

Bartlett Arboretum

**White House Farm, White House Lane
Spencers Wood, Reading**

Planning Ref. 232560

Phase 1 – External Lighting Scheme

Ecological Constraints & Mitigation *[Planning Condition 22]*

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**4Woods Ecology Ltd, 243 Woodlands Road, Woodlands, Southampton, SO40 7GJ
tel. 07801 432 878**

4Woods Ecology Ltd. Company registration no. 4801465. England.
Registered office: Partnership House, 84 Lodge Road, Southampton SO14 6RG

1.0 Background

Planning consent has been granted for development of commercial buildings with car parking, plus research beds and wider arboretum on a large site off White House Lane (Ref. 232560). The development will be completed in phases. Phase 1 includes development of the new buildings with access road and adjacent parking, and this is currently underway. An external lighting scheme is required for the phase 1 development, however, planning condition 22 requires the following:

22. External Lighting

Prior to first use of each phase of the development hereby permitted, a Lighting Design Strategy for Biodiversity for that phase shall be submitted to and approved in writing by the local planning authority. The strategy shall:

a) identify those areas/features on site that are particularly sensitive for bats and badgers and that are likely to cause disturbance in or around their breeding sites and resting places or along important routes used to access key areas of their territory, for example, for foraging; and

b) show how and where external lighting will be installed (through the provision of appropriate lighting contour plans and technical specifications) so that it can be clearly demonstrated that areas to be lit will not disturb or prevent the above species using their territory or having access to their breeding sites and resting places. All external lighting shall be installed in accordance with the specifications and locations set out in the strategy for all phases, and these shall be maintained thereafter in accordance with the strategy. Under no circumstances should any other external lighting be installed without prior consent from the local planning authority.

This document therefore seeks to provide the required information to satisfy Planning Condition 22 relating to the Phase 1 development only.

This document has been produced as a collaboration between the Ecologist (S Forster BSc PGDip CEnv MCIEEM, of 4Woods Ecology Ltd) and Lighting Designers (UK Lighting Design, UKLD), on behalf of Bartlett Tree Experts. Published advice provided by the *Guidance Note 8: Bats and Artificial Lighting at Night (ILP, 2023)* has been used to guide the design of the lighting scheme.

2.0 Overview of Existing Situation

The consented development (Phase 1) comprises x3 new commercial buildings at the northern end of the large site. The remainder of the site is to be gradually converted to an arboretum with research beds and extensive tree planting with meadow and pond mosaic habitat creation as part of future phases, where external lighting will generally not be required.

This large site is at the edge of a large residential development but backs onto open countryside. The surrounding roads are generally not lit. However, some domestic lighting will occur around the farmhouse at the northern edge of the site and houses immediately to the north of the wider site, plus car headlights along roads that extend around all site boundaries.

The occasional tall street light also exists at the north-eastern edge of the site amongst the houses, and to the west of the woodland part of the site within a private

property. A commercial development immediately beyond the north-western edge of the site also contains several high-level security lights (Google streetview: www.google.com/maps).

The consented site is indicated as being in the ‘yellow/brighter’ night light zone (2-4 NanoWatts/cm²/sr - on a scale of <0.25 Darkest to >32 Brightest) on the CPRE interactive ‘Light Pollution & Dark Skies map’. ([England’s Light Pollution and Dark Skies](#)).

3.0 Required Lighting at Bartlett Arboretum (Phase 1 only)

There are minimal lighting requirements at the developed part of the site to ensure safety while moving around the site, for emergency situations and for security. This includes:

- Lighting at the entrance and along the access road/turning area (for general safety for vehicles/pedestrians and for emergency vehicles).
- Emergency lights (indicating exit/safe routes out/meeting points).
- Security lights.
- Low-key lighting for staff moving around the site (e.g. personal door lights, pathways between buildings and parking area).

However, it is expected that the majority of lighting will only be required during the winter period when bats and other wildlife are significantly less active.

4.0 Ecological Constraints & Mitigation Requirements

4.1 Light-sensitive Species & Associated Habitat – ‘Key’ & ‘Supporting’ Habitat

The main light-sensitive species occurring at the site are: Bats & Badgers. In addition, Great Crested Newt, Dormice and Hedgehog are known to occur in the wider local area and could therefore possibly enter the site. These are all nocturnal species.

