Dellwood Hospital, Liebenrood Road, Reading, Berkshire RG30 2DX

Bat Survey Report
& Mitigation Strategy

October 2021

***on behalf of* Montpelier Estates**

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1 Executive Summary

Site Details	Dellwood Hospital, referred to as the 'site' for the purposes of this report, is a detached dwelling located to the east of Liebenrood Road, within 1.8km west of centre of the town Reading in Berkshire RG30 2DX. The Ordnance Survey grid reference for the site is SU 694 727.
Proposals	There are proposals to demolish the single storey extension and later additions of the existing building and erect an extension to the southern elevation. The re-roofing of the existing building may also need to take place, however, this will be dependent on what is found when construction work starts.
Methodology	A Preliminary Ecological Appraisal (PEA) was undertaken by Ramboll Environment and Health UK Limited on 12th February 2019 and a Daytime Roost Inspection by Lockhart Garratt on the 14th October 2019; these recommended three bat activity surveys. Three bat activity (emergence and re-entry) surveys of Dellwood Hospital were conducted at dusk on the 16th July 2020 and the 5th August 2020 and at dawn on the 3rd September 2020, in accordance with best practice (Collins, 2016).
Evaluation	• A peak count of one common pipistrelle, one soprano pipistrelle and one brown long-eared bat were seen to emerge from the main building during the three surveys. • The common and soprano pipistrelles are roosting under roof tiles, while the brown long-eared bats are roosting within the external fabric of the building; there are three roost locations. • The roosts are considered to be day roosts. There is no evidence of a maternity colony.
Impact Assessment	• The proposed demolition of the later additions of the building at Dellwood Hospital will result in the permanent loss of one day roost used by a brown long-eared bat. The proposed works also have the possibility of resulting in the permanent loss of the other three bat roosts. • The proposed works will affect small numbers of brown long-bats, present in a day roost. Based on re-roofing plans, the proposed works could also affect small numbers of a common species (common pipistrelle, soprano pipistrelle and brown long-eared bats only), present in day roosts. • If bats are present at the time of the demolition works, there is also the potential for them to be killed or injured.
Recommendations	It is recommended that the development works are covered under a Bat Mitigation Class Licence (BMCL) in order to derogate from the legal protection afforded to bats and to allow for the destruction of the bat roost.

	Recommendations are made with regard to careful work practices, removal of roof tiles and eaves by hand and ecological compensation for bats through the erection of five bat roost features. The recommended bat roost features are four bat brick/tubes integrated into the external walls of the proposed new building, and one bat box on a tree.

2 Introduction

2.1 Site Description

Dellwood Hospital, referred to as the 'site' for the purposes of this report, is a detached building located to the east of Liebenrood Road, approximately 1.8km west of centre of the town Reading in Berkshire RG30 2DX. The approximate Ordnance Survey grid reference for the site is SU 694 727 (for site location plans please see Appendix 2).

The site comprises a detached building with associated parking and garden space. To the east of the site, stands the Sue Ryder Duchess of Kent Hospice while to the north and south there are dwellings with associated garden and parking spaces. To the west is Prospect Park, a Local Wildlife Site (LWS). Residential development characterises the surrounding area and the site is situated within a built-up suburb of Reading.

2.2 Proposed Works

There are proposals to demolish the single storey extension and later additions of the existing building and erect an extension to the southern elevation. The re-roofing of the existing building may also need to take place, however, this will be dependent on what is found when construction work starts. Please see Appendix 3 for proposal plans.

2.3 Background

A Preliminary Ecological Appraisal (PEA) was undertaken by Ramboll Environment and Health UK Limited on 12th February 2019 and a Daytime Roost Inspection by Lockhart Garratt on the 14th October 2019. No bats were found within the building, but evidence of bats was found within loft A and the building was assessed as having 'high' potential to support roosting bats (Collins, 2016). The following excerpt is taken from the daytime inspection:

"*The main building is of red brick construction and stands at two storeys with a partly converted loft space; overall the brickwork is in good condition. A large linear single storey extension is present on the southern elevation of the main building. Several other single storey extensions are present on the western elevation of the main building, which house the boiler and maintenance rooms. The main building was extended further within the last 20 years to accommodate an internal fire escape stairwell on the northern elevation.*

The daytime inspection undertaken in October 2019 revealed evidence of bats within roof void A (single dropping). No other evidence was identified, however, the wider building was categorised as having High Suitability to support roosting bats, both externally and internally.

The roosting features provided by the building were likely to support a range of different species, from crevice dwellers to void roosting bats. Based on the types of features present it was concluded that the building had potential to support day/night, transitional, maternity, satellite and breeding roosts.

The proposed redevelopment of the Site would result in the full demolition of the building and all single storey extensions. It is therefore recommended that further survey work be carried out to determine the presence/likely absence of bats on Site."

