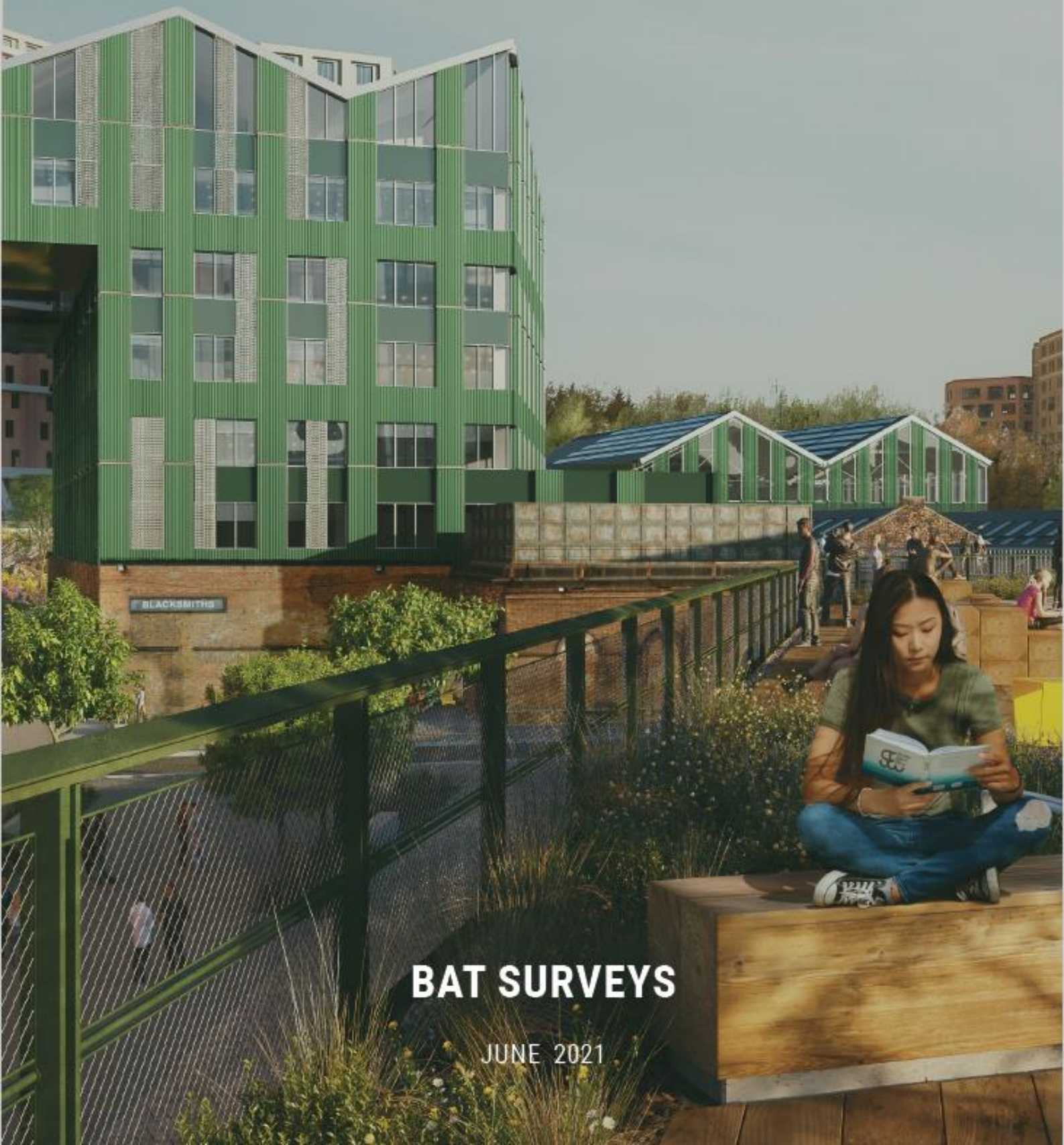
MURPHY'S YARD

AN APPLICATION BY FOLGATE ESTATES LIMITED



BAT SURVEYS

JUNE 2021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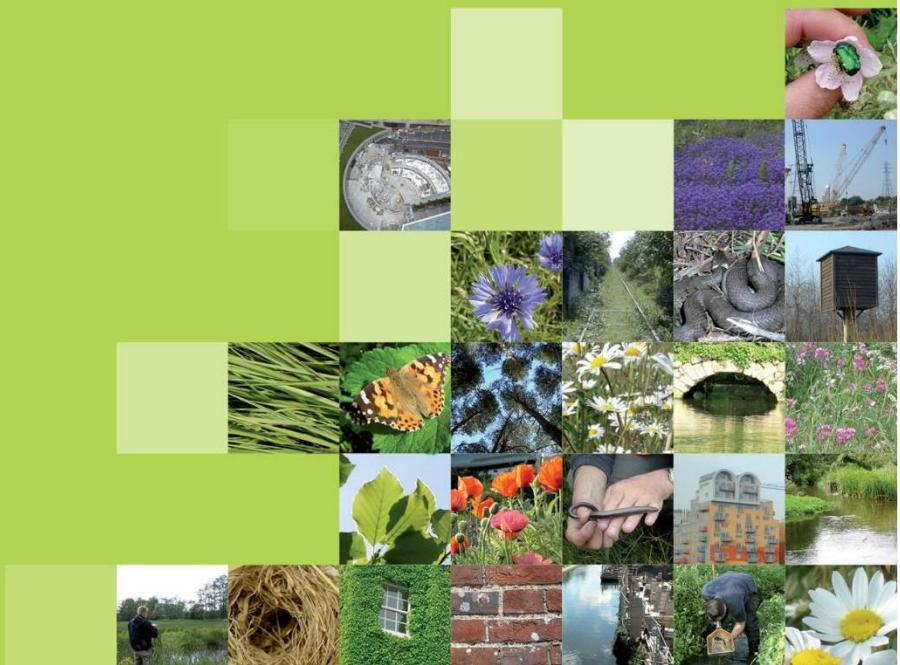
Murphy Site, Kentish Town / Bat Surveys / Report for Folgate Estates Ltd



The Ecology Consultancy

Murphy Site, Kentish Town

Bat Surveys

Folgate Estates Ltd

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Summary of Key Findings

The Ecology Consultancy was commissioned by Folgate Estates Ltd to determine the status of bats and any likely constraints to development arising at, The Murphy Site, Kentish Town in the London Borough of Camden. The development proposals for the site are for the demolition and refurbishment of existing buildings and the redevelopment of the site. The main findings are as follows:

- The site comprised 13 buildings surrounded by hardstanding with ruderal and ephemeral vegetation, and semi-mature trees on the boundaries of the site. A Preliminary Ecological Appraisal (PEA) (The Ecology Consultancy, 2019) and Preliminary Roost Assessment (PRA) was undertaken for the site in May 2019, which identified 3 buildings (B4, B5, and B6) with potential to support roosting bats.
- An inspection of any external potential roosting features was undertaken using a Mobile Elevated Working Platform (MEWP). A view of inside the loft void of B4 was gained on 8 August 2019 using a scaffolding tower, but there was no access inside the loft void to complete a thorough inspection for evidence of roosting bats. All other buildings on site were open to the apex. Buildings B4 and B5 had low potential to support roosting bats and in line with current survey guidelines, one dusk emergence survey was carried out on B4 and B5 on 8 August 2019. Following the inspection of the potential roosting features of B6 using a MEWP, these features were considered unsuitable for roosting bats, and no further survey work was considered necessary on B6.
- There were no trees on site with potential roosting features for bats.
- No evidence of roosting bats was identified in any of the buildings, and no bats were recorded emerging from B4 and B5 during the dusk emergence survey.
- The areas around the survey buildings during the emergence survey were well lit by flood lighting around the yard, and there were low levels of foraging and commuting activity from individuals of three species of bat.
- As there is no roost identified within the buildings on site, a European Protected Species Mitigation (EPSM) licence will not be required from Natural England prior to works. The final lighting design should avoid any extra lighting of the semi-mature trees on the boundaries of the site, to avoid disruption to commuting and foraging bats.

1 Introduction

BACKGROUND TO COMMISSION

1.1 The Ecology Consultancy was commissioned by Folgate Estates Ltd in April 2019, to carry out a Preliminary Roost Assessment (PRA) of land at the Murphy Site in Kentish Town, within the London Borough of Camden. The appraisal was carried out in order to provide ecological information to inform an outline planning application for a proposed redevelopment of the site. This appraisal considers land within the planning application site boundary (hereon referred to as 'the site') as indicated on the plan provided by the client (SEW, 2018).

