

LEWIS HOMES

**SANDY LANE, YSTRADOWEN**

**PRELIMINARY ECOLOGICAL APPRAISAL**

April 2024



**soltysbrewster**  
E C O L O G Y

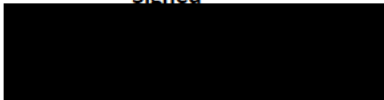
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1	-	Draft for review	11 March 2022	Daniel Jones (Senior Ecologist)	Dr M Watts (Director)	
2	Updated site location and layout plan	For submission	05 July 2023	Daniel Jones (Senior Ecologist)		
3	Updated Site Layout Plan	For submission	18 March 2024	Daniel Jones (Associate Ecologist)		
4	Updated layout plan included, Appx I	For Submission	11 April 2024	Daniel Jones (Associate Ecologist)		

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## SUMMARY

Soltys Brewster Ecology (SBE) were commissioned by Lewis Home to undertake a preliminary appraisal of an area of land to the north of Sandy Lane in Ystradowen, Vale of Glmaorgan. The site is proposed for the development of 46no. residential units. Previous ecological survey work was undertaken at the site by SBE in April 2020. An updated desk study and Extended Phase 1 Habitat Survey was undertaken at the application site in February 2022 to establish the current ecological baseline conditions and identify any constraints or opportunities associated with the proposals.

Desk based consultation confirmed that the application site does not hold any designation for nature conservation. The proposed site is located within close proximity to 2no. locally designated Sites of Importance for Nature Conservation (SINC). However, given the small extent of the proposals and residential development separating the sites, no significant impacts to the qualifying features of the SINC are considered likely. The desk study also returned a list of records for protected fauna and flora within 1km of the application site. This included multiple records of foraging/commuting bats within the surrounding area as well as records of protected and priority listed bird species, Great Crested Newt, common reptiles and [REDACTED] within the 1km search buffer.

An Extended Phase 1 Habitat survey undertaken in March 2022 identified a limited range of habitats present at the application site including poor semi-improved grassland, scattered broad-leaved trees and hedgerows. The habitats at the site were considered likely to support locally foraging/commuting bat species, roosting bats, foraging [REDACTED] and nesting birds with a low potential to support Hazel Dormouse, common reptiles and Great Crested Newt within their terrestrial phase.

The proposed layout plan indicates that the hedgerow located along Sandy Lane will be removed to accommodate the development design as well as a tree assessed to have high potential to support roosting bats. Further survey work will be required to establish the presence/absence of roosting bats and how bats are using the site to inform any mitigation measures or licencing requirements. In addition, further survey work is recommended to determine the presence/absence of Hazel Dormouse within habitats at the proposed site and GCN within ponds located in close proximity.

The development design should also include the translocation and on-site retention of the Sandy Lane hedgerow to ensure no loss of priority habitats. Vegetation removal (i.e., tree and scrub removal) will also be subject to seasonal constraints and should be undertaken via a directional two-staged process to minimise risks to nesting birds and reptiles that may be present. Other mitigation and enhancement opportunities at the proposed site include the covering of any excavations during the construction phase to minimise risks to [REDACTED] the inclusion of bat and bird boxes onto new residential units, the design the proposed attenuation basin and other SuDS features to benefit biodiversity, use of native species or those with a known biodiversity benefit within the soft landscape plan, creation of reptile hibernaculum and

the design of any external fences to include a 130x130mm gap to allowed continued connectivity for Hedgehog and other small mammals throughout the development.

## 1.0 INTRODUCTION

- 1.1 Soltys Brewster Ecology (SBE) were commissioned by Lewis Homes to undertake a preliminary ecological appraisal of an area of land to the north of Sandy Lane, Ystradowen, located in the Vale of Glamorgan (central grid reference: ST 01547 77862). The site, approx. 1.5 ha in size, is proposed for the development of 46no. residential units. To inform a planning application a survey to establish the ecological baseline conditions is required.
- 1.2 The proposed site comprises of a single field parcel with hedgerow boundaries and is located adjacent to Sandy Lane, Ystradowen. A plan showing the site location and proposed layout is included in Appendix I.
- 1.3 Previous ecological survey work was undertaken at the proposed site in 2020 by SBE (SBE, 2020). This included an Extended Phase 1 Habitat survey of the current site boundary as well as an additional field parcel to the north. The survey identified areas of poor semi-improved grassland, scattered trees and hedgerows within the current site boundary.
- 1.4 The current report presents the findings an updated desk study and Extended Phase 1 Habitat survey undertaken at the proposed site in March 2022. The report describes the existing ecological conditions at the site and identifies any potential ecological constraints/opportunities associated with proposed residential development.

## 2.0 METHODOLOGY

2.1 In order to establish the baseline ecological conditions at the proposed site a combination of desk-based consultation and Extended Phase 1 Habitat survey were undertaken in March 2022.

### Desk study

2.2 The desk study involved consultation with the South East Wales Biodiversity Records (SEWBRc) and the Vale of Glamorgan Council to identify any records of rare, protected or notable flora and fauna within 1km of the proposed site. The search criteria also included information relating to the location and citation details (where available) for any sites designated for their nature conservation interest such as Sites of Special Scientific Interest (SSSIs), Special Areas of Conservations (SACs) or Sites of Importance for Nature Conservation (SINCs).

2.3 The desk study also included a review of previous ecological survey work undertaken at the proposed site by SBE in April 2020.

### Extended Phase 1 Habitat Survey

2.4 The fieldwork was undertaken on 8<sup>th</sup> March 2022 by a suitably experienced ecologist<sup>1</sup> and followed standard Phase 1 Habitat Survey protocol (JNCC, 2010) as amended by the Institute of Environmental Assessment (1995). All habitats within and immediately adjacent to the proposed site boundary were classified and mapped as accurately as possible. Habitats considered to have potential to support rare, protected or otherwise notable species of flora and fauna were noted, as were any direct signs of these species (e.g. Eurasian ██████ *Meles meles* setts and dung-pits). Incidental observations of birds on or flying over the site were also recorded and any incidence of invasive weed species (e.g. Japanese Knotweed *Fallopia japonica*) noted.

2.5 A map of habitats was drawn up and target notes were used to identify features of ecological interest. Where possible, habitats were cross-referenced to any relevant important UK or Wales priority habitats as identified under Section 7 of the Environment Act (Wales) 2016.

2.6 During the field survey any trees at the proposed site were assessed for their potential to support roosting bats and were categorised in relation to the bat roosting features (BCT, 2016). The categories are as follows:

- **Known or confirmed roost**
- **High** - A tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.

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<sup>1</sup> Associate member of the Chartered Institute of Ecology & Environmental Management (CIEEM)

- **Moderate** – A tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status.
- **Low** – A tree with one or more potential roost sites that could be used by individual bats opportunistically. Or: A tree of sufficient size & age to contain PRFs (Potential Roost Features) but with none seen from the ground or features seen with only very limited roosting potential.
- **Negligible** – Negligible habitat features on site likely to be used by roosting bat



### 3.0 RESULTS

#### Desk Study

##### SEWBRc Records

3.1 Consultation with SEWBRc identified that the proposed site holds no designation for nature conservation, nor are any national or international designated sites (e.g. SACs or SSSIs) located within a 1km radius. However, the proposed site is located within close proximity to 2no. locally designated Sites of Importance for Nature Conservation (SINCs). Ystradowen North SINC and Old Quarry, Cowbridge Road SINC are located approx. 180m north and 200m east of the proposed site, respectively. Both sites are designated for their broad-leaved semi-natural woodland habitats. Although the designated SINCs are located in close proximity to the proposed site they are physically separated by existing residential development and the A4222 carriageway. It is considered unlikely that the proposed development will have any significant impact on the qualifying features of the SINCs based on the small extent of the proposals (confined to site boundary) and physical separation. On this basis they were considered of limited ecological relevance. Summary plans to illustrate the SEWBRc records are included in Appendix II.

3.2 The data search returned a limited list of protected species records within 1km of the proposed site. This included the identification of an unidentified bat roost approx. 900m from of the proposed site as well as roosting Common and Soprano Pipistrelle *Pipistrellus pipistrellus/pygmaeus* within approx. 925m. There were also foraging and commuting records of Common and Soprano Pipistrelle, Noctule *Nyctalus noctula*, Serotine *Eptesicus serotinus* and unidentified *Myotis sp.* bats within the 1km search radius.

[REDACTED]

3.4 There were multiple records of Great Crested Newt *Triturus cristatus* included within the data search results. The nearest of which is located approx. 300m east of the proposed site relating to an individual newt found within terrestrial habitats along Sandy Lane. Previous survey work undertaken by SBE in 2017 within the surrounding area also identified the presence of GCN (eDNA analysis) within a pond close to the Village Hall, approximately 350m west of the proposed site. Additional GCN records were identified up to 1km north-east of the proposed site, associated with habitats at Morfa Ystradowen. Other common amphibian records identified within the 1km search include those for Common Frog *Rana temporaria* and Common Toad *Bufo bufo*. The data search also included a single Common lizard *Zootoca vivipara* sighting located approx. 1km north-east of the proposed site, again associated with habitats at Morfa Ystradowen. A single Slow-Worm *Anguis*

*fragilis* was also recorded within the former field to the south of the site in 2013 as part of the residential development at Badgers Brook Rise (Planning Reference: 2013/00856/OUT).

- 3.5 The data search included a limited number of protected and priority listed bird records within 1km of the proposed site. This included records of Red Kite *Milvus milvus*, Barn Owl *Tyto alba* and Merlin *Falco columbarius*, all of which are protected under Schedule 1 of the Wildlife and Countryside Act (1981) (as amended). Other priority listed bird species, as listed under Section 7 of the Environment Act (Wales) 2016, recorded within the 1km search radius include House Sparrow *Passer domesticus*, Starling *Sturnus vulgaris*, Dunnock *Prunella modularis*, Song Thrush *Turdus philomelos*, Reed Bunting *Emberiza schoeniclus*, Linnet *Linaria cannabina*, Grasshopper Warbler *Locustella naevia* and Skylark *Alauda arvensis*. However, based on the habitats present at the proposed site not all of these records were considered of ecological relevance to the proposals e.g., ground nesting bird records.
- 3.6 The desk study results included a single record of Himalayan Balsam *Impatiens glandulifera*, located approx. 1km south-east of the proposed site. The species is listed as invasive plant species under Schedule 9 of the Wildlife and Countryside Act (1981) (as amended).

#### *Previous survey work*

- 3.7 The Extended Phase 1 Habitat Survey undertaken by SBE at the proposed site in April 2020 identified a limited range of habitats including poor semi-improved grassland, scattered trees and hedgerows. The survey also recorded areas of marshy grassland, dense scrub and running water to the north of the current site boundary (not included in the current application). The survey found evidence to suggest the use of the site by foraging/commuting [REDACTED] with guard hairs found along well-used mammal paths. A tree with high potential to support roosting bats was also identified along the northern site boundary. The habitats at the site were considered to have potential to support foraging/commuting bats, Hazel Dormouse *Muscardinus avellanarius* and Great Crested Newt in their terrestrial phase.

## Extended Phase 1 Habitat Survey

3.8 The distribution and extent of habitats recorded in March 2022 at the proposed site are illustrated on the Extended Phase 1 Habitat Plan with accompanying target notes in Appendix III. The proposed site supports a limited range of habitat types including poor semi-improved grassland, hedgerows, scattered trees and ditch, consistent with habitat features described during the previous (2020) survey.

### *Poor semi-improved grassland*

3.9 The entire proposed site comprises of species poor semi-improved grassland (Plate 1 and cover image). The grassland appears to be currently managed for hay cutting, but a review of Google Earth imagery indicates that it has historically been used for cattle and horse grazing. The grassland sward is tussocky with abundant Cock's Foot *Dactylis glomerata*, Yorkshire Fog *Holcus lanatus* and Creeping Bent *Agrostis stolonifera* with less frequent Perennial Rye Grass *Lolium perenne*. The sward is characterised by a limited diversity of herbaceous plants containing Dandelion *Taraxacum officinale* agg., Yarrow *Achillea millefolium*, Ribwort Plantain *Plantago lanceolata*, Creeping Buttercup *Ranunculus repens*, Common Sorrel *Rumex acetosa*, other unidentified Dock *Rumex* sp. and Thistle *Cirsium* sp. as well as occasional stands of Soft Rush *Juncus effusus*.

### **Plate 1: Poor semi-improved grassland sward, viewing eastwards across site.**



### *Scattered broad-leaved trees*

3.10 A single mature Oak *Quercus* sp. tree is located along the northern boundary. The tree appears over-mature/veteran in appearance and contains multiple potential bat roosting features which are described in paragraph 3.18.

## Hedgerows

3.11 The proposed site is bordered by a series of species-poor hedgerows and hedgerows with trees (labelled H1-5 on the Extended Phase 1 Habitat Plan). Hedgerows are listed as a priority habitat in Wales under Section 7 of the Environment Act (Wales) 2016.

