'*

1.3.4 Details of Policy 4 relate to alternative sources of evidence to reduce standard survey requirements (Natural England, 2022c).

2. Methodology

2.1 Introduction

2.1.1 The bat survey methodology has been informed by good practice guidelines (Collins, 2016, Bat Tree Habitat Key (BTHK), 2018; British Standard (BS) 8596:2015; and Bat Conservation Trust (BCT), 2022); consultation and engagement with relevant consultees; the results of desk studies; and professional judgement. Where there is deviation from published good practice guidelines, this has been agreed with Natural England, as documented in the Statement of Common Ground (**application document 7.3.2**).

2.1.2 The Order Limits include woodland habitats, hedgerows and trees which are suitable to support roosting, commuting and foraging bats. The project would unavoidably require trees to be modified or removed and therefore there is potential for effects on bats and their roosts. Buildings within and close to the Order Limits also have the potential to support bat roosts. As such, a programme of survey to identify bat roosts in trees and buildings started in May 2021. This started with ground-based assessment, followed by subsequent bat survey (climbing and ground-based endoscope inspections of trees and building surveys) starting in January 2022. These surveys were completed in October 2022.

2.1.3 HSM was undertaken to identify important habitats and commuting routes that could be affected by the project. Desk study data, previous activity survey data (static detector deployment), bat survey data from an overlapping infrastructure project and records made during surveys in 2022 were used to generate a statistical model and GIS mapping output.

2.1.4 A programme of targeted barbastelle bat field survey at Hintlesham Woods (Section AB: Bramford Substation/Hintlesham) was undertaken to:

- Confirm the bat species present;
- Identify presence of roosts and where found their characterisation within 50m of the Order Limits;
- Identify where the key commuting routes for bats were; and
- Identify how bats interacted with the existing overhead line and pylons.

2.1.5 This programme comprised static detector deployment, crossing point survey and a post-maternity bat trapping session.

2.2 Survey Guidance

2.2.1 The following publications and survey guidance have been considered in the methodology design:

- The Bat Conservation Trust Good Practice Guidelines (Collins, 2016);
- The BTHK (BTHK, 2018) and work on bat occupancy of trees (McLean, 2018);
- Published work on habitat suitability modelling (Bellamy *et al.,* 2013; Brown (2013); Slack *et al.,* (2023);

- Published work on disturbance of bats within roosts (Luo *et al*., 2015);
- Published work on bat habitat severance (Bennett & Zurcher, 2013; Berthinussen & Altringham, 2012; Gunnel *et al.,* 2012); and
- The CIEEM competency standards for surveyors (CIEEM, 2021).

2.3 Desk Study

2.3.1 A review of statutory designated sites was undertaken to identify the following:

- Any Special Area for Conservation (SAC) designated for bats within 30km of the Order Limits;
- Any Site of Special Scientific Interest (SSSI) designated for bats with Impact Risk Zones (IRZ) overlapping the Order Limits; and
- Any Local Nature Reserve (LNR) with bats mentioned in their description within 2km of the Order Limits.

2.3.2 A data request for locally designated sites and protected and notable species, that included bats, was made to the following organisations in February 2021 for 1km around the project scoping boundary at the time:

- Suffolk Biodiversity Information Service (SBIS);
- Essex Wildlife Trust (EWT); and
- Essex Field Club (EFC).

2.3.3 An updated data search, specific to bat species, was requested in April 2022 with an increased search radius of 7km based on the Order Limits. This was to specifically inform a programme of HSM for bats where species such as barbastelle bat could be accurately modelled having a core sustenance zone (CSZ) of at least 6km. The CSZ is the area surrounding a bat colony within which habitat quality and availability will have an impact on its long-term sustainability.

2.3.4 Bat surveys were undertaken in 2012 and 2013 prior to project pause. The results of these surveys are included in the desk study. The 2012/2013 survey programme comprised:

- Bat activity survey using static bat detectors and walked transects;
- Ground based assessments of trees for roosting potential; and
- Subsequent aerial inspections and emergence surveys.

2.3.5 The Royal Society for the Protection of Birds (RSPB) is the land manager and owner of Hintlesham Woods, see ES Figure 7.7.1 (**application document 6.4**). The RSPB shared a report with National Grid which detailed the results of a bat activity survey undertaken at Hintlesham Woods in 2012 (Suffolk Bat Group and Suffolk Wildlife Trust, 2012). Eleven location points in Hintlesham Woods (specifically Ramsey Wood, Hintlesham Little Wood and Hintlesham Great Wood) were surveyed on a single night in August 2012. This report identified the presence of barbastelle bats in the woods. The results of these surveys are included in the desk study.

2.4 Field Survey

2.4.1 In line with the BCT guidelines (Collins, 2016), surveys focused on those areas in which proposed construction works could contribute to an adverse effect on bat populations or could results in contravention of the legislation protecting bats.

2.4.2 Initially, the survey area was defined as a 50m area around the project Scoping Boundary, as described in the Scoping Report (**application document 6.5.1**). Aerial imagery was used to identify the location of trees and buildings within the survey area which would subsequently undergo ground level assessment of trees and buildings for roosting bat potential.

2.4.3 As the project developed, the survey area was refined down to an area of 50m around the narrower draft Order Limits, as presented at the statutory consultation.

2.4.4 As additional detail was developed for the project e.g. finalisation of Order Limits and confirmation of overhead line sections, underground cabling sections and vegetation clearance requirements, additional criteria was applied to further refine where subsequent bat roost surveys would be necessary. The criteria applied for the roosts survey area was:

- All trees with high or moderate potential to support roosting bats that could be modified or felled;
- All trees with high potential to support roosting bats within 50m of the Order Limits where potentially disturbing works (such as noisy activities) are proposed; and
- Buildings with high or moderate potential to support roosting bats within, or within 50m of the Order Limits where potentially disturbing works were proposed.

2.4.5 Trees with low potential to support roosting bats have not been surveyed at this stage but would be reviewed prior to construction to see if they required soft felling at the pre-construction stage.

Buildings - Ground Based Assessment

2.4.6 Buildings were inspected from the ground with the aid of binoculars and a powerful torch based on the methodology in Collins (2016). Where accessible, features were investigated using endoscopes and cameras. Evidence of bat use comprised:

- Live bats;
- Corpses or skeletons of bats;
- Droppings (notes made on relative freshness, shape and size of droppings);
- Feeding remains;
- Clean, cobweb-free timbers, crevices and holes;
- Characteristic staining from urine and/or grease marks;
- Known and potential access points to the roost; and
- Characteristic smell of bats if no other evidence was recorded.

2.4.7 All holes and cavities that could be inspected safely from ground level were assessed for evidence of current or past bat roosts.

2.4.8 A potential roosting category was then attributed in accordance with Collins, 2016 which is summarised in Table 2.1.

Table 2.1 – Potential Suitability for Bat Roosting (based on Collins, 2016)

Roosting Potential	Description
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitats to be used on a regular basis or by larger numbers of bats (i.e. likely to be suitable for maternity or hibernation). A tree of sufficient size and age to contain Potential Roost Features (PRFs) but with none seen from the ground or features seen with only very limited roosting potential.
Negligible	Negligible features likely to be used by roosting bats

Buildings - Active Season Bat Surveys

2.4.9 Where high or moderate bat roosting potential was identified in buildings, subsequent emergence/re-entry surveys were undertaken in accordance with Collins (2016) and BCT (2022) to characterise any potential bat roosts present.

Bat Roost Classification

2.4.10 When a bat roost was identified, it was classified in accordance with industry guidance on roost type, as detailed in Table 2.2 (Collins, 2016).

Table 2.2 – Classification of Roosts (based on Collins, 2016)

Roost Classification	Description
Day Roost	A place where individual bats, or small groups of males, rest or shelter in the day but are rarely found by night in the summer.
Night Roost	A place where bats rest or shelter in the night but are rarely found in the day. May be used by a single individual on occasion or it could be used regularly by the whole colony.
Feeding Roost	A place where individuals or occasionally small groups feed for generally short periods of time on waking from hibernation or in the period prior to hibernation.
Transitional/occasional roost	Used by a few individuals or occasionally small groups for generally short periods of time on waking from hibernation or in the period prior to hibernation.

Roost Classification	Description
Swarming site	Where large numbers of males and females gather during late summer to autumn. Appear to be important mating sites.
Mating site	Where mating takes place from late summer and can continue through winter.
Maternity Roost	Where female bats give birth and raise their young to independence.
Hibernation Roost	Where bats may be found individually or together during winter. They have a constant cool temperature and high humidity.
Satellite Roost	An alternative roost found in close proximity to the main nursery colony used by a few individual breeding females to small groups of breeding females throughout the breeding season.

Trees - Ground Based Assessment

2.4.11 Where land access permitted, trees within the survey area were assessed for their suitability to support roosting bats by a team of two ground-based surveyors.

2.4.12 These surveys were undertaken in accordance with current good practice guidelines (Collins, 2016; BTHK, 2018). A suitably experienced team of ecologists, licensed where necessary, assessed each tree from the ground with the use of torches, binoculars and an endoscope, where applicable. All evidence of the presence of bats or features that had or may have potential as roost sites were recorded and the location mapped.

2.4.13 Value was assigned to each tree based on its single highest Potential Roost Feature (PRF). The locations of all trees with PRF rated as ‘high’, ‘moderate’ or ‘low’ potential (Table 2.1) were recorded. Trees considered to have negligible suitability to support roosting bats and a diameter at breast height (DBH) less than 0.3m were not recorded as standard during surveys.

2.4.14 Each tree with one or more PRF was given a unique alphanumeric identification code and mapped using geographic information system software. The following information was then recorded for each tree to determine the most appropriate options for further survey and to facilitate locating the tree and the PRFs for further survey:

- Location (where agreed with the landowner, trees were also tagged with an identifier);
- Species;
- Age;
- Diameter at breast height (DBH);
- Relative location of tree (including reference to geographic features such as walls and watercourse); and
- Climbing safety (assessment of structural integrity of tree and proximity to roads, and power lines).

2.4.15 Photographs of each tree (and PRF where possible) were taken and detailed information on each PRF was also recorded:

- PRF type (typically, PRFs are categorised as decay/disease or damage features. These are summarised in Table 2.3);
- PRF height;
- PRF aspect; and
- PRF description (e.g. appearance of feature and location of feature within tree).

Table 2.3 – Summary of PRF Types

Type	Examples
Decay and disease	Woodpecker holes, squirrel-holes, knot-holes, pruning-cuts, tear-outs, wounds, cankers, compression-forks, butt-rots, ram's horns.
Damage	Lightning-strikes, hazard-beams, subsidence-cracks, shearing-cracks, transverse-snaps, welds, lifting-bark, desiccation-fissures, frost-cracks.

Trees – Bat Roost Surveys

2.4.16 A programme of follow-on surveys was undertaken where bat roosting potential was identified during the ground based assessment of trees. Where it was possible to safely undertake climbing or ground based (including ladder access) endoscope inspection of trees with bat roosting potential, these were surveyed three times for high potential trees and twice for moderate potential trees. One of these surveys included an inspection in the hibernation season where suitability was identified.

Trees – Hibernation Surveys

2.4.17 Trees with bat hibernation roost suitability identified during the ground assessment were surveyed via endoscope inspections by suitably licensed ecologists between November 2021 and March 2022.

2.4.18 The criteria used to determine whether a tree was suitable for a hibernation bat roost comprised a comparison against data collected in the BTHK for hibernation roosts, i.e. tree species, PRF type, minimum DBH and minimum maximum height of each tree species (specific criteria can be provided on request). R statistics (R studio version 4.2.1) was used to develop a script to identify trees where priority was given to specific trees for hibernation survey.

2.4.19 These surveys were carried out from ground level where possible or with the use of ladders and/or rope access techniques where tree climbing was deemed safe to do so. All PRF which could be investigated were assessed to confirm or refine the roosting potential category of the PRF identified during the ground-based assessment and look for evidence of current or past bat roosts in accordance with BTHK (2018) and Collins (2016).

Trees – Active Season Bat Surveys

2.4.20 Where bat roosting potential was identified in trees, PRF inspections were also undertaken in the bat active season (April-October) using high powered torches, mirrors and endoscopes to confirm or refine the roosting potential category of the PRF identified during the ground based assessment if no hibernation survey was undertaken and to

identify any evidence that might confirm the presence (e.g. bat droppings, odour, staining or a bat in residence) or likely absence of bat roosts.

2.4.21 The BTHK was used to maximise the likelihood of encountering bats in trees when surveyed and criteria established to focus climbing inspection survey in the months between April and October for particular tree species and/or PFR types when the BTHK indicated a timeframe where encountering a bat roost was more likely (the specific criteria can be provided on request). R statistics (R studio version 4.2.1) was used to develop a script to identify trees where priority was given to specific trees for surveys to occur during the maternity season.

2.4.22 These surveys were undertaken by qualified and licensed tree-climbing ecologists. The trees were climbed using ropes, harnesses and/or ladders. Trees were only climbed if safe to do so, as assessed on a case-by-case basis.

Alternative Survey Approach

2.4.23 As a minimum, all trees in accessible areas were subject to a ground-based assessment for bat roosting potential. Where it was not safe to climb trees or use a ladder to inspect bat roosting features (aerial inspection), or it was not possible to undertake ground-based endoscope inspection, then an alternative approach was used to further assess the bat roost potential.

2.4.24 The standard alternative methodology where endoscope is not possible, is to undertake emergence/re-entry surveys of features within buildings or trees (Collins, 2016; BTHK, 2018). For large scale infrastructure projects at the consenting stage where detailed design has yet to be developed, this survey methodology can be considered high cost requiring a high level of resource that can be disproportionate to the certainty in results that they would provide. For example, surveying trees with multiple features within woodland habitats has certain constraints such as poor visibility due to the understory/canopy cover which could reduce the overall reliability of the results, such as emergences or re-entries being missed by surveyors.

