A47 North Tuddenham to Easton Dualling

Scheme Number: TR010038

Volume 6
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APFP Regulation 5(2)(a)

Planning Act 2008

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

March 2021

Infrastructure Planning

Planning Act 2008

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

The A47 North Tuddenham to Easton Development Consent Order 202[x]

ENVIRONMENTAL STATEMENT APPENDICES
Appendix 8.11 - Bat hibernation report

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1. Scheme introduction and location

1.1. Background

1.1.1. Sweco UK was commissioned to complete bat hibernation surveys on the A47 North Tuddenham to Easton Improvement Scheme. This is to inform the Environmental Statement (ES) Chapter at PCF Stage 3 for the A47 North Tuddenham to Easton Dualling Scheme (**TR010038/APP/6.1**).

1.2. Scheme description and location

1.2.1. The A47 from North Tuddenham to Easton, comprising a single carriageway, is located approximately 10km to the west of Norwich and forms part of the main arterial highway route connecting Norwich and King's Lynn. The route currently experiences delays and high levels of congestion during peak hours. The situation is predicted to become worse with proposed growth in residential development.

1.2.2. It is proposed to upgrade the existing 7.9km section of single carriageway between North Tuddenham and Easton to dual carriageway. The new section of dual carriageway, with junction improvements, is proposed to be constructed to the north and south of the existing carriageway. This scheme will be referred to as the 'Proposed Scheme'.

1.2.3. The Proposed Scheme is considered to be a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008 and therefore requires a Development Consent Order (DCO), issued by the Secretary of State, before construction and operation can commence.

1.2.4. The Proposed Scheme improvements will:

- improve accessibility to and around the region, reducing congestion and delays to enable more reliable journey times
- improve safety performance for all road users, contributing to a 40% reduction target in accidents across Highways England's roads over the implemented schemes' first five years in operation
- provide alternative access to local roads
- improve the environmental impacts of traffic along the A47 route, particularly for the communities of the six scheme areas
- support economic growth in the Peterborough, Norwich and Great Yarmouth areas by improving overall road.

1.3. Aims and objectives

1.3.1. The purpose of the bat hibernation surveys, and this report, is to support the DCO planning application and inform the ES chapter at PCF Stage 3 by informing the assessment of impacts to ecological receptors (in this case bat roosts). Therefore, the aim of the surveys and this report are:

- 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
- to inform any Natural England mitigation licences that may be required

1.3.2. This baseline report details the results of the 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

Desk study

2.1.1. A desk study undertaken at Stage 1 and Stage 2 (Highways England, 2017) included the purchase of data from Norfolk Biodiversity Information Service (NBIS) which returned records of 177 bat roosts comprising 10 different species. In addition, records for up to 10 species were return for bats within 10km of the Scheme.

2.1.2. There are currently no designated sites within 10km whose qualifying features include bat species.

Phase 1 habitat surveys

2.1.3. An extended phase 1 habitat survey of habitats within 100m of the outermost route options was previously undertaken in 2016, and updated in 2017, at PCF Stage 1 (Highways England, 2017). Trees within 50m of the route options that had been identified at PCF Stage 1 as providing moderate or high bat roost potential (BRP) were subject to an aerial inspection using an endoscope to assess any features suitable for a winter hibernation roost.

Phase 2 bat surveys

2.1.4. Ground level BRP assessments of trees were previously conducted in 2017 with regard to four potential route options that were under consideration at that time. Nine trees (trees one – nine) requiring further hibernation roost surveys were identified (Amey, 2017). A confirmed tree hibernacula reported in 2017 is now approximately 200m outside of this DCO boundary further south down Mattishall Lane and at the opposite side of the river. The main major works are approximately 350m away.

2.1.5. In 2019 (Sweco, 2019) further surveys on the previously identified nine trees were undertaken, including ground level BRP assessments, aerial BRP assessments and automated surveys and an assessment was made regarding the hibernation BRP of the trees. Tree four was scoped out as it was now outside of the DCO boundary. Four trees (trees two, three, five and six) were assessed as having no hibernation potential, one tree (tree seven) could not be identified and one tree (tree one) was not subject to survey due to land access restrictions. The surveys on two trees (trees eight and nine) were considered inconclusive as, due to equipment malfunction, no data was recorded in the automated surveys and due to health and safety issues it was not considered safe to undertake a climbed aerial inspection without the use of a mobile

elevating work platform (MEWP). Two additional trees (trees 64 and 65) were identified which, from ground level, were considered to potentially have hibernation BRP and as such were subject to aerial survey.

2.1.6. As part of the 2019 surveys (Sweco, 2019) a complementary survey was undertaken with reference to Collins (2016) by deploying automatic bat detectors (two x Song Meter 2 (SM2s) and four x Anabat Swifts) at six locations across the site for two consecutive weeks between 4 February 2019 and 18 February 2019. No bats were recorded throughout the duration of the surveys due to software malfunction from the provider, therefore requiring a repeat of the survey in 2020.

