

PROPOSED DEVELOPMENT OF LAND AT BIRCHALL GARDEN SUBURB

INVERTEBRATE SURVEY

Prepared by:

Philip Parker Associates
White Row Cottage
Leziate Drove
Pott Row
KING'S LYNN
Norfolk
PE32 1DB

Prepared for:

Tarmac Trading Ltd

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CONTENTS

1.0 Background

2.0 Legislation and policy

3.0 Objectives of the survey

4.0 Survey methodology

5.0 Survey results

6.0 Valuation and discussion

7.0 References

Appendix 9.10.1 Complete species list from the 2014 invertebrate survey

Appendix 9.10.2 Distribution of invertebrate records and assessment of relative interest

1.0 BACKGROUND

- 1.1 Tarmac Trading Ltd are in the process of formulating proposals for the development of land near Welwyn Garden City known as Birchall Garden Suburb.
- 1.2 As part of the development process, Tarmac commissioned Philip Parker Associates Ltd (who have undertaken other survey work for them at Panshanger Park) to undertake various surveys to provide baseline ecological information to assist in the Ecological Impact Assessment (EclA) process.
- 1.3 As part of the initial scoping exercise for the site undertaken by Philip Parker Associates, it was determined that an assessment of the invertebrate potential of the site should be required. This report presents the findings of this assessment.
- 1.4 The report should be read in conjunction with Drawing 9.1.1 Ecological survey compartments and ponds.

2.0 LEGISLATION AND POLICY

- 2.1 A number of invertebrate species covered by the UK's domestic wildlife legislation, national biodiversity policies and relevant international statutes. Most of these measures aim to protect vulnerable species, but some invasive alien species are also covered by legislation.
- Internationally protected invertebrate species
 - Information on three international statutes is included in Table 9.10.3. One is a European directive the other two are global conventions. Table 9.10.3 covers only those species that occur in the UK.
 - Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive)
This Directive is implemented in the whole of the UK through The Conservation (Natural Habitats &c.) Regulations 1994 and The Conservation of Habitats and Species Regulations 2010. Three annexes in the Directive list species for which different types of protection are required. The annexes that include invertebrates are:
 - Annex IIa - designation of protected areas required within the natural range of the animal species listed Annex IVa - special protection required for the native animal species listed
Annex Va - exploitation of listed animal species to be subject to management if necessary in order to maintain their favourable conservation status.

- Schedule 2 of the Conservation of Habitats and Species Regulations lists those species of animals included in Annex IV(a) to the Habitats Directive that have a natural range that includes any area in Great Britain.
- It is illegal to trade in any of the species (or any part of the species) listed in Annex IVa of the Directive, whether or not they live in the UK.
- Council of Europe Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention). The Bern Convention was the forerunner of the Habitats Directive. It contains lists of animal and plant species requiring protection, including:
 - Appendix II - special protection required for listed animal species and their habitats
 - Appendix III - exploitation of listed animal species to be subject to regulation through 'appropriate and necessary legislative and administrative measures'.

3.0 OBJECTIVES OF THE SURVEY

3.1 The initial scoping survey of the site undertaken in late March 2014 was used to assess the character and invertebrate potential of all parts of the proposed development site. This was undertaken alongside a parallel scoping survey for botanical interest. On the basis of the combined results of botanical and invertebrate scoping surveys, codings were assigned to each major block of habitat and each boundary feature, except for ponds, which had already been coded. A brief statement was made of the character and potential of each, and the potential usefulness of further survey in determining or refining the interest was assessed. A small number of records were made of early spring terrestrial species and of aquatic invertebrates in a seasonal pond.

3.2 Further survey work was undertaken in June 2014, August 2014 and October 2014, the objectives of the survey being to:

- Re-visit areas assessed by the scoping survey as of greater than unambiguously low invertebrate potential;
- Re-assess habitat quality and invertebrate potential for these areas;
- Make general invertebrate records during the course of the walkover, with note taken of the general area of recording, and more precise details for many species of particular interest;
- Undertake brief targeted recording of areas and features where potential is considered relatively high, or difficult to assess confidently on habitat grounds alone;
- Concentrate survey work on species and groups likely to be of particular interest - especially in specific search for uncommon species for which apparently suitable habitat is present, and groups, such as saproxylic Coleoptera, which are of value in assessment and of potential interest at a landscape scale;

- To identify and list the by-catch of more common and less interesting species during any survey work, within the limits of allotted time;
- Prepare a full list of invertebrate records made, initially as a spreadsheet, summarised as a Word table;
- Build on the descriptions and assessments of potential provided by the scoping survey to provide a revised assessment for each listed compartment, together with a list of any key species recorded from each;
- Provide a summary of overall invertebrate interest, giving overviews by habitat, notes on the habitat requirements of key species recorded, and general comments on long-term management which would maintain or enhance the interest found or expected.

3.3 All sampling used simple, lightweight equipment compatible with efficient walking around the site, and most records were made by sweep-netting, beating, hand search and direct observation, with a lightweight pond net and sieves potentially used for sampling water bodies. Traps were not used. All records were assigned to coded features.

Table 9.10.1 Complete timetable of invertebrate work

Date	Time	Weather	Work
27 and 31 March 2014			Scoping survey; limited recording
10 June 2014	10.30 - 18.00	Fine, warm, sunny, with little wind	Re-visit and invertebrate sampling, north of Cole Green / Birchall Lane
14 June 2014	08.30 - 16.00	Fine, warm, sunny, with little wind	Re-visit and invertebrate sampling, south of Cole Green / Birchall Lane
3 August 2014		Fine, warm, sunny, with little wind	Invertebrate sampling, concentrating on mosaic habitats and grasslands
16 August 2014	10.00 - 17.00	Generally fine, but generally overcast and with brief rain showers towards the middle of the day	Invertebrate sampling, concentrating on water bodies
22 October 2014	09.00 - 17.30	Fine, but overcast and quite cool	Invertebrate sampling, concentrating on woodlands

4.0 SURVEY METHODOLOGY

4.1 Desk Top review

An updated data search was undertaken with HERC on the 30th March 2017. The latest search covers the site boundary plus an area of 2km beyond the boundary. This indicates the following invertebrate records within the area of search.

4.2 The various records are distributed as follows:

Table 9.10.2 Existing invertebrate records

Group	Distance from site boundary
Beetles – 87 Species mainly from the 1950's, 1990's and latest from 2012.	The majority of the records are from Panshanger Park 1470m to the west where this is a history of invertebrate recording
Butterflies – 9 species – The closest records are of small heath from the Common LNR and Cole Green	The closest records are within the site (Cole Green Tip) or adjacent the western boundary (the Common LNR)
Moths – 25 species	Many of the records are from Panshanger Park 1470m to the west although other records closer to the Birchall garden site (most records old as far back as 1961, latest 2013)
Bees and wasp – 3 species	Closest record 1140m from the Birchall Green Site (1993 – 1994)
Grasshoppers – 1 species	Panshanger Park (1955) and Lodge Meadow (2012)
True bugs – 1 species	Panshanger Park (1951)
Fly – 1 species –	Panshanger Park 1470m (1991)

4.3 The National Biodiversity Network Atlas, consulted on the 30th of November 2017, maps 86 records of 39 invertebrate species within the site boundary, dated from 1990 to 2016. These comprise eight water beetles, two terrestrial beetles, one earwig, five water bugs, five terrestrial bugs, ten dragonflies, three grasshoppers and five bush crickets. None has a formal conservation status. There is a wide scatter of records of orthopteroid insects across the site, especially from 1994; dragonfly records for the Holwell Lane Fishing Lake and for ponds in Blackthorn Wood, Holwell Park Wood and Rolls Wood; and lists of water beetles and bugs from ponds in Blackthorn Wood, Holwell Park Wood and Rolls Wood. The remaining records are few and scattered.

4.4 Field Work

Terrestrial invertebrates were sampled using a small range of active methods.

4.5 Sweep-netting

A lightweight folding circular frame 40 centimetres in diameter was fitted with a net bag supplied for sweep-netting by GB Nets and attached to an extending lightweight aluminium handle. Net strokes were reasonably rapid, and penetrated as far into the vegetation as

possible without the stroke being seriously slowed by its resistance. Sweeps were counted as single strokes of the net, either from left to right or right to left. A maximum of fifty sweeps was taken before examining the catch. The contents of the net were initially examined in the net, noting or capturing large, fast-moving or readily identified species. The contents were then sifted through a 0.5 centimetre mesh sieve onto a white tray, and the material in the tray examined for smaller and slower animals.

4.6 ***Beating***

Samples were taken from tree and shrub foliage, ivy, dead branches and dense, tall herbaceous vegetation by holding a sweep-net underneath and tapping the branches or stems above sharply several times with a stout stick. The sweep net currently in use was usually employed for collection of material. For high vegetation and larger branches, a net with a lightweight folding frame 55 centimetres in diameter and a long bag was also used: this net has the advantage that substantial amounts of foliage can be inserted into the net, or a substantial length of tall vegetation placed next to the net, before sampling. Material was initially examined in the net, then emptied onto a white tray for further sorting.

4.7 ***Active search of key features of value for invertebrates***

Features of significance to invertebrates which were not sampled, or not necessarily adequately sampled, by sweeping, beating or suction sampling were investigated by close examination, hand searching and sieving of litter through a 0.5 cm mesh sieve. Attention was particularly paid to: flowering plants providing an important nectar source; dense accumulations of plant litter; dead wood; the undersides of plant rosettes; and bare wet ground.

4.8 ***Direct observation***

A small number of relatively large and readily identified species, especially butterflies, dragonflies, some grasshoppers and crickets, larger hoverflies, bees and wasps, were seen without the need for specific search and either identified from sight or individually captured using a sweep-net.

4.9 ***Methods***

In all methods of sampling some readily identified species were noted in the field. Representative examples of most species were collected for subsequent identification or confirmation. Most were collected using a pooter. A dry pooter made from a flexible polythene sample bottle and a combination of rigid plastic and flexible polythene tubing was used to capture most insects and retain them alive; for spiders, some soft-bodied insects and predacious species which might do serious damage to other material if collected live into a dry pooter, a spider-pooter was used to gather up individual specimens which were then blown direct into a container of 60% propan-2-ol. Dry-pooted material was kept alive until return to

the laboratory. Here it was killed using ethyl acetate vapour, then either identified immediately, or layered between sheets of tissue paper and placed in a labelled plastic box for later examination.

4.10 Aquatic invertebrates were sampled using:

- A standard pond net of side twenty-four centimetres and mesh size one millimetre in deeper water;
- A plastic sieve of seventeen centimetres diameter with a mesh size of approximately one millimetre in dense vegetation and shallow water;
- A plastic sieve ten centimetres in diameter with a mesh size of 0.5 millimetres at water margins and to take secondary samples from areas disturbed by the larger sieve.

4.11 Representative bulk samples obtained by the larger pond net were examined in the net and large and obvious animals extracted immediately. Each sample was then spread on metal grids of mesh size five millimetres suspended over plastic trays, and active animals were allowed to make their own way through the grid for a minimum of ten minutes while the sieves were employed in the capture of additional material from shallower areas and the pond net in a search for additional large and active species. Material remaining on the metal grid was then sorted for less active invertebrates, such as molluscs, and additional larger individuals unable to fit through the mesh of the grid.

4.12 Readily identifiable species were noted immediately and released, though voucher specimens of scarce species were taken even if they could be confidently identified in the field. In samples poor in species and individuals, representatives of the remaining fauna were preserved in 70% propanol-2-ol for later examination. In larger and more varied samples, or those containing a large number of individuals requiring microscopic examination or dissection for identification, a portion of the sample was thinned by removal of large and easily identified species, concentrated by pouring through a fine-meshed sieve, and preserved whole in 70% propan-2-ol.

4.13 Further samples taken with the large net were placed in trays of water and searched for taxa prone to be overlooked by the preceding methods, particularly small soft-bodied animals, caddis larvae and some molluscs.

4.14 **TARGET GROUPS**

The following aquatic invertebrate groups were identified, or would have been if found.

- Tricladida - flatworms
- Mollusca - water snails and mussels
- Hirudinea - leeches

- Larger Crustacea - water lice and freshwater shrimps
- Araneae - spiders
- Coleoptera - water beetles
- Diptera - flies – to family only except for selected groups
- Ephemeroptera - mayflies
- Hemiptera - water bugs
- Lepidoptera - moths
- Megaloptera - alder flies
- Odonata - dragonflies
- Trichoptera - caddisflies.

4.15 The terrestrial survey was taxonomically wide-ranging, but concentrated on those groups considered most likely to be informative as to conservation interest and habitat requirements. Since the survey was approached in as open-minded a way as possible, the default position was to identify any group which it was thought might hold interest. However, the selection of groups, and the relative extent of identification of the various groups, has been limited by expertise. The following groups have been identified:

- Mollusca - snails, slugs
- Oligochaeta - earthworms
- Crustacea - woodlice
- Chilopoda - centipedes
- Diplopoda - millipedes
- Araneae - spiders
- Opiliones - harvestmen
- Pseudoscorpiones - false scorpions
- Coleoptera - beetles
Anthribidae, Apionidae, Biphylidae, Buprestidae, Byturidae, Cantharidae, Carabidae, Cerambycidae, Cerylonidae, Chrysomelidae, Ciidae, Cleridae, Coccinellidae, Cryptophagidae (excluding *Atomaria* and *Cryptophagus*), Curculionidae, Dasytidae, Dermestidae, Elateridae, Endomychidae, Eirrhinidae, Erotylidae, Heteroceridae, Kateretidae, Latridiidae, Leiodidae, Lucanidae, Malachiidae, Melandryidae, Monotomidae, Mordellidae, Nitidulidae, Oedemeridae, Phalacridae, Phloiophilidae, Ptinidae, Rhynchitidae, Salpingidae, Scarabaeidae, Scirtidae, Scaptiidae, Silphidae, Silvanidae, Staphylinidae (except Aleocharinae), Tenebrionidae, Tetratomidae, Throscidae
- Dermaptera - earwigs
- Diptera - flies

Anisopodidae, Asilidae, Bombyliidae, Calliphoridae (a single species); Chloropidae (Lipara only), Clusiidae, Conopidae, Ditomyiidae, Dixidae, Dolichopodidae, Empididae, Heleomyzidae, Hybotidae, Keroplatidae, Lauxaniidae, Limoniidae, Lonchopteridae, Opetiidae, Opomyzidae, Pallopteridae, Pediciidae, Platypoezidae, Platystomatidae, Ptychopteridae, Rhagionidae, Scathophagidae, Scatopsidae, Sciomyzidae, Stratiomyidae, Syrphidae, Tachinidae, Tephritidae, Tipulidae, Trichoceridae, Ulidiidae

- Ephemeroptera - mayflies
- Hemiptera - bugs
Auchenorrhyncha, Heteroptera, Psylloidea
- Hymenoptera - bees, wasps, ants
Aculeata, Symphyta
- Lepidoptera - moths, butterflies
Adult and conspicuous larval Macrolepidoptera, selected Microlepidoptera
- Mecoptera - scorpionflies
- Megaloptera - alderflies
- Neuroptera - lacewings
- Odonata - dragonflies
- Orthoptera - grasshoppers, crickets
- Plecoptera - stoneflies
- Psocoptera - barklice
- Raphidioptera - snakeflies
- Trichoptera - caddisflies.

4.16 Nomenclature

Checklists and other sources used for names have been selected as far as possible on the basis of easy availability, broad coverage, specific reference to the British fauna, of being reasonably recent, and of their availability in printed form. There are few occasions when all these criteria are met. The following sources have been used:

Mollusca	Anderson, 2005
Oligochaeta	Sherlock, 2012
Hirudinea	Elliott & Dobson, 2015
Crustacea	Gregory, 2009; Gledhill et al., 1993
Araneae	Harvey <i>et al.</i> , 2002
Opiliones	Hillyard, 2005
Pseudoscorpiones	Legg & Jones, 1988
Chilopoda	Barber, 2009
Diplopoda	Lee, 2006

Coleoptera	Duff, 2012; Duff, 2016
Dermaptera	Sutton, 2015
Diptera	Chandler, 2017
Ephemeroptera	Elliott & Humpesch, 2010
Hemiptera Auchenorrhyncha	Biedermann & Niedringhaus, 2009
Hemiptera-Heteroptera	Aukema & Rieger, 1995-2006
Hemiptera - Psylloidea	http://www.britishbugs.org.uk/systematic.html
Hymenoptera Aculeata	Else <i>et al.</i> , 2016
Hymenoptera Symphyta	Liston & Sheppard, 2010
Lepidoptera	Agassiz <i>et al.</i> , 2013
Mecoptera	Plant, 1997
Megaloptera	Plant, 1997
Neuroptera	Plant, 1997
Odonata	Cham <i>et al.</i> , 2014
Orthoptera	Sutton, 2015
Plecoptera	Pryce <i>et al.</i> , 2007
Psocoptera	New, 2005
Raphidioptera	Plant, 1997
Trichoptera	Barnard & Ross, 2012.