2.4 Aims of Study

The specific aim of this study is to survey the building for bats in accordance with the above recommendations made by Lockhart Garratt and Ramboll Environment and Health UK Limited following the PEA and Daytime Roost Inspection.

The report makes recommendations for appropriate mitigation, compensation and enhancement measures and the potential impacts are assessed in accordance with the legal protection afforded to bats under The Conservation of Habitats & Species Regulations 2017.

2.5 Bat Ecology

Bats are the only mammals to have developed the ability of true flight. At present, over 1,100 species of bat are recognised worldwide, making bats the second largest mammal group after rodents. As well as flight, bats have evolved a system of navigation and orientation using echolocation which has allowed many species to become nocturnal. There are 18 species of bat that occur within the British Isles, of which 17 are known to breed here. More species occur in the south and west of the country, with species numbers declining towards the north and into Scotland.

All bat species in the UK are nocturnal and feed exclusively on insects (they are insectivorous) which they catch in flight during their night-time activity, using echolocation to locate and home-in on their prey. Bats will roost during the daytime and seek out dark, enclosed and undisturbed places in which to do so, often using a variety of roosting sites within their home range. Different roost sites are used for different purposes (such as mating, giving birth and hibernation) and at different periods of a bat's life cycle.

During the summer, female bats will gather together in a maternity or breeding roost. In the UK, this starts to occur towards the end of May and the females will seek out a warm and undisturbed site in which to give birth. Because maternity roosts require a particular set of environmental attributes (such as location, temperature, orientation and size), breeding bats tend to return to roost and breed in the same locations year after year. Given that bats live a relatively long time (anywhere from 10-20 years), and only give birth to one pup a year, maternity colonies are crucial to the reproduction and survival of the local population and can be very sensitive to environmental change.

Relatively little is known about hibernation roosts, as tracking and locating hibernating bats is very difficult. However, many species (particularly those within the genera *Myotis* and *Rhinolophus*) have been found within underground sites such as caves, mines and cellars, where the temperature remains constant and low throughout the winter allowing the bats to remain in a state of torpor. The spring and autumn are periods of transition and bats can use a number of different locations on a temporary basis, often moving between roosts as environmental conditions change and temperatures fluctuate. In the autumn, bats will mate, and it has been shown that male and female bats will gather at particular locations (such as a building, cave or tree) to meet, socialise and copulate.

Bats choose to roost in a number of different locations, depending on the species, their activity pattern and the period of their lifecycle. Certain species, such as the pipistrelles, favour crevices and small cavities for roosting and will use features such as cracks, crevices and small rot holes in the boughs and trunks of trees and within certain features of buildings such as boxed eaves, gaps under roof tiles, hanging tiles and soffit boards. Other species favour large, uncluttered roof spaces and lofts within buildings where they can hang up on the underside of the roof and use the interior space for flying prior to emergence. Hollow trees, cellars, caves, barns, churches and cavity walls can also all be used for roosting, given suitable access. Certain species, such as the noctule, favour roosting sites within trees whilst others tend to favour buildings. Roost sites may be used by only a very small number of bats, such as solitary males, or may offer shelter to tens or hundreds of bats within maternity and hibernation roost sites.

The suitability of roosting sites is also highly influenced by the location or context of a tree, building or cave. Roost sites are most often favoured when they are within close proximity to foraging habitats and where those habitats are connected to one another within the landscape by features such as hedgerows, woodlands, rivers or sunken lanes along which bats disperse and 'commute' from place to place. Suitable foraging habitats are any places where insect prey is diverse and abundant such as woodlands, ponds, lakes, rivers, scrub, hedgerows and unimproved grassland or pasture. Thus,

the ecological context of a site is very important for determining if bats may be present within a roost and the potential for a roost to be present tends to be much higher within rural or village locations.

3 Methodology

3.1 Limitations on Survey Data

As with any survey undertaken on a certain date, the data presented within this report provide information at a particular point in time and present a 'snap-shot' of the ecological status of the site. Ecosystems and species behaviour/activity are dynamic and can change over time. Whilst this report presents a characterisation and evaluation of habitat and species status at the time of the study, it should not be taken as an exhaustive representation of the ecological status of the site either at present or into the future.

3.2 Bat Activity Surveys

Three bat activity (emergence and re-entry) surveys of Dellwood Hospital were conducted at dusk on the 16th July 2020 and the 5th August 2020 and at dawn on the 3rd September 2020, in accordance with best practice (Collins, 2016). For details of the surveyors employed during each of the surveys please see Table 1 below.

Table 1. Bat activity survey personnel.

