highways england

A47 Wansford to Sutton Dualling

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6.3 Environmental Statement Appendices
Appendix 8.11 – Bat Hibernation Report

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Planning Act 2008

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Infrastructure Planning

Planning Act 2008

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ENVIRONMENTAL STATEMENT APPENDICES
Appendix 8.11 - Bat Hibernation Report

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1. Proposed Scheme introduction

1.1.1. 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'.

1.1.2. The Proposed Scheme is designed to provide a new 2.6km dual carriageway which largely follows the existing A47 at the Wansford end, crossing to the north and running parallel to the existing A47 after Sutton Heath Road. There would also be a dedicated free-flow link road from the A1 southbound to the A47 eastbound to alleviate congestion at the Wansford junctions.

1.1.3. The Proposed Scheme is located at Wansford and extends eastwards to Sutton and forms a section of Single carriageway that is part of the main arterial highway route connecting to Peterborough and Norwich to the east.

1.2. Aims and objectives

1.2.1. The purpose of the bat hibernation surveys was to support the Development Consent Order (DCO), application by informing the assessment of impacts to ecological receptors and required the following:

- to determine the presence or likely absence of bat hibernation roosts on-site;
- to provide preliminary advice on mitigation strategies against any adverse effects on the local bat population which may arise as a result of the Proposed Scheme; and
- to inform any Natural England mitigation licences that may be required.

1.2.2. This baseline report details the results of bat hibernation surveys undertaken at the site between December 2019 and February 2020. It discusses the implications for the Proposed Scheme and provides further instructions for mitigation and/or further ecological work where necessary.

2. Ecological background

2.1. Previous studies

2.1.1. Mott MacDonald Sweco Joint Venture (MS2JV) carried out bat hibernation surveys on 28, 29 and 30 of January 2019 and the methods used, results and implications of these surveys are reported separately (MS2JV, 2019).

2.1.2. All trees with recorded hibernation potential for bats within 50m of the Proposed Scheme boundary were surveyed. Trees with hibernation potential generally have cavity-based Potential Roosting Features (PRFs) such as woodpecker holes, rot holes or splits which go deep into the tree where bats can shelter inside in stable conditions. PRFs were inspected closely either by eye or by using an endoscope. If PRFs were unable to be accessed from the ground, then they were accessed either by using a ladder, or a rope and tree climbing equipment where it was safe to do so.

2.1.3. A total of 24 trees were identified as having hibernation potential during tree inspection surveys previously undertaken in 2018 (MS2JV, 2019). Trees 33, 29, WB60, WB91 and WC39 were only able to be surveyed from the ground due to unsafe climbing conditions. Tree 82 had fallen naturally. The remainder of the trees surveyed had no bats or demonstrated no signs of roosting or hibernating bats. Table 2.1-1 shows the 2019 hibernation survey results for trees in detail.

Table 2.1-1 Hibernation survey results for trees (as taken from MS2JV, 2019).

Tree no.	Feature	Feature height (m)	Notes
WA9	Cavity	3-6	No bats or signs of bats recorded.
WA13	Cavity	0-7	No bats or signs of bats recorded.
WA19	Cavity	8	No bats or signs of bats recorded.
WB91	Rot hole	6	Tree heavily affected with fungal infection. Unsafe to reach feature.
WB60	Woodpecker holes	-	Tree partially dead so unsafe to climb.
WB143	Split down middle, rot holes	-	No bats or signs of bats recorded.
WB111	Split, cavity	-	No bats or signs of bats recorded.
WB108	Cavity	-	No bats or signs of bats recorded.
WB103	Rot holes	4, 7, 11	No bats or signs of bats recorded.

Tree no.	Feature	Feature height (m)	Notes
WC39	Trunk cavity	0-10	Unsafe to climb – high potential. Hollow trunk with large cavity and several smaller cavities.
10	Rot hole facing parking area	3, 7	No bats, no signs of bats recorded.
53	Dead limb with split and cavities	12	Ideal summer roost, no winter hibernation potential.
93	Break with splits	6, 10	No bats or signs of bats recorded.
80	Cavity	3	Poor feature, shallow.
76	Dead limb with splits	3, 5	Most features poor, one has deep split but no signs of bat activity.
79	Large dead limb with cavities	10	No bats or signs of bats recorded.
82	Rot hole	-	Tree has fallen naturally.
83	Cavity at base of tree going into main trunk	1-3	No bats or signs of bat activity.
27	Large cavity near base of tree	1-2	Ideal summer roost, no hibernation potential.
29	Woodpecker holes, field side	6	Tree heavily affected with fungal infection. Unsafe to reach feature.
31	Woodpecker hole facing A47	5	No bats or signs of bats recorded.
32	Field side cavities	4, 6	No bats or signs of bats recorded.
33	Woodpecker holes	5	Tree heavily affected with fungal infection. Unsafe to reach feature.
6	Large cavity on main limb	4	Shallow cavity, no hibernation potential.

2.1.4. All structures with hibernation potential for bats within 50m of the original Proposed Scheme boundary were surveyed. The survey consisted of a close and systematic inspection of all cracks, crevices and voids for hibernating bats or signs of bats using torches and endoscopes.

2.1.5. The A1 bridge over the River Nene, Heath House and the Sacrewell Farm barn complex were all recorded as having hibernation potential for roosting bats. The A1 bridge structure was unable to be surveyed as it was unsafe to access gaps in the thermal expansion joints.

2.1.6. Heath House loft space was examined using a ladder and torch. Pipistrelle droppings were found in the roof space; however, these were old and predicted

to be from the previous summer season as the roof space is known to be used as a soprano pipistrelle *Pipistrellus pygmaeus* maternity roost.

2.1.7. Sacrewell Barns were inspected internally and externally. Structure SB4 had high potential for hibernating bats with gaps in the brickwork leading to deep internal caverns. Due to the depth and the shape of these caverns, endoscopes were not always able to explore all areas. Table 2.1-2 has details for findings for each of the Sacrewell Barns.

