



Ecological Mitigation and Management Plan, Condition 13

Land at Bilsham Road, Yapton

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LIABILITIES:

Whilst every effort has been made to guarantee the accuracy of this report, it should be noted that living animals and plants are capable of migration/establishing and whilst such species may not have been located during the survey duration, their presence may be found on a site at a later date.

This report provides a snap shot of the species that were present at the time of the survey only and does not consider seasonal variation. Furthermore, where access is limited or the site supports habitats which are densely vegetated only dominant species maybe recorded.

The recommendations contained within this document are based on a reasonable timeframe between the completion of the survey and the commencement of any works. If there is any delay between the commencement of works that may conflict with timeframes laid out within this document, or have the potential to allow the ingress of protected species, a suitably qualified ecologist should be consulted.

It is the duty of care of the landowner/developer to act responsibly and comply with current environmental legislation if protected species are suspected or found prior to or during works.

1.0 Introduction

Background

- 1.1 The Ecology Partnership was commissioned by Bilsham Road LLP to develop an ecological management and mitigation report to support the discharge of condition 13. Permission has been granted for the development and associated works under reference Y/91/17/OUT with Condition 13 pertinent to ecology:

‘Prior to the commencement of construction works or any preparatory works for any phase an Ecological Management and Mitigation Plan including a Schedule of Works for that phase shall be submitted to the Local Planning Authority for approval. All approved details shall then be implemented in full and in accordance with the agreed timings and details.

Reason: This condition is necessary to ensure the protection of wildlife and supporting habitat and secure opportunities for the enhancement of the nature conservation value of the site in line with national guidance and Policy ENV SP1 and ENV DM5 of the Arun Local Plan. It is considered necessary for this to be a pre-commencement condition because of the need ensure measures are in place to protect wildlife and habitats on site prior to any disturbance.

Site Context and Status

- 1.2 The is situated along the southern boundary of the West Sussex village of Yapton. The site is set within a semi-rural landscape surrounded by agricultural land as well as commuter towns and villages. The immediate surroundings consist of residential dwellings to the north and east, and arable fields with hedgerows to the south and west. The site was dominated by arable land with one field considered to be semi improved grassland. The grid reference is SU 9702 4989.
- 1.3 The approximate red line boundary of the site is shown below in Figure 1 overleaf.



Figure 1: Approximate location of the redline boundary.

Description of Proposed Development

- 1.4 The strategic allocation SD7 in the local plan is for up to 550 dwelling with public open space provision. The master plan includes provision areas for recreation and children's play, enhancing the pedestrian and cyclists connectivity through the site, provision of landscape structure and the creation of new focal green spaces.
- 1.5 The site was surveyed to assess its ecological value and to ensure compliance with national and local plan policies. The reports were produced with reference to current guidelines

for preliminary ecological appraisal (PEA) (CIEEM 2013) and in accordance with BS 42020:2013 Biodiversity – Code of Practice for Planning and Development.

Purpose and Objectives

- 1.6 This document is designed to discharge Condition 13 of the outline planning permission and to ensure that adequate mitigation for protected species is incorporated into the design of the scheme.
- 1.7 The aims, objectives and use of this document are to provide detailed information regarding the ecological mitigation and enhancements required. This describes the checking and monitoring that would be implemented to ensure works are being undertaken in accordance with requirements, together with measures to ensure that appropriate corrective actions or mitigation measures are taken. Details regarding enhancements, habitat creation and management are also included with a view to significantly increase the biodiversity on site post-development.

2.0 Surveys and Results

- 2.1 A PEA was conducted on the 25th October 2015, 16th August 2016 and the 25th June 2019 which was supported by a desk top study, with both on line mapping services and through the purchase of biological records from Sussex Biological Records Centre.
- 2.2 Biological records identified the presence of slow worms, common lizards, grass snake and water voles within 1.5km of the site. GCNs and dormice records were located over 2km from the site. Bat species included serotine, natterer's bat, noctule and common pipistrelle.
- 2.3 The PEA identified that the site was dominated by arable land, with a single field within the red line boundary supporting semi improved grassland habitat. Grassy buffers were located around the edges of the arable fields. Hedgerows and tree lines, including mature oak, were present. These features were considered the most significant in terms of the habitats on site.

2.2 As a result of the PEA, the following species-specific surveys were conducted across the site.

Faunal Group	Survey Methodology	Guidance	Results
Bats – tree inspection	As part of the habitat surveys, any trees supporting particular features likely to be of value to bats, such as splits, cracks, rot holes, coverings of ivy, peeling bark or similar, were recorded. The potential for the trees to support roosting bats has been assessed in accordance with the criteria set out in the Bat Conservation Trust guidelines (BCT, 2012 and subsequently 2016) Conducted: October 2015 August 2016 June 2019	Bat Surveys – Good Practice Guidelines' (Bat Conservation Trust, 2012); The surveys followed BCT guidelines (2016).	A total of 19 trees were identified on site as having potential to support roosting bats (target noted on the habitat map); 13 were classified as 'low' and 6 as 'moderate' potential.
Bats – activity surveys	Several dusk surveys and the use of remote recording (anabat surveys) across the site using transect methods and stops for recording activity as per Bat Conservation Trust guidelines (BCT, 2016) Conducted: May, July, August and September 2016 as well as July and September 2019 Anabat Express were deployed on site in May, July and September 2016 as well as in July and September 2019	The surveys followed BCT guidelines (2016).	The site was found to support a range of bat species. The majority of bat passes were from common pipistrelles. Lower levels of soprano pipistrelles, noctule, <i>Myotis spp.</i> and serotine activity was also observed by the surveyors. These species of bat were not considered to be utilising the site as key foraging or commuting areas. The Anabat surveys displayed evidence of greater use of the site by bats than the activity transects suggest. A greater diversity of species were recorded, as well as a significantly higher frequency of bat passes than the activity transects. The remote bat recording also indicated common pipistrelles as being the most dominant species, however there was also a high frequency of <i>Myotis spp.</i> and soprano pipistrelles passes on certain nights of recording. Nathusius pipistrelle, serotine, noctule and brown long-eared bat species were recorded in lower frequencies, with no brown long-eared being recorded in 2019. Barbastelle bats were recorded in May 2016 only, with none appearing in the 2019 data.
Reptiles	The refugia were placed around the edges of the site adjacent to areas of scrub, hedgerow and within the	The timing and number of surveys	2016-The maximum number of slow worm adults/sub-adults identified in one survey visit was 63, therefore the site is considered