SCOPE OF REPORT

1.2 The primary aims are, through a process of investigation and assessment, to determine if any bat roosts are present, what the type of roost may be, the species using them, their status and relative conservation importance and any likely impacts that couldoccur as a result of the proposals. Where impact is identified, appropriate mitigation and compensation measures are provided as supporting information to inform the planning application.

1.3 The assessment of a site for bats is based on the following sources of information, including that obtained from third parties and the results of surveys:

- a desk study including:
  - a data search for bat records within a 2km radius of the site;
  - an assessment of the surrounding habitats for their likely importance to bats;
  - the presence of any protected areas cited for their bat populations; and
  - the location and status of any nearby European Protected Species Mitigation licensed sites for bats.
- a Preliminary Roost Assessment comprising a detailed building inspection;
- a Preliminary Ground Level Roost Assessment of any trees scheduled for removal or remedial works;
- DNA analysis of bat droppings found; and
- emergence and re-entry surveys.

1.4 The elements listed above comprise the individual parts of the process that underlie the assessment. If, at preliminary assessment, the buildings and or trees do not provide any

potential for a roost, the assessment can be stopped at this stage. If potential for a roost is identified, a suite of emergence/re-entry surveys will be required to confirm presence or likely absence, to determine the species present, and to characterise any roosts located. In cases where no roosts are identified or suspected during these surveys, the assessment can be halted at that stage. Where roosts are found to be present then an evaluation of the conservation value of the species concerned is made and the impacts of the development identified and addressed.

1.5 The surveys cover all structures and trees within the planning application site boundary (hereon referred to as 'the site') as indicated on the plan provided by the client (SEW, 2018).

1.6 This assessment has been prepared with reference to best practice guidance published by the Bat Conservation Trust (Collins, 2016) and as detailed in BSI Standards Publication 42020:2013 *Biodiversity - Code of Practice for Biodiversity and Development* (British Standards Institution, 2013) and BSI 8956:2015 *Surveying for Bats in Trees and Woodland* (British Standards Institution, 2015).

1.7 This report provides supporting information in the appendices with a georeferenced map of the survey results in Appendix 1, cross referenced photographs in Appendix 2 and raw survey data in Appendix 3.

SITE CONTEXT AND STATUS

1.8 The proposed development site is 6.23 hectares (ha) in size and is centered on Ordnance Survey National Grid reference TQ 2859 8544. The site lies within the urban area of Kentish Town, to the west of Sanderson Close. It is not subject to any nature conservation designations, but it is bordered by railway lines to the north, north-east, south-west and south, which make up part of the Kentish Town City Farm, Gospel Oak Railsides and Mortimer Terrace Nature Reserve Sites of Borough Importance for Nature Conservation (SBINC grade I). The wider landscape is dominated by urban development to the west, east and south, comprising residential and industrial use, with scattered trees and amenity greenspaces. The Site of Metropolitan Importance for Nature Conservation (SMINC) of Hampstead Heath, which is a large greenspace with ponds, grassland and woodland, is situated approximately 220m to the north-west of the site.

DEVELOPMENT PROPOSALS

1.9 The current development proposals involve "Outline planning permission with all matters reserved for the demolition of existing buildings and structures and redevelopment to be carried out in phases (with each phase being an independent act of development)

comprising the following mix of uses: residential (Use Class C3), residential institution (Use Class C2), industrial (Use Class B2 and/or B8), commercial floorspace (Class E), flexible commercial and Sui Generis floorspace (Use Class E and/or Sui Generis Use), Community (F1 and/or F2), Sui Generis, and cycle and vehicle parking, refuse and recycling storage, plant, highway and access improvements, amenity space, landscape and public realm improvements, and all associated works.".

RELEVANT LEGISLATION AND PLANNING POLICY

1.10 The following key pieces of nature conservation legislation are relevant to this assessment, with a more detailed description of this legislation provided in Appendix 4:

- The Conservation of Habitats and Species Regulations 2017 (as amended);
- The Wildlife and Countryside Act 1981 (as amended); and
- Natural Environment and Rural Communities Act 2006.

1.11 The actions that could result in an offence occurring under the above legislation include: the disturbance of bats within a roost; loss or damage of a roost; blocking a roost entrance; or modification of a roost. If development proposals are likely to result in an offence, then a European Protected Species Mitigation (EPSM) licence must be obtained from Natural England prior to works to provide a derogation from the legislation. Alternatively, where no more than three low conservation significance roostsare present and are used by low numbers of bats of no more than three of the (qualifying) species that EPSM licences are most commonly applied for, it may be possible to register the site under the Bat Mitigation Class Licence (BMCL) scheme. No like for like bat compensation is required for the majority of the species covered by BMCL.

1.12 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2019) requires local authorities to avoid and minimise impacts on biodiversity and to provide net gains in biodiversity when taking planning decisions. In addition, in England, under Section 40 of the Natural Environment and Rural Communities Act 2006, all public bodies are required to have regard to biodiversity conservation when carrying out their functions. This is commonly referred to as the 'biodiversity duty'.

1.13 Other planning policies at the local level which are of relevance to this development include the Kentish Town Draft Planning Framework (Camden, 2018) and The Camden Local Plan (Camden, 2017).

2 Methodology

DESK STUDY

2.1 A desk study was conducted to obtain data relating to bats within a 2km radius of the site, as made available by the London Bat Group (LBG).

2.2 Additional contextual information was compiled from publicly available data sources:

- MAGIC (http://www.magic.gov.uk) - the Government's on-line mapping service. Information was sought concerning: the presence of ancient semi-natural woodland (ASNW); statutory designated nature conservation sites[1]; and extant or historic European Protected Species Mitigation licences for bats; and
- Ordnance Survey mapping and publicly available aerial photography to determine any features such as: running and standing water; woodland; tree lines; hedgerows; railway corridors; and the surrounding landscape uses.

BAT SURVEYS

Personnel

2.3 The surveys were led by Gemma Watkinson MBiolSci (Hons) ACIEEM, an ecologist with over 4 years commercial bat survey experience

2.4 Gemma was assisted during the evening emergence survey by Natalie Hughes and Dan Connaghan, both ecologists with commercial bat survey experience.

Equipment

2.5 The surveys listed below made use of some or all the following equipment:

- an extendable ladder;
- a video endoscope;
- a handheld LED torch;
- a high-powered torch for illuminating features at height;
- close focussing binoculars;
- bat dropping (DNA) collection kit;
- Bat Box Duet, frequency division and heterodyne detector;

[1] Statutory designations include Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, National Nature Reserves (NNR), Sites of Special Scientific Interest (SSSI) and Local Nature Reserves (LNR).

- Canon XA30 Infrared video camera and 500w IR light;
- Elekon Bat Scanner, frequency division detector;
- Elekon bat logger M, full spectrum detector;
- FLIR Thermal imaging camera T1020; and
- Anabat Express, Zero Crossing Analysis (ZCA) detector.

Aims and Objectives

2.6 The aim of the survey methodologies outlined below is to establish the presence/likely absence of bat roosts within the trees and buildings within the site boundary. Once presence has been established the secondary aim is to obtain sufficient information to characterise the type of roost according to criteria set out in the current guidelines (Collins, 2016). This includes determining the function/s of the site by bats for maternity or hibernation roosts, transitional roosts, foraging and commuting. The gathered information is then used to inform an assessment of the potential impacts of the development proposals and to devise an appropriate and proportionate mitigation strategy.

Field surveys

2.7 The survey methodologies below follow best practice guidelines (Mitchell-Jones & McLeish, 2004; Collins, 2016; The British Standards Institution, 2015). A standard recording form was completed for each building within the site boundary and for each tree that is likely to be impacted by the proposals. This included recording the main structural features and layout, any potential access points and roost features and photographs. The criteria used as a framework to assess the suitability for structures or trees to support roosting bats are provided in Appendix 5. This section provides methodologies for the primary survey types used to assess the status of bats at a site, depending on the particulars of the site and the commission, not all of these survey types may be carried out.

Preliminary Roost Assessment - Buildings

2.8 The survey comprised an external inspection of each building, involving a detailed search of all accessible architectural features for bat droppings, urine staining, scratch marks, staining around suitable crevices and feeding remains. Window panes and otherexternal surfaces were visually checked for droppings or other secondary evidence. A high-powered torch was used to illuminate recesses and crevices at height and these were inspected using close focusing binoculars. This included external features, such as soffit boxes, roof tiles, hanging tiles, ridge areas and window casements. Any

features that could potentially provide access into internal areas such as roof voids and cavity walls were noted.