2.4.25 It was decided that carrying out emergence/re-entry surveys would not necessarily be advantageous to the project at this stage and would not change the conclusions of the impact assessment as precautionary mitigation methods are proposed, including pre-construction surveys. As such, a revised methodology, using Natural England's Policy 4, is proposed for the trees where ground based, or aerial inspection was not possible for the draft EPS bat licence.

2.4.26 The BTHK (BTHK, 2018) has been used to make an assumption on the likely bat species potentially using these features and roost types. In addition to this, survey results collected locally from trees where inspections were possible surveys were used to refine the potential results from trees that could not be safely inspected. Bat survey data collected for the project in 2012 and 2013 was also be used.

2.4.27 This methodology has also been applied to trees requiring bat survey within Hintlesham Woods, where the many trees within could not be inspected from the ground or safely climbed. Additional alternative sources of information has been used for these trees; static bat detector deployment and crossing point surveys between May and August 2022 and a bat trapping survey in August 2022 (both reported in this document).

2.4.28 Outside of Hintlesham Woods, trees that met the criteria for bat survey and that could not be safely climbed (aerial inspection) or inspected from the ground have been assessed similarly.

2.4.29 To reiterate, a precautionary approach to subsequent assessment and mitigation is provided in the application for development consent where further surveys have not been undertaken. This will include a programme of pre-construction survey, including emergence/re-entry survey for trees that were unable to be aerially inspected.

Grid Supply Point (GSP) Substation

2.4.30 Bat surveys of the trees associated with the proposed GSP substation and associated works were undertaken between June 2021 and February 2022. The methodology for these surveys was similar to that described above, but as the purpose of the field survey in this location was also to inform a separate planning application and any necessary EPS licence to permit works to proceed in spring 2023 (National Grid obtained planning consent for the GSP substation under the Town and Country Planning Act from Braintree District Council in October 2022 (planning reference 22/01147/FUL)), the approach was amended such that full survey effort, including emergence/re-entry surveys of trees was undertaken where ground based or aerial inspections were not possible. The difference in approach comprises:

- Hibernation Surveys: Trees that were assigned as having potential to support hibernating bats following the ground-based assessment were subject to two inspections during the hibernation period: one in January 2022 and one in February 2022;
- Active Season Bat Surveys: Trees that were assessed as requiring survey were surveyed twice in the active season if classified as having moderate potential to support roosting bats, and surveyed three times if identified as having high potential to support roosting bats; and
- Emergence and re-entry surveys: Trees that were unsafe to climb or could not be aerially inspected were subject to dusk emergence and dawn re-entry surveys whereby an ecologist observed the tree from ground level looking for bats exiting or accessing the PRF at dusk or dawn, respectively. Bat detectors (Elekon Batlogger, Anabat Swift and Anabat Walkabouts) and infrared cameras were used. Where a roost was recorded, the bat calls and video footage were analysed to confirm the bat species recorded in the field.

Habitat Suitability Modelling

2.4.31 HSM was used as a statistical technique to predict the suitability of the habitats within the Order Limits, and beyond, to support bat species. On completion of the HSM, heat maps showing the areas of relative high and low suitability were produced for each bat species. The extents and locations of these suitable areas were then used to identify key connective habitat crossed by the project.

2.4.32 Records of bat presence were collated from:

- Static detector data points from surveys undertaken for the project in 2012 (prior to project pause). Detectors were deployed at 27 locations for a minimum of four nights and were repeated at least once per month from July to October. All recordings

obtained from Anabats were analysed using AnalookW (version 3.9b) identification software and identified to species level using the bat call parameter data outlined by Russ (2012);

- Static detector data collected in 2022 from Hintlesham Woods and surrounds. Please see methodology below; and
- Static data (shared with permission and thanks) from the Strategic Pipeline Alliance Project by Anglian Water that crosses the project to the east. 327 detectors were deployed in 2022 within 7km of the Bramford to Twinstead Reinforcement Order Limits for a minimum of 10 nights between May and August 2022. WAV file recordings from SM4 static detectors were processed using Kaleidoscope Pro Version 5.1.8. Manual verification of species identification was completed using the techniques and resources in Barataud (2020).

2.4.33 HSM is a statistical technique that predicts the distribution of a species from environmental data and occurrence records. The models identify which of the environmental variables (EVs) assessed (such as roads, the presence of woodland, or water) most affect the distribution of a species. Data on 28 EVs were obtained at 100m by 100m resolution across the land within the Order Limits plus a seven-kilometre study area. The full list of EVs is given as Annex D.

Modelling and Mapping

2.4.34 Models were produced using MaxEnt 3.4.1. The EVs included in the final model were pruned in stages to remove any highly correlated variables, then all remaining EVs were pruned to identify the most powerfully predictive model. The final model for each species was used to create a heat map showing the most suitable areas for species presence within the seven-kilometre study area. Slack *et al*., (2023) details this process.

Identification of Key Connective Habitats

2.4.35 On completion of the HSM process, the heatmaps were cross referenced with the known roosts and the aerial images of the project to identify key connective habitat for each species.

2.4.36 Many bat species have similar hunting behaviour and flight characteristics because they occupy similar ecological niches. These similarities mean that the risks and mitigation required for species with similar ecological niches are broadly the same.

2.4.37 To facilitate effective consideration of trends in landscape use by different bat species, they were split into three groups. The three groups were: open habitat species, edge habitat species and cluttered habitat species. Groupings were made based on their flight speed, flight height, willingness to cross gaps and tolerance of lighting. The species groupings effectively follow those given in the Conference of European Directors of Roads (CDER) bat mitigation measures on roads guideline (Group A and Group B – cluttered habitat species, Group C and Group D – edge habitat species, and Group E – open habitat species). The list of species considered likely to be present within the 7km study area are grouped by their flight characteristics in Table 2.4.

Table 2.4 – Bat Groups and Key Similar Characteristics

Ecological Niche	Genus	Species	Flight Speed	Willingness to Cross Gaps and Open Habitat	Flight Height	Light Tolerance
Cluttered habitat species	*Myotis*	Natterer's bat	Slow	Least willing to cross gaps and open ground.	Generally, fly close to linear features, when crossing open habitat will usually fly close to the ground.	Least tolerant of light. Artificial lighting may present a barrier to these species.
		Daubenton's bat				
		Whiskered bat				
		Brandt's bat				
	Plecotus	Brown long-eared bat				
Edge habitat species	*Pipistrellus*	Common pipistrelle	Medium	Less affected by small and medium sized gaps.	Tend to fly within 10m of the ground / linear features.	Mixed - some species such as pipistrelles will hunt insects drawn to lights, other edge habitat species such as barbastelle are likely to avoid lighting.
		Soprano pipistrelle				
		Nathusius pipistrelle				
		Barbastelle				
		Serotine				
Open habitat species	*Nyctalus*	Noctule	Fast	Least affected by open habitat and gaps in connectivity.	Usually fly high 10m + above open habitat.	Light tolerant, will often predate insects drawn to lights.
		Leisler's bat				

Hintlesham Woods – Barbastelle Bats

2.4.38 A bat activity survey, undertaken in 2012 by Suffolk Bat Group and Suffolk Wildlife Trust, identified the presence of barbastelle bats at Hintlesham Woods. Therefore, a focused supplementary survey programme was undertaken in 2022 to confirm if barbastelle bats were still present and if so the likelihood of important roosts being present in the woods. This programme comprised:

- Static bat detector deployment;
- Crossing point surveys; and
- Bat trapping.

Static Detector Deployment

2.4.39 Static bat detectors were deployed at twelve locations at Hintlesham Woods at monthly intervals between May and August 2022 or until sufficient data had been collected to answer questions on barbastelle bat presence and activity. Six detectors were deployed on hedgerows connected to Hintlesham Woods and six within Hintlesham Woods itself. Bat activity was recorded from half an hour before sunset until half an hour after sunrise for a minimum of five consecutive nights. Annex B provides the weather data for these surveys.

2.4.40 Sound data recorded during the static detector surveys were analysed using Kaleidoscope Pro (version 5.4.8, Wildlife Acoustics). Due to the large number of sound files gathered by the detectors all files were run through the “Auto ID” function in Kaleidoscope. Once the “Auto ID” had assigned a likely species to each sound files the following manual verification process was undertaken:

- All barbastelle calls were manually verified by an experienced bat ecologist and then re-classified if not a barbastelle call;
- A minimum of 10% of sound files for each bat species (excluding barbastelle) were manually verified by an experienced bat ecologist, with manual verification taking place in ascending order of auto ID species confidence; and
- The earliest and latest call for each species within each month was also manually verified to gain an idea of the potential proximity a species roost may be to the detector.

Crossing Point Surveys

2.4.41 Eight crossing point survey locations were selected, comprising three locations within Hintlesham Woods and along five hedgerows connected to Hintlesham Woods. The surveys aimed to support the results of the static detector surveys by confirming whether the hedgerows were used by commuting bats, particularly barbastelle bats, but also to observe general bat activity in and around existing electricity infrastructure, including the existing maintained operational swathe through Hintlesham Woods.

2.4.42 The crossing points were surveyed using Anabat Walkabout Active bat detectors and infra-red cameras with two infra-red torches/lights. Wooden canes with reflective tape were deployed to determine height of active bats for both the benefit of the surveyor and infra-red camera footage. Where possible, surveyors were located on either side of the hedgerow or woodland feature where access to land was permitted. In addition to standard metadata collection, surveyors recorded all barbastelle bat activity, general activity of other bat species and height of bats crossing.

2.4.43 Sound data recorded during the crossing point surveys were analysed using Kaleidoscope Pro (version 5.4.8, Wildlife Acoustics), then cross referenced with the infra-red camera footage and surveyor field notes. Surveys began 15 minutes before sunset and continued for two hours after sunset. Annex C details the weather conditions for the crossing point surveys.

Bat Trapping

2.4.44 A session of bat trapping was carried out on two consecutive nights on the 9 and 10 August 2022. Faunatech Austbat triple bank harp traps with Sussex Autobat or Binary Acoustics AT100 lures and Ecotone microfilament mist nets were used on both nights. Each night focused on a different area of the woodland. Trapping locations were chosen where they were most likely to catch barbastelle bats based on habitat and the results of crossing point and static detector surveys at that point.

2.4.45 Trapping surveys were led by a Natural England Level 3 and 4 bat licence holder and assisted by a Level 2 licence holder and two Level 1 licence holders (names of surveyors and licence numbers can be given on request).

2.4.46 Traps with acoustic lures were placed a minimum distance of 100m from one-another and not within 50m of known bat roosts. Acoustic lures were used with calls focused on catching barbastelle bats. Trap information is provided in Table 2.5.

2.4.47 Following best practice, nets were checked at five-minute intervals and harp traps at 15 minute intervals. Although the focus was on barbastelle bats, all bats caught were examined to determine their species, sex, age, breeding status and general health observations before being released as soon as possible to limit stress caused to the bat.

2.4.48 The latest Covid-19 guidance for wildlife surveying was followed during the surveys (Defra, 2020). This included wearing disposable gloves and a face covering when handling the bats and disinfecting before and after handling each bat. All equipment was cleaned and disinfected before use and between each use.

Table 2.5 – Trap Information

Criteria	Trap 1 (H1)	Trap 2 (H2)	Trap 3 (H3)	Net 1 (N1)	Net 2 (N2)
9 August 2022					
Location	606598, 243452	606587, 243347	606744, 243189	606497, 243447	606549, 243465
Habitat	Broad leaved woodland	Broad leaved woodland	Broad leaved woodland	Broad leaved woodland	Broad leaved woodland
Trap placement	Between two trees in clutter	Between two trees in clutter	Between two trees in clutter	Across bridleway	Across footpath
Equipment	Triple bank harp, AT100	Autobat1	Autobat2	N/A	N/A
10 August 2022					
Location	606969, 243033	606875, 243091	N/A	607009, 243064	N/A
Habitat	Broad leaved woodland	Broad leaved woodland	N/A	Broad leaved woodland	N/A
Trap placement	Between hazel coppice	Between hazel coppice	N/A	Intersection at woodland ride	N/A
Equipment	Triple bank harp, Autobat Mk2	Triple bank harp, AT100	N/A	9m net	N/A

2.5 Limitations

Bat Roosts

2.5.1 Six trees (T109_T108, T109_T023, T134_T001, T148_T004, T148_T005, and T148_T007) have not had the full complement of required survey due to land access issues or felling (non-project related) of the tree. However, all trees able to be aerially surveyed have been done so at least once during the season.

2.5.2 Land access for field survey was dependent on a landowner's consent. Access was obtained for over 90% of the requested field study area. This is considered a good

proportion of the field survey area and is not considered to be a limitation to the results presented in this report. A survey has not been undertaken of the haul road off the A131. National Grid is proposing to survey this route in spring 2023 subject to landowner agreement.

2.5.3 Building BB18 was an abandoned/disused barn and unsafe to enter due to lack of structural integrity. Therefore, the surveyors were only able to assess the building externally. However, external inspection was deemed sufficient to identify the potential roosting category for this building.

2.5.4 BB10 was a confirmed roost with two surveys. A third survey is not considered a limitation as no maternity roost was likely present following the two initial surveys. A single survey was undertaken on BB5b. This is not considered a limitation as the survey was at the peak of the nursery bat roost season with the likely maximum number of bats recorded.

