



BROWN FISHER
ENVIRONMENTAL
REPORTS 4 PLANNING

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BIODIVERSITY ENHANCEMENT MANAGEMENT PLAN

Midland Distribution Centre
Markfield Road
Groby
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Report Ref: 257232BEMP

Report Date: 18th April 2025



BRIEF

Reports4Planning has been appointed to collate a Biodiversity Enhancement Management Plan to satisfy Condition 24 of Hinckley & Bosworth Borough Council planning permission 20/01284/FUL related to re-development of the site.

The details of the Condition are reproduced below:

24. Prior to occupation of the development, a Biodiversity Enhancement Management Plan (BEMP) shall be submitted to and approved in writing by the LPA. The BEMP shall include the following details:

- A) Description and plan of the features to be created/managed
- B) Aims and objectives of management
- C) Appropriate management options for achieving aims and objectives (including grazing management plan)
- D) Prescriptions for management actions
- E) Work schedule
- F) Tree/hedgerow species to be planted
- G) Ongoing monitoring and remedial measures and timetable for monitoring

The approved plan will be implemented in accordance with the approved details and carried out for a 30 year period from the occupation of the development hereby approved.

Reason: In order to protect wildlife and plant species and their habitats in accordance with Policy DM6 of the Site Allocations and Development Management Policies DPD 2016 and the requirements of the NPPF.

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1.0 INTRODUCTION

1.1 Background

Reports4Planning has been appointed to collate a Biodiversity Enhancement Management Plan to satisfy Condition 24 of Hinckley & Bosworth Borough Council planning permission 20/01284/FUL related to re-development of the site.

1.2 Site Location

The subject site forms a complex of industrial units operated by Keltruck, located on the north western fringes of Groby, Leicestershire, approximately 8 kilometres north west of Leicester city centre.

The site is located at Grid Reference SK 515 308 (451570, 307812).

An aerial view of the site location is shown below in Figure 1.

Figure 1: Aerial Image of Site



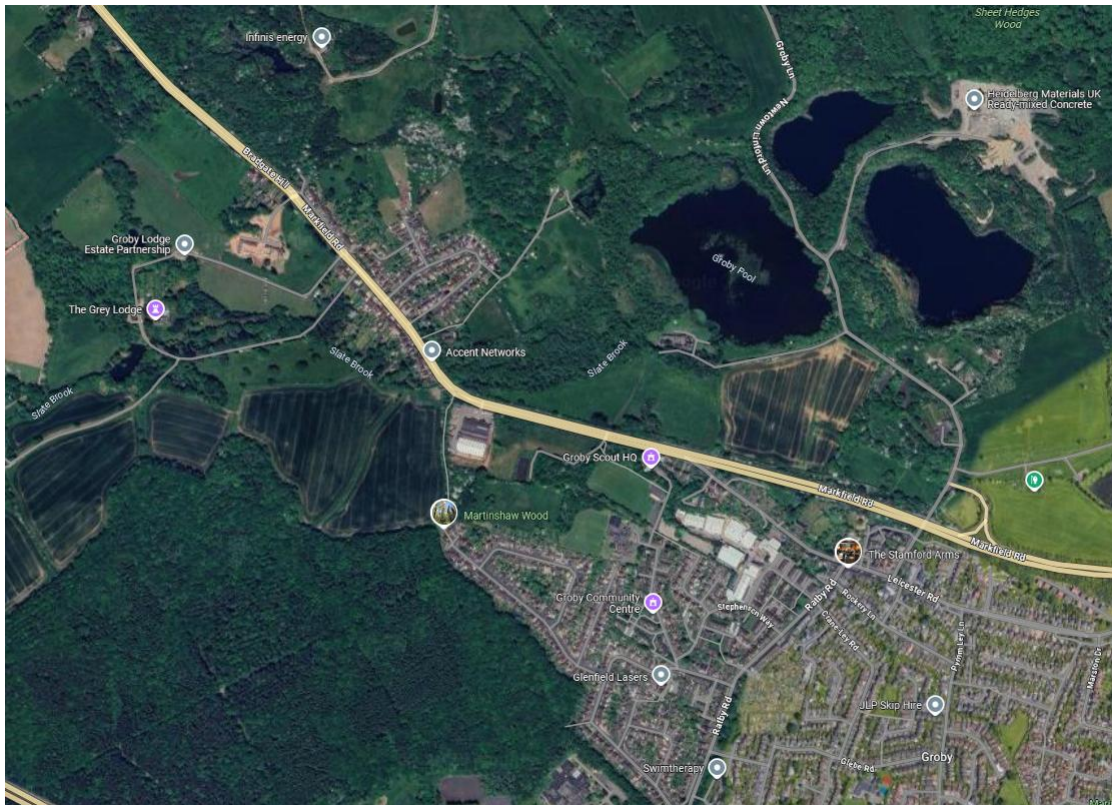
Map data 2025© Google

1.3 Site Description

The proposed development site supports existing industrial facilities and hardstanding, with a variety of land uses in the vicinity (see Figure 2). To the south is an area of deciduous woodland that is impacted by the works. There are areas of previous scrub (native) and grassland that are impacted to the East. However, no ecological or BS5837 tree surveys are available upon which to base recommendations.

The site is bordered to the north by the A50 Markfield Road, beyond which is the Groby Pool and Woods SSSI. The National Forest Way public footpath runs along the western side of the site, beyond which lies arable farmland.

Figure 2: Satellite Image of Local Area around Proposed Development



Map data 2025© Google

1.4 Brief Description of Project

See below and refer to planning application for full details. The development removes areas of grassland and scrub to the north east and also part of the deciduous woodland to the south of the site. Compensation in regard to grassland retention (area as agreed on plan), and shown on landscape plans (ATC Design and Build), new woodland and tree/hedge planting and a new wildlife pond are proposed to offset any losses and to create a net biodiversity gain on the site.