The following is an overview of the ‘key habitat’ (i.e. most important habitat used, or potentially used, by these light-sensitive species, and where increased lighting impacts should be avoided wherever possible), and ‘supporting habitat’ (i.e. other wider habitat of importance to these species populations but where some minimal level of ambient light pollution may be acceptable).

Bats

The following records of bat species exist within 2km of the site (TVERC):

Common Pipistrelle
Soprano Pipistrelle
Nathusius’ Pipistrelle
Brown Long-eared Bat,
Myotis sp.
Daubenton’s bat
Noctule
Serotine

However, only records of Common Pipistrelle were found to occur in close proximity to the site (4Woods Ecology Ltd, 2023). During evening bat emergence surveys completed at two buildings at the eastern edge of the woodland area within the site (4Woods Ecology Ltd, 2023) day roosts of Common Pipistrelle were recorded at the buildings (since demolished under EPS license) and all foraging bat activity at the edge of the woodland was by Common Pipistrelle, with the very odd Soprano Pipistrelle bat, plus very occasional Serotine and Noctule being detected in the vicinity. These are all less light-averse species being ‘open space’ or ‘edge space’ species (ILP, 2023).

The following ‘key habitat’ used by bats, or considered to have a high *potential* to be used by bats (either currently in the future), exists on the site (see **Map 1**):

- A small number of trees have been identified within the woodland area, with potential to support multiple bats (PRF-M, Collins, 2023) due to the presence of significant holes/crevices/cavities (4Woods Ecology, 2023). These are highlighted on **Map 1**. Note that no bat roosts have been confirmed within trees at the site and further endoscope surveys of those trees near to the Badger Sett in July 2024 revealed significant numbers of only slugs and woodlice within the cavities.
- The woodland also contains numerous trees with lower potential to be used by individual bats (e.g. due to the presence of small areas of loose bark, dense Ivy etc)(PRF-I). Tree-roosting bats will often move between suitable tree roosts and therefore the woodland as a whole should be viewed as a potential ‘roost resource’.
- The woodland interior (where a relatively clear flight path exists N/S through the woodland) and woodland edges are assessed as having high potential suitability for foraging/commuting bats (with different species likely to favour woodland interior or edge habitats).
- A number of bat boxes have also been installed on trees within or at the edge of the woodland area, and x2 bat boxes have been installed on the western gables of the new office/research buildings at the site. (**Map 1**)

The following ‘Supporting habitat’ occurs at the site:

- Additional bat foraging and commuting activity would be expected along boundary hedgerows of the wider site (particularly where mature trees extend along the opposite side of the lanes).
- Some bat foraging activity by certain ‘open space’ species is also likely to occur across the wider open site, particularly during darkness. Note that the proposed creation of the arboretum, including significant tree planting, meadow grassland and pond mosaic habitat creation, is expected to significantly improve the wider site for bat foraging in the future.

Badgers

Evidence of Badgers has been recorded at the site. In particular a small badger sett (x3 holes) has been identified at the south-eastern edge of the woodland (indicated on **Map 1**). This has been measured to be at least 30m distance from the overhead electric cables and therefore around 40m from the nearest new building at the site. These have been periodically checked by the ecologist as work has continued on site

since 2023 with very limited evidence being only occasionally found to indicate use of one of the holes by Badgers. The sett is considered to be 'key habitat' (**Map 1**).

Evidence found indicates that Badgers continue to cross the wider site to reach other foraging habitat within their territorial range and frequent badger access gaps have been created beneath the site boundary fence on all sides. It is expected that routes used by Badgers to cross the wider site will continue to change as the arboretum develops in the future. The wider site is therefore considered to be 'supporting habitat' for Badgers.

Note that proposed creation of the arboretum and habitat creation throughout the wider site is likely to improve foraging opportunities for badgers within the site in the future.

Other Possible Nocturnal species

If Dormice or Hedgehog were to enter the site, they are likely to utilise boundary hedgerows and the woodland area where suitable habitat/refuges occur.