Use of Static Detectors and Data

2.5.5 The use of bat detectors to sample bats in woodland is limited. Barataud (2020) found that UK bats within the genera *Plecotus*, and *Myotis*, have an average detection range of approximately ten metres in forest understorey, barbastelle has a detection range of approximately 15 metres and *Pipistrellus* bat species have a detection range of 25 metres or less. Therefore, bats foraging within the canopy are relatively undetectable at ground level. Additionally, within a woodland, bat activity is not necessarily concentrated in the same way it is on a hedgerow or along other linear features. However, all bat species expected to be recorded at Hintlesham Woods were recorded and therefore this is not considered a significant limitation to the interpretation of results.

2.5.6 The use of bat data from 2012 to inform the HSM is considered valid. As HSM is a statistical technique that predicts the distribution of a species from the association between environmental data and occurrence records, and the UK Habitat Classification (UKHab) survey of 2021-2022 shows minimal change in habitat types present to that of 2012 when previous bat activity survey was undertaken, any updated bat activity survey data for the full project is unlikely to provide any additional value. That said, in some instances data recorded in 2012 were sometimes classified as ‘unidentified’. This indicates that the sound was created by a bat but there was insufficient data recorded by the Anabat to allow for accurate identification to species level using the guidance available at the time (Russ, 2012). In addition, the file may have been dominated by social calls, for which there were no available parameters provided by Russ (2012) at the time of analysis. These have not been used in the HSM.

2.5.7 Bats in the genus *Myotis* have calls with peak frequencies which can overlap, and calls cannot always be reliably distinguished from each other. Therefore, all *Myotis* calls have been identified as ‘*Myotis spp.*’.

Hintlesham Woods Bat Survey

2.5.8 Surveys using static detectors in and around Hintlesham Woods were unable to be completed at some locations, particularly in the earlier months of the programme. For hedgerows outside of and connected to Hintlesham Woods, land access agreements were unable to be secured for most locations until July. While this prevented the deployment of static detectors, visual counts on crossing points survey were undertaken in these months where surveys could be undertaken by surveyors remaining within the adjacent woodland ownership extents. Once land access had been secured, static

detector deployment and crossing point surveys were able to be done along the hedgerows, at distance from the woodland edge. Within the woodland, data corruption meant results were lost for five surveys.

2.5.9 All limitations are described in Annex B for static detector surveys and Annex C for crossing point surveys. However, these limitations do not impact upon the robustness of the conclusions made from the collated results as the clear purpose of the survey and the repeated surveys across the survey area meant that that there is confidence in both the results and how these were interpreted to make conclusions on barbastelle bat presence and activity.

3. Results

3.1 Desk Study

Designated Sites

3.1.1 No SACs that have bats as qualifying features are located within 30km of the Order Limits. Designated sites identified with bats mentioned in their citations are summarised in Table 3.1 (listed from east to west) and shown in Figure 7.7.1 (**application document 6.4**). These include Little Blakenham Pit SSSI whose SSSI Impact Risk Zone (IRZ) overlap the Order Limits. Records show that three species of bat were found to regularly use the tunnel located within Little Blackenham Pitt SSSI, between September and April, in numbers often totalling 450 or more. It is used principally by Daubenton's bat, Natterer's bat and brown long-eared bat, but occasional visitors are Whiskered bat and Brandt's bat (Natural England, 2022a).

3.1.2 Two LNR and three County Wildlife Sites (CWS) were also identified as having bats mentioned in their citations.

Table 3.1 – Data Search Results for Designated Sites

Name	Designation	Reference to Bats	Approximate Distance from the Order Limits
Little Blakenham Pit	SSSI	SSSI supports one of the largest underground roosts for hibernating bats known in Great Britain	2.9km north
Sproughton Park	CWS	The mosaic of grassland and hedges present are ideal feeding habitat for bats	100m east
Raydon Great Wood	CWS	General reference to bat presence	205m south
Bushy Park Wood	CWS	Old oak pollards within the site are considered immensely valuable as a habitat for bats	Adjacent south
Arger Fen and Spouse's Vale	LNR	Specific mention of barbastelle bat presence	410m south
Tiger Hill	LNR	General reference to bat presence	10m south

Bat Records

3.1.3 The results of the data search returned 173 bat roosts within 7km of the Order Limits in the last 15 years as shown on ES Figure 7.7.1 (**application document 6.4**). No records of bats were provided that were located within the Order Limits. Many additional undefined or non-roost records of bats were also provided by the record providers and these are summarised in Table 3.2 with the roost records.

Table 3.2 – Summary of Bat Species Records

Common Name	Latin Name	Number of Records	Most Recent Record	Notes	Approximate Distance to Order Limits
Brown long-eared bat	*Plecotus auritus*	120	2021	31 unclassified roost records, three maternity roost records, 20 hibernation records	0.1km
Daubenton's bat	*Myotis daubentonii*	36	2020	One unclassified roost record, 10 hibernation records	1.2km
Leisler's bat	*Nyctalus leisleri*	12	2020	Non-roost records	0.1km
Long-eared species	*Plecotus spp.*	21	2017	Two maternity roost records	0.4km
Nathusius' pipistrelle	*Pipistrellus nathusii*	8	2020	Non-roost records	3.2km
Natterer's bat	*Myotis nattereri*	49	2020	Seven unclassified roost records, two maternity roost records, 21 hibernation records	1.4km
Noctule	*Nyctalus noctula*	71	2020	Non-roost records	0.2km
Nyctalus species	*Nyctalus spp.*	2	2016	Non-roost records	4.0km
Nyctalus/Eptesicus agg.	*Nyctalus/Eptesicus spp.*	2	2012	Non-roost records	0.9km
Common pipistrelle	*Pipistrellus pipistrellus*	250	2020	40 unclassified roost records, two hibernation records, one maternity roost record	0.1km
Soprano pipistrelle	*Pipistrellus pygmaeus*	169	2020	Nine unclassified roost records, two maternity roost records	0.1km
Pipistrelle species	*Pipistrellus spp.*	60	2019	Ten unclassified roost records, three maternity roost records	6.4km
Myotis species	*Myotis spp.*	22	2019	One unclassified roost record	0.1km
Serotine	*Eptesicus serotinus*	47	2019	Four unclassified roost records	0.2km
Unknown species	*Chiroptera*	25	2020	One maternity roost record, one unclassified roost record, one hibernation record	0.2km
Barbastelle	*Barbastella barbastellus*	42	2020	One unclassified roost record	0.5km

Previous Survey

3.1.4 Bat surveys were undertaken in 2012 and 2013 prior to project pause. The results are summarised below and shown on ES Figure 7.7.2 (**application document 6.4**):

- Eight walked transects (totalling approximately 62km) and one driving transect (approximately 70km) were undertaken along the preferred route corridor (as defined at that time) and recorded: barbastelle, common pipistrelle, soprano pipistrelle, Nathusius's pipistrelle, *Myotis* sp., *Nyctalus* sp., *Plecotus* sp., *Eptesicus* sp., and unidentified bat species;
- Static bat detectors were placed along 27 linear habitat features across the preferred route corridor. These detectors were left in each location for four days in July, August, September, and October 2012. Species recorded in addition to those in the walked/driven transect comprised: Natterer's bat; and barbastelle; and
- Ground-based assessment of trees were undertaken on all trees within 100m of the proposed alignment in 2013 in accordance with the BCT Guidelines (2012). Following aerial inspections and/or dusk/dawn emergence surveys resulted in 21 confirmed bat roosts in trees. Of these, 12 were located within the project Order Limits.

3.1.5 Bat activity survey undertaken in 2012 by Suffolk Bat Group and Suffolk Wildlife Trust indicated the presence of good foraging, commuting and roosting habitat for bats at Hintlesham Woods. Five bat species were recorded including barbastelle bat, common and soprano pipistrelle, *Myotis* species, and *Nyctalus* species. These surveys also identified several trees suitable for roosting bats, although no roosts were explicitly stated in the results.

3.2 Field Surveys

Buildings - Roosts

3.2.0 Ground based assessment of buildings was undertaken in November and December 2021 and in June 2022. Fifteen buildings were ground assessed with the roost potential categories identified for each building summarised in Table 3.3 and shown in ES Figure 7.7.3 (**application document 6.4**).

3.2.1 All buildings, except BB1 and BB2, were located outside of the Order Limits but within the 50m survey area. The buildings were classified as per the roost suitability categories described in Table 2.2.

3.2.2 Hill View is a residential property and associated outbuildings located within the Order Limits to the east of High Road, Assington (X: 594113, Y:237242). This property was not surveyed as the assumption at this location was for the new overhead lines to be routed to the south of the property with no impact to any potential bat roost present identified. If this assumption is to change and a potential impact is identified, a pre-construction survey will be undertaken.

Table 3.3 – Buildings – Roost Summary

Structure ID (ES Figure 7.7.3)*	Structure	Ground Assessment Date	Roost Suitability Category at Ground Assessment
BB1	Steel-framed barn	16/06/2022	Negligible
BB2	Steel-framed barn	16/06/2022	Low
BB3	Steel-framed barn	16/06/2022	Negligible
BB5	Brick barn conversion (potential storage house)	15/11/2021	High
BB5a	House	15/11/2021	High
BB5b	Brick annexe building next to main house	23/06/2022	High
BB6	House	15/11/2021	Low
BB7	House	15/11/2021	Negligible
BB8	Cottage	08/11/2021	Negligible
BB9	Shed	08/11/2021	Negligible
BB10	House	08/11/2021	Moderate
BB11	Stables and sheds	08/11/2021	Moderate
BB17	House with garage	06/12/2021	Low
BB17a	Sheet metal garage	06/12/2021	Low
BB18	Disused barn	06/12/2021	Low

*Structure ID BB4 and BB12 to 16 are now outside of the 50m survey area and are not presented.

3.2.3 Subsequent emergence and re-entry surveys that were undertaken on buildings with high or moderate potential for supporting roosting bats confirmed the presence of bat roosts at four buildings: BB5; BB5a; BB5b and BB10. Table 3.4 details the meta-data for these surveys while Table 3.5 summarises the emergence/re-entry results.

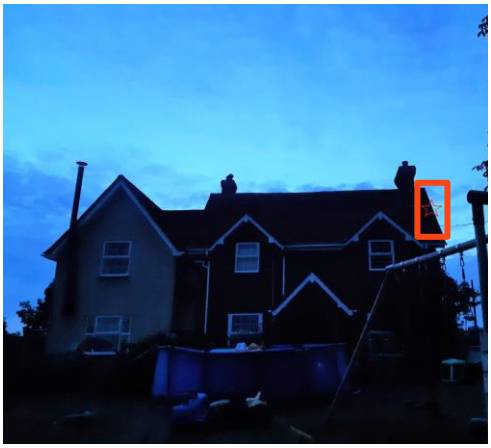
3.2.4 Three of the four buildings are gathered in a single farm complex (Nussteads Farm Section E: Dedham Vale Area of Outstanding Natural Beauty). Initially, BB5b was not included in the scope of field surveys as it is located just beyond the 50m survey area. However, a bat roost was confirmed at BB5b on 23 June 2022 during the re-entry survey of adjacent building BB5a. Due to the perceived high conservation value of this roost (a large soprano pipistrelle maternity roost) and the proximity to the Order Limits it was considered that additional information was required to establish potential impacts. All four buildings roosts are shown on ES Figure 7.7.3 (**application document 6.4**). During the emergence survey on 12 July 2022, additional surveyors were deployed to identify the key dispersal routes from the roost. The emerging bats were seen emerging south but then flying immediately east and north towards the adjoining woodland (Broom Hill Wood). Although many were seen feeding along the wooded edge directly east of Nussteads, none were observed flying south or southeast to cross the Order Limits.

Table 3.4 – Buildings – Bat Roost Survey (Meta-data)

Structure ID	Structure	Survey Date	Survey Time	Temperature (Degrees Celsius)	Rain (1-4)	Cloud (1-8)	Wind (Beaufort Scale)
BB5	Brick barn conversion	09/06/22	02:57-04:52	12	1	0	2
		28/06/22	21:05-23:21	21	1	3	1
		02/08/22	20:20-22:40	22	1	6	2
BB5a	House	23/06/22	02:36-04:51	15	1	1	1
		12/07/22	20:59-23:12	26	1	4	0
		03/08/22	20:29-22:44	21	1	2	1
BB5b	Brick annexe	23/06/22	02:36-04:51	15	1	1	1
		12/07/22	20:59-23:13	26	1	4	0
BB10	House	11/07/22	20:59-23:13	21	1	5	3
		02/08/22	03:20-05:35	19	1	2	1

Table 3.5 – Buildings – Roost Survey Detail

Structure ID	Structure	Survey Date	Emergence/Re-entry Information	Photo of Roost Location
BB5	Brick barn conversion	09/06/22	One soprano pipistrelle re-entry	
		28/06/22	Two soprano pipistrelle re-entries	
		02/08/22	No re-entry	

Structure ID	Structure	Survey Date	Emergence/Re-entry Information	Photo of Roost Location
BB5a	House	23/06/22	No emergence	
		12/07/22	Three common pipistrelle and one brown long-eared bat emergence	
		03/08/22	No emergence	
BB5b	Brick annexe	23/06/22	100-200 soprano pipistrelle re-entries	
		12/07/22	216 soprano pipistrelle emergences recorded and confirmed using IR camera	
BB10	House	11/07/22	One common pipistrelle emergence	
		02/08/22	Two common pipistrelle emergences	

Trees - Roosts

3.2.5 Over 700 trees were ground assessed (based on the initial Scoping Boundary and 50m study area) and had some level of bat roosting potential identified. These are shown in ES Figure 7.7.4 (**application document 6.4**) and survey information can be provided upon request.

3.2.6 As the design developed and refined with the Order Limits, the number of trees that met the criteria for further survey reduced, as shown in the third column of Table 3.6. As

engineering design and commitments to tree retention were further confirmed, the number of trees potentially impacted by the project were reduced further (fourth column of Table 3.6), and with it the scope of further bat survey. Some trees had a survey and then were subsequently removed from the Order Limits. References are made to these within this report to aid understanding of the wider context.