	more developed grassland field margins. Mats were set up prior to the commencement of the reptile survey. A total of seven survey visits were made to the site to check the refugia for the presence of reptiles during each survey, with eight being done in 2019. Visits were only carried out if the weather conditions were suitable for locating reptiles. On each visit to the site, a minimum of one circuit to check all refugia was carried out. Natural refugia were also surveyed during these visits. Any natural refugia, such as log piles and brash piles, were lifted and hand searched for evidence of reptiles. Conducted: May and July 2016 May and July 2019	completed were based on guidelines produced by Froglife (1999) and Gent and Gibson (1998).	to support an 'exceptional' population of slow worms. It was estimated that over 288 individuals were recorded during the 14 visits (7 to each portion of the site), of which about 102 were adults, 81 were sub-adults and 105 were juveniles. No other reptile species were found on-site. 2019- The maximum number of slow worm adults/sub-adults identified in one survey visit was 20, therefore the site is considered to support a 'good' population of slow worms. Overall, an estimated 242 individuals were recorded over the 8 visits, of which about 63 were adults, 47 were sub-adults and 142 juveniles. A single juvenile grass snake was also found to be present on-site, and as such the site is considered to support a 'low' population of grass snakes. No other reptile species were found on-site. As no other species were found during either of the 2016 or 2019 surveys, it is considered that no other species would be present within the red line boundary.
Water voles	The presence/likely absence of water voles and otters is largely determined by field signs. With regard to water voles, this includes: • Latrines; • feeding stations of neatly piled food cuttings; • burrows; • short grazed 'lawns' close to burrows; • runways in vegetation; • footprints; • sightings or sounds of water voles entering the water; and • nests consisting of finely shredded grasses or reeds. Conducted October 2015 August 2016 June 2019	Strachan, R. et al (2011) Water Vole Conservation Handbook. Wildlife Conservation Research Unit, Oxford.	Ditches appeared to be too shallow, and held very small quantities of water. No emergent or bankside vegetation present. No evidence of latrines, burrows or feeding remains found. Records were found 1.5km to the north of the site in 2016. Water voles have a very small range, however; 70m for females and 130m for males. It is therefore considered unlikely that water vole would travel 1.5km to habitat that is less suitable. No further surveys are therefore recommended.

Badgers	During the survey, all habitats potentially suitable for badgers were systematically examined for evidence of badger activity. Particular attention was paid to areas where the vegetation and/or the topography offered suitable sett sites such as embankments and wooded areas. Conducted October 2015 August 2016 June 2019	The evaluation of badger activity was based on methodology developed for the National Survey of Badgers (Creswell <i>et al.</i>, 1990).	No setts, snuffle holes, latrine or dung pits were located within the red line boundary on any of the surveys.
Breeding birds	The site was visited once monthly. A British Trust for Ornithology (BTO) Breeding Birds Atlas method (Balmer <i>et al.</i> 2013) was followed, adapted, through the sub-division of observations by habitat type, to provide information on breeding species and activity for each of the habitats within the site. Conducted: April, June, July 2016	BTO	The survey recorded a total of 21 bird species that were considered to breed or hold territory in habitats within or fringing the site. No annex 1 or schedule 1 species were recorded. Three species were BOCC red list (and UK BAP) were song thrush, starling and house sparrow. With BOCC amber list species swift, common gull and dunno. No ground nesting birds were recorded, albeit skylark were noted off site.

3.0 Site Design

Consultation

- 3.1 The environment officer reviewed the ecological submission (15th January 2018 for Y/91/17/OUT). The officer was happy with the proposed mitigation measures for the reptile surveys, agreed with recommendations with regards to bats (including lighting, commuting corridors), reiterated breeding bird season. Finally enhancements were recommended to be included in a 'habitat and ecological enhancement plan'.
- 3.2 Further recommendations from the officer included; dark corridor for bats creation of freshwater habitats, creation of wetland grasslands, wildflower meadows, strengthening the site's boundary with wildflower edges, retaining hedgerows, inclusion of native species planting, creation of log piles and compost heaps for reptiles, and the use of hedgehog tunnels, nesting boxes for birds and bat tiles, boxes and bricks

Green Infrastructure Development

- 3.3 The allocation falls under two separate ownerships / planning applications, however, ensuring the allocation incorporated a strategic level of green space and green linkages, was considered to be essential ensuring a landscape level approach to green infrastructure. In addition to the creation of a robust infrastructural network, the creation of amenity parks and focal green spaces are also developed within the design, inducing a large central green space within the allocated site.
- 3.6 As such the design of the allocation has included a range of features which are considered to be both of high biodiversity interest, as well as providing strong green infrastructural linkages to the wider landscape and provides high amenity value. The plan provides:
- Rural edges – this provides an ecotone between the built environment and the rural adjacent habitats. The rural edges are to provide new habitats within the site boundaries, such as wildflower areas and feature native tree planting.
 - Retaining hedgerows – these are being retained around the field systems of the Bilsham Road site. A small section of the hedgerow running between the two application areas will be removed, to allow for a central green space and road linkages. However, the retained hedgerows are to be managed sensitively and planted with new species of native value.
 - Retaining TPO trees – mature oaks and other species such as ash, are present within the field edges. These are to be protected and retained within the scheme. These trees are of intrinsic value but also provide a maturity to the landscape and are of high amenity value.
 - Provides new grassland areas / wildflower areas – these are to be provided with the SUDS / swale features and will be seeded with wildflower mixtures suitable for attenuation areas. In additional wildflower areas will be provided. These meadow features provide suitable foraging habitat for a range of bird species and invertebrates, which are not currently present within the red line boundary.
 - Tree lined streets – new tree planting along the new roads will be native and provide green stepping stones within the residential development.