Figure 3: Proposed Site Plan Layout showing Proposed Landscaping



[illegible]

A range of previous documents have been produced that have advised the terrestrial landscaping design, maintenance of retained features and mitigation for specific species, as follows:

-
- 4

2.0 ECOLOGICAL PROTECTION & ENHANCEMENT

2.1 Background

In order to demonstrate sustainable development at the site, there will be 3 main measures:

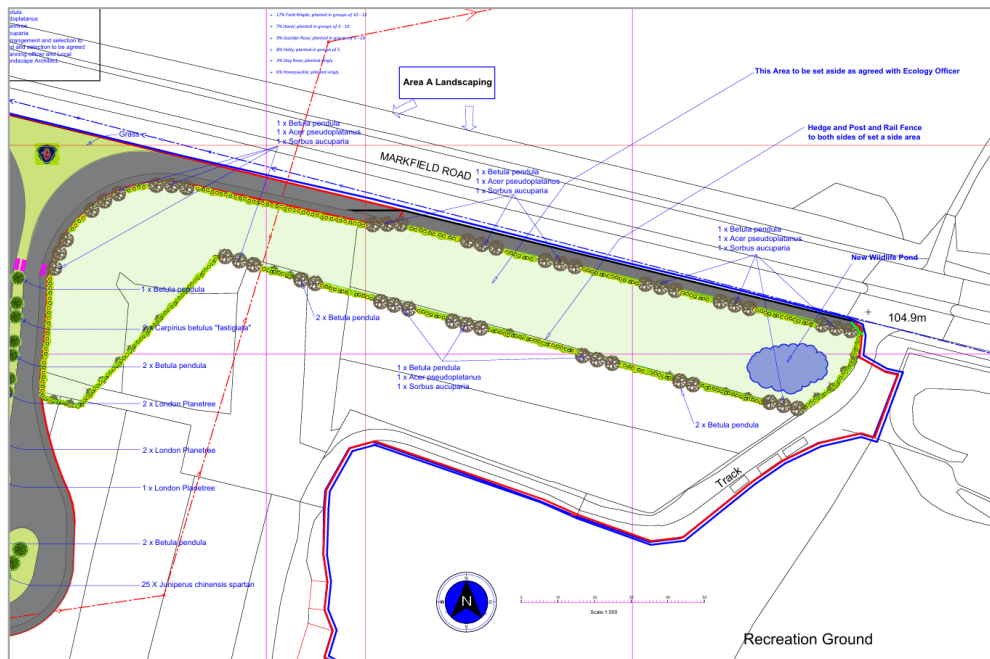
- Precautionary measures during development (specified within the CEMP) - refer to Construction Environmental Management Plan (R4P 257232CEMP) for further details.
- Improved biodiversity management of existing woodland and new woodland creation - refer to Woodland Maintenance & Management Plan (R4P 257232WMP) for further details.
- Ecological enhancements on-site mainly delivered through the terrestrial landscaping scheme, new wildlife pond, augmented by a number of bird/bat boxes attached to the new build.

The following sections focus on the on-site ecological enhancements.

2.2 Specific Habitat Enhancement Measures

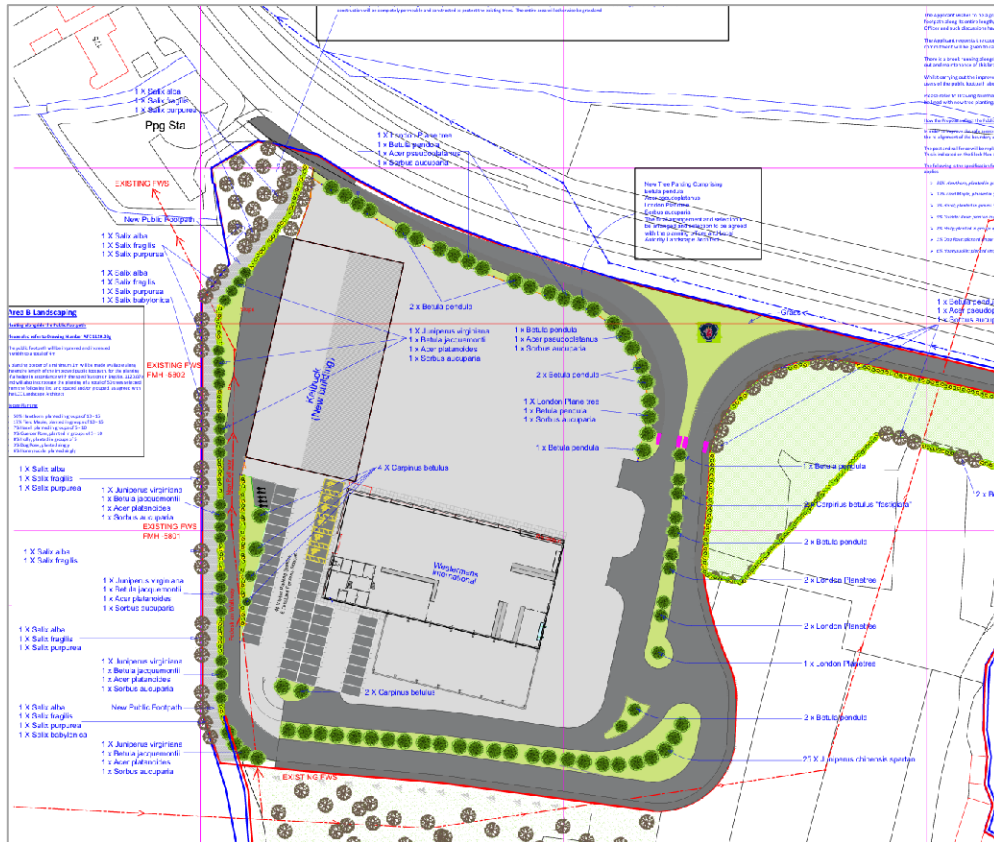
The opportunities for site enhancement lie in the following main areas:

- Set-aside area of grassland (to be agreed with Local Planning Ecologist) management objectives and works.
- Landscape planting using native species (specified in landscape plans).
- New wildlife pond creation.
- Introduction of bat and bird friendly native planting schemes and wildflower hedgerow edge mix seeding.
- A number of bird and bat boxes to be attached to the built structures.
- Bat-friendly lighting schemes.



