Bat Presence / Absence Survey

Buildings and Trees

At

Parliament Hill School, Highgate Road, London, NW5 1RL

Address	Parliament Hill School, Highgate Road, London, NW5 1RL		
Client	Colour: Urban Design Limited	**Ecologist**	Jonathan Jones
Our Ref	E0508141321	**Director**	Robert Sharpe
Report Date	8 October 2014	**Quality Checked**	Paul Hiscocks
Scope of Report	Bat Absence / Presence Survey – Buildings and Trees		

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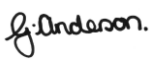
Version	Date	Author	Checked	Approved
1	08/10/2014	J Jones 	G Anderson 	P Hiscocks 

The opinions and information contained within this report were gathered using due skill, care and diligence. The report complies with the Biodiversity Code of Practice for Planning and Development (BS42020:2013) and has been prepared and provided in accordance with the Chartered Institute of Ecology and Environmental Management's (CIEEM) Code of Professional Conduct. We confirm that the opinions expressed are our true and professional bona fide opinions.

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Executive Summary

A thorough survey, externally and using ultrasonic detection equipment with data analysis, was made of the buildings and trees scheduled for removal at Parliament Hill School, Highgate Road, London, NW5 1RL by experienced ecologists.

The buildings on site scheduled for demolition were found to have low or negligible bat roost potential. In addition; all trees scheduled for works or removal were inspected with no trees noted to have features suitable to support roosting bats.

Dusk and dawn surveys were undertaken to ascertain whether bats were using the buildings for roosting and to monitor the level of foraging/ commuting activity across the site. The surveys identified limited commuting and foraging activity across the site; by Common and Soprano Pipistrelle bats. Foraging activity was mainly confined to the boundaries of the site and around trees in the central area as well as over the pond in the enclosed courtyard.

All buildings on site scheduled for demolition were found to have Low Bat Roost Potential (LBRP).

At no time during the surveys were bats observed emerging from trees or buildings on site.

Based on the results of the surveys the following recommendations have been made:

1. Bat and bird boxes are required within the new development design wherever possible, located on or integrated into the buildings. In this instance, 9 x bat boxes will be included within the new development design on buildings and wherever possible, on retained trees. Boxes must be situated between 4m and 6m above ground level, with entrances facing North, South-east and South-west to allow for use all year round. Assistance will be engaged from an ecologist in the design and location of bird / bat boxes. A suitable planting scheme is also required, including native and species beneficial to wildlife with native trees and shrubs used to landscape areas surrounding all buildings.

2. A suitable lighting scheme will be incorporated to prevent light pollution boundary areas after dark with suitable PIR timers only activated by large moving objects (NOT BATS).

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1.0 Introduction

1.1 Background

This report details the results of a Bat Presence/ Absence Survey of all buildings and trees at Parliament Hill School, Highgate Road, London, NW5 1RL.

The survey was undertaken to determine whether bats were using the buildings and trees as roosts and was carried out on behalf of Colour: Urban Design Limited.

The site is centered at Ordnance Survey Grid Reference TQ 2835 8597.

OS. Licence No.100043218

1.2 Site Description

The site consists of school buildings with a central detached section, hardstanding areas around the buildings and a car park to the east of the site. The buildings consist of the original c.1900 3 storey school building in the east of the site, brick built with a pitched, slate covered roof; connected to two additional blocks added c.1970 comprising 3 storey and single storey sections with flat roofs and mixed glass/ wooden covered walls. The central detached building is more modern, single storey constructed in 2004, partially built into an earth embankment including a green roof. In addition there are also three small temporary school rooms in the south of the site which are single storey, flat roofed with wooden cladding.

The green area comprises a large amenity playing field to the west of the buildings and small areas of amenity grassland in the centre of the site between buildings and along the eastern boundary. Across the site there are also scattered trees, concentrated around the buildings and included in the small enclosed courtyard between the two 1970's blocks which also contains a small pond.

1.3 Scope of Survey and Limitations

We have been advised that the two 1970's blocks will be demolished with some additional surrounding hard and soft landscaping stripped to facilitate the school modernisation program with associated hard and soft landscaping. The original c.1900 building and modern central building are understood to remain unaffected by roof or other external works. The scope of the report is to assess the presence/ absence of bats and make recommendations based upon the findings of the survey. In addition, any trees deemed suitable to support roosting bats were given a visual assessment from ground level and accessed with rope access methods where an aerial inspection was required. All areas of the site were accessible at the time of the survey and consequently there were not limitations on survey effort.

Bats are highly mobile in their nature and may only use buildings at certain times of the year that favour a particular part of their roosting, maternity and hibernating requirements.

2.0 Legislation

2.1 Planning and Biodiversity

Local Authorities have a requirement to consider biodiversity under the following European legislation:

- Natural Environment and Rural Communities (NERC) Act (2006);
- The Habitats Directive (EC directive 92/43/EEC);
- Environmental Impact Assessment (85/337/EEC as amended by directive 09/31/EC);
- Strategic Environmental Assessment (2001/42/EEC);
- The Environment Act (1995).

Section 40 of the Natural Environment and Rural Communities Act 2006 (the NERC Act) places a legal duty on public bodies, including planning authorities, to 'have regard' to the conservation of biodiversity when carrying out their normal functions, which includes consideration of planning applications.

In compliance with Section 41 of the NERC Act, the Secretary of State has published a list of species and habitats considered to be of principal importance for conserving biodiversity in England under the UK Post-2010 Biodiversity Framework. This is known as the England Biodiversity Priority (EBP) list, previously referred to as Local Biodiversity Action Plan (LBAP), of which there are 56 habitats and 943 species (Natural England, 2014). Seven bat species are EBP species; these are Barbastelle, Bechstein's, Brown Long-eared, Greater Horseshoe, Lesser Horseshoe, Noctule and Soprano Pipistrelle. The EBP list is used to guide planning authorities in implementing their duty under the NERC Act.

Local Authorities must also have regard for the following national planning policies:

- National Planning Policy Framework (NPPF) (DCLG, 2012);
- ODPM Circular 06/2005 (Defra Circular 01/2005);
- ODPM (March 2006) Planning for Biodiversity and Geological Conservation.

In addition, all *Pipistrellus spp*, Daubentons's, *Nyctalus spp.*, Brown Long Eared, Natterer's, and Serotine bats are currently listed on the Camden Local BAP.

2.2 Bat Legislation

All species of bat and their breeding sites or resting places (roosts) are protected under Schedule 2 of The Conservation of Habitats and Species Regulations 2010 and Section 9 of the Wildlife and Countryside Act 1981 (as amended). It is an offence for anyone intentionally to kill, injure or handle a bat, to possess a bat (whether live or dead), disturb a roosting bat, or sell or offer a bat for sale without a licence. It is also an offence to damage, destroy or obstruct access to any place used by bats for shelter, whether they are present or not (*Natural England, 2014*).

A roost is protected whether or not bats are present and any activity or works affecting a roost, even when bats are absent, is likely to be subject to the relevant licence procedure with Natural England.

This legislation makes it is an offence either deliberately or recklessly to:

- possess or control any live or dead specimens;
- destroy, damage or obstruct access to any bat roost, or place used for shelter, protection or breeding;
- disturb a bat using such place ('disturbing' a bat can include simply entering its roost and as such the appropriate licence should be held prior to doing so).

Such offences are punishable with a maximum fine of £5,000 per incident or per bat, up to six months in prison, and forfeiture of items used to commit the offence, e.g. vehicles, plant, machinery.

3.0 Survey Methodology

3.1 Desk Study

A desk study was undertaken to locate all known bat records within a 1km radius of the site data was requested from Greenspace Information for Greater London (GiGL) and the London Bat Group.

3.2 Weather Conditions and Timing

To comply with national Best Practice Guidelines (Hundt, 2012) bat activity surveys should be carried out in dry weather as bats may not leave their roost site if it is raining heavily, making any survey results suspect. Bat activity surveys should be carried out between May and September and winter hibernation surveys between October and April. The months can vary a little, depending on seasonal and geographic variations.

3.3 Personnel

During the survey effort a total of four surveyors were used; all surveyors have been appropriately trained and have had at least three full seasons bat surveying experience. All surveys were supervised by the Senior Ecologist who holds a full Natural England Bat Licence and has had vast experience in bat surveying and mitigation.

Personnel used on all surveys are as follows:

Paul Hiscocks (Senior Ecologist) (NE Bat Licence CLS001868): Over 10 years' experience with bats, extensive experience in surveying all types of habitat for bats and mitigation including numerous mitigation licences held for exclusion and roost destruction.

Phillip May (Ecologist): Over 20 years' experience as an ecologist and over 15 years work with various bat species and studies into migration over water.