Date	Surveyors
16.07.2020	Reuben Hayden *MSc QCIEEM* Matthew Blee *BSc (Hons)* Angela Mills (Natural England Bat Survey Licence No. WLM-A34 Level 2: 2015-10148-CLS-CLS) Robbie Birkett *MSci* (Natural England Bat Survey Licence No. WLM-A34 Level 1: 2019-39934-CLS-CLS)
05.08.2020	Reuben Hayden *MSc QCIEEM* Angela Mills (Natural England Bat Survey Licence No. WLM-A34 Level 2: 2015-10148-CLS-CLS) Robbie Birkett *MSci* (Natural England Bat Survey Licence No. WLM-A34 Level 1: 2019-39934-CLS-CLS) Infrared camera
03.09.2020	Reuben Hayden *MSc QCIEEM* Oliver Bevan *MEnvSci* Tracy Gray *BSc (Hons)* (Natural England Bat Survey Licence No. WLM-A34 Level 2: 2015-14396-CLS-CLS) Robbie Birkett *MSci* (Natural England Bat Survey Licence No. WLM-A34 Level 1: 2019-39934-CLS-CLS)

Please refer to Table 2 for timing and weather conditions during the bat activity surveys and Figure 1 for the location of surveyors during the surveys. Surveyors watched for bats emerging from the dwelling at dusk and were equipped with Echometer Touch bat detectors to record and analyse bat calls in real time.

Table 2. Timings and weather conditions during the bat activity surveys at Dellwood Hospital on 16th July 2020, 5th August 2020 and 3rd September 2020.

Date	Timing	Sunset/ Sunrise	Temp (Start)	Temp (Finish)	Weather (at start of survey)
16.07.2020	20:55-22:45	21:13	22°C	22°C	Dry, clear (30% cloud cover) with light air (Beaufort Scale 1).
05.08.2020	20:30-22:15	21:45	21°C	19°C	Slight drizzle before survey, overcast (70% cloud cover) with a gentle breeze (Beaufort Scale 3).
03.09.2020	4:20-6:35	6:20	17°C	17°C	Dry, overcast (100% cloud cover) with a gentle breeze (Beaufort Scale 3).