2.9 During the internal inspection the surveyor worked through the roof void of the building, where access allowed. Within the roof voids all surfaces including floor areas were checked for discarded feeding remains and bat droppings. The beam from a high-powered torch was shone along the length of each individual rafter, where appropriate to the roof type, looking for bats, staining and droppings. The roofing material was also inspected for areas of overlapping materials, holes and potential access points into the ridge area. .

2.10 A Mobile Elevated Working Platform (MEWP) was provided on site to allow access to inspect external features with potential to support roosting bats. A scaffold platform was provided to allow inspection of the loft void in B4. Within the roof void all surfaces including floor areas were checked for discarded feeding remains and bat droppings. The beam from a high-powered torch was shone along the length of each individual rafter, where appropriate to the roof type, looking for bats, staining and droppings. The roofing material was also inspected for areas of overlapping materials, holes and potential access points into the ridge area.

Preliminary Ground Level Roost Assessment - Trees

2.11 Any trees that were within the site boundary and likely to be impacted by the proposals were inspected for any suitable features that could provide suitable roosting locations for bats, including: loose, flaking or folded bark; cracks and fissures in limbs; woodpecker holes; or any downward-facing crevices or holes in the limbs or trunks. They were also inspected for any signs indicating possible use by bats, such as tiny scratches, rub marks and staining around access points, bat droppings in around or below access points.

Emergence and Re-entry Surveys

2.12 A total of three surveyors were employed to allow clear views of all potential roost entry/exit points identified during the preliminary roost assessments. The dusk surveys commenced 15 minutes before sunset and continued for up to 120 minutes after sunset. The dawn survey commenced 120 minutes before sunrise and continued until fifteen minutes after. Each of the surveyors noted down details of any bat activity including; bat passes[2], species, numbers, location, emergence or re-entry, foraging and

[2] For the purposes of this assessment a bat pass is taken to be a series of individual registrations by an individual bat that are emitted in a short sequence and either heard or recorded as a bat passes the position of the surveyor or the detection envelope of the recorder that is employed.

commuting, recording details to a data sheet and a map. The surveyors employed a combination of heterodyne bat detectors for aural ID in the field, and/or, full spectrum or zero crossing detectors for sound analysis post survey.

Post-Survey Analysis

2.13 The audio recordings may be analysed post survey using one or more of the following software: AnalookTM V3.3q., Bat Explorer™ or Kaleidoscope™, to confirm species identification and the timing of any passes. Any passes likely to have originated from one of the myotis species were determined to genus level only due to the complexity of differentiating between these species.

Roost Characterisation

2.14 The results from the preliminary roost assessments (including the PGLRA) and the emergence/-re-entry surveys are used to characterise any roosts that may be confirmed within the site. This follows standard criteria for roosts, classifying roost type[3] as described in the Natural England bat EPSM licence application form. Also included are variables such as: species; abundance; likely use; and importance throughout the year.

EVALUATION AND IMPACT ASSESSMENT

Evaluation

2.15 The conservation status of those species found to be roosting within the site or for which the site provides a measurable supporting function is drawn from published sources with the conservation significance of any roost provided according to accepted criteria[4].

2.16 If emergence and re-entry surveys were carried out, then the foraging and commuting activity recorded during those surveys is summarised along with an outlineinterpretation of the function the site may provide for these activities.

2.17 The ecological importance of the site for bats has been assessed broadly following guidance issued by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018) which ranks nature conservation importance according to a geographic scale of reference: international and European; national; regional; metropolitan, county vice-county or other local authority-wide area; local or of value at the site scale. The following factors are considered when making this evaluation: nature conservation

[3] Day, Night, Feeding Perch, Transitional, Satellite, Maternity, Hibernation, Foraging Area, Commuting Route, Swarming Site.
[4] Figure 4. *Guidelines for proportionate mitigation*, the Bat Mitigation Guidelines (Mitchell-Jones & McLeish, 2004) which assigns conservation significance to different types of bat roost on a sliding scale from Low to High

designations; rarity; vulnerability; distribution; and the conservation significance of any roosts.

Impact Assessment

2.18 An assessment is provided on the likely impacts of the development proposals on any bat roosts located within or immediately adjacent to the site boundary. This assessment is made with reference to Section 6[5] of the Bat Mitigation Guidelines (Mitchell-Jones & McLeish, 2004) and Natural England's standing advice[6] and includes a summary of the scale of impact according to roost type and development effect. This section considers types of construction impact to bats and their roosts including; disturbance, loss, modification and fragmentation in relation to duration and timing. For the site as a whole, a statement is made on the geographic scale at which impact is deemed to be significant, following CIEEM guidance (CIEEM, 2018).

DATA VALIDITY AND LIMITATIONS

2.19 It is important to note that even where data are held, a lack of records for a defined geographical area does not necessarily mean that there is a lack of ecological interest; the area may be simply under-recorded. Bats are highly mobile animals and can move roost sites both within and between years. Where surveys are not spread throughout the bat active season is possible that they could miss roosts that are occupied earlier or later in the year. However, where undisturbed, evidence of bats inside a building is likely to be detectable throughout the year. The detection of small numbers of crevice dwelling species may remain problematic in some cases, such as where droppings accumulate within an inaccessible void.

2.20 Data from bat surveys should be considered to be valid for a period of 24 months, unless there are any gross changes to the buildings or other habitats within the site.

2.21 It was not possible to enter the loft void of B4, and an inspection was made from the access hole only using a scaffold tower platform.

[5] *Predicting the Impact of Development*, the Bat Mitigation Guidelines (Mitchell-Jones & McLeish, 2004), assigns scale of impact to the favourable conservation status of bats according to type and extent of construction effect
[6] *Bats: surveys and mitigation for development projects*, first published 28 March 2015

3 Results

DESK STUDY

Data search

3.1 The London Bat Group data search returned a total of 354 records of bats or bat roosts from 1984 to 2017 within a 2km radius of the site. There are seven historic or extant EPSM licences for bats within a 3km radius of the site. There are no designated sites for bats within 3km of the site. A summary of the most pertinent results is presented in Table 3.1 and Table 3.2 below.

Table 3.1: Summary of most pertinent data search results from the local environmental records centre

Species	Distance & Orientation	Date	Roost type	Notes
Common pipistrelle	0.74km north-west	09/07/2010	Roost	Constantine Road, NW3
Soprano pipistrelle	1.25km north-east	01/05/2015	Roost	Highgate Cemetery (West)
Noctule	1.98km south	18/10/1987	Roost	London Zoo
Brown long-eared	0.29km west	13/09/2011	Casualty	Kiln Place NW5
Daubenton's	1.35 north-west	25/10/2017	Field Record	Hampstead ponds
Nathusius' pipistrelle	1.35 north-west	25/10/2017	Field Record	Hampstead ponds
Myotis sp.	1.3km north	January 2014	Hibernation Site	Highgate cemetery
Plecotus sp.	1.3km north	February 2013	Hibernation Site	Highgate cemetery
Leisler's	1.35km north	August 2012	Field record	Highgate cemetery
Natterer's	1.65km north-west	24/07/2005	Field record	Hampstead Heath

Table 3.2: Protected sites and bat EPSM licences within 3km of the site boundary

Receptor	Distance & Orientation	Notes
EPSM	2.1km SW	Extinct licence to allow destruction of a resting place for common pipistrelle and soprano pipistrelle (2012) EPSM2012-4961.

Table 3.1: Summary of most pertinent data search results from the local environmental records centre

Species	Distance & Orientation	Date	Roost type	Notes
EPSM	2.3km NW		Extinct licence to allow destruction of a restingplace for soprano pipistrelle (2012-2015) EPSM2012-4532.	
EPSM	2.56km W		Extinct licence to allow destruction of a resting place for common pipistrelle and soprano pipistrelle (2010-2012) EPSM2010-2134.	
EPSM	2.6km SW		Current licence for destruction of a resting place of common pipistrelle and soprano pipistrelle (2015-2020) 2015-9230-EPS-MIT.	
EPSM	2.7km S		Current licence for destruction of a resting place of soprano pipistrelle (2017-2022) 2017-30911-EPS-MIT.	
EPSM	2.8km SW		Current licence for destruction of a resting place of common pipistrelle (2015-2020) 2015-10291-EPS-MIT.	
EPSM	2.8km NE		Extinct licence to allow destruction of a restingplace for common pipistrelle (2011-2012) EPSM2010-2225.	