Table 2.1-2 Hibernation survey results for Sacrewell Barns

Barn no.	Notes
SB1	Small, open faced barn with no external or internal hibernation potential.
SB2	Small, open faced barn with no external or internal hibernation potential.
SB3	Compartmented stables. Minimal internal potential for hibernating bats. Externally, the northern wall had six gaps in the brickwork which all went back into a complex of small corridors and pockets.
SB4	Large barn used to shelter sheep. Internal inspection showed multiple holes in the north-east corner of the barn, which went deeper than surveyors were able to access when using an endoscope. Outside inspection resulted in a large number of gaps being found in the brickwork of the northern, eastern and southern walls. Using an endoscope, surveyors found droppings in two of the holes, one on the eastern wall (Figure 6.2, TN1) and one on the southern wall (Figure 6.2, TN2). Surveyors were unable to extract the droppings from the holes for genetic analysis as they were too deep into the structure. It is unknown whether droppings were from hibernation or summer roosting bats.
SB5	Some gaps in outside brickwork but no evidence of hibernating bats. No internal access.
SB6	Open facing barn. Some gaps in outside brickwork but no evidence of hibernating bats.
SB7	Open facing barn. Some gaps in outside brickwork but no evidence of hibernating bats.

2.1.8. Surveys have shown that Sacrewell Barns has the highest hibernation potential for all sites surveyed within the study area. Droppings were found in two external holes on the larger of the barns (SB4), but as the droppings were not able to be collected, the age or species of the bat is unknown. SB4 was found to be a day roost for a small number of common pipistrelles, *Pipistrellus pipistrellus* (Mott MacDonald Sweco Joint Venture, 2018), so it is possible that droppings were from the summer season. No other signs of hibernating bats were found throughout the survey.

3. Methodologies

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

3.1.2. These surveys, in conjunction with those undertaken by MS2JV in January 2019 ((see Section 2.1) MS2JV, 2019)) represent an update to those undertaken in 2017 (MS2JV, 2018). Following a delay in commissioning, surveys commenced in January which is the optimum time for bat hibernation surveys.

3.1.3. The following structures and trees were subject to survey:

- A1 bridge – subject to automated survey
- SB3 (stables in complex at Sacrewell Farm) – subject to limited internal inspection (from the open stable doors) and automated survey
- SB4 (large main barn in complex at Sacrewell Farm) – subject to internal inspection and automated survey
- SB5 (small barn attached to large main barn (SB4) in complex at Sacrewell Farm) – subject to a partial internal inspection (of the easternmost section adjoining SB4)
- B4 (Station House) – subject to automated survey
- B5 (Heath House) – subject to automated survey
- WC39 – subject to automated
- WB60 (tree) – subject to automated survey
- WB91 (tree) – subject to automated survey
- Tree 29 – subject to automated survey
- Tree 33 – subject to automated survey

3.1.4. As SB1 and SB2 were concluded, in surveys undertaken in January 2019 (MS2JV, 2019), to have no hibernation potential, and these conclusions are still within CIEEMs guidelines on the lifespan of ecological data (CIEEM, 2019), these buildings were not included in the winter 2019/2020 survey programme and no internal survey was undertaken of these two buildings. See Annex A for the locations of these buildings and the surveyed structures and trees listed above.

3.2. Internal Inspection

3.2.1. An internal inspection of building SB4, part of the barn complex at Sacrewell Farm, was undertaken on 23 January 2020. In conjunction a partial inspection of SB5 was undertaken; the easternmost part of SB5 was accessible from SB4 and as such was also inspected. A high-powered torch (Clulite CB2) was used to

search the interior of the buildings for evidence of bat presence such as individual bats, droppings and feeding remains. All areas of the buildings were systematically searched from the floor to the rafters. Binoculars (Bushnell) were used to provide a better view of the rafters and roof space.

3.2.2. A limited internal inspection of SB3 was undertaken on 23 January 2020. SB3, the stables, were largely inspected from partially open stables entrances as some stalls had occupants at the time of survey.

3.2.3. It was not possible to access SB6 for an internal inspection as livestock present in the courtyard and the entrance to the building itself prevented safe access.

3.2.4. All surveys were led by Adam West (former Consultant Ecologist, Sweco) who holds a level 2 Natural England bat class licence (registration number 2016-24724-CLS-CLS) and assisted by Beth Mell (Consultant Ecologist, Sweco).

3.3. Automated surveys

3.3.1. Automated surveys were undertaken at five trees in which the previously identified PRF's were not inspected due to them being of a height which could not be reached by ladder and the tree being unsafe to climb including;

- WC39
- WB60
- WB91
- 29
- 33

3.3.2. Automated surveys were also undertaken on structure SB4 to further investigate whether the droppings found during surveys undertaken in January 2019 (see Table 1.1-1) may have come from a hibernation roost. It is considered that the detectors deployed to further investigate SB4 may also potentially further investigate the westernmost end of SB3 with regards to hibernating bats as the detectors were installed on the wall connecting SB4 with SB3.

3.3.3. Collins (2016) recommends surveying between the months of November and March (inclusive) as bats will hibernate within this timeframe, depending on the location and prevailing weather conditions. The surveys were undertaken within this timeframe in January and February 2020.

3.3.4. Automated surveys for winter activity within structures with a moderate to high likelihood of bats being present should be undertaken for a minimum of two weeks in each month from December to February (Collins, 2019). It is considered that this guidance should also be applied to winter hibernation

surveys in trees as there is no specific guidance on the use of automated surveys to supplement hibernation surveys in trees, with respect to survey timings and effort. The guidelines regarding survey effort have, due to limitations, not been adhered to (see Section 3.4).

3.3.5. Automatic bat detectors, one Song Meter 2 and ten Anabat Swifts, were left at 11 locations across the site for 19 consecutive nights between 23 January 2020 and 12 February 2020. One detector was deployed at each tree or structure to be assessed, with the exception of the A1 bridge (over the River Nene), where a detector was deployed on both the south and north bank, and at SB3 and SB4 where two detectors were deployed very close to each other, however facing different aspects.

3.3.6. The locations of the automated detectors were in positions away from disturbance from the public, wherever possible, and secured to trees or buildings (Annex A). The detectors were set to record from 30 minutes before sunset until 30 minutes after dawn.

3.3.7. Table 3.3-1 below details the locations of surveyed structures and trees, the locations of automated detectors and the dates of survey. See Annex A for a drawing of the feature (structures/trees) locations.