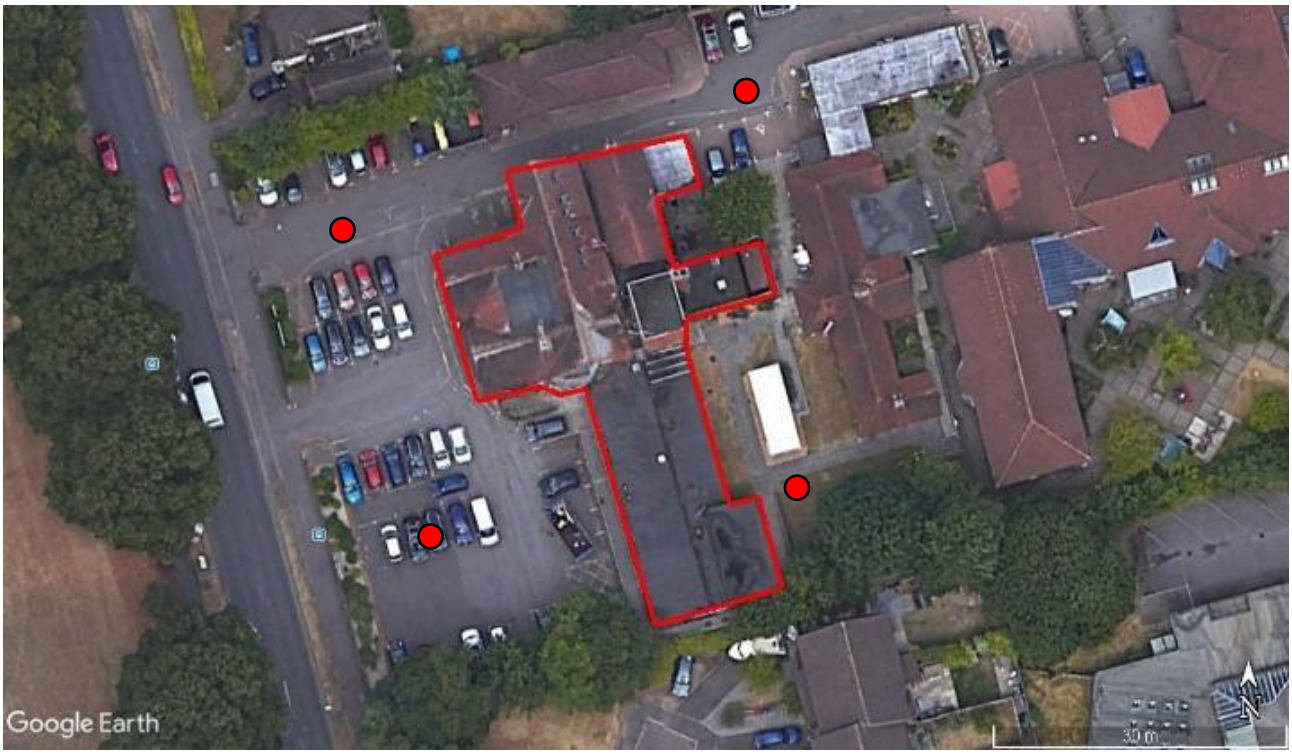

Figure 1. The position of the surveyors at Dellwood Hospital during the bat activity surveys undertaken in 2020. The positions of the surveyors (and infrared camera on one occasion) are shown as red circles. The study building is shown by the red outline.

4 Results

4.1 16th July 2020

One common pipistrelle *Pipistrellus pipistrellus* and one brown long-eared bat *Plecotus auritus* were seen to emerge from the building on the 16th July 2020 (see Table 3). The common pipistrelle came from a gap under the tiles on the western elevation and the brown long-eared bat came from a gap in the soffit eaves on the north eastern corner.

Weather conditions were suitable, and low levels of bat activity were recorded within the local area. Other than common pipistrelle and brown long-eared bats, the surveyors also detected Leisler's bat *Nyctalus leisleri*, noctule *Nyctalus noctula* and soprano pipistrelle *Pipistrellus pygmaeus*.

Table 3. Results of the dusk emergence survey of Dellwood Hospital, undertaken on 16th July 2020.

Time	Species	Emergence (Y/N)	Observation
21:51	Common pipistrelle	**Y**	Emerged from under a tile in the gap between the two western wings (roost access A).
22:14	Brown long-eared	**Y**	Emerged from a gap in the soffit eaves on the north east corner (roost access B).

4.2 5th August 2020

One common pipistrelle was seen to emerge from the building on the 5th August 2020 (see Table 4). This came from under a roof tile on the northern aspect of the western elevation.

Weather conditions were suitable, and low levels of bat activity were noted within the local area. Other than soprano pipistrelle, the surveyors also recorded common pipistrelle and noctule.

Table 4. Results of the dusk emergence survey of Dellwood Hospital, undertaken on 5th August 2020.

Time	Species	Emergence (Y/N)	Observation
21:07	Common pipistrelle	**Y**	Emerged from under a roof tile on the northern aspect of the western elevation and flew NW towards the row of trees (roost access C).

4.3 3rd September 2020

One brown long-eared bat was seen to re-enter the building on the 3rd September 2020 (see Table 5). The bat re-entered the building at the join between the window and hanging tiles on the south eastern elevation.

Weather conditions were suitable, and low levels of bat activity were noted within the local area. Other than brown long-eared, the surveyors also detected soprano pipistrelle, common pipistrelle, noctule and leisler's bats.

Table 5. Results of the dusk emergence survey of Dellwood Hospital, undertaken on 3rd September 2020.

Time	Species	Emergence (Y/N)	Observation
06:02	Brown long-eared	**Y**	Re-entered into gap at the join between the window and hanging tiles on the south eastern elevation (roost access D).

4.4 Summary of Roosting Bats

In summary, the following roosting bats have been observed at the site:

- Common pipistrelle: a peak count of one bat with one roost location (under roof tiles), with two access point, day roost site.
- Brown long-eared: a peak count of one bat with one roost location (gaps within the external fabric of the building), with two access points (gap in eaves and gap at joint between window and hanging tiles), day roost sites.
- One bat dropping was found within the loft A (during the Daytime Roost Inspection)

Please refer to Figure 2 for the locations of the confirmed bat roosts.

Roost access A (one common pipistrelle)

Roost access B (one brown long-eared bat)

Roost access C (one common pipistrelle)

Roost access D (one brown long-eared bat)

Figure 2. Bat roost access points at Dellwood Hospital (indicated by red circles), discovered from the bat activity surveys undertaken in 2020.

5 Discussion

5.1 Assessment of Results

The combined results of the PEA, Daytime Roost Inspection (completed by Ramboll Environment and Health UK Limited and Lockhart Garratt) and the subsequent bat activity surveys have confirmed the presence of roosting bats within the building.

Common pipistrelle and brown long eared bats were recorded emerging from the building on the 16th July 2020. A soprano pipistrelle was recorded emerging from the building on the 5th August 2020 and a brown long-eared bat was recorded re-entering the building on the 3rd September 2020. Exact locations of emergence/re-entry differed between four of the recorded emergences/re-entries; but all roosts are within the external fabric of the building. The emergences were from beneath roof tiles and a gap in the eaves and the re-entry was into a join between a window and hanging tiles. The bats are considered to be present within day roosts, and they are likely to be male bats.