Jonathan Jones (Assistant Ecologist): over 5 years' experience in bat surveying using both heterodyne and Anabat survey equipment.

Victoria Telford (Graduate Ecologist): 4 years' experience in bat surveying using both heterodyne and Anabat survey equipment.

3.4 Internal / External Building Inspections

A walkover survey of the site and detailed visual inspection of the interior and exterior of the buildings was undertaken to evaluate bat roost potential of the buildings and to locate suitable ingress/ egress points that bats could use to fly into the buildings and use areas within to roost. The external inspections were carried out from ground level using a Clulite CB2 1,000,000 candle power torch, Bushnell Nature view Close Focusing 10x42 Roof Prism Binoculars, and a Sony Cyber-Shot 14.1 Mega Pixel camera and where appropriate a Rigid Seesnake Micro Inspection Camera Mk II CA-100 was used to examine inaccessible cavities and a Flir i5 Lightweight Thermal Imaging Camera to check for heat sources (roosting bats).

The internal inspections were carried out using a Clulite CB2 1,000,000 candle power torch, Rigid Seesnake Micro Inspection Camera Mk II CA-100 where necessary, to examine inaccessible cavities, a Sony Cyber-Shot 14.1 Mega Pixel camera for photographs and a Flir i5 Lightweight Thermal Imaging Camera to check for heat sources (Roosting Bats). The following features were the main focal points of the surveys:

- Bats and or bat corpses;
- Droppings, staining and remains of feeding debris;
- Externally: access points such as displaced/missing tiles and ridge tiles, holes in walls, windows or woodwork; and
- Internally: potential roosting points such as cracks and crevices in the structural layout.

3.5 Tree Assessment

All trees deemed large enough to support roosting bats (>300 mm ABH) were observed from ground level to assess their potential to support roosting bats. This involved:

- Using close-focussing binoculars, Clulite (1,000,000 cp) and a Seesnake Endoscope with recorder where necessary, to inspect the tree from the ground to the canopy, and inspecting all aspects of the tree where possible;
- looking for features indicative of bat roosts including, natural holes, Woodpecker holes, cracks/splits in major limbs, loose bark, hollows/cavities, dense epicormic growth and bird and bat boxes if present; and
- listening for bats making audible social calls from roosts in trees.

3.6 Dusk Surveys (Emergence Survey)

The object of dusk surveys was to detect active bat use of the site and possible exit from buildings at points identified during the daytime inspection; this involved:-

- being at the site 15 minutes before sunset and approximately 2 hours after;
- using heterodyne, frequency division and time expansion detectors; additionally, recordings were made using four passive Anabat SD2 detectors left on continuous recording; and
- standing at different vantage points around the buildings (no more than 50m separation), using the bat detectors and attempting to see bats emerging from buildings.

3.7 Dawn Surveys (Re-Entry Survey)

The object of dawn surveys was to detect bats returning to possible roost sites from their night of foraging. Bats tend to swarm around their roost entrance for a period of time before going into the roost, which helps in identifying roost locations; this involved:-

- being at the site 1 ½ hours before sunrise;
- use of bat detectors as (3.4 above); and
- observation for swarming bats around the buildings.

3.8 Site Status Assessment

Based on the internal / external inspection and emergence survey results, structures with evidence of bats have been assessed to determine which of the following categories they fall into, if any (Hundt, 2012):

- **Night roost (March-November)** – used by bats as roosts other than traditional day roosts to rest in during the night. May be used by a single individual on occasion or regularly by an entire colony;
- **Day roost (March-November)** – used by bats during the day to rest in, often by males. Bats may regularly use a number of days roosts or the same site for several weeks;
- **Transitional roost (April-September/October)** – used by a few individuals or occasionally small groups of bats on waking from hibernation or in the period prior to hibernation;
- **Feeding roost (May-November)** – can be occupied by a single bat or a few individuals to an entire colony to feed, shelter from the weather or to rest temporarily;
- **Maternity roost (May-August)** – used by breeding females, where babies are born and raised to independence. Adult males rarely found here;
- **Satellite roost (May-August)** – used by a few individuals to small groups of breeding females as alternative roost sites in close proximity to maternity roosts;
- **Swarming sites (August-November)** – where large numbers of bats from several species gather, generally around caves and mines;

- **Mating roost (September-November)** – established by males of some species to display/call to females to mate;
- **Hibernation roost (October-March)** - where bats may be found during the winter. They vary greatly in terms of the number of individuals and diversity of species using them.

The roost assessment criteria in Appendix 4 were then used to ascertain the importance of any roosts present.

4.0 Results: Desk-based Assessment

Bat records within a 1km radius of the application site were obtained from Greenspace Information for Greater London (GiGL) and the London Bat Group.

Species	Scientific Name	Grid Ref (SD)	Source	Date
Common Pipistrelle	*Pipistrellus pipistrellus*	TQ287 867	LBG	2010
		TQ276 857	LBG	2010
		16 records, closest 162m SW	GiGL	1993-2006
Pipistrelle	*Pipistrellus sp.*	TQ274 859	LBG	2006
		TQ285 868	LBG	2005
		TQ274 861	LBG	2000
		26 records, closest 162 SW	GiGL	1985-2005
Soprano Pipistrelle	*Pipistrellus pygmeaus*	6 records, closest 280m SE	GiGL	1996-2002
Bat species	*Vespertilionidae*	835m SE	GiGL	2004
		864m NW	GiGL	1985
Mouse-eared Bat	*Myotis sp.*	977m W x 4	GiGL	2005
Daubentons Bat	*Myotis daubentonii*	20 records, closest 368m NW	GiGL	1993-2005
Natterers Bat	*Myotis Nattereri*	864m	GiGL	2001
		942m NW x 2	GiGL	1996-2001
Nyctalus	*Nyctalus sp.*	280m SE	GiGL	2002
Lesser Noctule	*Nyctalus leisleri*	280m SE	GiGL	2002
Noctule	*Nyctalus noctula*	19 records, closest 368m NW	GiGL	1985-2009

Table 1: Bat Species Desktop Records

4.1 Review of Desk Based Assessment Data.

The above desk based assessment shows the most recent record of bat activity within 1km of the site was in 2010 and was a Common Pipistrelle bat record approximately 800m West of the site in a residential estate.

There are also numerous *Pipistrellus spp.* records within close proximity to the site including as close as 160m to the SSW in the adjacent residential area. While many of the *Pipistrellus spp.* records are associated with housing the south of the site, *Myotis spp.* records tend to be associated with the open space of Hampstead Heath to the north of the site.

It is likely that the majority of activity expected on the site will be commuting behaviour from the residential target rich roost environment on the south of the site to the higher quality foraging grounds over Hampstead Heath.

5.0 Results: Survey

5.1 Weather Conditions

Survey times, temperatures and weather conditions are detailed below. At all times, weather conditions were conducive to bat survey work.

Date	10/09/2014	Sunset/ rise Time	Sunrise 06:27	Survey Type	Dawn Re-entry	
				From/ To	04:50	06:30
	Temperature ºC	Humidity %	Cloud Cover / Oktas	Wind Bft Scale	Precipitation Y/N	
Start	12.9ºC	69%	1	0 (1)	N	
End	10.7ºC	90%	1	0	N	

Date	16/09/2014	Sunset/ rise Time	Sunset 19:13	Survey Type	Dusk Emergence	
				From/ To	18:50	20:45
	Temperature ºC	Humidity %	Cloud Cover / Oktas	Wind Bft Scale	Precipitation Y/N	
Start	20.0ºC	871%	2	0 (1)	N	
End	17.9ºC	88%	2	0	N	

5.2 Internal/ External Inspection of the Buildings

External inspection of the buildings was undertaken to determine their Bat Roost Potential (BRP); these revealed very few possible ingress/ egress points for bats due to the construction of the building without a loft space and the generally good condition of the buildings. The results of the Internal Bat Roost Potential Assessment of the buildings are included in Appendix 2, together with the Bat Roost Potential rating for each building.

The results of the external inspection were used to help focus survey effort during the dusk emergence/ dawn re-entry surveys.

5.3 Tree Assessment

All trees scheduled for removal or tree works were inspected from ground level and categorised by their potential to support roosting bats. Many of the largest and most suitable trees with potential features to support roosting bats on the site are to be retained within the proposed development. A detailed assessment of all trees assessed is included within appendix 3.

5.4 Dusk Emergence & Dawn Re-Entry Surveys

Date	From	To	Temp	Weather	Species Recorded	Comment
10/09/14	04:50	06:30	11.8°C Avg	Clear sky, dry, still	(2)	Single pass by Soprano Pipistrelle recorded at 05:18 heading south.
16/09/14	18:50	20:45	18.5°C Avg	Clear sky, dry, still	(1), (2)	Commuting and foraging from 19:37 until 20:39. Frequent by Common Pipistrelle with occasional foraging by Soprano Pipistrelle.

