

A47 Wansford to Sutton Dualling

Scheme Number: TR010039

Volume 6

6.2 Environmental Statement Appendices **Appendix 8.13 – Bat Activity Survey Report**

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

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Infrastructure Planning

Planning Act 2008

**The Infrastructure Planning
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ENVIRONMENTAL STATEMENT APPENDICES
Appendix 8.13 - Bat Activity Survey Report

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1. Introduction

1.1. Background

1.1.1. In 2020, Sweco UK was commissioned by Highways England to undertake a bat activity survey between Blofield and North Burlingham in line with the Road Investment Strategy announced in 2014 (Highways England 2014). Full details on the site can be found in section 1.2. This is to inform the Environmental Statement (ES) Chapter 8 (Biodiversity) (TR010039/APP/6.1) at PCF Stage 3 for the A47 Blofield to North Burlingham Improvement Scheme.

1.2. Proposed Scheme summary

1.2.1. Highways England proposes to improve the A47 between Wansford and Sutton, hereafter known as 'the site', to dual carriageway standard, hereafter referred to as 'the Proposed Scheme'. This section of the A47 is 2.6km of single carriageway to the west of Peterborough, meeting the A1 Trunk Road, and regularly experiences congestion and delays. The junction of the A47 and A1 will also be realigned to ease traffic flow between the two roads.

1.3. Aims and objectives

1.3.1. These surveys and the report presented herein are intended as an update to the activity surveys undertaken in 2017 and 2018 outlined in Section 2.2. The main body of this report details the results of bat activity surveys undertaken at the site by Sweco in 2020 (see Section 2.1.2) and Annex A details activity surveys undertaken at the site by Wild Frontier Ecology in 2020 (see Section 2.1.3). An impact assessment based upon all 2020 surveys is provided in Section 5.1 and future survey and mitigation requirements are provided in Section 5.2.

1.3.2. The aim of the activity transect surveys is to:

- By sampling representative habitats across the site to gain information regarding bat species composition, distribution and activity across the site; and
- Use the above information to identify valuable foraging resources/areas, valuable commuting areas and commonly used flight paths.

2. Ecological background

2.1. Summary of 2020 surveys

2.1.1. Following surveys previously undertaken in 2017 and 2018 (see Sections 2.2.3 to 2.2.7) update bat activity transect surveys were undertaken in 2020. In addition to the update transect surveys, bat crossing point surveys were undertaken at one location to update crossing point surveys undertaken in 2018 (see Section 2.2.8) and to determine whether bats use the dismantled railway crossing to cross the A47 and how (i.e. by flying above or below the A47). The 2020 update activity transect surveys have been undertaken by Sweco and subcontractors Wild Frontier Ecology, and the update crossing point surveys were undertaken by Wild Frontier Ecology.

2.1.2. Results from the following surveys can be found in the report herein, provided by Sweco:

- Transect activity surveys; one July survey of each of the Transects 1 and 2, one September survey of Transect 1.

2.1.3. Results from the following surveys can be found in the attached report provided by Wild Frontier Ecology in Annex A:

- Transect activity surveys: one June and one August survey of Transect 1, and one June and one September survey of Transect 2
- Crossing point surveys: two surveys (July and August) of one crossing point.

2.2. Previous studies

Desk study

2.2.1. As detailed in the 2018 EIA Scoping Report (Highways England, 2018 (b)) desk-based results revealed 278 records of seven bat species within 10km of the site including Daubenton's *Myotis daubentonii*, noctule, common pipistrelle, soprano pipistrelle, brown long-eared *Plecotus auritus*, whiskered/Brandt's *Myotis mystacinus/brandtii* and unidentified bat species.

Phase 1 habitat surveys

2.2.2. An extended Phase 1 habitat survey was undertaken in 2017 as part of the environmental assessment reports (EARs) for PCF Stages 1 and 2 and subsequent bat activity surveys were designed and undertaken on the basis of the site having moderate habitat suitability for bats (Amey, 2017).

Phase 2 bat surveys 2017 (Amey, 2017)

- 2.2.3. Bat activity surveys were undertaken in 2017 based on an assessment of the habitat on site as being of moderate suitability to support bats, based upon the available commuting and foraging habitats on Site and their continuity and connectivity with the wider landscape in accordance with Collins (2016). Four transects were designed in accordance with Collins (2016) and covered key habitats present on site and included habitats suitable for foraging and commuting bats. Each of the four transect routes was surveyed once per month between July and October 2017.
- 2.2.4. In addition, static bat detectors were deployed on trees or within hedgerows at two locations per transect route (eight locations in total) for five consecutive nights each in July, August, September and October 2017. The locations were stratified based on habitat features which were considered likely to be favoured by bats for foraging and/or commuting activity.
- 2.2.5. In total, 861 bat passes were recorded during the walked transect route surveys including a minimum of five species (common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, noctule *Nyctalus noctula*, Leisler's *Nyctalus leisleri* and *Myotis* sp. (Highways England, 2018 (c)). This encompasses all passes recorded on the four transects across the four surveyed months with the highest number of passes (372 in total) recorded in August.
- 2.2.6. The static monitoring surveys recorded 29,185 sound files and a minimum of five species (the same as which were recorded in the transect surveys (see Section 2.2.5 above)). The location with the highest level of bat activity recorded during the static surveys was within Stibbington Pits Nature Reserve. Phase 2 bat surveys 2018 (Highways England, 2018)
- 2.2.7. In 2018 further activity surveys were undertaken. Due to design changes in the Proposed Scheme resulting in changes to the Proposed Scheme boundary, further scoping surveys were undertaken in 2018 to account for this and bat activity surveys in 2018 used two transect routes surveyed once per month between May and August. A total of 1274 passes from a minimum total of nine species were recorded, with common pipistrelles the most recorded and soprano pipistrelles the second most recorded. Data analysis identified four main areas of bat activity on the site, all of which are linear features with foraging opportunities; these are:
- Wittering Brook / Dismantled railway north of the A47;
 - Sutton Heath Road;
 - where the Wittering Brook meets the River Nene; and

- the Dismantled railway south of the A47.

2.2.8. In addition, static detectors were deployed at eight different locations (five which were directly on one of the two transect routes and three which were adjacent to or in proximity to one of the two transect routes) to record over four consecutive nights on two separate occasions. The locations for the static detector surveys were chosen based on features likely to support commuting and foraging bats. Relative counts of bat passes were calculated for each of the eight surveyed locations. In total, analysis of the data from the static detectors revealed a minimum of eight species recorded with a location on the River Nene being the most active site with very high numbers of Daubenton's and soprano pipistrelles. A location at Sacrewell farm was considered the most species diverse location, with seven species recorded here. Species recorded during the activity transect surveys and/or the static detector surveys undertaken in 2018 include the following of those recorded in 2017; common and soprano pipistrelle, noctule and *Myotis* sp. (see Section 2.2.5) and the following species not recorded in the 2017 surveys; barbastelle *Barbastella barbastellus*, serotine *Eptesicus serotinus*, Daubenton's, Nathusius's pipistrelle *Pipistrellus nathusii*, brown long-eared and natterer's *Myotis nattereri*.

2.2.9. Crossing point surveys of the dismantled railway crossing identified the following species below the A47; common and soprano pipistrelle, Daubenton's, *Myotis* sp. and brown long-eared. A high level of soprano pipistrelle foraging behaviour was recorded beneath the bridge and Daubenton's were recorded in high numbers using the dismantled rail line and passing beneath the bridge. It was considered that species recorded using the rail line in other surveys may be crossing above the A47 at this location.

2.3. Legislation

2.3.1. All bats in the UK are protected under UK and European law.

Wildlife and Countryside Act (WCA) 1981 (as amended)

2.3.2. All species of bat are protected under Schedule 5, Section 9.1 and 9.5(a)(b) of the WCA 1981 (as amended), making it an offence to:

- Damage or destroy a bat roost (whether or not occupied by bats at the time).
- Intentionally or recklessly obstruct access to a bat roost.
- Intentionally or recklessly disturb a bat in its roost, or deliberately disturb a group of bats.
- Deliberately kill, injure or take any bat.

The Conservation of Habitats and Species Regulations (CHSR) 2017 (as amended)

2.3.3. Included in Annex II and IV of EC Directive 92/43/EEC on the Conservation of Natural Habitats and of the Wild Fauna and Flora (the Habitats Directive 1992) as obligated by the Bern Convention (1979) which implements the Conservation of Habitats and Species Regulations 2017 (as amended) making it a European protected species (listed under Schedule 2). All bat species in the UK are European Protected Species (EPS) afforded protection under Section 2 of the CHSR 2017 Regulation 42.

2.3.4. Under the CHSR, it is an offence if you:

- deliberately capture, injure or kill any wild animal of a EPS
- deliberately disturb wild animals of any such species
- deliberately take or destroy the eggs of such an animal
- damage or destroy a breeding site or resting place of such an animal

2.3.5. With specific reference to the offence of disturbance, Regulation 39(1) of the Conservation of Habitats and Species (Amendment) Regulations 2012 states that a person commits an offence if he:

“deliberately disturbs wild animals of any such species [i.e. a European Protected Species] in such a way as to be likely significantly to affect:

(i) the ability of any significant group of animals of that species to survive, breed, or rear or nurture their young; or

(ii) the local distribution or abundance of that species”.

2.3.6. Where development will result in damage to, or obstruct access to, any bat roost (whether occupied or not) or risks harming or significantly disturbing bats, a European Protected Species Licence (EPSL) is required from Natural England to allow the development to proceed.

Natural Environment and Rural Communities Act (NERC)

2.3.7. Bats are also afforded more general protection in England (and Wales) within the Natural Environment and Rural Communities Act (NERC) 2006. This imposes a duty on all public bodies, including local authorities and statutory bodies, in exercising their functions, *“to have due regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity”* [Section 40 (1)]. It notes that *“conserving biodiversity includes restoring or enhancing a population or habitat”* [Section 40 (3)]. Consequently, attention should be given to dealing with the modification or development of an

area if aspects of it are deemed important to bats, such as roosts, flight corridors and foraging areas.

- 2.3.8. Section 41 (S41) of this Act requires the Secretary of State to publish a list (in consultation with Natural England) of habitats and species which are of principal importance for the conservation of biodiversity in England. The S41 list is used to guide decision-makers such as public bodies including local and regional authorities, when carrying out their normal (e.g. planning) functions. The S41 list includes 65 habitats of principal importance and 1,150 species of principal importance.
- 2.3.9. Seven species of bats (soprano pipistrelle, brown long-eared bat, greater horseshoe bat *Rhinolophus ferrumequinum*, lesser horseshoe bat *Rhinolophus hipposideros*, barbastelle Bechstein's bat *Myotis bechsteinii* and noctule) are listed under Section 41 of the NERC Act 2006.

Cambridgeshire and Peterborough Local Priority Species (LPSs)

- 2.3.10. The Cambridgeshire and Peterborough Biodiversity Group (2020) have listed local priority species (LPSs), formerly detailed in Local Species Action Plans, which includes UK priority species, species recorded in Cambridgeshire and Peterborough in the last 50 years, species which are not 'research only' species in the UK Biodiversity Action Plan (UK BAP) and species which are likely to be normally found/resident/breeding in Cambridgeshire and Peterborough. As part of planning applications, site management plans and other conservation projects, where practical, conservation efforts should be targeted for these species.
- 2.3.11. Barbastelle, brown long-eared, noctule and soprano pipistrelle are listed as LPSs.

3. Methodology

3.1. Desk study

- 3.1.1. As part of a desk study for the Proposed Scheme undertaken in 2020 records of protected/notable species (including all UK species of bat) on and within 2km of the site within the last ten years (exempting bat roosts, of which all records are included) were purchased from Cambridgeshire and Peterborough Environmental Records Centre (CPERC) and Northamptonshire Biological Records Centre (NBRC).
- 3.1.2. In addition, data was requested and received from the Cambridgeshire Bat Group and Northamptonshire Bat Group following recommendation to do so from CPERC and NBRC.
- 3.1.3. The Multi-Agency Geographical Information for the Countryside (MAGIC) website was used to identify any Special Areas of Conservation (SACs) designated for bats within 30km of the site and any EPS licences within 2km of the site pertaining to bats.

3.2. Field surveys

- 3.2.1. The 2020 field surveys were designed with reference to *Bat Surveys: Good Practice Guidelines 3rd Edition* (Collins, 2016).
- 3.2.2. Different bat species have different foraging methods and species-specific preferred foraging habitats, summarised in Table 3.2-1 - The foraging habitat preferences of different UK bat species below (adapted from Collins, J. 2016). Habitats within the Site include woodland, arable field margins, hedgerows, watercourses including Wittering Brook and the River Nene; roads, and roadside verges which may include hedgerows and/or lines of trees. The transect routes surveyed (see Annex B) include a range of these habitats and features with potential as foraging and/or commuting areas and as such are likely to be utilised by the widest range of bat species based upon their foraging habitat preferences as detailed in Table 3.2-1 below.

Table 3.2-1: The foraging habitat preferences of different UK bat species

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

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

- 3.2.3. Four transect routes were designed for the site at PCF Stages 1 and 2 (see Section 2.2.3). In 2018 these four transects routes were altered to create and survey two transect routes (see Section 2.2.6). For the purposes of establishing consistency these two transect routes surveyed in 2018 have been adopted for the 2020 surveys (see Annex B).
- 3.2.4. The two transect routes (see Annex B) were designed for the survey area upon data collected during the extended Phase 1 habitat survey undertaken at PCF Stage 1. The transect routes were designed to survey the likely commuting and foraging areas of bats, such as hedgerows, lines of mature trees, grassland strops and pockets of woodland and scrub. The two transect route locations are illustrated in Annex B: Transect route locations. These are indicative transect routes which varied slightly between surveys in response to health and safety constraints during each survey (see Sections 3.5.2 and 3.5.3).
- 3.2.5. Dusk activity surveys were undertaken by Sweco on 23 July and 14 September 2020 on transect 1 and 22 July on transect 2. During the surveys undertaken by Sweco in 2020, two surveyors walked each transect route for health and safety

reasons. Weather data was recorded at the start and end of each transect survey. Surveyors were equipped with a full spectrum bat detector (Anabat Walkabout – Titley Electronics) to aid detection of bats and made notes of the times and, where identifiable, species of bat calls detected in addition to any bat activity that had been seen or heard (commuting, foraging or social calls). The location of each detection/file recorded by the detector was automatically recorded by the detector itself. Surveyors walked at a constant speed along the transect line. The recordings and the field notes were used to help build a picture of bat use across the site and to identify areas of relatively higher use.

3.3. Data analysis

- 3.3.1. Bat calls were recorded during the survey in full spectrum (WAV) format using the Anabat Walkabout detectors. The recorded data was, in order to analyse more efficiently, converted into zero crossing (ZC) format using Kaleidoscope software. The ZC data was then analysed using Analook software. The conversion of data to, and analysis of, ZC format results in the loss of amplitude data compared with the raw full spectrum WAV data. However, the manually analysed ZC sound files found to contain bat calls were compared to the counterpart WAV sound files to confirm the identification of bat calls. Information regarding the interpretation of the analysed data is provided in Section 4.2.2. Analysis of the data focused on identifying calls, where possible, to species level by comparing call characteristics.

3.4. Survey timings, weather conditions and surveyors

- 3.4.1. The optimal survey season for undertaking bat activity surveys is between May to August, inclusive. The months of April, September and October are considered sub-optimal for survey, though acceptable with suitable weather conditions upon the professional judgement of the licensed ecologist. All surveys were undertaken within the optimal or sub-optimal season (see Table 4.2-2), including those undertaken by Wild Frontier Ecology in June (transects 1 and 2), July (crossing point), August (transect 1 and crossing point) and September 2020 ((transect 2) see Annex A).
- 3.4.2. Collins (2016) recommends surveying at temperatures of 10°C and above in dry conditions with no strong winds. All surveys were undertaken within the recommended weather conditions (see Table 4.1-1).
- 3.4.3. Surveys (those undertaken by Sweco) were undertaken by Keith Ross MCIEEM (Ecology Team Lead, Sweco), Chelsea Edwards (Senior Ecologist, Sweco) who holds a level 2 Natural England bat class licence 2018-33927-CLS-CLS, Beth Mell (Consultant Ecologist, Sweco) and Lydia Waite (Ecology Field Assistant, Sweco).