The bat dropping, indicative of a brown long-eared bat, found within loft A during the Daytime Roost Inspection is not considered to relate to a bat roost. The bat activity surveys do not indicate a confirmed roost within loft A and the one bat dropping found is most likely from an individual bat investigating the loft space only to subsequently leave.

There is no evidence to suggest the presence of a roost of high conservation significance, such as a maternity roost, and the building is not considered to be suitable for hibernation.

5.2 Legislative Guidance

As with many animal species within the UK, declines in the abundance and distribution of many bat species have been documented through recent decades. The reasons for these declines are various and complex but it is considered that the major factors are changes in land use and agriculture, the loss of woodlands and hedgerows and the loss of suitable roosting sites.

Bats are particularly sensitive to human activity due to the fact that they roost within buildings, trees and underground structures such as mines, and the availability of suitable roost sites is considered to be a key factor in the conservation of bats within the UK. As a consequence, all species of bat and their roost sites are protected under the Wildlife and Countryside Act 1981 (as amended by the Countryside and Rights of Way Act 2000) and under The Conservation of Habitats and Species Regulations 2017. Taken together, these make it an offence to:

(a) Deliberately capture or intentionally take a bat
(b) Deliberately or intentionally kill or injure a bat
(c) To be in possession or control of any live or dead wild bat or any part of, or anything derived from a wild bat
(d) Damage or destroy a breeding site or resting place of such an animal or intentionally or recklessly damage, destroy or obstruct access to any place that a wild bat uses for shelter or protection
(e) Intentionally or recklessly disturb any wild bat while it is occupying a structure or place that it uses for shelter or protection
(f) Deliberately disturb any bat, in particular any disturbance which is likely
- to impair their ability;
(i) to survive, breed, reproduce or to rear or nurture their young; or
(ii) in the case of hibernating or migratory species, to hibernate or migrate; or

- to affect significantly the local distribution or abundance of the species to which they belong

European Protected Species Licence (EPSL)
A bat roost may be any structure a bat uses for breeding, resting, shelter or protection. It is important to note that since bats tend to re-use the same roost sites, current legal opinion is that a bat roost is protected whether or not the bats are present at the time.

Although the law provides strict protection to bats, it also allows this protection to be set aside (derogation) under The Conservation of Habitats and Species Regulations 2017 through the issuing of licences. Where a lawful operation is required to be carried out, but which is likely to result in one of the above offences, a licence may be obtained from Natural England (the statutory body in England with responsibility for nature conservation) to allow the operation to proceed. However, in accordance with the requirements of The Conservation of Habitats and Species Regulations 2017, a licence can only be issued where the following requirements are satisfied:

- The proposal is necessary 'to preserve public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment';
- 'There is no satisfactory alternative';
- The proposals 'will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'.

These three criteria are often referred to as the 'three tests' of the Regulations. All three must be satisfied in order for a licence to be granted.

Bat Mitigation Class Licence (BMCL)
In 2015, Natural England launched a new class licence (WML-CL21), which provides a streamlined process to the European Protected Species Licence (EPSL) described above. The Bat Mitigation Class Licence (formerly the Low Impact Bat Class Licence) permits work that has a low impact on certain bat species and certain roost types, but which still needed to be licensed in order to meet legal requirements. Specifically, the criteria for using the class licence are set out below.

Bat species
The low impact licence can be used for sites where the following species are roosting:

- Common pipistrelle (*Pipistrellus pipistrellus)*
- Soprano pipistrelle *(Pipistrellus pygmaeus)*
- Brown long-eared (*Plecotus auritus*)
- Whiskered (*Myotis mystacinus*)
- Brandt's (*Myotis brandtii*)
- Daubenton's (*Myotis daubentonii*)
- Natterer's (*Myotis nattereri*)

Assemblage of bats
Sites that support a maximum of three bat species listed above can be registered for the class licence. Sites with a more diverse assemblage of bat roosts must apply for an individual European Protected Species (EPS) licence.

Number of bats
Sites that support individuals or small numbers (in total) of the bat species listed above can register for the low impact class licence. If more than one bat species will be affected, it is the total number of bats which must be considered. The conservation status of bats varies across regions and must be considered by the ecologist when determining what constitutes 'small numbers'.

Roost type
The Bat Mitigation Class Licence applies to roosts of low conservation significance, and is regulated to cover the following types of roosts in buildings:

- Feeding roosts
- Night roosts
- Day roosts
- Transitional roosts / occasional roosts

Sites with roosts of higher conservation significance such as maternity roosts, hibernation sites or swarming sites do not qualify.

Number of roosts
The Bat Mitigation Class Licence is applicable to sites that support no more than three roosts in total (across all structures).