- Focal green spaces (amenity / recreational) – whilst these are to be largely recreation focused, native tree planting within the focal greens, including specimen planting of mature trees, will provide green linkages across the green spaces and additional habitat for a range of species.
- Dark corridors – these will extend around the rural edge of the site, which covers the whole of the south eastern aspect of the site and the northern boundary. This will ensure that the landscape features created can be utilised by a range of protected species and species of interest.
- Wildlife boxes – bird and bat boxes will be included within the development. This will include the use of integral boxes within the built environment. Hedgehog friendly fencing will also be included across the whole of the development.

4.0 Roles and Responsibilities

Ecologists

4.1 The Ecology Partnership will be on site when appropriate to monitor work so that no harm comes to wildlife and also provide advice to site workers about best practices. The Ecology Partnership's duties include, but are not limited to:

- Monitoring site works;
- Provision of status reports and updates as necessary;
- Provision of advice and liaison with workers on site as necessary;
- Identifying environmental risks and developing appropriate environmental controls;
- Delivery of environmental training for site personnel and sub-contractors;
- Liaison with client.

4.2 If an occasion arises which requires advice about a wildlife issue, then the Ecology Partnership's office should be contacted on **01372 364133**.

Site workers

4.3 It is expected that all site workers will act responsibly whilst on the development site and adhere to the wildlife protection zones. All site workers will be briefed on ecological issues

with regards to fence-lines, protection zones and timings. All site workers will receive a toolbox talk (TBT) with relation to protected species and site works.

4.4 All site workers are expected to:

- Dispose of litter in the litter bins provided;
- Report fence damage immediately;
- Report any protected species found within the construction work areas.

4.5 Under NO circumstances must site workers:

- Clear any hedgerow, scrub or trees before being checked for protected species by a suitably qualified ecologist;
- Dump material in uncleared areas and 'wildlife protection zones';
- Move or damage fences;
- Enter fenced off areas ('wildlife protection zones');
- Have fires or store materials in areas not previously agreed;
- Handle or catch animals (unless the animal is in immediate danger);
- Remove or disturb wildlife boxes.

4.6 If any site worker is unsure of any of the above points, then they must refer to the site manager or the site ecologist.

5.0 Method of Works Pre-Construction

Reptile Translocation

5.1 Before any works can take place on site, the areas of suitable reptile habitat which are to be affected by the development need to be cleared of reptiles. Owing to the nature of the proposals and the extent of habitat enhancement included within the scheme, it is considered that reptiles may be adequately maintained within a pre-determined on-site receptor site to be located in the south west corner of the scheme. The on-site receptor site will need to be prepared before this takes place. This means that enhancements to this area will need to be carried out before the reptiles are translocated.

- 5.2 In addition to this, prior to translocation, the proposed receptor site is to be fenced off ensuring that the receptor site is protected during site works. Figure 3 below shows the location of the proposed receptor site.



Figure 3: Indicative fenced receptor site identified in green, with the red line boundary shown

- 5.3 The translocation of reptiles would be undertaken once perimeter reptile fencing had been established. This is to prevent the reptiles from back garden habitats entering the construction area. All retained trees and hedgerows are to be protected in line with arboricultural recommendations throughout construction using Heras fencing or similar.
- 5.4 The reptile fence will be constructed following the standard below (Figure 4).

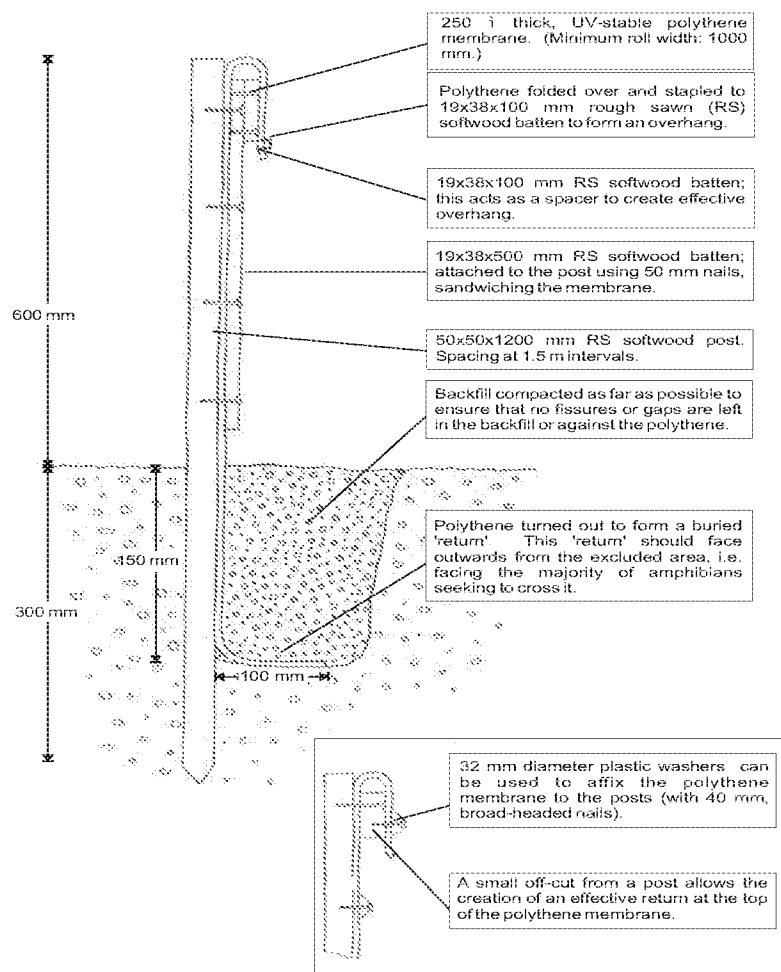


Figure 4: Fence-line standards

- 5.5 Grassland within the receptor site will be left unmanaged to become rank and tussocky with log and brash piles constructed to provide refugia for the translocated reptiles. They are also beneficial for amphibians, small mammals and saprophytic insects. They should consist of varying log shapes and sizes. Figure 5 shows examples of log piles that are to be included.