Table 3.3-1: locations of surveyed structures and trees, detector location information and survey period

Surveyed feature and grid reference		Detector type	Position of installed detector	Recorded from	Recorded to	Total nights surveyed	Constraints to survey
Tree 29 TL 09587 99274		Anabat Swift	On the tree or an adjacent tree	23/1/20	2/2/20	11	Does not meet the minimum survey effort ((Collins, 2019) see Section 3.4.4). Surveyed for approximately one week in January 2020, however the detector stopped recording at the beginning of February due to the SD card becoming full.
Tree 33 TL 09617 99213		Anabat Swift	On the tree or an adjacent tree	23/1/20	12/2/20	21	Does not meet the minimum survey effort ((Collins, 2019) see Section 3.4.4). Surveyed for approximately one week in January 2020 and approximately two weeks in February 2020.
A1 bridge TL 07645 99370		Anabat Swift	One detector installed on tree nearest to the bridge on both the north and south banks	23/1/20	4/2/20	13	Does not meet the minimum survey effort ((Collins, 2019) see Section 3.4.4). Surveyed for approximately one week in January 2020, however the detector stopped recording at the beginning of February due to the SD card becoming full. It was not possible to identify the times of all the identified bat calls due to a technical fault. As such some earlier or later calls which may have occurred at significant times to suggest emergence or re-entry may not have been identified.

B4 Station House TL 08952 99633		Anabat Swift	Outside of the building	23/1/20	12/2/20	21	The detector was located outside of the building as no internal access was arranged. Does not meet the minimum survey effort ((Collins, 2019) see Section 3.4.4). Surveyed for approximately one week in January 2020 and approximately two weeks in February 2020.
B5 Heath House TL 08960 99730		Anabat Swift	Outside of the building	23/1/20	12/2/20	21	The detector was located outside of the building as no internal access was arranged. Does not meet the minimum survey effort ((Collins, 2019) see Section 3.4.4). Surveyed for approximately one week in January 2020 and approximately two weeks in February 2020.
SB3 Stables at Sacrewell Farm TL 07939 99997		Anabat Swift	Both detectors were installed on the wall between/connecting SB3 and SB4. One detector was placed on the northern aspect of the wall facing out over the field to the north (SB3 detector) and the other on the southern aspect facing towards SB4 (SB4 detector).	23/1/20	9/2/20	18	The detector was located outside of the building as there were no features internally on which to affix the detectors out of the reach of livestock. Does not meet the minimum survey effort ((Collins, 2019) see Section 3.4.4). Surveyed for approximately one week in January 2020 and approximately two weeks in February 2020. It was not possible to discern any bat calls on the data recorded at SB3 due to a large amount of

							background noise (see Section 3.4.5).
SB4 Barn at Sacrewell Farm TL 07919 99998		Anabat Swift		23/1/20	12/2/20	21	The detector was located outside of the building as there were no features internally on which to affix the detectors out of the reach of livestock. Does not meet the minimum survey effort ((Collins, 2019) see Section 3.4.4). Surveyed for approximately one week in January 2020 and approximately two weeks in February 2020.
WB60 (tree) TL 09057 99513		Anabat Swift	On the tree or an adjacent tree	23/1/20	12/2/20	21	Does not meet the minimum survey effort ((Collins, 2019) see Section 3.4.4). Surveyed for approximately one week in January 2020 and approximately two weeks in February 2020. It was not possible to identify the times of all the identified bat calls due to a technical fault. As such some earlier or later calls which may have occurred at significant times to suggest emergence or re-entry may not have been identified.
WB91 (tree) TL 09096 99462		Anabat Swift	On the tree or an adjacent tree	23/1/20	12/2/20	21	Does not meet the minimum survey effort ((Collins, 2019) see Section 3.4.4). Surveyed for approximately one week in January 2020 and approximately two weeks in February 2020.
WC39 (tree)		SM2	On tree WC39	23/1/20	29/1/20	6	Does not meet the minimum survey effort ((Collins, 2019) see Section 3.4.4). Surveyed for

TF 07329 00505							approximately one week in January 2020, however the detector stopped recording at the end of January due to the SD card becoming full.

3.3.8. Recorded data were analysed using BatSound and Analook software for the Song Meter 2 and Anabat Insight and Analook for the Swifts.

3.3.9. For those nights where very large amounts of data were recorded the auto-ID analysis function in the Anabat Insight software was used to identify bat calls within the data. The certainty threshold used whilst running the auto-ID was set at low 50%. The lower the certainty threshold is set the less likely it is that genuine bat calls are not identified by the auto-ID function. All files identified as bat calls were then analysed manually to confirm the identification of bat calls. This method of auto-ID was used for the data collected from WB91 on 8 February 2020 when over 3000 files were recorded, and B5 on 9 and 10 February 2020 when over 900 and over 700 files were recorded respectively.

3.4. Survey limitations

3.4.1. Of the four buildings subject to automated survey none had detectors placed inside; all detectors were located outside the surveyed buildings (see Table 3.3-1). The use of automated bat detectors outside of a potential roost has inherent limitations. It can only be used to conclude that bats were active in the vicinity of the entrance to a potential roost. Without visual observation of bats exiting or entering the roost, the data from automated surveys must be considered as circumstantial evidence. However, the time of day at which bats are recorded around roost entrances and the weather conditions at that time, and on proceeding days, can be used to make a more robust assessment of likely roosting activity.

3.4.2. Typical bat emergence and re-entry times are known for bats during their active period (Jones and Rydell, 1994; Russ, 2012) and reflect a balance between insect availability and predator avoidance, with bats making a trade-off between emerging at the peak of insect abundance around sunset and in light levels in which diurnal predators may still be active. However, in the winter months drinking becomes a more important factor in determining arousal and emergence than feeding (Hays et al, 1992). As a result, bats may wait until later in the evening to emerge and/or re-enter the roost earlier than usual. It is not possible to determine whether calls recorded later than the usual emergence times of species (Jones and Rydell, 1994; Russ, 2012) are made by bats emerging from roosts from automated detectors alone. However, calls which fall within the typical emergence times for the species can be used to suggest a roost nearby, or potentially within, the surveyed structure or tree. Likewise, bat calls recorded very close to sunrise, or even after sunrise, can also be used to suggest a nearby roosting location.

3.4.3. The lack of data from December 2019 and the partial data obtained in January 2020 is not considered a significant constraint to this report. The surveys

comprise an update to previous surveys undertaken in 2017 (MS2JV, 2018) and 2019 (MS2JV, 2019) and the survey period included the optimum/peak time for hibernating bats (January). As such the reduced survey period is not considered a significant constraint.