3.5. Limitations

- 3.5.1. The results of this survey will remain valid until September 2022. Beyond this period, if works have not commenced, it is recommended that a new review of the ecological conditions is undertaken (CIEEM, 2019).
- 3.5.2. Survey of Transect 1 during both surveys omitted the section along Sutton Heath Road and through the Sutton Heath Bog Site of Special Scientific Interest (SSSI) due to health and safety concerns with regard to the busy road and electric and barbed wire fences within the SSSI. The lack of a more robust dataset from this area of the site is considered a minor constraint to the survey, however as this area of Transect 1 was surveyed on 25 June 2020 and partially surveyed on 24 August 2020 by Wild Frontier Ecology (see Annex A) this is not considered a significant constraint.
- 3.5.3. Survey of Transect 1 on 23 July included the survey of an additional field margin (the field margin one field west of Upton Road) which was not surveyed during the survey undertaken on 14 September 2020 by Sweco or in the surveys undertaken by WFE (see Annex A). This slight route alteration, which does not result in an area of transect previously surveyed not being surveyed, is not considered a significant limitation. However, there may be results on Annex C: Bat Activity Transect 1 23 July 2020 Survey Results which appear off the transect route (Annex A).
- 3.5.4. Good practice guidance (Collins, 2016) recommends that for habitat with moderate suitability for bats each transect is surveyed once per month between April and October, in addition to automatic detector surveys at two locations per transect with a minimum dataset of five consecutive nights each month (April to October). Due to the COVID-19 Pandemic and its associated restrictions this recommended survey effort has not been achieved. Transect 1 has been subject to survey once in June, July, August and September 2020 and Transect 2 has been surveyed once in June, July and September 2020 (see Sections 2.1.2 and 2.1.3).
- 3.5.5. Manual analysis of bat data (see Section 3.3) can present difficulties in establishing species of origin for calls from certain species which have similar echolocation call characteristics. Species of the genus *Myotis* are such species with very similar call characteristics and no attempt has been made to determine species for calls originating from this genus. The three UK species of big bat (noctule, serotine and Leisler's (NSL sp.)) can also be difficult to distinguish to species level during analysis. Sound files containing calls with a peak frequency below 35khz have been attributed to NSL sp. Where calls have included one or more pulse with a peak frequency of 19khz or below these have been labelled as noctule.

4. Results

4.1. Desk study

- 4.1.1. There are no SACs designated for bats within 30km of the site identified on the MAGIC website.
- 4.1.2. The MAGIC website identified a record of a licence dated 2014 – 2017 to allow for the damage and destruction of a breeding site and resting place used by brown long-eared and soprano pipistrelle bats (licence reference: 2014-666-EPS-MIT). The licence record is located approximately 83m north of the Proposed Scheme boundary at Sacrewell Farm.
- 4.1.3. The Northamptonshire Bat Group provided nine records (including roost records) of a minimum of six species of bat; common pipistrelle, soprano pipistrelle, brown long-eared, noctule, barbastelle, and whiskered/Brandt's. Of these records five related to foraging bats, including the species common and soprano pipistrelle, whiskered/Brandt's, noctule and barbastelle, dated between 2003 – 2004, and one related to a grounded brown long-eared bat. All records of foraging bats were made in the Old Sulehay Forest located approximately 900m south-west of the Proposed Scheme boundary.
- 4.1.4. The Northamptonshire Bat Group state that barbastelle, a rarer species of bat, is found in nearby woodlands including Old Sulehay to the north and Bedford Purlieu to the west, the latter of which is an area of woodland with value for bats. Bedford Purlieu has previously been surveyed in 2007 when seven species of bat were identified, including Natter's.
- 4.1.5. The remaining three records from the Northamptonshire Bat Group pertain to roosts, dated 1981 (pipistrelle sp.), 2001 (soprano pipistrelle) and 1999 (whiskered/Brandt's). All roosts were located in Yarwell which is situated approximately 1600m south-west of the Proposed Scheme boundary.
- 4.1.6. The Cambridgeshire Bat Group returned the following records:
- One record of Natterer's bat dated 2006
 - Two records of noctule dated 2003
 - Nineteen records of pipistrelle *Pipistrellus* sp. dated between 1985 and 2017 inclusive
 - Fourteen records of soprano pipistrelle dated between 2000 and 2017 inclusive
 - One record of a *Myotis* sp. dated 2003
 - Nine records of brown long-eared dated between 1985 and 2016 inclusive

- Four records of common pipistrelle dated between 1978 and 2012 inclusive
- Six records of Daubenton's dated between 2003 and 2012 inclusive (five records of which detailed one or more roosts located in the A1/River Nene road bridge)
- Fourteen records of unidentified bat sp. dated between 1982 and 2011 inclusive

4.1.7. CPERC (and the Cambridgeshire Bat Group) returned two further records of bat roosts as detailed below:

- One record of a *Pipistrellus* sp. roost, dated 2014. The record details a roost in St Kyneburgha's Church in Castor, approximately 1,760m south-east of the Proposed Scheme boundary
- One record of a *Plecotus* sp. roost, dated 2012. The record details a roost located approximately 950m north-west of the Proposed Scheme boundary in Wittering.

4.2. Transect surveys

4.2.1. Detailed descriptions of each of the two transects within the survey area are given in Table 4.2-1 below. See Annex B for the transect route locations surveyed in 2020 (and also previously in 2018 (Highways England, 2018)).

Table 4.2-1: transect and habitats descriptions

| Transect route | Description |
|----------------|--|
| 1 | This transect encompasses the site to the north of the A47 and includes survey of arable field boundaries at Sacrewell Farm, the edge of the woodland associated with Wittering Brook and the dismantled railway line, Sutton Heath Road (which was however not surveyed due to limitations (see Section 3.4.2)), arable field boundaries and the strip of plantation woodland adjacent to the A47 between Sutton Heath Road and Upton Road. |
| 2 | This transect encompasses the site to the south of the A47 and includes survey of the arable field boundaries between Nene Way and the dismantled railway line, the edges of the pockets of woodland and woodland strip associated with the dismantled railway line and habitat adjacent to the River Nene. |

4.2.2. The species recorded information in Table 4.2-2 below includes, for all species, number of detections in brackets. A detection is defined as any one sound file, during analysis of ZC data in Analook (see Section 3.3) which contains one or more identifiable pulse of that species. As this raw data can, at times, be misleading with regards to bat activity levels and numbers of bats (for example, when a single bat is recorded foraging for a period of time and results in a large number of detections it can appear as though there have been many bats and

many passes of that species) further analysis has been provided; **potential number of passes** has been provided based upon the recorded times of bat detections and upon the surveyors notes. Where bats have been visually recorded throughout the survey the numbers of these visual observations have also been provided. Please note the potential number of passes provided is approximate.

- 4.2.3. The drawings in Annex C show all detections of bats recorded during the surveys.

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Appendix 8.13 Bat Activity Survey Report

Table 4.2-2: survey details, weather conditions and survey results

| Survey | Survey date and type | Sunset/sunrise time and survey time | Survey details | Surveyors | Weather conditions at the start and the end of survey (Temp in °C, % cloud, wind in Beaufort) | Species recorded (number of detections) and potential number of bats | Additional survey notes |
|------------|---------------------------|-------------------------------------|--|-------------------------------|---|---|---|
| Transect 1 | 23 July 2020 Dusk | Sunset: 21:10 20:50 – 23:10 | Survey started with the westernmost field of the transect on Sacrewell Farm and moved eastwards throughout the transect. Survey paused whilst surveyors drove from Sacrewell Farm to Sutton Heath Road to commence with the eastern half of the transect, concluding the survey at Upton Road. | Keith Ross Chelsea Edwards | Temp: 19 - 17 Cloud: 90 - 100 Wind: 2 - 2 Precipitation: none - light drizzle started at 22:50 | Soprano pipistrelle (8), six potential passes | No bats were visually observed during the survey. |
| | | | | | | Common pipistrelle (14), nine potential passes | |
| | | | | | | Total bat detections: 44 | |
| Transect 1 | 14 September 2020 Dusk | Sunset: 19:20 19:20 – 21:38 | Survey started at easternmost point off Upton Road. Survey paused whilst surveyors drove from Sutton Heath Road to Sacrewell Farm to commence with western half of transect, concluding the survey following survey of the | Beth Mell Lydia Waite | Temp: 20 – 20 Cloud: 0 – 0 Wind: 0 – 0 Precipitation: none | Soprano pipistrelle (31) inc. social calls, three bats visually observed, potentially six passes* | Common and/or soprano pipistrelle social calls and foraging activity was recorded along the margin of the woodland adjacent to the A47 east of Sutton Heath Road. |
| | | | | | | Common pipistrelle (26), two bats visually observed, potentially nine passes* | |
| | | | | | | Pipistrelle sp. (4), considered two passes | |
| | | | | | | <i>Myotis</i> sp. (7), potentially 6/7 passes | |

A47 WANSFORD TO SUTTON DUALLING
Appendix 8.13 Bat Activity Survey Report

| | | | | | | | |
|-------------------|----------------------|--------------------------------|--|-------------------------------|---|---|------|
| | | | westernmost field at Sacrewell Farm. | | | Total bat detections: 68 | |
| Transect 2 | 22 July 2020 Dusk | Sunset: 21:10 20:50 – 23:10 | Survey started at the easternmost end of the transect. Survey paused whilst surveys drove from easternmost end to layby off the A47 to complete western section of transect. | Keith Ross Chelsea Edwards | Temp: 20 – 17 Cloud: 10 – 30 Wind: 0 - 2 Precipitation: none | <p>Soprano pipistrelle (56) inc. social calls, five bats visually observed, potentially six passes*</p> <p>Common pipistrelle (21), one bat visually recorded, potentially two passes*</p> <p>Pipistrelle sp. (2) – considered likely one bat pass</p> <p>Noctule (34) inc. foraging/feeding buzzes, two bats visually observed, potentially three passes automatically recorded</p> <p>NSL sp. (2) – potentially two passes automatically recorded</p> <p><i>Myotis</i> sp. (2) – potentially two passes automatically recorded</p> <p>Serotine (1) (based upon pulse duration of approximately 0.006s, call shape and a higher repetition rate than would be expected of noctule or Leisler's).</p> <p>Total bat detections: 118</p> | None |

*for common and soprano pipistrelles detected during the survey of Transect 1 on 14 September 2020 and Transect 2 on 22 July 2020 potential passes were identified solely through use of the surveyors notes, as opposed to referring to the timings of detections (see Section 3.3) in the analysed data as has been done for other species on all other occasions and common and soprano pipistrelles detected during survey of Transect 1 on 23 July 2020. This is due to the particularly large number of consecutive detections of these species during these surveys making it difficult to determine potential passes with a degree of certainty.

*NSL sp. refers to calls which are considered to originate from either noctule, Leisler's or serotine bats, but which are indistinguishable to species level. The calls of these three species can be, dependent upon environment and activity, very similar and indistinguishable from each other.

4.3. Results summary of Sweco surveys

- 4.3.1. A higher number of bat detections were recorded on Transect 2 on 22 July 2020 than were recorded in either of the surveys of Transect 1. The surveys detailed in this report and undertaken by Sweco identified a minimum of five species on Transect 2; common and soprano pipistrelle, noctule, serotine and *Myotis* sp. in addition to calls by NSL sp. and a minimum of four species on Transect 1: common and soprano pipistrelle, noctule and *Myotis* sp. in addition to calls by NSL sp.
- 4.3.2. Areas of high levels of bat activity on Transect 2 include:
- along the northern bank of the River Nene;
 - along the dismantled railway cutting and the woodland adjacent to it to the south;
 - along Sutton Drift; and
 - around the disused property adjacent to the A47 east of the railway cutting (see Annex C).
- 4.3.3. Areas of high levels of bat activity on Transect 1 recorded during the July survey undertaken by Sweco include:
- along the plantation woodland bordering the A47 immediately east of Sutton Heath Road; and
 - along the field margin one field west of Upton Road.
- 4.3.4. The July 2020 survey of Transect 1 recorded little activity in the arable fields in the western section of the transect (between the A1 and the railway cutting), however the September 2020 survey of the same transect recorded higher levels of activity of common and soprano pipistrelles and *Myotis* sp. bats relative to the eastern section of the transect east of Sutton Heath Road where activity recorded was low.
- 4.3.5. During the survey of Transect 1 on 14 September 2020 a cluster of bat activity was recorded adjacent to the A47 along the lane leading to Sacrewell Farm and the adjacent field margin. This cluster of activity may indicate that the linear feature created by the road to the north and road to the south of the A47, and their associated habitats, may be used by bats as a point at which to cross the A47. Activity was also recorded along this lane leading to Sacrewell Farm and adjacent field margin during the surveys of Transect 1 undertaken by Wild Frontier Ecology on 25 June and 24 August 2020 (see Annex A). However, as Transect 2 to the south of the A47 does not survey the habitat immediately opposite the lane to Sacrewell Farm there is no indication of whether bats are recorded in high numbers to the south of the A47 here.

- 4.3.6. A second location at which bats may potentially be crossing the A47, based upon the activity transect results, is just west of the dismantled railway cutting where a field margin/hedgerow meet the A47 on the north and a cluster of scattered trees are present to the south of the A47. Moderate levels of bat activity relative to other areas of the transects were recorded to the north of the A47 here on Transect 1 on 14 September 2020 and to the south of the A47 here on Transect 2 on 22 July 2020.

4.4. Summary of Wild Frontier Ecology surveys (Annex A)

- 4.4.1. In addition to those species identified on site during the surveys undertaken by Sweco (see Table 4.2-2) Wild Frontier Ecology also identified Leisler's and Brandt's on Transect 2; and Daubenton's and Nathusius's pipistrelle on Transect 1.
- 4.4.2. Activity during the first survey of Transect 1 undertaken on 25 June 2020 was focused on field margins on the western section of the Transect whilst the second survey undertaken on 24 August 2020 recorded a high level of activity along and adjacent to Sutton Heath Road relative to other areas of the Transect.
- 4.4.3. Areas of higher bat activity along Transect 2 identified during the surveys undertaken by Wild Frontier Ecology include along the northern bank of the River Nene, along the boundaries of the woodland adjacent to the dismantled railway cutting and the A47, and along the A47 west of Sutton Drift.

4.5. Combined summary and conclusion of 2020 survey results

- 4.5.1. The 2020 surveys undertaken by Sweco and Wild Frontier Ecology have identified areas of importance on site for commuting and foraging bats. During surveys by both Sweco and Wild Frontier Ecology higher levels of bat activity have been recorded along the northern banks of the River Nene in addition to along and around the dismantled railway cutting and associated woodlands to the south of the A47. It is considered that these two linear features and their associated habitats (the River Nene and the dismantled railway cutting and associated woodlands) are of high importance for the local bat populations, providing valuable foraging and commuting habitat, and in the case of the railway cutting, a point for bats to cross the A47 (see Annex B (and Section 2.2.8)).
- 4.5.2. Results from both the surveys undertaken by Sweco and Wild Frontier Ecology have confirmed the importance of other linear features such as arable field margins, hedgerows, roads and associated lines of trees, as commuting corridors (and foraging habitat) for bats moving around the site.

- 4.5.3. Other areas of higher levels of bat activity on site have been recorded by Sweco (including for example the plantation woodland adjacent to the A47 east of Sutton Heath Road (see Sections 4.3.2 and 4.3.3)) which likely represent other areas of importance to bats on site. In addition, two potential further crossing points have been identified by Sweco (see Sections 4.3.5 and 4.3.6) where clusters of activity were recorded near features positioned on either side of the A47. These potential crossing points are; a location west of the railway cutting where a field margin/hedgerow on the north meets the A47 and a location along the lane leading to Sacrewell Farm from the A47 and the road opposite leading south off the A47.