2.1.7. Table 2.1-1 below details the hibernation BRP assessment results from 2017 and the methodologies and results from the surveys undertaken in 2019 (Sweco, 2019) (**TR010038/APP/6.1**).

Table 2.1-1 BRP assessment results from 2017 and methodologies and results from the 2019 surveys

Tree	Grid reference	2017 hibernation potential categorisation	2019 hibernation potential assessment method	Result
1	TG1239511103	Moderate	Not assessed	N/A
2	TG0970712354	Moderate	Aerial survey and static monitoring	No hibernation potential
3	TG0969212407	High	Aerial survey and static monitoring	No hibernation potential
5	TG0689913278	High	Ground level assessment and static monitoring	No hibernation potential
6	TG1181211502	High	Ground level assessment and static monitoring	No hibernation potential
7	TG0969512047	Moderate	Static monitoring	No tree at this location
8	TG0864912686	Moderate	Ground level assessment and static monitoring	Inconclusive – further assessment required
9	TG0618013671	High	Ground level assessment and static monitoring	Inconclusive – further assessment required
64	TG0972112295	Not categorised	Aerial survey	No hibernation potential
65	TG0973112245	Not categorised	Aerial survey	No hibernation potential

2.2. Legislation

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

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

2.2.2. All UK bat species are protected under Schedule 5 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

2.2.3. 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 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.

2.2.4. 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

2.2.5. With specific reference to the offence of disturbance, Regulation 43(2) of the Conservation of Habitats and Species Regulations 2017 states *"disturbance of animals includes in particular any disturbance which is likely-*

(a) to impair their ability –

(i) to survive, to breed or reproduce, or to rear or nurture their young; or

(ii) in the case of animals of a hibernating or migratory species, to hibernate or migrate; or

(b) to affect significantly the local distribution or abundance of the species to which they belong."

2.2.6. 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)

2.2.7. 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.

2.2.8. 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.

2.2.9. Seven species of bat (soprano pipistrelle *Pipistrellus pygmaeus*, brown long-eared bat *Plecotus auritus*, greater horseshoe bat *Rhinolophus ferrumequinum*, lesser horseshoe bat, *Rhinolophus hipposideros*, barbastelle *Barbastella barbastellus*, Bechstein's bat *Myotis bechsteinii* and noctule *Nyctalus noctula*) are listed under Section 41 of the NERC Act 2006.

Norfolk Biodiversity Action Plan (BAP)

2.2.10. Local Biodiversity Action Plans (LBAP) identify habitat and species conservation priorities at a local level (typically at the County level) and are usually drawn up by a consortium of local government organisations and conservation charities. soprano pipistrelle, brown long-eared bat, barbastelle and noctule bats are included in the Norfolk Biodiversity Action Plan Strategy (Norfolk Biodiversity Partnership, 2020).

3. Methodology

3.1. Ground level hibernation BRP assessment

3.1.1. Tree one, which was not subject to hibernation BRP assessment in 2019 due to access restrictions (see Table 2.1.7), was subject to a ground level hibernation BRP assessment on 21 February 2020, in accordance with Collins (2016) (**TR010038/APP/6.1**). Using a visual assessment features on the tree with potential to support hibernating bats were searched for. Any potential access points at a height to allow for closer inspection from the ground were inspected for signs of use by bats. Table 3.1-1 below (taken from Collins (2016)) details tree features commonly used by bats for roosting or shelter and signs indicating potential use by bats (**TR010038/APP/6.1**).

Table 3.1-1: features of trees commonly used by bats for roosting or shelter, and signs indicating potential use by bats (Collins, 2016)

Features of Trees Used as Bat Roosts	Signs Indicating Possible Use by Bats
Natural/rot holes **Woodpecker holes** **Cracks/splits in major limbs** **Knot holes caused naturally or by pruning** **Man-made holes** **Hazard beams** **Cankers** **Double-leaders forming forks** **Gaps between overlapping branches** **Loose/platey bark** **Hollows/cavities** **Dense epicormics growth (bats may roost within it)** **Bird, dormouse and bat boxes** **Partially detached ivy with stem diameters over 50mm**	Tiny scratches around entry point Staining around entry point Bat droppings in, around or below entrance Audible squeaking at dusk or in warm weather Flies around entry point Distinctive smell of bats Smoothing of surfaces around cavity

3.1.2. Trees subject to a ground level hibernation BRP assessment are then assigned a hibernation roost potential of low, moderate or high based on the features on the tree, its location and the categories of suitability outlined in Table 3.1-2 below (taken from Collins (2016)) (**TR010038/APP/6.1**).

Table 3.1-2 categories of BRP in trees (Collins, 2016)

Suitability	Description
Negligible	Negligible habitat features on site likely to be used by roosting bats.

Suitability	Description
Low	A tree of sufficient size and age to contain potential roost features (PRFs) but with none seen from the ground or features seen with only limited roosting potential
Moderate	A tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of conservation status, which is established after presence is confirmed).
High	A tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitats.

3.1 Automated surveys

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

3.1.4. 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. All surveys were undertaken within this time frame with reference to recommendations for when the weather is at its coldest.