3.4.4. The bat detector deployed under the A1 road bridge, on the north bank of the River Nene, was not present when surveyors returned to collect it. The chain used to secure the detector to the tree was still hanging in place, apparently having been cut to remove the detector. The loss of this detector is not seen as a constraint on the survey as a second detector was located on the opposite bank of the river. The data from this other detector is considered sufficient to assess bat activity at this location.

3.4.5. The survey period undertaken does not meet the minimum survey effort requirements in the good practice guidelines (a minimum of two weeks survey each month between December and February inclusive (Collins, 2016)). . The lack of a full two weeks of data for each month between November to February inclusive is considered a significant constraint to the survey.

3.4.6. The sound files retrieved from the bat detector at SB3 contained so much background noise that it was not possible to discern any bat calls amongst the noise. This detector was suspended from a pipe below the eaves of the roof, facing out over an empty field. The source of the noise remains unexplained. It may be that bats were present but the noise in the sound files masks their presence. Alternatively, it may be the case that only noise was detected as no bats were present in the vicinity of this detector. Because of the uncertainty created by the background noise in the recordings, this survey cannot be considered robust enough to draw any conclusions from.

3.4.7. The details of this report will remain valid until September 2021. Beyond this period, if the proposed works have not commenced, it is recommended that a new review of the ecological conditions is undertaken.

4. Results

4.1. Internal inspection

SB4

4.1.1. The internal inspection of SB4, a large stone barn (see Photograph 1 below) at Sacrewell Farm, revealed evidence of bat presence. Bat droppings were found within the main body of the barn. The droppings were not especially numerous and were largely distributed evenly around the interior. A small concentration of droppings was found in the centre of the floor but here too droppings were low in number. As SB4 is a very open environment which is regularly used, including for the housing of livestock, it is considered unlikely that the droppings identified on 23 January 2020 would have been deposited during the active season and persisted until the survey on 23 January 2020. As such it is considered likely the droppings were deposited within the hibernation season.

Photograph 1: the interior of SB4. Photograph taken during the internal inspection on 23 January 2020.

SB5

4.1.2. The internal inspection of SB5 identified what is considered to be bat feeding remains in a small room in the easternmost end of the building adjoining and open to SB4. Two butterfly wings and a single moth wing were found on the floor of this room (see Photograph 2). As invertebrates, including butterflies, are not active in the bat hibernation period it is considered that these feeding remains would most likely have been deposited in the active season and are evidence of a summer roost within SB5. As the section of SB5 where the feeding remains were found is open to SB4 it is considered likely that SB4 is also used as a summer roost in conjunction with SB5.

Photograph 2: feeding remains, considered from a bat, on the floor in SB5 during the internal inspection on 23 January 2020.

SB3

4.1.3. SB3, the stables, were only subject to a very limited internal inspection, the majority of which was undertaken from the open stable doors (see Section 3.2.2 and 3.4). No evidence of bats was identified.

4.2. Automated surveys

Weather conditions during surveys

4.2.1. The website timeanddate.com was used to obtain weather information during the survey period. The weather conditions recorded during the automated survey period and the sunset and sunrise times are summarised in Table 4.2-1.

Table 4.2-1 Weather conditions during each activity survey with sunset and sunrise times (summarised from timeanddate.com)

Date	Sunrise time	Sunset time	Minimum temperature	Maximum wind speed (Beaufort scale)	Rain (Y/N)
23/1/20		16:30	5	2	N
24/1/20	07:56	16:32	6	3	N
25/1/20	07:55	16:34	5	4	N
26/1/20	07:53	16:35	6	4	N
27/1/20	07:52	16:37	3	4	N
28/1/20	07:51	16:39	No data		
29/1/20	07:49	16:41	6	5	N

30/1/20	07:48	16:43	9	5	N
31/1/20	07:46	16:45	11	5	N
1/2/20	07:44	16:47	7	5	N
2/2/20	07:43	16:48	9	5	N
3/2/20	07:41	16:50	3	4	N
4/2/20	07:40	16:52	2	3	N
5/2/20	07:38	16:54	0	3	N
6/2/20	07:38	16:56	2	2	N
7/2/20	07:34	16:58	7	4	N
8/2/20	07:34	17:00	8	7	Y
9/2/20	07:31	17:02	5	7	N
10/2/20	07:29	17:04	2	7	N
11/2/20	07:27	17:06	2	6	N
12/2/20	07:25		2	4	Y

4.3. Automated survey results

4.3.1. The following tables summarise the data obtained from the static detectors which were deployed at 10 locations across the site (Annex B). The data are presented as the number of passes recorded by each species per night. Dates where no passes were recorded have been omitted from the results. In addition, for each species and each night the times of the first and last detections (where more than one detection was recorded) are given in brackets. In addition, an 'F' is included in the brackets where definitive foraging behaviour has been recorded and 'SC' where social calls have been recorded.

4.3.2. The "date" refers to the period of darkness which began on that date. For example, bat passes recorded on 23 January 2020 includes those recorded from sunset on 23 January to sunrise on 24 January 2020.

Table 4.3-1 Number of passes per night for each species recorded at location tree 29

Date	Common pipistrelle *Pipistrellus pipistrellus*	Soprano pipistrelle *Pipistrellus pygmaeus*	Barbastelle *Barbastella barbastellus*	*Pipistrellus* sp.	*Myotis* sp.
23 January 2020	2 (19:39 and 00:10)	3 (23:02, 02:42)	-	-	-
30 January 2020	60 (22:59, 3:53, F, SC)	2 (22:34 and 3:36)	1 (1:50)	-	-
31 January 2020	-	2 (18:40 and 18:46)	1 (22:02)	-	-
1 February 2020	-	-	-	1 (19:52)	1 (1:15)

Table 4.3-2 Number of passes per night for each species recorded at tree 33

Date	Common pipistrelle	Soprano pipistrelle	Barbastelle	*Pipistrellus* sp.	*Myotis* sp.
23 January 2020	2 (19:39 and 00:10)	3 (23:01, 02:42)	-	-	-
24 January 2020	-	-	2 (19:22 and 20:52)	-	-
26 January 2020	1 (22:10)	-	-	-	-
29 January 2020	-	-	1 (19:42)	-	-
30 January 2020	76 (22:01, 3:53)	-	1 (1:50)	-	-
31 January 2020	2 (19:05 and 19:06)	3 (18:35, 18:46)	2 (21:19 and 22:02)	-	-
1 February 2020	-	-	-	1 (1:15)	-
3 February 2020	-	1 (19:15)	-	-	-
4 February 2020	11 (19:09, 22:02, F SC)	14 (18:53, 20:26)	-	-	-