5. Impact assessment and requirements (including mitigation)

5.1. Impact assessment

5.1.1. In addition to numerous areas of site being subject to higher levels of light and noise during construction, and potentially higher levels of noise near the proposed mainline during operation, the following identified areas of high bat activity (relative to other areas surveyed) may be further impacted:

- The field margin one field west of Upton Road – this field margin will be severed slightly north of the current A47 route to accommodate the proposed mainline
- The potential crossing point where bats may currently cross the A47 at the location at which the Sacrewell Farm entrance lane to the north and the road to the south meet the A47 – this potential crossing point would be severed by the construction of a wider mainline A47 carriageway just the north of the current A47 and the construction of the new slip-road to the south of the current A47. Should this location be commonly used by bats as a crossing point the construction of the Proposed Scheme could result in increased fatalities due to bats attempting to cross the wider carriageway. In addition, bats may be deterred from attempting to cross here post-construction which would result in the severance of foraging and commuting habitat.
- The potential crossing point where bats may currently cross the A47 west of the railway cutting where a field margin on the north and scattered trees on the south meet the A47 – at this location the proposed mainline will be much wider and positioned just south of the current A47. The scattered trees to the south of the current A47 will be lost and the new mainline may cause a barrier effect, severing potential foraging habitats to the north and south of the carriageway. There is also an increased risk of collision should bats attempt to cross the wider carriageway post-construction.
- The plantation woodland adjacent to the A47 east of Sutton Heath Road – this will be directly impacted at the western end and will be disconnected from habitats to the north post-construction by the proposed mainline.
- Sutton Heath Road – this linear feature will be directly impacted by the construction of the proposed mainline just north of the current A47 route. The proposed A47 route will also be wider here and involve the loss of a section of woodland associated with the dismantled railway cutting. This may prevent bats from using the rail line to commute between habitats to the north of the road and habitats to the south. Sutton Heath Road will also be directly impacted near the junction with Langley Bush Road where a new connecting road will join the current road.
- Field margins on the western section of Transect 1 (north of the A47 between the A1 and Sutton Heath Road) – direct impacts are anticipated upon many

of the field margins in this area of the site due to construction of the new mainline, slip roads and underpass.

5.2. Requirements and mitigation

Survey requirements

- 5.2.1. Due to the time delay between the completion of these surveys in 2020 and the onset of construction on site further surveys will be required to update the baseline and provide information required for any protected species licenses.

Mitigation requirements

- 5.2.2. Should the Proposed Scheme include night works, additional lighting would be employed at the site during hours of darkness which would have an impact on the commuting and foraging ability of bats around the Proposed Scheme. Care must be taken to avoid light spill onto semi-natural habitats of importance for commuting and foraging bats, specifically woodland edges and watercourses, and vertically into the sky above the works.
- 5.2.3. As general good practice to minimise disturbance to commuting and foraging bats during construction lighting above the pre-construction ambient levels should be avoided, as some bat species are deterred by light, or lighting may be used at lower heights to prevent bats from descending to road level. A wildlife sensitive lighting scheme should be designed in consultation with a suitably experienced ecologist to make sure that important foraging areas remain undisturbed during the construction and operational phases of the development. Where lighting is necessary, the following measures should be considered to reduce adverse effects:
- Consideration of hood design, lamp height, and angle, to reduce light spill particularly avoiding illuminating retained foraging and commuting habitat on the site such as mature trees, tree lines, and hedgerows. Additional lighting of water courses and waterbodies is to be avoided as far as practicable.
 - Use of less ultraviolet (UV) light emitting bulbs, such as metal halide or high-pressure sodium.
 - Minimising hours of lighting to those absolutely necessary for security and safety purposes. Where possible lighting should avoid key periods of bat activity (i.e. sunset and sunrise). Consider how new technologies can be used to control lighting levels (e.g. dimming lights at certain times).
- 5.2.4. Further technical details are given in the BCT and the institute of Lighting Engineers' Bats and Lighting in the UK (2009) and Artificial Lighting and Wildlife: Interim Guidance: Recommendations to Help Minimise the Impact of Artificial Lighting (BCT, 2014). Both publications are available at: <https://www.bats.org.uk/about-bats/threats-to-bats/lighting>.

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

References

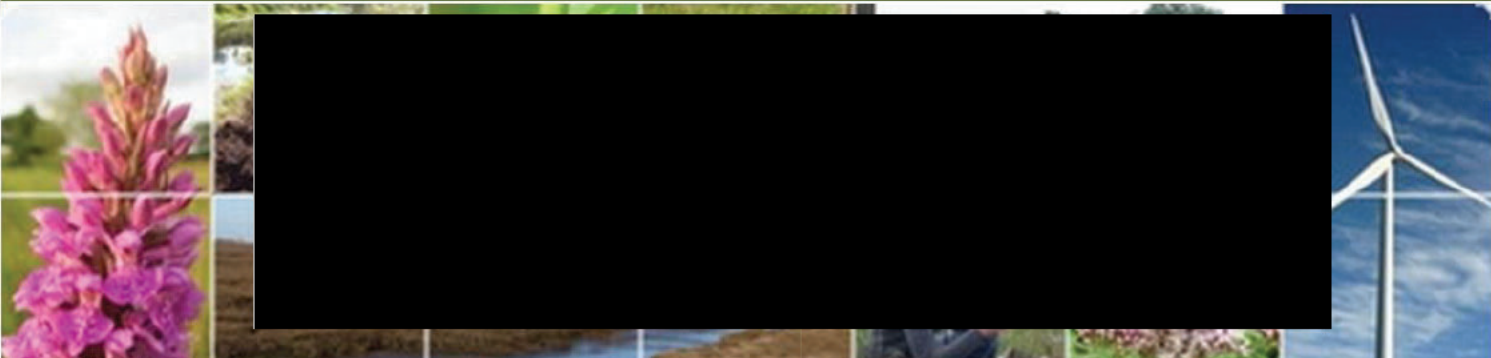
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Annex A. Wild Frontier Ecology report



WILD FRONTIER ECOLOGY

SWECO-A47 Wansford



Bat transect and disused railway crossing point data

October 2020

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The data which we have prepared and provided are accurate, and have been prepared and provided in accordance with the CIEEM’s Code of Professional Conduct. We confirm that any opinions expressed are our best and professional bona fide opinions.

Wild Frontier Ecology is ISO14001 accredited.



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1. Method

1.1. Data objectives

The purpose of this report is to summarise the species of bats that were seen during the A47 Wansford bat activity and transect surveys, the dates of the surveys and the surveyors who carried out the surveys. The results of the crossing point surveys will allow conclusions to be made regarding the amount of bat activity above and below the disused railway bridge. The results for the four transect surveys that took place will inform the understanding of bat species within the vicinity of the proposed development. The surveys also help to identify features which may be important for foraging or commuting bats.

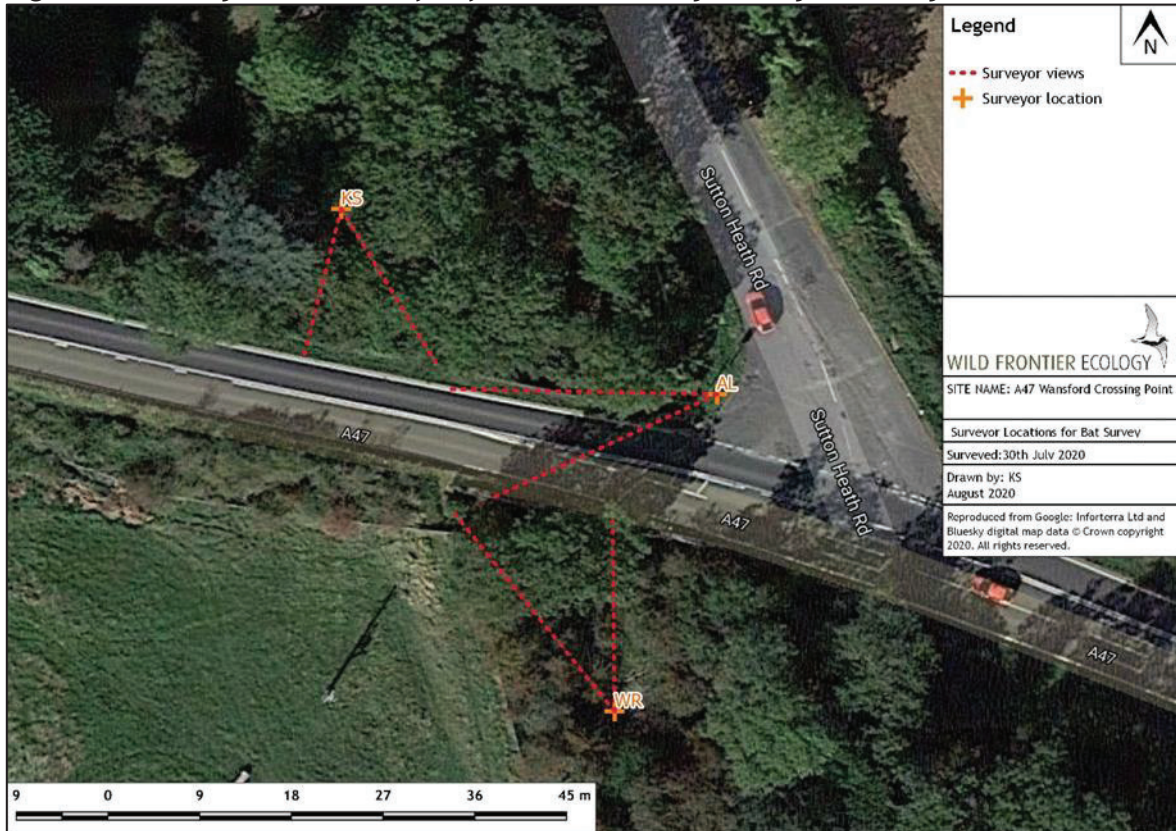
1.2. Background for crossing point survey

Wild Frontier Ecology Ltd. (WFE) was commissioned by SWECO to complete bat surveys of key points around the Wansford section of the A47. These surveys are required to inform an impact assessment of proposed changes to the road layout. Surveys including crossing point surveys and bat transects were undertaken in 2019 to assess how bats are using the areas around this part of the A47. Both the crossing point surveys of the disused railway bridge and the transect surveys required updating surveys in the bat-active season of 2020. WFE carried out these updating surveys by completing two crossing point surveys of the disused railway bridge and two surveys each of both transects routes located either side of the A47.

1.3. Crossing point activity surveys

1.3.1. First bat activity survey 30th July 2020

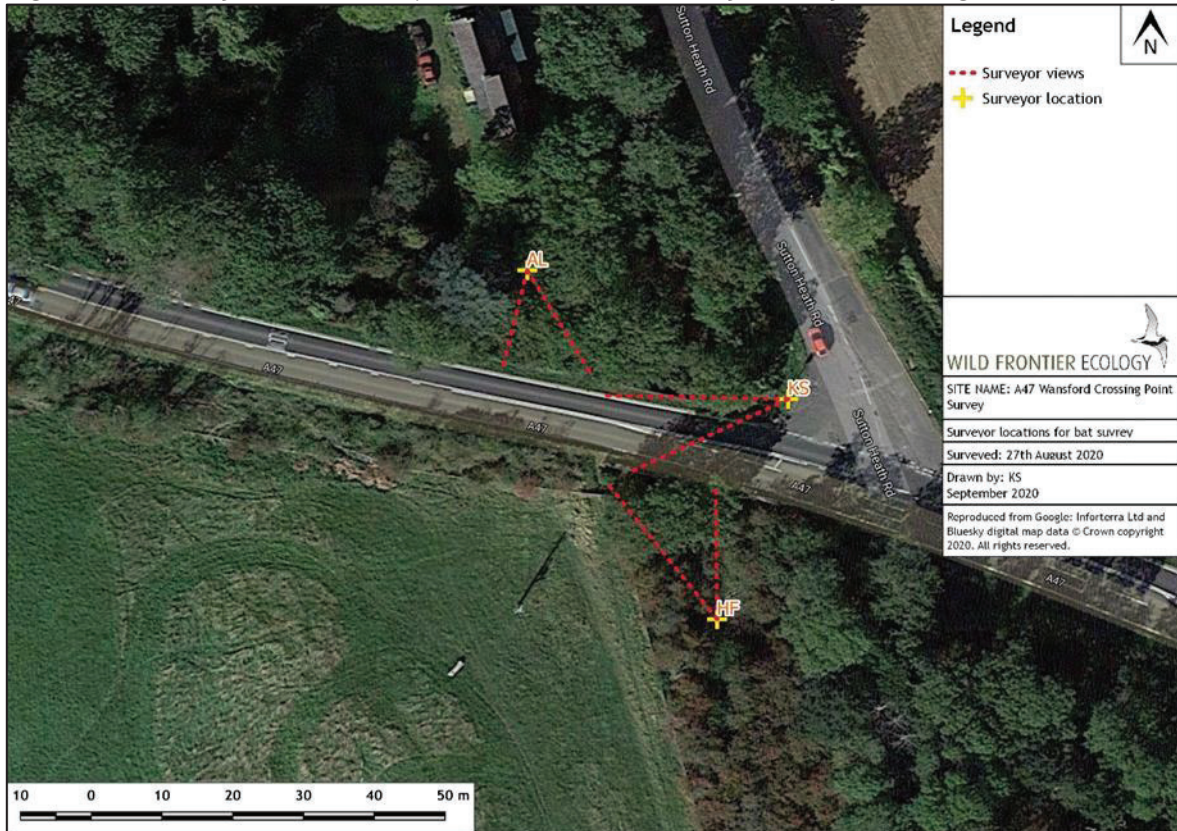
The first dusk emergence survey was undertaken on 30/07/20 by Katrina Salmon BSc, William Riddett BA ACIEEM and Alexander Lowe BSc MArborA. The surveyors monitored the bridge structure to identify 1) whether bats were flying above or below the road bridge (i.e. flying across the A47 at road level or under the bridge below road level), and 2) if any bats emerged from the bridge structure. Surveyors used Anabat SD1 bat detectors to assist in recording the number and species of bats commuting through or over the bridge. A. Lowe was positioned at the edge of the A47 at road-level, whilst K. Salmon and W. Riddett were underneath the bridge. The survey began at 20:42 which was 15 minutes before the sunset time of 20:57. The survey lasted for an hour and a half after sunset, giving a finish time of 22:27. The weather was warm with a start temperature of 25°C and an end temperature of 21°C. There was 10% cloud cover, no precipitation and BS1 wind speed. The surveyor positions for the first survey are indicated in Figure 1 below.

Figure 1. Surveyor locations for first bat activity survey 30th July 2020

1.3.2. Second bat activity survey 27th August 2020

The second dusk emergence survey was undertaken on 27/08/2020 by K. Salmon, A. Lowe, and Hayley Farnell BSc MSc MCIEEM. The survey approach was the same as during the 30th July survey. K. Salmon and A. Lowe used Anabat SD1 bat detectors and H. Farnell used an Elkon Bat Scanner bat detector to assist in recording the number and species of bats commuting beneath or over the bridge, or emerging from it. K. Salmon was positioned on the edge of the A47, whilst A. Lowe and H. Farnell were positioned underneath the bridge. The survey began at 19:45 which was 15 minutes before the sunset time of 20:00. The survey lasted for an hour and a half after sunset, giving a finish time of 21:30. The weather was mild with a start temperature of 14°C and an end temperature of 13°C. There was 100% cloud cover, light precipitation and BS1 wind speed. The surveyor positions for the second survey are indicated in Figure 2 below.