4.0 LANDSCAPE PLANTING

Figure 6: Landscaped Areas



The landscaping at the site will be as specified in Landscape Plans (ATC Design and Build), supplemented by wildflower planting on all disturbed ground areas (except where specified otherwise), and native shrub and hedgerow marginal planting along the footpath to the west of the site.

The landscape design plan will be amended in accordance with this Biodiversity Enhancement Management Plan to ensure it complies with the requirements set out here and submitted for discharge of the relevant Planning Condition.

4.1 Wildflower Planting

This will be Emorsgate EL1 flowering lawn mixture (or equivalent) to be used on all disturbed ground, except where specified otherwise.

Composition of Emorsgate EL1 Mixture

EL1 is a complete mix composed of 20% wild flowers and 80% slow growing grasses (by weight). The flower and grass components are also available to order separately as EL1F for the flower component and EG1 for the grass component. For quicker establishment of grass cover EL1 may be sown with an additional 10g/m² EG1 or lawn mixtures EG21 or EG22. Higher grass sowing rates will however reduce the time and space available for flower establishment, especially in good growing conditions.

Wild Flowers 20%

- 1.0 *Betonica officinalis* – Betony
- 2.4 *Centurea nigra* – Common Knapweed
- 1.2 *Galium verum* – Lady's Bedstraw
- 0.8 *Leontodon Hispidus* – Rough Hawkbit
- 2.4 *Lotus corniculatus* – Birdsfoot Trefoil
- 2.8 *Plantago lanceolata* – Ribwort Plantain
- 0.8 *Primula veris* – Cowslip
- 1.2 *Ranunculus acris* – Meadow Buttercup
- 0.4 *Salix silaus* – Pepper Saxifrage
- 0.4 *Vicia cracca* – Tufted Vetch
- 5.0 *Medicago lupulina* – Black Medic (Ag)
- 5.0 *Trifolium repens* – Small Leaved White Clover (Ag)

Grasses 80%

- 8.0 *Agrostis capillaris* – Common Bent (Ag)
- 1.0 *Carex flacca* – Glaucous Sedge
- 39.0 *Cynosurus cristatus* – Crested Dogstail (Ag)
- 28.0 *Festuca rubra* – Red Fescue (Ag)
- 4.0 *Phleum bertolonii* – Smaller Cat's-tail (Ag)

4.2 Native Shrub Mixture (To West of Site)

There are opportunities for mitigation native shrub planting within the site, which could contribute additional species and structure. The recommended mixture is below:

Hawthorn	<i>Crataegus monogyna</i>
Blackthorn	<i>Prunus spinosa</i>
Hazel	<i>Corylus avellana</i>
Holly	<i>Ilex aquifolium</i>
Field maple	<i>Acer campestre</i>
Guelder rose	<i>Viburnum opulus</i>
Wild privet	<i>Ligustrum vulgare</i>
Field rose	<i>Rosa arvensis</i>
Dogwood	<i>Cornus sanguinea</i>
Crab apple	<i>Malus sylvestris</i>
Spindle	<i>Euonymus europaeus</i>

4.3 Hedgerow Marginal Grassland

The seeded hedgerow marginal grassland along the public footpath area (W of site) is Emorsgate EH1. EH1 is a complete mix composed of 20% native wild flowers and 80% slow growing grasses (by weight).

Wild Flowers 20%

Agrimonia eupatoria – Agrimony
Alliaria petiolata – Garlic Mustard
Arctium minus – Lesser Burdock
Anthriscus sylvestris – Cow Parsley
Carex echinata – Star Sedge
Centaurea nigra – Common Knapweed
Chaerophyllum temulum – Rough Chervil
Cruciata laevipes – Crosswort
Daucus carota – Wild Carrot
Dipsacus fullonum – Wild Teasel
Filipendula ulmaria – Meadowsweet
Galium album (*Galium mollugo*) – Hedge Bedstraw
Geranium pratense – Meadow Crane's bill
Leucanthemum vulgare – Moon Daisy
Origanum vulgare – Wild Marjoram
Primula veris – Cowslip
Rumex acetosa – Common Sorrel
Saponaria officinalis – Soapwort
Silene dioica – Red Campion
Silene vulgaris – Bladder Campion
Torilis japonica – Upright Hedge-parsley
Vicia cracca – Tufted Vetch

Grasses 80%

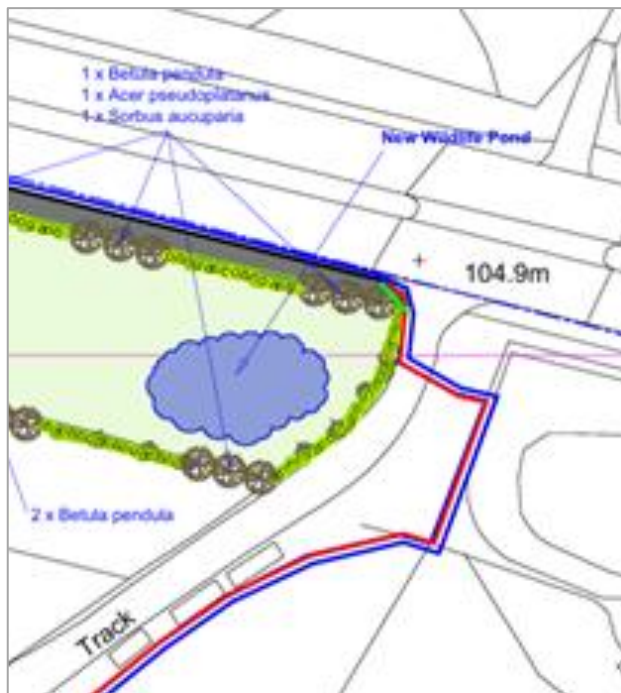
Agrostis capillaris – Common Bent (Ag)
Anthoxanthum odoratum – Sweet Vernal-grass
Brachypodium sylvaticum – False Brome
Cynosurus cristatus – Crested Dog's-tail
Deschampsia cespitosa – Tufted Hair-grass
Festuca rubra – Red Fescue
Poa nemoralis – Wood Meadow-grass

5.0 WILDLIFE POND AREA

On-site pond creation location and form, including artificial refugia - this comprises a pond, designed to be used by great crested newts

The plan below shows the on-site wildlife pond form and location:

Figure 7: Wildlife Pond Area



It is likely that this pond will become an enhancement for great crested newts on the site and as such the creation/management will follow the guidance provided in Appendix 1 of this plan in addition to that stated below.

