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Land west of Roundstone Lane, Angmering, West Sussex

Protected Species Surveys: Bats, Badger and
Great Crested Newt

May 2021



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Protected Species Surveys: Bats, Badger and Great Crested Newt

Client:	Sigma Homes	
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Abbreviations

BCT	Bat Conservation Trust
CHS	Conservation of Habitats and Species Regulations 2017 (as amended)
EPS	European Protected Species
LNR	Local Nature Reserve
LWS	Local Wildlife Site
MAGIC	Multi-Agency Geographic Information for the Countryside
NE	Natural England
NERC	Natural Environment and Rural Communities (Act 2006)
NNR	National Nature Reserve
NPPF	National Planning Policy Framework
PEA	Preliminary Ecological Appraisal
PRA	Preliminary Roost Assessment
PRF	Potential roost feature
SAC	Special Area of Conservation
SSSI	Site of Special Scientific Interest
SxBRC	Sussex Biodiversity Records Centre
TN	Target Note
WCA	Wildlife and Countryside Act 1981 (as amended)

0 Executive Summary

- 0.1.1 A Preliminary Ecological Appraisal (PEA) was carried out in October 2020 (UEEC, 2021) for the site of a proposed residential development at Land west of Roundstone Lane, Angmering, West Sussex. It was recommended that further surveys for bats, badgers and great crested newt (GCN) should be carried out due to the presence of favourable habitat, field signs and potential roosting features within and in close proximity to the site and within an existing building.
- 0.1.2 The survey approach involved: an emergence and return-to-roost survey to establish the presence or likely absence of bats within existing building B1; repeat site walkovers and an extended period of camera trap monitoring outside one possible badger sett entrance to determine whether the potential sett was active and to assess the level of use; and an eDNA water sample survey for the presence or likely absence of GCN.
- 0.1.3 One dusk emergence of building B1 was carried out on 17 May 2021. No bats were recorded emerging from the building during the survey. Low levels of foraging and commuting activity were recorded within and around the survey area by all surveyors.
- 0.1.4 Over the monitored period of 51 nights, there were no observations of badgers entering and exiting the monitored hole, but there were 16 observations of rabbit entering or existing the monitored hole. No further field signs of badger were recorded on any further site walkovers.
- 0.1.5 Pond P1 tested negative for great crested newt during the eDNA survey.
- 0.1.6 The survey results provide a good level of confidence that bats were absent from building B1 during the 2021 peak breeding season. There are very unlikely to be any direct or indirect impacts to bats or their breeding/resting places as a result of the proposed development. Bats are not considered to present a constraint to development proposals for the site.
- 0.1.7 Although suitable foraging and sett creation habitat exists on site, no badgers were recorded throughout the monitoring period and no further evidence of badger was found. Given the finding of badger hair in the entrance hole during the initial site walkover, it is possible that the hole was originally excavated or partially excavated by a badger and is a disused outlier tunnel.
- 0.1.1 No GCN DNA was detected in pond P1. Water samples were collected during the currently accepted period (15 April to 30 June) for reliably demonstrating proof of presence or absence and surveyors strictly adhered to the current eDNA survey protocol. The results are therefore considered to provide a good level of confidence in the absence of GCN from this pond. It is concluded great crested newt is likely to be absent from the site.
- 0.1.2 No specific avoidance, mitigation or compensation measures for bats, badger or GCN are required to be implemented as part of the currently proposed scheme because these species were not recorded. Precautionary measures in addition to those given in the PEA are advised and are listed in Table 0.1, and ecological enhancements are also proposed.

Table 0.1: Summary of recommendations

#	Recommended precautionary measures
R1	The current report is based on one presence/absence survey for Building B1 during the 2021 active season, which is proportionate to the buildings' suitability for roosting bats. If commencement of the works is significantly delayed (e.g. by more than 18 months from the survey date), updated active season surveys will need to be undertaken to record any changes in roosting status.
R2	The survey results indicate that bats are likely to be absent from buildings B1. In the unlikely event that bats are encountered during the works, site operatives will be advised to cease activity in the vicinity while advice from an ecologist is sought. The ecologist will then assess the most appropriate course of action before works continue.
R3	Avoid the use of external lighting or keep its use to the minimum required for its intended purpose, during both construction and operation. This will be of benefit to nocturnal species e.g. bats. Where external lighting is to be provided, it should be low-level, directional lighting with minimal spill and glare, and consideration should be given to reduced hours of operation and/or a movement responsive system of control. Use narrow-spectrum bulbs and light sources that emit minimal UV light, avoiding white and blue wavelengths of the spectrum. Use glass lantern covers instead of plastic to filter UV light. Lighting of the hedgerows around the site will be avoided.
R4	Badger's use of the landscape is dynamic and can change rapidly. A repeat sett search and field sign survey will be undertaken within one month prior to commencement to assess any new risk of impacts to badgers.

1 Introduction

1.1 Background

- 1.1.1 A Preliminary Ecological Appraisal (PEA) was carried out in October 2020 (UEEC, 2021) for the site of a proposed residential development at Land west of Roundstone Lane, Angmering, West Sussex (Grid Reference: 507298, 103447). It was recommended that further surveys for bats, badgers and great crested newt (GCN) should be carried out due to the presence of favourable habitat, field signs and potential roosting features (PRF) within and in close proximity to the site and within an existing building (B1 on the Phase 1 Habitats Plan, Appendix I).

1.2 Objectives and Approach of the Study

- 1.2.1 This study was commissioned to fulfil the following objectives for bats, badgers and GCN:
- ❖ To determine the presence or likely absence of roosting bats, badgers or GCN within the site or adjacent habitats which may be affected by works on the site;
 - ❖ To establish the baseline assemblage and relative abundance of bat species, badger or GCN using the site;
 - ❖ To identify and evaluate the types of roost present and assess the potential impacts of the development on bats;
 - ❖ To provide sufficient data to inform European Protected Species Mitigation Licence applications, if required; and
 - ❖ To outline the measures required for avoiding and mitigating negative impacts, including compensation of habitat losses if necessary, and make recommendations for ecological enhancement.
- 1.2.2 To meet these objectives the survey approach involved:
- ❖ An emergence and return-to-roost survey of potential bat roost features likely to be affected by proposed development, based on current industry guidelines (Collins (ed.), 2016), to establish the presence or likely absence of bats.
 - ❖ An extended period of camera trap monitoring outside one possible sett entrance (TN8, Appendix I) to record animal activity, to determine whether the potential sett was active and to assess the level of use.
 - ❖ An eDNA water sample survey for the presence or likely absence of GCN in pond P1 located c.45m south-west of the site (see the Pond Map at Appendix II).

1.3 Survey Area

- 1.3.1 The site lies in the southern extent of the village of Angmering in the Arun district of West Sussex. The site comprises c.1.37ha of previously developed land predominantly comprising hardstanding, bare ground and buildings (see Appendix I). The site is bounded to the east by Roundstone Lane and a residential house with a large garden, and to the south, west and north by industrial estates and derelict land. The extent of the survey area is outlined in red on Figure 1.1.
- 1.3.2 The wider landscape is characterised by sprawling suburban development, a patchwork of arable and pasture farmland, large areas of amenity grassland, some hedgerows and lines of mature trees.

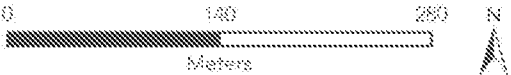
1.4 Proposed Construction Activities

- 1.4.1 It is understood that planning consent is being sought for demolition of existing buildings and construction of 40 dwellings together with parking, access, landscaping, and associated facilities. Figure 1.2 illustrates the proposed site layout.