Table 3.6 – Trees with Bat Roosting Potential That Met Criteria for Further Survey (Excluding GSP Substation)

Bat Roosting Potential	Within Scoping Boundary plus 50m	Within Survey Area (Order Limits plus 50m)	Within Survey Area (Where Potential Impacts Could Occur)
High	103	51	41
Moderate	251	151	44
Low	384	Not considered further at this stage – no further survey required as per BCT guidelines (2022)	

3.2.7 Eighty-five trees had moderate or high bat roosting potential and required further surveys. Of these, 67 could be safely climbed and 18 (5 high potential and 13 moderate potential) were deemed unsafe to climb / could not be inspected from ground level.

3.2.8 Seventy-nine trees were considered to have hibernation potential and were subject to subsequent hibernation surveys. One hibernation roost was found.

3.2.9 An additional 54 trees were surveyed in association with the GSP Substation under the amended survey approach (i.e. surveys also included pre-construction survey). None of the trees surveyed in the hibernation season at the GSP Substation identified the presence of hibernating bats. Two active season bat roosts were identified.

3.2.10 Combined, six bat roosts in trees have been found across the study area. Details of these are provided in Table 3.7 and are shown in ES Figure 7.7.4 (**application document 6.4**).

Table 3.7:– Confirmed Bat Roosts

Tree ID	Coordinates	Tree Species	No. of PRF	Confirmed Roost Feature	Bat Species	Bat Roost Classification
136a_T017	607013, 243163	Oak	1	PRF 1 – West facing Hazard beam with split in limb, 10-15m, confirmed roost.	One individual – unidentified species	Hibernation roost
136a_T059	606731, 243227	Hornbeam	5	PRF 2 – Cavity behind exposed heartwood in tear out. Forming a 3cm diameter cavity that extends up. Confirmed roost.	Single brown long-eared bat	Day roost
T136a_T049	606883, 242987	Ash	1	PRF 1 – Wound on eastern stem facing west inwards towards second stem. Vertical wound 30x0.5cm. Exposed heartwood flake. Flat base. Entrance at apex 4x4cm. Cavity extends up into stem by 40cm	Two (or more) *Myotis* species. Possibly Natterer's bats	Day roost
T35a_T004	588087, 236390	Elm	4	PRF 1 – cavity present at apex of wound on southern aspect. Entrance 4x2cm, extends upwards 20x5cm into barrow wedge. Dry and rough	Single pipistrelle species – probably soprano pipistrelle	Day roost
TC27	584257, 236963	Oak	3	PRF 1 - Rim of entrance smooth possibly from mammal use. Bowl shaped cavity full of sludge and slugs. Damp, wet and dirty interior. Entrance measures 7cm in diameter extending back 20cm. Internal diameter measures 10cm – low.	Three Natterer's bat. Confirmed through DNA analysis of droppings	Day roost
T16	584347, 236774	Cherry	2	PRF 1 - Three large woodpecker/rot holes facing west at approx. 3-4m. Present on main stem of large dying/dead tree showing rot and damage. PRF 2 - Woodpecker hole facing east at approx. 7m. Present on main stem of large dying/dead tree showing rot and damage.	Single soprano pipistrelle	Transitional roost

Trees – Not Surveyed – Desk Assessment

3.2.11 Where it was not possible to undertake either a ground based or aerial inspection of PRF with an endoscope, a desk study has been undertaken to identify the possible bat species and roost types that may be present, considering the bat species recorded in the desk study. This desk study is detailed in Table 3.8 and is based on the BTHK (BTHK, 2018) and other desk study records (see Section 2.1). The locations of these trees are shown in ES Figure 7.7.4 (**application document 6.4**).

3.2.12 The list of bat species potentially roosting in trees within Hintlesham Woods (i.e. the trees listed with ID 136a_x') has been further refined using the data collected during the surveys in 2022.

Table 3.8 – Desk Based Review of Potenial Bat Roosts in Trees Unable to be Inspected

Tree ID	Roosting Potential	Tree Species	DBh (m)	PRF(s)	Roost Type Potentially Present (W=Winter (hibernation) Jan-Feb; SF=Spring Flux Mar-Apr; P=Pregnancy May-Jun; N=Nursery(maternity) July-Aug; M=Mating Sept-Oct; AF = Autumn Flux Nov-Dec)
Section AB: Bramford Substation/Hintlesham					
122_T002	High	Oak	3	Knot holes and base	Common pipistrelle: SF; N; AF Soprano pipistrelle: SF; P; M; AF Brown long-eared: SF; P; N; M Daubenton's bat: SF; P; N; M Leisler's bat: N; M Natterer's bat: W; P; M Noctule: SF; P; M Barbastelle: AF
132_T003	High	Ash	0.85	Tear outs, wounds	Daubenton's bat: SF; P; N; M Natterer's bat: W; SF; P; N; M; AF Noctule: W; SF; P; N; M; AF Common pipistrelle: W; SF; N; M; AF Soprano pipistrelle: W;P; N; M; AF Brown long-eared bat: W: P; N; M; AF
132_T008	Moderate	Ash	0.7	Knot hole	Common pipistrelle: SF; N; AF Soprano pipistrelle: SF; P; M; AF Brown long-eared bat: SF; P; N; M Daubenton's bat: SF; P; N; M Leisler's bat: N; M Natterer's bat: W; P; M Noctule: SF
136a_T023	High	Ash	0.25	Knot holes	Common pipistrelle: SF; N; AF Soprano pipistrelle: SF; P; M; AF Brown long-eared bat: SF; P; N; M Daubenton's bat: SF; P; N; M

Tree ID	Roosting Potential	Tree Species	DBh (m)	PRF(s)	Roost Type Potentially Present (W=Winter (hibernation) Jan-Feb; SF=Spring Flux Mar-Apr; P=Pregnancy May-Jun; N=Nursery(maternity) July-Aug; M=Mating Sept-Oct; AF = Autumn Flux Nov-Dec)
					Noctule: SF; P; M Barbastelle: AF
136a_T029	Moderate	Ash	0.25	Wounds	Brown long-eared: W; SF; P; N; M; AF Barbastelle: SF; P; M Noctule: W; SF; P; N; M; AF Common pipistrelle: W; SF; P; N; M; AF Soprano pipistrelle: W; SF; P; N; M; AF
136a_T036	Moderate	Ash	0.9	Knot holes, wounds	Common pipistrelle: SF; N; AF Soprano pipistrelle: SF; P; M; AF Brown long-eared bat: SF; P; N; M Daubenton's bat: SF; P; N; M Noctule: SF; P; M Barbastelle: AF
136a_T045	High	Ash	0.3	Woodpecker holes	Brown long-eared bat: N; M Daubenton's bat: N; M Noctule: W; SF; P; N; M; AF
140_T001	Moderate	Oak	2.5	Pruning cuts	Nathusius pipistrelle: AF Common pipistrelle: N; M Soprano pipistrelle: N
140_T002	High	Oak	1.2	Woodpecker holes, wounds	Brown long-eared bat: N; M Daubenton's bat: N; M Natterer's bat: P; N Noctule: W; SF; P; N; M; AF Leisler's: P
170_T003	Moderate	Ash	0.2	Knot hole, ivy	Common pipistrelle: SF; N; AF Soprano pipistrelle: SF; P; M; AF Brown long-eared: SF; P; N; M Daubenton's bat: SF; P; N; M Leisler's: N; M Natterer's bat: W; P; M Noctule: SF; P; M Barbastelle: AF
261_T002	Moderate	Oak	0.6	Knot holes	
Section D: Polstead					
102_T007	Moderate	Cherry	0.2	Knot holes, lifting bark	Common pipistrelle: SF; N; AF

Tree ID	Roosting Potential	Tree Species	DBh (m)	PRF(s)	Roost Type Potentially Present (W=Winter (hibernation) Jan-Feb; SF=Spring Flux Mar-Apr; P=Pregnancy May-Jun; N=Nursery(maternity) July-Aug; M=Mating Sept-Oct; AF = Autumn Flux Nov-Dec)
102_T010	Moderate	Oak	1.25	Knot hole, ivy, tear out, transverse snap,	Soprano pipistrelle: SF; P; M; AF Brown long-eared: SF; P; N; M Daubenton's bat: SF; P; N; M Leisler's: N; M Natterer's bat: W; P; M Noctule: SF; P; M Barbastelle: AF
105_T001	Moderate	Hawthorn	0.25	Tear outs	Daubenton's bat: SF; P; N; M Natterer's bat: W; SF; P; N; M; AF Noctule: W; SF; P; N; M; AF Common pipistrelle: W; SF; N; M; AF Soprano pipistrelle: W; P; N; M; AF Brown long-eared bat: W; P; N; M; AF
109_T016	Moderate	Oak	1.25	Tear outs, transverse snap, knot hole	
109_T029	Moderate	Hawthorn	0.2	Hazard beam	Brown long-eared bat: SF; P; N; M; AF Barbastelle: N Daubenton's bat: SF; N Natterer's bat: SF; M Noctule: W; SF; AF Common pipistrelle: W; SF; AF Soprano pipistrelle: SF; P; N; M; AF
112_T001	Moderate	Oak	1.25	Tear out, transverse snap, knot hole	Daubenton's bat: SF; P; N; M Natterer's bat: W; SF; P; N; M; AF Noctule: W; SF; P; N; M; AF Common pipistrelle: W; SF; N; M; AF Soprano pipistrelle: W; P; N; M; AF Brown long-eared bat: W; P; N; M; AF
Section G: Stour Valley					
3_T001	Moderate	Ash	0.65	Knot holes, tear out, rot hole	Common pipistrelle: SF; N; AF Soprano pipistrelle: SF; P; M; AF Brown long-eared bat; SF; P; N; M Daubenton's bat; SF; P; N; M Leisler's bat: N; M Natterer's bat: W; P; M Noctule: SF; P; M Barbastelle: AF

Habitat Suitability Modelling

3.2.13 A visual representation showing the areas of relatively high and low habitat suitability (as determined by the modelling) and the models association with the EVs used in the final model is shown in the following series of ES figures (**application document 6.4**):

- Figure 7.7.5 – Myotis species;
- Figure 7.7.6 - Brown long-eared bat;
- Figure 7.7.7 - Barbastelle bat;
- Figure 7.7.8 – Serotine;
- Figure 7.7.9 – Soprano pipistrelle;
- Figure 7.7.10 – Common pipistrelle;
- Figure 7.7.11 – Nathusius' pipistrelle;
- Figure 7.7.12 – Leisler's bat; and
- Figure 7.7.13 – Noctule.

3.2.14 Each figure provides an overview of the full 7km study area around the Order Limits and a more detailed series of sheets where the underground cable sections are proposed (as locations where the greater impact to habitats would be anticipated).

Cluttered habitat species

3.2.15 Areas characterised by woodland, thick hedgerows and treelines generally appeared to be of high suitability for cluttered habitat species i.e. brown long-eared and Myotis species. This habitat is present across the project with a relatively higher density to the east of the project in Section AB: Bramford Substation/Hintlesham to Section C: Brett Valley, compared with other areas of the project further west.

Myotis species

3.2.16 The HSM output for *Myotis* species showed patches of moderate to high suitability throughout the study area to the north, north- east and south of the study area whilst the west and north-west was generally of lower suitability. Woodland variables had the most positive effect on suitability with the most extensive areas of high suitability present within woodland such as Hintlesham Wood, Bentley Long Wood, Bonny Wood, Raydon Great Wood and Assington Thicks County Wildlife Sites (CWS). Generally, as distance increased from woodland suitability decreased for *Myotis* species with most urban areas being of low suitability.

3.2.17 The Order Limits cross the following areas which were shown as high suitability for *Myotis* species (reference to ES Figure 7.1.2 (**application document 6.4**) can help with locations given below):

- Hintlesham Wood;
- Areas surrounding the disused railway south of Hadleigh Railway Walk (CWS);
- Areas around Valley Farm Wood CWS and Layham Pit Woodland and Meadow CWS;

- Areas around Millfield Wood CWS;
- Areas around Sprott's Hall, Sprott's Farm and Dollop's Wood CWS;
- Between Broom Hill Wood CWS and Bushy Park Wood CWS;
- Woodlands around and including Arger Fen & Spouse's Vale Nature Reserve;
- Woodland north-west of Chestnut Grove (north of Tiger Hill Long Meadow CWS);
- Woodland south-west of Appletree Wood / Meadow CWS; and
- River Stour (east of Daws Hall Local Wildlife Site (LoWS)).

3.2.18 Of these, the habitats in the proposed underground cable in Section D: Polstead and E: Dedham Vale Area of Outstanding Natural Beauty (AONB) contained high suitability, particularly around Millfield Wood and between Broom Hill Wood CWS and Bushy Park Wood CWS. The proposed underground cable in Section G: Stour Valley contained high suitability woodland south-west of Appletree Wood / Meadow CWS and the River Stour.

3.2.19 Three *Myotis* roost records are located within areas of moderate to high suitability with connectivity to the Order Limits and the within the maximum core sustenance zone for Myotis species (up to 4km). These include one roost record within Hintlesham Wood in close proximity to the Order Limits and two roost records near Bures, approximately 2.5km south of the Order Limits in Section G: Stour Valley.

Brown long-eared bat

3.2.20 The HSM mapping output for brown long-eared showed patches of moderate to high suitability habitat throughout the study area (see ES Figure 7.7.6 for locations (**application document 6.4)**), particularly to the north, north-east and south-east whilst the west was of relatively lower suitability. Woodland variables had the most positive effect on suitability with the most extensive areas of high suitability present within woodland such as Hintlesham, Raydon Great Wood, Holly Wood and Holbrook Park. Generally, as distance increased from woodland, suitability decreased for brown-long eared bats with most urban areas being of low suitability.