3.1.5. Automated surveys were undertaken on trees eight and nine, for which the assessments undertaken in 2019 were inconclusive, and tree one which could not be surveyed in 2019. 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). This guidance has been applied to these winter hibernation surveys 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.

3.1.6. With reference to Collins (2016) automatic bat detectors (Anabat Swifts and SM2s) were left at three locations across the site with the aim of collecting a minimum of two consecutive weeks of data per month between December 2019 and February 2020. See Table 3.1-3 below for dates of survey (**TR010038/APP/6.1**). Please note the dates of survey refer to the nights surveyed. For example, 03/02/2019 – 19/12/2019 refers to data collected from half an hour before sunset on 03/02/2019 to half an hour after sunrise on 20/12/2019. Where detectors have stopped recording early and the final night is not a full night of survey the time at which recording ended is in brackets in the 'end' column.

Table 3.1-3 summary of the trees subject to automated survey, including detector type deployed at each tree and time periods (nights) surveyed

Tree Surveyed	Detector Type	Date of Recordings	
		Start	End
8	Anabat Swift	03/12/2019	19/12/2019 (4:52)
8	SM2	27/01/2020	01/02/2020
9	Anabat Swift	03/12/2019	16/12/2019
9	Anabat Swift	01/01/2020	14/01/2020
9	SM2	11/02/2020	17/02/2020
1	Anabat Swift	09/12/2019	20/12/2019
1	Anabat Swift	11/02/2020	13/02/2020 (4:44)

3.1.7. Appendix A contains a map showing the locations of the trees and bat detectors. The Ordnance Survey (OS) national grid references for the three surveyed trees are as follows (**TR010038/APP/6.3**):

- Tree one – TG 12395 11103
- Tree eight – TG 08649 12686
- Tree nine – TG 06180 13671

3.1.8. The detectors were deployed on the trees and set to record from 30 minutes before sunset to 30 minutes after dawn and recorded data were analysed using Kaleidoscope and AnalookW software.

3.1.9. Surveys were undertaken by Adam West GradCIEEM (Consultant Ecologist, Sweco) who holds a level 2 Natural England bat class licence (registration number 2016-24724-CLS-CLS) assisted by Mike Youdale (Senior Consultant Ecologist Sweco), Ishbel Campbell ACIEEM (Senior Consultant Ecologist, Sweco) and Beth Mell GradCIEEM (Consultant Ecologist, Sweco).

3.2. Limitations

3.2.1. The comprehensiveness of any ecological assessment will be limited by the season in which surveys are undertaken. To determine presence or likely absence of a protected species and their status (that is, the number of individuals present) usually requires multiple visits at suitable times of the year.

The survey conditions and timings were suitable for the ground level hibernation BRP assessment of tree one for bats.

3.2.2. Collins (2016) states that *"automated/static 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."* Trees eight and nine were subject to automated survey for a minimum of two weeks in December 2019, however tree one was only surveyed for 12 nights as the batteries failed four minutes after sunset at 15:46 on 21 December 2019.

3.2.3. Tree nine was surveyed for a minimum of two weeks in January 2020, however tree eight was only surveyed from 27 January 2020 to 02 February 2020 due to a technical failure in the static detector, falling short of the minimum survey period for January. As the minimum amount of data (a minimum of 14 nights each month) was not recorded for tree eight in January and February 2020, all the data for tree eight from December 2019 has been analysed and included in this assessment and report. In addition, tree one was not surveyed in January due to access restrictions and was surveyed for three nights only in February 2020 due to a technical failure in the static detector. The lack of January data and very limited amount of February data for tree one, and the limited extent of January and February data for tree eight, is considered a significant limitation to the surveys of these two trees. As tree nine was only surveyed for seven nights in February 2020 this is considered a limitation to the survey of this tree, which did however receive full 14-night surveys in December 2019 and January 2020.

3.2.4. Detectors were set to record from 0.5 hours before sunset to 0.5 hours after sunset and the detector uses the GPS signal to determine the time. All detectors were deployed with a GPS signal. The automated detector deployed to record data at tree nine in December 2019 and January 2020 has not recorded at the correct times. For the survey period 03 to 16 December 2019, the time of the first recording varies between 16:14 and 16:43 whilst sunset time varies between 15:43 and 15:40. For the survey period 1 – 14 January 2020 the detector continued to begin recording between 0.1 – 1 hour after sunset.

3.2.5. The detector starting recording from approximately 0.5 – 1 hour after sunset is considered a significant limitation as emergences of earlier emerging species such as pipistrelle sp. and noctule, the latter of which is known to favour tree roosts (Collins, 2016), may potentially not be recorded. The detector continued to record until as late as 09:30 in December 2019 and 09:27 in January 2020, however this is not considered a limitation as the latest sunrise was 08:01 and 08:00 respectively and it is considered no bats will remain outside the roost after sunrise.