### Intact species-poor hedgerow

3.12 The southern site boundary comprises of an intact species-poor hedgerow (H2). The hedge is regularly managed and has been recently cut/flailed to a height of approx. 1.5m (Plate 2). The hedge largely comprises of Hazel *Corylus avellana* but also includes Hawthorn *Crataegus monogyna*, Blackthorn *Prunus spinosa*, Holly *Ilex aquifolium*, Elder *Sambucus nigra*, Bramble *Rubus fruticosus* and Ivy *Hedera helix* (no hedgerow at the site contained 5 or more woody species within a 30m section i.e., criteria for species-rich hedgerow). However, the hedgerow does contain a diverse ground-flora layer consisting of Lesser Celandine *Ficaria verna*, Nettle *Urtica dioica*, Herb Robert *Geranium robertianum*, Cow Parsley *Anthriscus sylvestris*, Lords-and-Ladies *Arum maculatum*, Cleavers *Galium aparine*, Hart's Tongue *Asplenium scolopendrium*, Hogweed *Heracleum sphondylium*, Primrose *Primula vulgaris*, Opposite-Leaved Golden Saxifrage *Chrysosplenium oppositifolium*, Dog's Mercury *Mercurialis perennis*, Bluebell *Hyacinthoides sp.*, cultivated Daffodil *Narcissus sp.* and Bracken *Pteridium aquilinum*. Hedgerows H1 and H5, located along part of the eastern and western boundaries, are similar in species and structure.

**Plate 2 – Hedgerow located along southern site boundary (H2), viewing westwards.**



### Species-poor hedgerow with trees

3.13 A species-poor hedgerow with trees is located along the northern site boundary (H3 and H4) and at the north-west corner of the site. These sections of hedgerow are unmanaged and contain taller stands (approx. 2-5m in height) of Hazel, Hawthorn, Oak and Holly (Plate 3). A similar assemblage of ground flora is present with stands of Horsetail *Equisetum telmateia* frequent within damper sections.

### *Ditch*

3.14 A small ditch is located north of the proposed site. The ditch is heavily shaded and contains leaf litter and woody debris.

### *Invasive species*

3.15 No invasive plant species listed under Schedule 9 of the Wildlife and Countryside Act (1981) (as amended) were identified at the proposed site during the current survey.

### **Plate 3 – Species-poor hedgerow with trees located along northern site boundary (H4), viewing westwards.**



### **Fauna**

3.16 In the course of the survey, a search of field signs for protected or notable species was undertaken and the potential of the habitats to support these species considered. In the context of this report, these species meet any of the following criteria:

- Species protected by British or international law;
- Priority species included on Section 7 (Environment Act, Wales);
- Nationally rare or nationally scarce species;
- Species of Conservation Concern (e.g. JNCC Red List, RSPB/BTO Red or Amber Lists);

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

*Bats*

3.18 The area of poor semi-improved grassland, which occupies the majority of the proposed site, provides limited opportunities for foraging bats. However, the hedgerow boundaries, specifically the unmanaged hedges with trees along the northern and western boundary, were considered likely to support locally commuting and foraging bat species. In addition, a single mature oak tree at the site was assessed to have high potential to support roosting bats (Target Note 4). The tree is located along the northern hedgerow boundary and contains multiple potential bat roost features (PRFs) capable of supporting several roosting bats including a woodpecker hole on the main trunk and vertical desiccation fissures.

*Birds*

3.19 During the survey a small number of birds were seen/heard at the proposed site. This included Robin *Erithacus rubecula*, Blackbird *Turdus merula*, House Sparrow, Dunnock, Wren *Troglodytes troglodytes*, Song Thrush, Coal Tit *Periparus ater*, Woodpigeon *Columba palumbus* and Magpie *Pica pica*. House Sparrow, Dunnock and Song Thrush are all listed as priority bird species within Section 7 of the Environment Act (Wales) 2016, and Wren is Amber listed as part of the latest Birds of Conservation Concern Review (Stanbury et al., 2021). The assemblage of species observed was considered typical of the habitats present at the site (e.g., hedgerow, scrub and farmland setting). The hedgerows and trees at the proposed site are likely to be used by a number of birds for nesting and foraging purposes. During the current survey a number of old bird nests were noted within the hedgerow boundaries along the southern and western margins. Based on the size and location of the proposed site, as well as the abundance of farmland in the surrounding landscape, the grassland habitats were not considered likely to support ground nesting bird species such as Skylark.

*Great Crested Newt*

3.20 Although there are no ponds located at the proposed site itself the hedgerow boundaries were considered suitable terrestrial habitats for foraging and hibernating Great Crested Newt (GCN), with the areas of tussocky poor semi-improved grassland considered to be sub-optimal. The data search returned multiple records of the species within 1km of the proposed site and a review of Ordnance Survey maps indicates that several ponds are located within 500m of the site. This includes two attenuation ponds within Badgers Brook Rise, located

approx. 90m south of the site, as well as a pond located approx. 175m north of the site across the A4222 carriageway.

- 3.21 The attenuation ponds at Badgers Brook Rise (Target Notes 7 and 8) were found to support breeding Common Frog with tadpoles and spawn present. The ponds contain a high macrophyte coverage and moderate terrestrial habitats in the surrounding area, however, they are relatively small in size (125-150m<sup>2</sup>) and likely to dry out annually. A Great Crested Newt Habitat Suitability Index (HSI) assessment was undertaken for both ponds during the current survey based on the guidance developed by Oldham *et al.*, 2000 (full assessment included in Appendix III). The two ponds were assessed to be of Average and Below Average suitability with a score of 0.61 and 0.58, respectively. Given that suitable terrestrial habitats for GCN exist at the proposed site and the number of ponds within the surrounding area there is a low potential for the species to be present at the site during their terrestrial phase.

#### *Hazel Dormouse*

- 3.22 The hedgerow habitats at the proposed site were considered structurally suitable to support Hazel Dormouse, specifically the hedgerow with trees along the northern site boundary (H3 and H4). The hedge contains a well-connected continuous canopy and existing habitat connectivity (via the hedgerow network, A4222 corridor and former railway line) to larger parcels of broad-leaved woodland located further north-east of the site. The hedgerows also contain suitable food resources for Dormouse; Hazel is abundant throughout with other food sources such as Oak and Bramble present. The hedgerow margins along Sandy Lane and the western boundary (H2 and H5) are more intensively managed (regularly trimmed/flailed) and were considered less suitable to support Dormouse although are likely to contribute to habitat connectivity (for Dormice and other species) in the immediate local area. A search/check of gnawed hazelnuts at the proposed site did not indicate the presence of Dormouse – these were attributed to vole and/or Wood Mouse *Apodemus sylvaticus*.

#### *Reptiles*

- 3.23 The habitats present at the proposed site were considered of low suitability to support common reptiles. The site is characterised by a north facing slope which is unsuitable for basking reptiles, however, the hedgerow margins and tussocky grassland are likely to provide some foraging and sheltering opportunities. In addition, the desk study search included single records of both Common Lizard and Slow-Worm within 1km of the site. Based on the above, it is considered unlikely to proposed site supports anything other than an individual/small population of common reptiles.

## 4.0 POLICIES AND PLANS

4.1 The following local and national planning policy relating to nature conservation and biodiversity are considered of relevance to the site.

### Planning Policy Wales (2024)

4.2 This document (Edition 12) sets out the land use planning policies of the Welsh Government with Chapter 6 dealing with Distinctive and Natural places which covers Biodiversity and Ecological Networks. The advice contained within PPW is supplemented for some subjects by Technical Advice Notes (TAN's), with TAN 5 addressing Nature Conservation.

4.3 TAN 5 identifies a number of key principles, which the town and country planning system in Wales should consider. Those relevant are detailed below:

- Work to achieve nature conservation objectives through a partnership between local planning authorities, Natural Resources Wales (NRW), voluntary organisations, developers, landowners and other key stakeholders;
- Integrate nature conservation into all planning decisions looking for development to deliver social, economic and environmental objectives together over time;
- Ensure that the UK's international obligations for site, species and habitat protection are fully met in all planning decisions;
- Look for development to provide a net benefit for biodiversity conservation with no significant loss of habitats or populations of species, locally or nationally;
- Promoting approaches to development which create new opportunities to enhance biodiversity, prevent biodiversity losses, or compensate for losses where damage is unavoidable. Minimising or reversing the fragmentation of habitats and improving habitat connectivity through the promotion of wildlife corridors;
- Local planning authorities should seek to protect trees, groups of trees and areas of woodland where they have natural heritage value or contribute to the character or amenity of a particular locality;
- The presence of a species protected under European or UK legislation is a material consideration when a local planning authority is considering a development proposal which, if carried out, would be likely to result in disturbance or harm to the species or its habitat.



## **Environment Act (Wales) 2016**

4.4 Part 1 of the Environment Act Wales' came into force in May 2016 and sets out the approach to planning and managing natural resources at a national and local level with a general purpose linked to statutory 'principles of sustainable management of natural resources' defined within the Act.

### *Section 6 - Biodiversity and resilience of ecosystems duty*

4.5 Section 6 of the Act places a duty on public authorities to 'seek to maintain and enhance biodiversity' so far as it is consistent with the proper exercise of those functions. In so doing, public authorities must also seek to 'promote the resilience of ecosystems'.

### *Section 7 - Biodiversity lists and duty to take steps to maintain and enhance biodiversity*

4.6 This section lists living organisms and types of habitat in Wales which are considered of key significance to maintaining and enhancing biodiversity in relation to Wales. The Welsh Ministers are required to take all reasonable steps to maintain and enhance the living organisms and types of habitat included in any list published under this section, and encourage others to take such steps.

## **Local Planning Policy**

### **Vale of Glamorgan Local Development Plan (2011-2026)**

4.7 The Local Development Plan (LDP) was formally adopted on 28th June 2017 and will be used for decision-making during the Plan period (2011-2026) to 'ensure the most efficient use of land and other limited resources, whilst at the same time promoting the regeneration and stimulation of the local economy for the benefit of the present and future population'. Policies within the LDP relating to biodiversity which are considered of relevance to the proposed development include:

### **Policy MD 9 - Promoting Biodiversity**

*New development proposals will be required to conserve and where appropriate enhance biodiversity interests unless it can be demonstrated that:*

- 1. The need for the development clearly outweighs the biodiversity value of the site; and*
- 2. The impacts of the development can be satisfactorily mitigated and acceptably managed through appropriate future management regimes.*

### **Policy MG19 – Sites and Species of European Importance**

*‘...Development proposals likely to have an adverse effect on a European protected species will only be permitted where:*

- 1. There are reasons of overriding public interest;*
- 2. There is no satisfactory alternative; and*
- 3. The action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.*

### **Policy MG20 – Nationally Protected Sites and Species**

*‘...Development proposals likely to affect protected species will only be permitted where it is demonstrated that:*

- 1. The population range and distribution of the species will not be adversely impacted;*
- 2. There is no suitable alternative to the proposed development;*
- 3. The benefits of the development clearly outweigh the adverse impacts on the protected species; and*
- 4. Appropriate avoidance, mitigation and compensation measures are provided...’*

### **Policy MG21 – Sites of Importance for Nature Conservation, Regionally Important Geological and Geomorphological Sites and Priority Habitats and Species**

*Development proposals likely to have an adverse impact on sites of importance for nature conservation or priority habitats and species will only be permitted where it can be demonstrated that:*

- 1. The need for the development clearly outweighs the nature conservation value of the site;*
- 2. Adverse impacts on nature conservation and geological features can be avoided;*
- 3. Appropriate and proportionate mitigation and compensation measures can be provided; and*
- 4. The development conserves and where possible enhances biodiversity interests.*

### **Supplementary Planning Guidance Biodiversity & Development (2018)**

4.6 The SPG provides further detail and guidance on the implementation of LDP policy in order to assist those involved in the development process in meeting statutory and policy requirements in relation to development proposals that may adversely impact upon biodiversity within the Vale of Glamorgan. Specifically, the SPG aims to:

- Ensure that the key principles of national planning guidance on biodiversity and nature conservation are fully met at the local level and specifically that local planning decisions ensure that new developments maintain, enhance, restore or increase biodiversity in the Vale of Glamorgan;
- Ensure that best practice is followed in a consistent and open manner;

- Provide clarity to developers, statutory consultees, local residents and other stakeholders and interested parties involved with ecology / biodiversity and the planning and development process;
- Minimise delays and cost to developers by ensuring that nature conservation is incorporated into the planning process at the earliest stages so that impacts are predictable and only relevant development proposals are affected; and
- Ensure that any adverse impacts of developments undertaken today will not only protect biodiversity today, but will still be delivering environmental benefits in the future. Mitigation shall ensure that the developments are future-proof.

## 5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 The combination of desk study and Extended Phase 1 Habitat survey identified a limited range of habitats at the proposed site including poor semi-improved grassland, scattered broad-leaved trees and hedgerows. Hedgerows are listed as a priority habitat under Section 7 of the Environment Act (Wales) 2016. The area of species-poor semi-improved grassland, which occupies the majority of the proposed site was considered to be of low ecological value, with the hedgerow and tree margins considered to be of the greatest ecological value in the context of the site. The habitats at the site (i.e. hedgerow and trees) were considered likely to support small numbers of foraging and commuting bats and nesting birds. They were also considered to have a low potential to support Hazel Dormouse, common reptiles and Great Crested Newt in their terrestrial phase. A single tree at the site was also assessed to have a high potential to support roosting bats. The proposed layout plan (Appendix I) indicates that the development design will result in the loss of majority of grassland habitats as well as the loss of hedgerow along Sandy Lane. The following avoidance, mitigation and enhancement measures are considered appropriate to the current application.