Roundstone Lane,
Angmering,
West Sussex

 Survey area

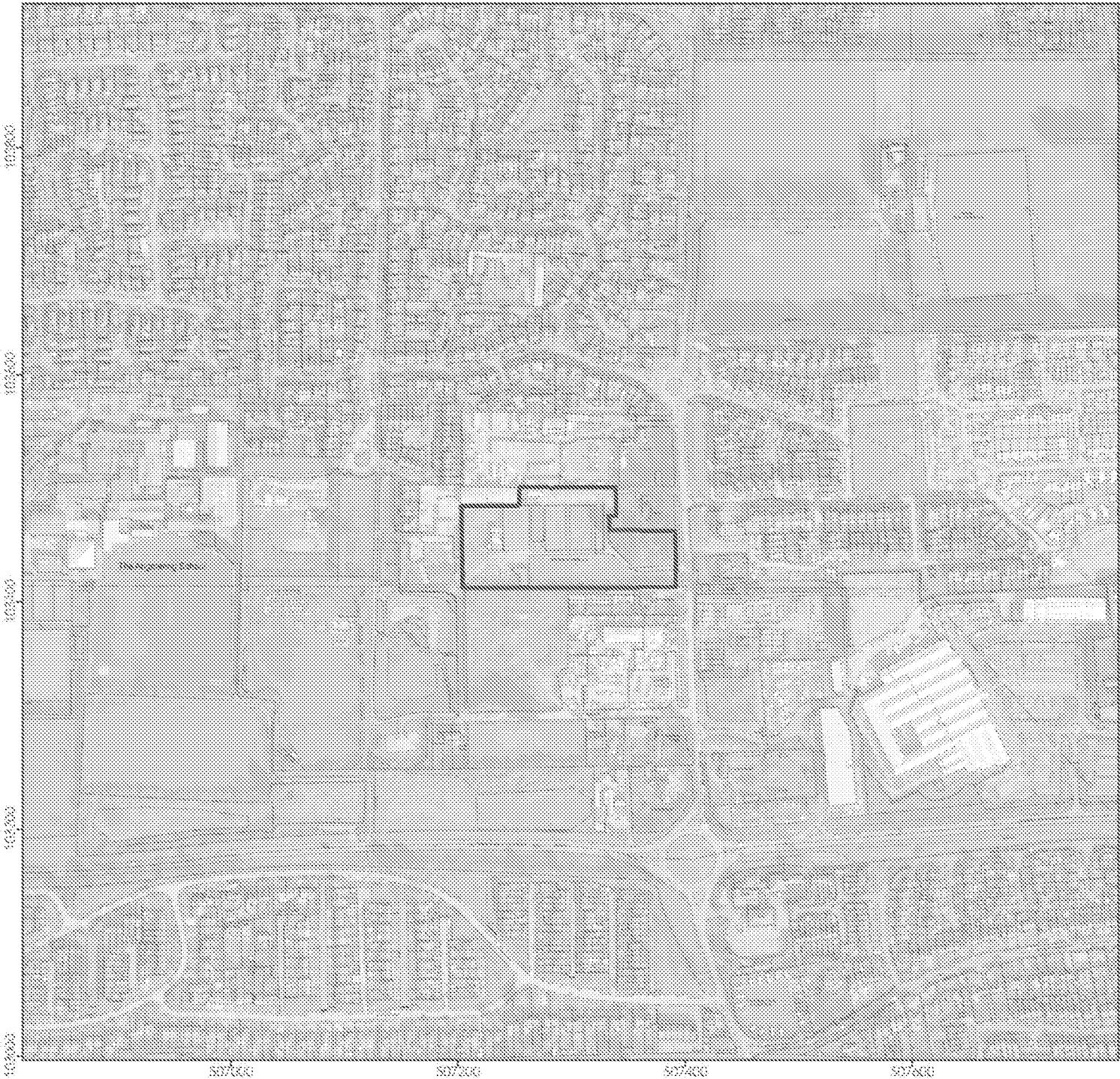
Figure 1.1: Survey area

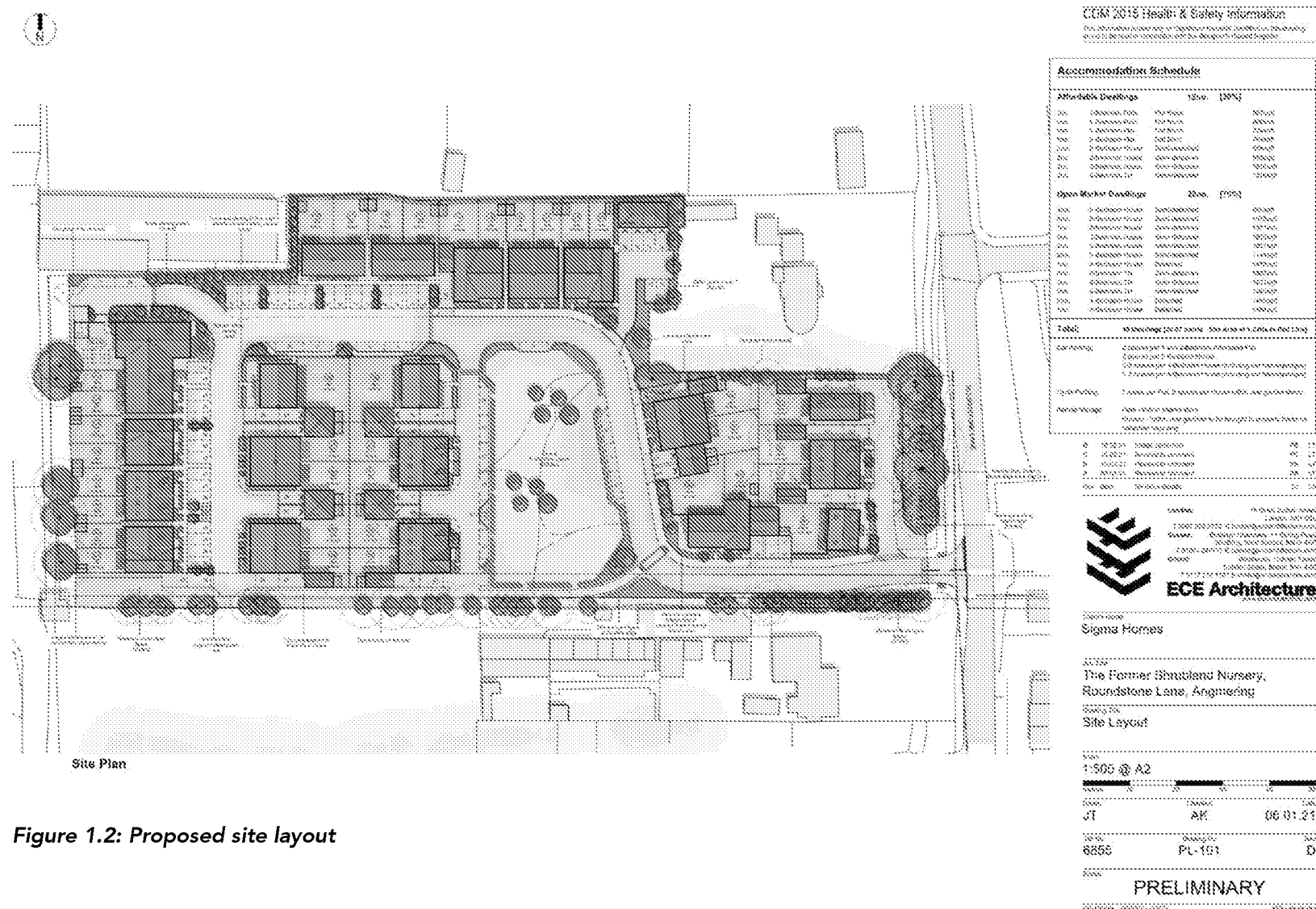


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Scale: 1:5,000 Created by: AD
Date: Nov 2020 Reviewed by: NP
Drawing number:
UR04105CD-SIN201103

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2 Methods

2.1 Field Survey

2.1.1 Field survey work undertaken for the project utilised a range of techniques in order to assess the usage of the site by bats, badger and GCN. These included:

- ✦ One presence/absence survey for bats in building B1.
- ✦ An extended period of camera trap monitoring outside one possible sett entrance to record animal activity, to determine whether potential setts were active and to assess the level of use.
- ✦ An eDNA water sample survey for the presence or likely absence of GCN in pond P1.

2.2 Presence/Absence Surveys

Bats

2.2.1 Where a structure/tree is found to contain evidence of roosting bats, or judged to be potentially suitable as a roost, then further surveys are required prior to undertaking works in order to confirm whether bats are currently present or are likely to be absent. These surveys typically take the form of emergence surveys (carried out as the bats leave the roost at dusk) and re-entry surveys (as bats return to the roost at dawn) and can be carried out between May and September (May to August being the optimal period).

2.2.2 Current guidelines (Collins (ed.), 2016) recommend the minimum levels of presence/absence survey effort for structures and trees, based on their overall suitability for roosting bats; see Box 1. In this instance, the PEA concluded that building B1 was of low potential, while all other buildings on site were assessed as negligible. No trees on site required further presence/absence surveys following the completion of a ground-level tree assessment (GLTA). The methods and results of these preliminary surveys are described in detail in the Preliminary Ecological Appraisal report (UEEC, 2021). The presence/absence survey was undertaken using a three-person survey team. Appendix III presents a map of surveyor positions.

Box 1: Recommended minimum survey effort for presence/absence surveys (Collins, 2016)

Low roost suitability	Moderate roost suitability	High roost suitability
One survey visit: One dusk emergence or dawn re-entry survey	Two survey visits: One dusk emergence and a separate dawn re-entry survey	Three survey visits: At least one dusk emergence & at least one separate dawn re-entry survey

2.2.3 The emergence survey commenced a quarter of an hour before sunset and continued for 2 hours after sunset. The objective was to establish the presence or likely absence of bats within building

B1 and, if present, to determine the assemblage and relative abundance of bat species using the features, and identify the type(s) of roost (e.g. day roost or maternity roost).

- 2.2.4 Detection equipment included Wildlife Acoustics Echo Meter Touch, EM Touch2 Pro and EM3 full spectrum detectors. Recordings of bat calls were analysed using BatSound (v4) and Kaleidoscope Pro (v5.1.9) software. The number of bats leaving/entering each building were noted, together with observations regarding point of emergence/re-entry, type of behaviour and areas of particularly high activity. Survey covariates were also noted (minimum/maximum air temperatures, wind speed/direction, precipitation and cloud cover). Table 2.1 shows the dates and weather conditions for each survey visit.

Table 2.1: Survey dates and weather conditions

Date	Dusk/dawn	Weather conditions
17 May 2021	Dusk	9.7°C – 12.6°C, 25 - 100% cloud cover, light wind (Beaufort scale 2), no precipitation

Badger

- 2.2.5 Surveys comprised detailed site walkovers (including within a 30m buffer around the site where access allowed) to search for signs of badger activity (after Harris, Creswell & Jeffries, 1989), coupled with monitoring of a potential badger sett entrance using camera traps, with reference to Natural England's standing advice on badgers.
- 2.2.6 Field sign surveys comprised a detailed investigation of all suitable areas of habitat for foraging and sett creation (subject to safe access) to record badger activity within the site, including:
- ✦ Dung pits: badgers usually deposit faeces in characteristic excavated pits, concentrations of which (latrine sites) are typically found at home range boundaries;
 - ✦ Setts: comprising either single isolated holes or a series of holes, likely to be interconnected underground. Sett searches included the entire site plus a minimum buffer of 30m, subject to safe access;
 - ✦ Runs/trails: paths between setts or leading to feeding areas;
 - ✦ Scratching posts at the base of tree trunks;
 - ✦ Snuffle holes: small scrapes where badgers have searched for insects, earthworms and plant tubers;
 - ✦ Day nests: bundles of grass and other vegetation where badgers may sleep above ground;
 - ✦ Hair traces; and
 - ✦ Footprints.
- 2.2.7 A comprehensive site walkover was carried out on 2 October 2020 to search for badger setts and field signs and was undertaken alongside the Phase 1 Habitat Survey by an experienced ecologist (Jeff Turton BSc (Hons) ACIEEM). A repeat site walkover to search for any newly formed badger setts or field signs was undertaken on 23 February 2021, 23 March 2021 and 15 April 2021 alongside site visits to refresh cameras or while surveying for other fauna. During the initial site

walkover on 2 October 2020, a mammal hole was discovered in the western part of the site (TN8 on the Phase 1 Habitats Plan, Appendix I) which was of sufficient size for badger, had fresh spoil and badger hair.

- 2.2.8 One Bushnell TrophyCam HD movement-triggered infrared camera was deployed on site, with the lens trained on the potential sett entrance. Survey dates and objective are reported in Table 2.2.
- 2.2.9 The camera recorded both still image and video footage, and was set to operate day and night, capturing one image per trigger event. The objective was to record animal activity to determine whether potential setts were actively used by badgers and to assess the level of use.

Table 2.2: Badger survey dates and survey details

Date	Survey objective
2 October 2020	Comprehensive site walkover for badger undertaken alongside Phase 1 Habitat Survey
23 February 2021	Camera setup and site walkover
23 March 2021	Battery change, download of data, site walkover
15 April 2021	Download of data, retrieval of camera, site walkover

Great Crested Newt

- 2.2.10 Great crested newt (GCN) surveys were based on standard industry guidelines (Biggs *et al.*, 2014; English Nature, 2001) and Natural England's standing advice¹ for GCN. Two ponds within 500m of the survey area were recorded during the PEA and subjected to a habitat suitability index (HSI) but only one of these (P1) was considered suitable for GCN and likely to present a constraint to development proposals (UEEC, 2021). P2 was found to have been incorrectly mapped as a pond and was instead part of a skate park. P1 was subsequently targeted for environmental DNA (eDNA) survey.
- 2.2.11 The objective of the survey was to establish the presence or likely absence of GCN from potentially suitable breeding ponds. The eDNA water sampling followed the methodology set out in Natural England's 'Technical advice note for field and laboratory sampling of great crested newt environmental DNA' (Biggs *et al.*, 2014), which is provided as an appendix of the research report published by Defra into environmental DNA testing for great crested newts. This is the only methodology currently accepted by Natural England for this technique.
- 2.2.12 A single visit to pond P1 was made on 15 April 2021. At the time of the survey, the following information was collected:
- ✧ Site name;
 - ✧ Nearest settlement;

¹ Natural England (2015): *Great crested newts: surveys and mitigation for development projects*. Accessed online at: <https://www.gov.uk/guidance/great-crested-newts-surveys-and-mitigation-for-development-projects>

- ❖ County;
- ❖ Time between receipt of sampling kit and date of sampling;
- ❖ Date of sampling;
- ❖ Personnel collecting sample;
- ❖ Ordnance Survey grid reference (12 figures);
- ❖ Percentage of pond perimeter that is accessible for survey;
- ❖ Data on inflows, and whether these were wet or dry at the time of survey;
- ❖ Data on presence and number of great crested newts recorded during the survey (if any);
- ❖ Information on any difficulties experienced during sample collection.