We recommend that new wildlife mitigation and habitat creation is made in the pond area, and should be designed to maximise its potential for wildlife including breeding amphibians, invertebrates and birds. No fish should be stocked in the ponds. A variety of native aquatic and marginal plants should be planted. A specific detailed plan for the pond scheme will be provided.

5.1 Suggested Plants

The following table provides suggestions as to what plants to consider for the wildlife pond and which to avoid:

Avoid aggressive plants, such as:	DO NOT PLANT any of the following invasive non-native plants
Branched bur-reed (<i>Sparganium erectum</i>)	Canadian pondweed (<i>Elodea canadensis</i>)
Bulrush (<i>Typha latifolia</i>)	Curly waterweed (<i>Lagarosiphon major</i>)
Greater pond sedge (<i>Carex riparia</i>)	Floating pennywort (<i>Hydrocotyle ranunculoides</i>) often supplied as Marsh pennywort (<i>Hydrocotyle vulgaris</i>)
Reed canary-grass (<i>Phalaris arundinacea</i>)	New Zealand swamp-stonecrop (<i>Crassula helmsii</i>)
Reed sweet-grass (<i>Glyceria maxima</i>)	Nuttall's pondweed (<i>Elodea nuttallii</i>)
Greater spearwort (<i>Ranunculus lingua</i>) – never introduce into small ponds	Parrot's-feather (<i>Myriophyllum aquaticum</i>)
	Water fern (<i>Azolla filiculoides</i>)

Erect marginal plants to consider	Low-growing marginal/aquatic plants to consider
Flowering-rush (<i>Butomus umbellatus</i>)	Amphibious bistort (<i>Persicaria amphibia</i>)
Gipsywort (<i>Lycopus europaeus</i>)	Brooklime (<i>Veronica beccabunga</i>)
Great water-dock (<i>Rumex hydrolapathum</i>)	Fleabane (<i>Pulicaria dysenterica</i>)
Hemp agrimony (<i>Eupatorium cannabinum</i>)	Floating sweet-grasses (<i>Glyceria</i> spp.)
Lesser reedmace/lesser bulrush (<i>Typha angustifolia</i>)	Marsh foxtail (<i>Alopecurus geniculatus</i>)
Marsh woundwort (<i>Stachys palustris</i>)	Marsh marigold (<i>Caltha palustris</i>)
Pendulous sedge (<i>Carex pendula</i>)	Meadowsweet (<i>Filipendula vulgaris</i>)
Purple loosestrife (<i>Lythrum salicaria</i>)	Water forget-me-not (<i>Myosotis scorpioides</i>)
Rush (<i>Juncus</i> spp.)	Water mint (<i>Mentha aquatica</i>)
Yellow iris (<i>Iris pseudacorus</i>)	Watercress (<i>Nasturtium officinale</i>)

5.2 Artificial Refugia

Purpose-built hibernacula for amphibians could be created in the hedgerow areas near the new pond, to provide enhanced habitat. This would provide cover, shelter and hibernation habitat for amphibians. Two will be created on site edges, although for great crested newt mitigation more may be required. As part of the mitigation required for great crested newts, artificial refugia will be created.

6.0 WILDLIFE FRIENDLY PLANTING

6.1 Principles

The following general principles will be adopted in order to enhance the value of planting schemes:

- Choose species which when planted together maximise flowering and fruiting periods to benefit invertebrates and birds.
- Wildlife habitats and informally landscaped areas should be planted with native species of local provenance wherever possible.
- Encourage natural regeneration wherever possible.
- Where appropriate, plant wet scrub and woodland.
- For best results planting should be carried out between November and March.
- Density and pattern of planting varies according to circumstances. Irregular, wide spacing of no more than 2/m² for shrubs and 10m spacing for trees creates a natural appearance, encourages natural infill and hence a diverse stand structure.
- In formal areas, mulching to suppress weed growth is important, as chemical control near water may pollute water and is likely to require consent from the Environment Agency.
- Once established, blocks of shrubs may be enhanced with appropriate herbaceous native plants; typically these are likely to be shade tolerant woodland species. They might be added either through direct seeding or plug planting at around 2/m².
- Spacing herbaceous plants at 3/m² will allow plants sufficient room to develop naturally.
- Good preparation and after care are critical; consider creating a planting plan for the SuDS.

6.2 Planting Plans

Planting plans should ensure that plant choice and location:

- prevent erosion of soil surfaces
- trap silt and prevent re-suspension
- filter and treat pollution
- provide wildlife habitat
- provide visual and landscape benefits.