Figure 2. Surveyor locations for second bat activity survey 27th August 2020

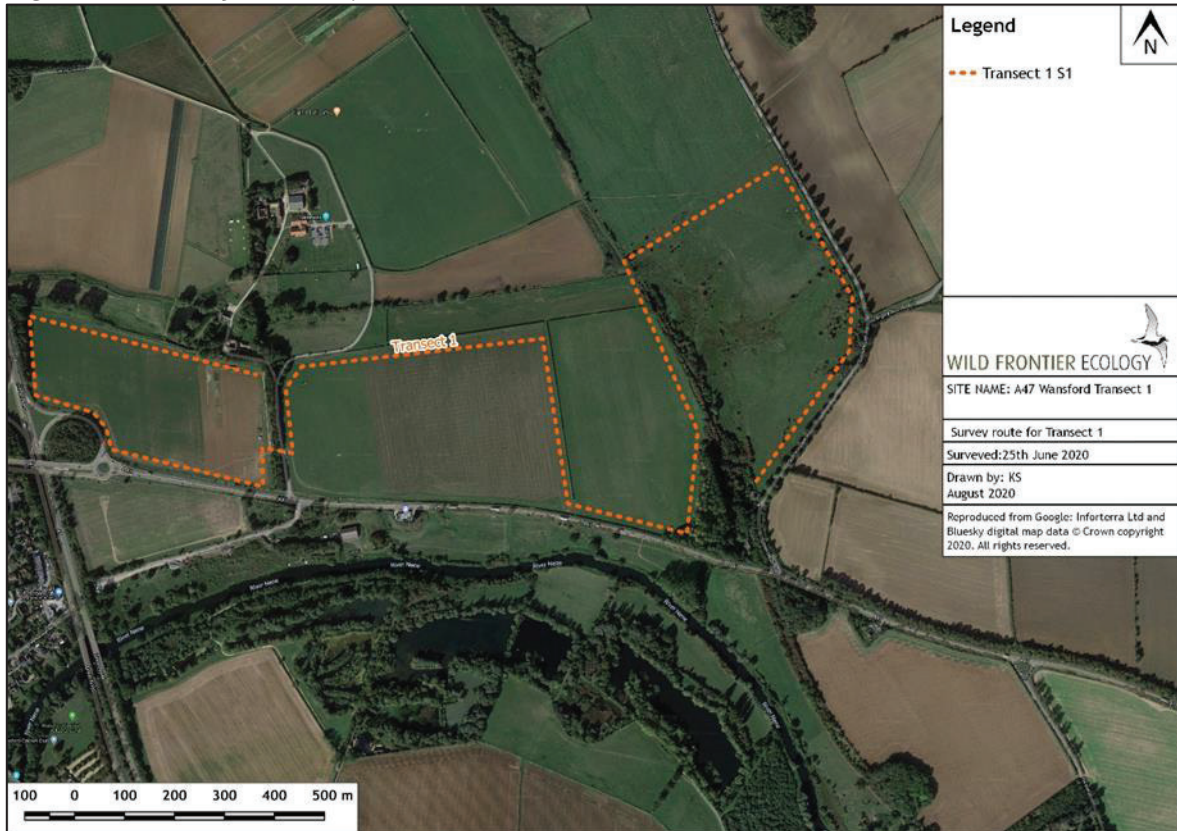


1.4. Transect surveys

1.4.1. First Survey of Transect 1 25/06/2020

Transect 1 was undertaken on 25/06/2020 by Rachel Bates BSc ACIEEM and K. Salmon. The surveyors walked a pre-determined route, which encompassed a range a different habitats suitable for bats. R. Bates used an Elkon Bat Scanner bat detector and K. Salmon used an Anabat SD1 bat detector to assist in recording the number and species of bats that were foraging or commuting along the route. The survey began at 21:29 and finished at 00:05. The weather was warm with a start temperature of 25°C and end temperature of 19°C. There was 10% cloud coverage, no rain and BS1 wind speed. The transect started in the east and the surveyors walked in a westerly direction. The transect route undertaken by the surveyors is outlined in Figure 3 below.

Figure 3. Survey route of Transect 1 25/06/2020

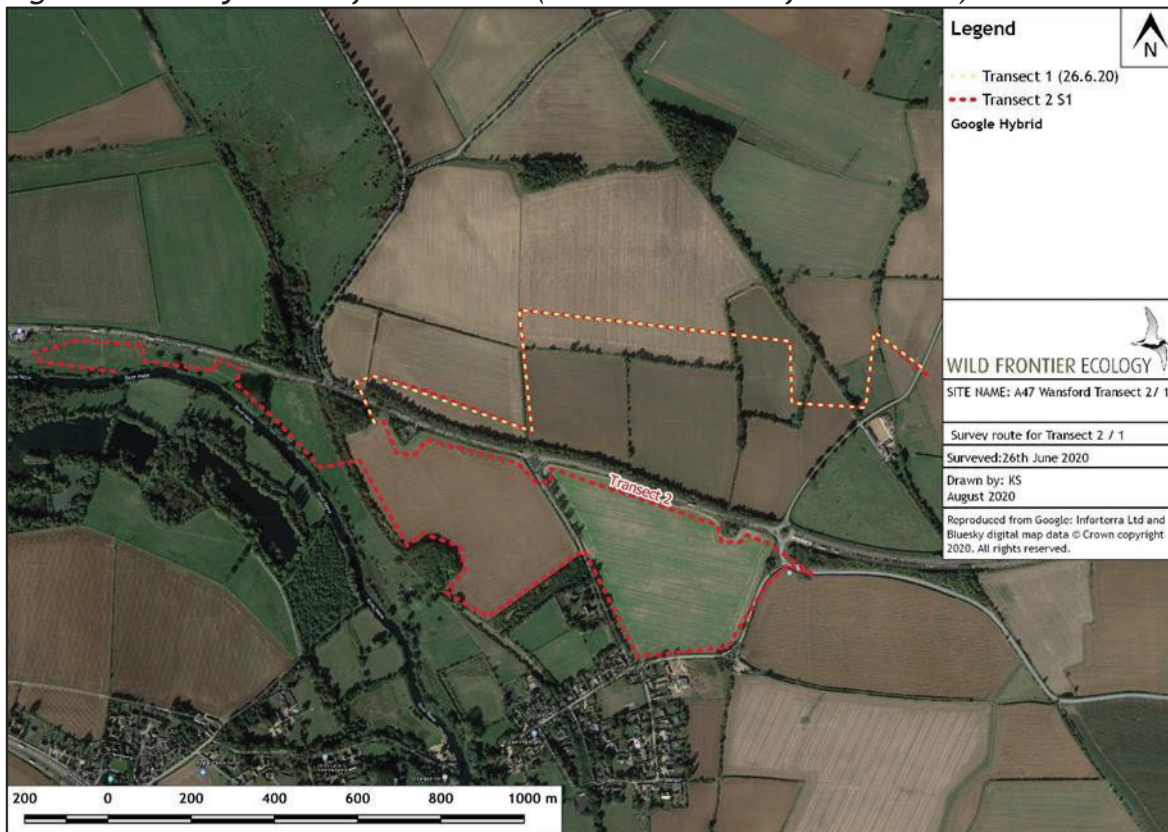


1.4.2. First Survey of Transect 2 26/06/2020

Transect 2 was undertaken on 26/06/2020 by R. Bates and Sharon Yardy BSc. The surveyors walked a pre-determined route, which encompassed a range of different habitats suitable for bats. Both surveyors used Elkon Bat Scanner bat detectors to assist in recording the number and species of bats that were foraging or commuting along the route. The survey began at 21:29 and finished at 00:30. The weather was warm with a start temperature of 24°C and an end temperature of 20°C. There was 80% cloud cover, no rain and BS1 wind speed. The transect started in the west and the surveyors walked in an easterly direction. At 23:34 the surveyors crossed the A47 and continued to survey the remainder of Transect 1. The transect route undertaken by the surveyors is outlined in Figure 4 below.



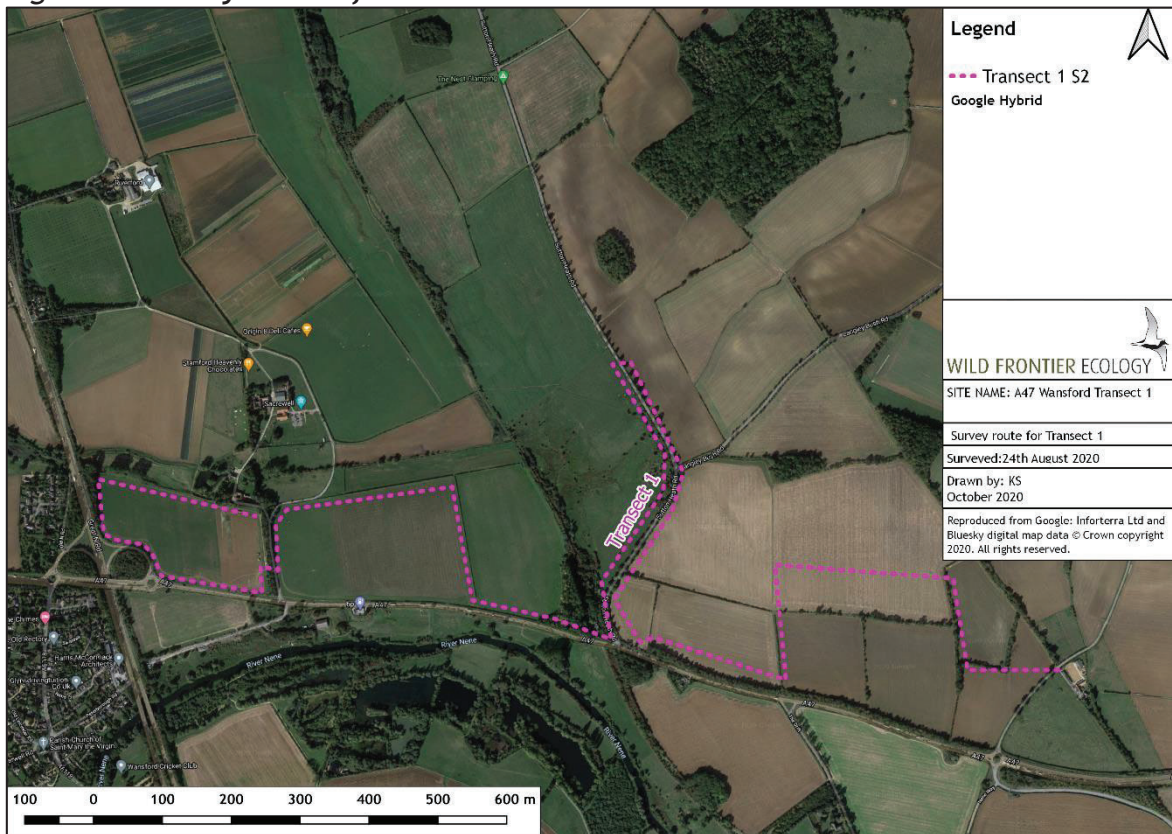
Figure 4. Survey route of Transect 2 (and remainder of Transect 1) 26/06/2020



1.4.3. Second Survey of Transect 1 on 24/08/2020

Transect 1 was undertaken on 24/08/2020 by H. Farnell and K. Salmon. The surveyors walked a pre-determined route, which encompassed a range of different habitats suitable for bats. H. Farnell used an Elkon Bat Scanner bat detector and K. Salmon used an Anabat SD1 bat detector to assist in recording the number and species of bats that were foraging or commuting along the route. The survey began at 20:07 and finished at 22:20. The weather was mild with a start temperature of 17°C and end temperature of 15°C. There was 100% cloud coverage, BS2 wind speed, and light rain began at 22:00. The transect started in the east and the surveyors walked in a westerly direction. The transect route undertaken by the surveyors is outlined in Figure 5 below.

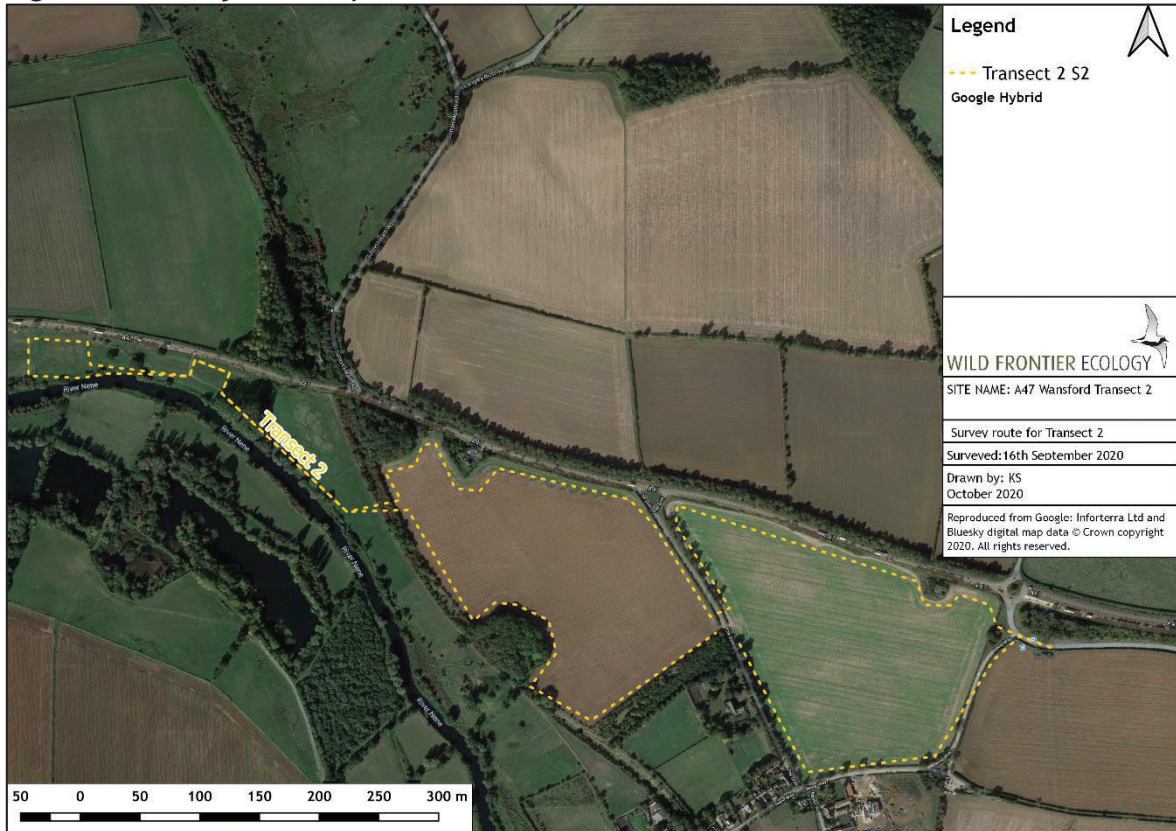
Figure 5. Survey route of Transect 1 24/08/2020



1.4.4. Second Survey of Transect 2 on 16/09/2020

Transect 2 was undertaken on 16/09/2020 by H. Farnell and W. Riddett. The surveyors walked a pre-determined route, which encompassed a range of different habitats suitable for bats. H. Farnell used an Elkon Bat Scanner bat detector and W. Riddett used an Anabat SD1 bat detector to assist in recording the number and species of bats that were foraging or commuting along the route. The survey began at 19:10 and finished at 21:16. The weather was mild with a constant temperature of 16°C. There was 100% cloud coverage, no precipitation and BS3-4 wind speed at the start of the survey. The surveyors started the transect by joining the survey route at The Drift, and then walked south-east. The transect route undertaken by the surveyors is outlined in Figure 6 below.

Figure 6. Survey route of Transect 2 16/09/2020



1.5. Audio Recording Analysis

All sound recordings were reviewed to confirm the full range of bat species encountered and to refine the speculation of bat activity exhibited. All Anabat SD1, Anabat Express, SM2 and SM2+ recordings were analysed using AnaloookW software. Audio analysis of frequency division and time expansion data was achieved by comparing sound characteristics and sonogram shapes and measurements (peak call frequency, call frequency range, and mode pulse interval) to reference measurements and/or recordings provided by Russ et al. (2012), Parsons and Jones (2000), the Bat Conservation Trust (2008), Sowler (2010), and Wild Frontier Ecology's in-house call reference library. Due to the high number of registrations collected on some of the detectors, Analoook filters that automatically identify calls were used to analyse batches of registrations in order to save time and labour.

2. Results

2.1. Crossing point activity surveys

2.1.1. First bat activity survey 30th July 2020

On the first activity survey, A. Lowe observed the most bat activity and saw a maximum count of 19 bats. The majority of bats were commuting across the A47 at/above road level, with the first bat (common pipistrelle *Pipistrellus pipistrellus*) seen commuting across the road at 21:18. The last commuting bats were seen at 21:45 and were a combination of brown long eared bats *Plecotus auritus* (BLE) and soprano pipistrelles *Pipistrellus pygmaeus*. There were occasional passes from Daubenton's bats *Myotis daubentonii* and another *Myotis* species (not classifiable to species level). The majority of bats were flying 3-5m above the A47, flying between two large trees either side of the bridge. The results are summarised in Figure 7 and Table 1, below. K. Salmon and W. Riddett, who were positioned below the bridge, had far less activity and recorded no bat emergences from the bridge. Single soprano pipistrelles and one noctule *Nyctalus noctula* entered the underpass and foraged on five occasions. The results are summarised in Figure 8 and Table 2 below.