3.2.6. Due to the fluctuating temperatures throughout December 2019, and January and February 2020, and the frequent rainfall during these three months, the validity of the automated data as a means of identifying potentially hibernating bats is reduced. Night temperatures did not fall below 0°C throughout the surveys, and temperatures as high as 12°C were recorded (see Table 4.2.1) (**TR010038/APP/6.1**). Such high temperatures at night are likely to result in bats foraging and commuting at distances further from their hibernation sites which may result in bats being detected in the automated surveys which had not necessarily emerged from nearby. The frequent rainfall across the survey period reduces the number of nights in which bats may choose to emerge. This is seen as an uncontrollable limitation to the hibernation surveys.

3.2.7. The results of this survey will remain valid until February 2022. Beyond this period, if works have not commenced, it is recommended that a new review of the ecological conditions is undertaken (CIEEM, 2019).

4. Results

4.1. Ground level hibernation BRP assessment

4.1.1. The ground level hibernation BRP assessment undertaken on tree one to determine its potential to support hibernating bats was inconclusive. Whilst tree one is considered old enough to have features which may provide hibernation potential, the tree is covered in ivy *Hedera helix* and as such cannot be adequately visibly assessed from the ground.

4.2. Automated surveys

Weather conditions during surveys

4.2.1. The weather conditions between sunset and sunrise during each automated survey are summarised in Table 4.2-1 below (**TR010038/APP/6.1**). The weather data has been recorded from timeanddate.com (2020). Where there was a change in temperature of 5°C or more the temperature range is recorded; otherwise a minimum temperature only is recorded. Wind speed is recorded in Beaufort scale. The highest level of humidity only is recorded.

Table 4.2-1: weather conditions during the automated surveys

Date and Time	Sunrise and sunset time	Weather conditions (wind speed is given in Beaufort scale)
2 December 2019	15:44	Rain: none Humidity: 100% Wind: F2-F3 Minimum night time temperature: 0°C
3 December 2019	7:47 15:43	Rain: none Humidity: 93% Wind: F2-F3 Night time temperature: 2-7°C
4 December 2019	7:48 15:43	Rain: none Humidity: 100% Wind: F1-F3 Night time temperature: 0-6°C
5 December 2019	7:49 15:42	Rain: yes Humidity: 94% Wind: F4-F5 Minimum night time temperature: 7°C
6 December 2019	7:51 15:42	Rain: light rain, rain Humidity: 94% Wind: F3-F5 Night time temperature: 7-12°C
7 December 2019	7:52 15:41	Rain: heavy rain, rain, light rain Humidity: 94%

Date and Time	Sunrise and sunset time	Weather conditions (wind speed is given in Beaufort scale)
		Wind: F3-F6 Minimum night time temperature: 8°C
8 December 2019	7:53 15:41	Rain: rain, light rain Humidity: 87% Wind: F3-F5 Minimum night time temperature: 5°C
9 December 2019	7:54 15:41	Rain: light rain and scattered showers between 15:50 and 16:50 Humidity: 93% Wind: F2-F4 Night time temperature: 0-6°C
10 December 2019	7:55 15:40	Rain: light rain Humidity: 94% Wind: F3-F6 Night time temperature: 2-12°C
11 December 2019	7:57 15:40	Rain: none Humidity: 93% Wind: F2-F3 Night time temperature: 0- 5°C
12 December 2019	7:58 15:40	Rain: drizzle, light rain, rain Humidity: 100% Wind: F2-F5 Minimum night time temperature: 6°C
13 December 2019	7:59 15:40	Rain: none Humidity: 87% Wind: F3-F5 Minimum night time temperature: 4°C
14 December 2019	8:00 15:40	Rain: light rain, rain Humidity: 87% Wind: F3-F6 Minimum night time temperature: 4°C
15 December 2019	8:00 15:40	Rain: none Humidity: 87% Wind: F3-F4 Minimum night time temperature: 5°C
16 December 2019	8:01 15:40	Rain: light rain, rain Humidity: 100% Wind: F0-F3 Minimum night time temperature: 5°C
17 December 2019	8:02 15:41	Rain: drizzle at 17:20 and 17:50, and light rain at 19:20 Humidity: 100% Wind: F0-F3 Minimum night time temperature: 3°C

Date and Time	Sunrise and sunset time	Weather conditions (wind speed is given in Beaufort scale)
18 December 2019	8:03 15:41	Rain: light rain, rain, heavy rain Humidity: 94% Wind: F3-F5 Night time temperature: 7-12°C
19 December 2019	8:03 15:41	Rain: light rain, rain, heavy rain Humidity: 100% Wind: F2-F5 Minimum night time temperature: 10°C
20 December 2019	8:04 15:42	Rain: scattered showers, light rain Humidity: 93% Wind: F2-F5 Night time temperature: 4-9°C
21 December 2019	8:05 15:42	Rain: light rain at 1:20, otherwise none Humidity: 100% Wind: F2-F4 Minimum night time temperature: 8°C
2 January 2020	8:07* 15:52	Rain: rain, heavy rain between 4:00 and 8:00 AM onwards Humidity: 100% Wind: F2-F4 Minimum night time temperature: 9°C
3 January 2020	8:07* 15:53	Rain: none Humidity: 93% Wind: F2-F4 Minimum night time temperature: 3°C
4 January 2020	8:07* 15:54	Rain: none Humidity: 87% Wind: F2-F3 Minimum night time temperature: 6°C
5 January 2020	8:06* 15:55	Rain: none Humidity: 87% Wind: F3-F4 Minimum night time temperature: 7°C
6 January 2020	8:06* 15:56	Rain: light rain between 17:00 and 18:00 Humidity: 93% Wind: F2-F4 Minimum night time temperature: 4°C at 4:50 and 6:20, otherwise minimum temperature of 5°C
7 January 2020	8:06* 15:58	Rain: light rain between 16:50 and 20:20 Humidity: 94% Wind: F3-F5 Minimum night time temperature: 10°C at 16:20, otherwise temperature 11°C with temperatures rising through the night to 14°C