3.2.21 The Order Limits crossed the following areas which were shown as high suitability for brown long-eared:

- Hintlesham Wood;
- Areas around the disused railway south of Hadleigh (Hadleigh Railway Walk CWS) and LNR;
- Layham Pit Woodland and Meadow CWS; and
- South of Apple Tree Wood / Meadow CWS.

3.2.22 No high suitability areas were located within the proposed underground cables alignment. However, moderate suitability habitat was identified around G: Stour Valley, E: Dedham Vale AONB and D: Polstead. One confirmed brown long-eared bat roost located within Hintlesham Wood, in close proximity to the Order Limits. An additional 20 confirmed roosts within the 3km core sustenance zones for brown long-eared bat are located within areas of moderate to high suitability.

Edge habitat species

3.2.23 The HSM mapping outputs for the edge habitat species (barbastelle, serotine, common pipistrelle, soprano pipistrelle and Nathusius' pipistrelle) identified differences in the patterns of high suitability for each species but areas characterised by areas of woodland appeared to be of high suitability for all species in some context.

Barbastelle

3.2.24 The HSM mapping output for barbastelle bat showed high suitability closely focussed around woodland, particularly those of more than 500m 'patch size' which was the most significant variable that influenced the model. The majority of woodland across the study area is shown as high suitability for barbastelle as well as the areas immediately around woodland, particularly small patches of connected woodland. Suitability decreases as distance from woodland increases, with arable and urban environments being the least suitable.

3.2.25 The Order Limits cross the following areas which are shown as high suitability for barbastelle:

- Areas around Hintlesham Park, northeast of Hintlesham Wood;
- Hintlesham Wood;
- Areas surrounding the disused railway south of Hadleigh;
- Raydon Great Wood CWS;
- East of the proposed Stour Valley East CSE compound; and
- Area north of Arger Fen & Spouse's Vale Nature Reserve.

3.2.26 Of these, the proposed underground cable running north-east between Section E: Dedham Vale AONB and F: Leavenheath/Assington, crosses an area of high suitability for barbastelle bat. In addition, the west end of the underground cable is within close proximity to the high suitability area at G: Stour Valley, and between Broom Hill Wood CWS and Bushy Park Wood CWS.

3.2.27 The barbastelle bat's core sustenance zone is 6km. One barbastelle roost was identified 5.4km south/south-east of the project at Brett Valley/Brett Vale Golf Club. The roost was located within close proximity to Timber Hill Wood, an area the HSM identified as having high habitat suitability for barbastelle. In addition, there was good connectivity to other habitat with high suitability further north at Section C: Brett Valley at areas around the railway line south of Hadleigh and Raydon Great Wood CWS. To the east, there is a second roost located approximately 7km south-east of the Order Limits in an area of low-moderate suitability (see ES Figure 7.7.7 for locations (**application document 6.4**)). However, the area between the roost and the areas of high habitat suitability within the Order Limits is more fragmented and therefore less connected when compared to the previously mentioned roost. There are areas of high habitat suitability nearby to the north-east and east, near Old Hall Wood and Butler's Wood, in Section H: GSP Substation where barbastelle bat activity was incidentally recorded during emergence surveys of trees in summer 2022.

Serotine

3.2.28 The HSM mapping output for serotine shows the majority of the study area being of low suitability (see ES Figure 7.7.8 for locations (**application document 6.4)**). The model generally showed serotine to have a positive relationship with woodland, as areas of high suitability across the study area were limited to large patches of woodland. Hintlesham Wood was the only extensive area of high suitability for Serotine. Other areas of moderate to high suitability for serotine included arable and grassland areas with patches of woodland and limited waterbodies or roads, such as that south-east of the Order Limits between Little Wenham and Mace Green.

3.2.29 The Order Limits cross the following areas which were shown as high suitability for serotine:

- Hintlesham Wood; and
- Areas surrounding the disused railway south of Hadleigh.

3.2.30 No high suitability areas were located within the proposed underground cable sections and generally suitability was shown low for serotine across all the proposed 400kv underground cables locations.

Soprano Pipistrelle

3.2.31 The HSM mapping output for soprano pipistrelle showed high suitability closely focussed around woodland, with woodland max patch size being the most significant EV that influenced the model (see ES Figure 7.7.9 for locations (**application document 6.4**)). The majority of woodland across the study area is shown as high suitability for soprano pipistrelle as well as the areas immediately around woodland, particularly small patches of connected woodland. As distance from woodland increase, suitability decreases, with arable and urban environments being the least suitable.

3.2.32 The Order Limits cross the following areas which are shown as high suitability for soprano pipistrelle:

- Areas around Hintlesham Park, northeast of Hintlesham Wood;
- Hintlesham Wood;
- Areas surrounding the disused railway south of Hadleigh;
- Woodland areas around and including Valley Farm CWS;
- Millfield Wood CWS and Dollops Wood CWS;
- Between Broom Hill Wood CWS and Bushy Park Wood CWS; and
- North of Arger Fen & Spouse's Vale Nature Reserve.

3.2.33 Of these, the proposed underground cable in Section D: Polstead and Section E: Dedham Vale AONB crosses the high suitability area between Broom Hill Wood CWS and Bushy Park Wood CWS. The Order Limits loop to the north to avoid Dollops Wood, also avoiding the highest suitability in this area. One soprano pipistrelle roost record is located approximately 1km south of this area which is connected to the Order Limits by areas of moderate to high suitability. This makes the Order Limits located within the soprano pipistrelle core sustenance zone (3km) for that roost.

Common Pipistrelle

3.2.34 The HSM mapping output for common pipistrelle showed high suitability closely focussed around woodland, with woodland max patch size 500 metres being the most significant EV that influenced the model (see ES Figure 7.7.10 for locations (**application document 6.4)**). The majority of woodland across the study area is shown as high suitability for common pipistrelle as well as the areas immediately around woodland, particularly small patches of connected woodland. As a general rule, suitability decreases the further from woodland, with arable and urban environments being the least suitable. Although, some urban areas in places such as Ipswich, Sudbury and Acton were shown to be of moderate to high suitability.

3.2.35 The Order Limits cross the following areas which are shown as high suitability for common pipistrelle:

- Hintlesham Woods;
- Areas surrounding the disused railway south of Hadleigh;
- Millfield Wood CWS and Dollops Wood CWS; and
- East of the proposed Stour Valley East CSE compound.

3.2.36 Of these, the proposed underground cable in Section D: Polstead and E: Dedham Vale AONB crosses high suitability areas south of Polstead Heath. In addition, the proposed underground cable at Section E: Dedham Vale AONB and F: Leavenheath/Assington crosses high suitability areas as it passes north-east through Leavenheath. Twelve common pipistrelle roosts are located within 2km of the Order Limits, connected to it by areas of moderate to high suitability. The Order Limits in these areas are therefore within the core sustenance zones for the species.

Nathusius' Pipistrelle

3.2.37 The HSM mapping output for the Nathusius' pipistrelle shows the majority of the study area as having low to moderate suitability (see ES Figure 7.7.11 for locations (**application document 6.4**)). The model generally showed Nathusius' pipistrelle to have a positive relationship with woodland with areas of high suitability limited to large patches of woodland such as Hintlesham and Raydon Great Wood CWS. Other areas of high suitability included Holbrook Park, Shrub Wood, Old Hall Wood, Spinney Wood and Wherstead Wood, all on the boundary of the 7km study area. The model showed Nathusius' pipistrelle to have a negative relationship with roads, with areas associated with roads and urban areas to be of the lowest suitability.

3.2.38 The Order Limits cross the following areas which were shown as high suitability for Nathusius' pipistrelle:

- Hintlesham Woods;
- Areas around the disused railway south of Hadleigh; And
- East of the proposed Stour Valley East CSE compound.

3.2.39 No high suitability areas for Nathusius' pipistrelle were located within the proposed underground cable sections. However, moderate suitability habitat was present in Sections D: Polstead, E: Dedham Vale AONB, F: Leavenheath/Assington, G: Stour

Valley and H: GSP Substation. No confirmed Nathusius' pipistrelle roosts were present within the study area.

Open habitat species

Leisler's bat

3.2.40 The HSM mapping output for Leisler's bat showed high suitability associated with woodland, with woodland cover and woodland max patch size being the most significant EV that influenced the model (see ES Figure 7.7.12 for locations (**application document 6.4**)). Across the study area, particularly in the north-east and south, large areas of woodland are shown as high suitability whilst smaller patches of woodland and ditches are shown as moderate suitability. Some areas of moderate suitability were associated with major roads whilst the majority of minor roads and urban areas were of low suitability for Leisler's bat.

3.2.41 The Order Limits cross the following areas which were shown as high suitability for Leisler's bat:

- Areas around Hintlesham Park;
- Hintlesham Wood;
- Areas surrounding the disused railway south of Hadleigh; and
- Woodland around and including Valley Farm Wood CWS.

3.2.42 No high suitability areas were located within the proposed underground cable sections. However, moderate suitability habitat was present in the west end of the proposed underground cable at the Section D: Polstead – E: Dedham Vale AONB boundary, between Broom Hill Wood CWS and Bushy Park Wood CWS, around Alder Carr in Section E and the east end of the cable within Section G: Stour Valley.

Noctule bat

3.2.43 The HSM mapping output for noctule bat showed patches of moderate to high suitability throughout the study area to the north, east and south whilst the west of the study area was generally of low suitability (see ES Figure 7.7.13 for locations (**application document 6.4**)). Woodland variables had the most positive effect on suitability with the most extensive areas of high suitability present within woodland such as Hintlesham Wood and woodland to the south and south-west of Hintlesham Woods in the wider study area. Minor roads across the study area generally showed moderate suitability suggesting some use as commuting features, whilst denser road networks, urban areas and ditches were generally of low suitability for noctule.

3.2.44 The Order Limits cross the following areas which were shown as high suitability for serotine bat:

- Hintlesham Wood;
- Areas surrounding the disused railway south of Hadleigh; and
- Areas south of Appletree Wood / Meadow CWS.

3.2.45 No high suitability areas were located within the proposed underground cable sections. However, moderate suitability habitat was present in Section E: Dedham Vale between

Alder Carr and Bushy Park Wood and to the east end of the cable within G: Stour Valley associated with Appletree Wood / Meadow CWS.

Hintlesham Woods – Barbastelle Bats

Static Detector Deployment

3.2.46 The locations of static detector deployment are shown in ES Figure 7.7.14 (**application document 6.4**). A summary of results of static monitoring in and around Hintlesham Woods (with focus on barbastelle bats) is presented in Table 3.9 (hedgerows) and Table 3.10 (woodland) below. The bat species recorded are listed with the times of their first and last call. Additional information on barbastelle bat activity is also provided.

3.2.47 In summary, for the static detectors identified bat registrations from barbastelle, serotine, noctule, common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, brown long-eared bat, Natterer's bat, Myotis sp., and Leisler's bat.

3.2.48 Specifically regarding barbastelle bats, a total of 8279 registrations were recorded, with 985 (12%) occurring along hedgerow and 7294 (88%) occurring in woodland areas. Static locations with the highest number of accumulated barbastelle bat passes recorded were at SH6 (316) and SW5 (2513) (see ES Figure 7.7.14 (**application document 6.4**)).

Table 3.9 – Summary of Static Bat Detector Results – Hedgerows

Static Location ID	Month	Total Number of Barbastelle Bat Passes Recorded	Average Number of Barbastelle Bat Calls Per Night	Highest Number of Barbastelle Bat Calls in a Single Night	Bat Species Recorded	Time of First and Last Call
SH1	July	30	4	6	Barbastelle	21:34/02:33
					Serotine	20:51/02:12
					Myotis sp.	21:09/02:41
					Noctule	20:20/03:07
					Leisler's bat	21:30/00:20
					Natterer's bat	20:23/02:36
					Common pipistrelle	20:10/03:31
					Soprano pipistrelle	20:43/03:34
					Brown long-eared bat	21:42/02:12
	August	128	32	54	Barbastelle	19:30/03:25
					Serotine	21:55/23:52
					Myotis sp.	21:41/22:33
					Common pipistrelle	19:35/04:03
					Soprano pipistrelle	19:54/03:59
					Noctule	20:29/00:27

Static Location ID	Month	Total Number of Barbastelle Bat Passes Recorded	Average Number of Barbastelle Bat Calls Per Night	Highest Number of Barbastelle Bat Calls in a Single Night	Bat Species Recorded	Time of First and Last Call
					Natterer's bat	20:35/21:32
					Brown long-eared bat	20:42/21:42
SH2	July	236	34	105	Barbastelle	20:11/03:23
					Serotine	21:00/02:54
					Myotis sp.	21:01/02:43
					Noctule	20:20/02:46
					Leisler's bat	21:41/23:42
					Natterer's bat	21:07/22:09
					Common pipistrelle	20:20/04:06
					Soprano pipistrelle	20:31/03:36
					Brown long-eared bat	22:17/03:04
	August	18	6	7	Barbastelle	19:53/03:38
					Serotine	20:49/03:16
					Common pipistrelle	19:13/04:31
					Soprano pipistrelle	19:29/04:33
					Brown long-eared bat	20:26/02:12
					Noctule	19:26/02:19
					Myotis sp.	20:03/02:40
					Leisler's bat	20:10/02:59
SH3	May	15	2	7	Barbastelle	20:50/02:13
					Common pipistrelle	20:23/03:30
					Soprano pipistrelle	20:33/03:21
					Myotis sp.	19:45/22:02
					Noctule	20:58/02:58
					Leisler's bat	21:39/03:22
					Natterer's bat	21:41/02:38
	July	216	31	99	Barbastelle	21:53/03:30
					Serotine	22:18/00:59
					Myotis sp.	22:16/02:02