2.2.13 The following methodology for the sampling procedure for eDNA analysis was applied in the field in accordance with the survey protocol (Biggs *et al.*, 2014):

- ❖ 20 samples of 30ml each were taken from around the perimeter of the pond, as equally spaced as possible. The locations of the samples were chosen to sample the entire margin with specific effort made to target areas where there may be newt egg laying and/or displaying activities.
- ❖ The sample ladle was stirred gently in the pond before the sample was retrieved in order to mix the water column, with care being taken not to stir up the sediment.
- ❖ All 20 samples were emptied as they were collected into a Whirl-Pack bag, which was then sealed and shaken for 10 seconds to mix the samples.
- ❖ Upon mixing, and using a sterile pipette, exactly 15ml of the sample was transferred from the Whirl-Pack bag into each of the six sterile tubes, which contained 35ml of ethanol. The sample was stirred between filling each tube to homogenize the water.
- ❖ Once filled to 50ml, each tube was mixed for 10 seconds to mix the sample and preservative Date of sampling;
- ❖ Samples were returned to the office and either dispatched at ambient temperature immediately for analysis or stored at 2-4°C in a refrigerator dedicated for this purpose.

2.2.14 The following precautions were adhered to, which ensured that no cross-contamination of samples occurred:

- ❖ Sterile gloves were worn by all surveyors at all times during the sampling process;
- ❖ Gloves were replaced with a new pair of gloves between sample collection from the pond and pipetting into the sterile preservation tubes; and
- ❖ Samples were collected without the surveyor entering the water (i.e. the surveyors stood on the pond bank or edge).

2.2.15 The laboratory used for analysis of the samples was SureScreen Scientifics Division Ltd, Morley Retreat, Church Lane, Morley, Derbyshire, DE7 6DE, which is participating in Natural England's proficiency testing scheme.

- 2.2.16 Water samples from P1 were collected on 15 April 2021 using eDNA kits provided by SureScreen. The samples were received by the laboratory on 19 April 2021. Results were received on 22 April 2021.

2.3 Evaluation

Bats

- 2.3.1 The potential suitability of roosting and foraging/commuting habitats is classified as negligible, low, moderate or high with reference to Table 4.1 in the *Good Practice Guidelines* (Collins (ed.), 2016). The conservation significance of bat roosts is classified as low, moderate or high with reference to Figure 4 in the *Bat Mitigation Guidelines* (English Nature, 2004). However, these are relative terms which require an interpretation of the rarity of different species and regional variations therein. The terms are hence applicable within the survey area only and are intended to indicate which features of the survey area may be of importance to the conservation status of local bat populations.
- 2.3.2 Evaluation of the potential impacts on bats was undertaken with reference to Chapter 6 of English Nature (2004) and Natural England Standing Advice, with predicted impacts to each feature noted as of Low, Medium or High significance.

Badger

- 2.3.3 Badger setts are usually classified into four types as follows:
- ❖ Main Sett: Large well-established setts normally in continuous use. The main sett will form the most likely location for the raising of cubs.
 - ❖ Annex Sett: It is common for annex setts to be found in close association with the main sett and will often be linked to it by a well-worn path. Annex setts are often used to raise a second litter of cubs should a clan produce two litters within a season.
 - ❖ Subsidiary Sett: Subsidiary setts often have only a few holes and are usually at least 50m from a main sett. They are not continuously active.
 - ❖ Outlier Sett: These setts are used on an occasional basis and usually consist of only one to three entrance holes. Spoil heaps will generally be smaller than those found associated with the other sett types, indicating a smaller underground structure.
- 2.3.4 However, sett use varies over time as badgers respond to environmental factors such as food availability, competition with other social groups or sources of disturbance. In practice it is often difficult to distinguish between annex, subsidiary and outlier setts without extensive monitoring.

Great Crested Newt

- 2.3.5 A positive result means that great crested newts are present in the water or have been present in the water in the recent past (eDNA degrades over around 7-21 days).

- 2.3.6 A negative result means that great crested newt DNA was not detected and GCN are likely to be absent from the waterbody.
- 2.3.7 On rare occasions an inconclusive result is issued. This occurs where great crested newt DNA has not been detected but the controls have indicated that the sample has been degraded or the polymerase chain reaction (PCR) inhibited in some way. This may be due to undefined components in the water chemistry or may be due to the presence of high levels of sediment or algae in the sample. A re-test could be performed but a fresh sample would need to be obtained, and if water chemistry was the cause of the indeterminate then a re-test would most likely also return an inconclusive result.
- 2.3.8 Sediment content of each sample is visually recorded in the lab and reported on the results document. Inhibition and degradation results are also noted. If the result is recorded as evidence of decay (meaning that the degradation control was outside of accepted limits) or evidence of residual inhibition (meaning that the PCR reaction was inhibited) any negative result is recorded as indeterminate.

2.4 Limitations

- 2.4.1 The presence/absence survey for bats reported herein was carried out during May 2020. The survey was hence undertaken in accordance with the BCT's recommended timings for presence/absence surveys (Collins (ed.), 2016) with the survey occurring during the peak maternity period of May to August.
- 2.4.2 It should be noted that presence/absence surveys can only indicate likely absence and results are limited to the time in which the surveys were undertaken. Presence/absence surveys cannot establish absolute certainty that the species surveyed for are not there at any other time, and while suitable habitat remains on site there is the potential for protected species to start using the site.
- 2.4.3 There were no difficulties in gaining access to the site to carry out the presence/absence surveys. All elevations were all viewed directly. Weather conditions were generally good and within acceptable parameters. There were no equipment malfunctions or other limitations of relevance to the methods applied. See Appendix IX for general Legal and Technical Limitations which apply to this document.

2.5 Personnel

- 2.5.1 The personnel deployed on the survey are listed in Table 2.3.

Table 2.3: Survey personnel and qualifications

Feature / Task	Personnel
Bat presence/absence survey	Jeff Turton (lead), Tim Lees, Holly Harkness
Badger survey	Jeff Turton
GCN eDNA survey	Jeff Turton



Personnel	Qualifications
Jeff Turton BSc(Hons) ACIEEM	Ecologist with six years' professional consultancy experience. Licence to survey for great crested newt (WML-CL09).
Tim Lees	Senior Ecologist with eight years' professional consultancy experience. Licence to survey for bats (WML-CL17).
Holly Harkness	Ecologist with five years' professional consultancy experience. Holly holds a Natural England Class Licence to survey for great crested newt (WML-CL08).

3 Results

3.1 Presence/Absence Surveys

Emergence survey for bats

- 3.1.1 One dusk emergence of building B1 was carried out on 17 May 2021. Sample sonograms recorded at the site are given at Appendix V.
- 3.1.2 Sunset on 17 May was at 20.47; the survey started at 20.32 and ended at 22.32. No bats were recorded emerging from the building during the survey.
- 3.1.3 Low levels of foraging and commuting activity were recorded within and around the survey area by all surveyors. The surveyor at location 1 (JT on the Surveyor Positions Plan at Appendix III) recorded very low numbers of common pipistrelle *Pipistrellus pipistrellus* passes and one pass from a serotine *Eptesicus serotinus*. No landscape features of particular interest to bats were noted. The surveyor at location 2 (HH) recorded common pipistrelle only with a brief spell of foraging noted over the building and a tree to the east of the surveyor. The surveyor at location 3 (TL) also recorded common pipistrelle only, with activity noted as occasional. Some foraging was noted and one bat was seen commuting north over the building. TL recorded the first bat at 20:53, which was a common pipistrelle.

Camera trap monitoring for badger

- 3.1.4 Over the monitored period of 51 nights, there were no observations of badgers entering and exiting the monitored hole, but there were 16 observations of rabbit *Oryctolagus cuniculus* entering or existing the monitored hole. Other mammals captured on film during the monitoring period include wood mouse *Apodemus sylvaticus*, common shrew *Sorex araneus*, and red fox *Vulpes vulpes*. The wood mouse and shrew were using the hole for shelter, while the fox just investigated.
- 3.1.5 No further field signs of badger were recorded on any of the site walkovers.

eDNA water sampling for great crested newt

- 3.1.6 Pond P1 tested negative for great crested newt during the eDNA survey. The full results are presented at Appendix VI.

4 Evaluation

4.1 Introduction

- 4.1.1 This chapter presents an assessment of likely impacts to roosting bats, badgers and GCN as a result of the development proposals before making recommendations for avoidance, mitigation, enhancement or compensatory measures where necessary.

4.2 Roosting bats

Presence or absence of bats

- 4.2.1 The survey results provide a good level of confidence that bats were absent from building B1 during the 2021 peak breeding season.
- 4.2.2 Surveys were carried out at an appropriate time of year and weather conditions were within acceptable parameters. The results are therefore considered to provide an accurate account of the bat roost status of the building.

Species assemblage

- 4.2.3 Species diversity recorded during the presence/absence surveys included two species. Their local and national conservation status is listed in Table 4.1 (BCT, 2010; Mathews *et al.*, 2018; Russ, 2012; Sussex Bat Group²). Both of these species have previously been recorded within 2km of the site, as confirmed during the desk study (UEEC, 2021).

Table 4.1: Conservation status of recorded bat species (abundance and distribution)

Species	Sussex abundance/distribution	UK abundance/distribution	UK status
Serotine	Uncommon, widespread	Uncommon, widespread, southern England	Vulnerable
Common pipistrelle	Abundant, widespread	Widespread, abundant	Least concern

- 4.2.4 The survey results demonstrate that there are very unlikely to be any direct or indirect impacts to bats, their breeding/resting places or foraging/commuting habitats as a result of the proposed development. Bats are not considered to present a constraint to development proposals for the site.

² Sussex Bat Group website: Bats in Sussex. Accessed online [24/05/21] at: <http://www.sussexbatgroup.org.uk/batsinsussex>

4.3 Badgers

Presence or absence of badgers

- 4.3.1 The areas in the west of the site containing mounds of bare earth, or mounds colonised with ephemeral/short perennial vegetation, provide suitable badger habitat for both foraging and sett creation. In addition, the mixed plantation woodland and dense scrub to the east of the site, and hedgerows H2 and H3 at the boundaries of the site provide further foraging habitat. However, no badgers were recorded throughout the monitoring period and no further evidence of badger was found. Given the finding of badger hair in the entrance hole during the initial site walkover, it is possible that the hole was originally excavated or partially excavated by a badger and is a disused outlier tunnel. It has since been accommodated by rabbits.

4.4 Great Crested Newt

- 4.4.1 The site and its surroundings include one potentially suitable breeding pond, and areas of low-quality terrestrial habitat suitable for great crested newt.
- 4.4.2 No great crested newt DNA was detected in pond P1. Water samples were collected during the currently accepted period (15 April to 30 June) for reliably demonstrating proof of presence or absence and surveyors strictly adhered to the current eDNA survey protocol (Biggs *et al.*, 2014). The results are therefore considered to provide a good level of confidence in the absence of GCN from this pond.
- 4.4.3 It is concluded great crested newt is likely to be absent from the site. GCN is not considered to present a constraint to the development proposals and no further recommendations for this species are required.

4.5 Impact Assessment

Bat roosts

- 4.5.1 No bat roosts in buildings/structures will be affected by the proposals for the site. Roosting bats are not considered to present a constraint to development and no recommendations for avoidance and mitigation of impacts are necessary.

Foraging and commuting habitats

- 4.5.2 Habitats within the site include mixed plantation woodland, dense scrub, species-poor hedgerows and lines of trees, features which provide habitats of low to moderate suitability for foraging bats. The boundary hedgerows may serve as a navigation route or foraging feature for bats, but it is anticipated that these will be retained and protected during the works. Given the urban setting of the site and the likely high level of artificial lighting in the area, significant impacts to foraging /commuting bats are unlikely. No bat activity surveys were considered necessary (JEEC, 2021).

Badger

- 4.5.3 Badger are not considered to present a constraint to development and no recommendations for avoidance and mitigation of impacts are necessary.

Great crested newt

- 4.5.4 Great Crested Newt are not considered to present a constraint to development and no recommendations for avoidance and mitigation of impacts are necessary.