Date and Time	Sunrise and sunset time	Weather conditions (wind speed is given in Beaufort scale)
8 January 2020	8:05* 15:59	Rain: drizzle, light rain, rain Humidity: 100% Wind: F1-F5 Night time temperature: 6-12°C
9 January 2020	8:04* 16:01	Rain: drizzle, light rain Humidity: 93% Wind: F0-F3 Minimum night time temperature: 6°C
10 January 2020	8:04* 16:02	Rain: none Humidity: 93% Wind: F2-F4/F5 Night time temperature: 3-8°C
11 January 2020	8:03* 16:03	Rain: light rain Humidity: 94% Wind: F4-F5 Minimum night time temperature: 9°C
12 January 2020	8:03* 16:05	Rain: light rain at 5:20 Humidity: 93% Wind: F2-F4 Minimum night time temperature: 4°C
13 January 2020	8:02* 16:06	Rain: light rain, rain Humidity: 93% Wind: F3-F6 Night time temperature: 6°C between 7:20 and 8:00, otherwise 7-11°C
14 January 2020	8:01* 16:08	Rain: drizzle, light rain, rain, heavy rain Humidity: 94% Wind: F2-F7 Night time temperature: 7-15°C
15 January 2020	8:00 16:10	Rain: none Humidity: 93% Wind: F3-F4 Minimum night time temperature: 6°C
27 January 2020	7:46 16:31	Rain: light rain, rain, heavy rain Humidity: 93% Wind: F1-F4 Night time temperature: 3-8°C
28 January 2020	7:45 16:32	Rain: none Humidity: 87% Wind: Minimum night time temperature: 2°C between 7:20 and 8:20, otherwise minimum temperature 3°C
29 January 2020	07:43 16:34	Rain: none Humidity: 87%

Date and Time	Sunrise and sunset time	Weather conditions (wind speed is given in Beaufort scale)
		Wind: F3-F5 Minimum night time temperature: 7°C
30 January 2020	07:42 16:36	Rain: none Humidity: 94% Wind: F3-F5 Night time temperature: 8-13°C
31 January 2020	07:40 16:38	Rain: drizzle at 18:50, otherwise none Humidity: 94% Wind: F4-F5 Minimum night time temperature: 10°C
1 February 2020	07:39 16:40	Rain: light rain, rain Humidity: 93% Wind: F2-F5 Minimum night time temperature: 6°C
2 February 2020	07:37 16:42	Rain: none Humidity: 82% Wind: F3-F5 Minimum night time temperature: 8°C from 07:20 onwards, otherwise minimum temperature of 9°C
11 February 2020	7:21 16:59	Rain: none Humidity: 81% Wind: F4-F6 Minimum night time temperature: 2°C
12 February 2020	7:19 17:01	Rain: light rain and rain from 00:50 – 7:20 Humidity: 93% Wind: F2-F5 Minimum night time temperature: 3°C
13 February 2020	7:17 17:03	Rain: very light rain between 20:20 – 20:50 Humidity: 93% Wind: F2-F4 Minimum night time temperature: 4°C at 6:50, otherwise 5°C
14 February 2020	7:15 17:05	Rain: none Humidity: 94% Wind: F4 Minimum night time temperature: 9°C
15 February 2020	7:13 17:07	Rain: light rain between 7:20 and 18:50, at 21:50 and between 3:50 and 4:50 Humidity: 88% Wind: F6-F7 Minimum night time temperature: 13°C
16 February 2020	7:11 17:08	Rain: none Humidity: 81% Wind: F4-F6 Minimum night time temperature: 6°C

Date and Time	Sunrise and sunset time	Weather conditions (wind speed is given in Beaufort scale)
17 February 2020	7:09 17:10	Rain: none Humidity: 87% Wind: F3-F5 Minimum night time temperature: 4°C
18 February 2020	7:07 17:12	Rain: light rain and rain from 17:50 to 19:20 Humidity: 87% Wind: F4-F5 Minimum night time temperature: 2° from 5:50 onwards, otherwise 3°C

*the survey times differ from the recommended 0.5-hours before sunset to 0.5-hours after sunrise (see Section 3.5.8) for tree nine between 2 January and 14 January 2020 due to a technical error (see Section 3.6.4) (**TR010038/APP/6.1**).