Likewise, if Great Crested Newts were to enter the site they are also most likely to use refuges along the boundary hedgerows and woodland habitat.

Note that the proposed habitat creation throughout the wider site as part of the Arboretum creation is expected to increase the likelihood of Great Crested Newt and Hedgehog occurring in the future.

The wider site, boundary hedgerows and woodland are therefore considered to be 'supporting habitat' for these species.

4.2 Ecological Constraints to Lighting – Required 'Dark Zones'

Based on the existing key and supporting habitat of sensitive species, and potential future key/supporting habitat, it is advised that the following 'dark zones' should be maintained by appropriate lighting design:

- Woodland habitat in general to remain dark (any proposed lighting at the future woodland car park as part of a future phase is to be reviewed/designed at a later date). This habitat contains trees with potential suitability for bat roosts and erected bat boxes within the woodland (note that the recently erected mitigation bat box near to the site entrance could be moved to an alternative position by the licensed ecologist only, if affected by the lighting (subject to assessment on site and an absence of bats));
- Woodland edges, including a buffer zone of at least 5m from the canopy edge (see **Map 1**) to remain dark. Where essential lighting comes close to the woodland edge at the site entrance (northern edge), the lighting here must ensure light spill (including glare) does not illuminate the tree canopy above/behind (e.g. directing light away from the woodland edge and using shields where necessary).
- Trees identified as having high potential for bat roosts (PRF-M) (see **Map 1**), are all located within the woodland or at the woodland edges and therefore are included within the above recommended 'dark zones'.

- Occasional/partially used outlier Badger sett at the south-eastern woodland edge (**Map 1**) is included within the recommended woodland edge 'dark zone'.
- Illumination of integrated bat boxes at the top of the western gables of the new buildings (Map 1) should be avoided. Any nearby lighting should be minimised and designed to avoid light spill/glare of the upper gables and flight corridor between the boxes and woodland edge.
- The wider site boundary hedgerows and majority of the wider site beyond the developed area should also be generally kept dark. Some level of ambient light around the developed area would be acceptable, particularly given that these areas will be of least value to wildlife (being dominated by research plots) and that the areas further from the development throughout the wider site will be significantly improved for wildlife with tree planting and other habitat creation. In general, the wider site and boundary hedgerows are unlikely to be affected by any proposed lighting scheme at the site.

5.0 External Lighting Design

5.1 Overview of Design Principles

An external lighting design has been devised by UK Lighting Design (UKLD) based on the above identified ecological constraints (**Section 4.0**) and further published guidelines to minimise impacts on wildlife (ILP, 2023).

All lighting at the site conforms with the following in order to minimise ecological impacts (in accordance with published guidance – ILP, 2023)

- All luminaires to lack UV elements. LED lights to be used.
- Warm white lights to be used, <2700K, to reduce the blue light component
- Lights to feature peak frequencies >550nm
- Light intensity to be the minimum to meet safety requirements.
- Directional/down lights will be used, with no light output above 90°. Additional shields are to be used if necessary to prevent light spill upwards or beyond the areas that are need to be illuminated in sensitive areas.
- Lights will be on a timer (as short a period as possible) or PIR, where appropriate. Lights will not be left on all night when not needed.

In addition, note that new tree/shrub planting is proposed between the new buildings and woodland edge which will help to attenuate any ambient light levels in the future, but not immediately.

5.0 Details of Lighting Design & Compliance with Ecological Constraints

In order to illustrate compliance with the identified ecological constraints (as described above and illustrated on **Map 1**), the following detailed information has been provided:

- Lighting Design (**Appendix I**)
- Light Contour maps (**Appendix II**)
- Specification for each of the lights proposed (**Appendix III**).

The following explanation of the Lighting Scheme has been provided by Lighting Designers (UKLD):

The external lighting has been carefully designed to minimise potential impacts on bats, badgers, and the wider site ecology. All fittings are full cut-off downlights, providing illumination only close to the building and preventing any upward spill. The lighting contour drawings include a clear key, with the outer dark blue line representing the 1 lux threshold.