Table 3: Bat Survey Summary of Data *(1) Common Pipistrelle bat (*Pipistrellus pipistrellus*)
(2) Soprano Pipistrelle bat (*Pipistrellus pygmaeus*)

5.5 Data Analysis

Ultrasonic survey data was collected throughout the survey period using 4 individually placed Anabat SD2 recording devices and an Echo Meter EM3+ placed evenly across the site, all recordings were analysed through Analook software.

Species positively identified from a combination of visual sighting, flight patterns and data analysis are recorded within Table 2 above.

6.0 Analysis of Results

The buildings on site scheduled for demolition include the two large 1970's built blocks and their associated connected section and the small temporary school rooms in the south east of the site. The 1970's blocks have been classified as having Low Bat Roost Potential (LBRP).

Dusk and dawn surveys were undertaken to ascertain whether bats were using the buildings for roosting and the level of foraging/commuting activity across the site. The surveys identified commuting and foraging activity across the site; frequent but at a low level by Common and Soprano Pipistrelle bats. Foraging activity was mainly found along the boundaries of the site and in around trees in the central area as well as over the pond in the enclosed courtyard.

At no time during the surveys were bats observed entering/ exiting any of the buildings or trees on site.

Impact Assessment

The development proposals for the site will result in a negligible loss of potential roost sites through the loss of the c1970's buildings which only have low bat roost potential. Any loss of potential roost sites can easily be replaced and enhanced through the erection of new bat boxes in retained trees or with the new building design itself.

There will also be only a slight negative impact on foraging across the site through the loss of some trees required for the new construction. Boundary features will stay intact and new shrubs planting and landscaping with native species suitable to support foraging insects as a food source for bats and birds can mitigate against the loss of the current low value resource.

7.0 Recommendations

A thorough survey, internally/ externally and using ultrasonic detection equipment with data analysis, was made of the buildings and trees scheduled for removal at Parliament Hill School, Highgate Road, London, NW5 1RL by experienced ecologists.

The buildings on site scheduled for demolition include the two large c1970's built school blocks and their associated connected sections including the small temporary school rooms in the south east of the site. The 1970's blocks have been classified as having Low Bat Roost Potential (LBRP). The development proposals for the site will result in a negligible loss in roost potential of the site through the loss of buildings which provide low bat roost potential. Any loss of potential roost sites can easily be replaced and enhanced through the erection of new bat boxes in retained trees or with the new building design itself.

Dusk and dawn surveys were undertaken to ascertain whether bats were using the buildings for roosting and to monitor the level of foraging/ commuting activity across the site. The surveys identified low levels of commuting and foraging activity across the site; by Common and Soprano Pipistrelle bats. Foraging activity was concentrated mainly along the boundaries of the site and in around trees in the central area as well as over the pond in the enclosed courtyard.

At no time during the surveys were bats observed emerging from the trees or buildings on site.

Based on the results of the surveys the following recommendations have been made:

7.1 Bat and bird boxes are required within the new development design wherever possible, located on or integrated into the buildings. In this instance, 9 x bat boxes will be included within the new development design on buildings and wherever possible, on retained trees. Boxes must be situated between 4m and 6m above ground level, with entrances facing North, South-east and South-west to allow for use all year round. Assistance will be engaged from an ecologist in the design and location of bird / bat boxes. A suitable planting scheme is also required, including native and species beneficial to wildlife with native trees and shrubs used to landscape areas surrounding all buildings.

7.2 A suitable lighting scheme will be incorporated to prevent light pollution boundary areas after dark with suitable PIR timers only activated by large moving objects (NOT BATS).

8.0 References

British Standards Institute (BSI) (2013). BS42020 - Biodiversity Code of Practice for Planning and Development. BSI, London.

Hundt (2012). *Bat Surveys – Good Practice Guidelines (2nd Edition).* Bat Conservation Trust: London.

Institute of Ecology and Environmental Management (IEEM) (2006). *Guidelines for Ecological Impact Assessment in the United Kingdom*. Available at: http://www.cieem.net/data/files/Resource_Library/Technical_Guidance_Series/EcIA_Guidelines/TGSEcIA-EcIA_Guidelines-Terestrial_Freshwater_Coastal.pdf.

Joint Nature Conservation Committee (JNCC) (2004). *Bat Workers Manual* (3rd Edition). JNCC: Peterborough.

Natural England (2014). *Habitats and Species of Principal Importance in England*. Available at: http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx

Mitchell-Jones, A.J. (2004). *Bat Mitigation Guidelines.* English Nature: Peterborough.

Wray, S., Wells, D., Long, E. & Mitchell-Jones, T. (2007). *EcIA: Specific Issues Associated with Bats.* Presentation at the Mammal Society/Zoological Society of London/IEEM Symposium on Advances in EcIA for Mammals.

Websites for access to Full Legislation and Policy Text:

Conservation of Habitats and Species Regulations 2010 (as amended):
http://www.legislation.gov.uk/uksi/2012/1927/contents/made

Countryside and Rights of Way Act 2000:
http://www.legislation.gov.uk/ukpga/2000/37/contents

Habitats Directive:
http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm

National Planning Policy Framework:
http://www.communities.gov.uk/documents/planningandbuilding/pdf/2116950.pdf

Natural Environment and Rural Communities Act 2006:
http://www.legislation.gov.uk/ukpga/2006/16/contents

UK Post-2010 Biodiversity Framework:
http://jncc.defra.gov.uk/page-6189.

Wildlife and Countryside Act 1981 (as amended):
http://www.legislation.gov.uk/ukpga/1981/69

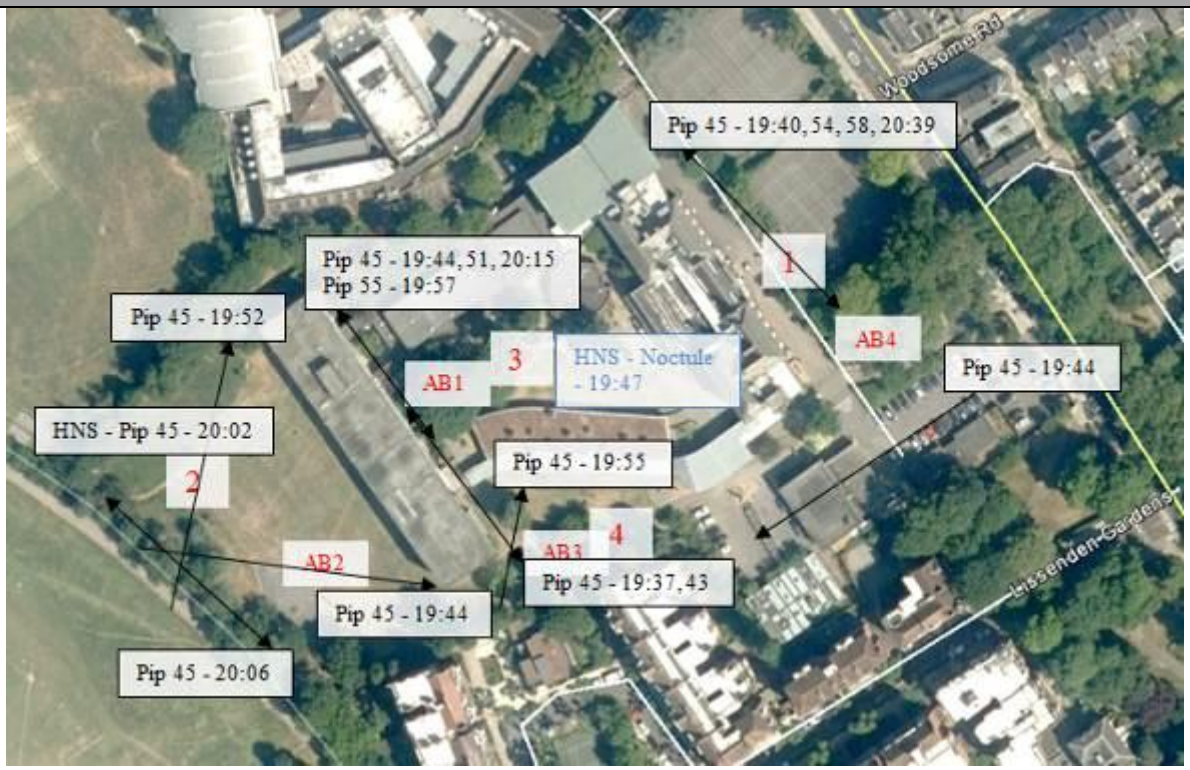
APPENDIX 1

Surveyor Location and Flight Lines

Location of surveyors and flight lines 10/09/14

1	Surveyor 1	P May	
2	Surveyor 2	P Hiscocks	
3	Surveyor 3	J Jones	
4	Surveyor 4	V Telford	
AB	Anabat Locations		
↘	Bat flight lines	Common Pipistrelle	