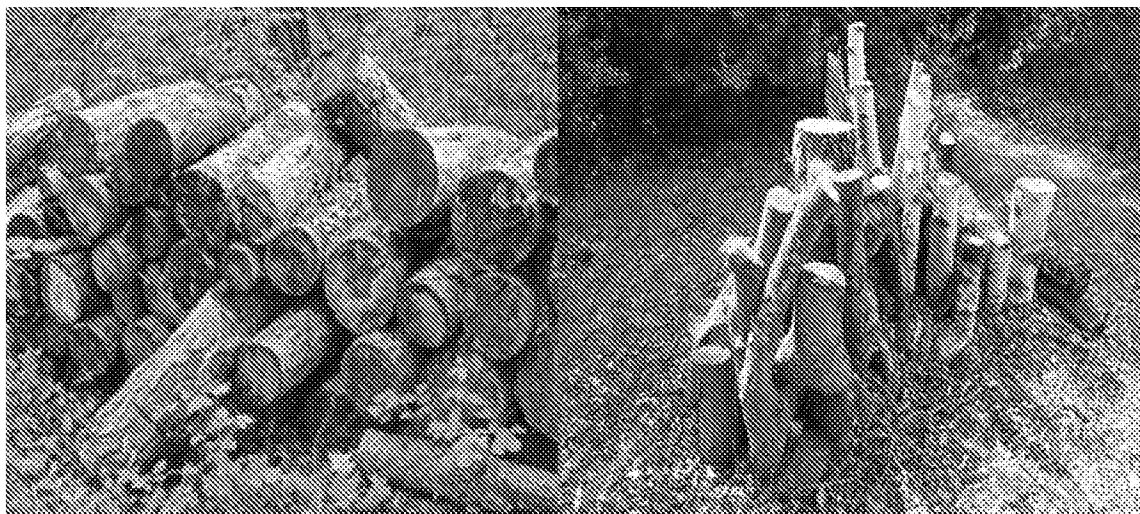


Figure 5: Examples of log and brash piles

- 5.6 With the receptor site ready and the exclusion fence set-up, the remainder of the site (development zone) can be trapped intensively for reptiles. It is recommended that the trapping period is undertaken for 60 days. If 5 consecutive no reptile-catch days have been attained by this time, it can be considered that the area is clear; however, if by this time reptiles are still being captured/seen, then trapping must continue until 5 clear days have been achieved. Trapping will take place in optimal weather conditions, between March and October (inclusive).
- 5.7 Once the trapping has been completed and 5 no catch days have been attained, areas of grassland within the development footprint will then be strimmed to 150mm, checked, and then finally strimmed down to ground level. This will be undertaken under ecological supervision. The arisings can be taken off site or placed in several compost heaps within the retained habitat on the margins or within the receptor site, providing good habitat for breeding slow worms and other reptile species, such as grass snakes.
- 5.8 For the final stage of the translocation process, any natural reptile refugia will need to be dismantled by hand or using sensitive machine work under close supervision of an ecologist.
- 5.9 The mitigation strategy will therefore follow:
- The on-site reptile receptor site will be fenced off and enhanced for reptiles.

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- The site will be trapped until there are 5 clear days. The slow worms will be removed from the development footprint and re-located within the reptile receptor site to the south east of the site. The exclusion fencing and proposed habitat manipulation will prevent them moving back into the construction zone.
 - The reptile receptor site will be monitored during site works by an ecologist to ensure the fence-lines are fit for purpose and that the area is respected as a 'wildlife exclusion area'.
 - Once 5 clear trapping days has been gained, the grass within the development zone will be strimmed.
 - Any areas which support dense vegetation should be removed sensitively under ecological supervision. The process would entail a visual inspection and fingertip search by an ecologist for the presence of reptiles. This is followed by a cut of the vegetation to 150mm above ground. This cut is inspected once more for the presence of reptiles. Finally, vegetation is cut to ground level.
 - Final clearance works and sensitive soil removal will also be carried out under the supervision of an ecologist.
 - Once this is complete, development works can start.

Badger Survey

- 5.10 Prior to any site works the site should be walked and the edges of the site surveyed for the presence of badgers and their setts. The previous surveys did not identify badgers present on site, however, badgers are mobile and as such a precautionary approach should be taken (see General Working Practices).

Vegetation Removal

- 5.11 Breeding birds are likely to use the trees, hedgerows and shrubs on site. The trees and vegetation edge are being retained and left in situ. Any vegetation removal which needs to be carried out should be done outside of the breeding bird season (March-September inclusive) or immediately after a nesting bird check by a suitably qualified ecologist. If active nests are identified, works in the vicinity of the nest must cease until the birds have fledged the nest.

- 5.12 Any ground vegetation clearance works should be undertaken prior to nesting bird season or be undertaken once a walkover assessment of the site has been undertaken.

Protective Fencing

- 5.13 Heras fencing and / or tree protection fencing will be established under the direction of the arboriculturalist around mature trees on the edges of the site and specimen trees present within the redline boundary. These must be retained in situ until after construction and will be removed under advice from the arboriculturalist. The site manager will monitor the fence lines to ensure that they are fit for purpose and ensure that no storage of materials, fires or damage to these areas occur.

General working practices

- 5.14 As badgers and other species such as foxes and hedgehogs maybe present in the wider landscape and have the potential to use the area, best practice guidelines should be followed to ensure that badgers and other mammals such as foxes are not harmed by the construction process;
- Any trenches or excavations on site should be either covered over at night or a plank of wood placed in so as to allow any mammals to escape if the animal were to accidentally fall in.
 - Any open pipes or conduits laid should be blocked off each night to prevent badgers/foxes/hedgehogs from entering them.
 - Construction work should only take place between dawn and dusk with no late evening work. This will reduce possible disturbance to badgers/foxes/hedgehogs as they emerge to forage and also reduce the risk of traffic casualties from late working site traffic.