Only the minimum level of external lighting has been provided to enable safe movement around the building and to facilitate emergency vehicle access. PIR sensors have been used where possible to limit the duration of lighting operation. For example, wall lights on the west-facing gables—required to illuminate the fire muster point for Building Control compliance—will operate only when triggered and otherwise remain off.

At the access gate, higher lux levels (up to 23 lux) occur solely at ground level and dissipate rapidly towards the woodland edge, maintaining a dark boundary zone. This level of lighting is required for safe access on and off the highway and therefore represents a health and safety requirement for site users.

Limited lighting has been included along the entrance drive to ensure safe access for emergency vehicles. These fittings utilise Bat-Safe lighting posts that direct light onto the roadway and away from adjacent tree canopies, thereby minimising light spill into ecologically sensitive areas.

Glare-Related Information Summary

1. Lighting Calculation Basis

- Based on **CIBSE Guidelines BS EN12464-1:2021** and **BS 5266-1:2016 + BS EN1838:2013**.
- These standards include requirements for glare limitation using the **UGR method**, but no explicit UGR values are reported — meaning this is a **preliminary design** focused on illuminance and uniformity, not full visual comfort analysis.
- Lighting is modelled with **average indirect fraction** and **maintenance factor 0.8**, suggesting basic consideration of reflective glare control.

2. Luminaire Types

- **LEDSCAPE EX6, EX3, and LIX-S60-T3M** fittings are specified.
- These are **cut-off luminaires** (typically 0° upward light output), designed to limit **upward and direct glare** in accordance with ecological lighting best practice.

3. Illuminance Uniformity (related to glare perception)

- Many areas show **uniformity ratios** (E_{min}/E_m) between **0.3–0.9**, which is within the range that minimizes strong contrast and perceived glare.
- The **entrance and drive areas** have higher maximum illuminance (up to 161 lx locally) but remain within controlled spread—important for safety lighting without excessive brightness contrast.
- One outlier (Area 11 and 23) shows extremely high localised max values ($E_{max} = 2140–2330$ lx) from modeling artefacts or direct luminaire beams—likely addressed by **shielding or hooding** in later refinement.

4. Ecological Context

- The fittings are all **full cut-off**, downward-directed, and limited to the **minimum required lux for safe movement**.
- This directly aligns with ILP Guidance Note 08/23 and **BCT (Bat Conservation Trust)** recommendations to minimize **glare spill** into ecological zones.

6.0 Conclusions

The proposed lighting scheme at Phase 1 of the Bartlett Arboretum development has been devised to avoid potential ecological impacts by preventing illumination of identified Key habitat for sensitive species and minimising/avoiding light spill on supporting habitat for such species. The type of lighting proposed conforms with advice contained within current guidelines to minimise impacts on bats (and other wildlife) (ILP, 2023).

As a result, it is considered unlikely that the proposed essential lighting scheme for Phase 1 will have a significant impact on wildlife.

References

4Woods Ecology Ltd (2023). *Bartlett Arboretum, White House Lane, Spencers Wood, Reading – Ecological Impact Assessment (September, 2023)*. Ecological report produced for planning application. Unpubl.

4Woods Ecology Ltd (2024). *Bartlett Arboretum, White House Lane, Spencers Wood, Reading – Ecological Permeability & Enhancements (November 2024)*. Report produced for Planning Condition 20, planning ref. 232560.

Collins, J (ed.) (2023) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edn)*. The Bat Conservation Trust, London.

Institute of Lighting Professionals (ILP) (2023). *Guidance Note 8: Bats and Artificial Lighting at Night*. Guidance Note produced by ILP and The Bat Conservation Trust (BCT). ILP, 2023.

Bartlett Arboretum, White House Lane, Reading

Map 1 - Phase 1 Lighting - Ecological Constraints & Mitigation Plan



10m

Key

- Very occasional/partially used Badger sett.
- ✕ Trees with high potential suitability for bat roosts (PRF-M).
- ✕ Bat boxes.
- Dark zone to be maintained along woodland edge.
- Minimal light levels at bat boxes and route to woodland edge.

Appendix I - Lighting Design

Appendix II - Light Contour plan

Appendix III - Specification for each of the lights proposed