4.17 In the lists, taxonomic arrangement of a sort governs the positioning of the highest taxa, with molluscs preceding crustaceans, spiders, and insects. Otherwise, the arrangement is as far as possible alphabetical. Most records are of insects. Within this group, orders are arranged alphabetically, families alphabetically within orders, and species alphabetically within families. No groupings between family and order, or between genus and family, are used. Other invertebrates are listed under larger taxonomic groupings, usually phylum or class.

4.18 **Statuses**

Each of the species recorded has been assigned at least one status. The better-known groups of invertebrates were assessed for formal conservation status in Red Data Books and National reviews from the mid-1980s onwards, using criteria from the IUCN for the rarest (Red Data Book) species, and defining species believed to occur in 100 or fewer 10-kilometres squares of the National Grid as Nationally Scarce (Notable). The earlier IUCN criteria have been superseded, but only a fraction of the British invertebrate fauna has as yet been assessed, in published reviews, under the newer criteria.

4.19 The following statuses and abbreviations from the older system are used in this report:

4.20 **Red Data Book category 1 - Endangered (RDB1)**

Taxa in danger of extinction in Great Britain and whose survival is unlikely if causal factors continue operating. Included are those taxa whose numbers have been reduced to a critical level or whose habitats have been so dramatically reduced that they are deemed to be in immediate danger of extinction. Also included are some taxa that are possibly extinct. Criteria for inclusion are: species which are known or believed to occur as only a single population within one hectad of the National Grid; species, which only occur in habitats known to be especially vulnerable; species, which have shown a rapid or continuous decline over the last twenty years and are now estimated to exist in five or fewer hectads; species which are possibly extinct but have been recorded this century and if rediscovered would need protection.

4.21 Red Data Book category 3 – Rare (RDB3)

Taxa with small populations that are not at present Endangered or Vulnerable, but are at risk. These taxa are usually localised within restricted geographical areas or habitats, or are thinly scattered over a more extensive range. Usually, such taxa are not likely to exist in more than fifteen post-1970 10km squares. This criterion may be relaxed where populations are likely to exist in over fifteen 10km squares but occupy small areas of especially vulnerable habitats.

4.22 Red Data Book category K - insufficiently Known (RDBK)

Taxa in Great Britain that are suspected, but not definitely known, to belong to any of the above categories, because of lack of information. Criteria for inclusion are: species recently discovered or recognised in Great Britain, which may prove to be more widespread in the future; species with very few or perhaps only a single known locality but which belong to poorly recorded or taxonomically difficult groups; species known from very few localities but which occur in inaccessible habitats or habitats which are seldom sampled; species with very few or perhaps only a single known locality and of questionable native status, but not clearly falling into the category of recent colonist, vagrant or introduction.

4.23 Nationally Scarce category A (Na)

Taxa which do not fall within RDB categories but which are nonetheless uncommon in Great Britain and are thought to occur in 30 or fewer hectads of the National Grid or, for less well-recorded groups, within seven or fewer vice-counties.

4.24 Nationally Scarce category B (Nb)

Taxa which do not fall within RDB categories but which are nonetheless uncommon in Great Britain and are thought to occur in between 31 and 100 10km squares of the National Grid or, for less well-recorded groups, between eight and twenty vice-counties.

4.25 Nationally Scarce (N)

For some less well-recorded groups and species, it has not been possible to determine which of the Nationally Scarce categories (A or B) is most appropriate for scarce species. These species have been assigned to an undivided Nationally Scarce category.

4.26 Two categories from the revised IUCN criteria have been used:

4.27 **Vulnerable (VU)**

A taxon is considered Vulnerable if it fulfils any of the following criteria.

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of 70% or more over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible and understood and ceased.
2. An observed, estimated, inferred or suspected population size reduction of 50% or more over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased or may not be understood or may not be reversible.
3. A population size reduction of 50% or more, projected or suspected to be met within the next ten years or three generations, whichever is the longer.
4. An observed, estimated, inferred or suspected population size reduction of 50% or more over any ten year or three generation period, whichever is the longer, where the time period must include both the past and the future, and where the reduction or its causes may not have ceased or may not be understood or may not be reversible.

B. Geographic range in the form of either B1 (extent of occurrence) or B2 (area of occupancy) or both:

1. Extent of occurrence estimated to be less than 500 km², and estimates including at least two of a-c:
 - A, Severely fragmented or known to exist at no more than five locations
 - B, Continuing decline, observed, inferred or projected, in extent of occurrence, area of occupancy, area, extent or quality of habitat, number of locations or subpopulations, or number of mature individuals
 - C, Extreme fluctuation in extent of occurrence, area of occupancy, number of locations or subpopulations, or number of mature individuals.
2. Area of occupancy estimated to be less than 500 km², and estimates including at least two of a-c:
 - A, Severely fragmented or known to exist at no more than five locations

- B, Continuing decline, observed, inferred or projected, in extent of occurrence, area of occupancy, area, extent or quality of habitat, number of locations or subpopulations, or number of mature individuals
 - C, Extreme fluctuations in area of occupancy, extent of occurrence, number of locations of subpopulations, or number of mature individuals.
 - D, Population size estimated to be fewer than 2500 mature individuals and either:
3. An estimated continuing decline of at least 20% within five years or two generations, whichever is the longer, or
 4. A continuing decline, observed, projected or inferred, in numbers of mature individuals and at least one of the following:
 - A. Population structure either with no subpopulation estimated to contain more than 250 mature individuals or at least 95% of mature individuals in one subpopulation
 - B. Extreme fluctuations in the number of mature individuals.
 - C. Population size estimated to number fewer than 350 mature individuals.
 - D. Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is the longer.

4.28 Lower Risk (LR)

A taxon is Lower Risk where it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the LR category can be separated into the following subcategories.

1. **Conservation Dependent (CD).** Taxa, which are the focus of a continuing taxon-specific or habitat-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.
2. **Near Threatened (NT).** Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable - in Britain, defined as occurring in 15 or fewer hectads but not CR, EN or VU. The absolute count of hectads is, in this review, considered subordinate to evidence of decline on an extent not qualifying the species for CR, EN or VU.
4. **Least Concern (LC).** Taxa, which do not qualify for Conservation Dependent, Near Threatened or National Scarce subcategories - in Britain, this covers all species found on evaluation not to fit into any of the other categories.

Under the revised criteria, at the national level, countries are permitted to refine the definitions for the non-threatened categories and to define additional ones of their own. The **Nationally Rare (NR)** category is defined as species recorded from 15 or fewer hectads of the Ordnance Survey national grid in Great Britain. The **Nationally Scarce (NS)** category is defined in the same way but the species is recorded from between 16 and 100 hectads since

1980. These correspond respectively to the former Red Data Book Categories 1-3 and the former Nationally Scarce (or Nationally Notable) categories A and B. Collectively, they are referred to as the GB Rarity status.

- 4.29 In recent reviews of invertebrate statuses, it has become the convention to assign each species both a GB Rarity status and an IUCN status. In earlier reviews, however, the GB Rarity status was applied only to species which did not qualify for any IUCN status, but were nonetheless uncommon. In the interests of simplicity and consistency, in this report GB Rarity status is not given for species with an IUCN status of Near Threatened or higher, even if one has been assigned.
- 4.30 Two conventions have been used in the text and tables, to simplify technical terms and maintain uniformity. The first is made necessary by the fact that under the older grading system, there was a clear demarcation between Red Data Book and Nationally Scarce species: only statuses higher than Nationally Scarce were included in the Red Data Book, and all took the form of '*Red Data Book category ...*'). Under the newer criteria, there is no unifying RDB prefix to Red Data Book categories. For uniformity in reporting, a division is maintained between Nationally Scarce and higher statuses: all the latter are described here as Red Data Book species. The second convention is that although in this section a distinction is made between the Nationally Scarce species defined under the older system and those defined under the newer system, since the two categories are for all usual purposes almost identical they are combined under the name '*Nationally Scarce*' in assessment and discussion. The different abbreviations are, however, maintained in tables and lists of species, so that their origins are clear.
- 4.31 Species falling into none of these categories have been assigned a status estimated on a four-point scale: common, frequent, occasional and rare, based largely on their status in the East Midlands but generally applicable more widely. No pretence is made that these statuses are assigned after rigorous assessment against precise criteria, but broad guidelines to their significance are as follows:
- 4.32 **Common:** species found in good numbers over substantial areas, usually in a number of habitats, and either having no very special ecological requirements or having requirements which are easily and widely met (restriction to a common foodplant, e.g.). Such species are expected or unsurprising in any sizeable tract of "wider countryside" within the central parts of their range.
- 4.33 **Frequent:** typically, species with somewhat more specialised or infrequently met habitat requirements, but expected where these characteristics are met; such species may be restricted to a narrow habitat range or to particular soil types, require a particular foodplant of

less than universal occurrence, or be associated with a widespread but erratic habitat resource, such standing dead wood of particular species or in particular conditions. Species in this category are expected or unsurprising wherever the habitat types with which they are associated is found.

4.34 **Occasional:** typically, species with a very particular and infrequently met habitat requirement; or species of poor mobility whose presence may be heavily dependent on habitat continuity; or species which, though not obviously of highly restrictive requirements, are nonetheless rarely recorded. Such species may be erratic in occurrence, and often require specific search of their specialist niches in order to be located; only in special circumstances are they expected merely on the grounds of broad habitat type.

4.35 **Rare:** typically, species with a particular and infrequently met habitat requirement, but sometimes merely highly geographically restricted. Such species are generally significantly less frequently found than apparently suitable habitat, and are expected, if at all, only when their very particular and special niche is found. They are expected to have very few populations within the county, unless it contains the core of a very restricted range or an unusual concentration of a very special habitat. Species falling into this category are usually expected to have already been assigned a formal conservation status. It is a useful category for groups and species which have not yet been included in formal reviews, or are disproportionately rare in this region, but it is infrequently used.

4.36 Nationally Scarce and Red Data Book statuses have been assigned to the species recorded according to the most conveniently accessible and useful summary of the most recently published statuses, as follows:

- Mollusca Seddon *et al.*, 2014
- Araneae Harvey *et al.*, 2002
- Chilopoda Lee, 2015
- Coleoptera Alexander, 2014; Alexander, 2017; Alexander *et al.*, 2014; Foster, 2010; Hubble, 2014; Hyman & Parsons, 1992; Telfer, 2016
- Diptera Ball & Morris, 2014; Falk 1991b; Falk *et al.*, 2016
- Hemiptera Bantock, 2016; Cook, 2015; Kirby, 1992
- Hymenoptera Falk 1991a
- Lepidoptera Fox *et al.*, 2010
- Orthoptera Sutton, 2015

4.37 The list has also been checked for any Priority species in the UK Biodiversity Action Plans (Biodiversity Reporting and Information Group, 2007). These are also species listed as "species of principal importance for the conservation of biodiversity" in Section 41 of the NERC Act, 2006. Such species are indicated in the summary species list by the abbreviation "BAP". However, BAP statuses are erratically and inconsistently applied amongst invertebrates, and are largely irrelevant to assessment; needless to say, they are also often not the species of principal importance for the conservation of biodiversity.

4.38 The abbreviations in bold are those used in tables and species lists in this report.

4.39 **Survey personnel**

Invertebrate surveys were undertaken by Dr Peter Kirby B.A. (Hons.) Zoology Class 2(i) 1976, University of Oxford. Ph.D. (Entomology) 1982, University of Nottingham. (and Christopher Kirby-Lambert (MBiolSci) 2013, University of Sheffield.

4.40 **Survey constraints**

The survey has covered a large area of diverse habitats over a small number of recording days. The amount of time devoted to any individual area or feature was limited, and the greatest number of species recorded from any one coded feature was 151, from M9. Such a level of recording is not sufficient to enable full assessment of any feature. The aim of sampling was not to do so, but rather to gather sufficient information to confirm or refute initial estimates of the relative interest of different parts of the site, and to generate, from the overall species, a meaningful impression of the overall character and value of the invertebrate fauna of the survey area. In this it can be considered successful, in that the overall total of recorded species is good for the amount of survey work undertaken, the recorded species include a number of conservation interest, and largely reflect and refine initial assessments made on habitat character alone. The total of recorded species may, however, constitute of a fraction of the identifiable fauna sufficiently well known to be of use in assessment. Although the survey data is now three years old, the habitats on site are generally of a similar composition to those at the time of survey and it is considered that no significant changes are likely to have occurred over that period of time.

4.41 The survey has used only a small range of active recording methods. There are many other methods which could be used to sample less accessible and more specialised species, and such species tend to include a disproportionately large fraction of the scarcer species of invertebrates, or at least a large proportion of those with formal conservation status. The proportion of the recorded fauna composed of species with high status is therefore, best regarded as the lowest possible level of their actual representation in the fauna of the survey area.

4.42 The degree of under-recording will vary according to the ecology and habits of the animals. For example, saproxylic insects, many of which spend much of their lives hidden within dead wood, are notoriously time-consuming to record at all thoroughly, and are likely to be relatively under-recorded compared to those phytophagous species which live exposed on the standing parts of plants. The recording of some ecological groups, such as those associated with carrion or fungi, is dependent on the chance finding of corpses or fruiting

bodies: it might be noted that no corpses or substantial fungal fruiting bodies were found during the present survey.

- 4.43 Survey work has been entirely diurnal, so nocturnal groups have been largely unrecorded, and found only when they could be disturbed from their day-time resting places. Many additional species could no doubt be added by night survey and a programme of light trapping.
- 4.44 The range of groups identified has been as wide as possible. However, it has been to some degree selective, both because of the methods employed and through deliberate choice. The sampling methods employed are commonly used in sampling, and are able to record a very wide range of species, but they are not exhaustive, and adoption of additional methods would have recorded other species.
- 4.45 Within the samples obtained, many species belonged either to groups which, because of their obscurity, seemed unlikely to be informative for site assessment, or to groups beyond the identification skills of the surveyor. Specimens of such groups were not retained, and uncommon species might have been amongst them.
- 4.46 No attempt has been made to sample the subterranean fauna, though some partially or predominantly subterranean species have been recorded beneath logs, in traps, or amongst leaf litter. The subterranean fauna is, amongst the groups investigated for this survey, of limited extent and relatively labour-intensive and time-consuming to record. It could, however, include some uncommon species, especially those associated with buried wood, decaying tree roots, and underground fungi. Hand-sorting or heat-extraction of soil, or the use of buried traps in strategic locations, could add interestingly to the species list.

5.0 SURVEY RESULTS

- 5.1 The 2014 survey has produced 2535 records of 1038 mutually exclusive taxa of invertebrates. Of these, four species are Red Data Book, 43 are Nationally Scarce, five are BAP Priority species and 158 are considered to be of at least somewhat local distribution. Complete records are provided in a separate spreadsheet. Appendix 9.10.1 is a complete list of recorded species, with statuses. Table 9.10.3 lists species of particular note or relevance to assessment. It includes all Red Data Book, Nationally Scarce and Priority BAP species, together with those species assessed as being of only occasional occurrence. Each species is assigned to a broad habitat category, and a brief entry provides a summary of its habitat requirements. Where appropriate, an indication is also given of any trends in frequency or range, and any doubts over the suitability of the species' current status. The latter entry is

necessary mostly because some statuses were applied some time ago, and the frequency and range of some species has changed considerably in recent years.

5.2 The habitat categories in Table 9.10.3 are intended as a shorthand indication of habitat association. Most of the entries in this column should be self-explanatory, but some are less so, and brief notes may assist in interpretation:

5.3 **Mosaic and transition**

In principle applicable to any situation where different habitats, or different structures in a single habitat, meet or are intermixed. In practice, most often, and invariably in this report, used for mixes and meetings of woody and herbaceous, usually grassy, vegetation, such as occur along hedgerows, at wood margins, or in areas of scrub invasion.

5.4 **Saproxyllic**

Defined by Fowles et al. (1999) as 'dependent upon microhabitats associated largely with the processes of damage and decay in the bark and wood of trees and larger woody shrubs and climbers. This includes sap runs, fungal hyphae or fruiting bodies, rot holes etc.'