Location of surveyors and flight lines 16/09/14



	1	Surveyor 1	P May	
	2	Surveyor 2	P Hiscocks	
	3	Surveyor 3	J Jones	
	4	Surveyor 4	V Telford	
	AB	Anabat Locations		
	↘	Bat flight lines	*Pipistrellus*	

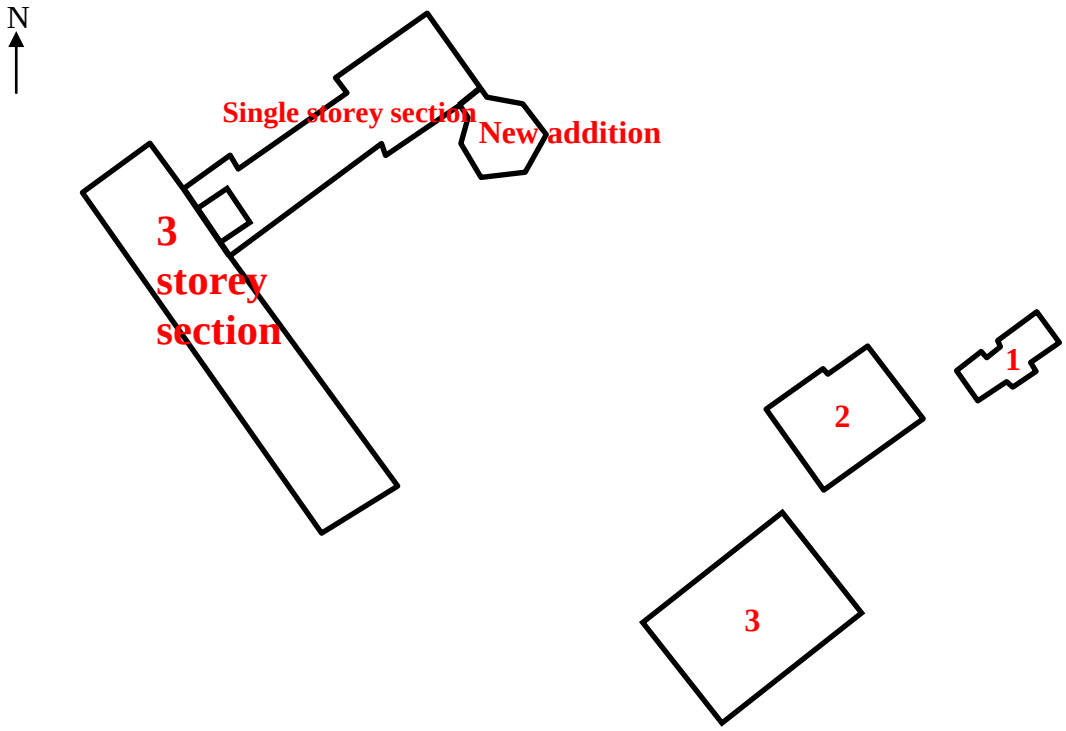
APPENDIX 2

Bat Roost Potential Assessment Results of Buildings

With Building Layout.

Surveyor	Jonathan Jones	**Case Ref**	E0508141321
Site Address	Parliament Hill School, Highgate Road, London, NW5 1RL	**Survey Date**	20/08/14
Building Type	School	**Roof Shape**	Flat
Approximate Construction Date	c. 1970	**Roof Cover**	Tarred roofing felt
Number of Stories	3 - 1	**Roof Condition**	Excellent condition
Number of Chimneys	0	**Soffits & Condition**	Wooden soffits, good condition some cosmetic damage/ weathering
Walls & Condition	All in good condition	**Windows & Condition**	Metal frames, single glazed; tight fitting and in good condition
Signs of Bats	None found	**BRP**	Low
Additional comments: None			

Building Plan



South Elevation of 3 storey section	West Elevation (join between 3 storey and 1 storey sections
	

East Elevation 3 storey section over green roof	New brick addition at eastern end of block to be demolished
	

Temporary Buildings 1 -3

APPENDIX 3

Bat Roost Potential Assessment Results Trees

Tree No	BS5837 Category	Species	Detail Of Work	Ecologist Comment in relation to Bats	Photograph
T12	C2	Norway Maple	Remove	Height 11m. No visual cavities or other suitable roosting opportunities for bats. Classified Category 3 Tree.	
T13	C2	Norway Maple	Remove	Height of 9m. This tree has no visual cavities or other suitable roosting opportunities for bats. Classified Category 3 Tree.	
T14/ 15	C2	Ornamental Apple	Remove	8/6m. No visual cavities or other suitable roosting opportunities for bats. Classified Category 3 Trees.	

T45	B2	Holm Oak	Remove	Pictured on right. 12 metres No visual cavities or other suitable roosting opportunities for bats. Category 3.	
T46	C2	Medlar		Pictured on left 7 metres No visual cavities or other suitable roosting opportunities for bats. Category 3.	
T47/ 48	A2	Holm Oak	Remove	6/9m These trees have no visual cavities or other suitable roosting opportunities for bats. Classified Category 3	
T49/ 50	U	Hawthorn	Remove	8m These trees have no visual cavities or other suitable roosting opportunities for bats. Classified Category 3.	

T51/ 52	U	Judas Tree (Right) Weeping Willow (Left)	Remove	4m These trees have no visual cavities or other suitable roosting opportunities for bats. Both with DBH <1m Classified Category 3.	
T67	C2	Box Elder	Remove	4m This tree has no visual cavities or other suitable roosting opportunities for bats. Classified Category 3.	
T68/ 69	C2	Ash (Right)/ Lilac (Left)	Remove	8/6m height These trees have no visual cavities or other suitable roosting opportunities for bats. Both with DBH <1m Classified Category 3.	

T78/ 79/ 80	C2/ B2/ B2	Silver Birch	Remove	11-15m height These trees have no visual cavities or other suitable roosting opportunities for bats. Classified Category 3.	
Pond	-	Weeping Willow	Remove	14m No visual cavities or other suitable roosting opportunities for bats. Classified Category 3.	
T33/ 35	U/C2	Cherry (left)/ Holm Oak (right)	Remove	5/8m height These trees have no visual cavities or other suitable roosting opportunities for bats. Classified Category 3.	

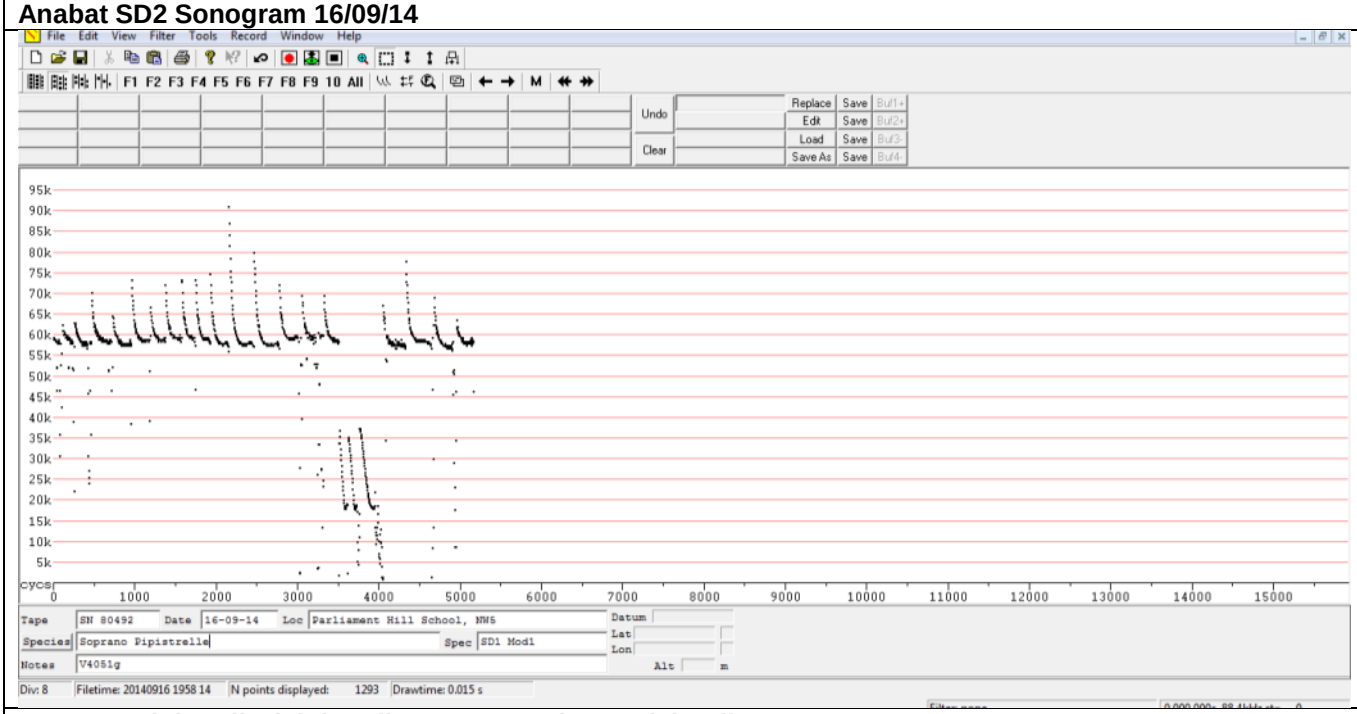
T30	C2	Cherry Laurel	Remove	9m No visual cavities or other suitable roosting opportunities for bats. All stems <1m DBH. Classified Category 3.	
T31/ 32	C2	Ash	Remove	15m height These trees have no visual cavities or other suitable roosting opportunities for bats. Classified Category 3.	
TG4	C2	Yew, Hawthorn, Cherry, Elder, Sycamore Seedling trees	Remove	10m No visual cavities or other suitable roosting opportunities for bats. All trees have DBH <1m Classified Category 3.	