6.0 Enhancement Details

6.1 The aims of the planting scheme are to:

- Provide for the 'gapping up' of the hedgerow edges;
- To provide new tree cover within the site, both as street trees and within the open space;
- To provide new grassland habitat of higher ecological interest, through the use of wildflower mixtures;
- Create biodiversity interest within gardens and amenity areas, including parks;
- Create new nesting opportunities for birds and roosting opportunities for bats;
- The creation of 'dark corridors' around the edges of the site;
- The creation of suitable reptile receptor sites;
- Provision of features such as log piles and hedgehog homes.

Habitats / Planting

Hedgerows and Trees

6.2 The hedgerows are to be maintained along the edge of the Bilsham Road site where possible. New hedgerow planting will occur on the edges of the wider site and where the housing development abuts the site and 'gapping up' of existing hedgerows will also occur. This will help to improve wildlife corridors around the site for species such as badgers, reptiles, amphibians, small mammals and birds. It is recommended that native species be used including:

- Hazel (*Corylus avellana*)
- Hawthorn (*Crataegus monogyna*);
- Blackthorn (*Prunus spinosa*);
- Field maple (*Acer campestre*);
- Holly (*Ilex aquifolium*);
- Elder (*Sambucus nigra*);
- Privet (*Ligustrum vulgare*);
- Dog rose (*Rosa canina*);
- Honeysuckle (*Lonicera periclymenum*).

6.3 Planting the bases of hedgerows with herbaceous plants and bulbs will attract bees, butterflies and other insects as well as providing ground cover for smaller animals. Seeds that are tolerant of semi-shade should also be used. Appropriate seed mixes can be purchased from native species stockists but usually include the following species:

- Yarrow (*Achillea millefolium*)
- Agrimony (*Agrimonia eupatoria*)
- Garlic mustard (*Alliaria petiolata*)
- Common knapweed (*Centurea nigra*)
- Wild basil (*Clinopodium vulgare*)
- Hedge bedstraw (*Galium album*)
- Wood avens (*Geum urbanum*)
- Oxeye daisy (*Leucanthemum vulgare*)
- Ribwort plantain (*Plantago lanceolata*)
- Cowslip (*Primula veris*)
- Selfheal (*Prunella vulgaris*)
- Red campion (*Silene dioica*)
- Hedge woundwort (*Stachys sylvatica*)
- Upright hedge parsley (*Torilis japonica*)
- Tufted vetch (*Vicia cracca*)

6.4 Any new tree planting within gardens and along the street should use native species of value to wildlife, including:

- Oak (*Quercus robur*)
- Ash (*Fraxinus excelsior*)
- Hazel (*Corylus avellana*)
- Beech (*Fagus sylvatica*)
- Cherry (*Prunus sp.*)
- Hornbeam (*Carpinus betulus*)
- Rowan (*Sorbus aucuparia*)
- Wild service tree (*Sorbus torminalis*)

Wildflower Areas

6.5 The wildflower areas are proposed around the ‘rural edge’ of the site. And include the dry SUDs basins. The creation of wildflower areas would provide opportunities for a range of species, notably invertebrates, birds and common reptiles. It is recommended that the area be sown with a native wildflower seed mix to increase plant diversity and the nectar resource available to insects throughout the year. This mix should be tailored according to the soil type present. A general seed mix should include species such as:

- Yarrow (*Achillea millefolium*)
- Common bent (*Agrostis capillaris*)
- Sweet vernal-grass (*Anthoxanthum odoratum*)
- Betony (*Betonica officianalis*)
- Common knapweed (*Centaurea nigra*)
- Greater knapweed (*Centaurea scabiosa*)
- Wild carrot (*Daucus carota*)
- Foxglove (*Digitalis purpurea*)
- Red fescue (*Festuca rubra*)
- Lady’s bedstraw (*Galium verum*)
- Perforate St John’s-wort (*Hypericum perforatum*)
- Oxeye daisy (*Leucanthemum vulgare*)
- Common bird’s-foot-trefoil (*Lotus corniculatus*)
- Musk mallow (*Malva moschata*)
- Black medick (*Medicago lupulina*)
- Field forget-me-not (*Myosotis arvensis*)
- Ribwort plantain (*Plantago lanceolata*)
- Hoary plantain (*Plantago media*)
- Smooth meadow-grass (*Poa pratensis*)
- Tormenit (*Potentilla erecta*)
- Salad burnet (*Poterium sanguisorba*)
- Cowslip (*Primula veris*)
- Selfheal (*Prunella vulgaris*)
- Bulbous buttercup (*Ranunculus bulbosus*)

- Common sorrel (*Rumex acetosa*)
- Wild clary (*Salvia verbenaca*)
- Red campion (*Silene dioica*)
- White campion (*Silene latifolia*)
- Night-flowering catchfly (*Silene noctiflora*)
- Devil's-bit scabious (*Succisa pratensis*)
- Goat's-beard (*Tragopogon pratensis*)

6.6 Before sowing, the ground needs to be prepared by removing weeds and scoring the ground. Seeds are best sown in March-April or August-September. Plug plants can be used for species that are difficult to establish from seed such as meadow cranesbill (*Geranium pratense*), field scabious (*Knautia arvensis*) and clustered bellflower (*Campanula glomerata*). These should be planted in weed-free soil in late March-April and should be well-watered.

6.7 Log piles (see details below) will be included within the wildflower meadow area to provide new features of interest for local wildlife.

Amenity Grassland / Gardens / Green Space

6.8 Newly formed areas of amenity grassland, such as those along the street and within gardens, should be supplemented by integrating a variety of native plant species. Wildflower seed mixes should be bought from native species stockists and can be tailored according to soil type and shading. These should be sown in areas where mowing is less frequent such as the edges of the gardens and areas in front of the house. Species-rich turf can be sourced to increase the botanical diversity of the gardens. These usually consist of a range of grass species as well as low-growing herbs which are more tolerant of regular mowing.

6.9 Additional habitat can be created for species such as birds and insects in the form of green walls. Climbing plants can be grown onto trellis along the fence line dividing the two gardens. Species which can be planted include:

- Honeysuckle (*Lonicera japonica*; *L. fragrantissima*; *L. standishii*);

- Clematis (*Clematis vitalba*, *C. armandii*, *C. alpina*, *C. montana*, *C. tangutica*);
- Ivy (*Hedera helix*);
- Climbing hydrangea (*Hydrangea petiolaris*);
- Dog rose (*Rosa canina*).