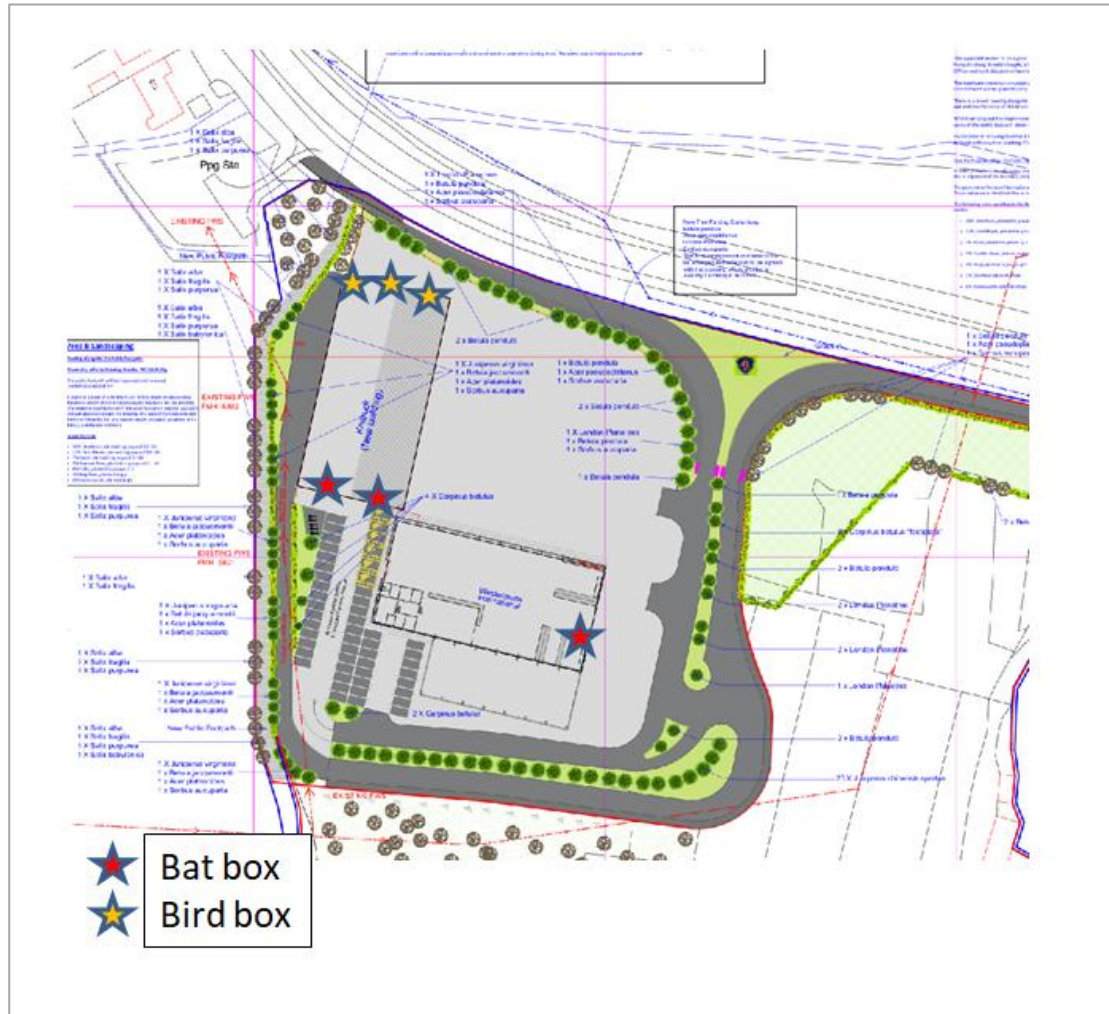
6.3 General Requirements

- Filter strips and swales normally require turf to be laid over 100–150mm of topsoil, sometimes (but not always and especially not if the objective is to create a wildlife-rich wetland swale) with a gravel under-drain to ensure water soaks quickly into the ground or flows to a convenient detention area.
- Detention and retention basins are simple depressions in the ground with a grass surface but can feature extensive wet areas that can be planted with native wetland plants or where natural recolonisation can be encouraged. • Ponds are basins designed to fill naturally with water in clay soils or can be lined to ensure water stays in the pond most of the year. Design guidance
- All bare soil surfaces should be protected as soon as possible following construction to prevent erosion.
- All other surfaces that will receive direct flows e.g. filter strips, swales, inlets and outlets etc. should be stabilised immediately using turf or similar (e.g. a fully biodegradable coir blanket seeded with native flowers and grasses) prior to commissioning.
- All surfaces adjacent to infiltration structures e.g. filter drains, permeable surfaces or infiltration basins should be turfed.
- All planting must be accessible in order to be easily maintained.
- Wherever possible, all seed and plants to be supplied from an accredited source which specialises in British native plants and can guarantee provenance. However, it may be desirable in some cases to use non-native plants (see Appendix 2 for further advice). Planting of areas adjacent.
- Use wildflower-rich turf to perform the same function. This may be more expensive so to reduce costs, consider using a smaller amount but intersperse this with the amenity turf so that over time, wildflowers can colonise other areas.
- All planting should aim to create permanent ground cover with no bare soil or use of surface mulches.
- Plant with native plant plugs after permanent ground cover has been established in order to bring added plant and wildlife diversity.
- Maintenance should consist of grass cutting and shrub pruning with no weed treatment or bare soil management but keeping inlets and outlets clear at all times.

7.0 BIRD AND BAT BOXES

A number of both bird boxes are recommended to be attached to the new build. The exact location will be confirmed on the architects plans including elevations. General locations are shown below:

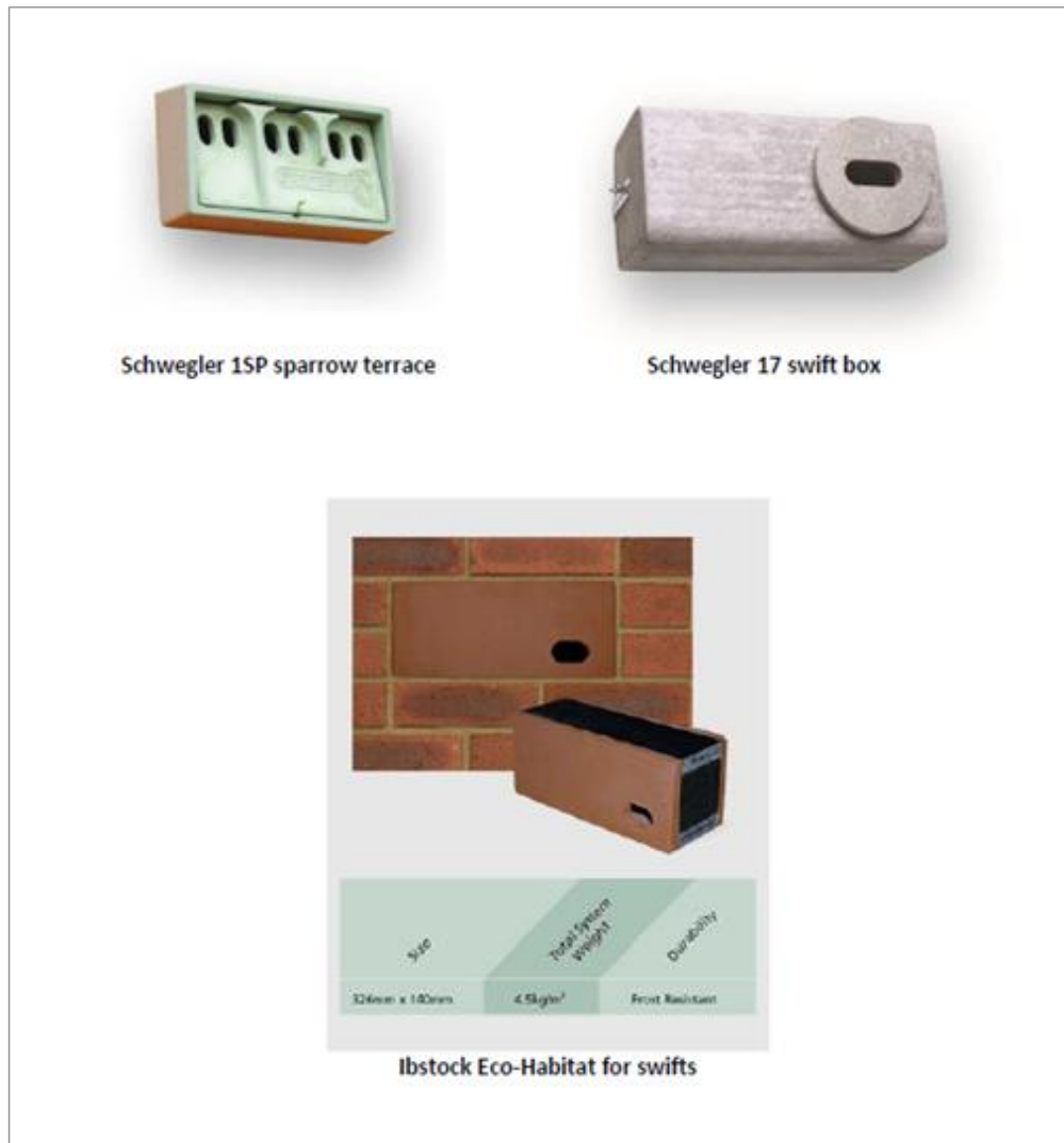
Figure 8: Proposed Locations of Bird & Bat Boxes



7.1 Birds

Bird boxes located beneath the eaves on the north and north east frontage of gables or under soffits, as high as possible (minimum of 4m above ground level), avoiding positions over windows, doors or parking/transit areas. See designs in Figure 9 below, 3 in number , using the Schwegler 17 Swift boxes or equivalent.

Figure 9: Bird Box Specifications



7.2 Bats

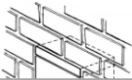
Bat boxes: 3 of Schwegler 1FR bat tube or equivalent, see Figure 10 below.

Bat boxes are to be located beneath the eaves on the south frontage of gables or under soffits, as high as possible (minimum of 4m above ground level), avoiding positions over windows, doors or parking/transit areas.

Figure 10: Bat Box Specifications



Bat Tube 1FR



Bat Tube 1FR

for installation in walls

The tube is designed as a Bat summer roost for bricking-into the external walls of buildings. Due to its small depth of 12.5 cm it is also very suitable for installing in the thermal insulation. The characteristic behavioural needs of building-inhabiting Bat species have been incorporated in the tube principle. A wooden panel on the inside with long-term resistance ensures that the animals can cling onto the wooden side or the opposite panel (made of breathable wood-concrete). This Bat Tube is maintenance-free, as the droppings can fall slowly downwards, via the special droppings chute.

Installation: Install in façades (brick-in or render-in), in concrete (for example, in bridge structures), or retrofit under weatherboarding during renovation work, etc.

Material: open-pored, breathable SCHWEGLER wood-concrete.

Colour: 1FR is delivered in "natural grey". It can be painted at any time with standard breathable façade paint.

Miscellaneous: If bats get inside the building, we recommend the 2FR model.

Entrance: W 15 x H 9 x D 2 cm.

External dimensions: W 20 x H 47.5 x D 12.5 cm.

Weight: approx. 9.8 kg.

Includes: Bat Tube 1FR.

8.0 BAT-FRIENDLY LIGHTING SCHEMES

Any new outside lighting for the proposed development will conform to Bat Conservation Trust (BCT) guidelines and in particular the specifications contained within the BCT guidance document 'Bats and External Lighting', 2018. This guidance was updated in 2023.

The exterior lighting plan for the new proposed development should be sympathetic to the needs of roosting, foraging and commuting bats. All areas towards the interior perimeter of the development should not be illuminated; however, if lighting is required for security only shrouded down lighters used on the lighting poles in these areas should be used or lights should be positioned close to the ground and directed downwards to minimise light spill. The lights should be activated by a time sensor with a low movement sensitivity, so as not to be triggered by wildlife. See general guidance in Appendix 2.

APPENDICES

APPENDIX 1: GUIDANCE ON CREATING WILDLIFE FRIENDLY PONDS (GREAT CRESTED NEWTS)

Guidance on creation of pool suitable for Great Crested Newts (Courtesy of the *Great Crested Newt Handbook*, 2003)

Construction of New Ponds

Constructing new ponds offers exciting opportunities to enhance the wildlife interest of an area. The pond type and its position in the landscape will be determined by a variety of factors and careful advance preparation is necessary. The cost of each stage in the process, including time for adequate research and supervision must be an early consideration. Tests may be needed to determine the suitability of ground conditions. Checking the development of the new pond should take place after construction to detect any adjustments that are needed to ensure its successful establishment.

Siting Considerations

New ponds should ideally be sited within 500m of a known great crested newt breeding pond. The position of purpose-built great crested newt ponds within surrounding terrestrial habitat is important as young newts may disperse for the first time in any direction. There are no fixed rules on minimum inter-pond distances. Two ponds close together can be more practical than two distant ones for some management purposes.

Local climate, soil type and catchment area will determine the amount of water collecting at a given place. This can be relatively easy to predict in heavy clay but quite difficult in more permeable soils and surface drifts, where pockets of mixed soils can cause seepage and reduced pond depth.