Static Location ID	Month	Total Number of Barbastelle Bat Passes Recorded	Average Number of Barbastelle Bat Calls Per Night	Highest Number of Barbastelle Bat Calls in a Single Night	Bat Species Recorded	Time of First and Last Call
					Noctule	21:29/03:07
					Leisler's bat	23:01/03:07
					Natterer's bat	22:17/03:04
					Common pipistrelle	21:47/04:00
					Soprano pipistrelle	21:49/04:27
					Brown long-eared bat	22:56/02:32
	August	6	2	3	Barbastelle	21:08/01:13
					Serotine	20:39/21:26
					Common pipistrelle	19:59/03:57
					Soprano pipistrelle	19:54/03:44
					Brown long-eared bat	20:42/23:32
					Myotis sp.	21:18/02:49
					Noctule	19:47/04:11
					Natterer's bat	20:46/20:46
SH4	August	6	3	3	Barbastelle	22:24/03:59
					Noctule	20:39/04:50
					Common pipistrelle	20:49/04:48
					Soprano pipistrelle	20:48/05:12
					Brown long-eared bat	01:02/04:24
					Serotine	23:34/23:34
SH5	July	14	7	12	Barbastelle	00:30/03:16
					Leisler's bat	23:18/23:18
					Common pipistrelle	21:55/03:52
					Soprano pipistrelle	22:02/04:09
					Myotis sp.	22:13/03:02
					Natterer's bat	23:39/23:39
					Noctule	21:20/05:04
					Serotine	23:52/03:28
					Brown long-eared bat	23:10/03:17

Static Location ID	Month	Total Number of Barbastelle Bat Passes Recorded	Average Number of Barbastelle Bat Calls Per Night	Highest Number of Barbastelle Bat Calls in a Single Night	Bat Species Recorded	Time of First and Last Call
SH6	July	262	37	89	Barbastelle	20:59/04:23
					Serotine	21:16/03:23
					Myotis sp.	21:05/02:28
					Noctule	21:05/03:35
					Leisler's bat	21:36/02:55
					Natterer's bat	20:37/02:30
					Common pipistrelle	20:22/03:26
					Soprano pipistrelle	20:36/03:25
					Brown long-eared bat	21:58/02:51
	August	54	18	25	Barbastelle	20:11/03:52
					Serotine	20:12/03:36
					Noctule	21:09/03:35
					Common pipistrelle	19:40/03:35
					Soprano pipistrelle	19:57/04:08
					Brown long-eared bat	20:19/03:46
					Myotis sp.	20:24/02:20

Table 3.10 – Summary of Static Bat Detector Results – Woodland

Static Location ID	Month	Total Number of Barbastelle Bat Passes Recorded	Average Number of Barbastelle Bat Calls per Night	Highest Number of Barbastelle Bat Calls in a Single Night	Bat Species	Time of First and Last Call
SW1	May	390	17	65	Barbastelle	20:32/03:35
					Natterer's bat	20:18/05:15
					Common pipistrelle	20:13/03:08
					Soprano pipistrelle	20:02/03:21
					Noctule	20:30/21:48
					Serotine	20:25/01:08
					Brown long-eared bat	21:10/02:29
					Myotis sp.	20:53/03:31
					Leisler's bat	19:52/19:52

Static Location ID	Month	Total Number of Barbastelle Bat Passes Recorded	Average Number of Barbastelle Bat Calls per Night	Highest Number of Barbastelle Bat Calls in a Single Night	Bat Species	Time of First and Last Call
	June	618	47	96	Barbastelle	20:39/01:56
					Myotis sp.	20:49/02:28
					Noctule	20:41/03:38
					Natterer's bat	20:36/03:01
					Common pipistrelle	20:26/03:26
					Soprano pipistrelle	20:19/03:14
					Serotine	20:49/03:18
					Brown long-eared bat	21:48/21:48
					Leisler's bat	20:56/21:18
	July	109	21	45	Barbastelle	20:25/03:25
					Serotine	20:34/03:06
					Myotis sp.	20:53/02:49
					Leisler's bat	22:40/23:54
					Noctule	21:45/02:59
					Common pipistrelle	20:11/03:40
					Soprano pipistrelle	20:11/03:45
					Brown long-eared bat	00:46/00:48
	August	7	2	2	Barbastelle	20:48/21:02
					Serotine	20:50/21:21
					Common pipistrelle	20:28/04:36
					Soprano pipistrelle	21:38/01:49
					Noctule	05:16/05:16
SW2	June	814	102	176	Barbastelle	21:30/04:12
					Myotis sp.	21:38/03:34
					Natterer's bat	00:44/01:03
					Common pipistrelle	21:34/03:58
					Soprano pipistrelle	21:22/04:13
					Brown long-eared bat	22:10/03:12
					Noctule	21:57/03:57

Static Location ID	Month	Total Number of Barbastelle Bat Passes Recorded	Average Number of Barbastelle Bat Calls per Night	Highest Number of Barbastelle Bat Calls in a Single Night	Bat Species	Time of First and Last Call
	July	1469	210	307	Barbastelle	20:06/03:48
					Common pipistrelle	19:56/03:45
					Soprano pipistrelle	19:43/04:17
					Myotis sp.	20:33/03:54
					Brown long-eared bat	20:52/04:10
					Serotine	21:22/00:33
					Noctule	00:34/00:34
SW3	May	38	24	42	Barbastelle	20:14/03:08
					Brown long-eared bat	20:56/20:56
					Common pipistrelle	20:18/03:08
					Soprano pipistrelle	19:57/03:25
					Myotis sp.	21:13/22:52
					Noctule	20:11/20:11
	July	801	160	374	Barbastelle	20:07/03:43
					Common pipistrelle	20:22/03:03
					Soprano pipistrelle	19:51/03:59
					Myotis sp.	20:44/03:43
					Brown long-eared bat	20:48/03:41
					Serotine	22:59/01:29
					Noctule	20:54/00:39
	August	343	86	83	Barbastelle	19:05/04:26
					Common pipistrelle	19:31/03:46
					Soprano pipistrelle	18:58/04:49
					Serotine	21:47/04:25
					Myotis sp.	21:23/00:07
					Brown long-eared bat	20:12/04:26
					Noctule	21:09/04:11
SW4	June	189	17	27	Barbastelle	20:39/03:02
					Common pipistrelle	20:36/02:57

Static Location ID	Month	Total Number of Barbastelle Bat Passes Recorded	Average Number of Barbastelle Bat Calls per Night	Highest Number of Barbastelle Bat Calls in a Single Night	Bat Species	Time of First and Last Call
					Soprano pipistrelle	20:40/03:11
					Natterer's bat	00:20/01:40
					Noctule	21:03/02:09
					Myotis sp.	21:16/23:03
					Brown long-eared bat	22:01/22:01
SW5	May	2337	106	215	Barbastelle	20:20/03:24
					Common pipistrelle	19:43/03:28
					Soprano pipistrelle	19:35/03:49
					Noctule	20:05/20:17
					Serotine	20:18/03:17
					Myotis sp.	20:39/02:40
					Brown long-eared bat	20:21/03:12
					Natterer's bat	21:12/02:12
	June	176	88	119	Barbastelle	20:42/03:03
					Myotis sp.	21:13/02:26
					Common pipistrelle	20:35/02:57
					Soprano pipistrelle	20:09/03:26
					Brown long-eared bat	22:05/01:37
					Serotine	20:48/20:48
SW6	June	0	0	0	Common pipistrelle	22:13/03:05
					Noctule	22:04/22:24
					Serotine	22:58/03:04
					Brown long-eared bat	22:12/03:46
	August	3	1	3	Barbastelle	20:01/03:42
					Serotine	19:38/04:18
					Noctule	19:39/04:15
					Common pipistrelle	18:54/05:01
					Soprano pipistrelle	19:14/04:39
					Brown long-eared bat	22:45/03:49

3.2.49 Table 3.11 summarises the average number of passes per hour by barbastelle bats for each month at each recording location. Table 3.12 and Table 3.13 provide additional detail by breaking down the information to give the number of barbastelle bats recorded per hour for all static detector surveys for hedgerows and woodland respectively.

Table 3.11 – Average Number of Barbastelle Bat Passes Per Hour Each Month

Statics	Average Barbastelle Passes Per Hour Each Month			
	May	June	July	August
SH1	N/A	N/A	2.7	13.9
SH2	N/A	N/A	22.1	71.9
SH3	1.64	N/A	19.9	1.8
SH4	N/A	N/A	N/A	4.7
SH5	N/A	N/A	1.4	N/A
SH6	N/A	N/A	23.8	4.9
SW1	35.5	55.8	7.6	0.7
SW2	N/A	73	133.6	N/A
SW3	3.4	N/A	131.5	33.1
SW4	N/A	16.9	N/A	N/A
SW5	203.4	18.2	N/A	N/A
SW6	N/A	0	N/A	0.3

Table 3.12 – Number of Barbastelle Bats Recorded Per Hour – Hedgerows

Static Detector ID	Survey Dates	Sunset Time	Sunrise Time	Number of Bat Passes Recorded Per Hour (combined)										
				19:00 – 20:59	20:00 – 20:59	21:00 – 21:59	22:00 – 22:59	23:00 – 23:59	00:00 – 00:59	01:00 – 01:59	02:00 – 02:29	03:00 – 03:59	04:00 – 04:59	05:00 – 05:59
SH1	13.07.22– 19.07.22	21:11– 21:04	04:51-04:58	0	0	2	12	7	5	3	1	0	0	0
	09.08.22– 13.08.22	20:31-20:23	05:29-05:36	0	40	63	18	11	11	8	1	1	0	0
SH2	12.07.22– 19.07.22	21;12-21:04	04:49-04:58	0	16	40	22	22	33	47	35	28	0	0
	16.08.22– 20.08.22	20:17-20:09	05:41-05:47	26	59	75	60	119	200	133	94	25	0	0
SH3	24.05.22– 30.05.22	20:56-21:05	04:49-04:42	0	2	9	3	2	1	0	1	0	0	0
	13.07.22– 18.07.22	21:11-21:06	04:51-04:57	0	0	1	11	27	6	62	106	6	0	0
	10.08.22– 13.08.22	20:29-20:23	05:31- 05:36	0	1	4	5	2	2	3	3	0	0	0
SH4	10.08.22– 13.08.22	20:29-20:23	05:31- 05:36	0	0	0	2	0	21	18	0	8	3	0
SH5	14.07.22- 17.07.22	21:11-21:06	04:51-04:57	0	0	0	0	0	3	7	4	1	0	0
SH6	12.07.22– 19.07.22	21:12-21:04	04:49-04:58	0	1	25	10	29	39	48	107	2	1	0
	10.08.22– 12.08.22	20:29-20:35	05:31-05:34	0	20	0	2	7	5	4	5	11	0	0

Table 3.13 – The Number of Barbastelle Bats Recorded Per Hour – Woodland

Static Detector ID	Survey Dates	Sunset Time	Number of Barbastelle Passes Recorded Per Hour (combined)										
			19:00 – 20:59	20:00 – 20:59	21:00 – 21:59	22:00 – 22:59	23:00 – 23:59	00:00 – 00:59	01:00 – 01:59	02:00 – 02:59	03:00 – 03:59	04:00 – 04:59	05:00 – 05:59
SW1	31.05.22 – 21.06.22	21:05 – 21:19	0	106	102	1	3	4	23	150	1	0	0
	22.06.22 – 11.07.22	21:20 – 21:13	0	35	169	14	22	32	74	241	27	0	0
	20.07.22 – 24.07.22	21:03 – 20:58	0	21	29	4	7	2	5	7	9	0	0
	17.08.22 – 19.08.22	20:15 – 20:11	0	7	1	0	0	0	0	0	0	0	0
SW2	22.06.22 – 29.06.22	21:20 – 21:19	0	0	173	111	3	11	25	80	398	2	0
	21.07.22 – 27.07.22	21:02 – 20:53	0	128	55	144	236	188	107	405	207	0	0
SW3	18.05.22 – 20.05.22	20:47 – 20:50	0	12	5	0	0	0	2	13	5	0	0
	21.07.22 – 25.07.22	21:02 – 20:56	0	496	171	111	209	114	72	99	174	0	0
	16.08.22 – 20.08.22	20:17 – 20:09	137	73	16	3	37	39	1	14	31	13	0
SW4	22.06.22 – 02.07.22	21:20 – 21:18	0	40	63	0	3	7	29	43	1	0	0
SW5	31.05.22 – 21.06.22	21:05 – 21:19	0	747	313	21	26	115	235	739	41	0	0
	21.06.22 – 23.06.22	21:19 – 21:20	0	35	26	0	5	2	8	119	5	0	0
SW6	22.06.22 – 06.07.22	21:20 – 21:16	0	0	0	0	0	0	0	0	0	0	0
	16.08.22 – 18.08.22	20:17 – 20:13	0	1	0	1	0	0	0	0	1	0	0

Crossing Point Surveys

3.2.50 The locations of the crossing point surveys are shown in Figure 7.7.14 (**application document 6.4**). Results of the crossing point surveys within and at the hedgerows connected to Hintlesham Woods in relation to barbastelle activity are presented in Table 3.14.

3.2.51 Barbastelle bat were record at all eight survey locations. 1357 barbastelle bat passes were recorded in total, with observed height of barbastelle flight ranging between two and 12 metres above ground.

3.2.52 Other species were also recorded during these surveys. These included but was not limited to common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, noctule, serotine, Leisler's bat, *Myotis sp.* And brown long-eared bat. The height at which these species were observed crossing ranged from one to 14 metres.