6.10 New gardens will be created as part of the scheme and these should be planted with species of value to wildlife. Shrubs species which are recommended include those which produce flowers and berries such as:

- Box (e.g. dwarf sweet box *Sarcococca hookeriana*);
- Bilberry (*Vaccinium myrtillus*);
- Wayfaring tree (*Viburnum lantana*);
- Sweet briar (*Rosa rubiginosa*);
- Wild privet (*Ligustrum vulgare*);
- Buckthorn (*Rhamnus cathartica*);
- Yew (*Taxus baccata*);
- Various hebes.

6.11 Herbs should include species which provide nectar opportunities for invertebrates such as lavender, jasmine, chamomile, fennel, oregano, evening primrose, thyme, mint and heather.

Wildlife Boxes

6.12 The use of bird boxes on trees within the development will provide new nesting opportunities on site. These boxes will be established on retained trees within the scheme and established on site under the direction of an ecologist. A combination of the following should be erected:

- Schwegler 1B Nest Box / or similar – This box will attract a wide range of garden birds and is made from Woodcrete to ensure that it lasts for decades. Different entrance hole sizes can cater for different species. A total of 10 of these will be established.
- Schwegler 2M Nest Box – This box is similar to the 1B nest box but differs in that it can be freely suspended which protects against predators e.g. cats. A total of 10 of these will be established.

- 6.13 To enhance the local bat population and provide roosting opportunities within the new development, integrated bat boxes/tubes will be incorporated into the structure of the new buildings (Figure 6). The bat tubes should be inserted as high up as possible in the brickwork. Habibat, in association with the Bat Conservation Trust, provide a range of boxes which are unfaced for render or designed to match the brickwork of the building (Figure 6).

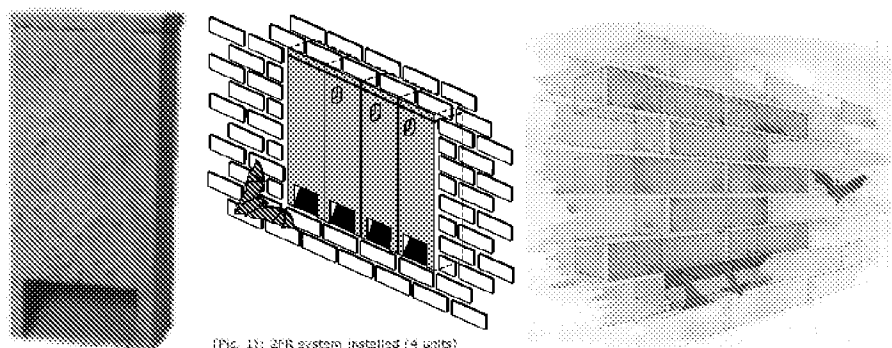


Figure 6: Bat tubes incorporated into the wall of a building to provide roosting space

- 6.14 These integrated bat boxes will be included in house numbers 52, 63, 64, 71, 77, 78, 93, 116, 118, 126, 127, 128, 129, 163, 174, 175, 177, 182.
- 6.15 To enhance the local bat population and provide roosting opportunities within the site, bat boxes can be hung on mature trees around the site. Schwegler boxes have been recommended as these are long-lasting and require no maintenance however, suitable alternatives can be used such as the Vivaro Pro Low Profile Woodstone Bat Box range if there are issues with availability or sourcing of the Schwegler range. The following are examples of boxes which can be used on site:
- Schwegler 2F Bat Box / or similar – These boxes are attractive to small bats such as pipistrelles and long-eared bats and can be hung on trees (Figure 7). A total of three of these should be used.
 - Schwegler 2FN Bat Box / or similar - This is slightly larger than the 2F and provides opportunities for the larger bats such as noctules. These should be hung on mature trees. A total of three of these should be used.

- Schwegler 1FD Bat Box/ or similar - This box has been designed specifically for smaller bats and provides opportunities as a maternity roost (Figure 7). A total of three of these should be used.

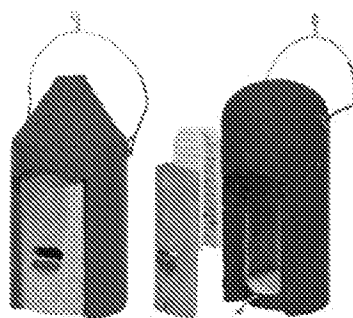


Figure 7: Schwegler 2F (left) and 1FD (right) bat boxes

- 6.16 A booklet should be created for future home owners informing them what the different type of boxes are for and the legal protection surrounding bat roosting sites. The bat boxes which are to be established on the trees, will be located in the retained mature tree line belts, notably on the south western edge of the site. These will be established on site under the direction of an ecologist.

Log piles

- 6.17 Log and brash piles have been recommended for the site to provide refugia and hibernacula for reptiles, amphibians and small mammals. They are also important for saprophytic bryophytes and saprophytic insects. They should be placed in a variety of locations (damp and sunny spots) and next to existing vegetation, such as the hedgerows and orchard edge, so that there is cover immediately adjacent. They should contain a mixture of log piles and shapes with some small diameter material to create a diverse structure. Logs from the sycamore to be felled can be incorporated. A total of 4 log piles will be established in the reptile receptor area, and a further 3 log piles located within the mature tree line on the south western edge of the site.



Figure 8: Examples of log and brush piles

Hedgehogs

- 6.18 This species has suffered substantial decline in recent decades for a variety of reasons, one of which is a decline in suitable habitat and connectivity around developments. Hedgehogs make use of natural log and brush piles in woodland to hibernate in the winter months and so supplementary log piles are to be established around the edges of the site, as well as a number of specific 'hogitat' boxes (as pictured in figure 9) to help hedgehogs find protection from predators. The boxes should be placed on the edges of scrub habitat and partially hidden under brash. A total of 4 of these will be used within the mature treeline belt.



Figure 9: Hedgehog house

- 6.19 Hedgehogs also suffer decline due to isolation of habitats. As such hedgehog friendly fencing be applied across the site (figure 10 below).