[REDACTED]

### Bats

5.3 The survey identified a single Oak tree at the proposed site with high potential to support roosting bats. The proposed layout plan indicates that this tree will be retained as part of the development. All UK bat species and their roosts are afforded protection under the Conservation of Habitats and Species Regulations (2017) and the Wildlife and Countryside Act (1981) (as amended). As such, further survey work to establish the presence/absence of roosting bats would be required to inform any mitigation or licencing requirements if plans were to change and involve felling or pruning. For trees with high bat roost potential current best practice guidelines (BCT, 2016) recommend that 3no. survey visits are undertaken between May – September comprising of at least one separate dusk emergence and dawn re-entry survey. In the first instance, a potential roost feature (PRF) inspection survey would also be considered appropriate to determine the likely presence/absence of roosting bats. This would involve the use of an endoscope and ladder/tree-climbing

equipment to access PRFs to assess more in detail their suitability to support roosting bats and search for any evidence of bats e.g. live or dead bats or droppings. This survey can be undertaken at any time of the year.

- 5.4 The hedgerow margins at the site were also considered likely to support locally foraging and commuting bat species. The proposed layout indicates that the entire hedgerow boundary along Sandy Lane will be removed to accommodate the development design. Although this hedgerow is regularly managed and maintained at a height of 1.5m it is recommended further activity surveys are undertaken in order to establish how bats are using the habitats present at the proposed site (in particular the Sandy Lane hedgerow) to inform any particular mitigation/avoidance measures. Based on the small size of the site and habitat present the minimum level of a survey identified in the best practice guidelines (BCT, 2016) would be appropriate to achieve a representative sample of bat activity across the site. This would comprise of 3no. activity survey visits in spring, summer and autumn in appropriate weather conditions for bats. Separate automated/statics surveys (minimum of 1 detector per transect) would also be required, with each session recording for 5 consecutive nights *in situ* per season. The locations of the static bat detectors (e.g. Anabat swift units) would be focused on the areas likely to be subject to development impacts (e.g. hedgerow section to be removed).
- 5.5 Any proposed lighting design at the development should be designed to reduce artificial light spill onto retained and created habitat features (e.g. retained hedgerow boundary to the north). See lighting guidelines extract provided in Appendix IV for advice on how to mitigate for the impacts of acritical lighting on bats. The proposed development should also provision for the inclusion of bat boxes into new residential units and retained trees.

#### *Birds*

- 5.6 The hedgerow and tree habitats at the proposed site are likely to support a number of scrub/tree nesting bird species. A number of old bird nests were noted within the hedgerow boundaries during the current survey. Under the Wildlife and Countryside Act (1981 (as amended) all wild birds and their nests are protected against damage or destruction whilst in use or being built. Given the high likelihood of nesting birds being present any future vegetation clearance at the site (i.e. hedgerow and tree removal) would be subject to seasonal constraints and should be undertaken outside of the nesting bird season (between September – February). If this is not possible an ecologist should be present to inspect habitats prior to removal to confirm the absence of nesting birds. Timing of vegetation clearance would also need to consider common reptiles (see 5.11) and a co-ordinated approach regarding nesting birds and reptiles would be required. The proposed development design should also provision for the inclusion of bird boxes on new residential units e.g., House Sparrow terraces.

#### *Great Crested Newt*

- 5.7 The habitats at the proposed site were considered to have a low potential to support Great Crested Newt (GCN) in their terrestrial phase. The hedgerow boundaries provide opportunities for hibernating and foraging

newts with the areas of tussocky poor semi-improved grassland considered to be sub-optimal. A review of Ordnance Survey maps revealed several ponds within 250m of the proposed site and GCN are known to be present within ponds approx. 350m west of the site. Individual newts are known to disperse up to 1km away from waterbodies and use terrestrial habitats for foraging within 500m of ponds (Langton *et al.*, 2001). The two ponds located at Badgers Brook Rise (approx. 90m south of the site) were assessed to be of Average and Below-Average suitability for breeding GCN, with HSI scores of 0.61 and 0.58. The proportion of Average suitability ponds predicted to be occupied by GCN is 0.55, with this figure at 0.20 for Below-Average suitability (ARG UK, 2010). If GCN are present within these ponds, given the proximity to the proposals, there is some potential they may use terrestrial habitats at the proposed site.

- 5.8 Great Crested Newt and their breeding and resting places are afforded protection under the Conservation of Habitats and Species Regulations (2017) and the Wildlife and Countryside Act (1981) (as amended). Therefore, further survey work is recommended to establish the likely presence/absence within ponds located in close proximity to the proposed site to inform any mitigation measures or licencing requirements. In the first instance, an initial eDNA survey of the off-site ponds (2no. ponds at Badgers Brook Rise and 1no. north of A4222) would be recommended to establish if GCN are present. Based on current guidance, eDNA samples should be taken during a single daytime visit between 15<sup>th</sup> April and 30<sup>th</sup> June.

#### *Hazel Dormouse*

- 5.9 The northern and north-western hedgerow margins at the proposed site were considered structurally suitable to support Hazel Dormouse, containing a well-connected continuous canopy and abundance of food sources. The hedgerow is connected to a wider hedgerow network and parcels of broad-leaved woodland to the north-east. Although no evidence of Dormouse was found during the survey (gnawed hazelnuts found were attributed to vole or wood mouse) and no records were included in the SEWBRc search, the presence of Dormouse within the habitats present at the proposed site cannot be precluded. Hazel Dormouse and their breeding and resting places are also afforded legal protection under the Conservation of Habitats and Species Regulations (2017) and the Wildlife and Countryside Act (1981) (as amended). Given that the latest proposed layout plan indicates that trees and sections of hedgerows are to be removed under the development design, which may impact Dormouse dispersal, further targeted survey work would be recommended to inform the application and any associated mitigation measures.
- 5.10 Further surveys would involve the deployment of nest tubes along the boundary hedgerow margins at the proposed site. As per best practice guidelines (Bright *et al.*, 2006), nest tubes should be deployed in March/April and checked at monthly intervals for the presence of Dormouse up until November. A minimum of 50no. nest tubes are required at a site to achieve a robust survey over the April – November period. The nest tube survey could also incorporate a more detailed nut search in the autumn.

## *Reptiles*

- 5.11 The habitats at the proposed site were considered to have a limited suitability to support reptiles and are unlikely to support anything other than an individual/small population of common reptiles such as Slow-Worm. All UK reptiles are protected against intentional killing and injuring under Section 9(1) of the Wildlife and Countryside Act (1981) (as amended). On a precautionary basis it is recommended that a sensitive approach is taken to any future vegetation clearance at the site to minimise any risks to reptiles that may be present, specifically hedgerow and fringe grassland. Vegetation clearance should be undertaken via a two-stage process where an initial cut to 100-150mm is undertaken with the use of hand tools (strimmers/brush-cutters), followed by a second cut to ground level after a minimum period of 48hrs. Arisings should be removed immediately following each cut. This directional clearance would need to be implemented during the period when reptiles are active, typically April to October. Any larger root systems that require removal should be undertaken outside of the reptile hibernation period (typically October – March) under the supervision of an ecologist via a supervised destructive search.
- 5.12 Enhancement measures to improve habitat suitability for both reptiles and amphibians in the long-term post-development include the creation of hibernacula and log/brush piles around the proposed attenuation basin.

## *Priority habitats*

- 5.13 The proposed layout plan indicates that the entire hedgerow along Sandy Lane will be removed as part of the development design. Hedgerows are listed as a priority habitat under Section 7 of the Environment Act (Wales) 2016 and the loss of these habitats will need to be appropriately mitigated for to ensure compliance with national and local planning policy MD9 (see sections 4.5 – 4.7). Although the hedgerow to Sandy Lane is regularly managed and species poor it does contain a diverse ground floral layer and it is recommended that the hedgerow is translocated and incorporated into the soft landscape design instead of removal from the site. This could include placement around the proposed areas of Public Open Space at the north-east corner and the strengthening of existing fence and hedgerow boundaries to the east and west of the site. The development design should seek to maintain and enhance biodiversity interests and priority habitats on site.

## *Other mitigation measures and enhancements*

- 5.14 The areas of poor semi-improved grassland hedgerow margins are likely to be used by Hedgehog for foraging purposes. The design of any future development should consider the presence of Hedgehog and other small mammals at the site by incorporating a gap of 130mm x 130mm at the bottom of garden/boundary fencing to ensure continued connectivity as part of the development, based on the Hedgehog Street principles by the

People's Trust for Endangered Species<sup>2</sup>. The proposed layout plan indicates that the development design will feature an attenuation basin as part of the SuDS strategy. The basin could be designed to hold water throughout most parts of the year and be seeded with a native wet grassland mix to provide benefits for biodiversity (see design of basins at Target Notes 7 and 8). The soft landscape plan should also include the use of native plant species or those with a known biodiversity benefit.

#### *Avoidance, mitigation and enhancement*

5.15 The avoidance, mitigation and enhancements described in the sections above are summarised below. Additional measures may be required following further survey work regarding the presence/absence of roosting bats, foraging and commuting bats, Hazel Dormouse and Great Crested Newt:

##### **Avoidance**

- Retention of hedgerow corridor (priority habitats) along northern boundary as far as practicable;
- Retention of mature Oak along northern boundary (retained within proposed POS);
- Vegetation clearance (tree and hedgerow removal) to avoid nesting bird season and be undertaken over the winter period (between September – February);

##### **Mitigation**

- Covering of any excavations overnight or means of escape provided during construction phase to minimise risks to [REDACTED] otter and any other small mammals that may become trapped;
- Design of site lighting to minimise artificial light spill onto retained northern hedgerow boundary for foraging/commuting bats;
- Sensitive approach to vegetation clearance to minimise any risks to reptiles that may be present (vegetation to be cleared via a directional two-stage process between April and October);
- Translocation and retention of Sandy Lane hedgerow on site, to be incorporated into soft landscape design;
- External boundary fencing to include 130x130mm gap to provide continued connectivity for hedgehog and other small mammals through the development;

##### **Enhancements**

- Landscape plan to include native tree and shrub species or those with a known biodiversity benefit;
- Strengthening of existing hedgerow and fence line margins along the eastern and western boundaries with new native tree and shrub planting;
- Native wet meadow grass seeding within proposed SuDS attenuation basin;
- Creation of reptile hibernaculum and log/brush piles; and

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<sup>2</sup> <https://www.hedgehogstreet.org/>



- Inclusion of bat and bird boxes onto new residential units.
- Management plan to be implemented for retained/new planting

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Welsh Assembly Government (2024) *Planning Policy Wales Edition 12*. February 2024.

## APPENDIX I SITE LOCATION & PROPOSED LAYOUT



Accommodation Schedule					
House Name	Code	Beds	Structural Area (ft <sup>2</sup> )	No. of Units	Total Area
<b>Open Market Units</b>					
Hyatt	HY	3	978	8	7824
Burnaby	BU	3	1021	5	5105
Shelby	SH	4	1213	8	9704
Roxbury	ROX	4	1417	3	4251
Thornbury	TH	4	1479	3	4437
<b>Sub Total</b>				<b>27</b>	<b>31321</b>
<b>Affordable Units</b>			<b>Finished Area (ft<sup>2</sup>)</b>		
1 Bed Flats	2.1.1	1	557	8	4456
2 Bed House	4.2.1	2	850	9	7650
3 Bed House	5.3.1	3	1003	2	2006
<b>Sub Total</b>				<b>19</b>	<b>14112</b>
<b>Total</b>				<b>46</b>	<b>45433</b>

- Site Key**
- Application Boundary
  - + Social Rented Unit
  - + LCHO Unit
  - 1.8m Close Board Fence
  - 1.8m Screen Wall
  - 1.2m Wall (To Screen Bin Stores on Front Elevations)
  - 1.2m Ball Top Railings
  - + Translocated Hedgerow  
Refer to Landscape Architects design for further information
  - + Proposed Tree Planting  
Refer to Landscape Architects design for further information
  - Existing Tree and RPZ
  - Refuse Storage Area
  - Refuse Collection Point
  - Bicycle Storage Shed
  - Indicative Rain Gardens  
Refer to engineers design for further information
  - Proposed Retaining Walls and Steps  
Refer to engineers design for further information
  - Indicative Location of Photovoltaic Panels  
Refer to supplier technical specification for accurate information
  - Indicative Location of Air Source Heat Pump  
Refer to supplier technical specification for accurate information

- REV. DESCRIPTION DATE**
- K: Landscaping updated. 20.03.24
  - J: Latest engineering info (steps, banking and retaining structures) imported with some private footpaths adjusted to suit. Four pumping compound now omitted. 07.03.24
  - H: Highway design updated following comments received in meeting with LA in January. Junction radii increased and altered surface road reinstated. Parking allocation amended. Public open space and play area improved. Substation omitted. Front boundary to plot 22 updated, include solar panel and air source heat pump locations added to site plan. 13.02.24
  - G: Plots 36, 42 and 44 omitted. Attenuation pits moved to address comments from LA housing strategy dept. resulting in alterations to plots 10-14 & 19-21. Bin storage areas to plots 13 and 20 relocated to the front of property due to site levels not allowing for acceptable rear access to mid terrace units. Bin store provided to flats (6-8) and site sheds provided to all flats (6-8 & 10-15). 27.11.23
  - F: Shared private drive serving plots 22-26 widened to the front of plots 22-26 to accommodate turning area for the landscaping vehicles. Bin collection point added to the front of plot 22. Parking allocation reduced for the 3 bed affordable units plots 10-12 & 19-21. Substation moved back 400mm. 29.08.23
  - E: Application boundary updated. 06.07.23
  - D: Engineering information imported in to layout. 07.06.23
  - C: Minor adjustments to house types. Private footpaths added with refuse storage added within rear gardens. Bicycle Storage sheds added to plots that have not been allocated a garage space. Refuse collection points added. Colour added and site key updated. 05.06.23
  - B: New open market units added to site layout to comply with new Part 1 regulations, resulting in revised floor areas. To accommodate larger units, plot 28 substituted to a shabby house type (previously a Thornbury). Plots 38 and 39 renamed. Air units and boundaries adjusted as a result of revised footprints. 20.04.23
  - A: New WGOR affordable units added to layout (plots 3-21). Plots 15-18 reoriented to face north. Latest attenuation basin design imported from engineer site pack. Translocated hedgerow relocated to top edge of basin's southern boundary. 03.03.23

CLIENT	Lewis Homes	
JOB TITLE	Sandy Lane, Ystradowen	
DRAWING TITLE	Proposed Site Layout	
SCALE @ A2	DATE	DRAWN BY
1:500	June '23	RW
JOB NO.	DRAWING NO.	REVISION
1941	TP-01	K

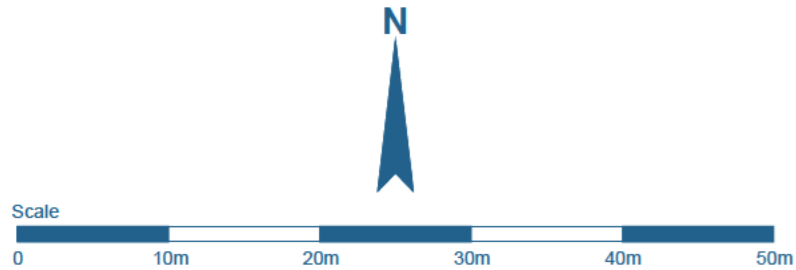
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Figured dimensions must be taken in preference to scaled dimensions and any discrepancies are to be referred to Hammond Architectural Ltd. Contractors, subcontractors and suppliers must verify all dimensions on site before commencing any work or making any workshop drawings.