Table 4.3-3 Number of passes per night for each species recorded at location A1 bridge

Date	Common pipistrelle	Soprano pipistrelle	Barbastelle	*Pipistrellus* sp.	*Myotis* sp.	N/s/l group*
23 January 2020	-	-	2 (19:35 and 19:59)	-	2 (22:36 and 22:41)	-
24 January 2020	1 (18:05)	-	-	-	1 (18:44)	-
25 January 2020	3 (18:13, 00:17)	1 (19:22)	-	-	-	-

Date	Common pipistrelle	Soprano pipistrelle	Barbastelle	*Pipistrellus* sp.	*Myotis* sp.	N/s/l group*
26 January 2020	1 (data missing)	-	-	-	-	-
27 January 2020	2 (both passes at 20:03)	-	-	-	-	-
30 January 2020	8 (18:48, 2:52, missing data)	21 (18:16, 19:23, missing data)	-	-	1 (19:14)	2 (both passes at 22:00)
31 January 2020	8 (18:29, 00:27, SC)	18 (18:22, 21:23, missing data)	-	5 (19:33, 1:28)	1 (18:47)	-
1 February 2020	2 (00:03 and 00:08)	1 (18:42)	-	-	-	-
3 February 2020	3 (all calls at 18:52)	-	-	-	1 (22:46)	-

*The n/s/l group comprises the species noctule *Nyctalus noctula*, serotine *Eptesicus serotinus* and Leisler's bat *Nyctalus leisleri*. These three bat species have overlapping call characteristics and can be indistinguishable during analysis of recordings.

Table 4.3-4 Number of passes per night for each species recorded at location B4

Date	Common pipistrelle	Soprano pipistrelle	Barbastelle	*Pipistrellus* sp.	*Myotis* sp.	N/s/l group
26 January 2020	-	1 (19:24)	-	-	-	-
3 February 2020	3 (18:03, 18:21)	1 (17:51)	-	-	-	-

Table 4.3-5 Number of passes per night for each species recorded at location B5

Date	Common pipistrelle	Soprano pipistrelle	Noctule	*Pipistrellus* sp.	N/s/l group
23 January 2020	-	5 (19:03, 20:55)	-	-	-
24 January 2020	-	10 (16:52, 00:38)	-	-	-
25 January 2020	--	7 (17:23, 21:13, F)	-	3 (21:11, 21:12)	-
29 January 2020	2 (both at 17:54)	1 (17:49)	-	-	-

Date	Common pipistrelle	Soprano pipistrelle	Noctule	*Pipistrellus* sp.	N/s/l group
30 January 2020	4 (17:34, 22:47)	27 (17:07, 00:54)	5 (20:26, 20:56)		1 (23:07)
31 January 2020	-	8 (18:27, 7:11)	-	-	-
1 February 2020	1 (1:27)	3 (17:31, 00:47)	-	-	-
2 February 2020	1 (18:49)	-	-	-	-
3 February 2020	1 (18:21)	1 (17:34)	-	-	-
4 February 2020	3 (18:02 and 18:03)	-	-	-	-
6 February 2020	3 (18:03, 23:45)	1 (18:22)	-	1(18:24)	-
9 February 2020	-	1 (18:29)	-		-

Table 4.3-6 Number of passes per night for each species recorded at location SB4

Date	Common pipistrelle	Soprano pipistrelle	Long-eared bat *Plecotus sp.*	*Myotis* sp.	Barbastelle	Brown long-eared bat *Plecotus auritus*
23 January 2020	10 (18:18, 00:29)	-	-	2 (18:23 and 19:23)	-	-
29 January 2020	12 (19:52, 6:51)	4 (18:28, 18:38)	-	-	-	-
30 January 2020	222 (17:58, 8:17, SC)	38 (18:16, 18:42, F, SC)	1 (3:16)	-	-	-
31 January 2020	109 (18:19, 8:12, F, SC)	33 (18:39, 8:12, F, SC)	-	-	1 (18:24)	1 (3:16)
1 February 2020	15 (1:57, 3:57, SC)	-	-	-	-	-
2 February 2020	1 (18:58)	-	-	-	-	-

Date	Common pipistrelle	Soprano pipistrelle	Long-eared bat *Plecotus sp.*	*Myotis* sp.	Barbastelle	Brown long-eared bat *Plecotus auritus*
3 February 2020	1 (18:47)	-	-	-	-	-
4 February 2020	2 (19:02, 19:32)	-	-	-	-	-
6 February 2020	2 (18:18 and 18:39)	-	-	-	-	-
8 February 2020	1 (21:19)	-	-	-	-	-
11 February 2020	4 (all calls within 6:25 and 6:26)	-	-	-	-	-

Table 4.3-7 Number of passes per night for each species recorded at location WB60

Date	Common pipistrelle	Soprano pipistrelle	N/s/l group	*Pipistrellus* sp.	*Myotis* sp.	Barbastelle
29 January 2020	-	1 (17:47)	-	-	-	-
30 January 2020	2 (1:24 and 3:21)	8 (17:52, 00:44, SC, missing data)	-	2 (both SC at 4:00)	-	-
31 January 2020	1 (17:00)	-	1 (17:11)	-	-	-
1 February 2020	-	2 (both passes at 21:39)	-	-	-	-
2 February 2020	2 (17:28, missing data)	-	-	-	-	-
3 February 2020	-	2 (18:20 and 18:38)	-	-	-	-
4 February 2020	-	1 (18:31)	-	-	-	-
6 February 2020	-	-	-	-	1 (19:27)	-
9 February 2020	-	1 (19:04)	-	-	-	-

Table 4.3-8 Number of passes per night for each species recorded at location WB91