5.5 **Grassland and open habitats**

"Open habitats" is here used for places where disturbed ground or the early stages of plant succession leave a significant proportion of bare ground, not necessarily in large individual patches. Vegetation in such areas is usually, though not always, dominated by herbs rather than grasses. There is no real dividing line between such structure and grassland, which can be regarded as that point where bare ground is relatively scarce ((though not necessarily absent) and grasses make up a substantial proportion of the vegetation. Some species are very definitely associated with very open, even sparsely vegetated, habitats and can be coded as such; others (especially grass-feeding species) are fairly definitely associated with grassland. Many, however, occur in habitats both sides of the vague borderline, or are most often associated with the ambiguous area between the two, so a large proportion of the species on the list are assigned to a joint habitat category.

5.6 **Aquatic and wetland**

These categories are distinguished in the list, but there is no sharp dividing line between the two, and the separation is generally made according to the sampling method: species usually caught, in an identifiable stage, with a pond net are aquatic; those caught with a sweep-net or other piece of dry equipment are wetland, even though some of the latter may have effectively or absolutely aquatic larvae.

Invertebrate records

Table 9.10.3 Key species for assessment

Taxon	Status	Status trends and issues	Recorded from	Habitat category	Notes on habitat requirements
Mollusca - snails, slugs, mussels					
Vertiginidae - whorl snails					
<i>Vertigo moulinsiana</i> Desmoulin's whorl snail ¹	VU BAP		P17-22	Wetland	Usually found amongst tall wetland vegetation in river flood-plains, at lake margins or in fens. Unusually, though not uniquely, at Birchall it was amongst sedge tussocks in a small, shallow, seepage-fed pond.
Araneae - spiders²					
Salticidae - jumping spiders					
<i>Marpissa muscosa</i> Fencepost jumper	Nb		M7	Saproxyllic	An active predator on bare vertical or near-vertical surfaces with nearby retreats. Over most of its range, it is found on bare dead wood, especially on standing trees, either entirely dead or, more often, living trees with areas of exposed bark-free wood. It can also be found occasionally on fence-posts and, in parts of its range, on stone walls.
Theridiosomatidae -ray spiders					
<i>Theridiosoma gemmosum</i>	Nb	No good evidence of change, but easily overlooked and doubtfully worthy of its status	P17-22	Wetland	A rather small spider which spins orb-webs low down amongst wetland vegetation in marshes, along water margins and in other damp situations. The egg-sac, however, is attached to trees and bushes at a considerable height. This joint requirement for relatively open herbaceous vegetation and easy access to tall woody vegetation may be a significant limiting factor in its distribution.
Chilopoda – centipedes					
Lithobiidae – stone centipedes					
<i>Lithobius macilentus</i>	NS		W1 W2	Woodland	Typically, a species of rural woodland, where it occurs amongst leaf litter, under logs and beneath bark, though sometimes recorded from other habitats, including mature gardens.
Coleoptera - beetles					
Anthribidae - fungus weevils					
<i>Choragus sheppardi</i>	Na	A small and easily missed species, doubtfully worthy of its status but	B4 W2	Saproxyllic	Larvae burrow in dead wood, usually of small to moderate diameter. It is perhaps most frequent on old hawthorn, but is regularly found on ivy and has been recorded from a number of other broadleaved trees and shrubs. Of the two records from Birchall, one was from ivy

Taxon	Status	Status trends and issues	Recorded from	Habitat category	Notes on habitat requirements
		with no evidence of increase			and one from hawthorn. It seems especially to be associated with somewhat shaded habitats. It tends to be highly localised, but may be found in large numbers on a particular tree, bush or log.
<i>Platyrhinus resinosus</i> Cramp-ball fungus weevil	Nb	A rather frequent species in the East Midlands, doubtfully worthy of its status	W10	Saproxyllic	Associated, except on rare occasions, with the cramp-ball fungus <i>Daldinia concentrica</i> , usually growing on substantial timber of dead ash. It can occur on both standing and fallen timber, and on stumps. Fallen trees and large branches are the commonest recorded habitat, probably simply because this is where <i>Daldinia</i> is most often found and most easily examined. The beetles are highly cryptic, but are large and fairly easily found by specific search.
Apionidae - seed weevils					
<i>Diplapion stolidum</i>	Nb	Doubtfully worthy of its status	G4	Grassland and open habitats	Associated with ox-eye daisy <i>Leucanthemum vulgare</i> . Larvae are believed to develop in the lower stems or roots. It is typically found where the foodplant is abundant but fairly small, especially on well-drained ground in full sun. It is not necessary for the plant to flower, so areas with quite heavy grazing are suitable, and grazing and disturbance by rabbits maybe particularly suitable management. It can also occur in numbers amongst profusely flowering plants in a grassy sward of moderate height, provided the vegetation is open-structured.
<i>Protapion filirostre</i>	Nb	Possibly increased, but easily overlooked; doubtfully worthy of its status	M6	Grassland and open habitats	Associated with black medick <i>Medicago lupulina</i> growing in very open-structured short vegetation in full sun on well-drained, neutral to calcareous, substrates soils. The larvae develop in the flower buds. A local southern species, though a rather regular inhabitant of brownfield sites.
<i>Squamapion cineraceum</i>	Na	Possibly increased, but easily overlooked; doubtfully worthy of its status	M3 M6	Grassland and open habitats	Associated with self-heal <i>Prunella vulgaris</i> . Larvae are possibly root-feeders. It is associated especially with large populations of small plants in full sun on well-drained calcareous substrates, in places where their growth is limited by grazing or, less often, trampling. Heavily rabbit-grazed areas in brownfield sites are perhaps the most frequent habitat, but rabbit-grazed grassland and the margins of paths may also be suitable. Dense vegetation and luxurious plants are avoided.
Buprestidae - jewel beetles					
<i>Agrilus sinuatus</i> Sinuate peartree borer	occasional	Recorded mostly by its distinctive exit holes. On this basis, it appears reasonably frequent, but it	B1	Saproxyllic	Usually associated with common hawthorn <i>Crataegus monogyna</i> , but also recorded from midland hawthorn <i>C. laevigata</i> and from a number of closely related imported species. Larvae mine sinuous galleries beneath the bark, often killing whole branches in the process, and are valuable in creating niches for a range of saproxyllic species. Adults are fast-moving and highly heliophilic,

Taxon	Status	Status trends and issues	Recorded from	Habitat category	Notes on habitat requirements
		may often be only a transient species which leaves long-lasting traces.			and typically attack only branches of fairly large diameter which are exposed to the sun. Small hawthorns in managed hedges, those with full dense crowns, and those in woodland shade are usually immune from attack.
Cantharidae - soldier beetles					
<i>Malthinus balteatus</i>	occasional		B1 B33 B41B W2 W6 W8 W9	Saproxyllic	Larvae have been suggested to develop in small dead branches in the canopy of broadleaved trees. It is reputed to be especially associated with floodplain woodlands and other sites with a high water table, but records from the East Midlands do not entirely support this: though it is recorded from damp and low-lying woods and those on seasonally wet clay, it is also found in well-drained sites on sand or gravelly soils. It is most often found in closed woodlands, albeit especially at margins and interior open space, but can also be found on more isolated trees in parkland and hedgerows. Though reported from a number of broadleaved trees and shrubs, it is perhaps most often associated with oak.
<i>Malthinus frontalis</i>	NS	Recent decline has been suggested	W6	Saproxyllic	Larvae develop in dead wood, perhaps especially in heartwood of trunks and large branches of substantial broadleaved trees. It has been reported as especially associated with old wood pastures and parkland, but it seems a reasonably regular inhabitant of more closed broadleaved woodland, and is not infrequently recorded from mature oaks, especially, in hedges.
<i>Rhagonycha lutea</i>	NS	Has possibly increased; still rather local, but arguably at the borderline of being considered frequent	B1 M7 W8 W9	Mosaics and transitions	Found in open-structured woodland, at wood edges, along hedgerows and in grass/scrub mosaics. The adult beetle lives amongst low foliage of scrub and trees; larvae are probably active predators in low vegetation. There is some evidence of historic decline, perhaps associated with the abandonment of coppicing, but <i>R. lutea</i> appears to have been more easily and frequently found again in recent years, perhaps reflecting a more widespread colonisation of secondary habitats.
Carabidae - ground beetles					
<i>Bembidion obliquum</i>	NS		P10	Wetland	Found at bare water margins in sun, on mud, silt, sand or fine gravel. It is typically associated with acid water, but also occurs, though much more locally and apparently unpredictably, by neutral or somewhat calcareous water.
<i>Syntomus truncatellus</i> Black flimsy	NS		B44 M6 M9	Grassland and open habitats	A ground-dwelling species, found in open structured or sparsely vegetated habitats on dry well-drained substrates.
Cerambycidae - longhorn beetles					
<i>Pseudovadonia livida</i>	occasional	Perhaps a	B17	Grassland,	An unusual longhorn beetle, in that larvae are subterranean, eating

Taxon	Status	Status trends and issues	Recorded from	Habitat category	Notes on habitat requirements
Fairy-ring longhorn beetle		borderline candidate for "occasional"; has possibly increased in recent years	W6	mosaics and transitions	the mycelium of the fairy-ring fungus <i>Marasmius oreades</i> . Adult beetles are usually found on flowers. Typical habitats are warm, sunny but sheltered locations with abundant flowers and herbaceous vegetation of moderate height, often at transitions, such as at wood margins, along well-structured hedges, the fringes of bramble patches, or at field margins, but it may sometimes occur over substantial areas of open grassland. Though generally local, it can be quite common in some areas, and has been reported as being so in parts of Hertfordshire. It is, however, undoubtedly much more local than apparently suitable habitat.
Chrysomelidae - leaf beetles					
<i>Chrysolina oricalcia</i>	occasional	.	B1 B4	Mosaics and transitions	Associated with a range of umbellifers. It can occur in quite open grassland, but this is unusual. More often, it is found at transitions, such as woodland margins, hedges or amongst scrub, where conditions are sheltered and management is light. Colonies are often quite small, and may occupy only a few metres of narrow fringe. Because of this, and because adults are probably largely nocturnal, it is easily missed during general recording.
<i>Longitarsus strigicollis</i>	NS	Has seemingly increased in recent years	G6 M7	Grassland and open habitats	Associated with teasel <i>Dipsacus fullonum</i> , usually where there are large populations of the plant on dry soils. Larvae are believed to be root-feeders, adults feed on the leaves, especially the rosette leaves. Formerly seemingly a very scarce species, but recent records suggest that it is widespread, if still somewhat local, across a wide area of southern England.
<i>Phyllotreta consobrina</i>	NS	A wide if scattered distribution and unexacting habitat requirements make the formal status doubtful	M6	Grassland and open habitats	Recorded from a wide range of open habitats on both wet and dry soils, and from a wide range of wild and cultivated members of the Brassicaceae. It is a predominantly south-eastern species, but scattered records extend into Scotland, the Scillies and the Welsh coast.
<i>Phyllotreta cruciferae</i>	NS	A wide if scattered distribution and unexacting habitat requirements make the formal status doubtful	M6	Grassland and open habitats	A phytophagous species recorded from a wide range of wild and cultivated members of the Brassicaceae, and also from wild mignonette <i>Reseda lutea</i> and nasturtiums <i>Tropaeolum</i> sp. Larvae feed on the roots, adults on the leaves. It has a very wide habitat range and a wide, if somewhat scattered, distribution.
Cleridae - chequer beetles					
<i>Tillus elongatus</i>	NS	Probably at best a borderline candidate for	W1	Saproxylc	Larvae and adults are active predators of wood-boring beetles of the family Ptinidae, especially <i>Ptilinus pectinicornis</i> , and can occur almost wherever such beetles occur in large numbers. The most

Taxon	Status	Status trends and issues	Recorded from	Habitat category	Notes on habitat requirements
		formal status			characteristic habitat is standing dead timber of broadleaved trees in sun, but it can also occur in shaded woodland under a dense canopy, and has been reared in some numbers from dead ivy with <i>Ochina ptinoides</i> . Despite its substantial size and distinctive appearance, this is an easily overlooked species, probably largely nocturnal and, when not active, inaccessible in often hard wood.
Coccinellidae - ladybirds					
<i>Hippodamia variegata</i> Adonis' ladybird	Nb	Has increased in frequency and range, though its formal status has perhaps always been open to doubt	G4 G8 G9 M3 M6 M9	Grassland and open habitats	Found in very open-structured or sparsely vegetated habitats, usually on well-drained ground, this is a characteristic species of early successional brownfield sites and arable field margins. It is a mobile species and an efficient colonist, able to build up substantial numbers quite quickly in suitable habitat. Many small populations may be transitory. In large parts of the south-east, it is an expected species wherever suitable conditions occur.
Curculionidae - weevils					
<i>Magdalis cerasi</i>	Nb		M7	Saproxyllic	Larvae develop in twigs and small branches of oaks and of members of the Rosaceae. It is especially associated with woodland fringes, rides and clearings, and also found in tall mature hedgerows.
<i>Magdalis ruficornis</i>	occasional	A local species, but occupying a widespread habitat and perhaps a borderline candidate for "occasional" status	B4 M7	Saproxyllic	Larvae develop in twigs of rosaceous trees and shrubs, especially species of <i>Crataegus</i> and <i>Prunus</i> , growing in woods, hedges and neglected orchards. It is widespread in southern Britain, but local and usually found at low density, despite the abundance of its preferred hosts.
<i>Rhinocyllus conicus</i> Thistle-head weevil	Na	Increasing in range, and now a frequent species in southern counties	M8	Grassland and open habitats	Associated with thistles, <i>Carduus</i> and <i>Cirsium</i> spp., the larvae developing in the flower-heads. It occurs only in open habitats in more or less full sun. It is not often found in dense beds of thistles on rich soils, preferring smaller and more scattered plants on harsher substrates, but does occur at arable field margins where a cultivated fringe and regular disturbance maintain open conditions. Formerly largely confined to southern coastal counties, this species has spread inland considerably in recent years.
<i>Zacladus exiguus</i>	Nb	Has probably increased in recent years; certainly it has been more frequently	M3 M6 M9	Grassland and open habitats	Associated with annual species of <i>Geranium</i> , and most often recorded from dove's-foot crane's-bill <i>Geranium molle</i> . It requires a substantial population of the plant in full sun and in short open-structured vegetation to be present throughout the summer, and is typically found in brownfield sites and at arable field margins. It is less often a species of established grassland, but may occur in

Taxon	Status	Status trends and issues	Recorded from	Habitat category	Notes on habitat requirements
		recorded; the formal status is open to doubt			numbers where rabbit grazing, especially, is sufficient to maintain locally open conditions.
Dytiscidae - diving beetles					
<i>Suphrodytes figuratus</i>	occasional	Exact status open to question because of confusion, until very recently, with <i>S. dorsalis</i>	P17-22	Aquatic	Found in small shaded ponds and ditches, often very shallow and with a bed of dead leaves. Ponds roughly fitting this description are reasonably frequent; the beetle is far less so. It may favour sites where a flow of water, even if very slight, maintains higher oxygen levels, and is usually absent where shade is heavy and there is no emergent or aquatic vegetation.
Elateridae - click beetles					
<i>Athous campyloides</i>	Nb	No evidence of change; a very localised and currently unpredictable occurrence makes confident estimation of status difficult	M3	Mosaics and transitions	Recorded from a rather wide range of habitats, including gardens, disused chalk and clay pits, a range of grassland types and coastal cliffs. It appears to be prone to forming quite dense colonies occupying small areas. A common feature of many localities is that they contain reasonably open-structured grassy vegetation but are sheltered by topography or fringing woody vegetation. Larvae are believed to be root-feeders; adults are largely crepuscular and nocturnal.
Endomychidae – handsome fungus beetles					
<i>Endomychus coccineus</i> False ladybird	occasional		W2	Saproxyllic	Adults and larvae live gregariously on or around fungoid growth beneath the bark of dead broadleaved timber of a range of tree species; adults are also occasionally found on bracket fungi.
Eirrhinidae - weevils					
<i>Notaris scirpi</i>	Nb	Far too frequent now to justify formal status, but probably under-recorded in the past rather than increasing	P4	Wetland	Found amongst tall wetland vegetation at water margins or in more extensive fluctuating swamps. Its habitats must be un-flooded for a substantial period in the summer, though it is tolerant of occasional brief periods of inundation. It is largely nocturnal, and usually found amongst plant litter on the ground during the day, but is more prone to ascend stems at night. It is phytophagous, but presumably polyphagous since it has been found in more or less pure stands of a number of species of wetland plants.
Hydrophilidae - scavenger water beetles					
<i>Berosus signaticollis</i>	occasional		G8	Aquatic	Intolerant of high levels of organic material, this water beetle is typically found in shallow, silt-bedded ponds with moderate aquatic vegetation cover in full sun. Often, such ponds are seasonal, though they must be continuously flooded for a reasonable period each spring/early summer to allow larval development. It is an