Impacts
Natural England's Bat Mitigation Class Licence permits activities resulting in the disturbance and/or capture of certain bat species (listed above) and/or the damage or destruction of roosts of low conservation significance.

Natural England's Bat Mitigation Class Licence is held by Registered Ecological Consultants and sites must be registered with, and approved by, Natural England before any licensable work can commence. The ecological consultant must apply to Natural England's Sustainable Development Wildlife Licensing to register the site with at least 3 weeks (15 working days) notice and no more than 12 weeks before commencement of any licensable activities.

6 Impact Assessment

The surveys have confirmed that small numbers of common pipistrelle, soprano pipistrelle and brown long-eared bats are present, and that the three roost locations are within the external fabric of the building. All the roosts are considered to be day roosts.

Given this, the proposed demolition of the later eastern addition of the building at Dellwood Hospital will result in the loss of the existing brown long eared bat roost, and will result in the 'destruction' of a place of shelter and protection. If bats are present at the time of the demolition works, there is also the potential for bats to be killed or injured.

Dependant on the requirements for re-roofing of the existing building, day roosts of small numbers of common pipistrelle, soprano pipistrelle and brown long-eared bats may also be lost. The need for re-roofing will be dependent on what is found when construction work starts.

In conclusion, the works will require a European Protected Species (Bat) Licence, and the most appropriate form of licence would be the Bat Mitigation Class Licence, since only small numbers of common species are present within day roosts.

7 Recommendations

7.1 Further Surveys

No further survey work is considered necessary at this stage.

7.2 Licencing

Prior to the commencement of works to the building, a bat licence will be required from Natural England. A Bat Mitigation Class Licence (BMCL) is considered appropriate due to the following:

- The presence of the common pipistrelle, soprano pipistrelle and brown long-eared bat, all common species
- Low numbers (possibly one bat of each species)
- Three roosts locations in one building
- No foreseeable impacts on maternity colony/hibernating bats

It is recommended that a Registered Consultant (ecologist) is employed to register the site with Natural England under the BMCL scheme.

7.3 Timing

Works can be undertaken at any time of year, as the works only have the potential to disturb small numbers of non-breeding and non-hibernating bats.

7.4 Supervision of Works

The Registered Consultant will give a 'tool box' talk regarding bats and their habitats, and where bats have been found at the property. Contractors should be briefed with regard to the fact that individual bats can often exploit very small crevices as roost sites and that bats can move between roost sites on a regular basis.

Works will proceed in a careful and controlled manner, with the removal of the roof tiles and disassembly of the building's eaves by hand. Work to the known roost locations will be directly supervised by the Registered Consultant (ecologist).

If bats are encountered, they will be rescued by the Registered Consultant (ecologist) by hand and moved to a pre-erected bat box on a nearby tree.

7.5 Replacement Roosting Opportunities

To compensate for the lost bat roosts, the erection of bat boxes is recommended. It is advised that five bat boxes are erected in total, with four integrated bat roost features (a bat brick or bat tube; see below) being installed on the new building and one being erected on a mature tree within the wider landholding. The bat box on the tree will be erected prior to any works and will be used to house rescued bats, if necessary.

Bat brick (sometimes also referred to as 'bat tubes') features can be obtained pre-fabricated and integrated directly into the fabric of the exterior walls of a building. The bricks/tubes have an external entrance slot which leads to an internal cavity for roosting (e.g. the Schwegler 1FR bat tube). The brick/tube can be concealed behind external cladding, brickwork, stonework or render.

For example, bat bricks/ bat tubes can easily be installed into traditional or modern buildings with external wooden weatherboarding; the brick/tube being concealed behind the overlapping wooden boards with access via a gap under a lifted board which leads to the entrance slot of the brick/tube. Bats can fit through very small gaps and so a crevice of 2-2.5cm should be sufficient to allow access to the slot of the bat brick/tube.

Alternatively, if integrated bat boxes are not feasible within design plans, conventional bat boxes could be installed instead; these should be woodcrete boxes (e.g. Schwegler boxes) specifically designed for buildings and houses (e.g. the Schwegler, 1FF, 1FQ or 1WQ bat boxes). If these boxes are adopted, it is recommended that they are installed as high as possible on the exterior walls, just under the eaves. South-facing façades should be favoured. All features will be installed at least 3.5m above ground level.

The bat box on a tree will be a Schwegler 1FF bat box, which is suitable for pipistrelles. This box will be erected on a tree within the wider landholding prior to the commencement of the demolition of the dwelling. This box will be used to house any bats which are rescued by the ecologist during the works.

All five replacement roost features will be retained in perpetuity, providing both compensation and enhancement for the loss of the common pipistrelle, soprano pipistrelle and brown long-eared day/occasional roosts.