T21	B2	Silver Birch	Remove	15m height This tree has no visual cavities or other suitable roosting opportunities for bats. Classified Category 3.	
T19	B1	Silver Birch	Remove	8m No visual cavities or other suitable roosting opportunities for bats. Classified Category 3.	
T26-29	C2	Elder, Contorted Hazel, Sycamore, Purple leaf Plum	Remove	10m height These trees have no visual cavities or other suitable roosting opportunities for bats. Classified Category 3.	

APPENDIX 4

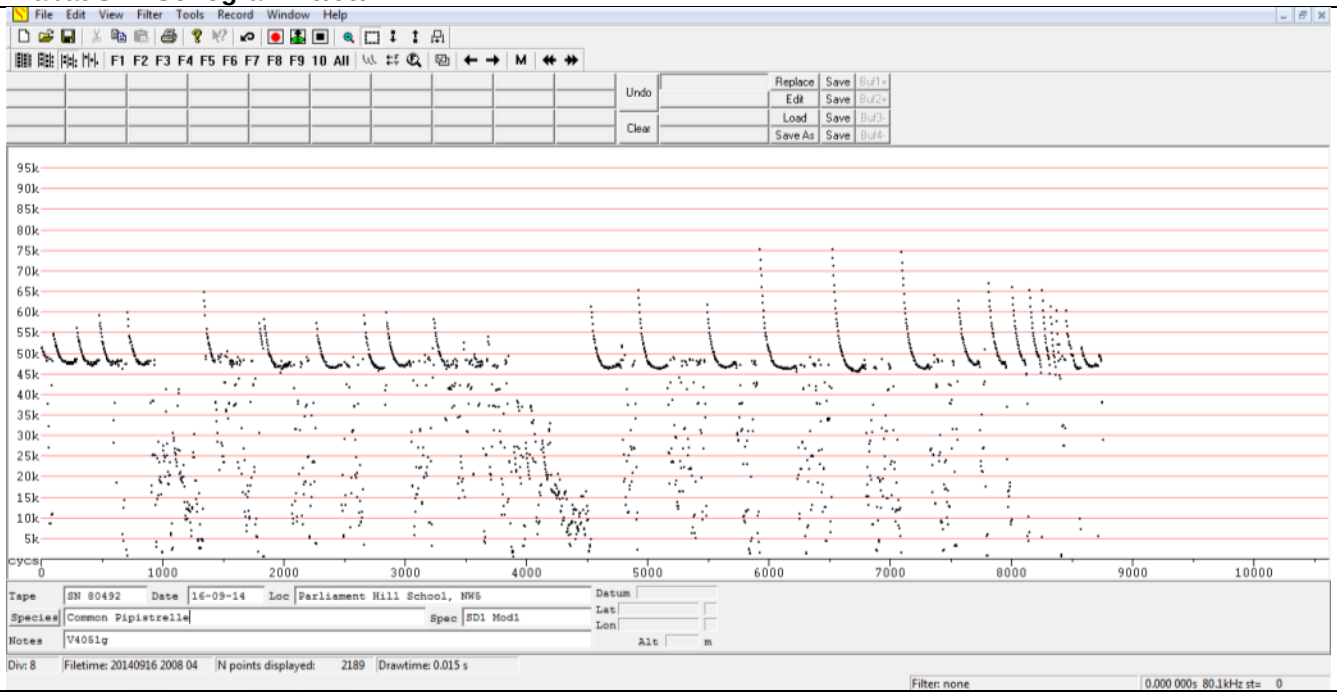
Ultrasonic Data Analysis

Anabat SD2 Sonogram 16/09/14



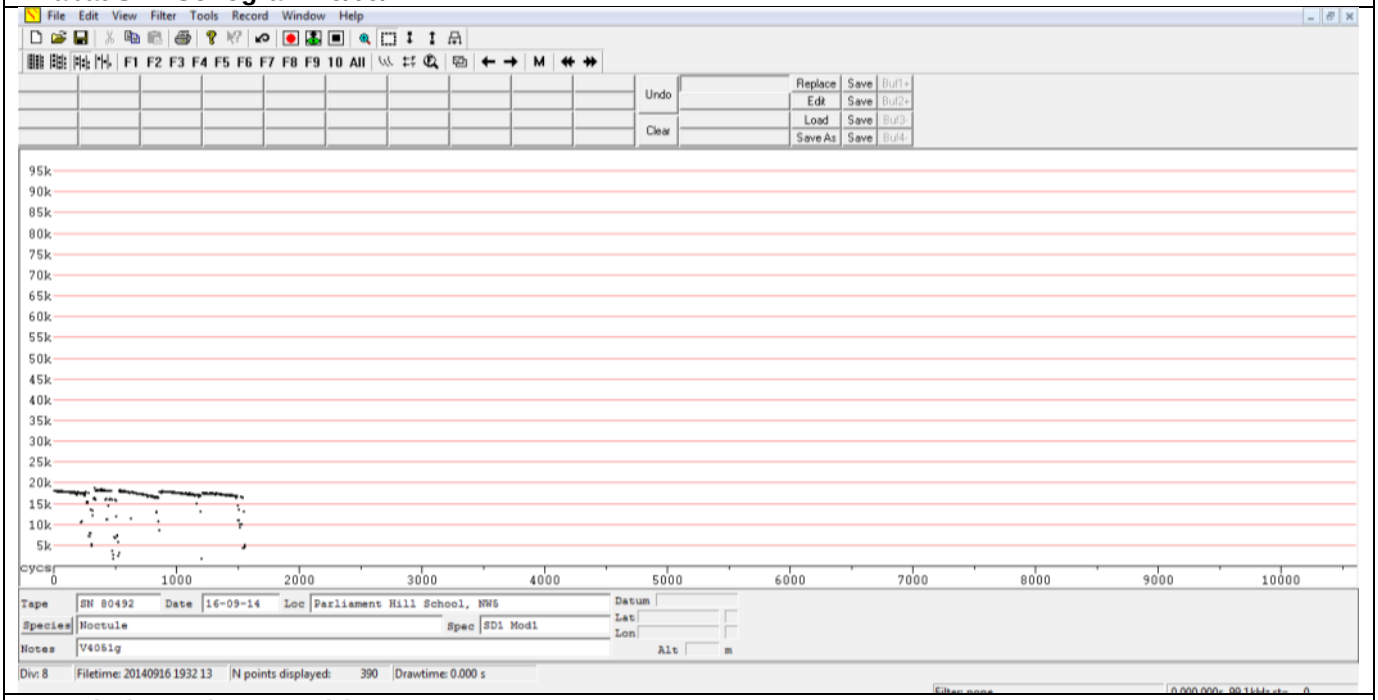
Soprano Pipistrelle (*Pipistrellus pygmaeus*) + Social Call

Anabat SD2 Sonogram 16/09/14



Common Pipistrelle (*Pipistrellus pipistrellus*)

Anabat SD2 Sonogram 16/09/14



Noctule (*Nyctalus noctula*)

APPENDIX 5

Roost Assessment Criteria

Table 1: Categorisation of Bats by National Rarity (From Wray et al., 2007)

Rarity Within Range	England	Wales	Scotland	Northern Ireland
Common (population over 100,000)	Common Pipistrelle Soprano Pipistrelle Brown Long-eared	Common Pipistrelle Soprano Pipistrelle	Common Pipistrelle Soprano Pipistrelle	Common Pipistrelle Soprano Pipistrelle
Rarer (population 10,000 - 100,000)	Daubenton's Natterer's Lesser Horseshoe Nathusius' Pipistrelle Leisler's Whiskered Brandt's Noctule Serotine	Daubenton's Natterer's Brown Long-eared Lesser Horseshoe	Daubenton's Natterer's Brown Long-eared	Daubenton's Natterer's Brown Long-eared Nathusius' Pipistrelle Leisler's
Rarest (population. under 10,000)	Alcathoe Greater Horseshoe Bechstein's Barbastelle Grey Long-eared Greater Mouse-eared	Alcathoe Whiskered Brandt's Greater Horse-shoe Bechstein's Noctule Nathusius' Pipistrelle Serotine Barbastelle	Alcathoe Whiskered Brandt's Noctule Nathusius' Pipistrelle Leisler's	Whiskered

Following the above framework for valuing bats in Ecological Impact Assessment set out by Wray et al. (2007), the site's bat roosts were each assigned a value, based on roost type and species rarity, using a geographic frame of reference (see Table 2 below).