Surrounding habitat

3.2 The habitats present on site are dominated by buildings and hardstanding. While the site itself does not contain habitats with high potential to support foraging and commuting bats, the boundary trees provide some connectivity between the site and nearby areas with good roosting and foraging value for bats. The site is also linked to suitable off-site foraging and commuting habitat via the railway lines adjacent to the western, southern and northern boundaries of the site, which would connect the site to Hampstead Heath at the north-west, which contains habitats suitable for foraging and commuting bats.

FIELD SURVEYS

Overview

3.3 The detailed external inspection found no bats, or evidence of roosting bats, in any of the buildings surveyed. However, several potential roosting features for bats were noted within the exterior brickwork of buildings B4, B5 and B6.

3.4 Following an inspection of these features using the MEWP, B4 and B5 were assessed as having low potential to support roosting bats. B6 was assessed as having negligible potential to support roosting bats and no further work was considered necessary.

3.5 During the dusk emergence survey there were no bats seen to emerge from the potential roosting features on B4 or B5. There were low levels of foraging and commuting activity throughout the evening survey by three species of bat.

Weather Conditions

3.6 The preliminary roost assessments, ground level roost assessments and the emergence survey were carried out in optimal weather conditions:

3.7 *PRA:* 14 May 2019, 16ºC, light breeze (Beaufort 1), 0/8 okta[7] cloud cover and no rain. Sunset was at 20:43 and the survey commenced at 10:30 and continued until 14:00.

3.8 *PGLRA:* 14 May 2019, 16ºC, light breeze (Beaufort 1), 0/8 okta[8] cloud cover and no rain. Sunset was at 20:43 and the survey commenced at 10:30 and continued until 14:00.

3.9 *Emergence Survey 1:* 8 August 2019, 23ºC, gentle breeze (Beaufort 1), 7/8 okta cloud cover and no rain, except for a rain shower during the final 5 minutes of the survey. Sunset was at 20:37 and the survey commenced at 20:22 and continued until 22:07.

Preliminary Roost Assessment - Buildings

3.10 The building inspection covered all of the buildings or structures within the site (B1- B14). Each building is detailed individually below with a site plan provided in Appendix1 and supporting photographs of key features in Appendix 2. Further photographs of each building can be viewed in the accompanying PEA report.

Table 3.3: Murphy site, Kentish Town - building descriptions

Building number	Description	Roosting potential
1	A series of single storey pitched roof workshops in constant use. They are constructed of a steel frame, open to the apex, and covered with corrugated metal sheeting, with plastic daylight panels in the roof covering. There was only one workshop with timber boarding beneath the metal sheeting roof covering, which would enclose a void. There were metal frame windows on the south-western elevation, with no gaps present.	Negligible

[7] An okta is a unit of measurement for cloud cover, based on an estimate of how many eighths of the sky are obscured by cloud.
[8] An okta is a unit of measurement for cloud cover, based on an estimate of how many eighths of the sky are obscured by cloud.

Table 3.3: Murphy site, Kentish Town - building descriptions

Building number	Description	Roosting potential
2	Prefabricated portacabin type office.	Negligible
3	Training building. Old warehouse building with brick skin addedafter, gap around existing windows, but wide (approx. 2cm). Pitched steel frame roof with corrugated metal sheeting and plastic daylight panels. Flat roof single-storey extension at west of building with bitumen felt.	Negligible
4	Canteen. This is a solid brick building with a cross gabled roof of slate and the south and a flat roof at the north. All roof tiles and ridgewere noted to be tight. There were several gaps in the brickwork on the eastern elevation of the building, where the existing sign is boltedto the wall, where a brick has twisted and exposed a cavity withinthe wall and around the parapet wall. Building 5 is adjacent on the western elevation.	**Low**
5	Large adjoining warehouse buildings, in constant use. Solid brick walls with no gaps noted within exterior or interior brickwork, with the exception of some gaps around a bricked-up window on the southern elevation. Steel frame supporting pitched (north) and flat roof (south) sections with corrugated steel sheeting and plastic daylight panels. Gaps at eaves but no potential roosting feature between brickwork and metal sheeting. Hanging clay tiles are present on a small section on the south-western elevation of Building 5, and there are gaps under the tiles on the corner of the building. Flat roof canopy constructed of timber adjacent on the eastern elevation.	**Low (southern elevation)**
6	Vehicle wash. Brick building with stone flat roof, with water tank above. Grill leading to a cavity within the brickwork on southern elevation, and gaps within stonework where mortar has eroded. Inspected using MEWP, no evidence of bats and features were considered open and exposed upon closer inspection and therefore negligible potential for roosting.	Negligible
7	Two-storey office building with solid brick walls and PVC windows, no gaps noted around windows. Appears to have been recently re-roofed, with no tiles missing or lifted, and PVC skylights within the	Negligible

Table 3.3: Murphy site, Kentish Town - building descriptions

Building number	Description	Roosting potential
	roof covering. PVC soffit boxes on the eastern, northern and southern elevations, no gaps noted.	
8	Refurbished office building to be retained on site. Cavity brick walls with timber cladding and PVC windows. No gaps noted on theexterior of the building. Northern and western elevations not accessible/ visible, southern elevation adjoin Building 5.	Negligible
9	Modern workshop constructed of a steel frame with profile metal sheeting on walls and roof covering, with plastic daylight panels. Within the modern building there is also an old warehouse building with brick walls, and a steel frame supporting a pitched roof of corrugate sheeting and plastic daylight panels. Netting has been used within the building to prevent birds nesting within the building. No gaps were noted within the brickwork.	Negligible
10	Brick chimney structure for the tunnel beneath the site, towards the south-west of the site. No gaps noted within the exterior brickwork.	Negligible
11	Gatehouse building. This is a modern building with cavity brick walls and timber cladding in places, supporting a flat roof, L-shaped on plan. No gaps noted within the brickwork or cladding.	Negligible
12	Kentish Town Forum. A four-storey building with solid brick walls, timber frame windows, with no gaps noted. A well-maintained building, with stone on the eastern façade, and a canopy on the eastern elevation with no potential roosting features.	None
13	Complex building with a series of additions on the south-western elevation, with flat roof sections and including skylights (limited visibility). The north-eastern elevation of the building is a four-storey building with solid brick walls and wooden sash windows, with no gaps or potential roosting features noted.	None

3.11 *Building 4: Description.* Building 4 was a solid brick building with two hipped roofs of slate adjoining to form a valley at the south (Appendix 2, Photograph 1), and there was an area of flat roof at the north. There was a timber floor to the loft void, with a modern suspended ceiling beneath this. Access could not be gained to fully inspect the interior

of the loft void. A view was gained of the loft void, from atop a scaffolding tower where there was a gap in the timber floor of the void, adjacent to the eastern wall of the building. Timber boarding was present beneath the slates and the bitumen felt that lined the timber had completely degraded (Appendix 2, Photograph 2).

3.12 *Building 4: Results.* The building was generally in good condition, with all roof tiles and ridge tiles noted to be tight. However, there were several gaps noted in the brickwork on the eastern elevation of the building, where the existing sign is bolted to the wall (Appendix 2, Photograph 3). There is also a brick that has twisted on the north-eastern corner of the building, and upon inspection was found to be an access point into a cavity within the wall and around the parapet wall (Appendix 2, Photograph 4). These gaps in the brickwork would provide potential roosting features for bats. There was alsoa gap in the brickwork at the apex of the parapet wall on the south-eastern elevation of the building, but this was large and exposed and considered unsuitable.

3.13 The loft void was found to contain an abundance of cobwebs. There was no evidence of bats recorded within the loft void, on top of the suspended ceiling tiles or on the timber floor of the loft void. Mouse droppings were noted above the suspended ceiling at the eastern end of the building (Appendix 2, Photograph 5).

3.14 Building 4 had low potential to support roosting bats, and one emergence survey was required on this building.

3.15 *Building 5: Description.* Building 5 was a large warehouse building that adjoins Building 4 on its western elevation. There were solid brick walls and a steel frame supported pitched (north) and flat roof (south) sections with corrugated steel sheeting and plastic daylight panels. Hanging clay tiles were present on a small section on the south-western elevation of Building 5. There were several bricked-up windows on the southern elevation of the warehouse.

3.16 *Building 5: Results.* The brickwork of the building is generally in good condition. There were no gaps noted within the brickwork, with the exception of some gaps around one of the bricked-up windows on the southern elevation (Appendix 2, Photograph 6). Gaps were also noted under the hanging tiles on the south-western corner of the building (Appendix 2, Photograph 7).