Taxon	Status	Status trends and issues	Recorded from	Habitat category	Notes on habitat requirements
					efficient colonist, and relatively frequent in areas of active and recent quarrying, but is easily lost to succession or eutrophication.
Lucanidae - stag beetles					
<i>Sinodendron cylindricum</i> Rhinoceros beetle	occasional	No evidence of change, but perhaps a borderline case for "occasional" status	W9	Saproxyllic	Larvae tunnel in the dead wood of substantial pieces of timber, both fallen and standing, and in the heartwood of living trees.
Malachiidae - false soldier beetles					
<i>Anthocomus fasciatus</i>	NS	No evidence of change, but it seems unlikely that the formal status could be fully justified	B17 G4	Saproxyllic	Exact requirements uncertain, though it is generally considered to be saproxyllic. It has been recorded from a quite wide range of mostly transitional and mosaic habitats, especially woodland edges, hedgerows and gardens, but is usually found in small numbers and the active adults are not necessarily closely associated with the location of larval development.
<i>Sphinginus lobatus</i>	occasional	A recent arrival, and undoubtedly increasing, but remaining decidedly local even within its range	W2	Saproxyllic	First recorded in Hampshire in 1982, this species has been spreading in the south, especially along major river valleys, but it remains a local species of restricted distribution. It has been recorded particularly in grassy places beneath the partial shade of oak trees. Dead wood, especially twigs, of oak and perhaps other trees have been suggested as possible sites of larval development.
Melandryidae - false darkling beetles					
<i>Orchesia micans</i>	NS	Questionably worthy of formal status; easily overlooked as an adult	B23	Saproxyllic	Develops in large polypore fungi on broadleaved trees. It is overwhelmingly most frequent in <i>Inonotus hispidus</i> on ash, but has also been found in other <i>Inonotus</i> species and occasionally on other genera. It appears to be a quite efficient colonist, found not only in woodlands and other landscapes where host trees and fungi are frequent, but also on quite isolated trees in hedges in extensive arable countryside.
Mordellidae - tumbling flower beetles					
<i>Mordellistena neuwaldeggiana</i>	NS	Misidentifications in the genus have made confident estimations of status difficult	M9	Saproxyllic	Reared from branchwood of hornbeam and field maple in the early stages of decay; adults are found mostly on flowers, but the range of circumstances and the varied composition of associated woody vegetation suggest a much wider range of broadleaved woody hosts is likely.
<i>Mordellistena parvula</i>	NS	More frequently recorded in recent years;	B14	Grassland and open habitats	Larvae develop in plant stems. Early British records were mostly from wormwood <i>Artemisia vulgaris</i> , but it is now most often found in association with yarrow <i>Achillea millefolium</i> . It is usually to be found

Taxon	Status	Status trends and issues	Recorded from	Habitat category	Notes on habitat requirements
		identification difficulties hinder confident assessment			in places where there is a good population of small to medium-sized plants growing in reasonably open-structured grassland on well-drained soils. Though it remains somewhat local, it is now a species to be expected where vegetation structure and composition are suitable.
<i>Mordellochroa abdominalis</i>	occasional		B1	Saproxylic	Larvae develop in the dry sapwood of dead broad-leaved trees and shrubs. Adults are usually to be found on flowers, especially umbellifers. It is characteristically a species of woodland fringes and open space, and is also, though less frequently, to be found along mature hedges. Though not unduly scarce, and rather an expected species in ancient woodland sites, it is decidedly local and associated with vegetation structure and composition which favours a range of other saproxylic species.
Mycetophagidae - hairy fungus beetles					
<i>Mycetophagus atomarius</i>	occasional		W1	Saproxylic	Larvae develop in the fruiting bodies of the fungi <i>Hypoxylon fragiforme</i> on beech, or <i>Daldinia concentrica</i> on ash. Adults can be found on a wider range of tree fungi. A widespread but very local species.
Phalacridae - smut beetles					
<i>Olibrus millefolii</i>	N		G8	Grassland and open habitats	Associated with yarrow <i>Achillea millefolium</i> , the larvae developing in the flower-heads. Preferred habitats have short to moderate length open-structured vegetation with abundant yarrow on well-drained substrates in full sun. Areas with moderate levels of grazing and some rabbit disturbance appear ideal. Dense or tall grassland and lushly growing foodplants are generally avoided.
Phloiophilidae					
<i>Phloiophilus edwardsii</i>	Nb		W2	Saproxylic	Larvae develop in the fungus <i>Phlebia merismoides</i> , which grows on the bark of dead branches of a range of broad-leaved trees and shrubs, though the beetle seems disproportionately recorded from oak. It is a widespread but local species.
Ptinidae – death-watch and spider beetles					
<i>Dorcatoma chrysomelina</i>	occasional		W8	Saproxylic	Larvae mine the red-rotten heartwood of the trunks and large boughs of standing broadleaved trees. Oak is the most frequent host, but it has also been recorded from ash.
Rhynchitidae – tooth-nosed snout weevils					
<i>Involvulus cavifons</i>	Nb		W8	Tree/shrub foliage	Larvae develop in one-year old twigs of oak. It is perhaps most frequent in reasonably open-structured woodland, and less often on more isolated open-grown trees. It is a predominantly southern species with a very local distribution.

Taxon	Status	Status trends and issues	Recorded from	Habitat category	Notes on habitat requirements
<i>Temnocerus coeruleus</i>	Nb		M9	Tree/shrub foliage	Most frequently associated with aspen, though also recorded from other poplars and from several species of willows, and occasionally from birch. Larvae develop in the leaf buds. It is interestingly local in distribution, and may favour fairly young growth in sheltered situations.
Salpingidae – narrow-waisted bark beetles					
<i>Lissodema denticolle</i>	NS	Doubtfully worthy of its status	B1 B4 B33 W2	Saproxylic	Larvae develop in the dead wood of a variety of broadleaved trees and shrubs, and have also been recorded from pine. Typically, fine branches and perhaps twigs are used, both on standing trees and shrubs and in loose piles of fallen or stacked material, but it is not to be found in dense heaps nor in very heavy shade. It is perhaps most frequent at wood edges and in hedges.
Scraptiidae – false flower beetles					
<i>Anaspis costai</i>	NS		B1 B33	Saproxylic	Considered to be saproxylic, in common with most related species, but the exact requirements of the larvae are uncertain. Adults are found mostly on flowers and foliage. Past identification difficulties make many older records uncertain, and incorrect identifications have tended to make this species appear commoner and more widely distributed than is actually the case; it appears to be both scarce and very local.
Tetratomidae – polypore fungus beetles					
<i>Tetratoma fungorum</i>	occasional		M8 W9	Saproxylic	Associated with fungi on the fruiting bodies of fungi on trees. Adults are most often found on oyster fungus <i>Pleurotus ostreatus</i> , but larvae, though found in a range of fungus species, are reported to develop most commonly in <i>Piptoporus betulinus</i> on birch.
Diptera – flies					
Asilidae - robberflies					
<i>Choerades marginatus</i> Golden-haired robberfly	occasional	Possibly increasing	W6	Saproxylic	A predator in all stages. Larvae are reported from beetle burrows in decaying oak branches; adults hunt a range of flying insects. The association with dead wood of oak seems fairly definite.
<i>Machimus cingulatus</i> Brown heath robberfly	occasional		G4 G8 G9	Grassland and open habitats	Though known particularly as a species of sandy heaths and coasts, this species also appears on a wider range of grassland and can be abundant on unimproved grazing levels. Unshaded and open-structured vegetation appear to be consistent requirements. It is one of the more surprising species to be recorded at Birchall, where it was common on the restored grasslands on areas of landfill.
Keroplastidae - fungus gnats					
<i>Platyura marginata</i>	occasional	The "occasional"	W9	Saproxylic	Larvae develop in silken webs spun under, usually, substantial logs

Taxon	Status	Status trends and issues	Recorded from	Habitat category	Notes on habitat requirements
		status may be open to question: this is not a very popular group of flies, so numbers of records can be misleading, and it is certainly not rare. It is, however, large and distinctive and is not that often seen			on the ground, occasionally in log piles.
Limoniidae - lesser craneflies					
<i>Dicranomyia lucida</i>	N		M8 P17-22	Wetland	Seepages and wet ground in sheltered places, especially in woodland or at woodland fringes. Larvae live in the surface layers of mud and wet plant debris. A particular, though not invariable, association with hemlock water-dropwort <i>Oenanthe crocata</i> has been suggested for this species, but in eastern counties such an association is rare.
<i>Gnophomyia viridipennis</i>	N	No real evidence of change, but a rather widespread and frequent species	W2	Saproxyllic	Larvae develop in the cambial layer beneath the bark of recently dead timber. There is a rather close association with poplar, though it is also known from beech and has been found in association with willows. Though a specialised and rather local species, it seems efficient at finding suitable habitat, and can be found on quite isolated groups of poplars in urban settings where long-term habitat continuity seems unlikely.
<i>Gonomyia recta</i>	occasional		P17-22	Wetland	Shaded seepages and fens; larvae in the surface layers of mud and wet plant litter. Not infrequently found in places where there is limited water movement beneath tree cover.
<i>Thaumastoptera calceata</i>	N		P17-22	Wetland	Confined to carr and wet woodland, especially in seepage areas. Larvae live in the surface layers of mud and wet plant debris, and make small cases out of dead leaves.
Stratiomyidae - soldier-flies					
<i>Nemotelus pantherinus</i> Fen snout	occasional		G9 M7	Wetland	Larvae develop in wet moss, in wet plant litter in fens, in shallow standing water, and probably also in damp soil. This species is quite strongly associated with seepages, including cryptic ones

Taxon	Status	Status trends and issues	Recorded from	Habitat category	Notes on habitat requirements
					where flushing keeps grassland damp but where there is no surface water in the summer, but it also occurs beside streams, ponds and ditches.
<i>Odontomyia tigrina</i> Black colonel	occasional	Possibly increased, but easily overlooked	P5 P17-22	Wetland	Larvae are aquatic, found typically amongst dense vegetation and plant litter in shallow water. It is usually associated with small ponds and narrow ditches, but has been recorded from the edges of canals and large rivers. Though local, it appears to be a quite efficient colonist of small and isolated water bodies - though inadvertent introduction of larvae with plants cannot always be ruled out in such cases.
<i>Oxycera nigricornis</i> Delicate soldier	occasional		M7 P17-22	Wetland	Associated with seepages, the margins of small streams, and in open marsh, often in the shade or shelter of trees. Some degree of water flow seems to be beneficial, if not absolutely necessary. Larvae have been found in wet moss and amongst wet sedge litter.
<i>Stratiomys potamida</i> Banded general	occasional		P5	Wetland	Larvae develop amongst plant litter or moss in shallow water of ditches, ponds, springs and seepages, including quite small and isolated rain-fed ponds prone to summer drying. It is tolerant of considerable shade, though not confined to shaded places. The range of possible habitats and the apparently efficient dispersal and colonisation abilities of the adult potentially leave a wide range of water bodies open to it, but it is nonetheless decidedly local and it is not always immediately obvious why some water bodies are occupied and others not.
Tachinidae - bristle-flies					
<i>Cistogaster globosa</i>	RDB1	Increasing; now widespread, though still local, in the south-east	M3	Grassland and open habitats	Larvae are parasites of the shieldbug <i>Aelia acuminata</i> which lives in open-structured dry grassland of moderate height, especially on neutral to calcareous soils. The bug is widespread and increasing in the south, but the fly is considerably more restricted, with a tendency to occur only in particularly open-structured grassland. Grassland developing on formerly cultivated land in the first few years after abandonment seems especially favoured, but mid-successional brownfield sites are also suitable.
Tephritidae - gall-flies					
<i>Merzomyia westermanni</i>	Nb	Possibly increasing, but perhaps overlooked in the past; formal status is doubtfully appropriate	G4 M3	Grassland and open habitats	Larvae develop in galls in the flowerheads of <i>Senecio</i> spp., usually hoary ragwort <i>Senecio erucifolius</i> growing on seasonally damp soils in tall but open-structured vegetation. Suitable habitat is of somewhat local occurrence, but in the south-east is usually occupied, and populations are often large. It is perhaps especially a species of brownfield sites, but also occurs in unimproved and semi-improved grasslands on suitable soils.

Taxon	Status	Status trends and issues	Recorded from	Habitat category	Notes on habitat requirements
Ulidiidae					
<i>Dorycera graminum</i> Phoenix fly	pNTBAP	Very local, but sufficiently frequently recorded in recent years to make both RDB and BAP status inappropriate	B4 B6 M7	Grassland and open habitats	This is a poorly-understood species, despite targeted research. It is found in grassland and on well-vegetated brownfield sites, usually amongst fairly tall but reasonably open-structured vegetation which is often lightly managed or unmanaged but sometimes grazed. Populations can sometimes be large, but may be quite tightly localised. It has so far proved difficult to find linking factors between its various sites which are not so ordinary that the fly should be common, which it unquestionably is not. The unimpressive nature of its habitats at many sites, and the gradually increasing number of known localities, have diminished the species' perceived individual value and its significance for wider assessment.
Hemiptera - bugs					
Cicadellidae - leafhoppers					
<i>lassus scutellaris</i>	Na	Has increased in range and frequency in recent years; doubtfully worthy of its status	M3 M5	Shrub and tree foliage	Feeding on elm foliage, this species has been rather less affected by elm disease than many other elm-associated insects and may prefer the low foliage of the shrubby elm growth which now predominates to high canopy. It has also increased its range, though it remains a south-eastern species, and is now expected wherever there is dense low elm growth in sunny, sheltered positions in the south-east.
Cixiidae - lace-winged planthoppers					
<i>Reptalus quinquecostatus</i>	Nb	Prone to considerable fluctuations in numbers	G4 G8 G9 M6 M9	Grassland and open habitats	Typically found amongst short or open-structured vegetation on clay soils which are prone to summer cracking, but sometimes also recorded from other soil types. A very local species of the south-east, but prone to large population fluctuations, probably in response to weather conditions. The nymphs are subterranean, feeding on plant roots.
Coreidae - squash-bugs					
<i>Syromastus rhombeus</i> Rhombic leatherbug	occasional	Has increased in range and frequency in recent years	G8	Grassland and open habitats	A species typically found in moderate-length open-structured dry grassland, or amongst herbaceous vegetation of variable length on early successional or grazed habitats, where it feeds on members of the Fabaceae. It does not usually occur in dense grassland or areas of shade. Historically with a strongly southern and rather restricted distribution, this species has spread quite widely in the south-east in recent years, but remains local.
Gerridae - pondskaters					
<i>Aquarius paludum</i>	NS	Increasing	P10	Aquatic	A large pondskater found on the surface of large ponds and lakes, where it feeds mostly on insects which fall into the water and are

Taxon	Status	Status trends and issues	Recorded from	Habitat category	Notes on habitat requirements
					trapped in the surface film. They live mostly well out from shore when the water is calm, but gather in sheltered areas in windy weather. Always a local species with a south-eastern distribution, it has increased in recent years, especially by spreading to gravel pits and other recent excavations. Relatively mature water bodies with a sheltering woody fringe are favoured.
Lygaeidae - ground-bugs					
<i>Megalonotus chiragra</i>	occasional	Perhaps borderline as an "occasional" species	M6	Grassland and open habitats	A ground-dwelling species found amongst sparse or open-structured vegetation on well-drained, often sandy, soils. Members of this group are seed-feeders, but the foodplants of <i>M. chiragra</i> are not known. Given the wide range of vegetation types amongst which it has been found, it seems likely to be polyphagous.
<i>Peritrechus lundi</i>	occasional		M6	Grassland and open habitats	A ground-dwelling species found amongst very short, usually sparse, vegetation on well-drained, often sandy or gravelly, substrates. Members of the groups are seed-feeders, but the hosts of <i>P. lundi</i> are not known.
Miridae - capsid bugs					
<i>Amblytylus delicatus</i>	RDB3	Increasing; no longer worthy of RDB status, but still local	B14	Grassland and open habitats	Associated with cudweeds, <i>Filago</i> and <i>Gnaphalium</i> spp., in open-structured habitats, usually on well-drained soils. A substantial population of the foodplant is full sun is needed. This necessarily makes the species rather local, and populations may often be transitory. It is, however, much more widely and frequently reported than in the past, and is probably now frequent enough in the south-east to make it likely that any suitable area of habitat will be colonised. It is especially characteristic of brownfield land and, on some soils, of the early stages of succession when land is removed from cultivation.
<i>Lygus pratensis</i>	RDB3	Enormously increased in recent years, and now common throughout south-east England and beyond	G9 M3 M4 M6 M9	Open habitats	Formerly confined to open spaces in ancient woodland in a few sites in the south-east, this species has, in recent years, become common and widespread on moderate to tall ruderal vegetation in sunny sites over a wide area in southern counties. This is probably the result of a secondary colonisation from mainland Europe, where the species has always had this broad ruderal association. It no longer has any conservation significance.
Notonectidae - backswimmers					
<i>Notonecta maculata</i>	occasional		P12-13	Aquatic	This is the only British backswimmer able to lay its eggs on hard surfaces, and can form large populations in vegetation-free and unpromising habitats such as water tanks and concrete-lined ponds. It tends to be easily out-competed by other species in more vegetated water bodies, but can co-exist if conditions are exactly