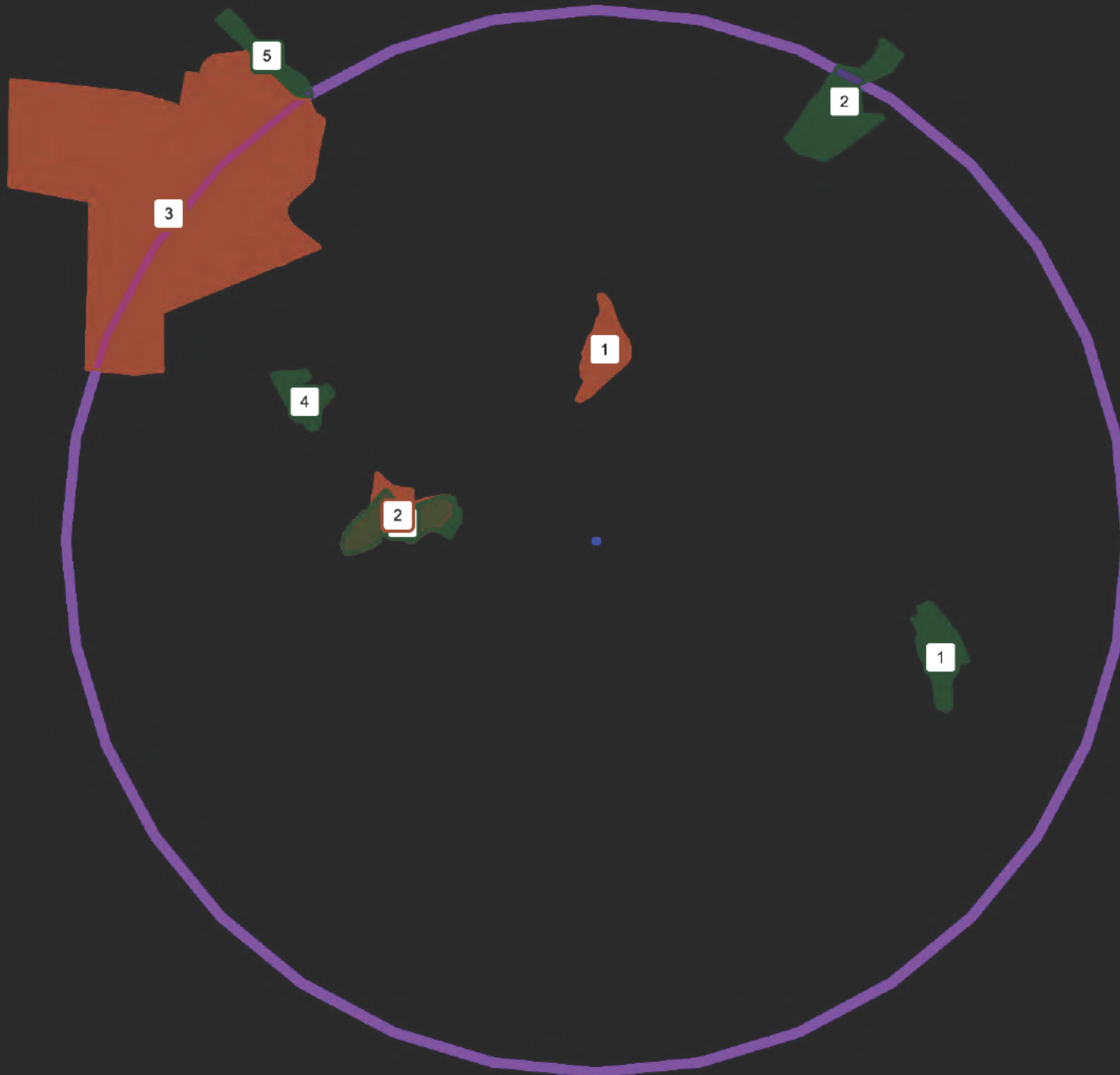
## APPENDIX II SEWBR<sub>e</sub>C DESK STUDY RECORDS



**Key**

-  Search Location
-  Search Buffer (1000m)

-  **Ancient Semi-natural Woodland**
  - 1: Ancient Semi Natural Woodland
  - 2: Ancient Semi Natural Woodland
  - 3: Ancient Semi Natural Woodland
  - 4: Ancient Semi Natural Woodland
  - 5: Restored Ancient Woodland Site
-  **Adopted SINC**
  - 1: Old Quarry, Cowbridge Road
  - 2: North Ystradowen
  - 3: Mynydd y Fforest





Aderyn  
LERC Wales' Biodiversity &  
Reporting Database



**eMapper for LERC Wales Aderyn Commercial**  
daniel-jones\_03/03/2022\_sandy-lane-ystradowen /  
4380/0212-874  
species




**Key**

-  Search Location
-  Search Buffer (1000m)

**Birds**





-  Common Reed Bunting
-  Dunnock
-  Eurasian Skylark
-  Grasshopper Warbler
-  House Sparrow
-  Kestrel
-  Linnet
-  Merlin
-  Red Kite
-  Redwing
-  Song Thrush
-  Starling
-  Western Barn Owl

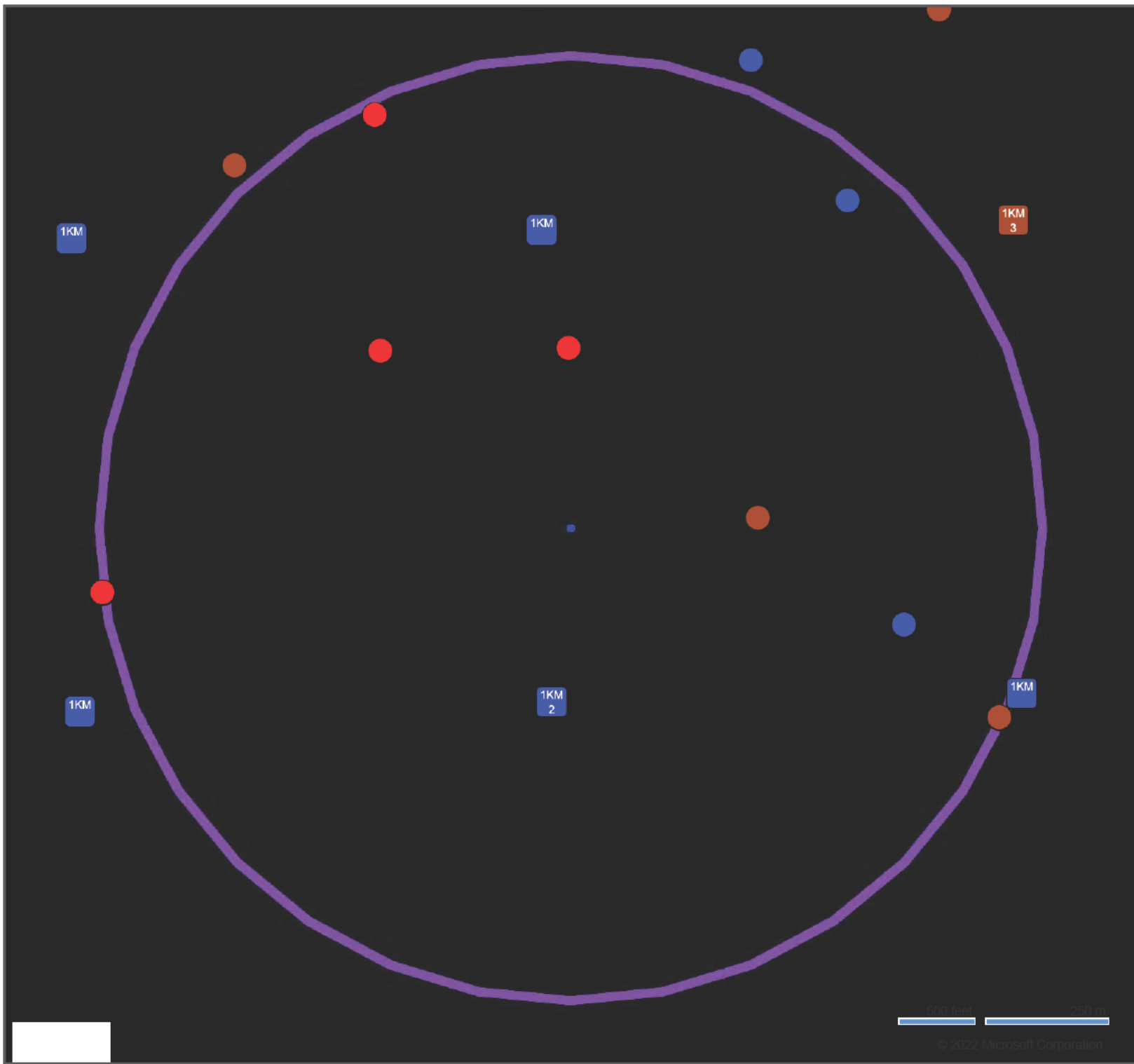
**Mammals**

-  Bats
-  Common Pipistrelle
-  [REDACTED]
-  Harvest Mouse
-  Noctule Bat
-  Pipistrelle
-  Serotine
-  Soprano Pipistrelle
-  Unidentified Bat
-  West European Hedgehog


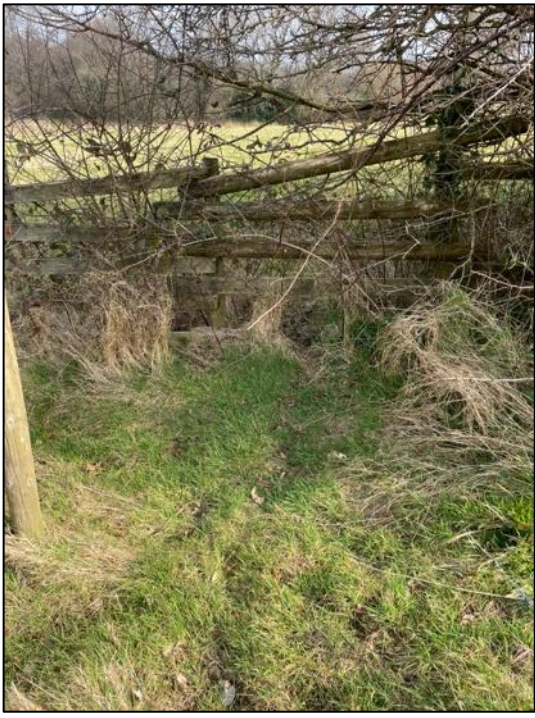
**Plants**

**Reptiles and Amphibians**

-  Common Frog
-  Common Lizard
-  Common Toad
-  Great Crested Newt



**APPENDIX III EXTENDED PHASE 1 HABITAT SURVEY PLAN & TARGET NOTES**

Target Note	Description/Comment
<p><b>Birds seen/ heard:</b> Robin, Blackbird, Song Thrush, Coal Tit, Dunnock, Wren, Woodpigeon, Magpie, House Sparrow</p>	
<p>1</p>	
<p>2</p>	<p>Mammal footprints indicative of domestic dog or fox. Mammal footpath located under base of hedgerow/fence.</p> 
<p>3</p>	<p>Mammal droppings indicative of fox.</p>
<p>4</p>	<p>Mature/over-mature oak tree located along the northern boundary assessed to have <b>high potential to support roosting bats</b>. The tree contains a woodpecker hole located 3-4m high on main trunk, leading to an internal cavity that could support several roosting bats. The tree also contains several vertical desiccation fissures within the upper canopy that are suitable for use by small numbers of crevice dwelling bats, as well as crevices associated with a hazard beam on a lower branch.</p>





5	Brash pile located along hedgerow base. Could provide shelter for common reptiles and amphibians.
6	Mature oak tree located to the north of the proposed site (off-site) assessed to have moderate potential to support roosting bats. Tree contains several cervices and cavities associated with a significant hazard beam on the north facing lower branch.