Automated survey results

4.2.2. The following tables summarise the data obtained from the static detectors which were deployed at three locations between December 2019 and February 2020. The data are presented as the number of detections recorded of each species per night. Dates where no detections 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.

Table 4.2-2: results from the static detector at tree one, shown as the number of bat passes per species

Tree 1				
Date	**Barbastelle**	**Common pipistrelle**	**Pipistrelle sp.**	**Myotis sp.**
15 December 2019				1 (19:18)
16 December 2019	1 (17:53)			
19 December 2019		2 (both passes at 01:34)	1 (02:09)	

Table 4.2-3: results from the static detector at tree eight, shown as the number of bat passes per species

Tree 8			
Date	**Barbastelle**	**Common pipistrelle**	**Soprano pipistrelle**
3 December 2019	2 (17:45, 17:51)		
5 December 2019	1 (17:18)	1 (03:52)	

Tree 8			
Date	**Barbastelle**	**Common pipistrelle**	**Soprano pipistrelle**
6 December 2019			31 (15:59, 21.22, F)
7 December 2019			11 (15:55, 17:24, F)
10 December 2019			1 (23:20)
28 January 2020		2 (17:21, 18:20)	
31 January 2020		3 (17:22, 21:38)	2 (17:29, 17:31)
2 February 2020		1 (04:10)	

Table 4.2-4: results from the static detector at tree nine, shown as the number of bat passes per species

Tree 9					
Date	**Barbastelle**	**Common pipistrelle**	**Soprano pipistrelle**	**Potential brown long-eared**	**Myotis sp.**
5 December 2019		1 (03:51)			
16 December 2019		7 (17:20, 17:37, F)			
2 January 2020		3 (00:56, 01:04)			
6 January 2020		2 (22:35, 00:30)			
7 January 2020		1 (23:43)			
8 January 2020		6 (17:31, 17:55, F)	2 (18:23, 18:40)		
14 February 2020		2 (18:10, 18:18)		1 (19:52)	1 (21:01)
17 February 2020			1 (18:43)		1 (18:38)

5. Conclusions, impact assessment and requirements

5.1. Conclusions

Bat roosts

5.1.1. No hibernation roosts were conclusively identified during this survey. 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 and, on some occasions, foraging has been recorded include 6 and 7 December 2019 where 31 and 11 soprano pipistrelles were recorded respectively at tree eight, 16 December where seven common pipistrelle passes and foraging was recorded at tree nine, and 8 January 2020 where six common pipistrelles and 2 soprano pipistrelles were recorded.

Tree one

5.1.2. Tree one, which was not assessed for hibernation BRP in 2019 due to access restrictions (see Table 2.1.7), was subject to a ground level assessment on 21 February 2020 and automated surveys in December 2019 and February 2020 (**TR010038/APP/6.1**). No automated surveys were undertaken at tree one in January 2020 due to access restrictions. As tree one is covered in ivy it was not possible to identify any features which may offer hibernation BRP from the ground level assessment. It is considered that an aerial assessment, either climbed or using a MEWP, would not be beneficial as visibility would remain poor due to the ivy and in addition the ivy causes health and safety concerns with regard to a climbed aerial assessment.

Trees eight and nine

5.1.3. A ground level hibernation BRP assessment of trees eight and nine was undertaken in 2019 (Sweco, 2019) which was inconclusive in determining hibernation BRP in these trees (see Table 2.1.7) (**TR010038/APP/6.1**). Trees eight and nine were surveyed only through automated survey between December 2019 and January 2020, as it was not considered safe to climb these trees in order to undertake an aerial assessment and aerial inspections with a MEWP, which were highlighted as a requirement following surveys in 2019 (Sweco, 2019), were not commissioned.

5.1.4. The surveys undertaken in 2019 recorded a Myotis sp. pass on a night where temperatures were below freezing following a cold spell and concluded that it

cannot be discounted that Myotis sp. hibernate in tree nine over winter (Sweco. 2019). Single Myotis sp. passes were recorded on two milder nights in February 2020, however due to the lack of a prolonged cold spell during the survey period it is not possible to determine any further whether Myotis may be hibernating in tree nine. As such the conclusions following the 2019 surveys, that a Myotis hibernation roost in tree nine cannot be discounted, are still considered accurate.

Bat activity

5.1.5. The automated surveys have revealed a minimum of four species active on site within the vicinity of the three surveyed trees: common and soprano pipistrelle, Myotis sp. and barbastelle, in addition to one potential brown long-eared pass.

5.1.6. Bat activity was detected in relatively low numbers (<10 bat passes per night near any one tree) during the automated surveys with the exception of 6 and 7 December 2019 at tree eight where 31 and 11 soprano pipistrelle passes occurred respectively. This slightly higher level of activity could be attributed to these nights being relatedly warm (7-12°C on 6 December and 8°C minimum on 7 December, see Table 4.2.1) for the December month which could result in more bats leaving their roosts and foraging, including in areas further from roosts (**TR010038/APP/6.1**). These bats may be from roosts/hibernacula further away from the tree surveyed.