Date	Common pipistrelle	Soprano pipistrelle	Noctule	Barbastelle
23 January 2020	7 (18:08, 21:31)	-	-	-
24 January 2020	-	1 (18:12)	-	-
25 January 2020	-	1 (18:19)	-	-
26 January 2020	-	3 (20:42, 21:36)	-	-
27 January 2020	-	-	-	-
30 January 2020	2 (22:33 and 4:21)	19 (18:25, 3:14)	1 (18:19)	4 (19:13 and 19:57)
31 January 2020	1 (7:38)	-	1 (18:25)	1 (18:35)
2 February 2020	1 (19:50)	1 (18:55)	-	-
3 February 2020	2 (both passes at 19:57)	-	-	-
4 February 2020	-	60 (18:26, 20:12, SC)	-	-
8 February 2020	-	1 (18:28)	-	-
9 February 2020	-	3 (all passes at 20:05)	-	4 (19:00, 19:11)

4.3.3. No bats were detected at location WC39 and no bat calls were discernible in the sound files recorded on the detector deployed at SB3 (see section 3.4.5)

5. Evaluation, impact assessment and requirements

5.1. Evaluation

Bat roosts summary

5.1.1. There were no prolonged periods of cold weather in the survey period (i.e. multiple consecutive days of temperatures below 0°C) and as such it is difficult to determine where bats might be hibernating amongst activity recorded where bats are, on milder nights, arousing from torpor to rehydrate and/or forage. Such milder nights where bat activity is relatively high for the time of year include 30 January 2020 when the temperature was 9°C and 60 common pipistrelle calls were recorded at tree 29, including the recording of social calls and foraging behaviour, and 79 soprano pipistrelles were recorded at tree 33 and 31 January 2020 when the temperature was 11°C. On 30 January 2020 222 common pipistrelles and 38 soprano pipistrelles were recorded at SB4 and on 31 January 2020 109 common pipistrelles and 33 soprano pipistrelles were recorded at SB4. Pipistrelle species generally hibernate in shallower features (for example beneath flaked bark and closer to the entrances of cavities) and as such are more likely to awake during periods of torpor.

5.1.2. Due to the milder weather experienced during the survey period the numbers of bat calls recorded cannot be used to infer whether winter roosts/hibernacula may potentially be present. In addition, the location of all the detectors outside of the features surveyed means that whether bats are roosting within the features or a nearby location cannot be confirmed. However, the times at which bat calls have been recorded has been used in this assessment to identify whether roosts may potentially be present nearby the features surveyed. In summary the following conclusions can be made regarding winter bat roosts on-site:

- Soprano pipistrelles are possibly roosting during the winter near B5, however a roost within B5 itself cannot be confirmed.
- SB4 is likely a winter roost due to the unidentified droppings found during the internal inspection. It is possible that common and soprano pipistrelle use SB4 in the winter, however unconfirmed, as these may have been from alternative roosts nearby including in SB3, SB5 and SB6 which were also identified as having hibernation potential.
- Common pipistrelles are possibly roosting during the winter near WB60, however a roost within WB60 itself cannot be confirmed.
- A bat of the n/s/l group is possibly roosting during the winter near WB60, however a roost within WB60 itself cannot be confirmed.
- Common pipistrelle/s are possibly roosting during the winter near WB91, however a roost within WB91 itself cannot be confirmed.

- No roosts have been identified nearby tree 29, tree 33, the A1 bridge, B4 and WC39.

5.1.3. SB5 is considered a summer roost due to the feeding remains (butterfly wings) identified on the floor during the internal inspection (see Section 4.1.2). Such invertebrate prey is not available in the winter months and as such the feeding remains would have been deposited during the active season. As SB5 (or at least the easternmost section of SB5) and SB4 are internally connected it is considered likely that bats use the internal areas in both buildings during summer and as such SB4 should also be considered a summer roost.

Tree 29

5.1.4. On the night of 30 January 2020 60 common pipistrelle passes were detected and eight bouts of probable feeding activity were recorded although the detail preserved in the recordings makes this a tentative analysis. The higher numbers recorded on 30 January 2020 are likely a consequence of warmer temperatures than on the preceding nights.

5.1.5. The times of the first and last calls of each species recorded at tree 29 cannot be used to infer a potential roosting location near tree 29. The earliest bat recorded throughout the survey period was a soprano pipistrelle recorded 1 hour 55 minutes after sunset on 31 January 2020 (see Table 4.3-1) however common and soprano pipistrelle bats generally emerge from the roost much earlier than this. No calls of any species were recorded at a time which might suggest emergence from or re-entry to a roost nearby.

Tree 33

5.1.6. The data obtained from tree 33 closely mirror those from tree 29 which is approximately 70m to the south-east. The picture given by the data are the same as at tree 29, which is of low numbers of bats on all nights with the exception of the night of 30 January 2020 when 79 bat passes were recorded.

5.1.7. The times of the first and last calls of each species recorded at tree 33 cannot be used to infer a potential roosting location near this tree 33. The earliest bat recorded throughout the survey period was a soprano pipistrelle recorded 1 hour 50 minutes after sunset on 31 January 2020 (see Table 4.3-2) however common and soprano pipistrelle bats generally emerge from the roost much earlier than this. No calls of any species were recorded at a time which might suggest emergence from or re-entry to a roost nearby.

A1 Bridge

5.1.8. No bats were recorded within an hour of sunset or sunrise at this location. As the earliest bat recorded (a common pipistrelle) was 1.5 hours after sunset and no bats were recorded within 1 hour of sunrise no conclusions regarding roost locations in the vicinity of the A1 bridge can be deduced from the identified times of bat calls recorded. However, due to the missing data regarding the times of some recorded bat passes (see Table 4.3-3 and Section 3.4.7) it is possible that some bat passes may have been recorded closer to sunset and/or sunrise and not identified. Low numbers of bat passes were recorded on each night, with the exception of the nights of 30 and 31 January (correlating with the warmer nights recorded). As this location, being a sheltered section of watercourse, represents high quality foraging habitat, it is likely to attract bats from the surrounding area. This fact, combined with the timings in relation to sunset and sunrise, makes a robust assessment of bat roosting at this location impossible to make.

B4

5.1.9. Bat passes were only recorded on two nights: 26 January, when one soprano pipistrelle was recorded; and 3 February when three common pipistrelle and one soprano pipistrelle were recorded. As the first bat was recorded over an hour after sunset on both nights, no bats were recorded within an hour of sunrise and the total number of bats is low, it is concluded that these bats did not emerge from a roost within B4 and were merely commuting past.

B5

5.1.10. Soprano pipistrelles were detected at times which suggest they may be roosting in or near B5 including the earliest detections of the species 20 minutes after sunset on 24 January 2020 and 23 minutes after sunset on 30 January 2020. On a further three occasions soprano pipistrelles were detected within one hour of sunset. In addition, a soprano pipistrelle was recorded 33 minutes before sunrise on 31 January 2020.