Taxon	Status	Status trends and issues	Recorded from	Habitat category	Notes on habitat requirements
					right. At Birchall, Pond P10 would seem the most suitable water body for it, but in practice it was recorded from P12/13, where it is vanishingly unlikely that it is a breeding species.
Saldidae - shorebugs					
<i>Saldula pallipes</i>	NS	Doubtfully worthy of formal status	A11 M5	Wetland	Found on bare and sparsely vegetated sediments at the margins of fluctuating water bodies. It is a rapid colonist, and a characteristic species of flooded gravel and sand pits.
Thyreocoridae – ebony bugs					
<i>Thyreocoris scarabaeoides</i> Scarab shieldbug	NS	Possibly increasing	B4	Grassland and open habitats	A ground-dwelling and burrowing bug, associated with violets <i>Viola</i> spp. in open-structured short vegetation on dry, well-drained ground with reasonably friable soil. It is a very local species, though easily overlooked because of its burrowing habits. Its fortunes may be quite closely tied to those of rabbits, which create suitable open conditions but find violets distasteful.
Hymenoptera - bees, wasps, ants, sawflies					
Formicidae - ants					
<i>Lasius brunneus</i> Brown tree ant	Na	Much more frequent and widespread than formerly, and now a fairly common species in parts, at least, of the south-east	W1 W2 W6 W8 W9 W10	Saproxylc	Virtually confined to trees and very rarely recorded on the ground, this ant nests in heartwood and the workers tend aphids in the tree canopy. Formerly a rather restricted species, associated chiefly with old oaks in parkland and other open situations in the south-east, and old orchard trees in the Severn Vale, it has become much less restricted in range and habitat in recent decades, and can now be found on a wide range of broadleaved trees, including street trees, garden trees, and quite small trees in closed woodland.
Megachilidae					
<i>Heriades truncorum</i> Large-headed resin bee	RDBK	Increasing: Red Data Book status is no longer appropriate	B43	Saproxylc	Nests are usually constructed in old beetle galleries in sound wood, though bramble stems and cavities in brickwork have also been used. Pollen is gathered only from yellow-flowered composites, especially common ragwort <i>Senecio jacobaea</i> . A combination of open habitat with scattered trees, woodland edge, or hedges with mature trees, is therefore favoured overall.
Tiphiidae					
<i>Tiphia minuta</i> Small tiphia	Nb	Doubtfully worthy of formal status; probably overlooked in the past	G8	Grassland and mosaics	Recorded from a quite wide range of habitats, including heathland, grassland on a range of soils, open woodland, and dunes, but all are reasonably dry and with at most light shade. Larvae are parasites of beetle larvae, especially of Scarabaeidae, in the soil. Because the adult wasp is small and flies low to the ground, it has tended to be under-recorded by hymenopterists.
Lepidoptera - moths, butterflies					

Taxon	Status	Status trends and issues	Recorded from	Habitat category	Notes on habitat requirements
Erebidae					
<i>Tyria jacobaeae</i> Cinnabar moth	common BAP		B4 G4 M8	Grassland and open habitats	Larvae feed on common ragwort <i>Senecio jacobaeae</i> , and less often other members of the genus, in a wide range of open habitats.
Geometridae - loopers					
<i>Chiasmia clathrata</i> Latticed heath	frequent BAP		M8	Grassland	Larval foodplants are members of the Fabaceae, especially clovers and trefoils. It is found in a wide range of open habitats, from calcareous grassland to the fringes of heathland and of fens, but its preferred habitats all have a reasonably open structure, are not intensively managed, and are unshaded.
Nymphalidae - browns, fritillaries, vanessids					
<i>Coenonympha pamphilus</i> Small heath	NT BAP		G4 M3	Grassland	Larvae feed on a range of grasses in short or open-structures vegetation on dry soils in full sun. Males establish territories around landmarks such as bushes and trees, so an overall mosaic habitat structure may be beneficial. Populations can be very large where there are substantial areas of suitable habitat, but the species typically lives in self-contained colonies of limited size, which may be maintained by small areas of grassland or by small patches of good-quality grassland in otherwise unsuitable areas.
Tortricidae					
<i>Strophedra nitidana</i> Little oak piercer	occasional	Davis (2012) suggests that this species deserves Nationally Scarce status	B1	Shrub and tree foliage	A woodland species, the larvae feeding on oak, and living in a spinning between two leaves; adults fly in the afternoon and early evening. A very local southern species.

1 *V. moulinsiana* is also listed in Annex 2 of the Habitats Directive, 1992.

2 Statuses lower than RDB are not listed for spiders in the JNCC spreadsheet of species statuses (<http://jncc.defra.gov.uk/page-3408>), because they are considered "out of date and unsuitable for inclusion". This is inconsistent, since other outdated and inaccurate statuses are displayed for some other groups. In the absence of alternative assessments, the old spider statuses are used here.

6.0 VALUATION AND DISCUSSION

6.1 If one species of unambiguously negligible conservation significance (*Lygus pratensis*.) is omitted from consideration, the representation of the main habitat categories in Table 9.10.3, in order of number of contained species, is as follows.

- Saproxylic 27
- Grassland and open habitats 26
- Wetland and aquatic 16
- Mosaics and transitions 5
- Tree and shrub foliage 4

6.2 The representation of the different habitat groups amongst the key species cannot be considered a wholly objective indication of their actual relative importance in the fauna, because recording was selective, and not of uniform intensity. Nonetheless, the division accords well with expectations from the assessment of habitats in the survey area and with the general character of other surveys in large areas of mixed habitats. If more intensive survey had been undertaken, with more specialised methods, it is likely that saproxylic species would outnumber those in other groups to a greater extent. Within the habitat categories considered, saproxylic species are the most difficult to record thoroughly.

6.3 Natural England's Invertebrate Species-habitats Information System (ISIS) provides an alternative means of identifying invertebrate assemblages. ISIS interprets species lists by identifying assemblage types within a list and then assessing the conservation value of each based on the rarity of the species it contains. If the rarity score of an assemblage crosses a pre-set threshold the assemblage is assessed as being of favourable status, this indicates it is of SSSI quality. The program can theoretically work at any geographic scale. It was primarily designed for Common Standards Monitoring of SSSI's, but can be used to analyse data from a wide range of sources. Use of data collected using non-standard methodologies can, however, sometimes complicate interpretation of the conservation value of assemblages.

6.4 Two levels of assemblage types are recognised. Broad assemblage types (BATs) are characterised by relatively widespread species, and their classification reflects environmental factors such as hydrology and disturbance cycles that have an important effect on invertebrate assemblages. Specific assemblage types (SATs) are characterised by more specialised species and are considered to have an intrinsic conservation value, and as such are generally found in sites with conservation value. SATs are more narrowly defined than BATs and each SAT is nested within a parent BAT.

6.5 ISIS is a powerful analytical tool but is not without issues. The number of assemblages it identifies is quite small, and devised on a national scale. In individual sites, ISIS can subdivide what is clearly a single functional assemblage on the ground, or combine assemblages more usefully regarded as separate. Any given invertebrate species must be assigned to a single assemblage, but many are not in reality so restricted. This can lead to the undervaluing of some cross-assemblage species with restrictive requirements, and to the identification of phantom assemblages, based on small numbers of species that have been coded to habitats with which they are not uniquely associated, and the appearance in the ISIS analysis of habitats which are not present on the site under investigation. A degree of care is therefore needed in interpreting any ISIS analysis.

Table 9.10.4 ISIS analysis of the overall species list

Specific assemblage types						
SAT code	SAT name		No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
A215	epiphyte fauna		5	fav	25	194
W211	open water on disturbed mineral sediments		8	fav	21	128
A212	bark & sapwood decay		64	fav	13	194
A213	fungal fruiting bodies		11	fav	12	194
F001	scrub edge		22	fav	12	
F112	open short sward		18	fav	9	195
F002	rich flower resource		21	fav	9	
W314	reedfen and pools		6		5	164
A211	heartwood decay		9	fav	5	194
W126	seepage		2		4	161
F003	scrub-heath & moorland		8		2	
F006	dung		2		2	
W122	riparian sand		1		2	161
F111	bare sand & chalk		6		1	195
Broad assemblage types						
BAT code	BAT name	Representation (1-100%)	Rarity score	Condition	BAT species richness	IEC
F2	grassland & scrub matrix	29	126		274	
A1	arboreal canopy	14	131		128	
W2	mineral marsh & open water	12	128		118	
A2	wood decay	12	194	fav	113	7
F1	unshaded early successional mosaic	8	195	fav	78	
W3	permanent wet mire	5	164		50	
F3	shaded field & ground layer	4	116		38	
W1	flowing water	4	161	fav	34	
M3	saltmarsh, estuary & mud flat	0			1	

- 6.6 There are several phantom or misleading assemblages in the ISIS list. The A215 epiphyte fauna is based largely on species which are corticolous but have no obligatory association with epiphytes; The W122 riparian sand, F003 scrub-heath and moorland, and M3 saltmarsh, estuary and mudflat assemblages, are reported on the basis of small numbers of species which in fact have wider habitat associations.
- 6.7 If these misleading assemblages are ignored, the groupings identified by ISIS are in broad agreement with those listed for scarce and rare species alone, if somewhat more subdivided. The condition assessments cannot be taken at face value, since the sampling methods used were not ISIS-compliant, but it is nonetheless noteworthy that the assemblages given favourable status are associated with wood decay, open habitats, and wetland, the three habitat groupings assessed as of greatest importance on the basis of representation of species with formal conservation status.
- 6.8 The habitats within the survey area can be conveniently considered under the following headings, which are closely related to the habitat groupings above, but correspond more closely to recognisable habitats and features on the ground. Each will be considered in more individual detail in subsequent sections:
- Old woodlands, old trees and old hedges;
 - Younger plantations, shelterbelts and young hedges;
 - Grasslands;
 - Ponds, watercourses and wetlands;
 - Mosaics;
 - Arable land.
- 6.9 The substantial area of landfill in the area south of Cole Green Lane might be thought to provide a potential source of brownfield habitats. It does not, in practice, do so to any significant extent. Grasslands developed on the landfill have a substantial ruderal element, but nonetheless are definitely grasslands; occasional piles of gravel or chalk form interesting features, but they are small and localised, and are incorporated into mosaic features; gravelly track margins, especially where there is considerable rabbit activity, are interesting, but are narrow, localised, and again incorporated into mosaic features.
- 6.10 **Old woodland, old trees and old hedge**
- Old woodland is of value for a wide range of invertebrates, but interest is, wherever circumstances permit, invariably concentrated in saproxylic groups. This saproxylic interest is usually greater in old trees in more open, wood pasture or parkland, settings. Panshanger Park, which adjoins the northern part of the survey area, is known to be of high interest for its saproxylic invertebrates, and the survey area is within a broader landscape rich in ancient

woodlands and parklands of high value for invertebrates. Good saproxylic faunas require continuity of habitat to survive, and some species are notoriously unlikely to re-establish once lost, but are quite persistent provided their habitat remains.

- 6.11 The majority of the recorded species which have an association with dead wood are beetles. This is usually the case in general surveys, and saproxylic beetles are routinely used to assess the quality of the dead wood fauna.
- 6.12 There are two widely used methods for assessing the interest of the saproxylic beetle fauna of a site. Alexander (2004) provides the most recent version of an Index of Ecological Continuity (IEC), based on species associated with habitat continuity, assessed on a three-point scale: Group 1 are species which are known to have occurred in recent times only in areas believed to be ancient woodland, mainly pasture woodland; Group 2 are species which occur mainly in areas believed to be ancient woodland with abundant dead-wood habitats, but which also appear to have been recorded from areas that may not be ancient or for which the locality data are imprecise; Group 3 are species which occur widely in wooded land, but which are collectively characteristic of ancient woodland with dead-wood habitats. A score of one is given to species in Group 3, a score of two to those in Group 2, and a score of 3 to those in Group 1. The index is calculated by summing the scores for all species recorded. Because this score is cumulative, it is heavily dependent on recording effort. A score of 15-24 is suggested to be indicative of regional value, and 25-79 of national importance.
- 6.13 The second scoring system (Fowles et al., 1999) calculates a Saproxylic Quality Index which is intended to be less dependent on recording effort than the Index of Ecological Continuity. Scores are assigned to saproxylic species according to their national status rather than the extent of their association with sites of long habitat continuity. Fowles et al. (1999) provide a complete list of species and their scores. Summation of the scores for all species provides the Saproxylic Quality Score (SQS): dividing this score by the number of scoring species and multiplying by 100 gives the Saproxylic Quality Index (SQI). A minimum of forty scoring species is recommended for the calculation of a reliable SQI. A score of 500 has been provisionally set as a threshold for national significance; no lower levels of significance have been defined.
- 6.14 Table 9.10.3 lists the saproxylic Coleoptera recorded from the survey area in 2014, together with their scores on the two systems. Note that some species have no scores in either system: these are either recent arrivals in Britain, or are not invariably saproxylic.

Table 9.10.5 Saproxylic Coleoptera recorded in 2014

Taxon	Status	Scores	
		SQI	IEC
<i>Anthribidae</i>			

Taxon	Status	Scores	
		SQI	IEC
<i>Choragus sheppardi</i>	Na	16	
<i>Platyrhinus resinus</i>	Nb	4	1
Biphyllidae			
<i>Biphyllus lunatus</i>	frequent	4	1
Buprestidae			
<i>Agrilus biguttatus</i>	frequent	8	
<i>Agrilus laticornis</i>	frequent	8	
<i>Agrilus sinuatus</i>	occasional	4	
Cantharidae			
<i>Malthinus balteatus</i>	occasional	8	
<i>Malthinus flaveolus</i>	common	1	
<i>Malthinus frontalis</i>	NS	8	
<i>Malthinus seriepunctatus</i>	common	2	
<i>Malthodes minimus</i>	common	1	
Cerambycidae			
<i>Clytus arietis</i>	common	1	
<i>Grammoptera ruficornis</i>	common	1	
<i>Leiopus nebulosus</i>	frequent	2	
<i>Rutpela maculata</i>	frequent	1	
<i>Tetrops praeustus</i>	frequent	2	
Cerylonidae			
<i>Cerylon ferrugineum</i>	common	2	
<i>Cerylon histeroides</i>	frequent	4	
Ciidae			
<i>Cis bilamellatus</i>	common		
<i>Cis pygmaeus</i>	frequent	2	
<i>Cis vestitus</i>	frequent	2	
<i>Ennearthron cornutum</i>	frequent	2	
Cleridae			
<i>Tillus elongatus</i>	NS	8	1
Curculionidae			
<i>Acalles misellus</i>	frequent	2	
<i>Euophryum confine</i>	common		
<i>Hylesinus toranio</i>	frequent	2	
<i>Magdalis cerasi</i>	Nb	4	
<i>Magdalis ruficornis</i>	occasional	2	
<i>Pityophthorus pubescens</i>	common	2	
<i>Scolytus rugulosus</i>	frequent	2	
Dasytidae			
<i>Dasytes aeratus</i>	frequent	2	
Dermestidae			
<i>Ctesias serra</i>	frequent	4	
Elateridae			
<i>Denticollis linearis</i>	common	1	
<i>Melanotus villosus</i> agg.	common	1	
Endomychidae			
<i>Endomychus coccineus</i>	occasional	2	
Erotylidae			
<i>Dacne rufifrons</i>	frequent	2	
Lucanidae			
<i>Dorcus parallelipedus</i>	frequent	2	
<i>Sinodendron cylindricum</i>	occasional	2	
Malachiidae			
<i>Anthocomus fasciatus</i>	NS	4	

Taxon	Status	Scores	
		SQI	IEC
<i>Malachius bipustulatus</i>	common	1	
<i>Sphinginus lobatus</i>	occasional		
Melandryidae			
<i>Orchesia micans</i>	NS	4	
Monotomidae			
<i>Rhizophagus dispar</i>	common	1	
Mordellidae			
<i>Mordellistena neuwaldeggiana</i>	NS	16	1
<i>Mordellochroa abdominalis</i>	occasional	4	
Mycetophagidae			
<i>Mycetophagus atomarius</i>	occasional	2	1
<i>Mycetophagus multipunctatus</i>	frequent	2	
<i>Mycetophagus quadripustulatus</i>	frequent	2	
Phloiophilidae			
<i>Phloiophilus edwardsii</i>	NS	8	1
Ptinidae			
<i>Anobium fulvicorne</i>	common	1	
<i>Anobium punctatum</i>	common	1	
<i>Dorcatoma chrysolina</i>	occasional	4	1
<i>Dryophilus pusillus</i>	common	2	
<i>Ernobius mollis</i>	common	2	
<i>Ochina ptinoides</i>	frequent	2	
<i>Ptilinus pectinicornis</i>	common	1	
Pyrochroidae			
<i>Pyrochroa serraticornis</i>	common	1	
Salpingidae			
<i>Lissodema denticolle</i>	Nb	8	
<i>Salpingus planirostris</i>	common	1	
<i>Vincinellus ruficollis</i>	frequent	2	
Scaptiidae			
<i>Anaspis costai</i>	NS	2	
<i>Anaspis frontalis</i>	common	1	
<i>Anaspis pulicaria</i>	common	1	
Staphylinidae			
<i>Atrechus affinis</i>	common	1	
<i>Gabrius splendidulus</i>	common	1	
Tetratomidae			
<i>Tetratoma fungorum</i>	occasional	2	
Number of scoring species		63	7
IEC			7
SQS		198	
SQI		314.3	

- 6.15 The Index of Ecological Continuity for the site is quite low. Since this is a cumulative score, and it is likely that only a fraction of the saproxylic fauna has been recorded, it would no doubt be increased by further work, possibly by a considerable amount.
- 6.16 A list of sites evaluated using the SQI is available at <https://khepri.uk/main>, arranged in order of their SQI. Two hundred and three sites were listed on 19 November 2017. If the fauna recorded from Birchall in 2014 were placed in this list it would, on current records, be at

position 156. This is hardly an exalted placing, but is more respectable than might at first appear. The list of evaluated sites includes the New Forest, Epping Forest, and other sites of national or international importance, and a large proportion are places which have been examined precisely because they were considered likely to hold interesting saproxylic faunas. It would be very unusual to find a previously unrecorded site which, on the basis of a single year's recording, fell within the top 50 on the list. The SQI falls within the range recorded for ancient woodlands and historic parklands, and the number of species, and especially the number of uncommon species recorded, suggests a rich fauna.