3.17 Building 5 had low potential to support roosting bats, and one emergence survey was required on this building.

3.18 *Building 6: Description.* Building 6 was used as a vehicle wash. It was a brick building with a flat roof, with water tank above. There was a grill on southern elevation, and gaps within the stonework where mortar had eroded (Appendix 2, Photograph 8).

3.19 *Building 6: Results.* The gaps within the stonework and the grill on the southern elevation were inspected using a MEWP. The cavity behind the grill, and the gaps within the stonework were found to be open and exposed and was considered to be unsuitable for roosting bats (Appendix 2, Photograph 9). No evidence of bats was notedwithin these features, and they were considered to have negligible potential for roosting.No further survey work is required on B6.

Preliminary Ground Level Roost Assessment - Trees

3.20 There were no mature trees on site considered to provide potential roosting features for bats.

Emergence Survey 1

3.21 There were no bats recorded emerging from Building B4 and B5 during the evening emergence survey. Full survey data can be found in Appendix 3. The areas around the buildings and the yard and carparking areas of the site were all found to be highly illuminated by flood lighting during the emergence survey.

3.22 Occasional bat activity was recorded throughout the survey, with 16 calls recorded by the surveyors. Three species were recorded - common pipistrelle *Pipistrellus pipistrellus*, noctule *Nyctalus noctule* and soprano pipistrelle *Pipistrellus pygmaeus*.

- The first call recorded was a noctule at 20:36. This species accounted for the majority of the activity recorded on site, being recorded 11 times during the survey, between 20:36 and 21:32.
- Common pipistrelle bats were recorded 3 times during the survey, at 21:04, 21:44, and 21:58; and
- Soprano pipistrelle was recorded twice during the survey, at 21:09 and 21:17.

3.23 *Sound Analysis*: All bat calls were clear enough to be identifiable to species level.

ROOST CHARACTERISATION

3.24 The table below provides a summary of the results of the assessment for each building and tree that were included in the surveys.

Table 3.3: Characterisation of roost type and status

ID	Evidence	Species	Count	Potential/Type	Annual pattern of use
B4	Emergence survey and Sound analysis	No roost present	n/a	n/a	n/a
B5	Emergence survey and Sound analysis	No roost present	n/a	n/a	n/a

4 Evaluation and Impacts

EVALUATION

Species

4.1 Common pipistrelle and soprano pipistrelle bats are probably the most common and widespread species; found throughout the UK with pre-breeding population estimates grouped together at up to two million (Harris and Yalden, 2008). These species are believed to be common and widespread throughout Greater London and the data search located roosts for these species within 2km of the site.

4.2 Noctule is another widespread species and roosts for noctule bats have also been recorded within 2km of the site.

Foraging and commuting

4.3 The site provides a function as a foraging and commuting resource used by at least three species of bat; common pipistrelle, soprano pipistrelle, and noctule. A single common pipistrelle was seen travelling from west to the east of the site. It is consideredlikely that bats are using the railway sidings adjacent to the south of the site for foraging and commuting.

Summary of the Site's Importance to Bats

4.4 The site is assessed as important at the site level only, as there are no roosts recorded within the buildings on site and there was occasional use by commuting and foraging bats.

IMPACT ASSESSMENT

Species

4.5 Not applicable, no roost present.

Foraging and commuting habitats

4.6 The development proposals for the site include the retention of existing trees on the boundaries of the site. It is considered that the proposed development will not result in the loss of commuting and foraging habitat for bats. The new lighting planned for the construction and operational phases of the development should be carefully designed to ensure that there is no additional light spill onto adjacent habitats, to ensure there will be no disruption to existing commuting routes and foraging areas.

Summary of the Predicted Impact at Site Level

4.7 There is not considered to be any significant impacts on commuting bats at the site level.

5 Summary and Recommendations

SUMMARY OF FINDINGS

5.1 This section summarises the findings of the surveys and the likely impacts on bats, bat roosts and supporting habitats that are present on the site, as described in previous sections of this report.

5.2 No ecological constraints have been identified on site in respect of bats.

RECOMMENDATIONS

5.3 To ensure that the operational phase of development does not cause any disruption to bat commuting routes, it is recommended that the final lighting scheme be designed to minimise any light spillage to the semi-mature trees on the boundaries of the site, and the adjacent railway sidings (BCT, 2018).

5.4 Some generic proposals for mitigation, compensation and enhancement measures are provided in Appendix 6.

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Appendix 1: Map of Survey Results and Compensation Measures

Figure 1: Map of Preliminary Roost Assessment survey results

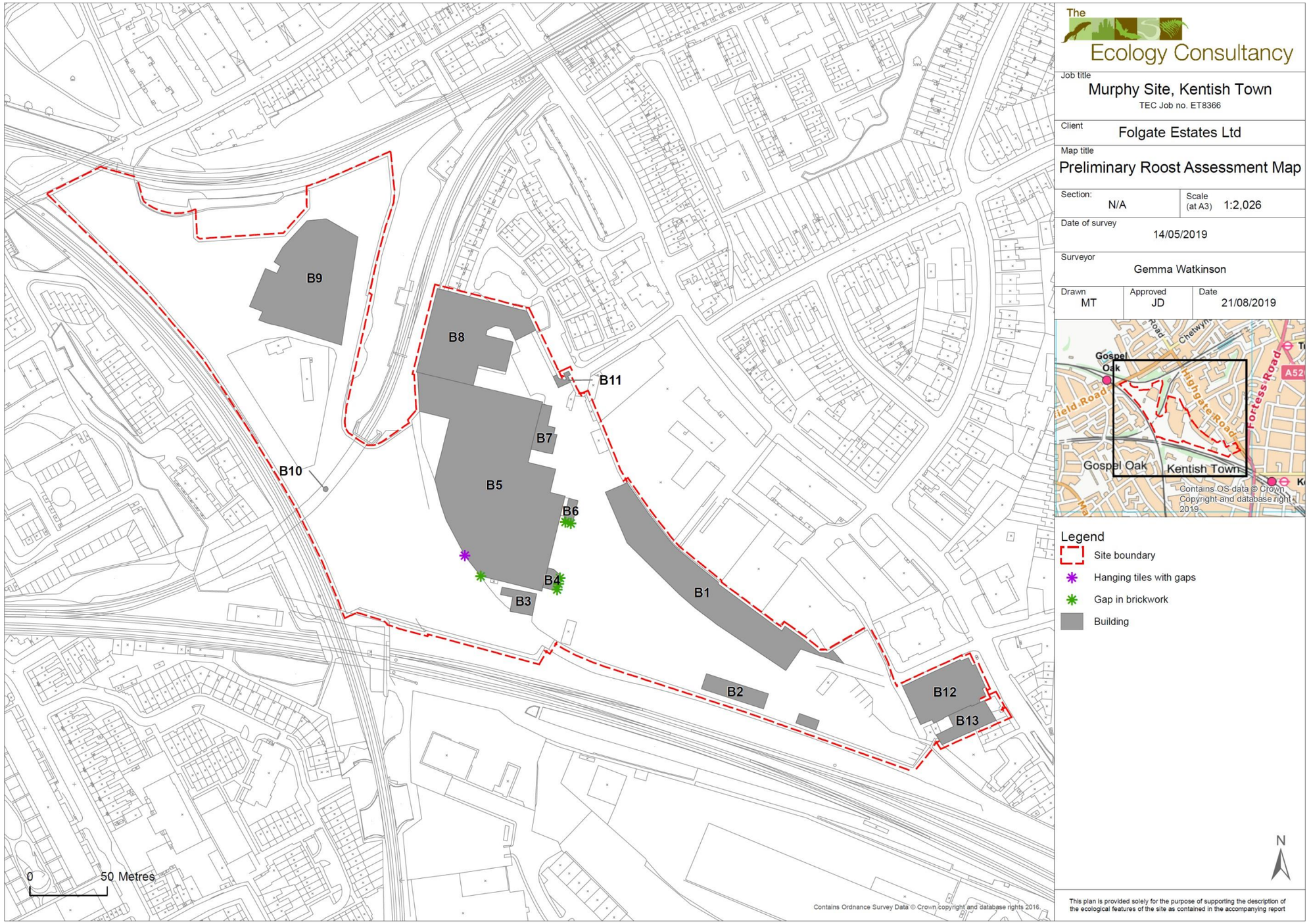
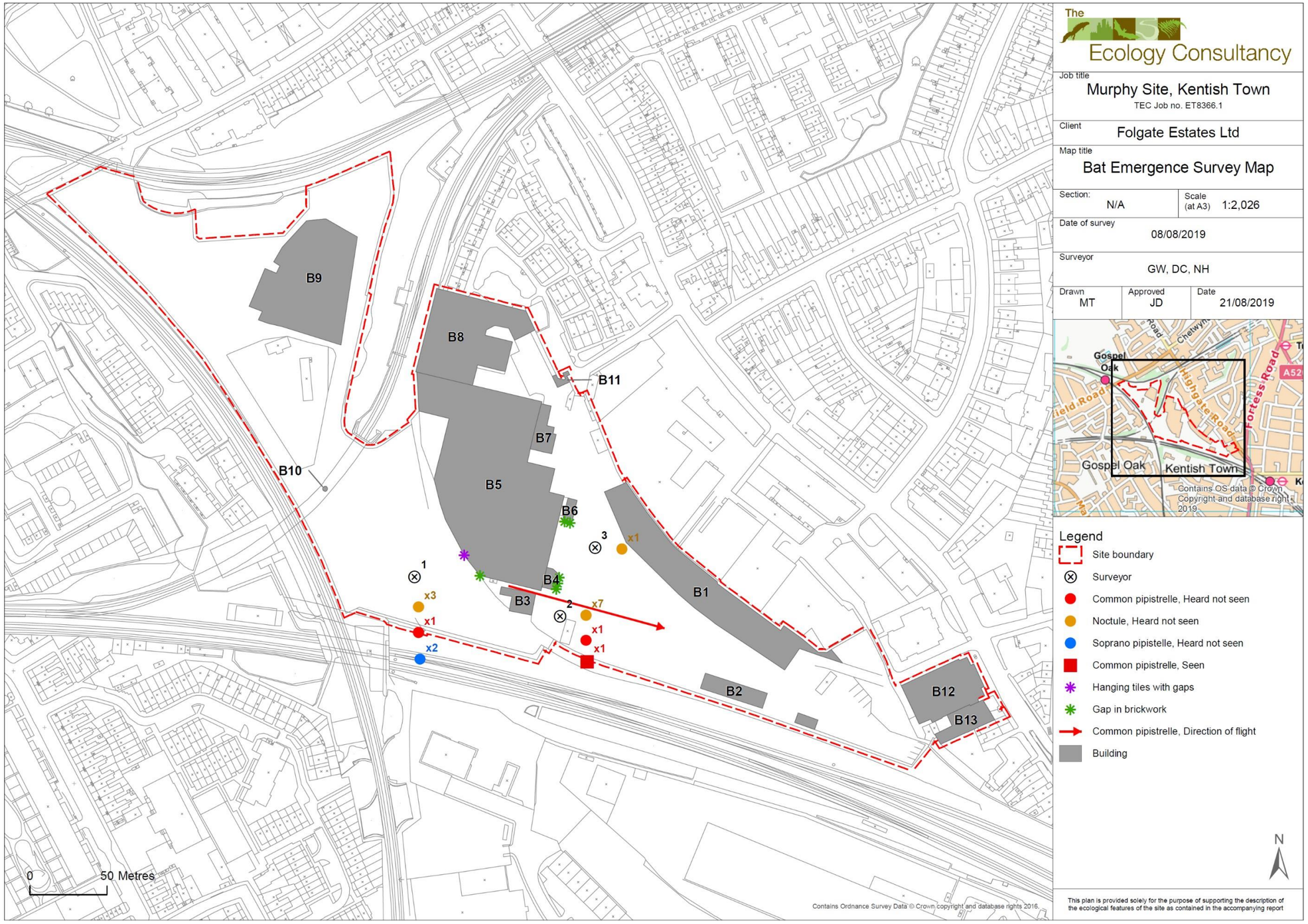