7.6 Lighting

External lighting should be minimised within the development proposals, unless it is necessary for reasons of security and safety. Avoidance of external lighting will ensure that bat activity is not adversely affected. There should be no lighting or light spillage around the new bat roost features.

If lighting is required, it should be kept at low level and at low intensity, with hoods and baffles used to direct the light to where it is required (Bat Conservation Trust 2018; Emery 2008). To minimise the impact on bats, the use of low pressured sodium lamps is recommended in preference to mercury or metal halide lamps which have a UV element that can affect the distribution of insects and attract bats to the area, affecting their natural behaviour (Bat Conservation Trust 2018).

The key principals for choosing a suitable type of lamp are:

- Avoid blue-white short wavelength lights: these have a significant negative impact on the insect prey of bats. Use alternatives such as warm-white (long wavelength) lights as this will reduce the impact on insects and therefore bats.
- Avoid lights with high UV content: (e.g. metal halide or mercury light sources) or reduce/completely remove the UV content of the light. Use UV filters or glass housings on lamps which filter out a lot of the UV content.

Selecting an appropriate lamp unit that is designed to be environmentally friendly will minimise light spill, but further controls can be imposed by installing directional accessories such as baffles, hoods and louvres on lamps to direct light away from ecologically sensitive areas.

LED (Light Emitting Diode) units are an effective way to direct the light into small target areas and are recommended for lighting the proposed parking and turning area. Composite LEDs can be switched off to reduce/direct the light beam to specific areas.

8 References

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Emery, M., 2008. Effect of Street Lighting on Bats. Urbis Lighting Ltd., Anglia.

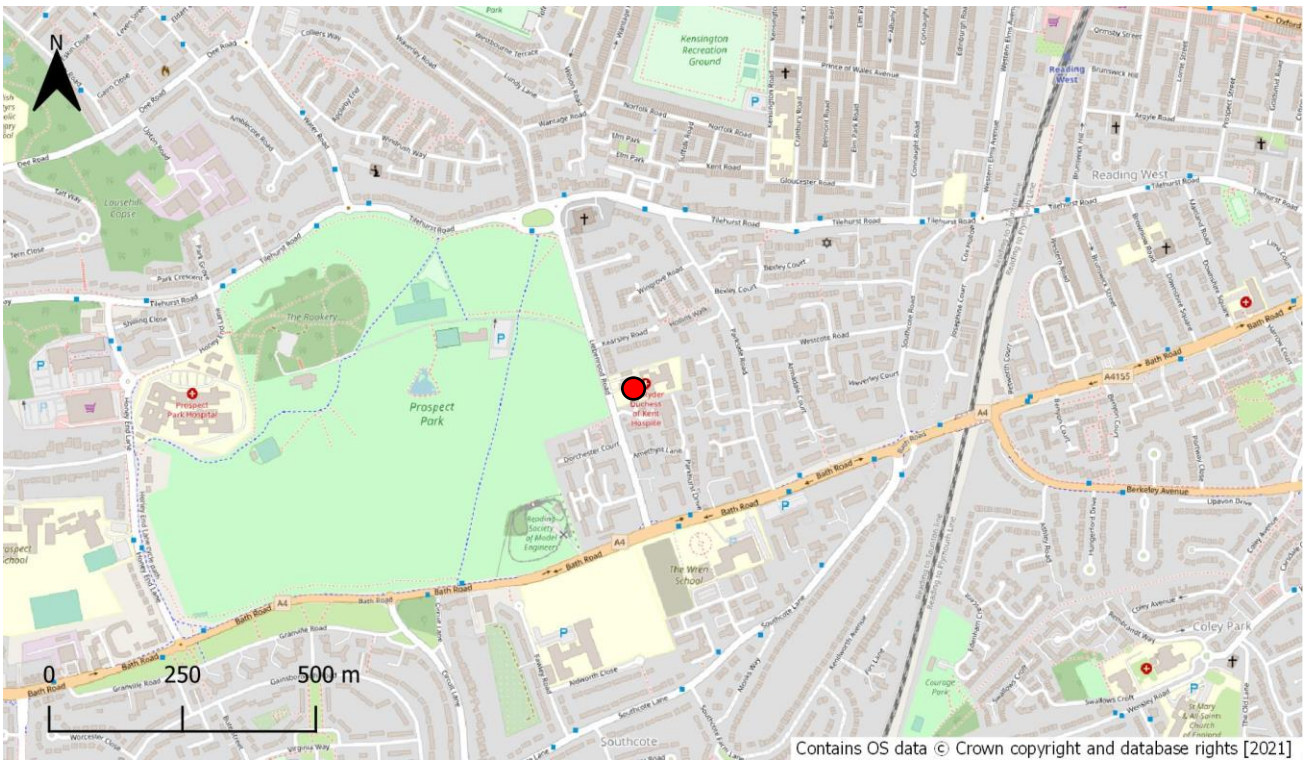
Joint Nature Conservation Committee, 2012. *Bat Worker's Manual*. Joint Nature Conservation Committee, Peterborough, UK.