Table 3.14 – Summary of Crossing Point Surveys in Hintlesham Woods

Crossing Point Location ID	Survey Date	Number of Barbastelle Bat Passes Recorded	Height of Barbastelle Bat Flight Line (Crossing)	First Barbastelle Bat Call
CPH1	19/05/2022	2	Heard not seen	21:46
	23/06/2022	3	2-6m	22:05
	20/07/2022	2	Heard not seen	22:04
	15/08/2022	14	Heard not seen	20:14
CPH2	18/05/2022	21	Heard not seen	21:18
	22/06/2022	7	4m	22:02
	26/07/2022	2	Heard not seen	21:45
	15/08/2022	15	Heard not seen	20:44
CPH3	24/05/2022	0	N/A	N/A
	22/06/2022	7	Heard not seen	22:34
	20/07/2022	0	N/A	N/A
	17/08/2022	28	Heard not seen	21:10
CPH4	20/07/2022	5	Heard not seen	21:58
	17/08/2022	4	N/A	21:19
CPH5	21/06/2022	12	Heard not seen	22:32
	27/07/2022	19	Heard not seen	21:40
	18/08/2022	21	Heard not seen	21:00

Crossing Point Location ID	Survey Date	Number of Barbastelle Bat Passes Recorded	Height of Barbastelle Bat Flight Line (Crossing)	First Barbastelle Bat Call
CPW1	17/05/2022	1	Heard not seen	21:35
	20/06/2022	15	Heard not seen	21:50
	21/07/2022	102	Heard not seen	21:18
	18/08/2022	243	Heard not seen	20:44
CPW2	16/05/2022	25	8-12m	21:05
	21/06/2022	142	10-13m	21:28
	21/07/2022	487	Heard not seen	21:13
	16/08/2022	103	Heard not seen	20:42
CPW3	23/06/2022	42	4-6m	21:47
	21/07/2022	32	Heard not seen	21:36
	16/08/2022	3	Heard not seen	20:58

Bat Trapping

3.2.53 During the first night of trapping on 9 August 2022, 19 bats were caught comprising four different bat species:

- Three barbastelle bats captured soon after anticipated roost emergence time (two post-lactation females and one juvenile male);
- Fourteen common pipistrelle bats (eight adult males, two adult females; one juvenile male and three juvenile females);
- One brown long-eared bat (adult male); and
- One Daubenton's bat (adult male).

3.2.54 Full results are provided in Table 3.15 and the location of the trap ID shown in ES Figure 7.7.15 (**application document 6.4**).

Table 3.15 – Bat Trapping Results – 9 August 2022

Bat Species	Trap ID	Sex	Age	Reproductive Status
Barbastelle	N1	Female	Adult	Post-lactating
Barbastelle	N1	Male	Juvenile	n/a
Barbastelle	N1	Female	Adult	Post-lactating
Daubenton's bat	N1	Male	Adult	Large testes
Common pipistrelle	N1	Male	Adult	Large testes

Bat Species	Trap ID	Sex	Age	Reproductive Status
Common pipistrelle	H3	Female	Juvenile	n/a
Brown long-eared bat	H2	Male	Adult	Medium, dark epididymis
Common pipistrelle	H1	Female	Juvenile	n/a
Common pipistrelle	N1	Male	Adult	Not recorded
Common pipistrelle	H1	Female	Juvenile	n/a
Common pipistrelle	N1	Male	Adult	Large testes
Common pipistrelle	H3	Male	Adult	Large testes
Common pipistrelle	H2	Male	Adult	Not recorded
Common pipistrelle	H1	Male	Adult	Not recorded
Common pipistrelle	H1	Male	Adult	Not recorded
Common pipistrelle	H1	Male	Adult	Not recorded
Common pipistrelle	H1	Female	Adult	Not recorded
Common pipistrelle	H1	Male	Juvenile	n/a
Common pipistrelle	H1	Female	Adult	Not recorded

3.2.55 On the second night of trapping on 10 August 2022, 11 bats were caught comprising four different species:

- Four soprano pipistrelle bats (three adult males and one juvenile male);
- Two common pipistrelle bats (one juvenile male and one juvenile female);
- Two noctule bats (one adult male and one adult female); and
- Three brown-long eared bats were caught (two post-lactation females and one juvenile male).

3.2.56 Full results are provided in Table 3.16 and the location of the trap ID shown in ES Figure 7.7.5 (**application document 6.4**).

Table 3.16 – Bat Trapping Results – 10 August 2022

Bat Species	Trap ID	Sex	Age	Reproductive Status
Soprano pipistrelle	H1	Male	Adult	Dark epididymis
Brown long-eared	H2	Male	Juvenile	n/a
Common pipistrelle	H1	Female	Juvenile	n/a
Brown long-eared	H1	Male	Juvenile	n/a
Noctule	H1	Male	Adult	Large testes
Noctule	H1	Female	Adult	Not breeding
Brown long-eared	H2	Female	Adult	Breeding

Bat Species	Trap ID	Sex	Age	Reproductive Status
Common pipistrelle	H1	Male	Juvenile	n/a
Soprano pipistrelle	H1	Male	Adult	Not recorded
Common pipistrelle	H1	Male	Adult	Large testes
Soprano pipistrelle	H1	Male	Juvenile	n/a

4. Interpretation of Results

4.1 Bat Roosts

4.1.1 No confirmed bat roosts in trees were found within the Order Limits during the most recent surveys carried out in 2022. All roosts in trees identified in the wider 50m survey area were of single or low numbers of bats of common and widespread species. One of these was a hibernation roost.

4.1.2 Efforts were made to correlate the 12 bat roosts found during surveys caried out in 2012 with the trees surveyed in 2022 but confident matches were not possible. In the intervening years it is likely that features in trees have changed. Of note is the high frequency and wide distribution of trees with bat roosting features recorded and the availability of roosting features within the study area.

4.1.3 The bat roosts identified in buildings were also of few individuals of common and widespread species. Of exception was the large maternity roost of over 200 soprano pipistrelle bats identified with supplementary identification of dispersal routes away from the Order Limits.

4.2 Hintlesham Woods – Barbastelle Bats

4.2.1 Barbastelle passes were recorded during all three survey types carried out within and around Hintlesham Woods.

4.2.2 The most active crossing point survey location was CPW2 (see ES Figure 7.7.14 (**application document 6.4**)) along a ride within Hintlesham Little Wood, recording 757 barbastelle passes recorded across four months (approximately 55% of all the barbastelle bat passes recorded in the static detector survey). The higher number of passes within woodland survey areas indicate that Hintlesham woodland is an important habitat for barbastelle but they also use a number of linear habitats, i.e. hedgerows, surrounding the woodland for commuting and foraging purposes.

4.2.3 Barbastelle bats typically emerge 30 minutes after sunset. At both hedgerow and woodland survey locations, barbastelle were first recorded around 30 to 60 minutes after sunset. The earliest barbastelle pass was 20:14 and latest was 22:59. This coincides with sunset times at the time of the survey, with some passes being earlier than typical emergence times for this species (which may be explained by the reduced light within dense areas of the woodland). These early calls indicate a barbastelle roost within the woodland. These timings were further supported by static survey data, which showed similar timing pattern of passes to the crossing point data. Although tree roost surveys within Hintlesham Woods were limited to within 50m of the Order Limits, numerous trees were identified with bat roosting potential and features within the trees that are of preferential use by barbastelle bats (BTHK, 2018). However, no barbastelle roosting in trees were directly confirmed by aerial endoscope inspection, but barbastelle bats are a transient species, moving from tree to tree within woodlands. Together, this strongly indicates that Hintlesham Woods supports roosting barbastelle bats.

4.2.4 During subsequent bat trapping surveys in the post-maternity season, barbastelle bats were captured soon after anticipated roost emergence time, including two post-lactating females and one juvenile male. This suggests that there is a barbastelle maternity roost within Hintlesham Woods with the presence of post-lactating females, indicating that the

maternal care of their young has ended, and a juvenile male indicating that the species is successfully reproducing in the area.

4.2.5 Relatively high numbers of barbastelle bat passes were recorded by woodland static detectors in Ramsey Wood (SW2), Hintlesham Little Wood (SW3) and in Hintlesham Great Wood (SW5). This shows barbastelle bat activity across all components of the woodland in this area. Taking July as an example, at SW2 and SW3, either side of the Order Limits where they cross Hintlesham Woods, the earliest barbastelle bat calls were recorded within the woodlands over one hour before sunset. Subsequent calls recorded within five minutes at SH2 suggest early dispersal to the north, aided by the sheltered nature of the tree belt. Approximately 40 minutes later, barbastelle activity was recorded along SH6, the hedgerow lined public right of way to the south. The static surveys showed that barbastelle passes were recorded frequently through the night, across all months, at low to moderate numbers along all hedgerows surveyed but with higher total number of passes and higher average calls per night at SH2, SH3 and SH6.

4.2.6 Interestingly, the manned crossing point surveys at SH2 (CPH2) and SH6 (CPH5) (with handheld detectors) in July did not record first calls until 45 minutes or more after the first calls recorded by deployed static detectors. This may have been due to daily differences in recording and weather conditions but could suggest 'light testing' behaviour, where individuals repeatedly exit and re-enter the woodland until a suitable level of darkness has fallen, which was picked up by the deployed static detector, but individuals did not emerge far enough along the hedgerow for surveyors to see.

4.2.7 Static detector SW6 and crossing point location CPW3 were located within the existing operational swathe where the existing overhead lines cross Hintlesham Woods. At this location the canopy is kept at a reduced height. While the deployed static detectors did not pick up much activity by barbastelle bats (no calls in June and two in August), the manned crossing point surveys visually recorded (with confirmation of handheld detectors) 42 bat passes in June, 32 in July and 3 in August within the 2-hour survey. This suggests that the static detectors may have been unable to pick up calls within the open swathe environment where bat activity would be dispersed along the 190m long and 20m wide area. However, the surveyor observed crossing point surveys were able to confirm that barbastelle bats crossed, unimpeded by the pylons and overhead lines, across the existing swathe.

4.2.8 In summary, the results from all three survey types confirm that Hintlesham Woods support barbastelle bat, that there is a likely maternity roost present and the preferred dispersal routes from the woods are along two linear features to the north (SH2 and SH3) and one to the south (SH5). The results show that Hintlesham Woods acts as an important habitat for barbastelle bats in terms of foraging, commuting and breeding.

4.3 Habitat Suitability Modelling

4.3.1 Overall, the landscape along the project largely comprises agricultural fields, small woodland patches and several small towns and villages/hamlets, with a number of linear features such as watercourses, hedgerows and line of trees.

4.3.2 The landscape is generally open in nature with moderate to large arable field sizes with hedgerows and treelines of varying quality and density. Some larger areas of woodland are present, such as Hintlesham Wood. See ES Figure 7.7.5 to Figure 7.7.13 (**application document 6.4**) for habitat suitability modelling for individual bat species.

Section AB: Bramford Substation/Hintlesham to Section C: Brett Valley

4.3.3 The HSM showed a moderate to high habitat suitability for most bat species within these sections, with high to moderate suitability being concentrated within the Hintlesham Woods SSSI, including Raydon Great Wood outside of the Order Limits, and Hadleigh Railway Walk CWS, which has excellent connectivity to additional woodlands south of the Order Limits. Where these habitats intersect the Order Limits, they are likely to provide important flight lines across the Order Limits to help accommodate commuting and foraging to wider habitats for a variety of species of bat. This is further aided by linear features such as hedgerows, treelines and watercourses which provide moderate to high suitability for most species within this area.

4.3.4 Habitats of low suitability appears to be concentrated within the south-eastern area of Section AB: Bramford Substation/Hintlesham and western area of Section C: Brett Valley, for all the bat species, where habitats present are predominantly arable and large woodland habitats are sparse. Although, commuting bats through these areas are likely to be facilitated by the connection of linear features within these sections to wider suitable habitats.

Section D: Polstead to Section F: Leavenheath/Assington

4.3.5 In comparison to the previous sections, the HSM showed there was generally low habitat suitability for most species within Sections D: Polstead to F: Leavenheath/Assington. The exception being for soprano pipistrelle and *Myotis*, which have multiple patches of moderate to high habitat suitability concentrated around Millfield Wood CWS, The Dollops Wood CWS and Bushy Park Wood CWS within the Order Limits. High to moderate suitability habitats also connect to wider large woodlands beyond the Order Limits such as Stack Wood CWS and Hazel Grove/Long wood in section D, and Assington Thicks and Arger Fen in Section E: Dedham Vale AONB.

4.3.6 The landscape is dominated by arable fields with few linear features such as hedgerows. Areas of suitable habitat for bats are present in the form of small to moderate woodland pockets and treelines but they are generally not well connected which may explain lack of suitability for the majority of species according to the HSM.

4.3.7 Within the proposed underground sections, there appears to be a comparable increase in habitat suitability for all species around The Dollops Wood CWS, Bushy Park Wood, the River Box and Alder carr, which intersect the Order Limits. These results suggest that these habitats and inter-connecting linear features, could be important flight lines / commuting routes for a variety of species to wider suitable habitat outside of the Order Limits.

Section G: Stour Valley to Section H: GSP Substation

4.3.8 The HSM showed there was generally low habitat suitability for most bat species, with only small patches of moderate to high suitability. Soprano pipistrelle and *Myotis* species are most likely to favour the habitats present within these sections according to the HSM. Habitats with higher suitability appear to be predominately in section G of the Order Limits, including woodland habitats east of the River Stour connecting to Appletree Wood / Meadow LoWS outside of the Order Limits, the River Stour, Alphamstone Meadows LoWS connecting to Ansell's Grove LoWS, Alphamstone Complex LoWS which intersect the Order Limits and Moat Farm/Burnt House March LoWS outside of the Order Limits.