Table 2: Roost Valuation System (From Wray et al., 2007)

Geographic Frame of Reference	Roost Types
District, Local or Parish	Feeding perches (common species) Individual bats (common species) Small numbers of non-breeding bats (common species) Mating sites (common species)
County	Maternity sites (common species) Small numbers of hibernating bats (common and rarer species) Feeding perches (rarer/rarest species) Individual bats (rarer/rarest species) Small numbers of non-breeding bats (rarer/rarest species)
Regional	Mating sites (rarer/rarest species) including well-used swarming sites Maternity sites (rarer species) Hibernation sites (rarest species) Significant hibernation sites
National/UK	Maternity sites (rarest species) Sites meeting SSSI (Sites of Special Scientific Interest) guidelines
International	SAC sites (Special Areas for Conservation)

APPENDIX 6

Bats and Lighting

Bat Conservation Trust

BATS AND LIGHTING IN THE UK
Bats and the Built Environment Series

This document is aimed at lighting engineers, lighting designers, planning officers, developers, bat workers and anyone specifying lighting. It is intended to raise awareness of the impacts of lighting on bats and mitigation is suggested for various scenarios. It also offers an explanation of the facts associated with the lighting industry for the benefit of bat workers.

This is a working document and as such the information contained will be updated in line with advances in our knowledge both into the impact on bats and also to reflect the advances in technology available in the lighting industry.

ABOUT BATS – FOR THE LIGHTING INDUSTRY

General Ecology

Bats are the only true flying mammals. Like us, they are warm-blooded, give birth and suckle their young. They are also long-lived, intelligent and have a complex social life. In Britain there are 17 species, all of which are small (most weigh less than a £1 coin) and eat insects.

Bats have evolved a number of unusual features, mainly connected with their ability to fly. Their wings are formed from a web of highly elastic skin stretched over greatly elongated finger bones, the legs and tail, though their thumbs remain free to help them cling on when roosting. Bats have also developed a highly sophisticated echolocation system that allows them to avoid obstacles and catch tiny insects, which they seize in flight or pick off water, the ground or foliage, even in complete darkness. When they're flying, bats produce a stream of high-pitched calls and listen to the echoes to produce a sound picture of their surroundings.

Some bats specialise in catching large insects such as beetles or moths but others eat large numbers of very small insects, such as gnats, midges and mosquitoes. Bats gather to feed wherever there are lots of insects, so the best places for them include traditional pasture, woodland, marshes, ponds and slow moving rivers.

During the winter there are relatively few insects available, so bats hibernate. In September and October they put on weight and then, as the weather gets colder, they seek out appropriate sheltered roosts, let their body temperature drop to close to that of their surroundings and slow their heart rate to only a few beats per minute. This greatly reduces their energy requirements so that their food reserves last as long as possible. Bats don't hibernate right through the winter but may wake up and go out to feed on mild evenings when insects are active.

During the spring and summer period female bats gather together into maternity colonies for a few weeks to give birth and rear their young (called pups). Usually only one pup is born each year. This is looked after carefully and suckled for between four and six weeks until it is old enough to fly out and hunt for itself. Bats don’t build nests and don't bring food back to the roost to feed their young, so the baby lives only on its mother's milk until it is old enough to fly. Once the baby is independent, the colony breaks up and the bats generally move to other roosts. Bats may gather together from a large area to form these maternity roosts, so any disaster at the summer breeding site can affect the whole colony of bats from a wide surrounding area. Many of these maternity sites are used every summer as bats have a strong tradition of returning to the same site year after year.

Legal Protection of bats

Due to the decline in bat numbers, all species of bat are protected by the Wildlife & Countryside Act (1981) (as amended) and the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). This makes it illegal to: kill, injure, capture or disturb bats, obstruct access to bat roosts or damage/destroy bat roosts. Lighting in the vicinity of a bat roost causing disturbance could constitute an offence, so it is important that Natural England, Countryside Council for Wales, Scottish Natural Heritage or Environment and Heritage Service, Northern Ireland is consulted and allowed time to provide advice on lighting proposals in the vicinity of bats and roosts.

Impacts on bats

Roosts

Illuminating a bat roost creates disturbance and may cause the bats to desert the roost. Light falling on a roost access point will at least delay bats from emerging and this shortens the amount of time available to them for foraging. As the main peak of nocturnal insect abundance occurs at and soon after dusk, a delay in emergence means this vital time for feeding is missed.

Insects and foraging

In addition to causing disturbance to bats at the roost, artificial lighting can also affect the feeding behaviour of bats. There are two aspects to this. One is the attraction that light from certain types of lamps has to a range of insects; the other is the presence of lit conditions.

Many night flying species of insect are attracted to light, especially those lamps that emit an ultra-violet component and particularly if it is a single light source in a dark area. As well as moths a range of other insects can be attracted to light such as craneflies, midges and lacewings. Studies have shown that, although noctules, Leisler's, serotine and pipistrelle bats swarm around white mercury street lights (this would also apply to metal halide) feeding on the insects attracted to the light, this behaviour is not true for all bat species. The slower flying broad winged species such as long-eared bats, *Myotis* species (which include Brandt's, whiskered, Daubenton's, Natterer's and Bechstein's), Barbastelle and greater and lesser horseshoe bats generally avoid street lights. In addition it is also thought that insects are attracted to lit areas from further afield. This is thought to result in adjacent habitats supporting reduced numbers of insects. This is a further impact on the ability of the light avoiding bats to be able to feed. It is noticeable that most of Britain's rarest bats are among those species listed as avoiding light. Clearly, effective mitigation where there is potential for impact on bats has importance in the conservation of these species.

Artificial lighting is thought to increase the chances of bats being preyed upon. Many avian predators will hunt bats which may be one reason why bats avoid flying in the day. Observations have been made of kestrels (diurnal raptors) hunting at night under the artificial light along motorways.

Lighting can be particularly harmful if used along river corridors, near woodland edges and near hedgerows used by bats. In mainland Europe, in areas where there are foraging or 'commuting' bats, stretches of road are left unlit or lighting is designed in such a way as to avoid isolation of bat colonies.

Other behaviours
Artificial lighting disrupts the normal 24-hour pattern of light and dark which is likely to affect the natural behaviour of bats. Bright light may reduce social flight activity and cause bats to move away from the light area. Studies have shown that continuous lighting along roads creates barriers which some bat species cannot cross. For example, Daubenton's bats move their flight paths to avoid street lamps. The following images indicate possible scenarios where bats' commuting routes may cross a road. They are linear features such as tree lines, river corridors, hedgerows or where tree canopies form a link over the road.

ABOUT THE LIGHTING – FOR BAT WORKERS

Types of lights in use
A range of lighting equipment is available:

1) **Low pressure sodium lamps (SOX)** (typical orange lamps seen along roadsides). Light is emitted at one wavelength, contains no ultraviolet (UV) light and has a low attraction to insects. The lamps tend to be large which makes it more difficult to focus the light from these lamps. These are in the gradual process of being removed or replaced.

2) **High pressure sodium lamps (SON) (**brighter pinkish-yellow lamps). Commonly used as road lighting. Light is emitted over a moderate band of long wavelengths including a small UV component. Insects are attracted to the brighter light. The lamp is of medium size and the light can be more easily directed than low pressure sodium. This is the predominant lamp now in use.

3) **Mercury lamps (MBF)** (bluish-white lamps). These emit light over a moderate spectrum including a larger component of UV light to which insects are particularly sensitive. Insects are attracted in large numbers along with high densities of bat species. (Rydell & Racey 1993). They are rare now and are not used in new developments.

4) **White SON.** This is whiter than High Pressure Sodium and has a larger component of UV light.