4.6 Recommendations for Avoidance, Mitigation and Compensation of Impacts

- 4.6.1 No specific avoidance, mitigation or compensation measures for bats, badger or GCN are required to be implemented as part of the currently proposed scheme because no roosting bats, active badger setts or evidence of GCN were recorded. However, precautionary measures are nevertheless advised and are listed in Table 4.2.
- 4.6.2 The precautionary measures given below are in addition to those given in the Preliminary Ecological Appraisal (UEEC, 2021) and do not supersede those given there.

Table 4.2: Recommended precautionary measures

#	Recommended precautionary measures
R1	The current report is based on one presence/absence survey for Building B1 during the 2021 active season, which is proportionate to the buildings' suitability for roosting bats. If commencement of the works is significantly delayed (e.g. by more than 18 months from the survey date), updated active season surveys will need to be undertaken to record any changes in roosting status.
R2	The survey results indicate that bats are likely to be absent from buildings B1. In the unlikely event that bats are encountered during the works, site operatives will be advised to cease activity in the vicinity while advice from an ecologist is sought. The ecologist will then assess the most appropriate course of action before works continue.
R3	Avoid the use of external lighting or keep its use to the minimum required for its intended purpose, during both construction and operation. This will be of benefit to nocturnal species e.g. bats. Where external lighting is to be provided, it should be low-level, directional lighting with minimal spill and glare, and consideration should be given to reduced hours of operation and/or a movement responsive system of control. Use narrow-spectrum bulbs and light sources that emit minimal UV light, avoiding white and blue wavelengths of the spectrum. Use glass lantern covers instead of plastic to filter UV light. Lighting of the hedgerows around the site will be avoided.
R4	Badger's use of the landscape is dynamic and can change rapidly. A repeat sett search and field sign survey will be undertaken within one month prior to commencement to assess any new risk of impacts to badgers.

4.7 Recommendations for Ecological Enhancement

- 4.7.1 The following ecological enhancements will be considered for the site to contribute towards achieving net gains for biodiversity in line with the requirements of local and national policy and guidance.

Roosting opportunities

- 4.7.2 The value of the site for bats can be enhanced by installing a range of artificial roost boxes. It is recommended that these are placed on retained mature trees within the development or hedgerows at the site boundaries, or incorporated within buildings facades. Boxes suitable for a wide range of species should be used, for instance:

- ❖ New buildings: integral bat tubes could be installed within buildings which face vegetated areas, particularly towards the east. Bat tubes can be incorporated into the design of the building so that only the access holes are visible from the exterior of the building. The Schwegler 1FR or 2FR Bat Tube is designed to meet the characteristic requirements of the types of bats that inhabit buildings such as pipistrelles *Pipistrellus spp.* or serotines *Eptesicus serotinus*. It is designed to be installed on the external walls of buildings, either flush or beneath a rendered surface.
- ❖ Pipistrelles *Pipistrellus sp.*: bat boxes suitable to install on mature trees either within or at the edges of the development include the Schwegler 1FF Flat Bat Box, or other manufacturer's equivalent.
- ❖ Noctules *Nyctalus spp.* and brown long eared bats *Plecotus auritus*: bat boxes suitable to install on mature trees either within or at the edges of the development include the Schwegler 2F General Purpose Bat Box or the 2FN Woodland Bat Box, or other manufacturer's equivalent.

- 4.7.3 General considerations for installation of bat boxes are listed in Box 3 below, while bat box specifications are listed at Appendix VII.

Plant species which encourage bats

- 4.7.4 It is recommended that new botanical species planting at the site aims to encourage a diverse range of invertebrate food sources and increased bat roost potential. The table at Appendix VIII lists suggested species of plants that can provide benefit for bats either by providing a food source for insects on which bats feed, or providing additional roosting opportunities (Gunnell et al., 2012). The plant species are predominantly native to Britain, but not all species will be suitable in all situations.

Box 2: Considerations & key requirements for crevice-dwelling bats (after Gunnell et al., 2013)	
Species	Barbastelle, serotine, Bechstein's, Brandt's, Daubenton's, whiskered, noctule, Leisler's, pipistrelles (common, soprano & Nathusius')
Consideration	Solution
Where in a development	Anywhere that the access is not illuminated by artificial lighting If possible they should be installed facing vegetation features such as mature hedgerows or trees, but with a clear line of flight for bats entering or leaving the roost
Where in a building	Summer maternity roosts in most southerly or westerly aspect for solar heating, or in a location that provides thermal stability Male roosts and winter hibernation roosts on northerly aspect
Height	2m–7m, preferably >4m above ground level
Dimensions	Any size as long as some components of the area are crevices of c.20-30mm wide Total area of >c.1m ² would be useful for summer maternity roosting Male roosts contain a smaller number of individual bats
Access dimensions	20mm–50mm (w) x 15mm–20mm (h)
Other considerations	Rough interior surface (for grip) Non-toxic and non-corrosive materials Absence of breathable roofing membranes to avoid the risk of entanglement Suitable thermal properties (reducing 24hr fluctuations), providing stability but allowing maximum thermal gain for summer roosts The use of thermal insulation materials for maternity roosts should be carefully considered in relation to other desired properties e.g. energy efficiency

5 Conclusions

5.1 Summary

- 5.1.1 The proposed development is unlikely to result in negative impacts to roosting bats, active badger setts or GCN. Proportionate measures are recommended to manage residual risks associated with the site's ongoing suitability for bats and badger. Considering the site's landscape context, no such measures are considered necessary for GCN.

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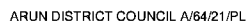
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Appendix I: Phase 1 Habitats Plan

Please see following page.

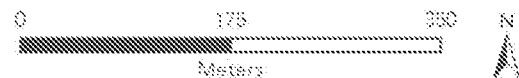


Appendix II: Pond Map

Please see following page.

Roundstone Lane, Angmering, West Sussex

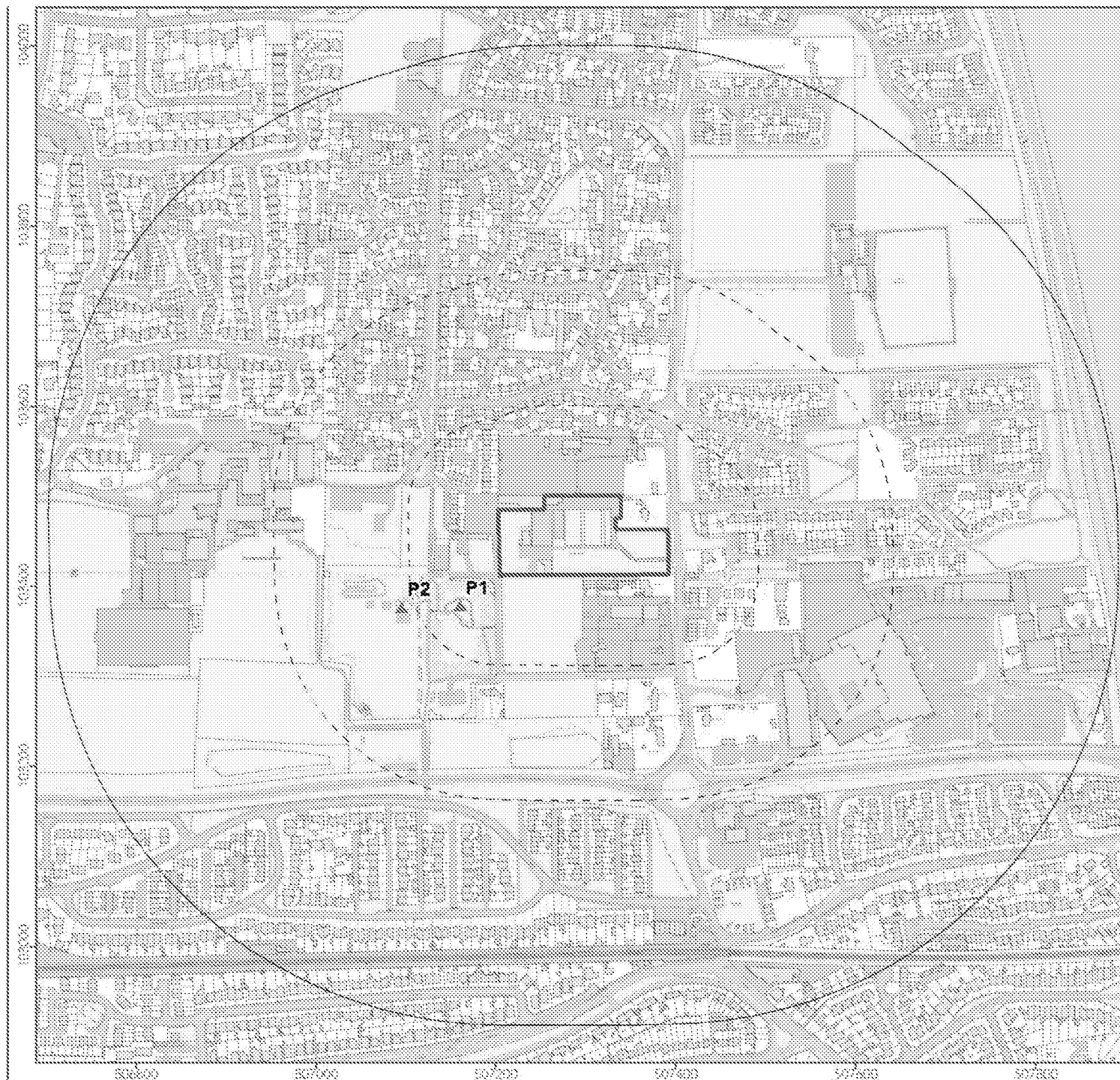
-  Survey area
-  Pond number
-  100m buffer
-  250m buffer
-  500m buffer



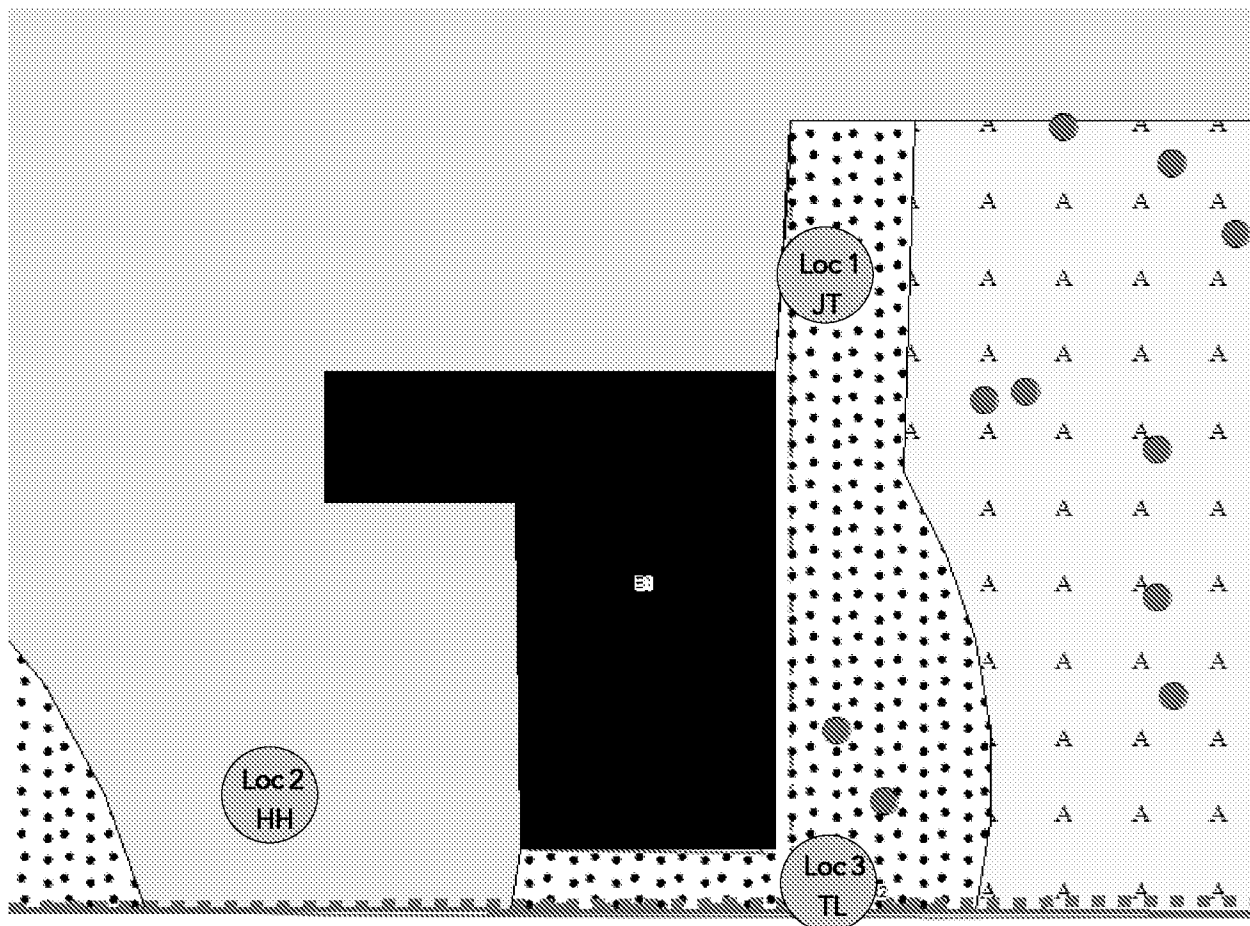
© Crown copyright and database rights 2020
Ordnance Survey 100031673