Figure 2: Map of dusk emergence survey results



Appendix 2: Photographs

Photograph 1
View of roof structure of Building B4, as viewed from the east, with B5 behind.

Photograph 2
Representative view of interior of loft void of building B4, as viewed from atop a scaffold tower at the eastern end of the void.

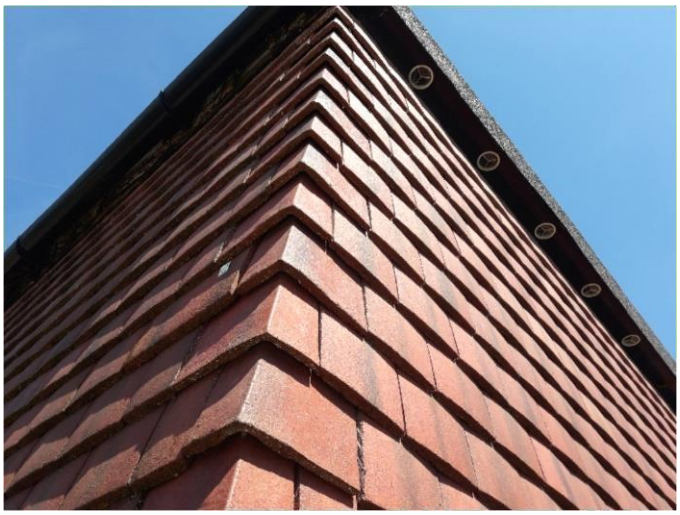
Photograph 3
Holes within brickwork where sign has been fixes to south-eastern elevation of Building B4.

Photograph 4
Twisted brick on north-eastern corner of Building B4, creating an access point to cavity within parapet wall.

Photograph 5
Mouse dropping on upper side of suspended ceiling in Building B4.

Photograph 6
View of gaps around the bricked-up window on the southern elevation of B5.

Photograph 7
View of gaps beneath hanging tiles on south-western corner of building B5.



Photograph 8
View into cavity behind grill on southern elevation of Building B6.

Photograph 9
View into cavity between stonework on southern elevation of Building B6.

Appendix 3: Survey Data

Project		8366.1 Murphy Site Kentish Town		**Building reference**		B4	
Surveyor		Gemma Watkinson		**Date**		14/05/2019	
Grid ref - Easting,Northing		528647	185401	**Equipment used**		MEWP, high powered torch, scaffold platform	
General weather conditions		Bright, sunny, dry					
Temperature	16	**Cloud cover (0-8)**	0	**Wind (Beaufort 0-12)**	1	**Rain (0-5)**	0
External Assessment							
Structure type	Converted brick warehouse			**In use as:**	Canteen		
Approximate age	c1900			**Roof material**	Slate		
Roof shape	Two adjoining pitched roofs at south, with flat roof at north			**Cladding?**	None	**Soffits?**	None
Hanging tiles?	None			**Chimney?**	None	**Lead flashing?**	In roof valleys
Shape of Building	Square			**Dormers?**	None	**Bargeboard?**	None
Constructed of:	Brick with timber roof			**General condition**	Good		
Internal Assessment							
Roof void present?	Yes			**Frame type**	Timber		
Truss Type	Unknown			**Insulation type**	None		
Floor type (void)	Timber			**Cavity in wall?**	Yes		
Evidence of use by bats	None						
Description / notes	Parapet wall at gable end, on eastern elevation. There is a modern suspended ceiling beneath the timber floor of the loft void – no evidence of bats seen within loft void, or on top of suspended ceiling beneath, where the timber floor of void is missing to provide an access point. Roof covering tight and lead flashing around the roof valleys was all seen to be tight. Gaps within exterior brickwork where 'canteen' sign has been bolted into the brickwork. Also gaps in brickwork of parapet wall, some leading into sheltered cavities, others are more exposed. No evidence of bats noted within or beneath gaps within brickwork.						

Project		8366.1 Murphy Site Kentish Town		**Building reference**		B5	
Surveyor		Gemma Watkinson		**Date**		14/05/2019	
Grid ref - Easting,Northing		528598	185416	**Equipment used**		MEWP, high powered torch	
General weather conditions		Bright, sunny, dry					
Temperature	16	**Cloud cover (0-8)**	0	**Wind (Beaufort 0-12)**	1	**Rain (0-5)**	0
External Assessment							
Structure type	Warehouse building			**In use as:**	Warehouse		
Approximate age	C1900			**Roof material**	Corrugated steel sheeting and plastic daylight panels		
Roof shape	Pitched and flat roof sections			**Cladding?**	None	**Soffits?**	None
Hanging tiles?	Yes – south-western elevation			**Chimney?**	None	**Lead flashing?**	None
Shape of Building	L-shaped			**Dormers?**	None	**Bargeboard?**	None
Constructed of:	Brick walls with steel frame supporting pitched roof			**General condition**	Good condition		
Internal Assessment							
Roof void present?	None			**Frame type**	Steel		
Truss Type	n/a			**Insulation type**	None		
Floor type (void)	n/a			**Cavity in wall?**	None		
Evidence of use by bats	None						
Description / notes	Large adjoining warehouse buildings, in constant use. Solid brick walls with some gaps around a bricked-up window on the southern elevation. Steel frame supporting pitched (north) and flat roof (south) sections with corrugated steel sheeting and plastic daylight panels. Gaps at eaves but no potential roosting feature between brickwork and metal sheeting. Hanging clay tiles are present on a small section on the south-western elevation of Building 5, and there are gaps under the tiles on the corner of the building. Flat roof canopy constructed of timber adjacent on the eastern elevation.						