5) **Metal Halide**. A small lamp and therefore more easy to focus light and make directional. Emits less UV light than mercury but more than high pressure sodium. It comes in three forms a) Quartz arc tube (HQI); b) Ceramic arc tube (CDM-T) and c) Cosmo which is a new ceramic form.

6) **Light Emitting Diodes** (LEDs). Predicted to compete with metal halide and high pressure sodium as a widely used light source within the next few years. The light emitted is more directional. The light is produced in a narrow beam. It is instant light.
7) **Tungsten Halogen** (more directional). It is not used in new lighting schemes but may be encountered as security light on a private household.
8) **Compact Fluorescent** Mostly in use in residential street lighting. It produces a white light that does include UV light. It can be used at a low wattage and therefore on a low output to achieve low lux.

Legal requirements for lighting

There is no legislation requiring an area or road to be lit.
The Building Regulations specify that 150 W is the maximum for exterior lighting of buildings but this does not apply to private individuals.
There are a number of British Standards that relate to various components of lighting and there are also guidelines that relate to crime prevention, prevention of vehicular accidents and amenity use.
Many County councils and less often District and Borough councils set out standards in local guidance policy documents. These are sometimes based on the advice given by the Highways Authority 'TA49 – Approval of new and replacement lighting on trunk roads and trunk road motorways'.
In assessing the need for lighting it would be beneficial to ask the local authority for their lighting policy document as this should incorporate all of the above.

The installation of lighting and the planning system

Domestic lighting needs no planning permission and depends on direct advice being given to the householder. Lighting associated with new development or a listed building does require planning permission. Planning officers or developers when dealing with applications for lighting in an area of suitable bat habitat eg. woodland, old pasture, linking hedgerows and water habitats) should seek information on bat roosts in the area.

If assistance is needed they can contact the BCT Bat Helpline 0845 1300 228 who may be able to suggest how best to access information on bat roosts known in the area. If bat roosts are suspected, it may be necessary to conduct a bat survey. A survey may need to

determine the species of bat affected, their population levels, the likely impact of the lighting on the bats and possible mitigation.
The need to install lighting should be questioned. Where lighting is permitted, as may be necessary for public safety, conditions should be imposed to ensure the impact of the lighting on the bats is kept to a minimum. The use of a lighting design computer program that predicts where light will fall should be used to predict the potential impact and to plan mitigation.
The consultation on the addition to PPS23 on Pollution Control of Annex 3 on lighting is on hold at the present time (July 2007) until the outcome of the Baker review is known.

MITIGATION OF LIGHTING IMPACTS ON BATS

1. BAT ROOSTS

No bat roost (including access points) should be directly illuminated. If it is considered necessary to illuminate a building known to be used by roosting bats, the lights should be positioned to avoid the sensitive areas. Close offset accent lighting causes less light pollution; it is more specific and can be designed to avoid bat sensitive areas, and better highlights the features of the subject of the illumination.

2. FORAGING AND COMMUTING

Type of lamp (light source)

The impact on bats can be minimised by the use of low pressure sodium lamps or high pressure sodium instead of mercury or metal halide lamps where glass glazing is preferred due to its uv filtration characteristics.

Luminaire and light spill accessories

Lighting should be directed to where it is needed and light spillage avoided. This can be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvres and shields to direct the light to the intended area only. Planting can also be used as a barrier or manmade features that are required within the build can be positioned so as to form a barrier.

Lighting column

The height of lighting columns in general should be as short as is possible as light at a low level reduces the ecological impact. However, there are cases where a taller column will enable light to be directed downwards at a more acute angle and thereby reduce horizontal spill. For pedestrian lighting this can take the form of low level lighting that is as directional as possible and below 3 lux at ground level. The acceptable level of lighting may vary dependent upon the surroundings and on the species of bat affected.

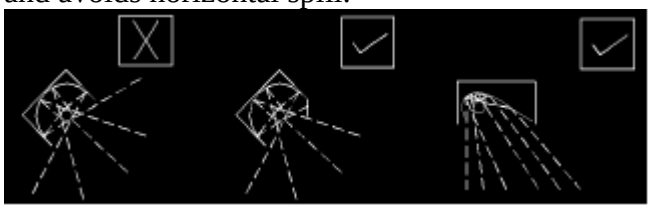
Predicting where the light cone and light spill will occur

There are lighting design computer programs that are widely in use which produce an image of the site in question, showing how the area will be affected by light spill when all the factors of the lighting components listed above are taken into consideration. This should be a useful tool to inform the mitigation process.

Light levels
The light should be as low as guidelines permit. If lighting is not needed, don't light.
Timing of lighting
The times during which the lighting is on should be limited to provide some dark periods. Roads or trackways in areas important for foraging bats should contain stretches left unlit to avoid isolation of bat colonies. These unlit stretches should be 10 metres in length either side of commuting route.

3. FLOODLIGHTING OF SPORTS OR EVENTS

The use of asymmetric beam floodlights (as opposed to symmetric) orientated so that the glass is parallel to the ground will ensure that the light is cast in a downward direction and avoids horizontal spill.



See the National Trust guide to 'Events, concerts and bats' at http://www.nationaltrust.org.uk/main/w-bat05_events.pdf for further advice on ways to reduce the impact of event lighting.

4. SECURITY LIGHTING

Power It is rarely necessary to use a lamp of greater than 2000 lumens (150 W) in security lights. The use of a higher power is not as effective for the intended function and will be more disturbing for bats.
Movement sensors Many security lights are fitted with movement sensors which, if well installed and aimed, will reduce the amount of time a light is on each night. This is more easily achieved in a system where the light unit and the movement sensor are able to be separately aimed.
Timers If the light is fitted with a timer this should be adjusted to the minimum to reduce the amount of 'lit time'.
Aim of light The light should be aimed to illuminate only the immediate area required by using as sharp a downward angle as possible. This lit area must avoid being directed at, or close to, any bats' roost access points or flight paths from the roost. A shield or hood can be used to control or restrict the area to be lit. Avoid illuminating at a wider angle as this will be more disturbing to foraging and commuting bats as well as people and other wildlife.
Alternatives
It may be a better solution for security lighting on domestic properties to use a porch light.

Ongoing areas of research

- The impact of light on commuting corridors used by lesser horseshoe bats. Emma Stone, University of Bristol
- The effects of lighting on prime bat foraging areas within London, concentrating on riparian habitats and open spaces. Alison Fure.
- The effect of light and noise on British bat species. Frank Greenaway.

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Glossary of terms
(used in this article or that may be used by the lighting industry)

Arc tube	A tube normally ceramic or quartz enclosed by the outer glass envelope of a HID lamp that contains the arc stream.
Asymmetric beams	Lamp is off-centre in a reflector more steeply curved at one end.
Candela	The intensity of a light source in a specific direction. Unit of Luminous intensity
Contrast	The relationship between the luminance of an object and its background. The higher the contrast the more likely it is an object

	can be seen.
Cowl	Physical light spill control accessory.
Diffuse	Term describing dispersed light distribution referring to the scattering of light.
Efficacy	A measure of light output against energy consumption measured in lumens per watt.
HID	High Intensity Discharge. Describes mercury vapour, metal halide and high pressure sodium lamps.
High Pressure Sodium Lamp	A HID lamp whose light is produced by radiation from high pressure sodium vapour which usually includes a small amount of UV light.
Hood	Physical light spill control accessory.
Illuminance	Illuminance is the quantity of light, or luminous flux, falling on a unit area of a surface. It is designated by the symbol E. The unit is the lux (lx).
Lamp	Light source.
Light cone	The angle at which the beam falls off to 50% of peak intensity.
Light Pollution	The spillage of light into areas where it is not required. Also known as obtrusive light.
Light spill	The light that falls outside the light cone.
Light Trespass (nuisance)	Light that impacts on a surface outside of the area designed to be lit by a lighting installation. The correct legal term is nuisance.
Louvres	Physical light spill control accessory.
Low Pressure Sodium	A discharge lamp in which light is produced by radiation from low pressure sodium vapour. Emits light at only 589nm ie. monochromatic.
Lumen	The unit of light output from a lamp.
Luminaire	Light fitting or unit designed to distribute light from a lamp or lamps.
Luminance	The physical measure of the stimulus that produces the sensation of brightness measured by the luminous intensity reflected in a given direction. The unit is the candela per square metre (cd/m^2).
Lux (LX)	Illuminance is the quantity of light or luminous flux, falling on a unit area of a

	surface in the environment. It is designated by the symbol E. The unit is lux (lx).
Metal Halide (includes CDM-T)	A type of HID lamp in which most of the light us produced by radiation of metal halide and mercury vapours in the arc tube. Emits UV light. UV poor variants are available. It comes in three forms a) Quartz arc tube (HQI); b) Ceramic arc tube (CDM-T) and c) Cosmo which is a new ceramic form
Mercury	High pressure white light lamp that emits significant UV light.
Optic	The components of a luminaire such as reflectors, refractors, protectors which make up the directional light control section.
Photocell	A unit which senses light to control luminaires.
Reflector	A device used to reflect light in a given direction.
Refractor	A device used to redirect the light output from a lamp when the light passes through it. It is usually made from prismatic glass or plastic.
Shield	Physical light spill control accessory.
Sky glow	The brightening of the night sky caused by artificial lighting.
Symmetric beams	Lamp mounted in the centre of the reflector.
Ultra violet (UV)	Radiation that is shorter in wavelength and higher in frequency than visible violet light.
Voltage	The difference in electrical potential between two points of an electrical circuit.
Watt (W)	The unit for measuring electrical power.