In some arable land on less permeable soils such as clay, land drains (perforated plastic or pottery pipes and gravel trenches set below the ploughing depth) have been installed to increase the rate of land drainage and so help to promote crop growth. Land drains cross fields at regular intervals and can be tapped to increase the water supply to a pond. On gradients, these can act like springs, rapidly filling ponds after heavy rain; many existing ponds have field drains feeding into them. The quality of water being collected is a consideration; it will not always be desirable to tap into drains that take water from land that is being fertilised, as this is likely to lead to nutrification of the pond. Surface run-off and road drains feeding into ponds in urban areas may rapidly affect water quality by introducing pollutants and can also produce dramatic water level increase. Siting ponds in existing habitat such as woodland or grassland will require care to minimise damage to existing wildlife interest. It is important not to site new small ponds too close to trees, as they may become over-shaded and rapidly silted up. The amount of direct sunlight that a pond receives is very important as water temperature and light greatly influence the rate of growth and development of invertebrates, plants and amphibians. When creating ponds in the floodplain consult EA/SEPA.

Designing Ponds for Great Crested Newts

Decisions about the depth and overall shape of new ponds will be influenced by the purpose for which the pond is being built. For example, dew ponds that are also to be used as a livestock drinking supply may be shallower than those on heavy clay soils in arable farmland. The size of a permanent pond (i.e. one that does not or very rarely dries out) will influence both its capacity to sustain adult newts throughout the year and the number of young that can be produced.

In deeper, larger ponds, the water is more buffered from cold air cooling or freezing the upper layers of water than in shallow ponds, especially in spring and autumn. Temperature

influences newt metabolism; ponds in excess of one metre depth are most likely to maintain water temperatures at the bottom that are high enough for newt activity throughout the year. Ponds of less than about 25 square metres surface area tend to have insufficient depth and volume to allow many great crested newt larvae to survive. This may be because of competition, with larvae preying on each other, and bottom dwelling predators being able to find them more easily. Small ponds that are 'topped up' or that receive water from natural sources in late summer may have a better prospect of recruiting young than those that progressively dry out. In conditions where the water table fluctuates greatly, occasional drying out may sometimes favour newts in the long run, as this can result in a large drop in predator numbers, especially fish.

Predicting the variation in pond water levels may require prior survey and testing so that the likely result of high rainfall, and of dry or drought conditions is understood. Altering the profile of a pond after construction may be difficult, although inlet/outlet pipes or ditches can be adjusted.

Excavating and Lining New Ponds

Marking out

Design drawings should show the pond shape and levels, both above and below the proposed average summer and winter water lines. Once the outer edge that is to be dug away has been marked on the ground, any topsoil present can be removed. Topsoil and sub-soil can either be used creatively onsite, for example to make a raised hedge base, or removed from site. The first marginal shelf can then be marked out to assist the excavator driver. Survey equipment may be needed during the excavation, to help check that the levels are correct and that the pond fills as closely as possible to the desired extent.

Excavation and soil disposal

As in pond restoration, an excavator with a large bucket will normally be able to load dumper trucks or lorries with soil. The 'turn around' time for moving soil away will need to be matched to the rate of excavation. The tipping rate can vary, from a few minutes for 'on-site' tipping to an hour or more for disposal some distance off-site. Matching the excavator with appropriate size and number of soil removal vehicles is essential for greatest cost efficiency. An experienced plant operator will be able to suggest appropriate machinery, and provide an estimate for the job to include hourly or daily rates for each machine and costs for driver, fuel and haulage to and from site. If there is local demand, selling topsoil and sometimes sub-soil may offset some of the cost of machinery hire. The demand for soil varies greatly however. The time of year when material can best be disposed of may influence the most cost effective time for you to do the work. Checking all of these details in advance of work starting will pay dividends. EA/SEPA should also be able to offer advice. Favourable weather conditions are extremely important when using heavy machinery to move soil, as wet weather can slow progress or stop work for days or even weeks until the ground dries out.

Factors influencing the siting of new great crested newt ponds:

- 1 Proximity to occupied great crested newt pond/s
 - 2 Suitability of habitat linking existing pond/s to new site
 - 3 Buffer zone habitat (20m radius)
 - 4 Surrounding terrestrial habitat (500m radius)
 - 5 Access for machinery
 - 6 Location of spoil disposal area
 - 7 Aspect to direct sunlight
 - 8 Geology, landform and drainage
-

Pond Linings

In general, artificial pond liners should be avoided for a range of reasons, the most important being that they are costly to renew. In addition, rubber, plastic, concrete and puddled clay linings can all be damaged by the effects of extreme weather conditions, puncturing by sharp objects, plant roots and animal hooves/teeth and other general wear and tear. Problems may also be experienced if surface water cannot all be channelled into the pond (on top of the liner), but instead collects underneath. Nevertheless, artificial liners may be essential on free-draining soils or made-up (disturbed) ground.

If pond linings are to be used, it is important to consider which of the several types available is the most suitable. Consideration must also be given to picking the most appropriate materials to protect the liner from damage. Lining large ponds is best done by specialist firms. Larger ponds are usually lined with heavy duty plastic liners of a type used at landfill sites, sometimes joined using hot-welding techniques. Small ponds up to about ten metres radius can be lined with a single piece of liner. The pond base will probably have to be 'picked-over' by hand to ensure that there are no sharp stones that could puncture the overlying liner. A 'blinding' of sand or other stone-free soil can be used above and below linings to help prevent puncture. Such blinding may be used in conjunction with matting made from polyester or natural materials. Machinery used for excavation can often be used to help lift into place and spread lining materials, before they leave site.

Clay-based matting or puddled clay and cast concrete provide alternatives to plastic and butyl, but advice from experienced pond builders and managers is advised due to the differing constraints and risks in using these linings.

Filling with Water

Ponds dug in late autumn may fill with rain over their first winter, although larger, deep ponds may need two winters to fill naturally. Test filling ponds may sometimes be possible as a check for leakage. Until fully established with plant cover, evaporation from the pond edge can be relatively high, especially in dry summer conditions. Once the final water levels have been established, deep rooting plants can then be placed at the best depth for their development as the water levels rise. Many plants will die or do very poorly if they are planted too deep or subsequently become too deeply submerged.