5.1.11. These levels of activity at the times stated suggest that soprano pipistrelles are roosting near this location, however confirmation of the species roosting within B5, as opposed to B4 which also has hibernation potential, cannot be unequivocally confirmed as the detector was located outside of the building (see Table 3.3-1 and Section 3.4.1). In addition, due to the mild temperatures throughout the survey period (see Table 4.2-1 and Section 5.1.1) it is considered possible that bats have been roosting in features which do not offer hibernation potential on warmer nights. In conclusion, a soprano pipistrelle roost within B5 itself cannot be conclusively confirmed.

5.1.12. Common pipistrelle has on one occasion been recorded within 1-hour after sunset; 51 minutes following sunset on 30 January 2020. However, given that the temperature on this night was particularly mild and bat activity and foraging across the surveyed areas has been high on 30 January 2020 relative to other nights it is considered that this recording is not sufficiently significant to suggest a common pipistrelle roost in B5 or nearby.

SB3

5.1.13. No bat calls were discernible in the sound files recorded on the detector at this location (see section 4.3.3). However, given the proximity of SB3 to SB4 and the proximity of the two detectors installed it is considered possible that bats recorded after sunrise on the detector installed to survey SB4 may also have emerged from SB3 (see Sections 5.1.16 and 5.1.17). A roost in SB3 cannot be ruled out.

SB4

5.1.14. No bats were recorded at a time following sunset which would suggest emergence from a roost in or nearby SB4. However, common and soprano pipistrelles were detected at this location at significant times following sunrise (see Table 4.3-6; on the night of 30 January 2020 when sunrise was 7:46 common pipistrelle were recorded at 8:17 and on the night of 31 January 2020 when sunrise was 7.44 both species were recorded at 8:12). On these nights high levels of activity have been recorded at all survey areas which can be attributed to the significantly milder temperatures encouraging bats to rouse and leave the roosts to forage and rehydrate. Of the two other nights when common pipistrelles were recorded within 1-hour of sunrise (29 January and 11 February 2020) the temperatures were 6°C and 2°C respectively, the latter of which was following a warmer period.

5.1.15. The detection of common and soprano pipistrelles at these times strongly suggests a roost is located either in or significantly close to SB4, however due to the location of the detector being installed outside of SB4 as opposed to inside (see Table 3:3-1 and Section 3.4.1) it is not possible to determine whether these bats were roosting in SB4 or a nearby location (including SB3 which is adjacent to SB4 and was also identified as having hibernation potential). As the temperature was very mild on these nights, a high level of bat activity was recorded and the bats were recorded foraging it is considered that the nearby roost is not necessarily used as a location in which bats use to achieve a period of torpor. As such it is considered possible the bats may have been roosting in a nearby tree or building which may not be suitable for hibernation but suitable for alternative roosts in milder weather. However, given the bats were recorded in the area as late as 31 minutes following sunrise (common pipistrelles on 30

January 2020) and the results of the internal inspection of SB4 identified bat faeces and feeding remains ((the latter of which was in the adjoining SB5) see Sections 4.1.1 and 4.1.2) it is considered likely that the bats recorded were from the roost identified in SB4 during the internal inspection. However, as stated above this does not confirm the bats use SB4 in extremely cold weather to achieve a state of torpor for periods of time and it must also be acknowledged that the bats could also have been using SB3 to roost which is directly adjacent to SB4 and was subjected to a limited internal inspection only (see Section 4.1.4).

5.1.16. No other bats were recorded at times which may suggest emergence from and/or re-entry to a roost in SB4 or nearby.

WB60

5.1.17. On the night of 31 January, a common pipistrelle was detected fifteen (15) minutes after sunset. In their active period, this species typically emerges between 20 and 30 minutes after sunset. The timing of the above detection suggests that common pipistrelles are roosting in or nearby WB60. It cannot be confirmed that common pipistrelles are roosting in WB60, as opposed to the nearby WB91 which was also identified as having hibernation potential. In addition, as 31 January 2020 was a particularly mild night with high levels of bat activity in comparison to other surveyed nights it is considered possible that the common pipistrelle detected was roosting in a nearby location which may not have hibernation potential.

5.1.18. N/s/l (noctule, serotine or Leisler's) are early emerging species (Collins, 2016) and a bat of the n/s/l group was detected 26 minutes after sunset on 31 January 2020. As such it is considered possible that the bat detected emerged from a nearby location, including WB60, however this cannot be confirmed.

WB91

5.1.19. On the night of 31 January 2020, a common pipistrelle was detected six (6) minutes before sunrise. The timing of this detection suggests a common pipistrelle is roosting somewhere nearby the location of WB91. It is not possible to determine the exact location of the roost, and given the mild temperatures on 31 January 2020 it is considered possible that the bat was roosting in a tree or structure which does not provide hibernation potential as such may have been roosting elsewhere.

WC39

5.1.20. No bats were detected at this location.

5.2. Impacts

5.2.1. Due to the difficulties determining the exact location of roosts it is difficult to provide an accurate impact assessment.

5.2.2. The summer roosts in SB4 and SB5 would not be subject to direct impacts as they are outside of the Proposed Scheme boundary however, may be subject to indirect impacts such as disturbance form increased noise, vibration and light during construction. B5 is also outside of the Proposed Scheme boundary however, should bats be roosting in this building indirect impacts may occur. Any bat roosts present in the A1 bridge which is adjacent to the Proposed Scheme boundary, may also be indirectly impacted by works.

5.2.3. Tree 29, tree 33, WC39 and B4 Station House, all considered to have hibernation potential, are within the Proposed Scheme boundary (or partially within in the case of B4) and should these trees/structures be lost this would in turn result in a loss of roosting opportunities for bats. Potential bat habitat would also be lost should WB60 and WB91, also within the Proposed Scheme boundary, be removed and furthermore should bats be present in these trees the roosts would be lost.