APPENDIX 7

Raw Survey Data

Bat Ultrasound Survey Record Sheet

Date	10/09/2014	Site	Parliament Hill School, Highgate Road, London, NW5 1RL					Sunrise/ Set Time	06:27	Ecologist	J Jones	Sheet No	1/1
Weather Data		Temperature °C	Humidity %	Cloud Cover Okta	Wind Bft Scale	Precipitation Y/ N		Survey Type	DAWN	Start	04:50		
	Start	12.9°C	69%	1	0-1	N				End	06:30		
	End	10.7°C	90%	1	0	N		Detector	Batbox + ABL				

Time	Map No.	Forage	Comm	Direction	Peak Khz	Species?	Comment
04:50							START SURVEY
05:18	HNS		✓		55	P.pipistrelle	Very brief comuts only heard N/S
06:30							END SURVEY

NOTES:

Bat Ultrasound Survey Record Sheet

Date	10/09/2014	Site	Parliament Hill School, Highgate Road, London, NW5 1RL				Sunrise/ Set Time	06:27	Ecologist	PH	Sheet No	1-1
Weather Data		Temperature °C	Humidity %	Cloud Cover Okta	Wind Bft Scale	Precipitation Y/ N	Survey Type	DAWN	Start	0500		
	Start	11.1°C	98%	0	0	N	Detector	DUET / ANABAT	End	0630		
	End	9.6°C	93%	3	0	N						

Time	Map No.	Forage	Comm	Direction	Peak Khz	Species?	Comment
0500							START SURVEY
0630							END SURVEY
							NO BAT ACTIVITY - SURVEY DISCONTINUED

NOTES:

Bat Ultrasound Survey Record Sheet

Date	10/09/2014	Site	Parliament Hill School, Highgate Road, London, NW5 1RL				Sunrise/ Set Time	06:27	Ecologist	VT	Sheet No	1 of 1
Weather Data		Temperature °C	Humidity %	Cloud Cover Okta	Wind Bft Scale	Precipitation Y/ N	Survey Type	DAWN	Start			
	Start								End			
	End						Detector	Batbox Duet +ABG				

Time	Map No.	Forage	Comm	Direction	Peak Khz	Species?	Comment
							NO BATS

NOTES:

Bat Ultrasound Survey Record Sheet

Date	10/09/2014	Site	Parliament Hill School, Highgate Road, London, NW5 1RL				Sunrise/ Set Time	06:27	Ecologist	DM	Sheet No	1
Weather Data		Temperature °C	Humidity %	Cloud Cover Okta	Wind Bft Scale	Precipitation Y/ N	Survey Type	DAWN	Start			
	Start								End			
	End						Detector	CM3+ Bat				

Time	Map No.	Forage	Comm	Direction	Peak Khz	Species?	Comment
							No Bats Seen or Heard

NOTES:

Bat Ultrasound Survey Record Sheet

Date	16/09/2014	Site	Parliament Hill School, Highgate Road, London, NW5 1RL					Sunrise/ Set Time	19:13	Ecologist	JS/AS	Sheet No	1/1
Weather Data		Temperature °C		Humidity %	Cloud Cover Okta	Wind Bft Scale	Precipitation Y/ N	Survey Type	DUSK	Start	18:52		
	Start	20.0°C		71%	3	0(1)	N	Detector	Duet+ Anabat①	End	20:45		
	End	17.4°C		85%	2		N						

Time	Map No.	Forage	Comm	Direction	Peak Khz	Species?	Comment
18:50							START SURVEY
19:44	HMS	✓			45	Pipistrelle	Fairly heavy 2x pass.
19:47	HMS		✓			Nyctule	Commuter high overhead.
19:51	HMS①	✓			45	Pipistrelle	Found - Foraging for 2 mins, passed one central tree. up one tree + along building Early until 20:15.
19:57	\	✓			55	Pipistrelle	Forage until 20:12
20:15	\	✓			45	Pipistrelle	Forage until
20:45							END SURVEY

NOTES:

Bat Ultrasound Survey Record Sheet

Date	16/09/2014	Site	Parliament Hill School, Highgate Road, London, NW5 1RL					Sunrise/ Set Time	19:13	Ecologist	PM	Sheet No	1
Weather Data		Temperature °C	Humidity %	Cloud Cover Okta	Wind Bft Scale	Precipitation Y/ N		Survey Type	DUSK	Start			
	Start							Detector	EM3+	End			
	End												

Time	Map No.	Forage	Comm	Direction	Peak Khz	Species?	Comment
19:40	①	✓			45	P.P	around trees & tennis Courts.
19:44	②		✓	E-W	"	"	along access Road to Flats
19:54	①	✓			"	~	around trees.
19:58	①	✓			"	~	Brief pass over trees.
20:39	②	✓			"	~	" " "

NOTES:

Bat Ultrasound Survey Record Sheet

Date	16/09/ 2014	Site	Parliament Hill School, Highgate Road, London, NW5 1RL	Sunrise/ Set Time	19:13
Ecologist	PH	Sheet No	1-1		
Survey Type	DUSK	Start	1850	End	2100
Detector	Duet Anabat				

Weather Data	Temperature °C	Humidity %	Cloud Cover Okta	Wind Bft Scale	Precipitation Y/ N
Start	17.8°C	81%	0	1-2	N
End	[illegible]	[illegible]	0	0	N

Time	Map No.	Forage	Comm	Direction	Peak Khz	Species?	Comment
1850							Start Survey
1944	1		✓	E-W	45	P.P	Single P.P commuted across site W-E
1952	2		✓	S-NW	48	P.P	Commuted from Park in S-NW across site
2001	3		✓		45	P.P	Hrs Heard not seen
2006	4	✓	✓	SE-NW	45	P.P	Foraging along tree line
2017							[illegible]
2030							High levels of light pollution
2100							End Survey

NOTES:

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Date	16/09/2014	Site	Parliament Hill School, Highgate Road, London, NW5 1RL				Sunrise/ Set Time	19:13	Ecologist	VT	Sheet No	1/1
Weather Data		Temperature °C	Humidity %	Cloud Cover Okta	Wind Bft Scale	Precipitation Y/ N	Survey Type	DUSK	Start			
	Start						Detector	Batbox Duet +AB4	End			
	End											

Time	Map No.	Forage	Comm	Direction	Peak Khz	Species?	Comment
19:37	1	✓		NW	45	Pip	brief forage
19:43	2		✓	NW	45	Pip	
19:55	3	✓		NW	45	Pip	Brief forage

NOTES:

APPENDIX 8

Building Classification Form

General				Roof					Walls and windows						Cellar		Loft									
Building	Approximate construction date	Current usage	Number of stories (excluding loft)	Roof shape	Roof cover	Roof condition	Number of chimneys	Soffits	Walls	Cavity walls	Wall condition	Windows	Hanging tiles?	Wooden cladding?	Present?	Description	Exists	Loft access	Loft structure	Flying space within loft	Underfelt	Comments	Obvious access points recorded	Signs of bats	Comments	Bat roost potential assessment
1	1970	*Classrooms*	3	Flat	Roofing felt	Excellent	None	Wooden	Brick/ Wooden panel	Yes	Excellent	Metal Frame single pane	none	Yes	Yes	Estates Office/ boiler room	No	-	-	-	-	-	None	None	-	Low
2	1980	*Classrooms*	1	Flat	Roofing felt	Excellent	None	Wooden	Brick/ Wooden panel	Yes	Excellent	Metal Frame single pane	none	Yes	No	-	No	-	-	-	-	-	None	None	-	Negligible
3	1980	*Classrooms*	1	Flat	Roofing felt	Excellent	None	Wooden	Brick/ Wooden panel	Yes	Excellent	Metal Frame single pane	none	Yes	No	-	No	-	-	-	-	-	None	None	-	Negligible
4	1980	*Classrooms*	1	Flat	Roofing felt	Excellent	None	Wooden	Brick/ Wooden panel	Yes	Excellent	Metal Frame single pane	none	Yes	No	-	No	-	-	-	-	-	None	None	-	Negligible