Table 1. Summary of bat activity recorded by A. Lowe above the bridge, looking over the A47

| Time | Species | Number of bats | Activity | Figure Ref |
|-------|---------------------|----------------|--|------------|
| 21:18 | Common pipistrelle | 1 | Commuting across the A47 from north to south | 1 |
| 21:25 | Soprano pipistrelle | 3 | Commuting across the A47 from south to north | 2 |
| 21:27 | Common pipistrelle | 1 | Commuting across the A47 from north to south | 1 |
| 21:29 | Common pipistrelle | 1 | Commuting across the A47 from north to south east | 3 |
| 21:35 | Soprano pipistrelle | 3 | Commuting across the A47 from north to south | 1 |
| 21:35 | Daubenton's bat | 1 | Commuting across the A47 from north to south | 1 |
| 21:37 | <i>Myotis</i> | 1 | Commuting from north east and flew south west down the middle of A47 | 4 |
| 21:40 | BLE | 1 | Commuting across the A47 from south to north | 2 |
| 21:40 | Soprano pipistrelle | 4 | Commuting across the A47 from south to north | 2 |
| 21:45 | BLE | 2 | Commuting across the A47 from north to south | 1 |
| 21:45 | Soprano pipistrelle | 1 | Commuting across the A47 from north to south | 1 |

Figure 7. Survey results and main flight paths of commuting and foraging bats recorded by A. Lowe

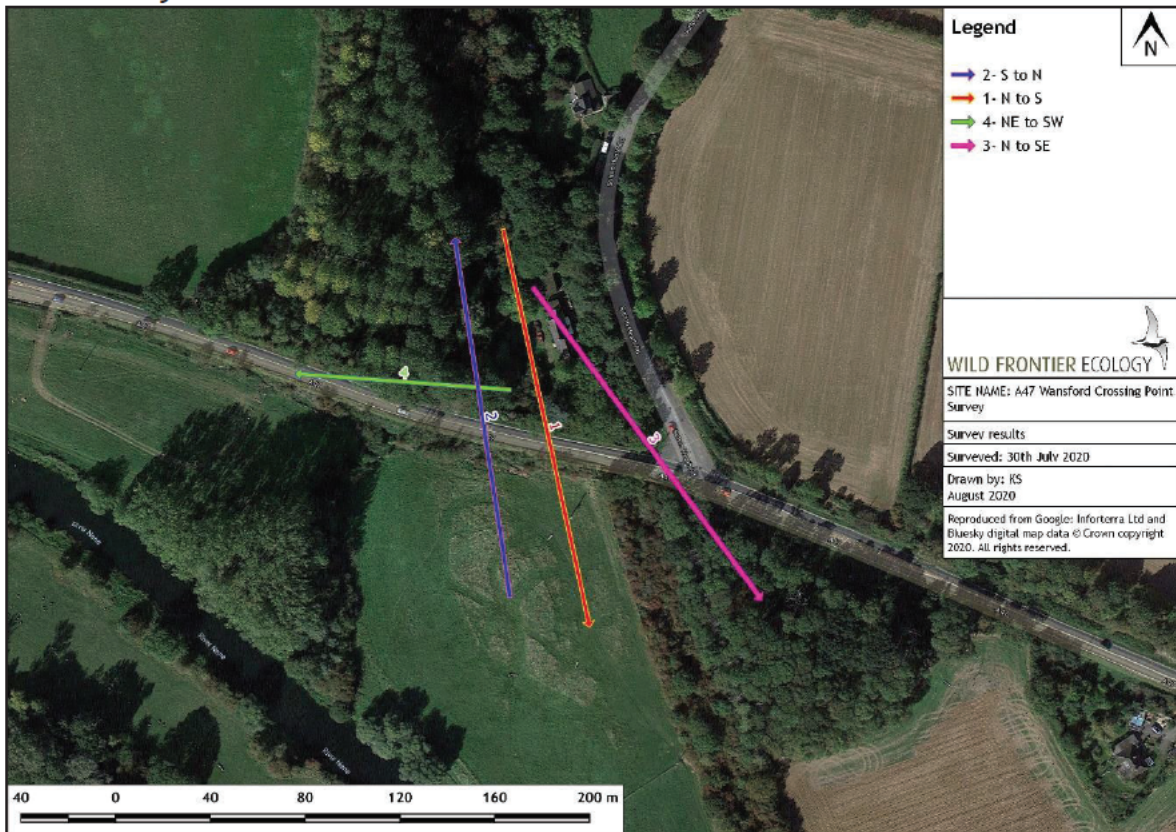
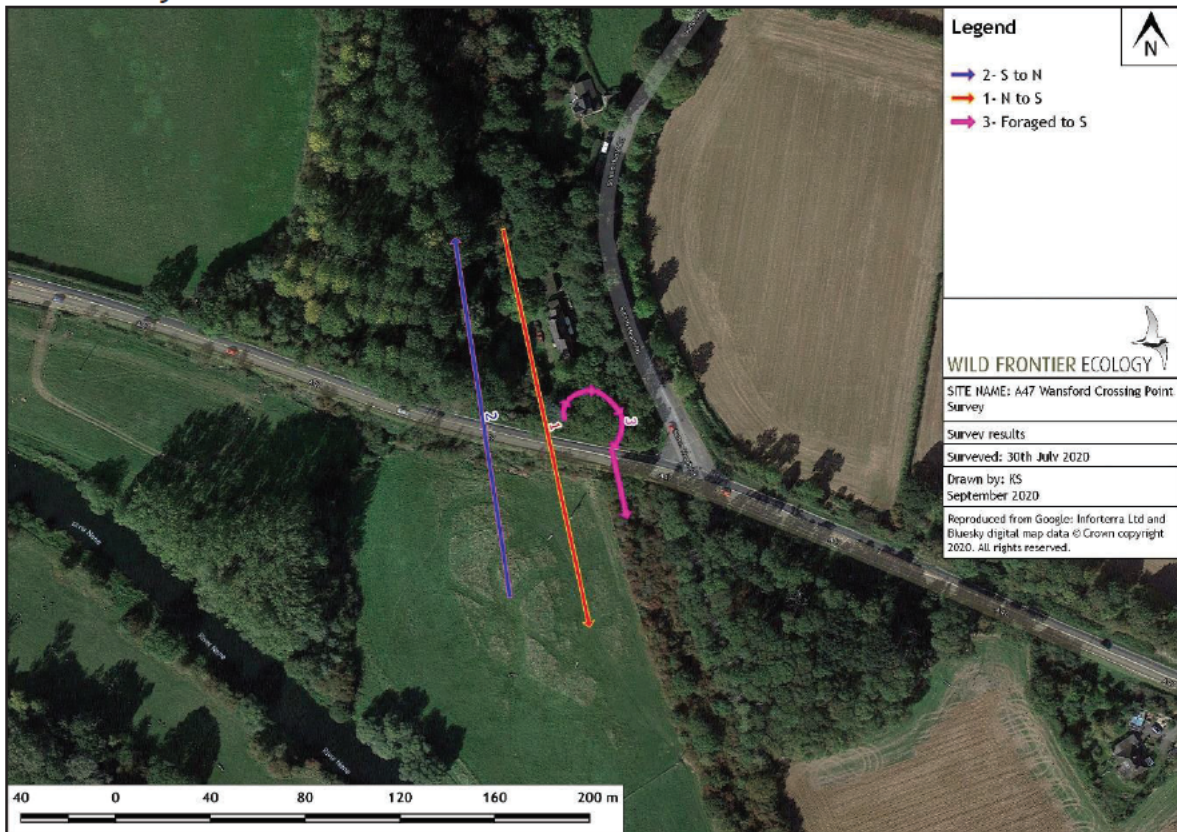


Table 2. Summary of bats recorded under the bridge by K. Salmon and W. Riddett

| Time | Species | Number of bats | Activity | Figure Ref |
|-------|---------------------|----------------|--|------------|
| 21:02 | Soprano pipistrelle | 1 | Came from north and foraged underneath bridge for 2 minutes before flying off south | 1 |
| 21:07 | Soprano pipistrelle | 1 | Possibly same bat- came from south and foraged underneath bridge for 2 minutes before flying off south | 2 |
| 21:32 | Soprano pipistrelle | 1 | Came from north and foraged underneath bridge for 1 minute before flying off south | 1 |
| 21:40 | Soprano pipistrelle | 1 | Flew underneath bridge flying north-south | 1 |
| 22:01 | Noctule | 1 | Briefly foraged underneath bridge | 3 |

Figure 8. Survey results and main flight paths of commuting and foraging bats recorded by K. Salmon and W. Riddett.



2.1.2. Second bat activity survey 27/08/2020

K. Salmon, who was monitoring above the bridge, looking over the A47, observed five bat passes over the bridge. These were a mixture of noctule, common pipistrelle, soprano pipistrelle and BLE commuting over the A47. Most bats recorded took a similar flight path, where they commuted over the A47 (at around 3-5m) using the two large trees. Species such as noctules took a higher flight path over the road at approximately 8m. Underneath the bridge, A. Lowe and H. Farnell noted common and soprano pipistrelles foraging. These were likely low numbers of the same bats, which were continuously using the open space underneath the bridge to forage.

Table 3. Summary of bat activity recorded by K. Salmon above the bridge, looking over the A47

| Time | Species | Number of bats | Activity | Figure Ref |
|-------|---------------------|----------------|--|------------|
| 20:22 | Noctule | 1 | Commuting across A47 from south east to north west | 1 |
| 20:27 | Common pipistrelle | 1 | Commuting across A47 from south to north | 2 |
| 20:44 | Soprano pipistrelle | 1 | Commuting across the A47 from north to south | 3 |

| | | | | |
|-------|----------------------|---|--|---|
| 20:46 | Soprano pipistrelle | 1 | Commuting across A47 from south east to north west | 1 |
| 21:04 | Brown long-eared bat | 1 | Commuting/ foraging across A47 from south to north | 2 |

Figure 9. Survey results and main flight paths of commuting and foraging bats recorded by K. Salmon

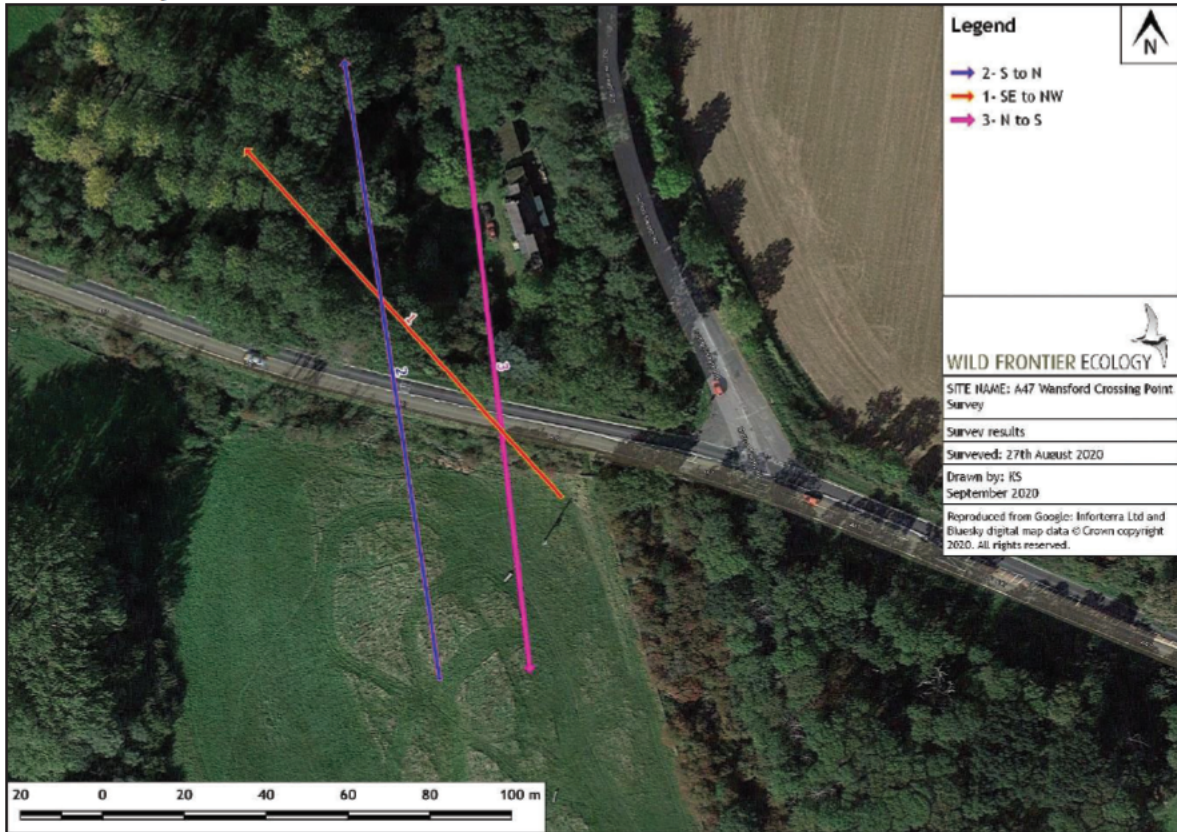
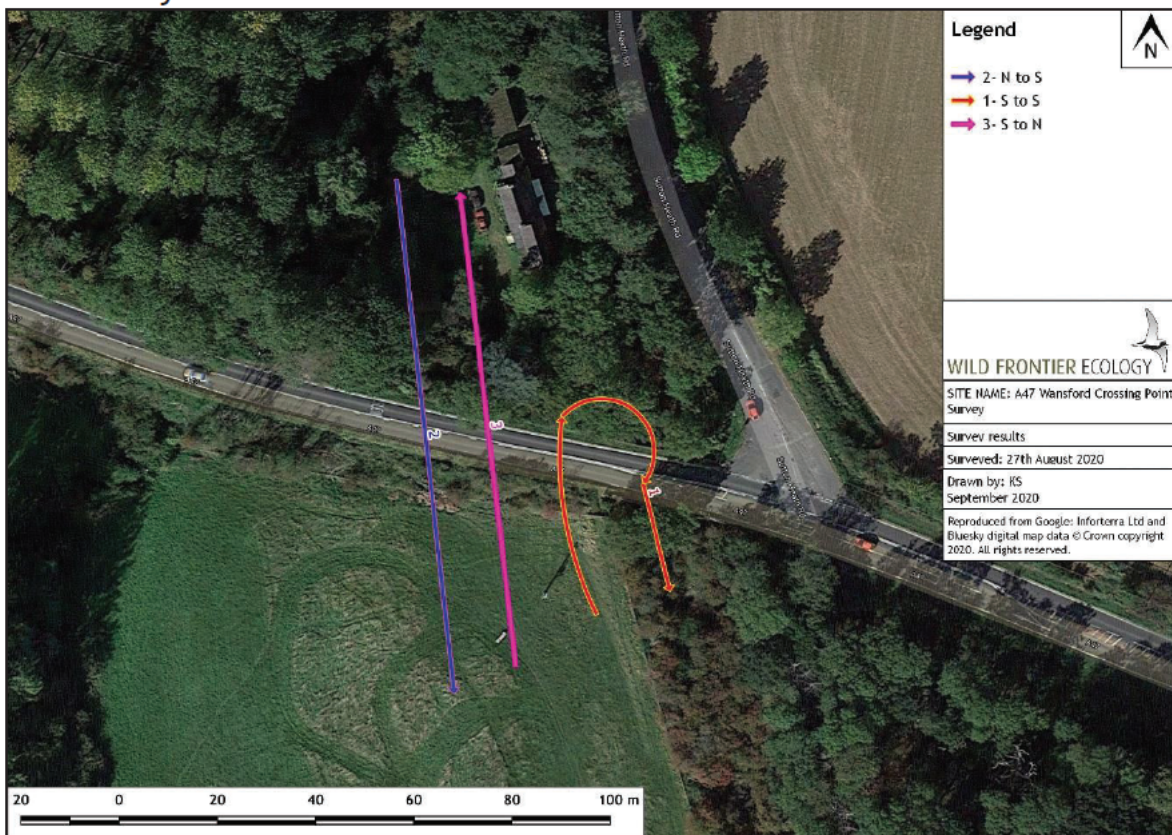


Table 4. Bat activity recorded underneath the bridge by A. Lowe and H. Farnell

| Time | Species | Number of bats | Activity | Figure Ref |
|-------|---------------------|----------------|---|------------|
| 20:05 | Soprano pipistrelle | 1 | Bat entered underpass from the south and foraged for eight minutes before flying south | 1 |
| 20:39 | Common pipistrelle | 1 | Bat entered underpass from the south and foraged for 12 minutes before flying south | 1 |
| 21:01 | Common pipistrelle | 1 | Commuting under bridge from north to south | 2 |
| 21:04 | Common pipistrelle | 1 | Bat enters from south and foraged under bridge for three minutes before flying north | 3 |
| 21:10 | Common pipistrelle | 1 | Bat (possibly same bat as above) enters from the north and forages for 10 minutes before flying south | 2 |

Figure 10. Survey results and main flight paths of commuting and foraging bats recorded by A. Lowe and H. Farnell



2.2. Transect surveys

2.2.1. First Survey of Transect 1 on 25/06/2020

A total of five species were recorded across the first T1 transect survey of 2020. These species were common pipistrelle, soprano pipistrelle, Nathusius’s pipistrelle *Pipistrellus nathusii*, Daubenton’s bat and noctule. The majority of commuting and foraging behaviour recorded was from common and soprano pipistrelles. The results are displayed in Figure 11 and Table 5 below.