Project		8366.1 Murphy Site Kentish Town		**Building reference**		B6	
Surveyor		Gemma Watkinson		**Date**		14/05/2019	
Grid ref - Easting,Northing		528659	185447	**Equipment used**		High powered torch	
General weather conditions		Bright, sunny, dry					
Temperature	16	**Cloud cover (0-8)**	0	**Wind (Beaufort 0-12)**	1	**Rain (0-5)**	0
External Assessment							
Structure type	-			**In use as:**	Vehicle wash		
Approximate age	C1900			**Roof material**	Stone (with metal water tank)		
Roof shape	Flat			**Cladding?**	None	**Soffits?**	None
Hanging tiles?	None			**Chimney?**	None	**Lead flashing?**	None
Shape of Building	Square			**Dormers?**	None	**Bargeboard?**	None
Constructed of:	Brick with stone roof			**General condition**	Good		
Internal Assessment							
Roof void present?	None			**Frame type**	n/a		
Truss Type	n/a			**Insulation type**	n/a		
Floor type (void)	n/a			**Cavity in wall?**	Yes – behind grill on south elevation		
Evidence of use by bats	None						
Description / notes	Brick building with stone flat roof, with water tank above. Grill leading to a cavity within the brickwork on southern elevation, and gaps within stonework where mortar has eroded. Inspected using MEWP, no evidence of bats and features were considered open and exposed upon closer inspection and therefore negligible potential for roosting.						

Project		8366.1 Murphy Site Kentish Town		**Building reference**		B5	
Surveyor		1		**Date**		08/08/2019	
Survey no		1		**Survey start/end times**		20:22 / 22:07	
Sunset/rise time		20:37		**Equipment reference**		Batlogger	
Surveyor-Easting, Northing		528589	185400	**Surveyor location**		South-west of B5	
General weather conditions		Warm, overcast, gentle breeze, rain shower during last 5 minutes of survey					
Temperature (start and end)	23 - 23	**Cloud cover (0-8)**	7	**Wind (Beaufort 0-12)**	1	**Rain (0-5)**	0-1

Species - (CP=common pipistrelle, SP=soprano pipistrelle, LE=long-eared, N=Noctule, S=Serotine, M=Myotis, U=Unknown

Activity type - (E = Emergence, R = Return to roost, C = Commuting, F = Foraging, S = Socialising)

Time	Species	Number of bats	Seen/not seen (S/NS)	Activity type	Direction of flight	Notes (inc map ref)
20:59	N	1	NS	F	n/a	Faint. Not recorded on batlogger
21:04	CP	1	NS	F	n/a	Faint calls
21:09	SP	1	NS	U	n/a	Identified during sound analysis
21:17	SP	1	NS	U	n/a	Brief pass
21:18	N	1	NS	U	n/a	-
21:32	N	1	NS	U	n/a	-

Project		8366.1 Murphy Site Kentish Town		Building reference		B4	
Surveyor		2		Date		08/08/2019	
Survey no		1		Survey start/end times		20:22 / 22:07	
Sunset/rise time		20:37		Equipment reference		Batlogger	
Surveyor-Easting, Northing		528651	185381	Surveyor location		South-east of B3 and B4	
General weather conditions		Warm, overcast, gentle breeze, rain shower during last 5 minutes of survey					
Temperature (start and end)	23 - 23	Cloud cover (0-8)	7	Wind (Beaufort 0-12)	1	Rain (0-5)	0-1

Species - (CP=common pipistrelle, SP=soprano pipistrelle, LE=long-eared, N=Noctule, S=Serotine, M=Myotis, U=Unknown

Activity type - (E = Emergence, R = Return to roost, C = Commuting, F = Foraging, S = Socialising)

Time	Species	Number of bats	Seen/not seen (S/NS)	Activity type	Direction of flight	Notes (inc map ref)
20:36	N	1	NS	C	n/a	Very faint, very distant
20:59	N	2	NS	C/F	n/a	Quite distant
21:14	N	1	NS	C	n/a	Very faint, distant. Not recorded on batlogger
21:17	N	1	NS	C	n/a	Very faint
21:19	N	1	NS	C	n/a	Faint. Not recorded on batlogger
21:31	N	1	NS	C	n/a	distant
21:44	CP	1	S	C	E	West to east across yard
21:58	CP	1	NS	C	n/a	Brief pass

Project		8366.1 Murphy Site Kentish Town		Building reference		B4	
Surveyor		3		Date		08/08/2019	
Survey no		1		Survey start/end times		20:22 / 22:07	
Sunset/rise time		20:37		Equipment reference		Batlogger	
Surveyor-Easting, Northing		528661	185413	Surveyor location		North-east of B4	
General weather conditions		Warm, overcast, gentle breeze, rain shower during last 5 minutes of survey					
Temperature (start and end)	23 - 23	Cloud cover (0-8)	7	Wind (Beaufort 0-12)	1	Rain (0-5)	0-1

Species - (CP=common pipistrelle, SP=soprano pipistrelle, LE=long-eared, N=Noctule, S=Serotine, M=Myotis, U=Unknown

Activity type - (E = Emergence, R = Return to roost, C = Commuting, F = Foraging, S = Socialising)

Time	Species	Number of bats	Seen/not seen (S/NS)	Activity type	Direction of flight	Notes (inc map ref)
20:59	N	1	NS	C	n/a	
						Very brightly lit by floodlights

Appendix 4: Legislation

Important Notice: This section contains details of legislation applicable in Britain only (i.e. not including the Isle of Man, Northern Ireland, the Republic of Ireland or the Channel Islands) and is provided for general guidance only. While every effort has been made to ensure accuracy, this section should not be relied upon as a definitive statement of the law.

NATIONAL LEGISLATION AFFORDED TO BAT SPECIES

The objective of the EC Habitats Directive[9] is to conserve the various species of plant and animal which are considered rare across Europe. The Directive is transposed into UK law by The Conservation of Habitats and Species Regulations 2017 (formerly The Conservation (Natural Habitats, &c.) Regulations 2010 (as amended) and The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended).

The Wildlife and Countryside Act 1981 (as amended) is a key piece of national legislation which implements the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and implements the species protection obligations of Council Directive 2009/147/EC (formerly 79/409/EEC) on the Conservation of Wild Birds (EC Birds Directive) in Great Britain.

Explanatory notes relating to all bat species protected under The Conservation of Habitats and Species Regulations 2017 are given below.

- In the Directive, the term 'deliberate' is interpreted as being somewhat wider than intentional and may be thought of as including an element of recklessness.
- The Conservation of Habitats and Species Regulations 2017 does not define the act of 'migration' and therefore, as a precaution, it is recommended that short distance movement of animals for e.g. foraging, breeding or dispersal purposes are also considered.
- In order to obtain a European Protected Species Mitigation (EPSM) licence, the application must demonstrate that it meets all of the following three 'tests': i) the action(s) are necessary for the purpose of preserving public health or safety, or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequence of primary importance for the environment; ii) that there is no satisfactory alternative and iii) that the action authorised will not be detrimental to the maintenance of the species concerned at a favourable conservation status in their natural range.

[9] Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora

All species of bat are fully protected under The Conservation of Habitats and Species Regulations 2017 through their inclusion on Schedule 2. Regulation 41 prohibits:

- Deliberate killing, injuring or capturing of Schedule 2 species (all bats)
- Deliberate disturbance of bat species as:

  a) to impair their ability:

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

  (ii) to hibernate or migrate[3]

  b) to affect significantly the local distribution or abundance of the species
- Damage or destruction of a breeding site or resting place
- Keeping, transporting, selling, exchanging or offering for sale whether live or dead or of any part thereof.

Bats are also currently protected under the Wildlife and Countryside Act 1981 (as amended) through their inclusion on Schedule 5. Under this Act, they are additionally protected from:

- Intentional or reckless disturbance (at any level)
- Intentional or reckless obstruction of access to any place of shelter or protection
- Selling, offering or exposing for sale, possession or transporting for purpose of sale.

How is the legislation pertaining to bats liable to affect development works?