7 Attenuation pond located within Badgers Brook Rise approx. 90m south of the site (Pond 1). The pond is approx. 150m<sup>2</sup> in area and contains a rocky substrate base (clean stone aggregate). Aquatic vegetation present includes Bulrush, Yellow Flag/Iris, Soft Rush, Creeping Bent, Floating Sweet-Grass and Brooklime as well as some filamentous algae cover. Surrounding terrestrial habitat includes managed grassland with newly planted shrubs and woodland. Based on the basin design (attenuation and infiltration) it was considered likely to dry annually. There is no evidence to suggest fish presence or impacts by waterfowl. Water quality was assigned to be moderate based on the assemblage of aquatic plant species present. Common Frog spawn/tadpoles were also present.

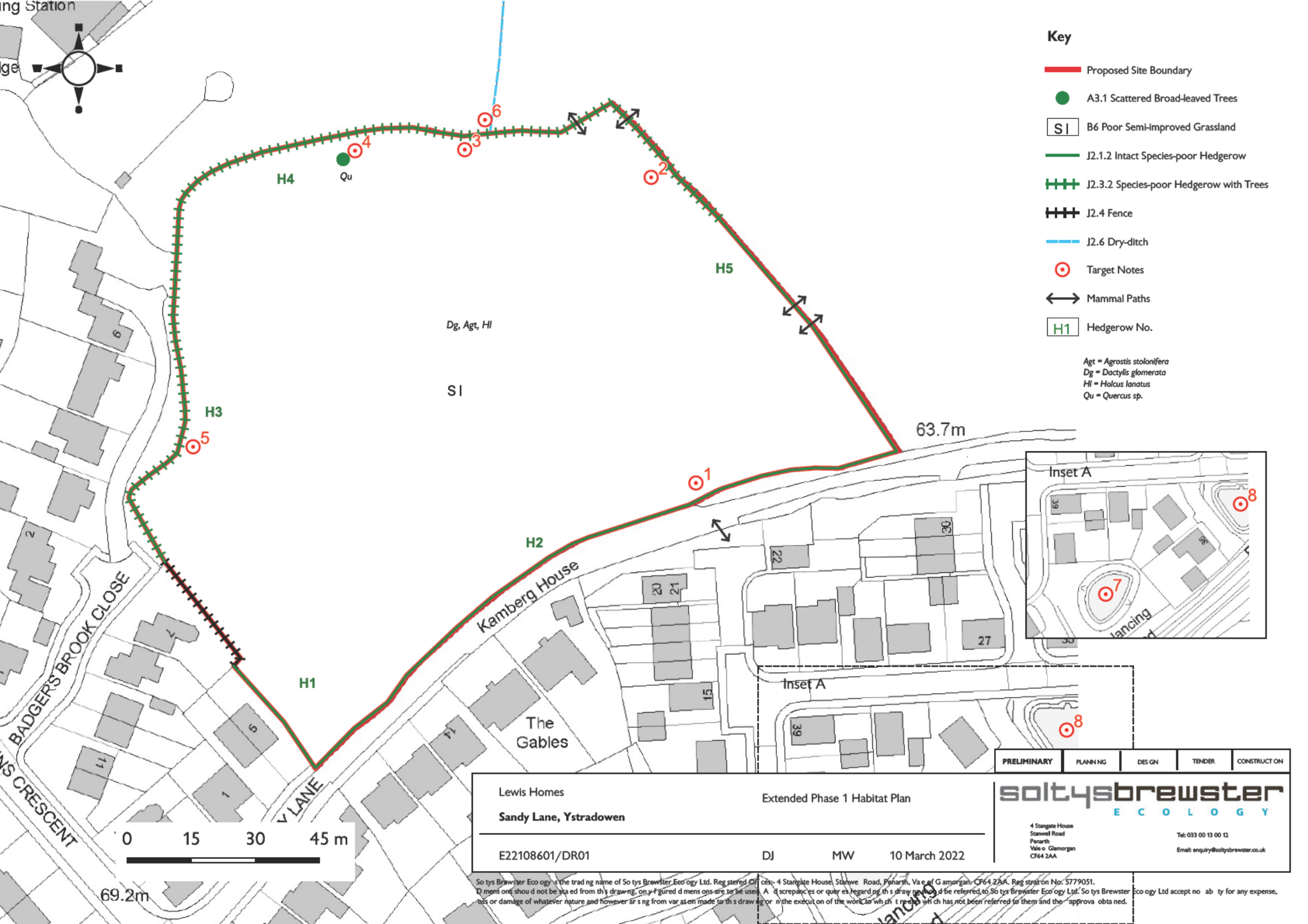
	<b>Factor</b>	<b>Description</b>	<b>Score</b>
S <sup>1</sup>	Geographic location	Zone B	0.5
S <sup>2</sup>	Pond area	150m <sup>2</sup>	0.3
S <sup>3</sup>	Permeance	Dries annually	0.1
S <sup>4</sup>	Water quality	Moderate	0.67
S <sup>5</sup>	Shade	0-60%	1
S <sup>6</sup>	Waterfowl	Absent	1
S <sup>7</sup>	Fish	Absent	1
S <sup>8</sup>	Pond count	12	1
S <sup>9</sup>	Terrestrial habitat	Moderate	0.67
S <sup>10</sup>	Macrophytes	66-80%	1
			<b>0.61 (Average)</b>



8 Second attenuation pond located within Badgers Brook Rise approx. 90m south of the site (Pond 2). The pond is approx. 125m<sup>2</sup> in area and again contains a rocky substrate base (clean stone aggregate). Aquatic vegetation present is similar to Pond 2 but with less overall cover. Surrounding terrestrial habitat includes managed grassland with newly planted shrubs and woodland. Based on the basin design (attenuation and infiltration) it was considered likely to dry annually. There is no evidence to suggest fish presence or impacts by waterfowl. Water quality was assigned to be moderate based on the assemblage of aquatic plant species present. Common Frog spawn/tadpoles were also present.

	<b>Factor</b>	<b>Description</b>	<b>Score</b>
S <sup>1</sup>	Geographic location	Zone B	0.5
S <sup>2</sup>	Pond area	125m <sup>2</sup>	0.25
S <sup>3</sup>	Permeance	Dries annually	0.1
S <sup>4</sup>	Water quality	Moderate	0.67
S <sup>5</sup>	Shade	0-60%	1
S <sup>6</sup>	Waterfowl	Absent	1
S <sup>7</sup>	Fish	Absent	1
S <sup>8</sup>	Pond count	12	1
S <sup>9</sup>	Terrestrial habitat	Moderate	0.67
S <sup>10</sup>	Macrophytes	46-50%	0.8
			<b>0.58 (Below Average)</b>





**Key**

- ▬ Proposed Site Boundary
- A3.1 Scattered Broad-leaved Trees
- SI B6 Poor Semi-Improved Grassland
- ▬ J2.1.2 Intact Species-poor Hedgerow
- ▬▬▬ J2.3.2 Species-poor Hedgerow with Trees
- ▬▬▬ J2.4 Fence
- ▬▬▬ J2.6 Dry-ditch
- ⊙ Target Notes
- ↔ Mammal Paths
- H1 Hedgerow No.

*Agt* = *Agrostis stolonifera*  
*Dg* = *Dactylis glomerata*  
*Hl* = *Holcus lanatus*  
*Qu* = *Quercus* sp.



PRELIMINARY	PLANNING	DESIGN	TENDER	CONSTRUCTION
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Lewis Homes Sandy Lane, Ystradowen	Extended Phase 1 Habitat Plan		
E22108601/DR01	DJ	MW	10 March 2022

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## APPENDIX IV BATS AND ARTIFICIAL LIGHTING AT NIGHT GUIDANCE NOTE

The following is an extract from the **Bat Conservation Trust and Institution of Lighting Professionals (2023)** guidance note on **Bats and Artificial lighting at night**. Section 4 contains advice on how to mitigate for the impacts of artificial lighting on bats. Full citation:

**Bat Conservation Trust & Institution of Lighting Professionals (2023) *Bats and artificial lighting at night*. Guidance Note 08/23. Bat Conservation Trust, London.**

## 4. Bats, lighting and the mitigation hierarchy

### Introduction

- 4.1 This chapter provides a process for considering the impact on bats as part of a proposed lighting scheme or new development incorporating night-time lighting. It contains a toolkit of techniques which can be used on any site, whether a small domestic project or larger mixed-use, commercial or infrastructure development. It also provides best practice advice for the design of a lighting scheme, for both lighting professionals and other users who may be less familiar with the terminology and theory.
- 4.2 Under the Agent of Change principle within national planning policy, those seeking to introduce a new plan or project are also responsible for the management of its impact. Therefore, it is crucial that the impacts of obtrusive lighting are mitigated or avoided altogether. While this chapter focuses on how potential lighting impacts on bats can be identified, avoided and mitigated, opportunities for ecological betterment beyond maintaining the status quo should be pursued wherever possible. Doing so would not only fulfil our responsibilities under this principle but contribute to Biodiversity Net Gain in line with legislation. <sup>xlix</sup> Further information on Biodiversity Net Gain can be found here: <https://cieem.net/i-am/current-projects/biodiversity-net-gain/>
- 4.3 Effective avoidance and mitigation of lighting impacts on bats relies on close collaboration from the outset between multiple disciplines. Depending on the specific challenges this will almost certainly involve ecologists working alongside architects and/or engineers; however, lighting professionals and landscape architects should be approached when recommended by your ecologist. This should be done at as early a stage as possible, in order to ensure the proposed lighting strategy is acceptable to all disciplines, mitigation is effective and is not in breach of legislation. In this way, delays to approval/adoption and unforeseen costs or liability can be avoided.
- 4.4 The stepwise process and key follow-up actions are outlined in the flowchart overleaf see figure 3 and followed throughout the Chapter. The questions in the flowchart should be asked in good time to allow any necessary bat survey information to be gathered in advance of lighting design, or fixing a scheme design.
- 4.5 It should be noted that the measures discussed in this document relate only to the specific impacts of lighting upon retained or newly created bat habitat features, on or adjacent to the site. If loss or damage to roosting, foraging or commuting habitat is likely to be caused by other aspects of the development, separate ecological advice will likely be necessary in order to avoid, mitigate or compensate for this legally and/or in line with ecological planning policies.

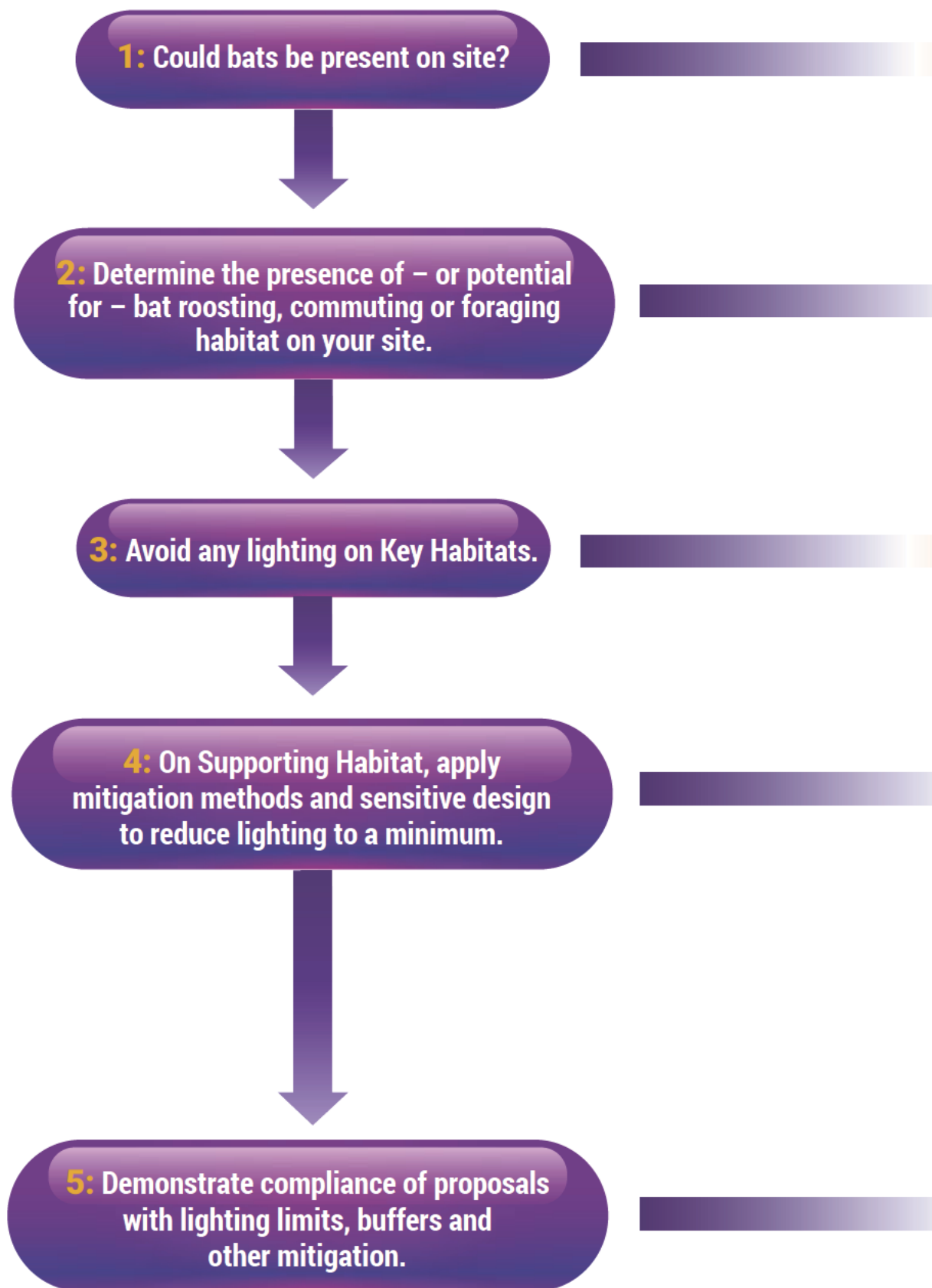






Figure 3. Ecology process for lighting.