Mitchell-Jones, A., 2004. *Bat Mitigation Guidelines*. English Nature.

Neuweiler, G., 2000. *The Biology of Bats.* Oxford University Press, Oxford, UK.

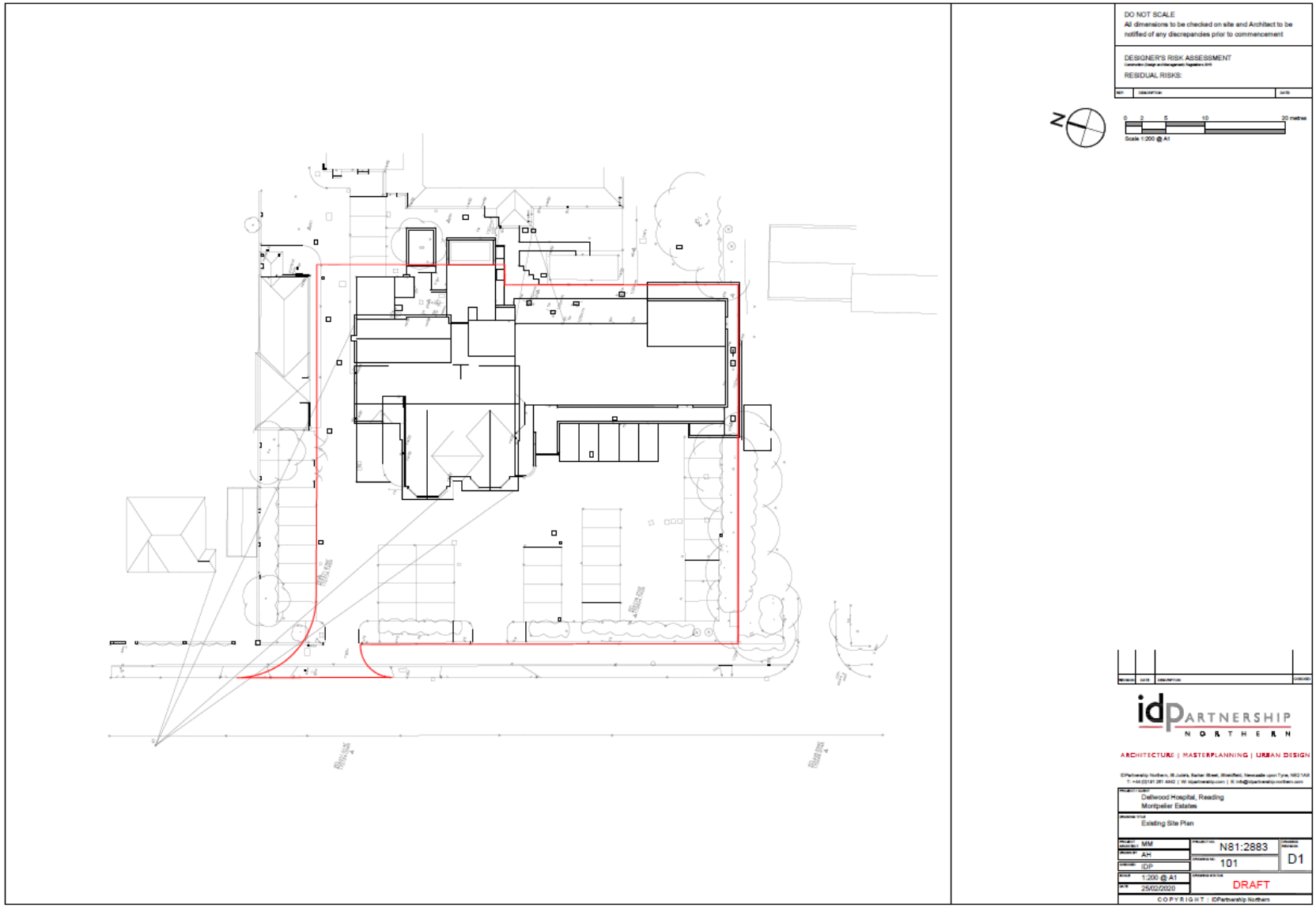
9 Appendix 1. Site Location Plans

Aerial photograph showing the location of Dellwood Hospital (outlined in red). *Source: Google Satellite*



An Ordnance Survey map showing the location of Dellwood Hospital (indicated by the red dot) within the wider local area. *Source: OS Standard*

10 Appendix 2. Existing Site Plan



11 Appendix 3. Proposal Plan