5.3. Future requirements

5.3.1. The following buildings and trees have hibernation potential and have been identified as possible roosting locations for bats in winter (see Section 5.1.2):

- B5 (soprano pipistrelles)
- SB4 ((common and soprano pipistrelles) however these may also have been from alternative roosts nearby including in SB3, SB5 and SB6 which were also identified as having hibernation potential)
- WB60 (common pipistrelles and a bat of the n/s/l group)
- WB91 (common pipistrelles)

5.3.2. Works should be timed to protect bats when they are at their most vulnerable (i.e. when they are hibernating). Works within 50m of B5, SB4 (and SB3, SB5 and SB6), WB60 and WB91 should be undertaken outside of the bat hibernation season (November – March, inclusive (Collins, 2016)). The following trees/buildings have been previously identified as having hibernation potential:

- Tree 29

- Tree 33
- WC39
- A1 bridge
- B4

5.3.3. Whilst the surveys detailed in this report have not identified potential roosts in these features, due to the limitations to the surveys (see Section 3.4) and the identification of hibernation potential in these features in previously undertaken surveys (see Section 2) works within 50m of these features should also be undertaken outside of the bat hibernation season (November – March, inclusive (Collins, 2016)) as a precautionary approach.

5.3.4. Natural England can grant licences to undertake works which would otherwise result in an offence under the Wildlife and Countryside Act (1981) (as amended) and Conservation of Habitats and Species Regulations (2017) (as amended). Any works which may result in bats being disturbed or their roosts damaged, destroyed or obstructed would require a licence. Licences to disturb the roosts at SB4 and SB5 may be required owing to the fact that these structures are within 50m of the Proposed Scheme boundary (depending on final works footprint); and licences may also be required if it is shown that bats are using the possible roosts at B5, SB3, SB6, WB60 and WB91. Additional survey work may be required in order to identify the species or number of bats using a structure or tree, or to characterise the roost – for the purpose of the licence application and the design of specific mitigation measures. The survey effort undertaken to date has identified the structures and trees which are most likely to require interventions and the requirement for – and nature of - further survey effort should be determined on a case by case basis depending on the validity of the existing data (CIEEM, 2019), whether there have been any material changes to the roost or immediate environment, and the works that are proposed at (and distances from) each location. The licence application requires mitigation to be included to minimise the disturbance resulting from the works. Full mitigation strategies, including methods of working, timings, compensation measures and post-construction monitoring must be detailed in the method statement for the licence application. Compensation measures for lost winter/hibernacula roosting locations include the provision of alternative roosting locations. The alternative roosting locations provided should be suitable for use as hibernation roosts (for example, installing bat boxes on the north aspect of trees would help maintain the cool temperatures hibernating bats require).

5.3.5. Planting to benefit bats will be considered within the landscape planting plan. This may include the replacement of removed trees on at least a like-for-like basis with fast growing, semi-mature, native species or other species that benefit bats listed in Annex B. Trees planted along field margins would provide a

feeding resource and aid in commuting. The siting of the trees at field margins would not impact the current use of those fields east of the roundabout currently used as arable farmland. The species-rich areas of arable field margins that contain the most invertebrates should be replaced with areas of species-rich grassland to maintain biodiversity levels and provide alternative foraging resource for bats.

5.3.6. Should the Proposed Scheme include night works, additional lighting would be employed at the site during hours of darkness. This 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 areas containing likely roost locations and habitats of importance for commuting and foraging bats, specifically woodland edges and watercourses, and vertically into the sky above the works. This policy also applies within the buffer distance of the identified hibernation and potential hibernation roosts.

5.3.7. 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).

5.3.8. 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.

5.3.9. 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 B.

6. References

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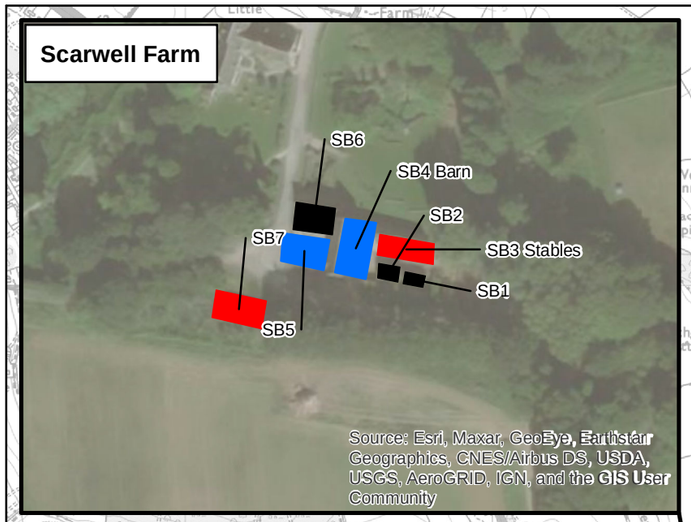
Annex A. Locations of surveyed structures and trees



WB39

B4 Station House

WB60

B5 Heath House

WB91

A1 Bridge

Tree 29

Tree 33

N

0 500 1,000 Metres

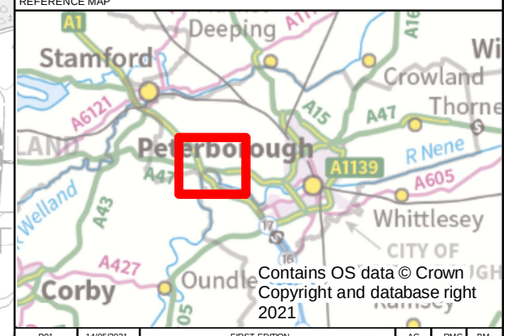
LEGEND

- Proposed Scheme Boundary
- Surveyed Trees

Bat hibernation structures:

- Surveyed structure with hibernation potential
- Confirmed roost (unconfirmed roost type)
- Structures subject to survey in 2019 and not surveyed in 2020

REFERENCE MAP



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REV	DATE	REVISION NOTE	ORG	CHK'D	APP'D
P01	14/05/2021	FIRST EDITION	AC	RMC	BM

DESIGNER

SWECO

CONTRACTOR

GallifordTry

CLIENT

highways england

PROJECT TITLE

A47 WANSFORD TO SUTTON

PROJECT STAGE

PCF STAGE 3

DRAWING TITLE

ANNEX A: LOCATIONS OF SURVEYED STRUCTURES AND TREES

TR010039/APP/6.2

SUITABILITY

FOR INFORMATION

SHEET SIZE	SCALE	STATUS
A3	1:20,000	S2

DRAWING NUMBER

HE551494-GTY-EGN-000-DR-GI-30082

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

Table A-5.3-1 Trees, shrubs and climbers

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

Table A-5.3-2 Flowers for borders

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