## Step 1: Could bats be present on site?

- 4.6 If there is no ecological data for your site, an ecologist should be contacted at the earliest opportunity to advise on an initial survey and any potential follow-on surveys. This information should be collected as early as possible in the design process, and certainly before lighting is being specified, so as to avoid the need for costly revisions.
- 4.7 If any of the following habitats occur on site, and are adjacent to or connected with any of these habitats on or off site, it is possible that proposed lighting may impact local bat populations (please note this list is indicative and advice should be sought from an ecological consultant):
- Woodland, individual mature trees or lines of trees
  - Hedgerows and scrub
  - Ponds, lakes and other wetland
  - Ditches, streams, canals and rivers
  - Infrequently managed grassland, or parks, gardens and Public Open Space
  - Buildings - Especially, **but not limited to**, those in disrepair or built pre 1970s
  - Gravel pits, quarries, cliff faces, caves and rock outcrops
  - Any building or habitat known to support protected species
  - Any additional scenarios as advised by your Local Planning Authority (LPA)
- 4.8 If you are unsure about whether bats may be impacted by your project, and an ecologist has not yet been consulted, sources of information on the presence of bats within the vicinity of your site include the following.
- Local Environmental Records Centres (LERC) - Will provide third-party records of protected and notable species for a fee. Search <http://www.alerc.org.uk/> for more information
  - The Wildlife Assessment Check is a free online tool designed by the Partnership for Biodiversity in Planning to support small-to-medium scale developments by helping identify whether ecological advice should be sought prior to submitting a planning application. The WAC is available online at [www.biodiversityinplanning.org/wildlife-assessment-check/](http://www.biodiversityinplanning.org/wildlife-assessment-check/)
  - National Biodiversity Network Atlas - Provides a resource of third-party ecological records searchable online at <https://nbnatlas.org> - typically this is less complete than LERC data. Please note: Some datasets are only accessible on a non-commercial basis, while most can be used for any purpose, provided the original source is credited
  - Local Authority Planning Portal - Most local planning authorities have a searchable online facility detailing recent planning applications. These may have been accompanied by ecological survey reports containing information on bat roosts and habitats

- Defra’s MAGIC map - Provides an online searchable GIS database including details of recent European Protected Species licences, and details of any protected sites designated for bat conservation
- 4.9 The professional directory at the website of the Chartered Institute of Ecology and Environmental Management ([www.cieem.net](http://www.cieem.net)) provides details of ecologists in your area with the relevant skills/experience. The early involvement of a professional ecologist can minimise the likelihood of delays at the planning stage (if applicable) and ensure your project is compliant with conservation and planning legislation and policy.

## **Step 2: Determine the presence of/potential for bat roosts or habitat and evaluate their importance**

- 4.10 Once a potential risk to bats has been identified, the ecologist will visit the site in order to record the habitats and features present, and evaluate their potential importance to bats. Additionally, they should consider the likelihood that bats could be affected by lighting both on and immediately off site. This survey may also include daytime building and tree inspections, and the deployment of automated bat detectors. On the basis of these inspections, further evening surveys may be recommended, either to determine the presence or likely absence of bats within buildings and/or trees, or to assess the use of the habitats by bats by means of a walked survey. Such surveys may be undertaken at different times during the active season (May - September) and should also involve the use of automated bat detectors left on site for a period of several days. The surveys should be carried out observing the recommendations within the Bat Conservation Trust’s Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2016), and the Interim Guidance Note: Use of Night Vision Aids for Bat Emergence Surveys (BCT, May 2022), or as superseded.
- 4.11 The resulting report will detail the relative conservation importance of each habitat feature to bats, including the roost-supporting potential of any built structures or trees. The ecologist’s evaluation of the individual features will depend on the specific combination of contributing factors about the site, including:
- The conservation status of species likely to be present
  - Geographic location
  - Type of bat activity likely (breeding, hibernating, night roosting, foraging etc.)
  - Habitat quality
  - Habitat connectivity off-site
  - The presence of nearby bat populations or protected sites for bats (usually identified in a desk study)

- 4.12 The evaluation will enable the ecologist to determine the presence of any Key Habitats or Supporting Habitats for bats. The whereabouts of these habitats should be set out on a plan of the site or as an Ecological Constraints and Opportunities Plan (ECOP), see Case Study 3. The bat habitat plan/ECOP and report can then be used to help guide the design of the lighting strategy (see next steps) as well as the wider project.
- 4.13 Key Habitats are those which are considered essential for the function and stability of local bat populations, while Supporting Habitats may be of lesser significance or usage. Habitats falling within neither category are considered to be of negligible or very low importance to bats.
- 4.14 Examples of Key Habitats include:
- Roosting and swarming sites for all species and their associated flightpaths and commuting habitat
  - Foraging or commuting habitat for highly light-averse species (greater and lesser horseshoe bats, some Myotis bats, barbastelle bats and all long-eared bats) or nationally/locally rare species
  - Foraging or commuting habitat supporting relatively large numbers of bats or high activity rates as assessed through survey
  - Any habitat otherwise assessed by the ecologist as being of elevated importance in maintaining the 'favourable conservation status' of the bat population using it

### **Step 3: Avoid lighting on any Key Habitats**

- 4.15 An adverse impact from illumination onto a Key Habitat feature is likely to have a significant effect on the bats using it. Therefore, an absence of artificial illumination and glare acting upon both the feature and an appropriately sized buffer zone is most often the only acceptable solution. An ecologist will be best placed to set the size of such a buffer zone according to the species present and the level of usage, and these can be tens of metres if unattenuated light spill or glare from local sources is predicted. The input of a lighting professional should be sought when determining the distances of light spill from new sources and likelihood of glare. It is recommended that proposals are communicated by them to the Principal Designer and the Highways Designer, (if applicable) as in some circumstances these decisions may influence highway function (e.g. visibility departures). Further information on demonstrating an absence of illumination within proposals via lux/illuminance contour plans is provided in Step 5.
- 4.16 As detailed in Section 2.1, there is no legal duty requiring any place to be lit. British Standards and other policy documents allow for deviation from their own guidance where there are significant ecological/environmental reasons for doing so. It is acknowledged that in certain situations lighting is critical in maintaining safety, such as some industrial sites with 24hr operation, or in high-risk security situations. Nevertheless, these are not exempt from

the statutory protection afforded to bats, their roosts and commuting routes directly associated with roosts, and good design principles recommended under industrial documents such as the Institution of Lighting Professionals' GN01: The Reduction of Obtrusive Light remain best practice. However, in the public realm, while lighting can increase the perception of safety and security, measurable, objective benefits on safety and security are less well established. Consequently, lighting design should be holistic, taking into consideration the relevant British Standards or local policies concerning lighting but, through a risk assessment-style process, be able to fully take into account the presence of protected species and the likely adoption of mitigation approaches through proper engagement with local communities (see Case Study 4).

- 4.17 Completely avoiding any lighting conflicts in the first place is advantageous, because proposals would be automatically compliant with the relevant wildlife legislation and planning policy, and costly, time-consuming additional surveys, mitigation and post-development monitoring would be avoided. Furthermore, LPAs are likely to favour applications where steps have been taken to avoid such conflicts.
- 4.18 Sources of lighting which can have the potential to disturb bats are not limited to roadside, footpath or security lighting, but can also include light spill via windows, permanent but sporadically operated lighting such as sports floodlighting, and in some cases car headlights. It is important to note that these situations often comprise many complex variables, and light emission is often difficult to predict or model accurately.
- 4.19 A competent lighting professional should be involved in the design of proposals as soon as potential impacts (including from glare) are identified by the ecologist, in order to avoid planning difficulties, or late-stage design revision. The lighting professional will be able to make recommendations about placement of luminaires tailored to the project.

## **Glare**

- 4.20 Glare (extremely high contrast between a source of light and the surrounding darkness - linked to the 'intensity' of a luminaire) may additionally affect bats over a greater distance than the area directly lit by a luminaire. Glare impacts on bats and other wildlife should be considered on the site alongside best practice advice on reducing obtrusive light (see ILP GN01).

## **Highways**

- 4.21 Where highways lighting schemes are to be designed by the LPA, the ecology officer (or planning officer) should be consulted on the presence of important bat constraints, determined in Step 2, which may impact the design of the lighting scheme in order to ensure compliance with wildlife legislation.

### **LPA-specific guidance**

- 4.22 Some LPAs have Supplementary Planning Documents (SPD) or other guidance concerning the management of potential development impacts on particular species of bats, or in relation to certain protected sites, such as Special Areas of Conservation (SACs). These should be consulted for particular advice concerning lighting. For example, the North Somerset and Mendip Bats SAC Guidance on Development SPD provides a methodology for calculating the specification of compensatory habitat required to off-set certain development impacts on the bat population of the SAC. In it, retained or created habitats that are subject to lighting above certain lux levels, are considered to be lost to development, with implications for compensation requirements<sup>1</sup>.

### **Environmental Impact Assessment (EIA)**

- 4.23 For plans and projects subject to the Environmental Impact Assessment (EIA) Regulations screening process, it is important for LPAs to understand the nature of mitigation measures at this relatively early stage. Under current EIA Regulations, schemes planning to avoid likely significant effects on the environment through either embedded design measures, such as sensitive site configuration or strategic land/building usage etc., or by other robust mitigation, may be exempt from EIA and therefore less costly. However, the over-reliance on conditions to effect environmental mitigation may be open to legal challenge.

### **Step 4: On Supporting Habitat, apply mitigation methods and sensitive design to reduce lighting to a minimum**

- 4.24 Supporting Habitats may be less frequently used by bats compared to Key Habitats, or support fewer, or more light-opportunistic species. Consequently, a balance between a reduced lighting level appropriate to the ecological importance of each feature and species, and the lighting objectives for that area will need to be achieved.
- 4.25 It is important to reiterate the legal protection from disturbance that bats receive under the Wildlife and Countryside Act 1981, as amended. Where the risk of offences originating from lighting is sufficiently high, it may be best to apply the avoidance approach in Step 3. (see Case Study 5).
- 4.26 Advice from an ecologist and lighting professional will be essential in finding the right approach for the site according to their evaluation. The following are techniques which have been successfully used on projects to limit lighting impacts on bats, and are often used in combination for best results.

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<sup>1</sup> <https://n-somerset.gov.uk/sites/default/files/2020-03/North%20Somerset%20and%20Mendip%20Bats%20SAC%20guidance%20supplementary%20planning%20document.pdf>

## Dark buffers and concentric zonation

- 4.27 A buffer zone subdivided into smaller zones of increasing illuminance limit further away from the Supporting Habitat would ensure light levels (illuminance - measured in lux) do not exceed certain defined limits. This has the effect of a gradual decrease in lighting from the developed zone, rather than a distinct cut-off, which may provide useable area for the project which also limits lighting impacts on less sensitive species, or less well-used habitat.
- 4.28 The ecologist (in collaboration with a lighting professional) can help determine the most appropriate buffer widths and illuminance limits according to the value of that habitat to bats. Figure 4 gives an example of a multi-zoned approach which includes Key Habitat (Zone A) which would receive no ALAN, and Supporting Habitat (Zones B and C) which would act as a 'light attenuation zone', but remain within the public realm, and so receive reduced light levels.

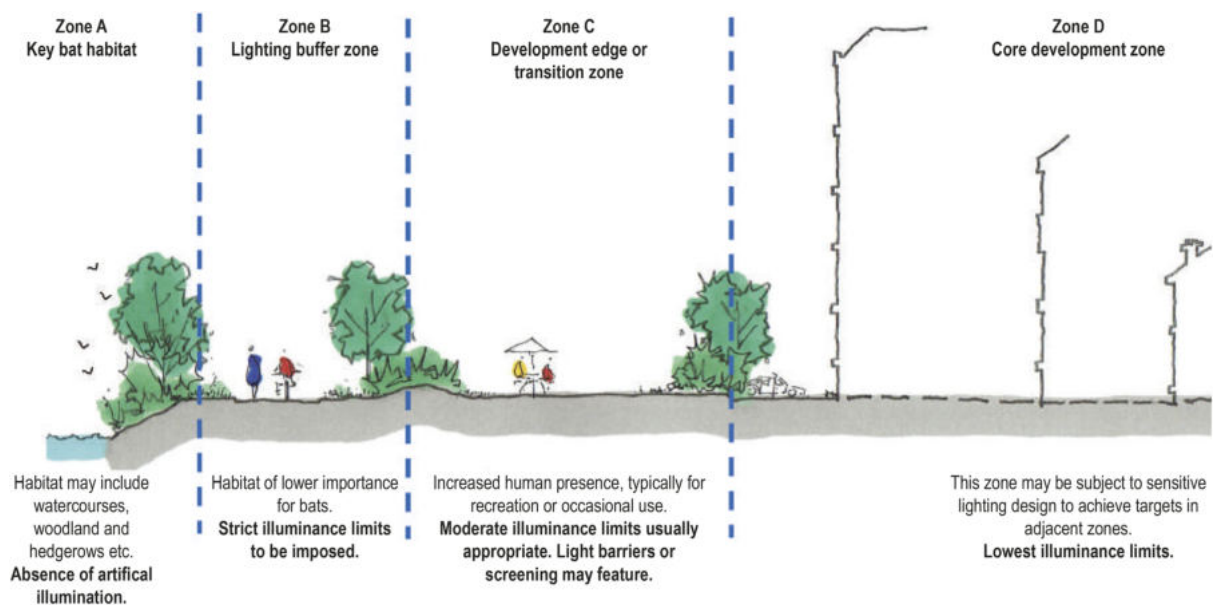


Figure 4. Example of illuminance limit zonation.