5.1.7. Higher levels and more frequent common pipistrelle activity was recorded at tree nine and soprano pipistrelle activity was recorded at tree eight in comparison to the activity recorded at tree one, however it must be noted that tree one was monitored for a shorter period (see Table 3.1.5) due to access limitations (3.2.3) (**TR010038/APP/6.1**).

5.2. Impact assessment

5.2.1. As it is not possible to conclude with a degree of certainty whether bats are or are not hibernating in trees one, eight and/or nine based upon this data an accurate impact assessment on hibernating bats cannot be undertaken.

5.2.2. However, should a hibernation roost be present in tree nine it would be lost as it is within the footprint of a proposed slip road. A hibernation roost in tree one (which is within the DCO boundary and approximately 37m from the footprint of the proposed mainline) would be expected to be impacted by increased levels of noise and light during construction and operation. It is uncertain whether tree one would be directly impacted by the works at this stage. Should a hibernation roost be present in tree eight (which is 30m from the DCO boundary) potential adverse impacts include disturbance during the construction phase by increases in noise and light levels, however adverse impacts during operation from

increased disturbance is considered less likely as tree eight is approximately 114m from the footprint of the proposed mainline.

5.3. Future requirements

5.3.1. Trees eight and nine shall be subject to an aerial inspection using a MEWP to assess their hibernation BRP, as was detailed as a requirement following the surveys undertaken in February 2019 (Sweco, 2019). Should the aerial assessment of either of these trees conclude that the tree does not have potential as a hibernation roost for bats the static monitoring surveys recommended in Section 5.3.2 (Future requirements) below need not be undertaken on that tree (**TR010038/APP/6.1**).

5.3.2. As the minimum survey effort of static monitoring for a minimum of two weeks each month between January – February (see Section 3.1.5 (Automated surveys) (Collins, 2016)) was not achieved due to limitations outlined in Section 3.2 (Automated surveys) it is recommended that a full suite of static monitoring of trees one, eight and nine is undertaken in accordance with Collins (2016) prior to the commencement of works (**TR010038/APP/6.1**).

5.3.3. These further surveys will inform the need for mitigation. Tree one, for which an aerial assessment would be considered not beneficial (see Section 5.1.2) (Tree one), is within the DCO boundary approximately 37m from the works footprint (see Section 5.2.2.) (Impact Assessment) (**TR010038/APP/6.1**). This tree should be retained if possible.

References

5.3.4. CIEEM (2019). Advice Note on the Lifespan of Ecological Reports and Surveys. Available online at: https://cieem.net/resource/advice-note-on-the-lifespan-of-ecological-reports-and-surveys/ (Accessed 13/01/2020).

5.3.5. Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). London: The Bat Conservation Trust.

5.3.6. Multi-Agency Geographical Information for the Countryside. Available online at: http://magic.defra.gov.uk/ (Accessed 13/01/2020).

5.3.7. Norfolk Biodiversity Partnership (2020). Habitats and Species (online). Available at: http://www.norfolkbiodiversity.org/habitats-and-species/ (Accessed 30/11/2020).

5.3.8. Sweco (2019). A47 North Tuddenham to Easton Bat Hibernation Survey Report. P01.

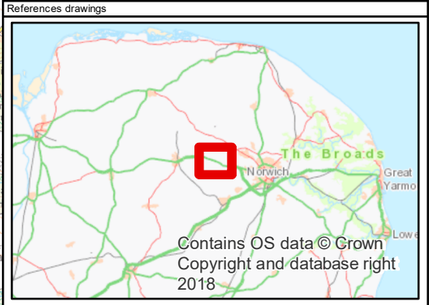
5.3.9. Timeanddate.com (2020). Available online at: https://www.timeanddate.com/ (Accessed 1/12/2020)

Annex A. Trees and survey locations plan

Key to symbols

- Static Receptor Locations
- DCO Boundary

References drawings



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P02	03/05/2019	Scheme boundary inserted, basemap changed	AC	AW	DW
P01	05/04/2019	FOR INFORMATION	AC	AW	DW

SWECO
Grove House
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Tel : +44 (0)113 262 0000