An EPSM licence issued by the relevant countryside agency (e.g. Natural England) will be required for works liable to affect a bat roost or for operations likely to result in a level of disturbance which might impair their ability to undertake those activities mentioned above (survive, breed, rear young and hibernate). The licence is to allow derogation from the relevant legislation but also to ensure appropriate mitigation measures be put in place and their efficacy to be monitored.

Though there is no case law to date, the legislation may also be interpreted such that, in certain circumstances, important foraging areas and/or commuting routes can be regardedas being afforded *de facto* protection, for example, where it can be proven that the continuedusage of such areas is crucial to maintaining the integrity and long-term viability of a bat roost[10].

[10] Garland & Markham (2008) Is important bat foraging and commuting habitat legally protected? Mammal News, No. **150**. The Mammal Society, Southampton.

Appendix 5: Assessment Criteria for Preliminary Roost Assessments

ASSESSMENT CRITERIA - PRELIMINARY ROOST ASSESSMENT - STRUCTURES

The potential for structures to support roosting bats, ranging from negligible to the presence of a confirmed roost, is assessed using the findings of the survey and the desk study. The following criteria were used to determine the level of potential of the buildings for roosting bats:

- **Negligible potential** - While presence cannot be absolutely discounted there were no significant visible features that could be used by bats for roosting.
- **Low** - Small number of potential roosting features such as could be utilised by individual opportunistic roosting bats. Site situated within isolated habitat that could be used by foraging bats but which is not connected by prominent linear features such as woodland edge, hedgerows and tree lines.
- **Moderate** - Several potential roosting features in the buildings or other structures. There is surrounding habitat such as woodland, scattered trees, hedgerows suitable to support foraging and roosting bats. The site is connected with the wider landscape by linear features such as woodland edge, hedgerows and tree lines that could be used by commuting bats.
- **High** - Buildings or other structures, such as mines, caves, tunnels, ice houses and cellars, with numerous features of potential significance for roosting bats. Surrounding landscape has high value habitat for roosting, foraging and commuting that is contiguous with on-site habitats. The site is connected with the wider landscape by strong linear features and may be close to known roosts or other potentially valuable habitat resources.
- **Confirmed roost** - Evidence indicates a building or other structure is used by bats, for example:
  - bats seen roosting or observed flying from a roost or freely in the habitat;
  - droppings, carcasses, feeding remains;
  - bats heard 'chattering' inside on a warm day or at dusk.

ASSESSMENT CRITERIA - GROUND LEVEL ROOST ASSESSMENT - TREES

All trees that may have a level of potential for a roost are assessed using the Cowan Scale (Cowan, 2006). The following values are assigned in considering the availability of suitable features for roosting bats:

- **0 - negligible potential** - No visible features that could be used by bats for roosting
- **1 - low potential** - One or two minor features, possible associated with feeding or night-time roosts, such as:

- sparse ivy *Hedera helix*;
- minor branch splits or fissures;
- small areas of loose bark;
- features less than ten years old.

- **2 - moderate potential** - Features that may provide a more secure site for individuals or small groups of bats, such as:
  - dense ivy;
  - significant branch splits;
  - small cavities such as woodpecker holes;
  - features present for between 10 and 30 years.
- **3 - high potential** - Features of particular significance, suitable for high priority roost such as maternity roosts and likely to be used by larger groups of bats, such as:
  - features that provide rare or uncommon conditions in the local area;
  - large cavities or extensive branch or trunk splits;
  - multiple features in the same tree;
  - features present for more than 30 years that could have been used by several generations of bats.
- **4 - confirmed roost** - Evidence indicating use by bats, such as:
  - droppings, carcasses, feeding remains;
  - bats heard 'chattering' inside on a warm day or at dusk;
  - bats seen roosting or observed flying from a feature.

Appendix 6: Standard Guidance for Mitigation, Compensation and Enhancement

Bat tubes, bat bricks and bat boxes

To compensate for the loss of roosts used by crevice dwelling species or to provide enhancement measures thought should be given to utilising proprietary producs from recognised manufacturers such as: Bird Brick Houses, The Nest Box Company, Schwegler, Habibat, Causa and Vincent. Bat tubes and integrated bat bricks are artificial roost features that can be incorporated into building structures. Bat boxes are generally fitted externally to mature trees or structures. The site's value to bats could be enhanced by installing any of these features. Any bat tubes and bat bricks used for enhancement would need to be in addition to any required to compensate for the loss of the roosts.

Bat tubes, bat bricks or bat boxes should be located at least 5m above ground level facing southeast – southwest and to allow for clear flight paths and should not be directly lit by artificial lighting. Bat boxes should be woodcrete designs as they are long lasting compared to wooden boxes and insulate occupants from extremes of temperature and condensation.

Breathable roof membrane

Breathable roof membranes (BRMs) have been shown to entangle roosting bats, leading to mortality, sometimes of entire colonies. Therefore it is recommended that only bitumen roofing felt that does not contain polypropylene filaments (e.g. bitumen felt type 1F) should be used to reduce the risk of bat mortality.

Bats and lighting

While different species of bat react differently to night time lighting, research has found that bats overall are sensitive to artificial lighting. Excessive and/or poorly directed lighting may delay bats in emerging from their roosts; shortening the time available for foraging, as well as causing bats to move away from suitable foraging grounds and drinking resources, movement corridors or roosting sites, to alternative dark areas (Jones, 2000). Artificial lighting is also thought to increase the chance of predation, as many avian predators will hunt bats (Institute of Lighting Professionals, 2018).

To minimise indirect impacts from lighting associated with the proposed development it is recommended that artificial lighting is only directed where necessary for health and safety reasons. Lighting should not illuminate any features of value to bats, or suspected or confirmed bat roosting sites. Habitats which are likely to support bats and which could be affected by newly proposed lighting include woodland, mature trees, hedgerows, scrub, ponds, lakes, ditches, streams, canals, rivers, rough grassland and buildings (typically pre

1970's or in disrepair). Lighting should only be used for the period of time for which it is required (Jones, 2000).

This can be achieved by following accepted best practice (Fure, 2006; Institute of Lighting Engineers 2009; Bat Conservation Trust 2011; Stone 2013; Bat Conservation Trust 2014; Institute of Lighting Professionals, 2018):

- Where appropriate, professional lighting designers should be consulted, and the need for quantitative lighting measurements should be considered;
- Lighting mitigation should be based on robust baseline surveys of bat behaviour and existing light levels on site wherever possible;
- The level of artificial lighting including flood lighting should be kept to an absolute minimum;
- Where this does not conflict with health and safety and/or security requirements, the site should be kept dark during peak bat activity periods (0 to 1.5 hours after sunset and 1.5 hours before sunrise);
- Variable lighting regimes (VLR) can be utilised to lower lighting levels during periods of low human activity (e.g 00:30-05:30);
- Lighting required for security or safety reasons should use a lamp of no greater than 2000 lumens (150 Watts) and should comprise sensor-activated lamps;
- Use narrow-spectrum light sources that peak higher than 550 nanometres, avoiding lights with UV, white and blue wavelengths;
- Lights utilising LED technology are the preferred option as these lights do not emit on the UV spectrum, are easily controllable in terms of direction/spill and can be turned on and off instantly;
- A 'warm white' spectrum LED light (ideally <2700 Kelvin) should be used over 'cool white' to reduce blue light component;
- Avoid the use of sodium or metal halide lamps, these gas lamps require a lengthy period in which to turn off and the diffuse nature of the light emitted makes light spillage a significant problem.
- Lights required for night time deliveries or security patrols could be set to activate with pressure activated sensors set into the ground;
- Lighting should be directed to where it is needed to minimise light spillage. This can be achieved by limiting the height of the lighting columns and by using as steep a downward angle as possible and/or a shield/hood/cowl/baffle/louvre that directs the light below the horizontal plane and restricts the lit area;

- Usually using lower lighting columns and increasing the spacing between them reduces light intensity and spill;
- Plant vegetation to form light barriers and dark corridors. Use close-boarded fencing to screen light until vegetation matures. Dark corridors should be well connected to commuting routes;
- Artificial lighting should not directly illuminate any confirmed or potential bat roosting features or habitats of value to commuting/foraging bats. Similarly, any newly planted linear features or compensatory bat roosting features should not be lit;
- The use of reflective surfaces under lights should be avoided;
- Consider the use of 'smart glass' or automatic blinds where windows and glass facades cannot be avoided; and
- Create new habitat as alternative bat flightpaths if the effects of light cannot be properly mitigated for.

The Ecology Consultancy

The Ecology Consultancy is part of the Temple Group.

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