Scale: 1:6,300 Created by: AD
Date: Nov 2020 Reviewed by: NP
Drawing number:
UR04105CD-PW4201103

 **URBAN EDGE** Tel: 01273 566 756
ENVIRONMENTAL Email: hello@ueec.co.uk
CONSULTING Web: www.ueec.co.uk



Appendix III: Surveyor Positions



Appendix IV: Distribution, Ecology and Status

Bats

Distribution

There are eighteen native species of bats found in the UK. These range from relatively common and widespread species such as common pipistrelle *Pipistrellus pipistrellus* and brown long eared bat *Plecotus auritus* to the rare species such as Bechstein's bat *Myotis bechsteinii* and barbastelle bat *Barbastella barbastellus*.

Both common pipistrelle and brown long eared bats can be found throughout the UK. However, many other bat species have a much more limited distribution. The greater horseshoe bat *Rhinolophus ferrumequinum* is confined to south-west England and southern Wales and Bechstein's bat is located exclusively in the south of England. However it should be noted that there may still be areas of the country where bats are under recorded, and hence the distribution of species is not fully understood.

Ecology

The habitat preferences of different bat species are diverse, with some species being specialists and others more generalist. For instance Bechstein's bat typically forages and hibernates in mature woodland whereas Daubenton's bat *Myotis daubentonii* tends to hunt prey close to water. Pipistrelle bats on the other hand can be found foraging in almost any habitat and will roost in a variety of habitats ranging from hanging tiles on new buildings to beneath loose bark on trees.

Bat activity is highly seasonal and weather dependent. Generally they enter torpor when the temperature becomes unfavourable, usually from October to March, although bats may still emerge to feed on warmer nights. However, during the active period their behaviour is affected by weather conditions and breeding activity. Typically they are active in warm dry weather and are less active during heavy rain, high winds or in temperatures much below 10°C at dusk.

Mating occurs prior to hibernation with the young being born the following year around April and May. Female bats congregate in maternity roosts often numbering several hundred individuals and will give birth around June or July. Once the young are weaned the females will leave the roost to find mates prior to hibernation.

Status, Legislation and Policy

In the UK, the general trend is that bat populations have declined over the last century. In an attempt to halt this decline, all species of bat receive the greatest protection afforded by both European and UK wildlife legislation.

National legislation (Wildlife and Countryside Act 1981 (as amended)) gives full protection to the species and their habitats and this is further strengthened by European-derived legislation (Conservation of

Habitats and Species Regulations 2017 (as amended)) which provides protection from disturbance and disturbing activities. Under this legislation it is an offence to:

- ❖ Intentionally kill, injure or capture/take a bat.
- ❖ Intentionally or recklessly damage, destroy, or obstruct access to any structure or place of shelter or protection. This is taken to mean all bat roosts whether or not bats are present.
- ❖ Intentionally or recklessly disturb a bat while it occupies such a structure or place that it uses for shelter or protection.
- ❖ Sell, offer or expose for sale, or possess, or transport for the purpose of sale, any live or dead bat, any part of a bat, or anything derived from a bat.

Under the Habitats Regulations disturbance includes any activity which is likely to:

- ❖ Impair the ability of a bat to survive, breed, reproduce, or rear/nurture its young.
- ❖ Impair the ability of a bat to migrate or hibernate.
- ❖ Significantly affect the local distribution or abundance of the species.

Local Planning Authorities are obliged to have regard to conserving biodiversity when undertaking their functions. Section 40 of the Natural Environment and Rural Communities (NERC) Act 2006 states that public authorities must have regard to conserving, maintaining and enhancing biodiversity. Section 41 of the Act requires the Secretary of State to maintain a list of Habitats and Species of Principal Importance in England; the list includes several species of bat.

Furthermore, Government policy (National Planning Policy Framework – Section 15: Conserving and enhancing the natural environment) directs that planning decisions should be “*minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures*”.

Guidance and Best Practice

The methodology for the bat surveys was based on the latest *Good Practice Guidelines* from the Bat Conservation Trust (Collins (ed.), 2016; 3rd edition) as well as Natural England Standing Advice on bats. The following documents were used for reference:

- ❖ *Acoustic Ecology of European Bats: Species Identification, Study of their Habitats and Foraging Behaviour* (Barataud, 2015);
- ❖ Bat Conservation Trust websites; www.bats.org.uk and <http://roost.bats.org.uk/>;
- ❖ *Bat Mitigation Guidelines* (English Nature, 2004);
- ❖ *Bat Workers Manual* (Joint Nature Conservation Committee, 2004; 3rd edition);
- ❖ *Bats of Britain and Europe* (Dietz & Kiefer, 2016); and
- ❖ *British Bat Calls: A Guide to Species Identification* (Russ, 2012).

Badger

Distribution

Currently the badger is common and widespread throughout the UK though with higher numbers in the south and south west. In Britain badgers occupy a large range of habitat types and they are often found in woods and copses (deciduous, coniferous and mixed), scrub, hedgerows, quarries, moorland, open fields and urban areas. They are however more abundant in areas where a mosaic of features are present such as deciduous woodland, pasture and arable habitat types.

There are no official estimates of badger numbers in the UK, although a survey³ based on badger setts estimated that there are approximately 64,000 social (family) groups in England.

Ecology

Badgers are a mainly nocturnal animal and during the day rest in their sett. They feed mainly on earthworms and grubs although this is supplemented with a wide variety of other food items including: insects, fruits, roots and bulbs, and cereal crops. Adult badgers grow up to a metre long and males can weigh up to 14kg⁴.

Badgers form social groups of normally around five individuals in winter and are typically headed by a dominant male and female. Badger setts usually comprise a network of underground tunnels and chambers and are typically excavated in soil that is well drained and easy to dig. Setts are normally found on sloping ground where there is some cover, for example woods and copses, especially if attached to pastureland.

Badgers mate throughout the year but pregnancy starts around the end of November or early December, when the previously fertilised embryos implant into the sow's uterus. Often only the most dominant sow in a family group will produce cubs. Badgers will usually give birth to two to three cubs, which are born between January and March. Cubs are usually suckled underground for a period of around eight weeks and will emerge from the sett between April and May. The cubs remain dependent upon the sow for a further few weeks while they are weaned and learn how to fend for themselves.

Badgers do not hibernate over winter, but they are much less active and stay below ground especially during very cold or wet weather.

Status, Legislation and Policy

Badgers are listed under Schedule 6 of the Wildlife and Countryside Act 1981 (WCA) which grants them partial protection. This protection is extended by the Protection of Badgers Act 1992 (Badger Act) which makes it an offence to:

- ✧ Wilfully capture, kill, injure or cruelly ill-treat a badger;

³ Defra (2014): *Response to Environmental Information Request: Badger Population Size and bTB Incidence*. Accessed online [November 2014] at: www.gov.uk/government/uploads/system/uploads/attachment_data/file/320950/6488.pdf

⁴ Badger Trust (Revised 2011): *Badger Factsheet*. Accessed online [November 2014] at: <http://badgertrust.org.uk/badgers/badger-portrait.aspx>

- ✧ Intentionally or recklessly interfere with a sett, including damaging or destroying a sett, obstructing access to a sett, and disturbing a badger whilst it is occupying a sett;
- ✧ Sell or possess a live badger, or attempt to do so; and
- ✧ Mark or ring a badger without a licence.

Under the Badger Act disturbance is illegal without a licence. Natural England has published guidelines to be adopted when determining whether an activity is 'disturbing' and would necessitate a licence. For example, using heavy machinery (generally tracked vehicles) within 30m of any entrance to an active sett is considered to constitute disturbance. Licences are not normally issued for works affecting an active sett during the badger breeding season (December – June inclusive).

Local Planning Authorities are obliged to take a wider view of biological conservation when undertaking their functions. Section 40 of the Natural Environment and Rural Communities Act 2006 (NERC) states that public authorities must have regard to the conservation of biodiversity. Furthermore, Government policy (National Planning Policy Framework – Section 15: Conserving and enhancing the natural environment) directs that planning decisions should be "*minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures*".

Great crested newt

Distribution

There are three native species of newt in the UK. These consist of; smooth newt *Lisotriton vulgaris*, palmate newt *Lisotriton helveticus* and great crested newt (GCN) *Triturus cristatus*.

The great crested newt has a widespread distribution in lowland England and Wales but is less frequent in the far south-west and Scotland, in upland areas, intensively farmed landscapes and heavily urbanised areas. It is absent from Ireland. GCN has specific habitat requirements, spending much of its life-cycle on dry land including areas of rough grassland, woodland and hedgerow, and returning to ponds for the breeding season.

Great crested newt and their habitats are protected because the species has undergone significant declines over recent decades, primarily due to the loss of suitable breeding ponds as a result of agricultural intensification. The loss of terrestrial and connective habitats due to development has also been detrimental to the species' population. Furthermore, the UK has an internationally important population of great crested newts which have suffered serious decline throughout Europe.

Ecology

The breeding season for great crested newts (which coincides with the survey season) occurs almost immediately after they emerge from their winter dormancy. GCN are nocturnal and tend to emerge on wet, mild nights when the temperature has risen above 5°C. This usually occurs between February and April, though this is staggered and some newts will not reach their breeding ponds until May.

Great crested newts exhibit more specific habitat requirements than other widespread amphibian species. As a general rule, a good breeding pond will not be too shaded by overhanging trees and vegetation, will

be located within a network of other ponds, will not contain ducks or fish and contain clean water and abundant aquatic vegetation. Plants such as water mint *Mentha aquatic*, water forget-me-not *Myosotis scorpioides* and water plantain *Alisma Plantago-aquatica* are particularly favoured for egg-laying.