Client: GallifordTry

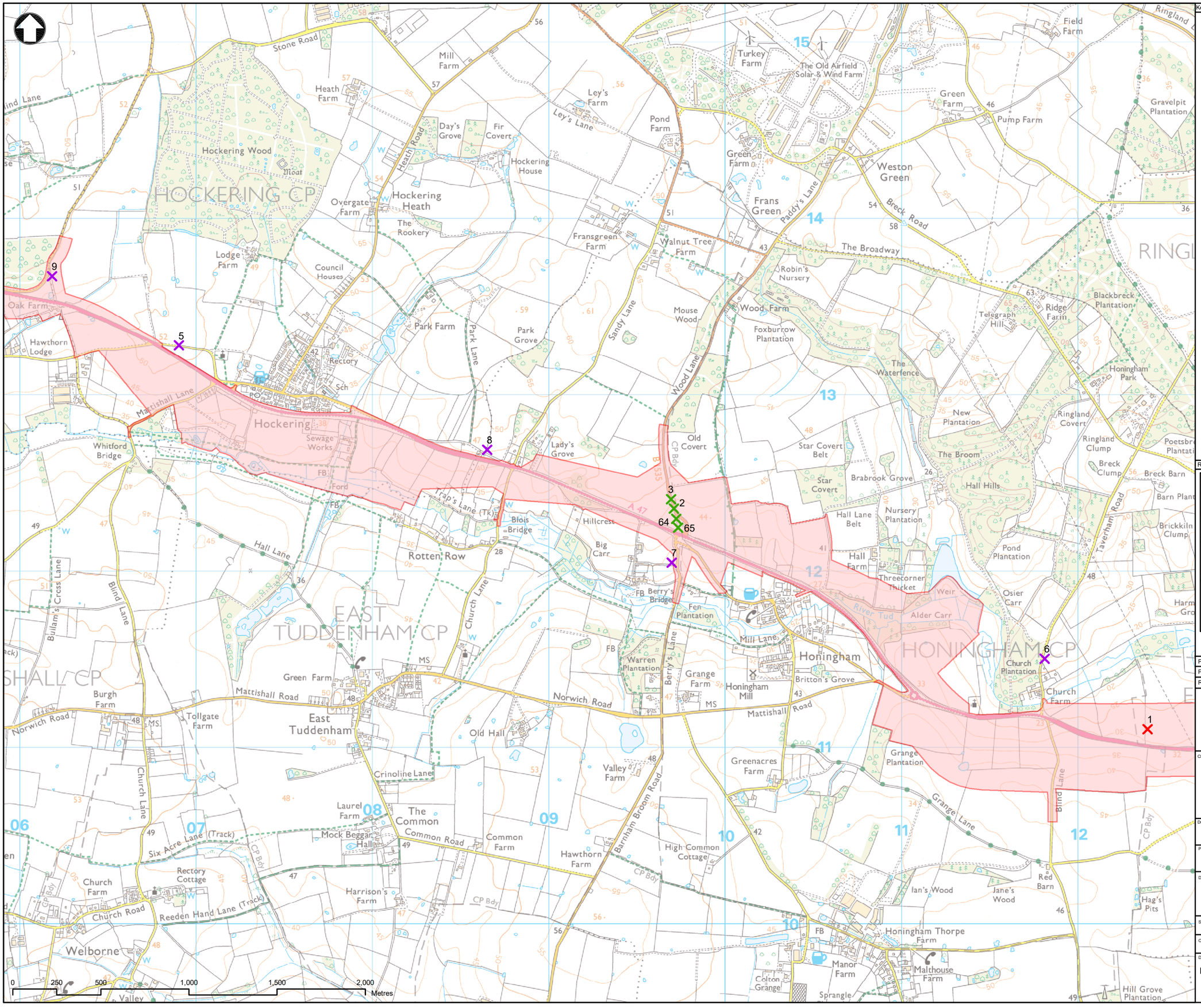
Drawing Status	Suitability
For Information	S0

Project Title: A47 - North Tuddenham to North Easton

Drawing Title: Static Receptor Locations for Bat Hibernation Survey

Scale	Designed	Drawn	Checked	Approved
1:25,500	West, Adam	Corcoran, Ant	Bell, Fran	Wood, Diane
Original Size	**Date**	**Date**	**Date**	**Date**
A3	03/5/2019	03/5/2019	03/5/2019	03/5/2019

Drawing Number HE PIN	Originator	Volume			Project Ref. No.
HE551489	- GTY	- EDB	-		HE551489
000	- DR	- LX	- 00001		Revision P01
Location	Type	Role	Number		

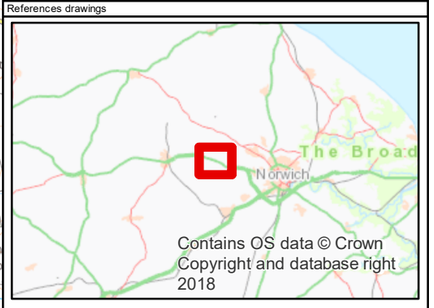


Key to symbols

Inspection Type

- Aerial Inspection
- Ground Inspection
- Not Accessed
- DCO Boundary
- "1" Tree ID Number

References drawings



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P02	03/5/2019	Scheme boundary inserted, basemap changed	AC	AW	DW
P01	05/04/2019	FOR INFORMATION	AC	AW	DW

SWECO
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Client: GallifordTry

Drawing Status: For Information

Suitability: S0

Project Title: A47 - North Tuddenham to North Easton

Drawing Title: Tree Inspection for Bat Hibernation Survey

Scale	Designed	Drawn	Checked	Approved
1:20,000	West, Adam	Corcoran, Ant	West, Adam	Wood, Diane
Original Size	**Date**	**Date**	**Date**	**Date**
A3	03/05/2019	03/05/2019	03/05/2019	03/05/2019

Drawing Number: HE PIN HE551489 | Originator GTY | Volume EDB | Location 000 | Type DR | Role LX | Number 00002

Project Ref. No.: HE551489

Revision: P01