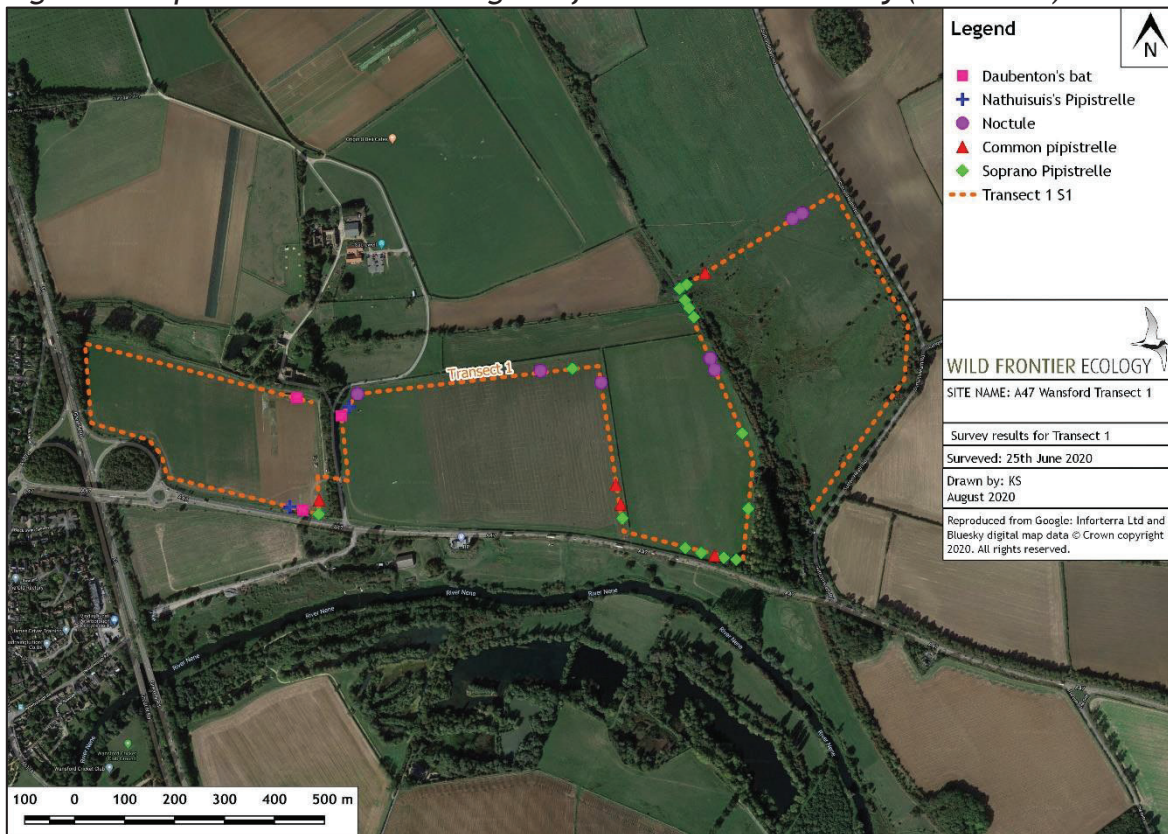
Table 5. Species recorded during the first Transect 1 survey (25/06/20)

| Time | Species | Activity |
|-------|---------------------|---|
| 22:01 | Noctule | 2 bats flew north east to south west |
| 22:12 | Common pipistrelle | 1 bat flew south to north along hedgerow |
| 22:14 | Soprano pipistrelle | 1 bat flew south to north along hedgerow |
| 22:15 | Soprano pipistrelle | 2 bats flew south to north along hedgerow |
| 22:18 | Soprano pipistrelle | 2 bats flew south to north along hedgerow |
| 22:25 | Noctule | 1 bat commuting north to south |
| 22:28 | Noctule | 1 bat commuting north to south |

| | | |
|-------|-------------------------|---|
| 22:31 | Soprano pipistrelle | 1 bat commuting north to south |
| 22:36 | Soprano pipistrelle | 1 bat foraging along tree line |
| 22:40 | Soprano pipistrelle | 1 bat commuting north to south |
| 22:41 | Common pipistrelle | 1 bat foraging |
| 22:42 | Soprano pipistrelles | 2 bats foraging along roadside hedgerow |
| 22:46 | Noctule | 1 bat commuting north to south |
| 22:50 | Soprano pipistrelle | 1 bat foraging alongside roadside hedgerow |
| 22:52 | Soprano pipistrelle | 1 bat commuting north to south |
| 22:53 | Soprano pipistrelle | 1 bat foraging north to south down hedgerow |
| 22:58 | Soprano pipistrelle | 1 bat foraging along hedgerow |
| 23:05 | Noctule | 1 bat commuting north to south |
| 23:11 | Soprano pipistrelle | 1 bat foraging along hedgerow |
| 23:21 | Noctule | 1 bat commuting south to north |
| 23:22 | Daubenton's bats | 1 bat commuting from north to south |
| 23:23 | Nathusius's pipistrelle | 1 bat commuting from north to south |
| 23:27 | Common pipistrelle | 1 bat foraging along the tree line |
| 23:27 | Soprano pipistrelle | 1 bat foraging along the tree line |
| 23:32 | Daubenton's bat | 1 bat commuting from north to south |
| 23:32 | Nathusius's pipistrelle | 1 bat commuting from north to south |
| 00:03 | Daubenton's bat | 1 bat commuting from north to south |



Figure 11. Species recorded during the first Transect 1 survey (25/06/20)



2.2.2. Second Survey of Transect 1 on 24/08/2020

A total of five bat species were recorded across Transect 1. There were many foraging common and soprano pipistrelles and occasional passes of noctules, brown long-eared bats and *Myotis* species. The results are displayed in Figure 12 and Table 6 below.



Figure 12. Species recorded during the second survey of Transect 1

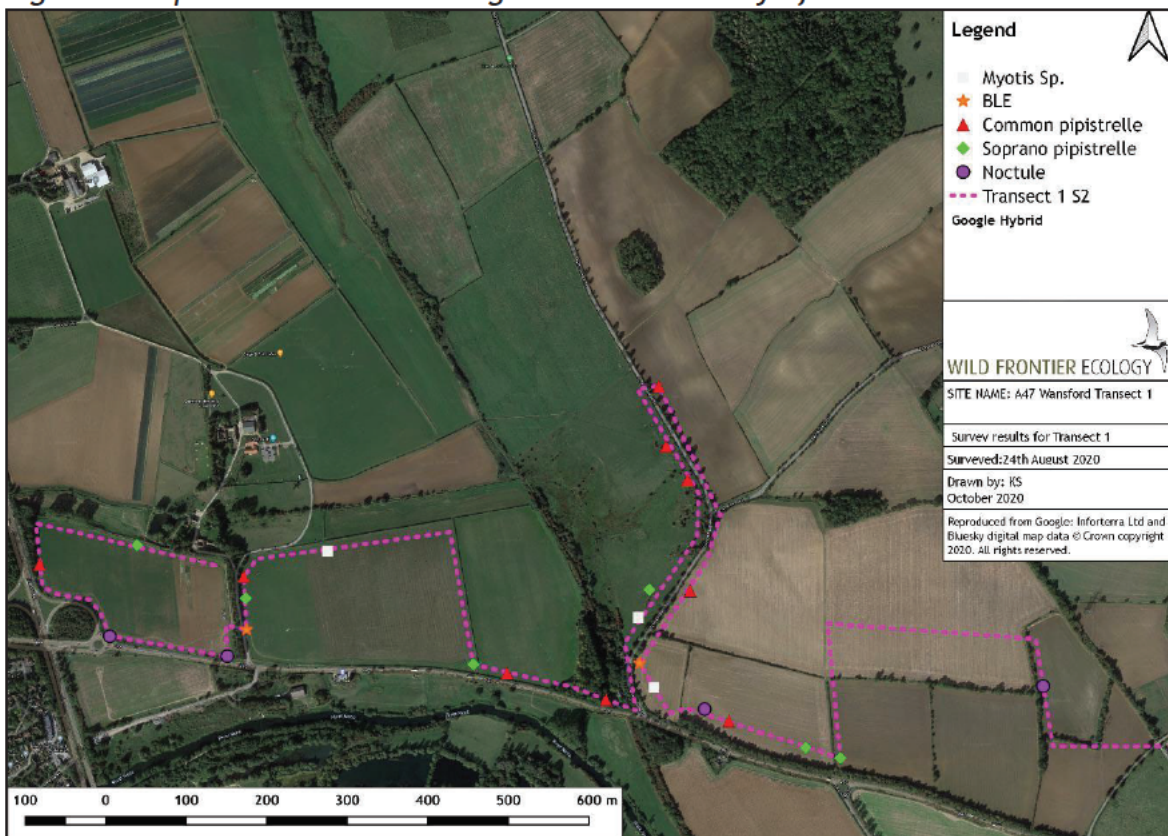


Table 6. Species recorded during the second survey of Transect 1

| Time | Species | Activity |
|-------|----------------------|--|
| 20:25 | Noctule | 1 bat flew north to south |
| 20:39 | Soprano pipistrelle | 1 bat foraging along hedgerow |
| 20:41 | Soprano pipistrelle | 2 bats foraging along hedgerow |
| 20:47 | Common pipistrelle | 1 bat foraging along hedgerow |
| 20:52 | Noctule | 1 bat commuting north to south |
| 21:04 | Myotis | 1 single pass (not seen) |
| 21:05 | BLE | 1 single pass (not seen) |
| 21:11 | Common pipistrelle | 1 bat foraging above trees |
| 21:21 | Common pipistrelle | 1 bat foraging along hedgerow |
| 21:27 | Common pipistrelle | 1 single pass (not seen) |
| 21:30 | Common pipistrelle | 1 bat commuting south to north |
| 21:32 | Soprano pipistrelles | 1 bat foraging along roadside hedgerow |
| 21:43 | Myotis | 1 bat commuting north to south |
| 21:36 | Common pipistrelle | 1 bat foraging along roadside hedgerow |

| | | |
|-------|---------------------|--|
| 21:41 | Common pipistrelle | 1 bat foraging along roadside hedgerow |
| 21:43 | Soprano pipistrelle | 1 bat commuting north to south |
| 21:54 | <i>Myotis</i> | 1 single pass (not seen) |
| 21:58 | Common pipistrelle | 1 single pass (not seen) |
| 21:58 | BLE | 1 bat foraging along hedgerow |
| 21:58 | Soprano pipistrelle | 1 single pass (not seen) |
| 22:01 | Noctule | 1 single pass (not seen) |
| 22:05 | Noctule | 1 bat commuting from north to south |
| 22:09 | Common pipistrelle | 1 single pass (not seen) |
| 22:13 | Soprano pipistrelle | 1 bat commuting along hedgerow |

2.2.3. First Survey of Transect 2 on 26/06/2020

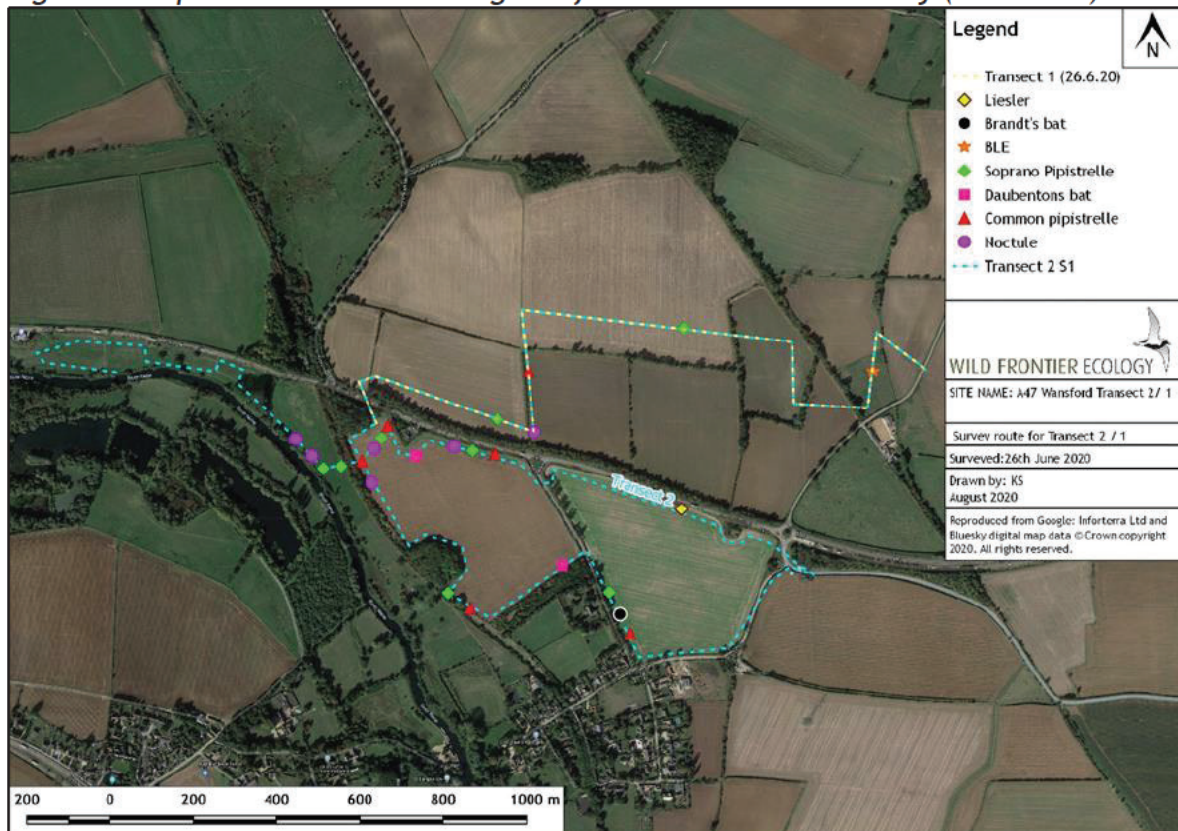
A total of seven bat species were recorded across Transect 2. There were many foraging common and soprano pipistrelles and occasional passes from noctule, Daubenton's bat, Leisler's bat *Nyctalus leisleri*, brown long-eared bat and Brandt's bat *Myotis brandti*. At 23:34, the surveyors crossed the A47 to continue the second half of Transect 1. The second half of Transect 1 recorded four registrations, each one relating to a different species (i.e. one of common pipistrelle, one of soprano pipistrelle, one of noctule and one of brown long-eared bat). The survey results are displayed in Figure 13 and Table 7 below.