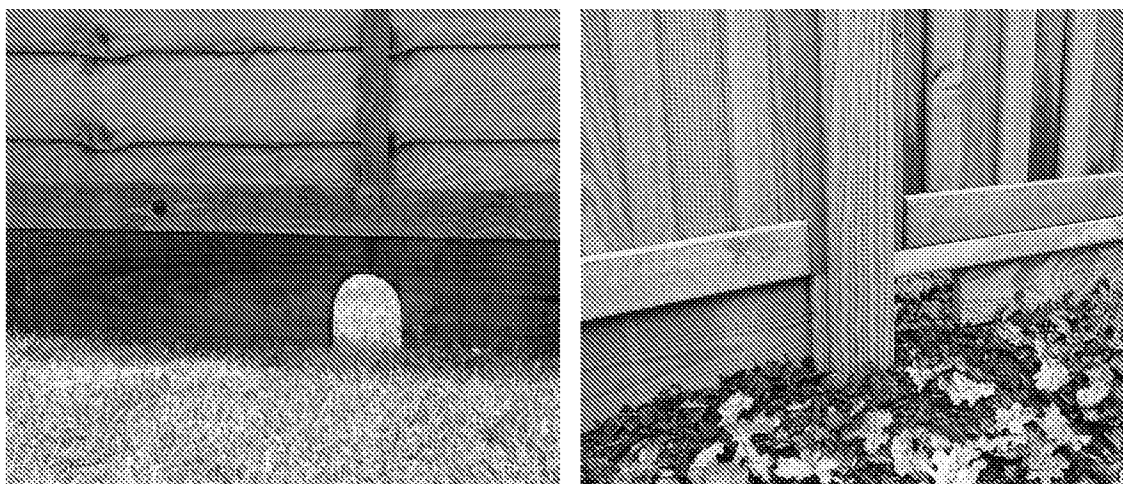


Figure 10: Examples of hedgehog friendly fencing

- 6.20 All adjoining garden fences in plots 33 – 41 and plots 1 – 51, and all plots 52 – 71, 72 – 79, and plots 182 – 205 will be made hedgehog friendly.
- 6.21 These plots will have a 13cm x 13cm hole at the bottom of the fence line to provide a passageway for hedgehogs to travel between gardens and other habitats on site. Fences and walls are one of the main reasons why hedgehog numbers are declining as the amount of land available to them is reduced. To ensure that new residents do not block these ‘highways’, small signs can be erected above the hole, such as those produced by the People’s Trust for Endangered Species (PTES), informing them of their purpose (Figure 11).



Figure 11:: Hedgehog highway sign for fences (hedgehogstreet.org)

Lighting Strategy

6.22 The areas that should be maintained as 'dark corridors' are the rural edges of the site, around the entire edge of the allocation. Maintaining these areas as 'dark corridors' will encourage nocturnal fauna such as bat species away from the lit areas or around lit obstacles such as the internal road network (Stone, 2013). To maintain these areas as 'dark corridors' the following recommendations will be adhered to:

- Lighting will only be installed if there is a significant need, no lighting will be installed along the southern, eastern or western boundaries. Any lighting installed within adjacent areas will have a focused luminance on the target area preventing light spill and unwanted sky glow. It is important to avoid lighting above 90° and 100° with an ideal angle of less than 70°;
- A Variable Lighting Regime (VLR) will be employed across the site where lighting is installed. Lighting will be switched off or significantly dimmed during periods of low human activity (23.30 – 05.30).
- Low-level lighting will be installed which will reduced the volume of the illuminated space (Stone, 2013). Bat species will also be able to fly over the light units within the dark space above.
- Light intensity will be kept low though the use of low pressure sodium lamps or high sodium lamps instead of mercury or metal halide lamps where glass glazing is preferred due to its uv filtration characteristics;

7.0 Post Construction***Fence-line removal***

- 7.1 Once habitat creation and enhancements have been completed within the site and allowed to grow sufficiently, the reptile fence can be removed. This will allow the reptiles to disperse naturally into the surrounding area and beyond.

Habitat Management

- 7.2 Management of landscapes and habitats on site post development will be undertaken by a management company. The management company will be responsible for ensuring that all areas of landscaping (except private gardens) are appropriately managed.
- 7.3 It is recommended that a suitable specialist Landscape Contractor be employed to carry out the works described in this specification. The proposed Landscape Contractor shall be a full member of the British Association of Landscape Industries (BALI) and shall only be selected from the list of approved Contractors.

Trees

- 7.4 The native tree planting should be managed with the following considerations:
- Remove any dead, dying and damaged branches or growth obstruction pedestrian or vehicular routes.
 - Check condition of stakes, ties, guys and shelters and replace broken or missing items until such a time as they become redundant. Adjust if necessary to allow for growth and prevent damage to bark.
 - Undertake Pest and Disease Control using suitable pesticides or fungicides as advised, only if severe infestation occurs.
 - Maintain a wood-free area at the base of all trees, 1m diameter mulch area for trees in grass or planting.
 - Undertake coppicing to selected species on a 5-year cycle or other specialist management operations as specified and leave all arisings on site, to provide dead wood habitat of benefit to wildlife

- Undertake thinning between establishment and maturity unless trees have been planted at their final spacings. Thinning should be commenced when the outermost leaves of crowns are competing for light with leaves of neighbouring trees.
- All works to established trees should be undertaken between September and February to avoid impact on nesting birds. However, when not carrying out works, avoid compacting ground during autumn/winter (wet areas in particular).

7.5 With regards to tree management, the first five years should include the following:

- Watering – Drought stress is common with newly planted trees (in the first three years), particularly when specimens have a large root ball. Dry, windy conditions are especially likely to lead to water shortages so correct watering is essential.
- Weeding – Keep a vegetation-free circle for a least 1m in diameter around the tree to avoid competition for water from weeds, lawns and other plants. Weeding should therefore be undertaken once every two months between April-September for the first three years.
- Mulch – After feeding, apply a layer of mulch around the tree in late winter, which will help to conserve moisture and suppress weeds. Ensure there is a collar of 10cm around the stem of the tree which does not have mulch to prevent the mulch causing the bark to rot.
- Tree guards – It may be necessary to replace the tree guards and eventually they will need to be removed.