- 6.17 The SQI is considerably lower than that for the adjoining Panshanger Park. The same site list places the Park, based on post-1980 records, at position 86, with an SQI of 407.1 and an IEC of 23. Interestingly, these scores are based on only 56 species. It would not be expected that the quality of the fauna in the survey area would closely approach that of Panshanger Park, which even very superficial examination shows to be of much higher habitat quality. The difference is especially shown in the difference in the IEC, based on similar numbers of species in the two cases, which emphasises the greater habitat continuity in the Park. The SQI may be further affected by dilution. The score for the survey area is based on survey spread across a wide range of features, habitat characteristics, and species of tree and shrub, including many which are clearly unlikely, individually, to have saproxylic faunas of high interest. Varied habitats of unimpressive quality favour a high diversity of relatively common species, and since the SQI averages the score over all recorded species, the overall score for the site may be depressed as a result. This effect is a major limitation of the SQI as a measure of faunal quality.
- 6.18 The dilution effect could be reduced, and potentially useful additional information generated, by separate assessment of individual coded features. However, too few species were recorded from any given feature to make this feasible. It is likely, also, that a higher SQI could have been got for the survey overall with use of additional survey methods, and especially by trapping. It is, anyway, worth noting that individual assessment of separate features would in considerable measure miss the point: saproxylic invertebrate interest would be best judged on a site-wide scale, and mitigation would need to ensure connectivity - not in the sense of having continuous wooded features, which would be a singularly bad idea, but in the sense of ensuring free flight lines between existing features and maintaining timber continuity over time.
- 6.19 Overall, the results of the survey are consistent with expectations from habitat grounds and context alone: that old landscape features containing old trees and shrubs are habitat components for a site-wide saproxylic invertebrate assemblage, and so of substantial invertebrate interest. It is possible that such an assumption exaggerates the significance of some or all of the features - some old trees and hedges within the survey area are rather

isolated and in currently hostile surroundings, which may limit their interest. There is, however, a good chance of historical habitat continuity and, considering the highly degraded character of much of the survey area, there is quite good linkage of old woodlands and boundary features, especially around the western margin.

6.20 The range of old trees and dead wood within the survey area is considerable. Old oaks and hornbeams are the most conspicuous in general. Old oaks are especially obvious, though decidedly scattered, in hedges. Hornbeams include old coppice and pollards. A noteworthy feature of the site is old laid and coppiced hornbeam in hedges and wood boundaries, though the curious structure of the old hedges may make them appear more interesting than is actually the case; the amount of dead wood they contain is not always large. There are also substantial ash, including old pollards, with considerable amounts of dead wood. Dead birch is a prominent feature in places; field maple and Scots pine contribute local interest; hawthorn, and even blackthorn provide a significant amount of old timber and dead wood in some old hedges. However, hedges on the survey area are not generally of high interest in themselves. Much of any potential they possess comes from any old trees they contain. Their potential can be mostly judged by how much dead wood they contain, and they are chiefly of interest where they link other features of potential value or contribute significantly to the overall variety of relatively complex areas.

6.21 **Younger plantations, shelterbelts and hedges**

Plantation woodland, shelterbelts and young hedges on the survey area are generally of low intrinsic value for invertebrates, though some are of structural value. Young continuous canopy plantations are amongst the least interesting of habitats for invertebrates, and some of those in the survey area are not only of low interest in themselves but compromise the potential of older features. They may, however, provide shelter and transitions for other habitats: this is the case, for example, where there is more open habitat, especially wetland, on landfill in the south. Older plantations may develop interest if the trees are allowed to age and die. Some older areas of plantation within the survey area do have significant amounts of dead wood, and have contributed records to the overall site list of saproxylic species. Few uncommon saproxylic species are likely to be confined to the newer plantings, but specialist species associated with poplars, for example, might be. Such secondary features may be of greater interest than their appearance would initially suggest, given the wider interest of the survey area: it is a frequent finding that scarce species may breed in relatively young trees or low-grade habitat if this forms part of a site of high general saproxylic interest. Most of the shelterbelts and hedges on the landfill area are too young to have developed any character likely to be of particular value for invertebrates. The most interesting are those which have been noticeably unsuccessful, and which contain many trees which are dead or not thriving. These not only provide habitat for saproxylic species, but also retain a mosaic structure, with areas of sheltered but not unduly shaded grassland beneath and alongside the trees.

6.22 The limited value assigned to young woody vegetation is to a degree unfair: old trees are assessed as valuable, and the continuity of habitat which the saproxylic fauna needs can only be supplied by young trees; considered at a long-term landscape scale a more benign judgement might be placed on them. However, assessment can realistically be made only on current interest, and even at the landscape scale the potential of much of the young plantings is questionable: some of the plantations compromise the potential of existing older features; the planting of continuous-canopy plantations is doubtfully ever a good plan for invertebrates; and the selection of trees for planting, at least in the youngest areas, seems often inappropriate to the landscape or for the provision of continuity, sometimes odd, and occasionally apparently random.

6.23 **Grassland**

There is little grassland within the survey area which might be of any significant age and most that might be is improved to a degree which removes the possibility of significant invertebrate interest. The fragments of more interesting grassy vegetation which remain are generally small and associated with boundary features or mosaics. The only records suggestive of significant interest in the grassland in the part of the site north of Cole Green Lane come from the line of the footpath, partly in a green lane, running from Panshanger Lane to the southern edge of Birchall Wood, and coded as a boundary feature (B4 and B6) because the grass strip is so narrow. Despite its low floristic quality, this is presumably an old feature which has undergone progressive decline through eutrophication and spray drift rather than deliberate modification, and may have retained a proportion of its pre-existing interest.

6.24 South of Cole Green Lane, the restored landfill contains a large area of recently established grassland of rather uniform but interesting character on poorly-draining clay, maintained by horse-grazing as a sward of varied height and structure. The value for invertebrates varies from field to field. Some have a rather dense closed sward and low floristic diversity, and are of rather slight potential, but the best, exemplified by G4, have a quite varied flora, good populations of a number of important invertebrate foodplants and nectar sources, varied structure, and fringing and contained scrub to provide shelter, hibernation sites, and transitions. The seasonally damp clay capping which dominates the grassland is a strong controlling factor on the invertebrates. Many ground-dwelling, burrowing species may be unable to cope, and some subterranean species, or root-feeding larvae, may be defeated by winter waterlogging. Some species, however, are favoured by such conditions. Amongst the recorded uncommon species, the gall-fly *Merzomyia westermanni* occurs selectively on such clay soils, attacking the flowers of hoary ragwort. In places, however, drier conditions and more friable soils prevail, especially on the higher ground in those parts of the grassland which have a hummocky topography (notably G8).

6.25 Overall, the grasslands have produced a good range of uncommon invertebrates, especially amongst phytophagous Coleoptera and Hemiptera. Suction sampling and pitfall trapping would probably have substantially increased the number of uncommon species recorded. Most of the recorded species are more or less predictable, or at least reasonably to be hoped for, given the soil characteristics and the composition and structure of the vegetation. The two least expected species - the planthopper *Reptalus quinquecostatus*, which favours clay soils, and the robber fly *Machimus cingulatus*, traditionally more strongly associated with sandy ground - were, on the basis of the 2014 records, quite frequent and widely distributed on the landfill grassland.

6.26 **Ponds, watercourses and wetlands**

Water bodies within the survey area are numerous and varied in character, but there are few which suggest the likelihood of substantial invertebrate interest. The fishing pool in the north-west corner of the part of the survey area south of Cole Green Lane is the largest water body on the site and is distinctive by virtue of being gravel-bedded, but it too abrupt-edged, heavily used, and poorly vegetated to have substantial interest. The ponds which receive run-off from arable land are eutrophic and unprepossessing. Some are also under dense shade, further reducing their potential. The more isolated ponds in woodlands, away from the influence of arable land, have higher potential in principle, but most are densely shaded, stagnant, and have little or no aquatic vegetation. Water bodies and wetland in woodland tend to need at least a small amount of water flow if they are to maintain significant invertebrate interest. Minor drains and ditches are seemingly generally intermittent in flow and poor in structure, and most contained no more than isolated patches of water even at the time of the scoping survey in early spring. The single substantial stream which supplies and drains ponds P12 and P13 is generally poorly-structured, and the ponds had, at the time of the scoping survey, murky water and a considerable amount of sediment deposited on emergent vegetation. These ponds probably have greater potential for the swamp fauna than for their aquatic fauna. Little evidence was found of such interest, but the swamp fauna is under-recorded, largely because of the physical difficulties of access and recording. Ponds P14-16, effectively now a single area of bulrush swamp, might have some potential as a wetland habitat, but they are bordered by eutrophic vegetation of ruderal tall herbs and invasive scrub, and little sign of interest could be found. Pond P4 is interesting chiefly because of its fluctuating level, areas of shallow flooding at the margins, and mineral-dominated bed, but is not of high interest and is imminently threatened by the growth of woody vegetation in the recent plantation which largely surrounds it.

6.27 North of Cole Green Lane, the water body with highest potential for invertebrates is considered to be P5, which has varied aquatic and, especially, marginal vegetation, is well-structured, in a sheltered location, and prone to considerable fluctuation in water level over the year. It is perhaps more heavily shaded than would be ideal, and somewhat abruptly

edged. Limited evidence of interest was found, but the aquatic fauna was probably under-recorded, because the water level was low at the time of survey and the best-structured areas of vegetation were dry.

- 6.28 The eastern side of Holwell Park Wood contains, or borders, a series of ponds of varying sizes and degrees of permanence which are linked by an intermittently flowing channel running the length of the wood and are also connected to shallow streams exiting from the north and south sides and running round the edges of a field, partly bordered by a hedge and trees. The water supply to this wetland fringe comes in part from surface flow from the adjoining area of landfill, which contains superficial wetland amongst mossy rushes and taller wetland of great willowherb *Epilobium hirsutum* and bulrush *Typha latifolia*. This is arguably the most interesting wetland feature within the survey area for invertebrates, supporting a number of species associated with shaded seepages and an unexpected and very isolated population of Desmoulin's whorl snail *Vertigo moulinsiana*. The outflowing streams are small, poorly structured and heavily managed drains, and though a sample from one of them produced the best flowing-water invertebrate list obtained from the site, they are, for invertebrates, noteworthy chiefly as wasted potential: the water they carry away so efficiently could feed interesting water bodies and wetlands.
- 6.29 Very shortly before passing beneath the road, the drain carrying water away from P 17-22 is joined by a second small drain, B23 flowing through a narrow channel between what are currently two areas of fallow land, originating along the southern margin of a small wood, and seemingly fed substantially, perhaps entirely at the time of survey, by seepage from higher land to the north. The drain was presumably intended to intercept such seepage to enable cultivation of the land below, now largely abandoned and developing as grassland and tall herbs. A wetland flora is re-establishing locally below the drain. Considering the history of this area and its current neglected state, an interesting, if small, set of wetland species was recorded. From an invertebrate viewpoint this is another area notable for the past damage done and the opportunities for enhancement as much as for existing interest.
- 6.30 Seasonal ponds in hollows in the recently established grassland on the landfill are features of interest. Most proved, in the spring of 2014, to be very transitory. Few held a significant amount of water even at the very beginning of April, and only one a substantial amount. If this is the usual pattern, it will restrict the amount of interest which might be present, or which might develop. Such seasonal pools in grassland can be very interesting for invertebrates, but good examples tend to be old, and their most interesting associated species are poor colonists. The single pond which was sampled in 2014, the largest and likely to be the best from an invertebrate point of view, held an interesting aquatic fauna, not exceptional but including species not found in other water bodies in the survey area.

6.31 **Mosaics**

"Mosaics" has been used as a heading to cover a rather miscellaneous set of habitat areas. They have in common that they contain a variety of vegetation structure and that they do not conveniently fit any of the other categories used, but are sufficiently miscellaneous that few general comments will be useful. Some are merely collections of uninteresting habitats and features, the collective interest of which is not greater than the sum of their parts. Area M8 is of interest chiefly for its wetland components, considered above, and for the potential of an area sown with a bird-seed mix, which has good populations of a range of plants of potential value for invertebrates, in open-structured vegetation with bare ground. M12 also has an area of bird-seed mix of similar potential, though rather different composition. Little interest has in practice been recorded from either seeded area, however, and in both cases the habitat is recent, artificial, transitory without active management, and re-creatable on arable land almost anywhere within the survey boundary. M4, along a stream valley, contains elements of value, especially in old trees, but overall is nutrient-enriched and under-managed and of limited general potential in its current state, though open to improvement.

6.32 Areas M3, M6, M7 and M9 are amongst the most varied and interesting parts of the survey area for invertebrates. M3 has developed in part on formerly cultivated land which has undergone considerable disturbance by machinery and is now a complex mix of ruderal and grassland vegetation on soil of varying degrees of compaction and wetness, with invading scrub of several species. This complex structure and composition has favoured a particularly varied set of species associated with grassland, open ground and transitions. M6 is also mostly a recently developed grass/scrub mosaic, though this time mostly on restored landfill and including planted trees and shrubs. The complex structure, inclusion of ruderal vegetation on relatively free-draining substrate at a track margin, well-structured transitions and areas of shelter support a diverse fauna. M9, which meets M6 along the line of the cycleway, also has areas of recently developed open-structured grassland and a good mosaic structure, but is distinguished by the inclusion of old trees and other old landscape features continuous with the edge of Holwell Park Wood, and containing a number of uncommon species associated with woody vegetation. M7 is a complex area of dry and wet grassland, seepage areas, seasonal pools and recent plantation. The plantation has probably already eradicated much that would otherwise be of interest and threatens the remainder, though very wet conditions locally have killed a number of trees and created some saproxylic interest in the short term. Ultimately, the retention of interest here will depend on the removal of many planted trees and perhaps the severe management of more. The wetland components of this area are best considered in conjunction with ponds P17-22 in Holwellpark wood, which they feed and with which they are contiguous.

6.33 **Arable land**

Intensively managed arable land is generally considered to be of negligible invertebrate potential. When actually surveyed, this assessment not infrequently proves unnecessarily harsh, and arable land is certainly usually more interesting than heavily improved grassland. In the present case, however, there is nothing in the character of the arable land to suggest the likelihood of significant interest, and no records contradict this opinion. Cultivation is thorough and efficient, and the fields appear generally impressively weed-free. Where there is a weedy marginal component it is generally effectively a constituent of a boundary feature, and even then is usually of slight potential. The best areas of weedy fringe, from an invertebrate point of view, are in the northern part of the survey area, but they are generally in areas where tracks and paths border directly onto arable land, and even these are best considered as boundary features.