Planting New Ponds

Approaches to planting newly created ponds vary. In many instances, letting the pond colonise naturally, by chance, with no deliberate planting is the recommended option. The rate of plant arrival is related to the distance from the nearest sources together with other plant dispersal variables. Permitting natural colonisation in this way may mean that it can take many years for ponds to reach their maximum plant species richness, and remote ponds are more likely to have low plant species richness.

For great crested newt projects that involve the recovery of very small populations, or at introduction sites where animals may be released, some planting may be necessary, but must be carried out only with careful planning and rigorous checks throughout. Planting helps to ensure that cover is established relatively quickly, and invertebrate food to sustain the newt population is available (see above photo opposite). Where planting is advised, aquatic plants should be appropriate for the habitat concerned and sourced from nearby ponds, not from outside the local region. Very careful checks are needed to avoid the transferral of fish, or the seeds or fragments of undesirable invasive or exotic plants.

All planting undertaken should be recorded on a planting map that is kept as a part of the pond management records. Most valuable are plants used for egg-laying and cover for newts and invertebrates. It may take up to ten years or more for plants to spread within a

small pond and their position and dominance will fluctuate. Planting at the correct depths and with spacing to allow growth and spread will speed establishment.

Once settled in, pond vegetation can be left to develop undisturbed. There are a few exceptions to this. The removal of introduced, exotic or highly invasive species before they take hold is one such exception. Such work should be timed to minimise disturbance to pond life. While the presence of livestock (e.g. cattle and ducks) in low numbers can help keep ponds 'open', over stocking can cause the disappearance of plant, invertebrate and amphibian species. Where livestock is present at a high density, excessive trampling of pond margins can be avoided by fencing or screening off sections of pond edge on a temporary or permanent basis.

Typical aquatic plant species at great crested newt ponds

Soft rush	<i>Juncus effusus</i>
Meadowsweet	<i>Filipendula ulmaria</i>
Marsh cinquefoil	<i>Potentilla palustris</i>
Purple loosestrife	<i>Lythrum salicaria</i>
Marsh marigold	<i>Caltha palustris</i>
Yellow flag iris	<i>Iris pseudacorus</i>
Water mint	<i>Mentha aquatica</i>
Brooklime	<i>Veronica beccabunga</i>
Water plantain	<i>Alisma plantago-aquatica</i>
Duckweed	<i>Lemna minor</i>
Water forget-me-not	<i>Myosotis scorpioides</i>
Mare's-tail	<i>Hippuris vulgaris</i>
Greater spearwort	<i>Ranunculus lingua</i>
Arrowhead	<i>Sagittaria sagittifolia</i>
Amphibious bistort	<i>Polygonum amphibium</i>
Water crowfoot	<i>Ranunculus aquatilis</i>
Spiked water-milfoil	<i>Myriophyllum spicatum</i>
Common water starwort	<i>Callitriche stagnalis</i>
Fennel-like pondweed	<i>Potamogeton pectinatus</i>
Common hornwort	<i>Ceratophyllum demersum</i>
Frogbit	<i>Hydrocharis morsus-ranae</i>
Curled pondweed	<i>Potamogeton crispus</i>
White waterlily	<i>Nymphaea alba</i>
Water soldier	<i>Stratiotes aloides</i>
Willow moss	<i>Fontinalis antipyretica</i>
Cuckoo flower or lady's smock	<i>Cardamine pratensis</i>

Artificial Refugia

Purpose-built hibernacula for amphibians could be created in the hedgerow areas near the new pond, to provide enhanced habitat. This would provide cover, shelter and hibernation habitat for amphibians. 2 to be created on site edges, though for the great crested newt mitigation more may be required. As part of the mitigation required for great crested newts, artificial refugia will be created.

APPENDIX 2: LIGHTING GUIDANCE

MITIGATION OF LIGHTING IMPACTS ON BATS

- **Type of lamp (light source):** The impact on foraging and commuting bats can be minimised by the use of low pressure sodium lamps or high pressure sodium instead of mercury or metal halide lamps where glass glazing is preferred due to its uv filtration characteristics.
- **Luminaire and light spill accessories:** Lighting should be directed to where it is needed and light spillage avoided. This can be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvres and shields to direct the light to the intended area only. Planting can also be used as a barrier or manmade features that are required within the build can be positioned so as to form a barrier.
- **Suitable examples shown below:**

Double Asymmetric Luminaire



Simple Hood



- **Lighting column:** The height of lighting columns in general should be as short as is possible as light at a low level reduces the ecological impact. However, there are cases where a taller column will enable light to be directed downwards at a more acute angle and thereby reduce horizontal spill. For pedestrian lighting this can take the form of low level lighting that is as directional as possible and below 3 lux at ground level.
- **Light levels:** The light should be as low as guidelines permit. If lighting is not needed, don't light. **Timing of lighting** The times during which the lighting is on should be limited to provide some dark periods. Roads or trackways in areas important for foraging bats should contain stretches left unlit to avoid isolation of bat colonies. These unlit stretches should be 10 metres in length either side of commuting route.
- **Security lighting power:** It is rarely necessary to use a lamp of greater than 2000 lumens (150 W) in security lights. The use of a higher power is not as effective for the intended function and will be more disturbing for bats.
- **Movement sensors:** Many security lights are fitted with movement sensors which, if well installed and aimed, will reduce the amount of time a light is on each night. This is more easily achieved in a system where the light unit and the movement sensor are able to be separately aimed. **Timers** If the light is fitted with a timer this should be adjusted to the minimum to reduce the amount of 'lit time'.

- Aim of light: The light should be aimed to illuminate only the immediate area required by using as sharp a downward angle as possible. This lit area must avoid being directed at, or close to, any bats' roost access points or flight paths from the roost. A shield or hood can be used to control or restrict the area to be lit. Avoid illuminating at a wider angle as this will be more disturbing to foraging and commuting bats as well as people and other wildlife.

Suitable types are shown below (note that these are wall mounted and directed downwards)

Circular Louvre



Cowl & Louvre



Cowl (or Hood)



References: Bats and lighting BCT guidance and Guidance notes for the reduction of obtrusive lighting.