Table 7. Species recorded during the first Transect 2 survey (26/06/20)

| Time | Species | Activity |
|-------|---------------------|---|
| 21:51 | Noctule | 1 bat commuting high over field near river |
| 21:54 | Noctule | 1 bat commuting high over field near river |
| 21:55 | Soprano pipistrelle | 1 bat commuting along footpath east to west |
| 22:01 | Soprano pipistrelle | 1 bat foraging along railway |
| 22:01 | Common pipistrelle | 1 bat foraging along railway |
| 22:03 | Common pipistrelle | 1 bat foraging along field edge |
| 22:05 | Noctule | 1 single pass (not seen) |
| 22:08 | Soprano pipistrelle | 1 bat foraging along field edge |
| 22:11 | Common pipistrelle | 1 Bat flew from field- north west to south east |
| 22:15 | Daubenton's bat | 1 single pass (not seen) |
| 22:18 | Soprano pipistrelle | 1 bat foraging along hedge |
| 22:18 | Brandt's bat | 1 single pass (not seen) |
| 22:19 | Common pipistrelle | 1 bat foraging |

| | | |
|-----------------|--|---|
| 22:44 | Leisler | 1 bat commuting |
| 22:48- 23:07 | Common Pipistrelle, Soprano pipistrelle, Noctule | 3 bats foraging |
| 23:08 | Daubenton's bat | 1 bat commuting |
| 23:14- 23:34 | Common Pipistrelle, Soprano pipistrelle, Noctule | Frequent passes from all species over several minutes |
| Remainder of T1 | | |
| 23:54 | Soprano pipistrelle | 1 bat foraging along hedgerow |
| 23:56 | Noctule | 1 bat commuting |
| 23:58- 00:11 | Common pipistrelle | 1 bat frequent foraging until end of survey |
| 00:29 | Brown long eared bat | 1 bat commuting |

Figure 13. Species recorded during the first Transect 2/1 survey (25/06/20)



2.2.4. Second Survey of Transect 2 on 16/09/2020

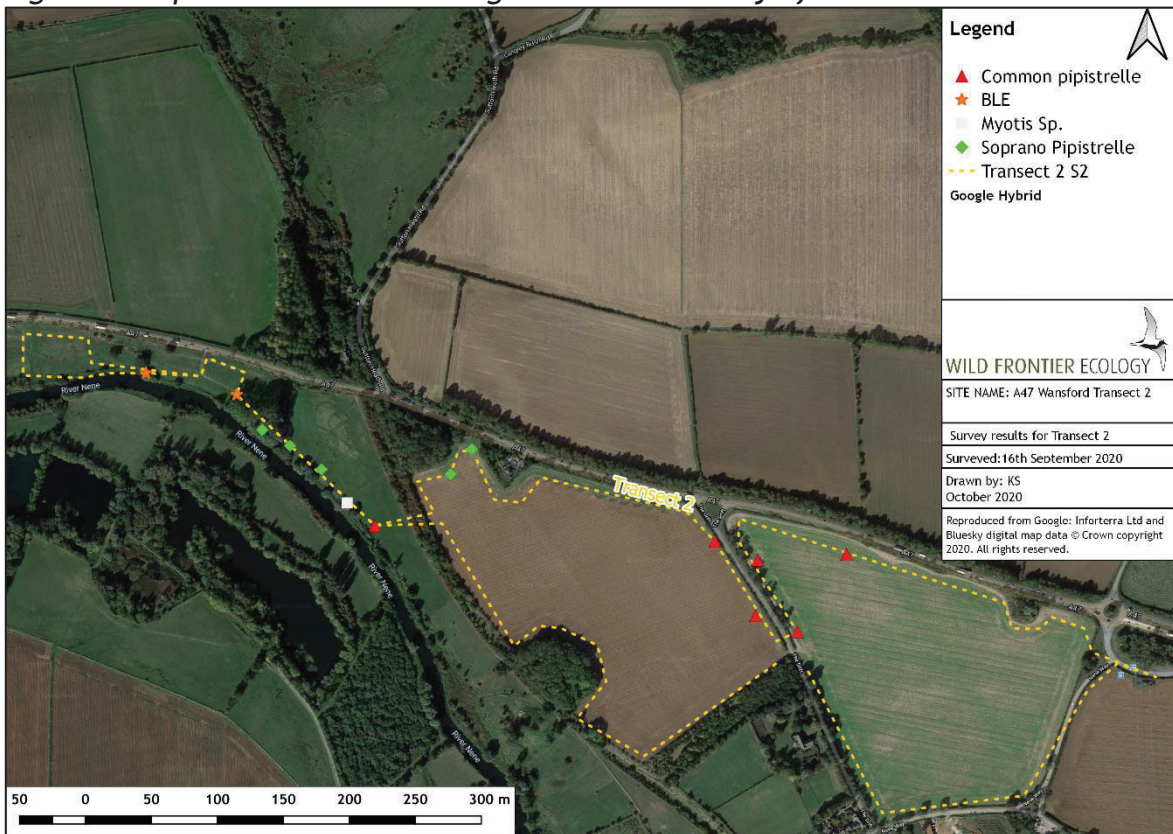
A total of four bat species were recorded across Transect 2. There were many foraging common and soprano pipistrelles and occasional passes of brown long-eared bats and *Myotis* species bats. The *Myotis* bats are likely to have been Daubenton's bats based on the proximity of the registration to the river. The results are displayed in Figure 14 and Table 8 below.

Table 8. Species recorded during the second survey of Transect 2

| Time | Species | Activity |
|-------|----------------------|---|
| 19:44 | Common pipistrelle | 1 single pass not seen |
| 19:47 | Common pipistrelle | 1 bat foraging along tree line bordering road |
| 19:48 | Common pipistrelle | 1 bat foraging along tree line bordering road |
| 19:51 | Common pipistrelle | 1 bat foraging along tree line bordering road |
| 19:54 | Common pipistrelle | 1 bat foraging along tree line bordering road |
| 22:05 | Soprano pipistrelle | 1 single pass (not seen) |
| 22:06 | Soprano pipistrelle | 1 single pass (not seen) |
| 20:15 | Common pipistrelle | 1 single pass (not seen) |
| 20:25 | Soprano pipistrelle | Multiple passes (not seen), likely foraging along river |
| 20:26 | Soprano pipistrelle | Multiple passes (not seen), likely foraging along river |
| 20:44 | Brown long eared bat | 1 single pass (not seen) |
| 20:48 | Brown long eared bat | Multiple passes (not seen), likely foraging along river |
| 20:49 | Soprano pipistrelle | Multiple passes (not seen), likely foraging along river |
| 20:52 | <i>Myotis</i> Sp. | Multiple passes (not seen), likely foraging along river |



Figure 14. Species recorded during the second survey of Transect 2



3. Preliminary Conclusion

3.1. Crossing point surveys

For both crossing point activity surveys, surveyors positioned looking over the bridge at road level (at the edge of the A47) observed more commuting behaviour than surveyors monitoring underneath the bridge. Multiple bat species were seen commuting over the A47 in both directions. Surveyors beneath the bridge noted foraging behaviour of mostly pipistrelles. These bats were observed flying along the line of the disused railway line, to or from the north or south of the bridge.

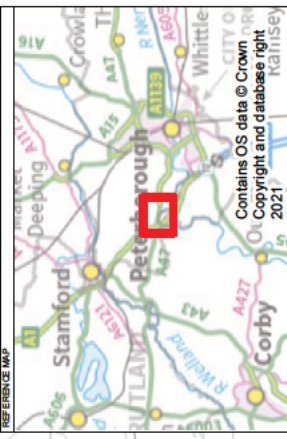
3.2. Transect surveys

Transect 1 recorded a higher number of bats (in terms of total registrations) than Transect 2. Both Transect 1 surveys recorded five different species of bats, whereas Transect 2 recorded seven species on the first survey and four species on the second survey. Some rarer species such as Nathusius' pipistrelle, Leisler's and *Myotis* species were recorded across both transects. Particular areas of Transect 1 had regular activity, especially along hedgerows. Transect 2 also had most foraging activity along hedgerows and along the river.

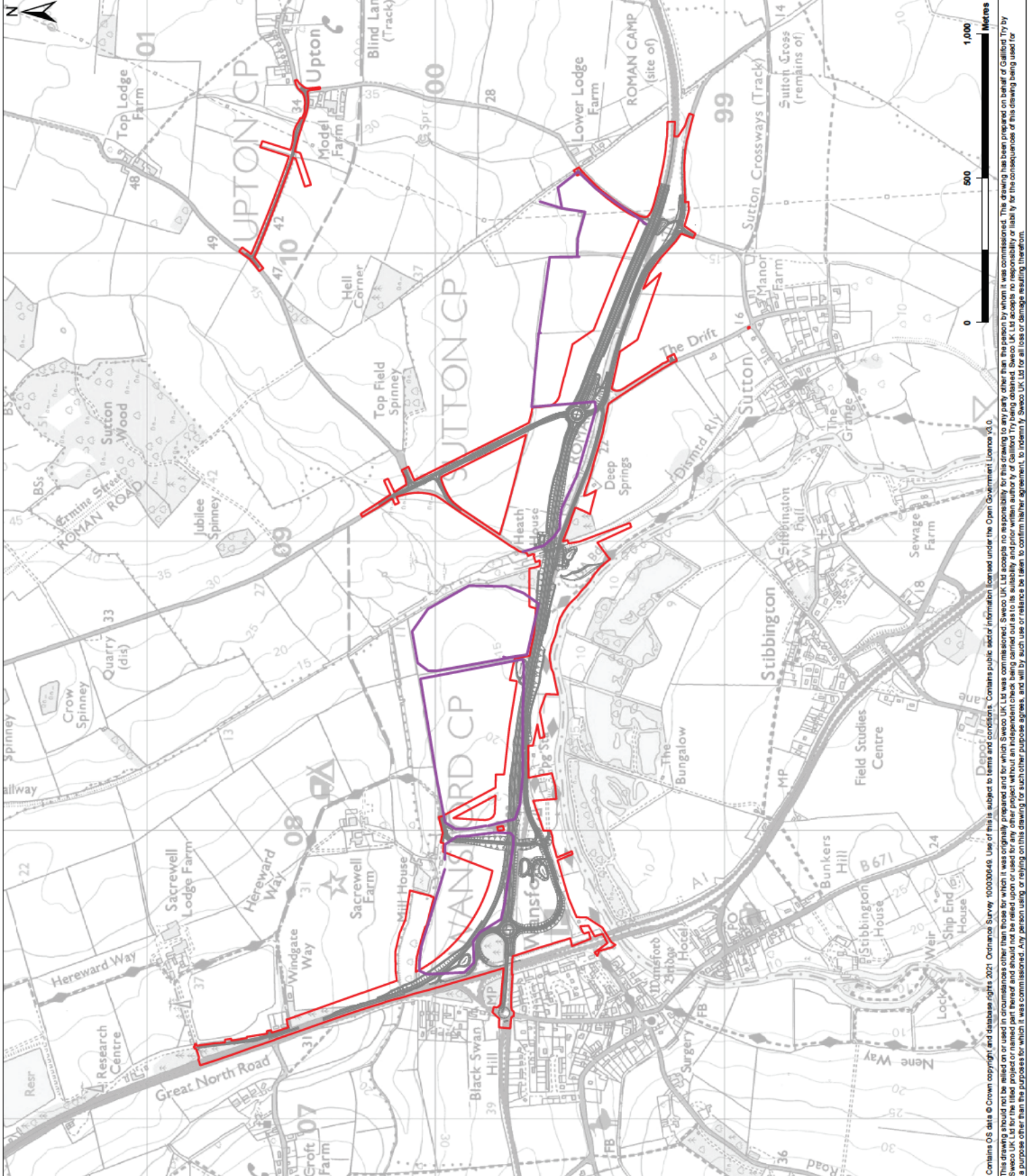
Annex B. Transect route locations

LEGEND

- Proposed Scheme Boundary
- Proposed Scheme Design
- Transect 1



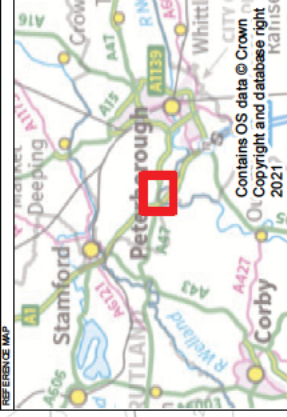
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| | | | | | |
| DRAWING TITLE | | | PROJECT TITLE | | |
| ANNEX B: TRANSECT ROUTE LOCATIONS - ROUTE 1 | | | A47 WANSFORD TO SUTTON | | |
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| HE551494-GTY-EGN-000-DR-GI-30088 | | | PCF STAGE 3 | | |
| SHEET NUMBER | | | DRAWING TITLE | | |
| 01 | | | ANNEX B: TRANSECT ROUTE LOCATIONS - ROUTE 1 | | |
| SHEET SIZE | | | FOR INFORMATION | | |
| A3 | | | SCALE | | |
| 1:12,500 | | | STAFF US | | |
| S2 | | | | | |



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LEGEND

- Proposed Scheme Boundary
- Proposed Scheme Design
- Transect 2



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| | | | | | | |

DEVELOPER

CONTRACTOR

CLIENT

SWECO

GallifordTry

PROJECT TITLE

A47 WANSFORD TO SUTTON

PROJECT STAGE

PCF STAGE 3

DRAWING TITLE

APPENDIX B: TRANSECT ROUTE LOCATIONS-ROUTE 2

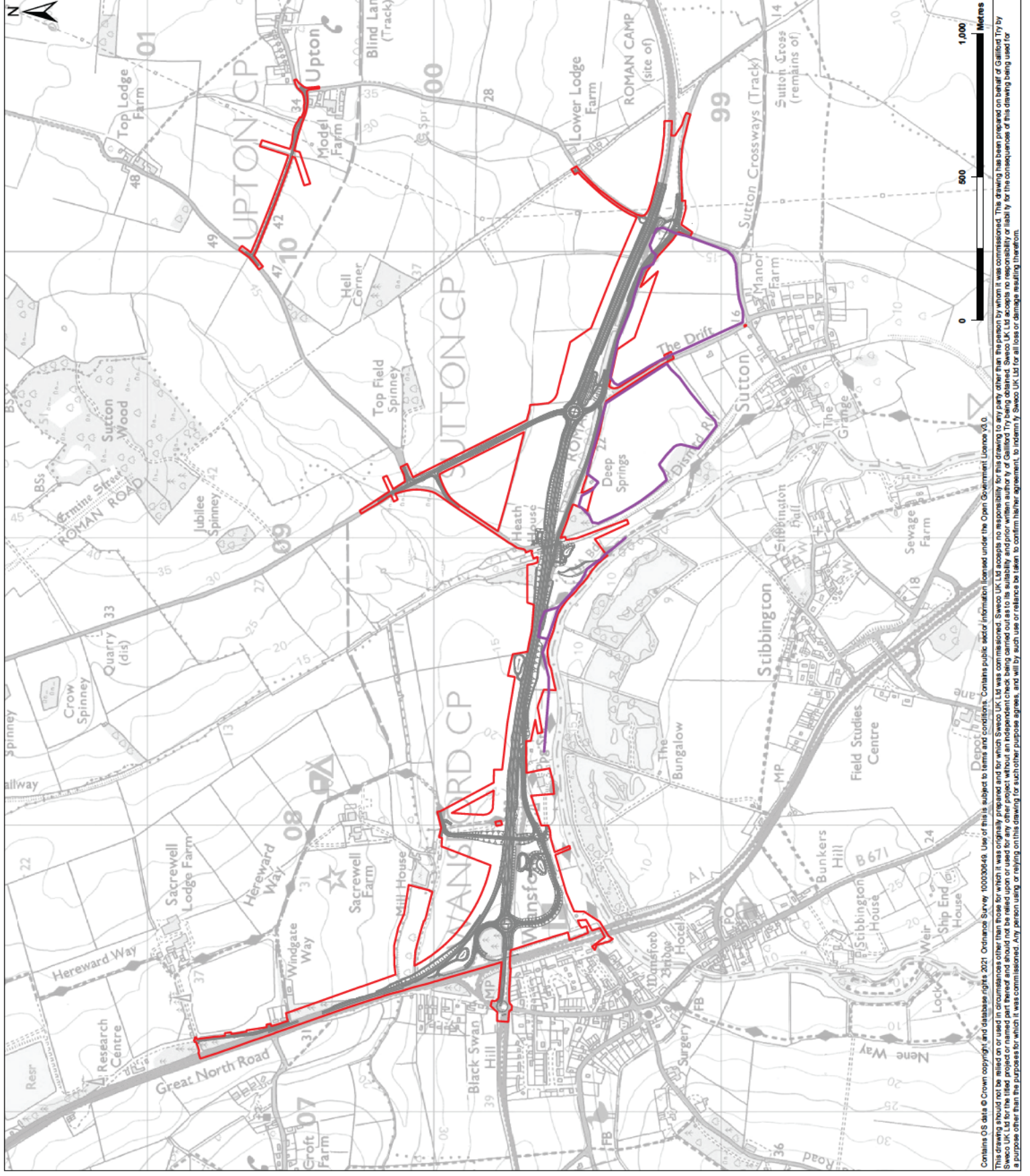
APPENDIX B: TRANSECT ROUTE LOCATIONS-ROUTE 2

TR010039/APP/6.2

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DRAWING NUMBER

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Annex C. Transect survey results