6.34 **Assessment of interest**

The aims of invertebrate survey have been largely to determine the relative value of different features and habitat components in the context of the survey area, and the level of invertebrate recording is generally insufficient to make confident estimates of the actual level of interest in a local or national context of any individual areas or features. There are no very useful guidelines for the assessment of the general invertebrate interest of a site, and even where firm criteria exist, in the form of specified numbers of scarce and rare species, uncertainties as to current status and significance of individual species make careful interpretation essential. Nonetheless, it is clear that the overall invertebrate fauna of the survey area is of at least county significance. However, none of the individual habitats and features on the site is considered of very high proven interest, based on records obtained, nor of very high potential, based on habitat characteristics.

6.35 Appendix 9.10.2 lists all the individually identified features, together with the number of invertebrate records made from each, and any key species of invertebrates recorded (as listed in Table 9.10.3), and gives a grading of 1 to 5 for the significance of each feature for invertebrates, based in part on assessment of habitat quality and in part on records obtained. Though these gradings indicate the relative value of the features in the context of the survey area, the expectation is that areas graded 1 are likely to be of county significance, but that no areas graded lower than 2 would be so; and that areas graded 5 are of low value. To a first approximation, areas graded 1 or 2 can be regarded as essential components of invertebrate habitat which should be retained if invertebrate interest is not to be compromised, areas graded 3 as those which make a significant contribution to invertebrate interest but the interest of which could be retained, or enhanced, even with a degree of modification; and areas graded 4 or 5 as either disposable or readily re-created.

6.36 The level of significance assigned to the invertebrate fauna, based on the records obtained in 2014, depends in part on exactly what parcels of land the records are drawn from. For current

purposes, lists have been produced for the survey area overall, and for individually recognisable and mappable features, but this is a purely pragmatic arrangement. In practice, there may be good reasons for assessment at different scales. It has been considered appropriate to examine the saproxylic fauna at the level of the entire site, because this can be a landscape-scale fauna, dependent on dead wood and old trees which are widespread in the survey area, and to a degree independent of surrounding land use. Combining all pond data, together, however, would be essentially meaningless. There are several areas where a good case could be made for collectively considering groups of features at an intermediate scale. For example, all grassland on capped landfill and its contained boundary features, together with M6, might logically be combined; and woodlands W9 and W10, along with M7 and the woodland ponds P9, P17-22 and P 24, effectively form a single unit of interdependent parts. Such amalgamation of features would produce overall levels of interest which might alter their assessment, but would be less useful in defining key areas and informing development proposals, and would not alter the upper limit of county-level significance.

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**APPENDIX 9.10.1
COMPLETE SPECIES LIST FROM THE 2014 INVERTEBRATE SURVEY**

Taxon	Status	Taxon	Status
Mollusca		<i>Asellus aquaticus</i>	common
Agriolimacidae		Crangonyctidae	
<i>Deroceras reticulatum</i>	common	<i>Crangonyx pseudogracilis</i>	common
Arionidae		Gammaridae	
<i>Arion ater</i>	common	<i>Gammarus pulex</i>	common
<i>Arion intermedius</i>	common	Oniscidae	
<i>Arion subfuscus</i>	common	<i>Oniscus asellus</i>	common
Cochlicopidae		Philosciidae	
<i>Cochlicopa lubrica</i>	common	<i>Philoscia muscorum</i>	common
<i>Cochlicopa lubricella</i>	common	Porcellionidae	
Discidae		<i>Porcellio scaber</i>	common
<i>Discus rotundatus</i>	common	Trichoniscidae	
Helicidae		<i>Trichoniscus pusillus</i>	common
<i>Cepaea nemoralis</i>	common	Araneae	
<i>Cornu aspersum</i>	common	Agelenidae	
Hydrobiidae		<i>Agelena labyrinthica</i>	frequent
<i>Potamopyrgus antipodarum</i>	common	Amaurobiidae	
Hygromiidae		<i>Amaurobius fenestralis</i>	common
<i>Trochulus striolatus</i>	common	Anyphaenidae	
Limacidae		<i>Anyphaena accentuata</i>	common
<i>Lehmannia marginata</i>	common	Araneidae	
<i>Limacus maculatus</i>	common	<i>Agelenatea redii</i>	frequent
<i>Limax maximus</i>	common	<i>Araneus diadematus</i>	common
Lymnaeidae		<i>Araneus sturmi</i>	frequent
<i>Lymnaea palustris</i> agg.	common	<i>Araniella opisthographa</i>	common
<i>Radix balthica</i>	common	<i>Larinioides cornutus</i>	common
Milacidae		<i>Neoscona adianta</i>	frequent
<i>Tandonia budapestensis</i>	common	<i>Nuctenea umbratica</i>	common
Oxychilidae		Dysderidae	
<i>Oxychilus alliarius</i>	common	<i>Harpactea hombergi</i>	common
Planorbidae		Linyphiidae	
<i>Gyraulus crista</i>	common	<i>Lepthyphantes minutus</i>	common
Sphaeriidae		Lycosidae	
<i>Pisidium</i> sp.		<i>Alopecosa pulverulenta</i>	common
Vertiginidae		Philodromidae	
<i>Vertigo moulinsiana</i>	VU BAP	<i>Philodromus aureolus</i>	common
Oligochaeta		<i>Philodromus cespitum</i>	common
Lumbricidae		Pisauridae	
<i>Aporrectodea caliginosa</i>	common	<i>Pisaura mirabilis</i>	common
<i>Dendrodrilus rubidus</i>	common	Salticidae	
<i>Lumbricus rubellus</i>	common	<i>Marpissa muscosa</i>	Nb
Hirudinea		Tetragnathidae	
Glossiphoniidae		<i>Pachygnatha clercki</i>	common
<i>Helobdella stagnalis</i>	common	Theridiidae	
<i>Theromyzon tessulatum</i>	common	<i>Achaearenea lunata</i>	frequent
Crustacea		<i>Enoplognatha ovata</i>	common
Armadillidiidae		Theridiosomatidae	
<i>Armadillidium vulgare</i>	common	<i>Theridiosoma gemmosum</i>	Nb
Asellidae		Thomisidae	

Taxon	Status	Taxon	Status
<i>Diaea dorsata</i>	frequent	<i>Oxystoma subulatum</i>	common
<i>Xysticus cristatus</i>	common	<i>Protapion apicans</i>	common
Opiliones		<i>Protapion assimile</i>	common
Leiobuninae		<i>Protapion filirostre</i>	Nb
<i>Dicranopalpus ramosus</i>	common	<i>Protapion fulvipes</i>	common
<i>Nelima gothica</i>	frequent	<i>Protapion nigritarse</i>	common
Nematostomatidae		<i>Protapion trifolii</i>	common
<i>Nemastoma bimaculatum</i>	common	<i>Squamapion cineraceum</i>	Na
Phalangiidae		<i>Stenopterapion tenue</i>	common
<i>Oligolophus tridens</i>	common	<i>Taeniapion urticarium</i>	frequent
<i>Phalangium opilio</i>	common	Biphyllidae	
Pseudoscorpiones		<i>Biphyllus lunatus</i>	frequent
Chernetidae		Buprestidae	
<i>Chernes cimicoides</i>	frequent	<i>Agrilus biguttatus</i>	frequent
Chilopoda		<i>Agrilus laticornis</i>	frequent
Geophilidae		<i>Agrilus sinuatus</i>	occasional
<i>Stigmatogaster subterranea</i>	common	Byturidae	
Lithobiidae		<i>Byturus tomentosus</i>	common
<i>Lithobius forficatus</i>	common	Cantharidae	
<i>Lithobius macilentus</i>	NS	<i>Cantharis cryptica</i>	common
<i>Lithobius microps</i>	common	<i>Cantharis decipiens</i>	common
Diplopoda		<i>Cantharis lateralis</i>	common
Bianiulidae		<i>Cantharis nigra</i>	common
<i>Proteroiulus fuscus</i>	common	<i>Cantharis pellucida</i>	common
Craspedosomatidae		<i>Cantharis rufa</i>	common
<i>Nanogona polydesmoides</i>	common	<i>Cantharis rustica</i>	common
Glomeridae		<i>Malthinus balteatus</i>	occasional
<i>Glomeris marginata</i>	common	<i>Malthinus flaveolus</i>	common
Julidae		<i>Malthinus frontalis</i>	NS
<i>Brachyiulus pusillus</i>	common	<i>Malthinus seriepunctatus</i>	common
<i>Cylindroiulus punctatus</i>	common	<i>Malthodes minimus</i>	common
<i>Julus scandinavicus</i>	common	<i>Rhagonycha fulva</i>	common
<i>Ophiulus pilosus</i>	common	<i>Rhagonycha lignosa</i>	common
<i>Tachypodoiulus niger</i>	common	<i>Rhagonycha limbata</i>	common
Polydesmidae		<i>Rhagonycha lutea</i>	NS
<i>Polydesmus angustus</i>	common	Carabidae	
<i>Polydesmus denticulatus</i>	common	<i>Abax parallelipedus</i>	common
Coleoptera		<i>Acupalpus dubius</i>	common
Anthribidae		<i>Agonum emarginatum</i>	common
<i>Choragus sheppardi</i>	Na	<i>Agonum fuliginosum</i>	common
<i>Platyrhinus resinus</i>	Nb	<i>Agonum marginatum</i>	frequent
Apionidae		<i>Amara aenea</i>	common
<i>Apion frumentarium</i>	common	<i>Amara ovata</i>	common
<i>Aspidapion radiolus</i>	common	<i>Anchomenus dorsalis</i>	frequent
<i>Ceratapion gibbirostre</i>	common	<i>Bembidion articulatum</i>	common
<i>Ceratapion onopordi</i>	common	<i>Bembidion guttula</i>	common
<i>Diplapion confluens</i>	common	<i>Bembidion lampros</i>	common
<i>Diplapion stolidum</i>	Nb	<i>Bembidion lunulatum</i>	common
<i>Eutrichapion ervi</i>	common	<i>Bembidion obliquum</i>	Nb
<i>Exapion ulicis</i>	common	<i>Bembidion obtusum</i>	common
<i>Holotrichapion pisi</i>	common	<i>Bembidion varium</i>	frequent
<i>Ischnopterapion loti</i>	common	<i>Calathus fuscipes</i>	common
<i>Ischnopterapion virens</i>	common	<i>Demetrias atricapillus</i>	common
<i>Malvapion malvae</i>	common	<i>Dromius quadrimaculatus</i>	common
<i>Oxystoma pomonae</i>	common	<i>Elaphrus cupreus</i>	common

Taxon	Status	Taxon	Status
<i>Elaphrus riparius</i>	common	<i>Oulema obscura</i>	common
<i>Harpalus affinis</i>	common	<i>Phaedon armoraciae</i>	common
<i>Harpalus rufipes</i>	common	<i>Phaedon cochleariae</i>	common
<i>Harpalus tardus</i>	frequent	<i>Phratora laticollis</i>	common
<i>Loricera pilicornis</i>	common	<i>Phratora vulgatissima</i>	common
<i>Microlestes minutulus</i>	common	<i>Phyllotreta atra</i>	common
<i>Nebria brevicollis</i>	common	<i>Phyllotreta consobrina</i>	NS
<i>Notiophilus biguttatus</i>	common	<i>Phyllotreta cruciferae</i>	NS
<i>Oxypselaphus obscurus</i>	common	<i>Phyllotreta diademata</i>	common
<i>Paradromius linearis</i>	common	<i>Phyllotreta nigripes</i>	common
<i>Pterostichus diligens</i>	common	<i>Phyllotreta nodicornis</i>	common
<i>Pterostichus madidus</i>	common	<i>Phyllotreta ochripes</i>	common
<i>Pterostichus nigrita</i>	common	<i>Phyllotreta undulata</i>	common
<i>Pterostichus strenuus</i>	common	<i>Phyllotreta vittula</i>	common
<i>Syntomus foveatus</i>	common	<i>Psylliodes affinis</i>	common
<i>Syntomus obscuroguttatus</i>	frequent	<i>Psylliodes chrysocephala</i>	common
<i>Syntomus truncatellus</i>	NS	<i>Psylliodes dulcamarae</i>	common
<i>Trechus quadristriatus</i>	common	<i>Psylliodes napi</i>	common
Cerambycidae		Ciidae	
<i>Clytus arietis</i>	common	<i>Cis bilamellatus</i>	common
<i>Grammoptera ruficornis</i>	common	<i>Cis pygmaeus</i>	frequent
<i>Leiopus nebulosus</i>	frequent	<i>Cis vestitus</i>	frequent
<i>Pseudovadonia livida</i>	occasional	<i>Ennearthron cornutum</i>	frequent
<i>Rutpela maculata</i>	frequent	Cleridae	
<i>Tetrops praeustus</i>	frequent	<i>Tillus elongatus</i>	NS
Cerylonidae		Coccinellidae	
<i>Cerylon ferrugineum</i>	frequent	<i>Adalia bipunctata</i>	common
<i>Cerylon histeroides</i>	frequent	<i>Adalia decempunctata</i>	common
Chrysomelidae		<i>Anisosticta novemdecimpunctata</i>	frequent
<i>Altica palustris</i>	common	<i>Calvia quattuordecimguttata</i>	common
<i>Bruchidius varius</i>	common	<i>Coccidula rufa</i>	common
<i>Bruchus loti</i>	common	<i>Coccinella septempunctata</i>	common
<i>Bruchus rufimanus</i>	common	<i>Exochomus quadripustulatus</i>	common
<i>Bruchus rufipes</i>	common	<i>Harmonia axyridis</i>	common
<i>Cassida rubiginosa</i>	common	<i>Hippodamia variegata</i>	Nb
<i>Chaetocnema concinna</i>	common	<i>Myrrha octodecimguttata</i>	common
<i>Chrysolina oricalcia</i>	occasional	<i>Propylea quattuordecimpunctata</i>	common
<i>Chrysolina polita</i>	common	<i>Psyllobora vigintiduopunctata</i>	common
<i>Crepidodera aurata</i>	common	<i>Rhyzobius chrysomeloides</i>	common
<i>Crepidodera aurea</i>	common	<i>Rhyzobius litura</i>	common
<i>Crepidodera fulvicornis</i>	common	<i>Scymnus auritus</i>	frequent
<i>Cryptocephalus fulvus</i>	frequent	<i>Scymnus frontalis</i>	frequent
<i>Epitrix pubescens</i>	frequent	<i>Scymnus suturalis</i>	common
<i>Gastrophysa polygoni</i>	frequent	<i>Subcoccinella</i>	
<i>Gastrophysa viridula</i>	common	<i>vigintiquattorpunctata</i>	common
<i>Longitarsus atricillus</i>	common	<i>Tytthaspis sedecimpunctata</i>	common
<i>Longitarsus dorsalis</i>	frequent	Cryptophagidae	
<i>Longitarsus strigicollis</i>	NS	<i>Antherophagus pallens</i>	frequent
<i>Longitarsus gracilis</i>	common	Curculionidae	
<i>Longitarsus jacobaeae</i>	common	<i>Acalles misellus</i>	frequent
<i>Longitarsus luridus</i>	common	<i>Anthonomus rubi</i>	common
<i>Longitarsus melanocephalus</i>	common	<i>Exomias pellucidus</i>	common
<i>Longitarsus pratensis</i>	common	<i>Ceutorhynchus assimilis</i>	common
<i>Neocrepidodera transversa</i>	common	<i>Ceutorhynchus chalybaeus</i>	common
<i>Oulema melanopus</i> agg.	common	<i>Ceutorhynchus obstrictus</i>	common