4.3.9 As with other areas of the Order Limits, the landscape is dominated by arable fields/farmland, small pockets of woodland with minimal linear features such as hedgerows. Sudbury is located north of the Order Limits and can be described as a large, urbanised area which the HSM showed to be of low suitability for most species apart common and soprano pipistrelle.

4.3.10 Focusing on the proposed underground section, the HSM suggests that there are habitat features that are likely to be important flight lines / commuting features to wider suitable habitat for some bat species, such as the River Stour which has parallel lines of trees, allowing connectivity to suitable habitats such as large woodlands outside of the Order Limits. A higher increase in suitability for common and soprano pipistrelle is shown within the LoWSs noted above compared to other bat species, suggesting that these species are likely to use these habitats and suitable linear features to travel throughout the Order Limits within this section.

Annex A. Draft Bat EPS Licence

The Draft Bat EPS Licence can be found at **application document 6.3.7.7.1**.

Annex B. Static Detector Metadata – Hintlesham Woods

Table B.1 – Weather conditions at hedgerow static detector locations (SH1 – SH6)

Crossing Point Location ID	Month of Survey	Survey start date	Lowest temperature (degrees Celsius)	Highest temperature (degrees Celsius)	Max wind speed (mph)
SH1	May	No survey - land access permission in process			
	June	No survey - land access permission in process			
	July	13/07/22	13/07/22	11	14
		14/07/22	14/07/22	10	14
		15/07/22	15/07/22	11	15
		16/07/22	16/07/22	15	16
		17/07/22	17/07/22	17	18
		18/07/22	18/07/22	22	23
		19/07/22	19/07/22	22	23
	August	09/08/22	09/08/22	16	21
		10/08/22	10/08/22	16	21
		11/08/22	11/08/22	16	21
		12/08/22	12/08/22	16	21
		13/08/22	13/08/22	18	33
SH2	May	No survey - land access permission in process			
	June	No survey - land access permission in process			
	July	13/07/22	11	14	7
		14/07/22	10	14	6
		15/07/22	11	15	6
		16/07/22	15	16	9
		17/07/22	17	18	9
		18/07/22	22	23	9
		19/07/22	22	23	9
	August	16/08/22	No data	No data	No data

Crossing Point Location ID	Month of Survey	Survey start date	Lowest temperature (degrees Celsius)	Highest temperature (degrees Celsius)	Max wind speed (mph)
		17/08/22	16	22	13
		18/08/22	15	26	9
		19/08/22	18	26	13
		20/08/22	14	24	13
SH3	May	24/05/22	9	11	6
		25/05/22	9	14	10
		26/05/22	14	16	16
		27/05/22	10	13	12
		28/05/22	5	9	9
		29/05/22	5	10	6
		30/05/22	9	10	7
	June	Static detector deployed elsewhere			
	July	13/07/22	c	14	7
		14/07/22	10	14	6
		15/07/22	11	15	6
		16/07/22	15	16	9
		17/07/22	17	18	9
		18/07/22	22	23	9
	August	10/08/22	22	23	9
		11/08/22	17	32	13
		12/08/22	17	32	13
		13/08/22	18	33	12
SH4	May	No survey - land access permission in process			
	June	No survey - land access permission in process			
	July	No survey - land access permission in process			
	August	10/08/22	22	23	9
		11/08/22	17	32	13

Crossing Point Location ID	Month of Survey	Survey start date	Lowest temperature (degrees Celsius)	Highest temperature (degrees Celsius)	Max wind speed (mph)
		12/08/22	17	32	13
		Static detector removed			
SH5	May	No survey - land access permission in process			
	June	No survey - land access permission in process			
	July	14/07/22	13	25	12
		15/07/22	12	26	16
		16/07/22	12	23	11
		17/07/22	14	26	11
	August	Detector not deployed			
SH6	May	No survey - land access permission in process			
	June	No survey - land access permission in process			
	July	12/07/22	14	26	11
		13/07/22	Data corruption		
		14/07/22	Data corruption		
		15/07/22	Data corruption		
		16/07/22	11	14	7
		17/07/22	10	14	6
		18/07/22	11	15	6
		19/07/22	15	16	9
	August	10/08/22	17	18	9
		11/08/22	22	23	9
		12/08/22	22	23	9

Table B.2 – Weather Conditions at Woodland Static Detector Locations (SW1 to SW6)

Static Detector Location ID	Month of Survey	Survey Start Date	Lowest Temperature (Degrees Celsius)	Highest Temperature (Degrees Celsius)	Max Wind Speed (mph)
SW1	May	31/05/22	15	28	13
		01/06/22	19	32	13
		02/06/22	19	32	13
		03/06/22	13	13	19
		04/06/22	13	14	18
		05/06/22	11	14	8
		06/06/22	11	13	4
		07/06/22	13	14	10
		08/06/22	12	15	16
		09/06/22	15	16	13
		10/06/22	12	16	11
		11/06/22	11	14	9
		12/06/22	10	14	11
		13/06/22	12	15	3
		14/06/22	14	15	7
		15/06/22	14	1	3
		16/06/22	16	6	6
		17/06/22	16	21	7
		18/06/22	12	15	15
		19/06/22	10	14	9
		20/06/22	12	13	4
		21/06/22	14	15	7
		22/06/22	14	15	7
	June	22/06/22	14	15	8
		23/06/22	15	16	8
		24/06/22	13	16	15

Static Detector Location ID	Month of Survey	Survey Start Date	Lowest Temperature (Degrees Celsius)	Highest Temperature (Degrees Celsius)	Max Wind Speed (mph)
		25/06/22	12	14	10
		26/06/22	13	16	8
		27/06/22	11	15	8
		28/06/22	14	16	6
		29/06/22	14	15	6
		30/06/22	12	15	12
		01/07/22	12	15	11
		02/07/22	12	15	9
		03/07/22	12	18	7
		04/07/22	11	16	11
	July	20/07/22	17	22	9
		21/07/22	17	18	13
		22/07/22	16	17	7
		23/07/22	18	20	16
		24/07/22	18	22	16
	August	17/08/22	16	18	11
		18/08/22	18	21	7
		19/08/22	15	20	13
SW2	May	Equipment malfunction			
	June	22/06/22	14	15	8
		23/06/22	15	16	8
		24/06/22	13	16	15
		25/06/22	12	14	10
		26/06/22	13	16	8
		27/06/22	11	15	8
		28/06/22	14	16	6
		29/06/22	14	15	6

Static Detector Location ID	Month of Survey	Survey Start Date	Lowest Temperature (Degrees Celsius)	Highest Temperature (Degrees Celsius)	Max Wind Speed (mph)
	July	21/07/22	17	18	13
		22/07/22	16	17	7
		23/07/22	18	20	16
		24/07/22	18	22	16
		25/07/22	15	19	14
		26/07/22	16	17	7
		27/07/22	17	18	16
	August	Equipment malfunction			
SW3	May	18/05/22	14	14	10
		19/05/22	13	13	2
		20/05/22	11	14	10
	June	Equipment malfunction			
	July	21/07/22	17	18	13
		22/07/22	16	17	7
		23/07/22	18	20	16
		24/07/22	18	22	16
		25/07/22	15	19	14
	August	16/08/22	17	19	8
		17/08/22	16	18	11
		18/08/22	18	21	7
		19/08/22	15	20	13
		20/08/22	16	19	10
SW4	May	Equipment malfunction			
	June	22/06/22	14	15	8
		23/06/22	15	16	8
		24/06/22	13	16	15
		25/06/22	12	14	10

Static Detector Location ID	Month of Survey	Survey Start Date	Lowest Temperature (Degrees Celsius)	Highest Temperature (Degrees Celsius)	Max Wind Speed (mph)
		26/06/22	13	15	8
		27/06/22	11	15	8
		28/06/22	14	16	6
		29/06/22	14	15	6
		30/06/22	12	15	12
		01/07/22	12	15	11
		02/07/22	12	15	9
	July	Equipment malfunction			
	August	Equipment malfunction			
SW5	May	31/05/22	9	11	11
		01/06/22	10	12	4
		02/06/22	12	14	11
		03/06/22	13	13	19
		04/06/22	13	14	18
		05/06/22	11	14	8
		06/06/22	11	13	4
		07/06/22	13	14	10
		08/06/22	12	15	16
		09/06/22	15	16	13
		10/06/22	12	16	11
		11/06/22	11	14	9
		12/06/22	10	14	11
		13/06/22	12	15	3
		14/06/22	14	15	7
		15/06/22	14	16	3
		16/06/22	16	17	6
		17/06/22	16	21	7

Static Detector Location ID	Month of Survey	Survey Start Date	Lowest Temperature (Degrees Celsius)	Highest Temperature (Degrees Celsius)	Max Wind Speed (mph)
		18/06/22	12	15	15
		19/06/22	10	14	9
		20/06/22	12	13	4
		21/06/22	14	15	7
	June	21/06/22	12	14	7
		22/06/22	14	15	8
		23/06/22	15	16	8
	July	Detector not deployed			
	August	Detector not deployed			
SW6	May	Detector not deployed			
	June	22/06/22	15	15	8
		23/06/22	15	16	8
		24/06/22	13	16	15
		25/06/22	12	14	10
		26/06/22	13	16	8
		27/06/22	11	15	8
		28/06/22	14	16	6
		29/06/22	14	15	6
		30/06/22	12	15	12
		01/07/22	12	15	11
		02/07/22	12	15	9
		03/07/22	12	18	7
		04/07/22	11	16	11
		05/07/22	13	14	10
		06/07/22	16	19	16
	July	Detector not deployed			
	August	16/08/22	17	19	8

Static Detector Location ID	Month of Survey	Survey Start Date	Lowest Temperature (Degrees Celsius)	Highest Temperature (Degrees Celsius)	Max Wind Speed (mph)
		17/08/22	16	18	11
		18/08/22	18	21	7

Annex C. Crossing Point Surveys Metadata – Hintlesham Woods

Table C.1 – Weather Data for Crossing Point Surveys

Crossing Point Location ID	Month of Survey	Survey Start Date	Lowest Temperature (Degrees Celsius)	Highest Temperature (Degrees Celsius)	Max Wind Speed (mph)	Cloud Cover (%)	Rain
CPH1	May	19/05/2022	14	16	9	0	None
	June	23/06/2022	16	20	10	60	None
	July	20/07/2022	20	24	20	60	None
	August	15/08/2022	21	22	13	75	Heavy
CPH2	May	18/05/2022	14	15	9	75	None
	June	22/06/2022	16	18	9	10	None
	July	26/07/2022	14	17	11	80	Light
	August	15/08/2022	21	22	13	75	Heavy
CPH3	May	24/05/2022	9	11	16	30	Light
	June	22/06/2022	13	16	9	0	None
	July	20/07/2022	20	24	20	10	None
	August	17/08/2022	18	20	16	100	None
CPH4	May	25/05/2022	16	16	19	40	None
	June	No survey					
	July	20/07/2022	16	20	20	Unknown	None
	August	17/08/2022	16	20	16	80	None
CPH5	May	No survey					
	June	21/06/2022	13	17	9	30	None
	July	27/07/2022	15	17	11	100	None
	August	18/08/2022	21	22	9	20	None
CPW1	May	17/05/2022	15	17	9	0	None
	June	20/06/2022	11	13	11	40	None
	July	21/07/2022	16	23	9	Unknown	None

Crossing Point Location ID	Month of Survey	Survey Start Date	Lowest Temperature (Degrees Celsius)	Highest Temperature (Degrees Celsius)	Max Wind Speed (mph)	Cloud Cover (%)	Rain
	August	18/08/2022	19	22	9	25	None
CPW2	May	16/05/2022	14	17	16	0	None
	June	21/06/2022	13	15	9	0	None
	July	21/07/2022	16	23	9	Unknown	None
	August	16/08/2022	20	21	11	100	None
CPW3	May	26/05/2022	14	17	19	60	None
	June	23/06/2022	17	18	10	10	None
	July	21/07/2022	16	23	9	Unknown	None
	August	16/08/2022	21	22	11	100	None

Annex D. Habitat Suitability Modelling – Supporting Information

Table D.1 – Environmental Variables Used in the Habitat Suitability Modelling

Variable Type	Variable Description
Topography	Altitude at a 300m scale
Topography	Aspect Eastness (radians) at a 300m scale
Topography	Aspect Northness (radians) at a 300m scale
Topography	Slope (radians) at a 100m scale
Distance	Distance to ditches (m)
Distance	Distance (m) to a major road (A road or Motorway)
Distance	Distance (m) to a minor road (B road, C road and unclassified roads)
Distance	Distance (m) to waterbodies
Distance	Distance (m) to woodland
Coverage	Ditch cover (%) at a 500m scale
Coverage	Ditch cover (%) at a 1500m scale
Coverage	Minor road density (average % cover) at a 200m scale
Coverage	Minor road density (average % cover) at a 500m scale
Coverage	Water cover (%) at a 500m scale
Coverage	Water cover (%) at a 1500m scale
Coverage	Woodland cover (%) at a 100m scale
Coverage	Woodland edge density (km/km^2) at a 300m scale
Coverage	Woodland edge density (km/km^2) at a 1000m scale
Coverage	Woodland edge density (km/km^2) at a 2000m scale
Climate	May precipitation (mm)
Climate	May temperature (average daily ° Centigrade x 10)
Climate	Mean annual precipitation (mm)
Climate	Mean annual temperature (average daily ° Centigrade x 10)
Climate	Mean spring precipitation (mm)
Climate	Mean spring temperature (average daily ° Centigrade x 10)
Climate	Mean summer precipitation (mm)
Climate	Mean summer temperature (average daily ° Centigrade x 10)

Variable Type	Variable Description
Structure	Maximum woodland patch size km^2 at a 500m scale

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