LEGEND

- Proposed Scheme Boundary
- Proposed Scheme Design
- Bat Survey**
- ▲ Big bat sp.
- ▲ Common pipistrelle
- ▲ Noctule
- ▲ Soprano pipistrelle

REFERENCE MAP

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DESIGNER

CONTRACTOR

CLIENT

PROJECT TITLE

PROJECT STAGE

DRAWING TITLE

SCALE

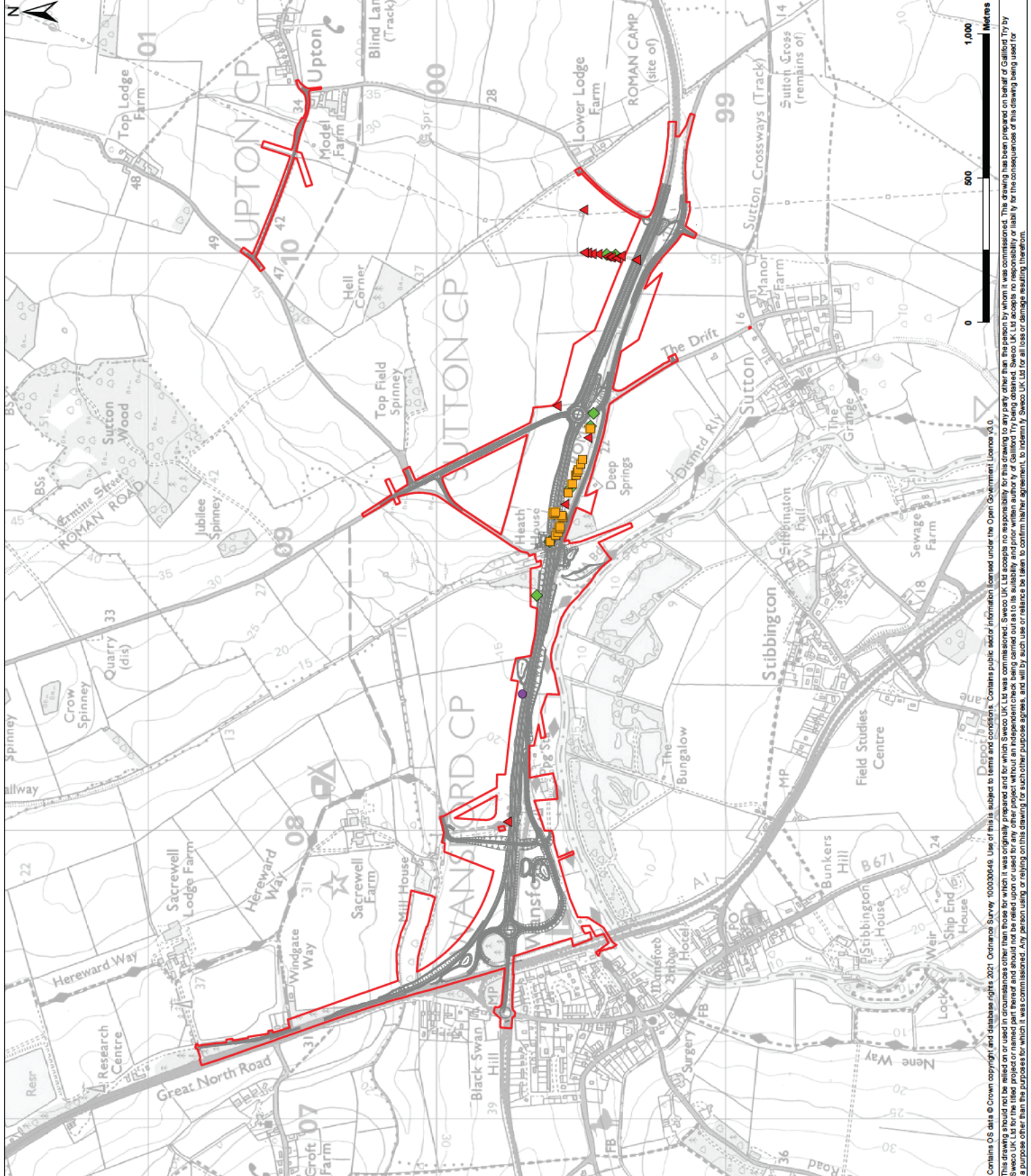
FOR INFORMATION

SHEET SIZE

SHEET NO

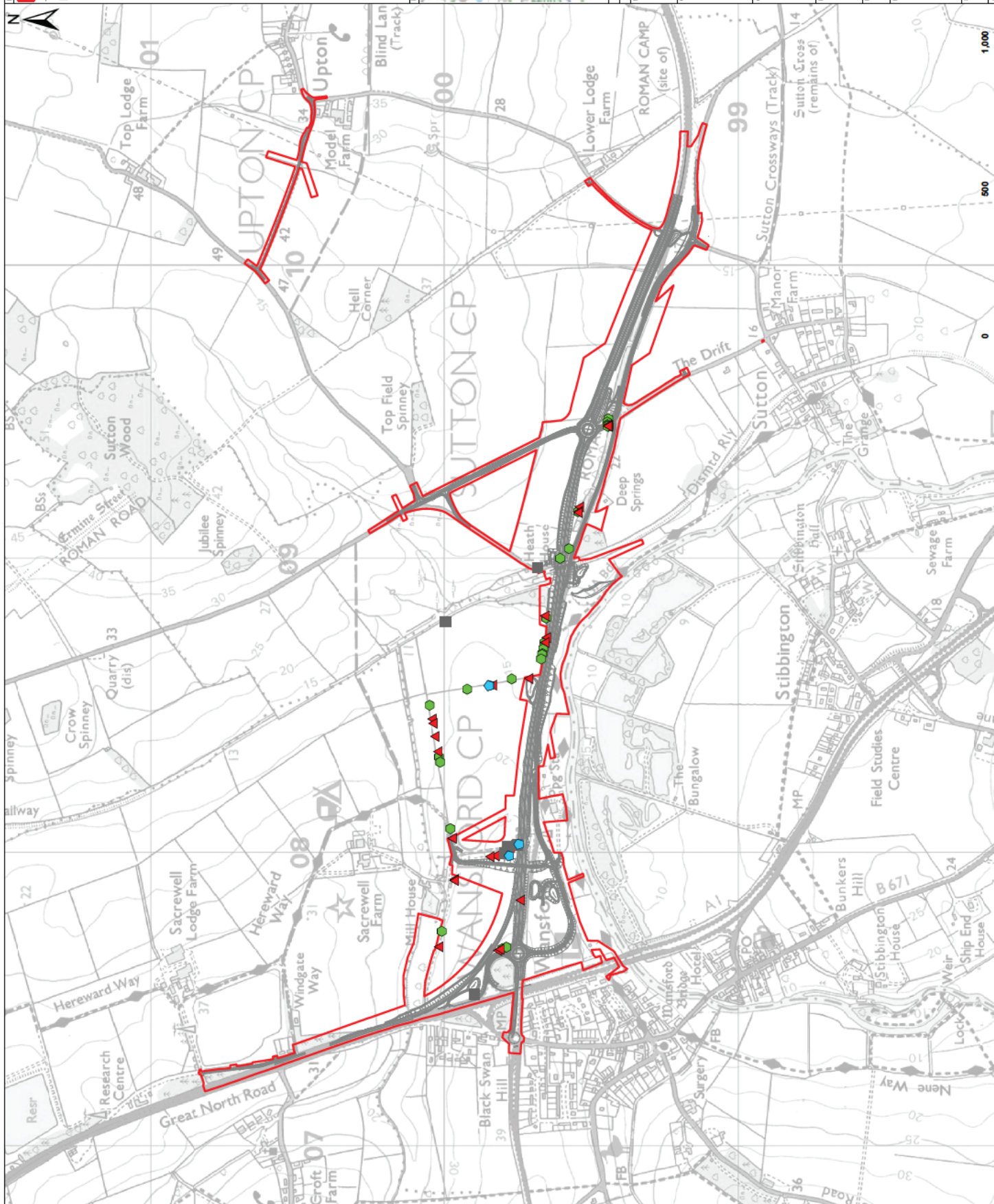
SCALE

DATE



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LEGEND

- Proposed Scheme Boundary
- Proposed Scheme Design
- Bat Survey**
- Common pipistrelle
- Myotis sp.
- Pipistrelle sp.
- Soprano pipistrelle

REFERENCE MAP

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CONTRACTOR

CLIENT

highways england

| PROJECT TITLE | |
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| A47 WANSFORD TO SUTTON | |
| PROJECT STAGE | |
| PCF STAGE 3 | |
| DRAWING TITLE | |
| ANNEX C: TRANSECT SURVEY RESULTS - TRANSECT 1 (14 SEPTEMBER 2020) | |
| TR010039/APP6.2 | |
| SHEET INFO | |
| FOR INFORMATION | |
| SHEET NO | SCALE |
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LEGEND

- Proposed Scheme Boundary
- Proposed Scheme Design
- Bat Survey**
- Big bat sp.
- Common pipistrelle
- Myotis sp.
- Noctule
- Pipistrelle sp.
- Soprano pipistrelle
- Serotine

REFERENCE MAP

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DEVELOPER

CONTRACTOR

CLIENT

PROJECT TITLE

PROJECT STAGE

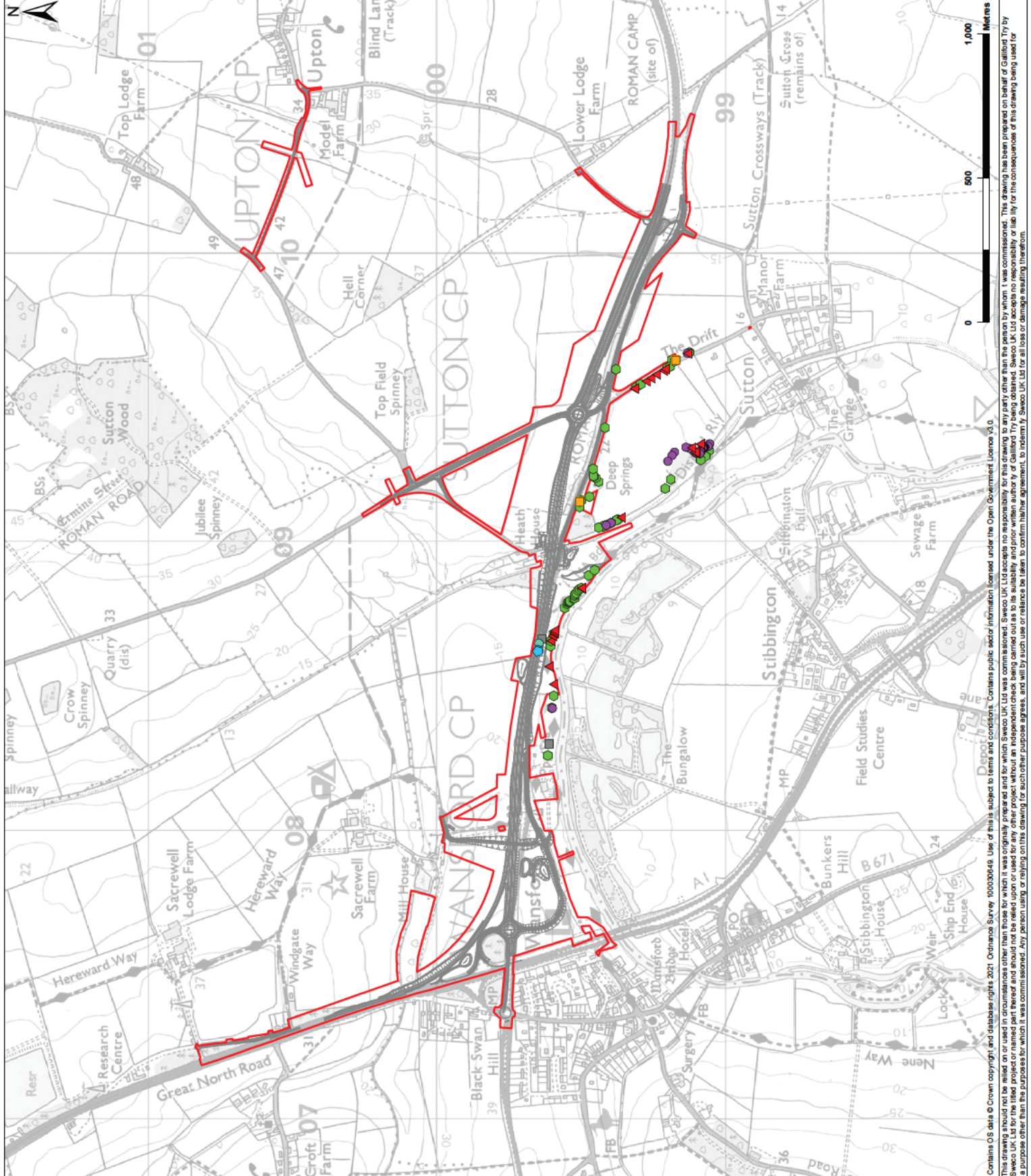
DRAWING TITLE

DATE/REV

SCALE

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TOTAL SHEETS



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Annex D. Plant species which could be used to enhance the site for foraging bats

Table A: Trees, shrubs and climbers

| Common name | Scientific name |
|--------------|------------------------------|
| Bramble | <i>Rubus fruticosus</i> |
| Common alder | <i>Alnus glutinosa</i> |
| Dog rose | <i>Rosa canina</i> |
| Elder | <i>Sambucus sp.</i> |
| English oak | <i>Quercus robar</i> |
| Guelder rose | <i>Viburnum opulus</i> |
| Hawthorn | <i>Crataegus sp.</i> |
| Hazel | <i>Corylus sp.</i> |
| Honeysuckle | <i>Lonicera periclymenum</i> |
| Hornbeam | <i>Carpinus sp.</i> |
| Ivy | <i>Hedera sp.</i> |
| Jasmine | <i>Jasminum sp.</i> |
| Rowan | <i>Sorbus sp.</i> |
| Silver birch | <i>Betula pendula</i> |

Table B: Flowers for borders

| Common name | Scientific name |
|------------------|----------------------------------|
| Corncockle | <i>Agrostemma githago</i> |
| Cornflower | <i>Centaurea cyanus</i> |
| Corn marigold | <i>Glebionis segetum</i> |
| Corn poppy | <i>Papaver rhoeas</i> |
| English Bluebell | <i>Hyacinthoides non-scripta</i> |
| Field poppies | <i>Papaver rhoeas</i> |
| Knapweed | <i>Centaurea sp.</i> |
| Mallow | <i>Malva sp.</i> |
| Ox-eye daisy | <i>Leucanthemum vulgare</i> |
| Primrose | <i>Primula vulgaris</i> |
| Red campion | <i>Silene dioica</i> |
| Scabious | <i>Scabiosa sp.</i> |
| St John's wort | <i>Hypericum perforatum</i> |