## Appropriate luminaire specifications

- 4.29 Light sources, lamps, LEDs and their fittings come in a myriad of different specifications which a lighting professional can help to select. However, the following should be considered when choosing luminaires and their potential impact on Key Habitats and features:

- All luminaires should lack UV elements when manufactured. Metal halide, compact fluorescent sources should not be used
- LED luminaires should be used where possible due to their sharp cut-off, lower intensity, good colour rendition and dimming capability
- A warm white light source (2700Kelvin or lower) should be adopted to reduce blue light component

- Light sources should feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats (Stone, 2012)
- Internal luminaires can be recessed (as opposed to using a pendant fitting - See Figure 5) where installed in proximity to windows to reduce glare and light spill
- Waymarking inground markers (low output with cowls or similar to minimise upward light spill) to delineate path edges (see Case Study 1)
- Column heights should be carefully considered to minimise light spill and glare visibility. This should be balanced with the potential for increased numbers of columns and upward light reflectance as with bollards
- Only luminaires with a negligible or zero Upward Light Ratio, and with good optical control, should be considered - See ILP GN01
- Luminaires should always be mounted horizontally, with no light output above 90° and/or no upward tilt
- Where appropriate, external security lighting should be set on motion-sensors and set to as short a possible a timer as the risk assessment will allow. For most general residential purposes, a 1 or 2 minute timer is likely to be appropriate
- Use of a Central Management System (CMS) with additional web-enabled devices to light on demand
- Use of motion sensors for local authority street lighting may not be feasible unless the authority has the potential for smart metering through a CMS
- The use of bollard or low-level downward-directional luminaires is strongly discouraged. This is due to a considerable range of issues, such as unacceptable glare, poor illumination efficiency, unacceptable upward light output, increased upward light scatter from surfaces and poor facial recognition which makes them unsuitable for most sites. Therefore, they should only be considered in specific cases where the lighting professional and project manager are able to resolve these issues. See Case Study 6
- Only if all other options have been explored, accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only to where it is needed. However, due to the lensing and fine cut-off control of the beam inherent in modern LED luminaires, the effect of cowls and baffles is often far less than anticipated and so should not be relied upon solely



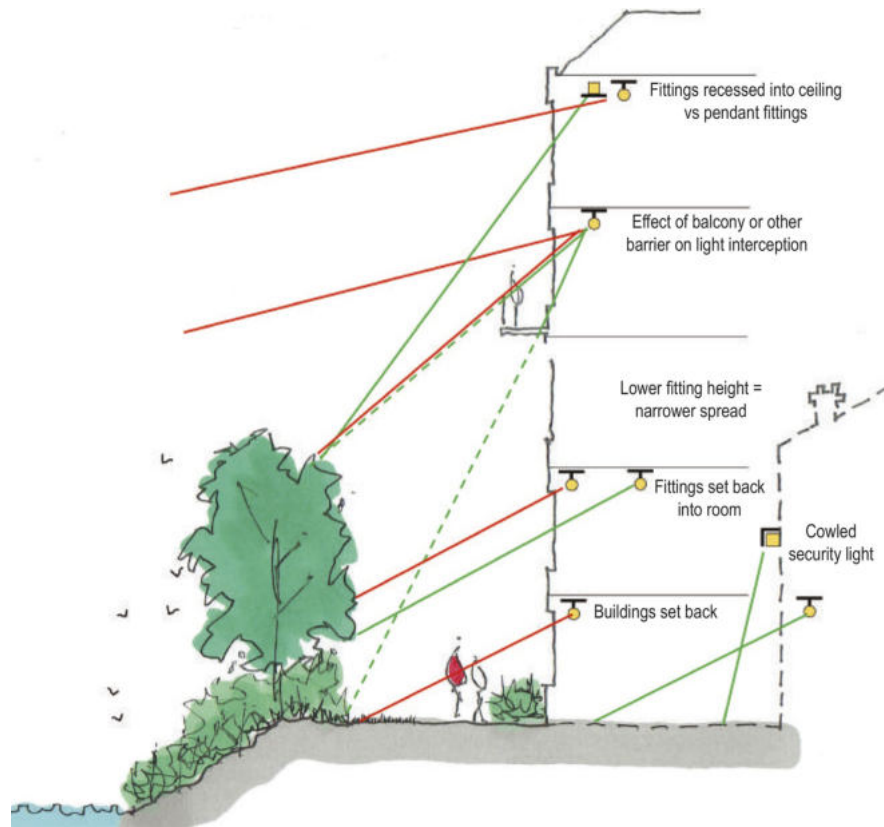


Figure 5. Internal lighting mitigation options.

### Sensitive site configuration

4.30 The location, orientation and height of newly built structures, and hard standing, relative to each other can have a considerable impact on light spill. Small changes in terms of the placement of footpaths, open space and windows can all help to achieve a better outcome in terms of minimising light spill onto Key Habitats and features.

- Key or Supporting Habitat is often located alongside, or to the rear of buildings, on new developments. In this case, the removal or reduction of windows can be the most effective way to permanently limit light spill, potentially alongside the internal reconfiguration of the building, to ensure high-use spaces are not as impacted by loss of natural light
- It may be possible to include Key or Supporting Habitat into unlit public open space such as parks. However, avoid including into residential gardens, as uncontrolled and inappropriate lighting may be introduced by residents following occupation
- It is often considered better for a residential scheme to specify good quality downward-directional external light fittings for security, and/or at the front entrance, on short PIR timers, rather than risk the imposition of poor quality and poorly controlled lighting at a later date
- Buildings, walls and hard landscaping may be sited and designed so as to block light spill from reaching habitats and features

- Paved surfaces should not be located within Key Habitat or buffer zones, unless they form part of unlit public open space
- Taller buildings may be best located toward the centre of the site, or sufficiently set back from Key Habitats, to minimise the effect of their light spill
- Column mounted luminaires can be located so that the rear shields are adjacent to habitats, or narrow optics selected that direct light into the task area where needed

### **Physical screening**

- 4.31 Light spill can be successfully screened through landscaping and the installation of walls and fences, or even banks and bunds (See Figure 6). In order to ensure that fencing makes a long-term contribution, it is recommended that it is supported on concrete or metal posts. Fencing can also be over planted with hedgerow species or climbing plants to soften its appearance and provide a vegetated feature which bats can use for navigation or foraging.
- 4.32 The planting of substantial landscape features integrated to the wider network of green corridors such as hedgerows, woodland and scrub would make a long-term positive contribution to the overall connectivity of bat habitat and light attenuation. It would also contribute to any local Nature Recovery and Green Infrastructure policies and help achieve obligatory Biodiversity Net Gain targets. A landscape architect can be appointed to collaborate with the ecologist on maximising these natural light screening opportunities.
- 4.33 It should be noted that newly planted vegetation (trees, shrubs and scrub) is unlikely to adequately contribute to light attenuation upon Key Habitats for a number of years, until it is well established. Sufficient maintenance to achieve this is also likely to be required. Consequently, this approach is best suited to the planting of dense, mature or translocated vegetation. In some cases, it is appropriate to install temporary fencing, or other barrier, to provide the desired physical screening effects until the vegetation is determined to be sufficiently established.
- 4.34 Given the fact that planting may be removed, die back or inadequately replaced over time, it should never be relied on as the sole means of attenuating light spill.

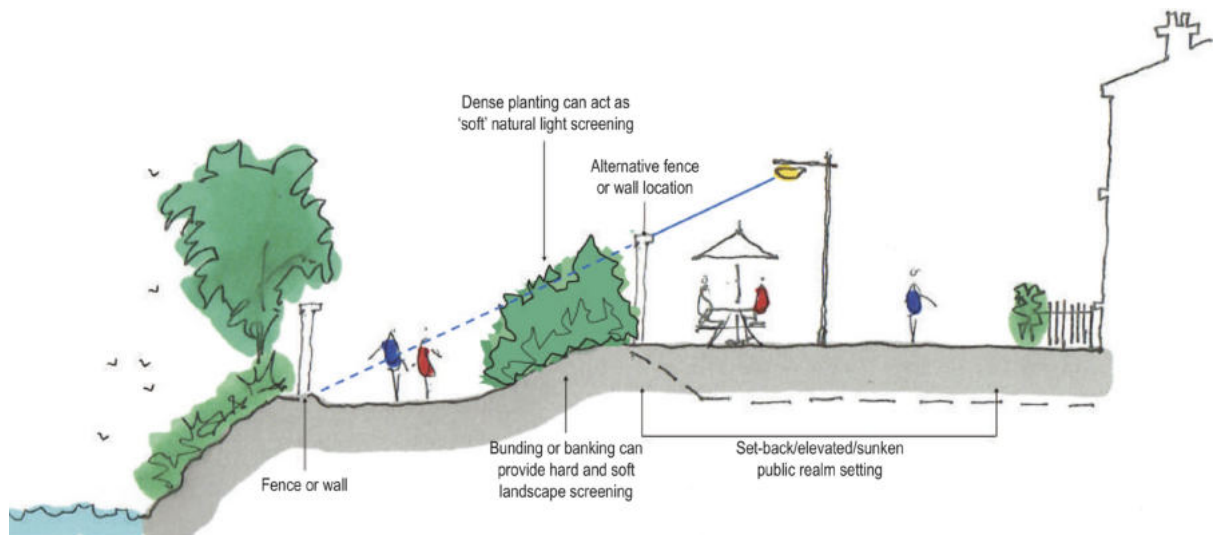


Figure 6. Examples of physical light screening options.

### Dimming and part-night lighting

- 4.35 Depending on the pattern of bat activity across the Supporting Habitat identified by the ecologist, it may be appropriate for an element of on-site lighting to be controlled by dimming or switching either diurnally, seasonally, or according to human activity (light on demand). This is known as Part-Night Lighting (PNL). It is important to state that PNL is not likely to be appropriate where Key Habitats are at risk, especially as PNL often results in lighting when bats are most active.
- 4.36 A Central Management System (CMS) can be specified by the lighting engineer to dim or turn off individual or groups of luminaires when not in use or during less busy times. Dimming can be precisely controlled, with dimming states often being as low as 10 or 20%. However, due to the electrical difficulties of maintaining a dimming state of under 10%, luminaires should be set to off below this point.
- 4.37 Lighting could be set to a low output state by default, to turn up to a pre-determined output in response to a trigger, and be combined with a timeclock or photocell to further add an element of seasonal or diurnal control. For example, Passive Infrared (PIR), Artificial Intelligence enabled cameras, on demand controls, or pressure sensors may be used to trigger lights to come on or dim in response to movements, either by vehicles (for example at car parks or industrial loading bays) or by pedestrians (for example a footpath leading from residential development through an area of Supporting Habitat). The timeclock or photocell could ensure that this response only occurs during a set window of hours after sunset and before sunrise, or during certain months.
- 4.38 Where some trigger is used to temporarily modify lighting states, it will be necessary to specify the timed trigger window during which the response is maintained beyond the last triggering activity. For most typical residential purposes, 1-2 minutes is likely to be sufficient, however risk assessments must

be performed in line with BS5489-1. The proposed system of lighting control will be determined by the outcome of the risk assessment. Where used in locations which receive distinct busy periods, such as cycle paths used by commuters, care will be needed to ensure lighting responds adequately to permit safe usage, but avoids both over-illumination and potentially disruptive dimming states of lighting groups.

- 4.39 Alternative lighting designed for subtle waymarking, rather than illumination, may be more appropriate, such as very low-wattage, ground-level luminaires (photo 4). This lighting option can have a number of additional benefits such as a reduced risk of vandalism, lower carbon footprint during manufacture and fitting and no requirement for cabling. However, it should be noted that these systems depend on regular maintenance and a long-term



*Photo 4: Waymarkers installed on a multi-user path in Worcester. Image credit: Cody Levine.*

commitment for them to be successful, as well as a clear view of the sky for solar-powered options. Due to this, proposals and potential planning conditions should be considered in liaison with maintenance teams, to ensure success (and any handover of assets) post install. See Case Study 1 for further information.

- 4.40 Part-Night Lighting should be designed with input from an ecologist as it may still produce unacceptably high light levels when active or dimmed. Part-Night Lighting is not usually appropriate where lights are undimmed during key bat activity times, as derived from bat survey data or within riparian habitats (see research chapter 1.27). Research has indicated that impacts upon commuting bats are still prevalent where lighting is dimmed during the middle of the night at a time when illumination for humans' use is less necessary (Azam et. al., 2015) thus this approach should not always be seen as a solution, unless backed up by robust ecological survey and assessment of nightly bat activity. In this case, designing areas to be lit to avoid retained Key Habitat, or the provision of sufficient alternative dark corridors, may be the only solution.