Once breeding has taken place the female newts lay eggs individually on the leaves of aquatic or submerged plants. The leaf is then folded around the egg in order to protect it. The amount of time spent in the breeding ponds can vary enormously with some individuals only staying a few days before dispersing back onto land. The majority of great crested newts will remain within a core area of up to c.250m from the breeding pond if that area can fulfil their lifecycle requirements although, as with all amphibians, small numbers of individuals (often juveniles) will disperse as colonisers to distances of 1km or more (Langton *et al.*, 2001).

During the terrestrial phase, great crested newts spend their time foraging and dispersing back to winter habitats. Once the temperature drops below 5°C newts will enter a period of dormancy. GCN will use a variety of hibernation sites, including beneath rubble or dead wood, rabbit burrows, cracks in buildings or even loose soil at the edge of their breeding habitat.

Status, Legislation and Policy

Despite its widespread distribution there is a continuing decline in the great crested newt population. The great crested newt is fully protected under Schedule 5 of the Wildlife and Countryside Act (WCA) 1981 and Schedule 2 of the Conservation of Habitats and Species Regulations 2010, and is a European Protected Species. The legislation makes it an offence to:

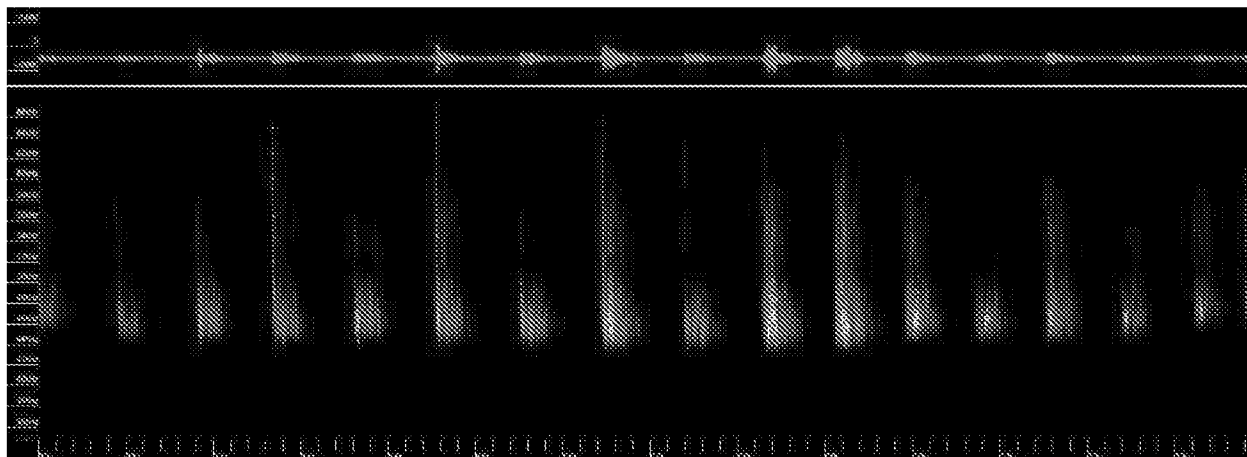
- ✧ Intentionally kill, injure or capture/take a GCN.
- ✧ Intentionally or recklessly damage, destroy or obstruct access to any place that a GCN uses for shelter or protection.
- ✧ Intentionally or recklessly disturb a GCN while it is occupying a structure or place that it uses for shelter or protection.
- ✧ Sell, offer or expose for sale, or possess, or transport for the purpose of sale, any live or dead GCN, any part of a GCN, or anything derived from a GCN.

The law refers to all stages of a great crested newt's lifecycle, including eggs.

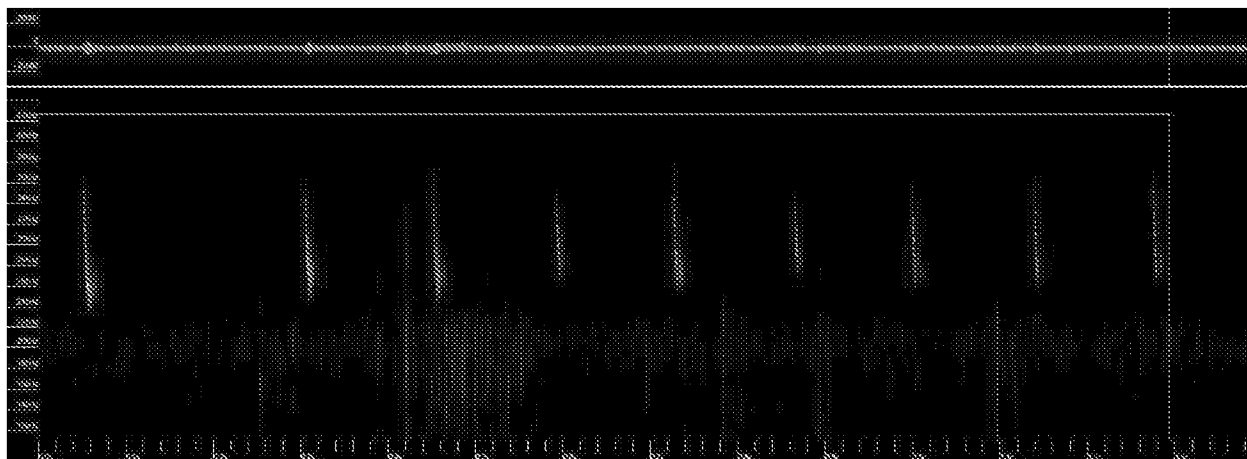
Both smooth and palmate newts are partially protected under Schedule 5 of the WCA which prohibits the sale or trade of either species.

Local Planning Authorities are obliged to take a wider view of biological conservation when undertaking their functions. Section 40 of the Natural Environment and Rural Communities (NERC) Act 2006 states that public authorities must have regard to the conservation of biodiversity. Section 41 of the Act requires the Secretary of State to maintain a list of Habitats and Species of Principal Importance in England; the list includes great crested newt. Furthermore, Government policy (National Planning Policy Framework – Section 15: Conserving and enhancing the natural environment) directs that planning decisions should be “*minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures*”.

Appendix V: Example Sonograms



PIPI recorded by TL at 21.23 on 17/5/21



EPSE recorded by JT at 22.07 on 17/5/21

Appendix VI: Results of the eDNA water samples

Please see following page.



Folio No: E9246
Report No: 1
Purchase Order: UE0410-210419
Client: URBAN EDGE
ENVIRONMENTAL
CONSULTING LTD
Contact: Jeff Turton

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS (*TRITURUS CRISTATUS*)

SUMMARY

When great crested newts (GCN), *Triturus cristatus*, inhabit a pond, they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm GCN habitation or establish GCN absence.

RESULTS

Date sample received at Laboratory: 19/04/2021
Date Reported: 22/04/2021
Matters Affecting Results: None

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
0756	UE0410_P1	TQ 07165 03373	Pass	Pass	Pass	Negative	0

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Chris Troth

Approved by: Gabriela Danickova



Se



METHODOLOGY

The samples detailed above have been analysed for the presence of GCN eDNA following the protocol stated in DEFRA WC1067 'Analytical and methodological development for improved surveillance of the Great Crested Newt, Appendix 5.' (Biggs et al. 2014). Each of the 6 sub-sample tubes are first centrifuged and pooled together into a single sample which then undergoes DNA extraction. The extracted sample is then analysed using real time PCR (qPCR), which uses species-specific molecular markers to amplify GCN DNA within a sample. These markers are unique to GCN DNA, meaning that there should be no detection of closely related species.

If GCN DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If GCN DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

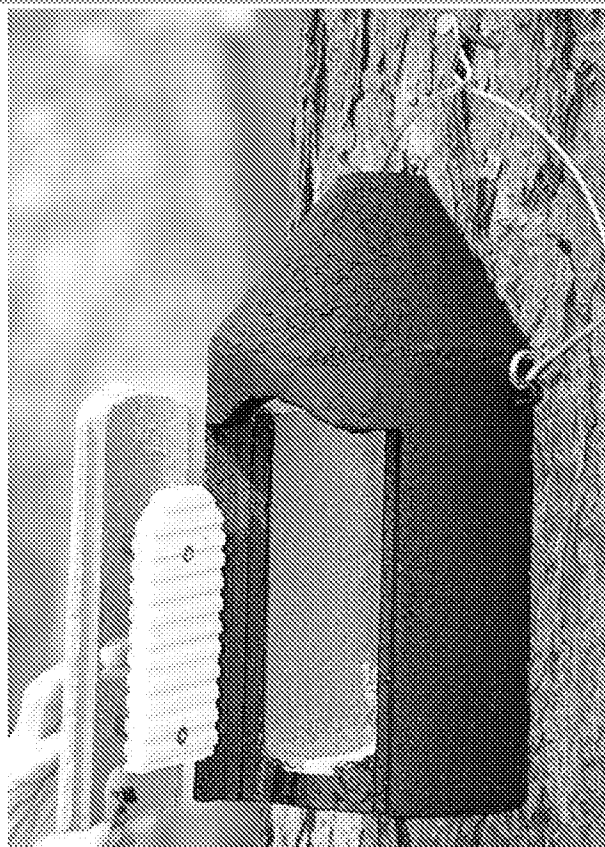
SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-laboratory checks on accuracy of results as part of our quality control procedures.

INTERPRETATION OF RESULTS

SIC:	Sample Integrity Check [Pass/Fail] When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.
DC:	Degradation Check [Pass/Fail] Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample between the date it was made to the date of analysis. Degradation of the spiked DNA marker may lead indicate a risk of false negative results.
IC:	Inhibition Check [Pass/Fail] The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.
Result:	Presence of GCN eDNA [Positive/Negative/Inconclusive] Positive: GCN DNA was identified within the sample, indicative of GCN presence within the sampling location at the time the sample was taken or within the recent past at the sampling location. Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for GCN presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive. 0/12 indicates negative GCN presence. Negative: GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of GCN absence, however, does not exclude the potential for GCN presence below the limit of detection.



Appendix VII: Bat Box Specifications



Schwegler 2F DFP General Purpose Bat Box:

Apex roof to mimic tree cavity, suitable for noctule, brown long-eared, Bechstein's and Daubenton's. Internal double front panel creates a crevice suitable for pipistrelles

Siting and Positioning:

On a tree-trunk or on buildings

Cleaning and Inspection:

Easy cleaning and inspection due to removable front panel. If occupied by bats, inspection and cleaning must be carried out by a licensed professional

Entrance hole:

Slotted hole

Occupants:

Bats

Material:

Air-permeable and long lasting SCHWEGLER wood-concrete



Schwegler 1FF Flat Bat Box:

Open at bottom so cleaning not required. Varied internal roost surfaces. Suitable for crevice roosters such as pipistrelles, and large enough for use as maternity roost

Siting & positioning:

On the tree-trunk or on buildings

Cleaning and inspection:

Open at bottom, cleaning not required. Easy to inspect due to removable front panel. If occupied by bats, inspection and cleaning must be carried out by a licensed professional

Entrance hole:

Width 12-24 mm x Length 21cm

Occupants:

Bats

Material:

Air-permeable and long lasting SCHWEGLER wood-concrete

Kit includes:

Roost box with removable front panel
Galvanized steel hanger - forestry approved
Aluminium Nail - forestry approved

Colour:

Black

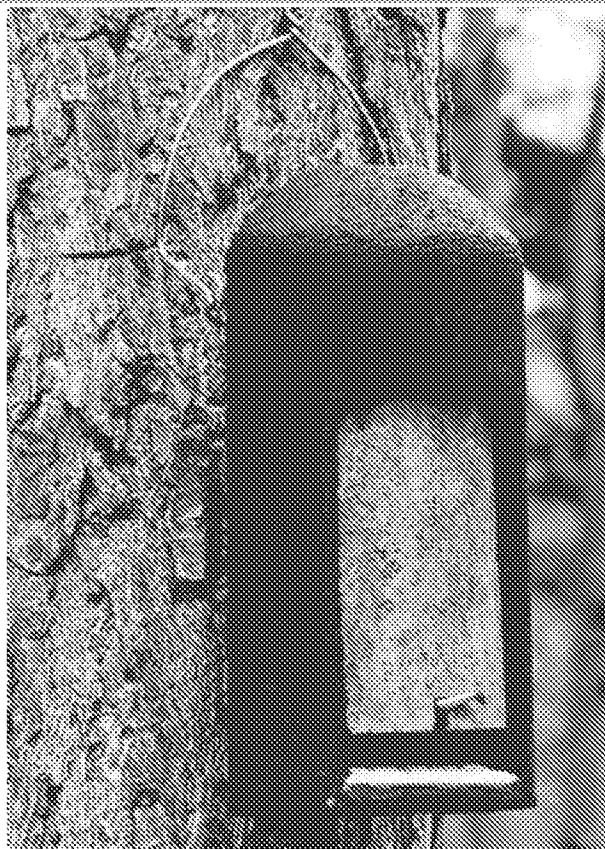
Dimensions:

Height: 350mm

Dia.: 165mm

Weight:

4kg approx.