7.6 Care should be taken to avoid tree cutting at certain times of the year. Berries and other fruit provide a vital food source for birds and other species throughout the winter. Therefore, cutting should take place as late as possible. Shrubs, hedgerows and trees should only be cut over the winter period to avoid the bird breeding season.

Meadow grassland

7.7 With regards to the grassland meadows on site, the following considerations should be undertaken with regards to management:

- Correct management of all meadow areas needs to be continued in perpetuity by cutting grassland vegetation to a height of no shorter than 100mm-150mm. To

prevent accidental harm to reptiles, this needs to take place between October and March, when reptiles are most likely to be hibernating. Cutting late in the year also means that plants will already have released their seeds, so the arisings can immediately be removed from the site (or drawn together as compost heaps under scrub, hedgerow or tree cover). Arisings must not be left to rot in situ as this will lead to enrichment of the topsoil and decline of ecological value.

- Remove litter, rubbish and other debris from grassed areas prior to cutting.
- Exercise extreme care when working in close proximity to existing/new trees and prevent damage to stems/trunks.
- Do not apply organic or inorganic fertilisers.
- Do not apply insecticides, herbicides or fungicides, as these can harm reptiles and destroy valuable wildlife. The exception is herbicides for the control of specific problem weeds (i.e. nettle, spear thistle, creeping thistle, curled dock, broadleaved dock and ragwort) – herbicides for these species should be applied by weed wiper or spot treatment with a back-pack sprayer.
- Do not plough, level or re-seed the grassland areas – if individual patches become bare, these can be re-seeded with a native species-rich seed mix.
- Do not apply lime as this could affect the range of plants growing in the grassland.
- Avoid compacting ground when wet use of hand-held strimmer where required to avoid trafficking of grass by machine.

7.8 It is recommended that following construction, the grassland around the edges of the site be left to become rough grassland. This will therefore remain unmown to improve habitat structure and provide overwintering sites for insects. Rough grassland eventually produces a litter layer which is valuable for small mammals. Scrub should only be cut back if it begins to significantly encroach on the grassland, since bramble and nettle are important food sources for invertebrates and other wildlife. Where it needs cutting back, it should not be cut all at once to ensure that food sources remain available. In order to maintain the successional habitat, it will be necessary to cut back immature trees periodically (every 10 years or so) to keep an early successional strip of vegetation, which will provide opportunities for a range of wildlife.

Hedgerows

- 7.9 Aftercare of newly planted hedgerows is largely concerned with the correct trimming and management of the hedgerow as well as the suppression of 'weeds'. A hedgerow with a bushy base is the main objective and once this has been achieved, management of existing retained and newly established hedgerows may be reduced to trimming. This should not be performed annually as this prevents flowering and fruiting and the complete length of hedgerow should not be trimmed all at once. Therefore, sections of hedgerow should be trimmed on rotation every 3 years in over the winter months (to avoid the nesting bird season and retain berry crop for wintering birds).
- 7.10 Following construction, a margin is to be left undisturbed adjacent to the hedgerows, ideally 2m wide. These should be planted with semi-shade tolerant species to encourage insects and other wildlife. The margins should be cut in sections bi-annually on a rotational basis to ensure some over-wintering vegetation is always provided. The cuttings should be removed and placed on log piles or compost heaps along the boundaries of the site.

SuDS ponds

- 7.11 The habitats within the SuDS basins will require very little management as this will be left to colonise naturally and cutting of scrub and damp vegetation will be carried out only when needed. This can be monitored when undertaking other management on site.

Wildlife Boxes

- 7.12 Schwegler bird boxes and bat boxes have been recommended; however, where these are not available, additional woodcrete boxes may be used. Bird boxes can be cleared out once a year if considered necessary. This should be done in the winter months, i.e. outside the bird nesting and breeding season.
- 7.13 Bat boxes should not be cleaned out or checked unless a licenced ecologist is present. It is recommended that the boxes are left in situ for several years prior to checking.

8.0 Conclusions

- 8.1 The site has been subject to a range of ecological surveys. These surveys have identified the species using the site and have provide the baseline for the range of enhancements which have been included within the design strategy.
- 8.2 The development would provide robust habitat networks which will ensure continual species use and provide biodiversity gains within the scheme.
- 8.3 It is considered that this report is sufficient to discharge condition 13.

Appendix 1: Signage Examples

WILDLIFE PROTECTION ZONE

**PROTECTIVE FENCING MUST
NOT BE MOVED**

NO UNAUTHORISED ENTRY

NO MACHINERY

NO STORAGE OF EQUIPMENT

QUERIES SHOULD BE DIRECTED TO THE SITE ECOLOGIST

Appendix 2: Programme of Works

	Activity	Period	Ecological supervision required?	Persons involved
Pre-Construction	Update badger walkover and assessment	Immediately prior to construction commencing	Yes	Specialist contractors The Ecology Partnership
	Reptile fence line established around the edges of the site. Reptile receptor area established	Prior to construction commencing	Yes	Specialist contractors The Ecology Partnership
	Reptile translocation for 60 days plus 5 further days	Prior to construction commencing	Yes	The Ecology Partnership
	Protective heras fencing installation around protected trees	Immediately prior to construction commencing	N/A	Contractors
	Clearance of trees and shrub	Immediately prior to construction commencing Outside nesting season (March – September) or under ecological supervision if within the nesting season	Yes	Specialist contractors The Ecology Partnership
	Bird and bat boxes established on the retained trees Log piles created.	Immediately prior to construction commencing	Yes	Specialist contractors The Ecology Partnership
During Construction	Monitoring of heras fencing and the reptile fence line	Weekly throughout construction period	N/A	Site manager
	Monitoring of works including general working practices	Monthly throughout construction period	N/A	Site manager The Ecology Partnership
	Bat boxes set within the buildings	Integral boxes to be inserted into new buildings during construction	N/A	Specialist contractors
Post-Construction	Heras fence and reptile fence line removal	Once construction works have been completed	No	Contractors

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