## Glazing treatments on buildings

- 4.41 As mentioned, glazing should be restricted and reduced wherever the ecologist and lighting professional determine there to be a likely significant effect upon bats' Key Habitat and associated features.
- 4.42 Where Supporting Habitat is present, glazing treatments such as tinted, frosted or low transmission glazing treatments are not generally considered suitable ways of fully mitigating light spill. In the case of frosted or 'frit' glazing, windows typically remain luminous surfaces in their own right, defeating the objective of reducing lighting impacts. Although promisingly named, low-transmission glazing (glazing with a lower visible light transmittance) often makes only a very small difference to light spill in practice - a window's fundamental objective is to transmit light!
- 4.43 Automatic blinds should be discouraged as their longevity depends on regular maintenance and successful routine operation by the occupant. Such blinds are generally only suited to commercial situations where maintenance can be incorporated into the long-term regime routine for the building.
- 4.44 Depending on the height of the building and windows, and therefore predicted light spill, glazing treatments or window design restrictions may not be required on all storeys. This effect can be more accurately determined by a lighting professional.

## Creation of alternative valuable bat habitat on site

- 4.45 The provision of new, additional or alternative bat flightpaths, commuting or foraging habitat is encouraged and could result in appropriate compensation for any such habitat being lost to the development. The ecologist will be able to suggest and design such alternative habitats, although particular consideration should be given as to its connectivity to other features, the species to be used, the lag time required for a habitat to sufficiently establish and the provision for its ongoing protection and maintenance.
- 4.46 As almost all new development will be required to result in at least 10% Biodiversity Net Gain (BNG), opportunities to improve habitat connectivity for bats should always be considered. Further to the 10 principles at the core of BNG, the implementation of sensitively sited habitat features for bats would be a clear contribution to 'additionality'. Particularly when considering achieving BNG off-site, assessment should be made of the impacts of altering the type and proportion of bat-suitable habitats, both within and beyond the site, upon the potential Core Sustenance Zone of any maternity roosts which use them.<sup>2</sup>

<sup>2</sup> <https://cdn.bats.org.uk/uploads/pdf/Bat-Species-Core-Sustenance-Zones-and-Habitats-for-Biodiversity-Net-Gain.pdf>

## **Step 5: Demonstrate compliance with illuminance (lux) limits and buffers within proposals and, where appropriate, the operational scheme**

- 4.47 Once it has been determined through the above process how Key and Supporting Habitats will be protected, or impacts on them mitigated or compensated for, it will be necessary to demonstrate how this will be achieved. For a planning application, this information is increasingly required prior to determination in order for the LPA to make an informed decision and discharge statutory duties towards protected species legislation and policies. This is most likely to be the case for 'Full' planning applications. For 'Outline', phased or complex applications, this information is, at times, deemed a 'Reserved Matter', for which detail will normally follow at a later date before final consent is granted, or in the discharging of reserved matters. Incidences include EIAs and should be made prior to determination. It is appropriate for a pre-commencement planning condition to be imposed on a consented application which would require that an ecologically sensitive lighting plan is prepared, or is achievable.
- 4.48 In all cases where impacts from lighting on bats are possible, the LPA will require some form of documentation to be produced by the lighting engineer, either in collaboration with the ecologist, or working to the constraints set out within the bat habitat plan/ECOP (see Step 2), in order to demonstrate compliance. Usually, this will take the form of a 'Lighting Strategy', 'Lighting Design' or 'Lighting Impact Assessment', depending on the level of detail in the application. A Lighting Strategy may simply set out the agreed lighting parameters, objectives and likely mitigation requirements (e.g. unlit zones and any other bat mitigation), together with a plan. A Lighting Design/Impact Assessment would provide finalised details, consisting of a plan to show modelled illuminance from all proposed (and existing, where necessary) light sources, taking into account all site configuration, physical screening and glazing measures adopted. It would usually be accompanied by an explanatory document detailing the specification of each luminaire, as well as all assessment assumptions made and any other rationale for lighting mitigation, such as recessed light fittings or part-night lighting.
- 4.49 In the case of Outline or phased applications, the precise detail of architectural materials, glazing, landscaping etc. might not be known at the time of submission, therefore a Lighting Strategy may be the most appropriate document to provide. As described above, the bat mitigation objectives derived from the ecologist's bat habitat plan/ECOP should be referenced. It is worth being aware of the potential for matters such as highways (incorporating highways-specific lighting needs) to be fixed at Outline consent stage, which can make the resolution of bat mitigation requirements at a later stage challenging. This highlights the importance of inter-discipline collaboration and early communication of ecological constraints.
- 4.50 In the case of small or simple planning applications, where significant impacts upon bats from lighting are of a low likelihood, the production of a full Lighting Design package may be disproportionately costly and time-consuming. It may therefore be appropriate to provide a simplified document produced between

the ecologist and lighting engineer, setting out design decisions undertaken and the likely achievability of the recommendations within the ECOP according to the lighting engineer's professional judgment.

### Lighting contour plans

- 4.51 A horizontal illuminance contour plan can be prepared by a suitably experienced and competent lighting professional (Member of the Institution of Lighting Professionals (ILP), Chartered Institution of Building Services Engineers (CIBSE), Society of Light and Lighting (SLL) or similar to ensure competency) using an appropriate software package to model 'Day 1', extent of light spill from the proposed, retained and, possibly, existing luminaires. The various buffer zone widths and illuminance limits which may have been agreed can then be overlaid to determine if any further mitigation is necessary. In some circumstances, a vertical illuminance contour plot may be necessary to demonstrate the light in sensitive areas, such as entrances to roosts or the Key Habitat associated with it (see Appendix).
- 4.52 Such calculations and documentation would enable the LPA ecologist to fully assess impacts and compliance.
- 4.53 Because illuminance contour plots and plans may need to be understood and examined by non-lighting professionals, such as architects and local planning authority ecologists, the following should be observed when producing or assessing illuminance contour plans, to ensure the correct information is displayed.
- A calculation showing output of luminaires to be expected at 'Day 1' of operation should be included, where the luminaire and/or scheme Maintenance Factor is set to 1. Schemes using Constant Light Output (CLO) luminaires should also be calculated using 'Day 1' output
  - Where deemed necessary by a lighting professional, models should be issued so that all luminaires (i.e. internal and external, or between different phases/plots) can be assessed and each should be set to the maximum output anticipated to be used in normal operation on site (i.e. no dimming where dimming is not anticipated during normal operation)
  - Where dimming, PIR, or variable illuminance states are to be used, an individual set of calculation results should accompany each of these states
  - A horizontal calculation plane representing levels of illuminance at ground level should always be used
  - Vertical calculation planes should be used wherever appropriate, for example along the site-facing aspects of a hedgerow or façade of buildings containing roosts, to show the illumination directly upon the vertical faces of the feature. Vertical planes can also show a cross-sectional view within open space (however, they will only face one direction.) Vertical planes will enable a visualisation of the effects of illumination at the various heights at which different bat species fly. An ecologist can

advise on the most appropriate dimensions to use according to the likely locations of bat flight around the site's habitats

- The contours (and/or coloured numbers) for 0.2, 0.5, 1, 5, and 10 lux must be clearly shown, as well as appropriate contours for values above these
  - Each illuminance/lux contour plan should be accompanied by a table showing their minimum and maximum illuminance/lux values
  - Where buildings are proposed in proximity to key features or habitats, plots should also model the contribution of light spill through nearby windows, making assumptions as to internal luminaire specification, internal lighting levels, and visible light transmittance of windows. It should be assumed that blinds or curtains are absent or fully open. Assumptions will need to be made as to the internal luminaire specification and levels of illuminance likely to occur on 'Day 1' of operation. These assumptions should be clearly stated and guided by the building/room type and discussions between architect, client and lighting professional. Consideration may also need to be given to the site topography, and differences in ground levels between key features and lit areas or buildings. It is acknowledged that in many circumstances, only a 'best effort' can be made in terms of accuracy of these calculations as it is often not possible to account for all 'real world' conditions and variables which influence light. Note that evidence-based professional judgement is needed to assess whether light from windows should undergo a full assessment, dependent on factors such as the distance between light source and critical habitats
  - Modelled plots should not include any light attenuation factor from new or existing planting, due to the lag time between planting and establishment and the risk of damage, removal or failure of vegetation. This may result in difficulties in the long-term achievement of the screening effect and hamper any post-construction compliance surveys
  - The illuminance contour plots should be accompanied by an explanatory note from the lighting professional to list where, in their opinion, sources of glare acting upon the key habitats and features may occur, and what has been done/can be done to reduce their impacts
- 4.54 **N.B.** It is acknowledged that, especially for vertical calculation planes, very low levels of light (<0.5 lux) may occur even at considerable distances from the source if there is little intervening attenuation. It is therefore very difficult to demonstrate 'complete darkness' or a 'complete absence of illumination' on vertical planes where some form of lighting is proposed on site, despite efforts to reduce them as far as possible and where horizontal plane illuminance levels are zero. Consequently, where 'complete darkness' on a feature or buffer is required, it may be appropriate to consider this to be where illuminance is at or below 0.2 lux on the horizontal plane, and at or below 0.4 lux on the vertical plane. These figures are still lower than what may be expected on a moonlit night and are in line with research findings for the illuminance found at hedgerows used by lesser horseshoe bats, a species well known for its light averse behaviour. <sup>xvi</sup>



## Baseline and post-completion light monitoring surveys

- 4.55 Baseline, pre-development lighting surveys may be useful where existing on or off-site lighting is suspected to be acting on Key and Supporting Habitats and features, and so may prevent the agreed or modelled illuminance limits being achieved. This data can then be used to help isolate which luminaires might need to be removed, or where screening should be implemented, or establish a new illuminance limit reduced below existing levels. For example, where baseline surveys establish that on or off-site lighting illuminates potential Key Habitat, improvements could be made by installing a tall perimeter fence adjacent to the habitat, and alterations to the siting and specification of new lighting, to avoid further illumination.
- 4.56 Baseline lighting surveys must be carried out by a suitably qualified competent person with the correct equipment. As a minimum, readings should be taken at ground level on the horizontal plane (to give illuminance hitting the ground), and in at least one direction on the vertical plane at between either 1.5m or 2m above ground (to replicate the likely location of bats using the feature or site). The orientation should be perpendicular to the dominant light sources, or perpendicular to the surface/edge of the feature in question (such as a wall or hedgerow), in order to produce a 'worst case' reading. Further measurements at other orientations may prove beneficial in capturing influence of all luminaires in proximity to the feature, or principal directions of flight used by bats. This should be discussed with the ecologist.
- 4.57 Baseline measurements should be taken systematically across the site or features in question, with time, date and time of sunset also recorded. They will need to be repeated at intervals to sample across the site or feature, either in a grid or linear transect, as appropriate. The lighting professional will be able to recommend the most appropriate grid spacing.
- 4.58 Measurements should always be taken in the absence of moonlight, either on nights of a new moon or heavy cloud, to avoid artificially raising the baseline. As an alternative, moonlight can be measured at a place where no artificial light is likely to affect the reading.
- 4.59 As all illuminance level contours will be produced from modelled luminaires at 100% output, baseline measurements should, wherever practicable, be taken with all lights on and undimmed, and with blinds or screens over windows removed. Cowls and other fittings on luminaires can remain in place.
- 4.60 Where possible, measurements should be taken during the spring and summer, when vegetation is mostly in leaf, in order to accurately represent the baseline during the principal active season for bats, and to avoid artificially raising the baseline.
- 4.61 The topography of the immediate surrounding landscape should be considered in order to determine the potential for increased or decreased light spill beyond the site.

### Post-construction/operational phase compliance-checking

- 4.62 Post-completion lighting surveys are often required where planning permission has been obtained on the condition that the proposed lighting levels are checked to confirm they are in fact achieved on site, and test that the lighting specification (including luminaire heights, design and presence of shielding etc.) is as proposed.
- 4.63 All lighting surveys should be conducted by a suitably qualified competent person. They should be conducted using the same measurement criteria and lighting states used in the preparation of the illuminance contour plots and/or baseline surveys, as discussed above. It may be necessary to conduct multiple repeats over different illumination states, or other conditions specific to the project.
- 4.64 Depending on the potential for residual impacts on bats, and the scale of the proposed scheme, it is often appropriate to factor in bat monitoring surveys. These should have the aim of confirming an absence of significant changes in bat presence, species assemblage or behaviour between lit and unlit areas, compared to baseline results. Results should always be reported to the LPA as per any such planning condition. A 'Statement of Conformity' or similar report should be prepared in order to provide an assessment of compliance by the lighting professional, and a discussion of any remedial measures which are likely to be required in order to achieve compliance. Any limitations or notable conditions such as deviation from the desired lighting state, or use of blinds/barriers should be clearly reported. Ongoing monitoring schedules can also be set, especially where compliance is contingent on automated lighting and dimming systems, or on physical screening solutions.

### Conclusion

- 4.65 **In summary**, the importance of integrating avoidance measures (as per the first step of the mitigation hierarchy) into developmental design, cannot be overemphasised. Retaining ecologically functional 'dark corridors' and Key Habitats for bats within schemes (in preference to seeking lighting mitigation strategies), avoids costly and time-consuming additional surveys, mitigation and post-development monitoring. Furthermore, LPAs are likely to favour applications where steps have been taken to avoid such conflicts. This master-planning work needs to be informed by robust ecological survey data and lighting assessments, carried out by the relevant experts at the earliest opportunity in the project. Ultimately, light levels should always be designed to minimise potential environmental impact, and maximise the potential of habitat and species enhancement work, through multidisciplinary working and evidence-based new, or retrofit, scheme design.