**Schwegler 2FN Woodland Bat Box:**

Two entrances, one at the rear against the tree trunk and one at the front. A domed roof to form clusters and an increased internal height. Suitable for brown long-eared and woodland species e.g. noctule

Siting and Positioning:

On a tree-trunk or on buildings

Cleaning and Inspection:

Easy cleaning and inspection due to removable front panel. If occupied by bats, inspection and cleaning must be carried out by a licensed professional

Kit includes:

Roost box with swing-away front panel
Galvanized steel hanger - forestry approved
Aluminium Nail - forestry approved

Colour:

Black

Dimensions:

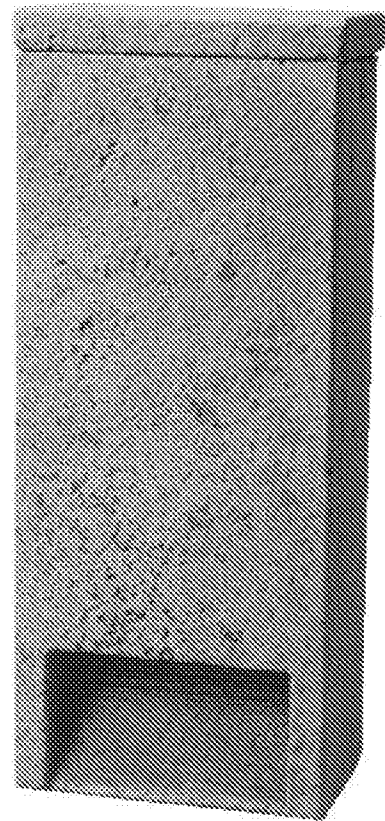
Depth: 140mm

Width: 270mm

Height: 430mm

Weight:

10kg approx.

**Schwegler 1FR/2FR Bat Tube:**

Suitable for building into or mounting onto external walls. Open at bottom so cleaning not required. Can be used individually (1FR) or by connecting two or more 2FR. Suitable for bats that use buildings e.g. pipistrelles or serotine

Siting & positioning:

Can be installed on external walls – either flush or beneath a rendered surface in concrete and, during renovation work, under wooden panelling or in building cavities (e.g., slab-type building structures, bridges, etc). If required, it can be

Entrance hole:

Slotted hole

Occupants:

Bats

Material:

Air-permeable and long lasting SCHWEGLER wood-concrete

Kit includes:

Roost box with removable front panel
Galvanized steel hanger - forestry approved
Aluminium Nail - forestry approved

Colour:

Black

Dimensions:

Height: 360mm

Dia.: 160mm

Weight:

4.9kg approx.

Painted using standard air-permeable exterior paint. Birds will not occupy this box.

Cleaning:

Maintenance-free

Entrance hole:

Height: 20mm

Width: 150mm

Occupants:

Bats

Material:

SCHWEGLER wood-concrete

Kit includes:

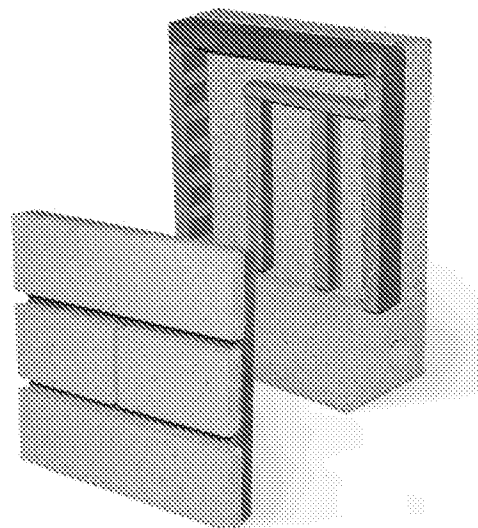
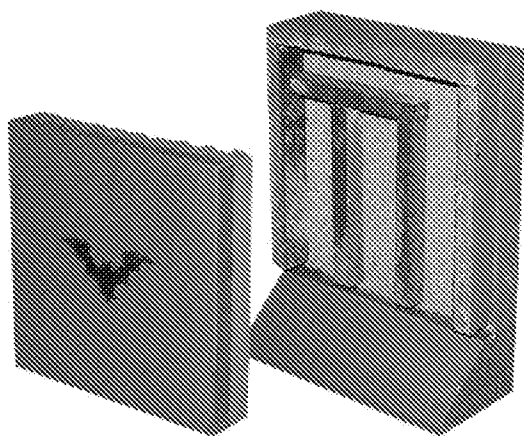
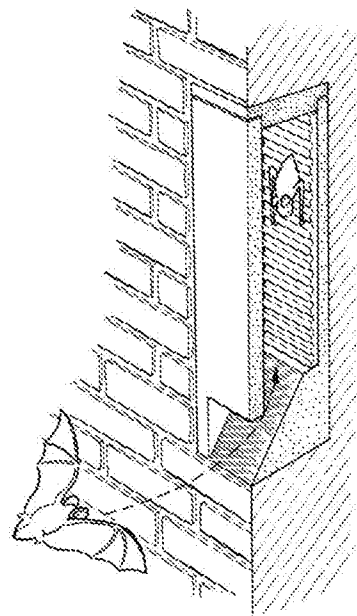
1 x Bat Tube

Colour:

Grey material,
paintable with standard air-permeable wall-paint

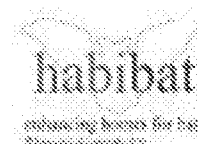
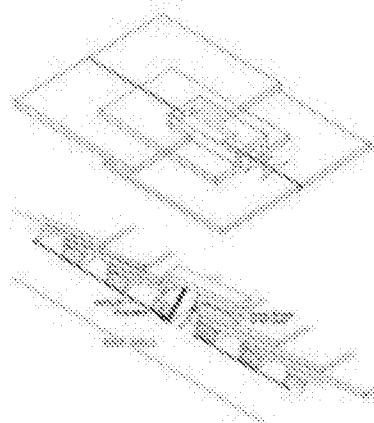
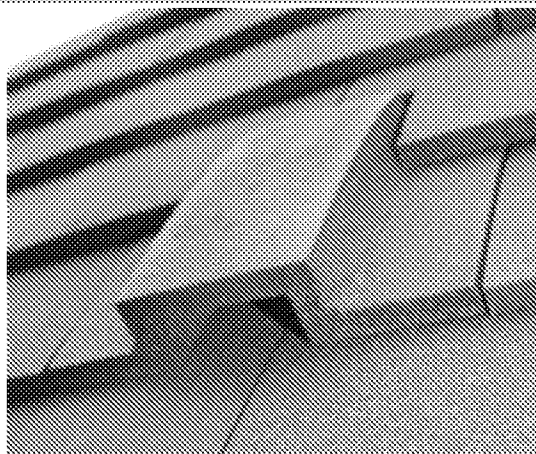
Dimensions:

Height: 475mm; Width: 200mm; Depth: 125mm

Weight: 10kg approx.**Ibstock Enclosed Bat Box (Type B or C):**

- Designed specifically for pipistrelle bats
- Available in all brick types
- Discrete home for bats
- Various sizes
- Several roosting zones are created inside the box
- Bats are contained within the bat box itself
- Maintenance free with entrance at the base
- Suitable for new build & conservation work

- Bat Box Type B: 215 x 215 or 215 x 290 / Bat Box Type C: 215 x 215 or 215 x 290



Habibat Bat Access Tile (available in clay, slate or lead):

The Habibat Access Tile is a roof tile which has been modified to allow bats either into the batten space (between tiles and liner for pipistrelles) or into the roof void (for brown long-eared bats).

The Habibat Access Tile consists of a vacuum-moulded plastic cowl embedded into the tile. The access cowl is designed to prevent rainwater ingress to the roof but is of correct size and roughened to be suitable for bats.

The 5 piece clay tile set fits on any roof with plain clay tiles to provide access for bats either behind the tiles or into the roof space.

The slate tile consists of a standard sized slate, with a capped vent which allows access into the batten space (between tiles and liner for pipistrelles) or into the roof void (for brown long-eared bats).

Dimensions: (H) 418 x (W) 375 x (D) 80mm

Entrance hole dimensions: (H) 20 x (W) 100mm

Weight: 1.3kg

Appendix VIII: Plant Species which encourage Bats

Please see following pages which are drawn from Gunnell *et al.* (2012).

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Plant Species	Common name	Native	Type	Benefit	Soil	Light	Extensive green roofs	Living walls	Rain Gardens	Hedges/trees	Beds/borders
<i>Acer campestre</i>	Field maple	N	T/S	C	Any	Sun / shade				Y	
<i>Acer platanoides</i>	Norway maple		T	S	Well drained / alkaline	Sun / shade				Y	
<i>Acer saccharum</i>	Sugar maple		T	S	Any	Sun / shade				Y	
<i>Achillea millefolium</i>	Yarrow	N	HP	C,F	Well drained	Sun	Y				
<i>Aluga reptans</i>	Bugle	N	HP	C,F	Any	Sun / shade	Y				
<i>Anthyllus vulneraria</i>	Kidney vetch	N	HP	F	Well drained	Sun	Y				
<i>Aubrieta deltoidea</i>	Aubrieta		H	F	Well drained	Sun / shade		Y			
<i>Betula pendula</i>	Silver birch	N	T	C	Sandy / Acid	Sun				Y	
<i>Cardamine pratensis</i>	Cuckoo-flower	N	HP	F	Moist	Sun / shade					Y
<i>Carpinus betulus</i>	Hornbeam	N	T	C	Clay	Sun				Y	
<i>Centaurea nigra</i>	Common knapweed	N	HP	C,F	Dry, not acid	Sun	Y				Y
<i>Centranthus ruber</i>	Red valerian		HP	F	Well drained / alkaline	Sun	Y				Y
<i>Clematis vitalba</i>	Old man's beard	N	C	F	Well drained / alkaline	Sun				Y	
<i>Corylus avellana</i>	Hazel	N	S	C	Any dry	Sun / shade		Y		Y	
<i>Crataegus monogyna</i>	Hawthorn	N	S	S,C	Any	Sun / shade				Y	
<i>Daucus carota</i>	Wild carrot	N	Bi	S,C,F	Any	Sun	Y				Y
<i>Dianthus spp.</i>	Pinks	N	A,Bi	F	Well drained	Sun	Y	Y			Y
<i>Digitalis purpurea</i>	Foxglove	N	Bi	C	Well drained	Shade / partial shade				Y	Y
<i>Erica cinerea</i>	Bell heather	N	S	F	Sandy	Full sun					Y
<i>Erysimum cheiri</i>	Wallflower		Bi,F	F	Well drained	Sun		Y			
<i>Eupatorium cannabinum</i>	Hemp agrimony	N	H	F	Moist	Sun / shade					Y
<i>Fagus sylvatica</i>	Beech	N	T	C,R	Well drained / alkaline	Sun / shade				Y	
<i>Foeniculum vulgare</i>	Fennel		H	F	Well drained	Sun					Y
<i>Fraxinus excelsior</i>	Common ash	N	T	C,R	Any	Sun / shade				Y	
<i>Hebe spp.</i>	Hebe species		S	F	Well drained	Sun / shade				Y	Y
<i>Hedera helix</i>	Ivy	N	C	F,C	Any	Sun / shade		Y		Y	Y
<i>Hesperis matronalis</i>	Sweet rocket		H	F	Well drained / dry	Sun / shade					Y
<i>Hyacinthoides non-scripta</i>	Bluebell	N	B	F	Loam	Shade / partial shade		Y		Y	Y
<i>Ilex aquifolium</i>	Holly	N	T	C	Any	Sun / shade				Y	
<i>Jasminum officinale</i>	Common jasmine		C	F	Well drained	Sun		Y			Y
<i>Lavandula spp.</i>	Lavender species		S	F	Well drained / sandy	Sun		Y			Y
<i>Linaria vulgaris</i>	Toadflax	N	HP	C	Well drained / alkaline	Sun	Y				Y
<i>Lonicera periclymenum</i>	Honeysuckle	N	C	F	Well drained	Sun		Y		Y	
<i>Lotus corniculatus</i>	Bird's foot trefoil	N	HP	F	Well drained / dry	Sun	Y				Y
<i>Lunaria annua</i>	Honesty		Bi	F	Any	Sun / partial shade	Y				
<i>Malus spp.</i>	Apple		T	C	Any	Sun				Y	
<i>Matthiola longipetala</i>	Night-scented stock		A	F	Well drained/ moist	Sun			Y		
<i>Mysotis spp.</i>	forget-me-not	N	A	F	Any	Sun	Y	Y			
<i>Nicotiana glauca</i>	Ornamental tobacco		A	F	Well drained/ moist	Sun / partial shade			Y		
<i>Oenothera spp.</i>	Evening primrose species		Bi	F	Well drained/ dry	Sun	Y				
<i>Origanum vulgare</i>	Marjoram	N	HP	F	Well drained/ dry	Sun	Y	Y			
<i>Populus alba</i>	White poplar	N	T	C	Clay loam	Sun				Y	
<i>Primula vera</i>	Coxsage	N	HP	F	Well drained/moist	Sun / partial shade	Y				
<i>Primula vulgaris</i>	Primrose	N	HP	F	Moist	Partial shade	Y	Y		Y	
<i>Prunus avium</i>	Wild cherry	N	T	C	Any	Sun				Y	



Plant Species	Common name	Native	Type	Benefit	Soil	Light	Extensive green roofs	Living walls	Rain Gardens	Hedges/trees	Beds/borders
<i>Prunus domestica</i>	Plum		T	C	Well drained/ moist	Sun				Y	
<i>Prunus spinosa</i>	Blackthorn	N	S	C	Any	Sun / partial shade				Y	
<i>Quercus petraea</i>	Scots oak	N	T	C, R	Sandy loam	Sun / shade				Y	
<i>Quercus robur</i>	Common oak	N	T	C, R	Clay loam	Sun / shade				Y	
<i>Rosa canina</i>	Dog rose	N	S	C	Any	Sun			Y	Y	
<i>Salix</i> spp.	Willow species	N	S	S, C	Moist	Sun / shade			Y	Y	
<i>Sambucus nigra</i>	Elder	N	T	C	Clay loam	Sun				Y	
<i>Saponaria officinalis</i>	Soapwort	N	HP	F	Any	Sun					
<i>Saxifraga oppositifolia</i>	Saxifrage	N	HP	C	Well drained	Sun	Y	Y			
<i>Scabiosa columbiana</i>	Small scabious	N	HP	F	Well drained/ alkaline	Sun	Y				
<i>Sedum spectabile</i>	Ice plant		HP	F	Well drained/ dry	Sun	Y				
<i>Siene dioica</i>	Red campion	N	HP	F	Any	Shade / partial shade		Y	Y	Y	
<i>Sorbus aucuparia</i>	Rowan	N	T	C	Well drained	Sun				Y	
<i>Stachys lanata</i>	Lamb's ears		HP	F	Well drained/dry	Sun	Y				
<i>Symotrichum</i> spp.	Michaelmas daisies		HP	F	Any	Sun					
<i>Tegetes patula</i>	French marigold		A	F	Well drained/moist	Sun					
<i>Thymus serpyllum</i>	Creeping thyme	N	HP/S	F	Well drained/dry	Sun	Y	Y			
<i>Tilia x europaea</i>	Common lime		Type	C	Any	Sun / shade				Y	
<i>Trifolium</i> spp.	Clover species	N	HP	F	Any	Sun	Y				
<i>Valeriana</i> spp.	Valerian species	N	HP	F	Moist	Sun / partial shade			Y		
<i>Verbascum</i> spp.	Mulleins	N	Bi, HP	C	Well drained	Sun	Y				
<i>Verbena bonariensis</i>	Verbena		HP	F	Well drained/moist	Sun					
<i>Viburnum lantana</i>	Wayfaring tree	N	S	C	Any	Sun / shade				Y	
<i>Viburnum opulus</i>	Guelder rose	N	S	C	Moist	Sun / shade			Y	Y	
<i>Viola tricolor</i>	Pansy	N	A	F	Well drained/moist		Y	Y			

The table above is derived from the BCT publication Landscape and Urban Design for Bats and Biodiversity (Gunnell et al., 2012) and lists suggested plant species that can provide benefit for bats either by providing a food source for insects or roost potential. The plants listed are predominately native to Britain. The small group of non-native plants is included for their documented value for wildlife. This list has been checked against Natural England's list of invasive non-native plants.

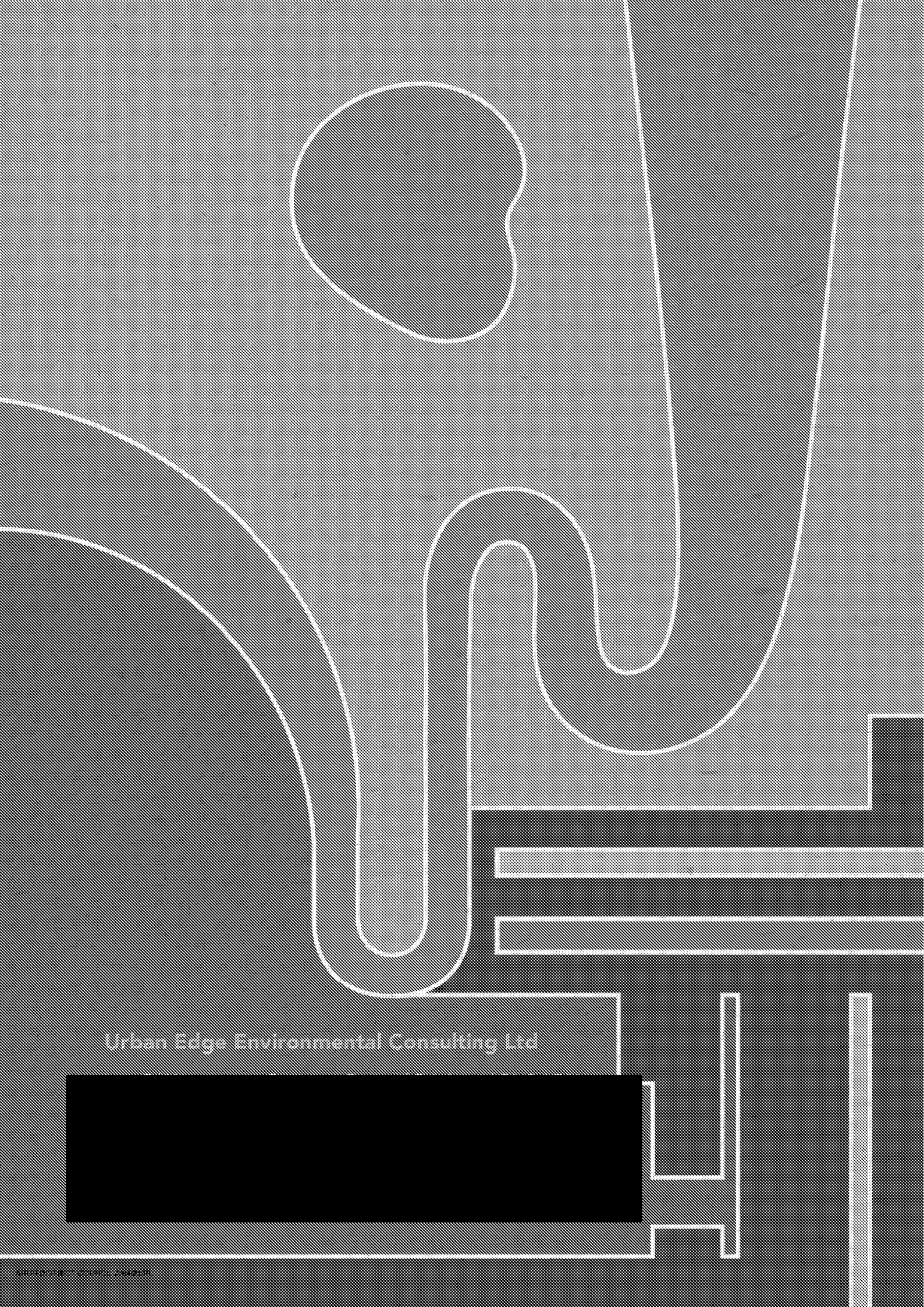
HP: Herbaceous perennial	T: Tree	A: Annual	Benefit:		
Bi: Biennial	S: Shrub	B: Bulb	C: Moth caterpillar food plant	F: Flowers attract adult moths	
BiP: Biennial perennial	H: Herb	C: Creeper/climber	S: Sap sucking insects (e.g. whiteflies)	R: Good roost potential	



Appendix IX: Legal and Technical Limitations

- This report has been prepared by Urban Edge Environmental Consulting Ltd (UEEC Ltd) with all reasonable skill, care and diligence within the terms of the contract made with the Client to undertake this work, and taking into account the information made available by the Client. No other warranty, expressed or implied, is made as to the professional advice included in this report or any other services provided by us.
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- Unless otherwise stated in this report, the assessments made assume that the sites and facilities that have been considered in this report will continue to be used for their current planned purpose without significant change.
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- This report has been prepared using factual information contained in maps and documents prepared by others. No responsibility can be accepted by UEEC Ltd for the accuracy of such information;
- Every effort has been made to accurately represent the location of mapped features, however, the precise locations of features should not be relied upon;
- Populations of animals and plants are often transient in nature and a single survey visit can only provide a general indication of species present on site. Time of year when the survey was carried out, weather conditions and other variables will influence the results of an ecological survey (e.g. it is possible that some flowering plant species which flower at other times of the year were not observed). Every effort has been made to accurately note indicators of presence of protected, rare and notable species within and adjacent to the site but the possibility nonetheless exists for other species to be present which were not recorded or otherwise indicated by the survey;
- Any works undertaken as a consequence of the recommendations provided within this report should be subjected to the necessary health & safety checks and full risk assessments.

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NATURAL PROGRESSION