Taxon	Status	Taxon	Status
<i>Ceutorhynchus pallidactylus</i>	common	<i>Colymbetes fuscus</i>	common
<i>Ceutorhynchus pyrrhorhynchus</i>	common	<i>Dytiscus marginalis</i>	common
<i>Ceutorhynchus typhae</i>	common	<i>Hydrobius fuscipes</i>	common
<i>Cionus scrophulariae</i>	common	<i>Hydroporus angustatus</i>	common
<i>Curculio glandium</i>	common	<i>Hydroporus incognitus</i>	frequent
<i>Dorytomus taeniatus</i>	common	<i>Hydroporus memnonius</i>	common
<i>Dorytomus tortrix</i>	common	<i>Hydroporus palustris</i>	common
<i>Euophryum confine</i>	common	<i>Hydroporus planus</i>	common
<i>Hadroplontus litura</i>	common	<i>Hygrotus impressopunctatus</i>	common
<i>Hylesinus toranio</i>	frequent	<i>Hygrotus inaequalis</i>	common
<i>Hypera nigrirostris</i>	common	<i>Ilybius fuliginosus</i>	common
<i>Hypera plantaginis</i>	common	<i>Ilybius quadriguttatus</i>	common
<i>Hypera postica</i>	common	<i>Laccophilus minutus</i>	common
<i>Liophloeus tessulatus</i>	common	<i>Nebrioporus elegans</i>	common
<i>Magdalis cerasi</i>	Nb	<i>Rhantus suturalis</i>	common
<i>Magdalis ruficornis</i>	occasional	<i>Suphrodytes figuratus</i>	occasional
<i>Mecinus pascuorum</i>	common	Elateridae	
<i>Mecinus pyraeter</i>	common	<i>Adrastus pallens</i>	common
<i>Nedyus quadrimaculatus</i>	common	<i>Agriotes acuminatus</i>	common
<i>Orchestes quercus</i>	common	<i>Agriotes obscurus</i>	common
<i>Otiorhynchus rugosostriatus</i>	frequent	<i>Agriotes sputator</i>	common
<i>Otiorhynchus singularis</i>	common	<i>Athous campyloides</i>	Nb
<i>Otiorhynchus sulcatus</i>	common	<i>Athous haemorrhoidalis</i>	common
<i>Phyllobius pomaceus</i>	common	<i>Denticollis linearis</i>	common
<i>Phyllobius roboretanus</i>	common	<i>Kibunea minuta</i>	common
<i>Pityophthorus pubescens</i>	common	<i>Melanotus villosus</i> agg.	common
<i>Polydrusus cervinus</i>	common	Endomychidae	
<i>Polydrusus tereticollis</i>	frequent	<i>Endomychus coccineus</i>	occasional
		Eriirhinidae	
<i>Rhamphus oxyacanthae</i>	common	<i>Notaris scirpi</i>	Nb
<i>Rhamphus pulicarius</i>	common	<i>Tanysphyrus lemnae</i>	common
<i>Rhinocyllus conicus</i>	Na	Erotylidae	
<i>Rhinoncus pericarpus</i>	common	<i>Dacne rufifrons</i>	frequent
<i>Scolytus rugulosus</i>	frequent	Haliplidae	
<i>Sitona cylindricollis</i>	frequent	<i>Haliplus ruficollis</i>	common
<i>Sitona hispidulus</i>	common	Helophoridae	
<i>Sitona humeralis</i>	common	<i>Helophorus aequalis</i>	common
<i>Sitona lineatus</i>	common	<i>Helophorus brevipalpis</i>	common
<i>Sitona puncticollis</i>	frequent	<i>Helophorus grandis</i>	common
<i>Sitona sulcifrons</i>	frequent	<i>Helophorus minutus</i>	common
<i>Sitona suturalis</i>	common	<i>Helophorus obscurus</i>	common
<i>Strophosoma melanogrammum</i>	common	Heteroceridae	
<i>Trichosirocalus troglodytes</i>	common	<i>Heterocerus fenestratus</i>	common
<i>Tychius meliloti</i>	frequent	Hydraenidae	
<i>Tychius picirostris</i>	common	<i>Ochthebius minimus</i>	common
<i>Zacladus exiguus</i>	Nb	Hydrophilidae	
Dasytidae		<i>Anacaena globulus</i>	common
<i>Dasytes aeratus</i>	frequent	<i>Anacaena limbata</i>	common
Dermestidae		<i>Berosus signaticollis</i>	occasional
<i>Anthrenus verbasci</i>	common	<i>Cercyon convexiusculus</i>	frequent
<i>Ctesias serra</i>	Nb	<i>Cercyon marinus</i>	frequent
Dytiscidae		<i>Cercyon sternalis</i>	frequent
<i>Agabus bipustulatus</i>	common	<i>Cymbiodyta marginella</i>	frequent
<i>Agabus nebulosus</i>	frequent	<i>Enochrus testaceus</i>	common
<i>Agabus paludosus</i>	frequent	<i>Helochaeres lividus</i>	frequent

Taxon	Status	Taxon	Status
<i>Hydrobius fuscipes</i>	common	<i>Phloiophilus edwardsii</i>	Nb
<i>Laccobius bipunctatus</i>	common	Ptinidae	
<i>Laccobius minutus</i>	common	<i>Anobium fulvicorne</i>	common
<i>Megasternum concinnum</i>	common	<i>Anobium punctatum</i>	common
Kateretidae		<i>Dorcatoma chrysomelina</i>	occasional
<i>Brachypterus glaber</i>	common	<i>Dryophilus pusillus</i>	common
<i>Brachypterus urticae</i>	common	<i>Ernobius mollis</i>	common
<i>Kateretes rufilabris</i>	common	<i>Ochina ptingoides</i>	frequent
Latridiidae		<i>Ptilinus pectinicornis</i>	common
<i>Aridius nodifer</i>	common	Pyrochroidae	
Leiodidae		<i>Pyrochroa serraticornis</i>	common
<i>Catops tristis</i>	common	Rhynchitidae	
<i>Nargus wilkini</i>	common	<i>Lasioryhynchites cavifons</i>	Nb
<i>Ptomaphagus subvillosus</i>	common	<i>Tatianaerhynchites aequatus</i>	common
<i>Sciodrepoides watsoni</i>	common	<i>Temnocerus coeruleus</i>	frequent
Lucanidae		Salpingidae	
<i>Dorcus parallelipipedus</i>	frequent	<i>Lissodema denticolle</i>	NS
<i>Sinodendron cylindricum</i>	occasional	<i>Rhinosisimus planirostris</i>	common
Malachiidae		<i>Vincinellus ruficollis</i>	frequent
<i>Anthocomus fasciatus</i>	NS	Scarabaeidae	
<i>Anthocomus rufus</i>	frequent	<i>Aphodius contaminatus</i>	common
<i>Axinotarsus marginalis</i>	frequent	Scirtidae	
<i>Cordylepherus viridis</i>	common	<i>Cyphon coarctatus</i>	common
<i>Malachius bipustulatus</i>	common	<i>Cyphon laevipennis</i>	common
<i>Sphinginus lobatus</i>	occasional	<i>Cyphon ochraceus</i>	frequent
Melandryidae		<i>Microcara testacea</i>	common
<i>Orchesia micans</i>	NS	Scraptidae	
Monotomidae		<i>Anaspis costai</i>	NS
<i>Rhizophagus dispar</i>	common	<i>Anaspis frontalis</i>	common
Mordellidae		<i>Anaspis maculata</i>	common
<i>Mordellistena neuwaldeggiana</i>	NS	<i>Anaspis pulcaria</i>	common
<i>Mordellistena parvula</i>	NS	<i>Anaspis regimbarti</i>	common
<i>Mordellistena pumila</i>	frequent	Silphidae	
<i>Mordellochroa abdominalis</i>	occasional	<i>Silpha atrata</i>	common
Mycetophagidae		Silvanidae	
<i>Mycetophagus atomarius</i>	occasional	<i>Psammoecus bipunctatus</i>	frequent
<i>Mycetophagus multipunctatus</i>	frequent	Staphylinidae	
<i>Mycetophagus quadripustulatus</i>	frequent	<i>Anotylus rugosus</i>	common
Nanophyidae		<i>Anotylus sculpturatus</i>	common
<i>Nanophyes marmoratus</i>	common	<i>Atrecus affinis</i>	common
Nitidulidae		<i>Bisnius fimetarius</i>	common
<i>Cychramus luteus</i>	frequent	<i>Carpelimus corticinus</i>	common
<i>Epurea unicolor</i>	common	<i>Gabrius splendidulus</i>	common
<i>Meligethes aeneus</i>	common	<i>Lesteva sicula</i>	common
<i>Meligethes flavipes</i>	common	<i>Ocypus brunnipes</i>	common
Noteridae		<i>Philonthus micantoides</i>	frequent
<i>Noterus clavicornis</i>	common	<i>Platystethus arenarius</i>	common
Oedemeridae		<i>Proteinus brachypterus</i>	common
<i>Oedemera lurida</i>	common	<i>Stenus biguttatus</i>	frequent
<i>Oedemera nobilis</i>	common	<i>Stenus bimaculatus</i>	common
Phalacridae		<i>Stenus cicindeloides</i>	common
<i>Olibrus aeneus</i>	common	<i>Stenus junio</i>	common
<i>Olibrus millefolii</i>	N	<i>Stenus picipes</i>	common
<i>Stilbus testaceus</i>	common	<i>Stenus pubescens</i>	common
<i>Phloiophilidae</i>		<i>Stenus pusillus</i>	common

Taxon	Status	Taxon	Status
<i>Tachyporus hypnorum</i>	common	<i>Sciapus platypterus</i>	common
<i>Tachyporus nitidulus</i>	common	<i>Sympycnus pulicarius</i>	common
Tenebrionidae		<i>Syntormon denticulatus</i>	common
<i>Isomira murina</i>	common	Empididae	
<i>Lagria hirta</i>	common	<i>Dolichocephala oblongoguttata</i>	common
Tetatomidae		<i>Dolichocephala irrorata</i>	common
<i>Tetratoma fungorum</i>	occasional	<i>Empis aestiva</i>	common
Throscidae		<i>Empis livida</i>	common
<i>Trixagus dermestoides</i>	common	<i>Empis stercorea</i>	common
<i>Trixagus carinifrons</i>	frequent	<i>Empis tessellata</i>	common
Dermoptera		<i>Hilara fuscipes</i>	common
Forficulidae		<i>Phyllodromia melanocephala</i>	common
<i>Forficula auricularia</i>	common	<i>Rhamphomyia atra</i>	common
Diptera		<i>Empis longipes</i>	common
Anisopodidae		Heleomyzidae	
<i>Sylvicola fenestralis</i>	common	<i>Suillia affinis</i>	common
Asilidae		<i>Suillia atricornis</i>	common
<i>Choerades marginatus</i>	occasional	<i>Suillia bicolor</i>	common
<i>Dioctria atricapilla</i>	common	<i>Suillia variegata</i>	common
<i>Dioctria baumhaueri</i>	common	Hybotidae	
<i>Dioctria linearis</i>	common	<i>Drapetis ephippiata</i>	common
<i>Leptogaster cylindrica</i>	common	<i>Ocydromia glabricula</i>	common
<i>Machimus atricapillus</i>	common	<i>Oedalea flavipes</i>	common
<i>Machimus cingulatus</i>	common	<i>Oedalea holmgreni</i>	common
Bombyliidae		<i>Oedalea stigmatella</i>	common
<i>Bombylius major</i>	common	<i>Platypalpus pallidiventris</i>	common
Calliphoridae		Keroplidae	
<i>Pollenia rudis</i>	common	<i>Macrocera anglica</i>	common
Clusiidae		<i>Macrocera centralis</i>	common
<i>Clusiodes albimanus</i>	common	<i>Macrocera phalerata</i>	common
Conopidae		<i>Macrocera stigma</i>	common
<i>Sicus ferrugineus</i>	common	<i>Platyura marginata</i>	occasional
Culicidae		Lauxaniidae	
<i>Anopheles messeae/atroparvus</i>	common	<i>Peplomyza litura</i>	common
<i>Culex pipiens</i>	common	Limoniidae	
Ditomyiidae		<i>Achyrolimonia decemmaculata</i>	frequent
<i>Symmerus annulatus</i>	common	<i>Austrolimnophila ochracea</i>	common
Dixidae		<i>Cheilotrichia cinerascens</i>	common
<i>Dixa nubilipennis</i>	common	<i>Dicranomyia chorea</i>	common
<i>Dixella autumnalis</i>	common	<i>Dicranomyia lucida</i>	N
Dolichopodidae		<i>Dicranophragma nemorale</i>	common
<i>Campsicnemus curvipes</i>	common	<i>Ellipteroides lateralis</i>	frequent
<i>Campsicnemus scambus</i>	common	<i>Epiphragma ocellare</i>	common
<i>Chrysotus gramineus</i>	common	<i>Erioptera fusculentata</i>	common
<i>Dolichopus festivus</i>	common	<i>Erioptera lutea</i>	common
<i>Dolichopus plumipes</i>	common	<i>Gnophomyia viridipennis</i>	N
<i>Dolichopus unguilatus</i>	common	<i>Gonomyia recta</i>	occasional
<i>Medetera saxatilis</i>	common	<i>Helius flavus</i>	frequent
<i>Medetera truncorum</i>	common	<i>Helius longirostris</i>	common
<i>Microphor crassipes</i>	common	<i>Ilisia maculata</i>	common
<i>Neurigona quadrifasciata</i>	common	<i>Ilisiaoccoecata</i>	common
<i>Poecilobothrus nobilitatus</i>	common	<i>Limonia nigropunctata</i>	frequent
<i>Rhaphium caliginosum</i>	common	<i>Limonia nubeculosa</i>	common
<i>Scellus notatus</i>	common	<i>Limonia phragmitidis</i>	common
<i>Sciapus contristans</i>	frequent	<i>Molophilus bifidus</i>	common

Taxon	Status	Taxon	Status
<i>Molophilus ochraceus</i>	common	<i>Tetanocera elata</i>	common
<i>Neolimonia dumetorum</i>	common	<i>Tetanocera ferruginea</i>	common
<i>Ormosia hederæ</i>	common	<i>Tetanocera hyalipennis</i>	common
<i>Paradelphomyia senilis</i>	common	<i>Tetanura pallidiventris</i>	frequent
<i>Phylidorea ferruginea</i>	common	Stratiomyidae	
<i>Pilaria discicollis</i>	common	<i>Beris chalybata</i>	common
<i>Pseudolimnophila lucorum</i>	common	<i>Beris vallata</i>	common
<i>Pseudolimnophila sepium</i>	common	<i>Chloromyia formosa</i>	common
<i>Rhipidia maculata</i>	common	<i>Chorisops nagatomii</i>	frequent
<i>Symplecta stictica</i>	common	<i>Chorisops tibialis</i>	common
<i>Thaumastoptera calceata</i>	N	<i>Microchrysa flavicornis</i>	common
Lonchopteridae		<i>Microchrysa polita</i>	common
<i>Lonchoptera lutea</i>	common	<i>Nemotelus nigrinus</i>	frequent
Opetiidae		<i>Nemotelus pantherinus</i>	occasional
<i>Opetia nigra</i>	common	<i>Odontomyia tigrina</i>	occasional
Opomyzidae		<i>Oxycera nigricornis</i>	occasional
<i>Geomyza tripunctata</i>	common	<i>Oxycera trilineata</i>	frequent
<i>Opomyza florum</i>	common	<i>Pachygaster atra</i>	common
<i>Opomyza germinationis</i>	common	<i>Pachygaster leachii</i>	common
Pallopteridae		<i>Stratiomys potamida</i>	occasional
<i>Palloptera umbellatarum</i>	common	Syrphidae	
Pediciidae		<i>Anasimyia contracta</i>	frequent
<i>Tricyphona immaculata</i>	common	<i>Chalcosyrphus nemorum</i>	frequent
Platypozidae		<i>Cheilosia albipila</i>	frequent
<i>Callomyia amoena</i>	common	<i>Cheilosia albitarsis</i>	common
Platystomatidae		<i>Cheilosia bergenstammi</i>	common
<i>Rivellia syngenesiae</i>	frequent	<i>Cheilosia illustrata</i>	common
Ptychopteridae		<i>Cheilosia impressa</i>	frequent
<i>Ptychoptera albimana</i>	common	<i>Cheilosia soror</i>	frequent
<i>Ptychoptera contaminata</i>	common	<i>Chrysogaster solstitialis</i>	common
<i>Ptychoptera minuta</i>	frequent	<i>Chrysotoxum bicinctum</i>	frequent
Rhagionidae		<i>Episyrphus balteatus</i>	common
<i>Chrysopilus asiliformis</i>	common	<i>Eristalinus sepulchralis</i>	common
<i>Chrysopilus cristatus</i>	common	<i>Eristalis horticola</i>	common
<i>Rhagio lineola</i>	common	<i>Eristalis pertinax</i>	common
<i>Rhagio scolopaceus</i>	common	<i>Eristalis tenax</i>	common
<i>Rhagio tringarius</i>	common	<i>Eupeodes luniger</i>	common
Scathophagidae		<i>Helophilus pendulus</i>	common
<i>Scathophaga stercoraria</i>	common	<i>Leucozона lateraria</i>	common
Scatopsidae		<i>Leucozона lucorum</i>	common
<i>Scatopse notata</i>	common	<i>Melanogaster hirtella</i>	common
<i>Thripomorpha coxendix</i>	common	<i>Melanostoma mellinum</i>	common
Sciomyzidae		<i>Melanostoma scalare</i>	common
<i>Coremacera marginata</i>	frequent	<i>Meliscaeva auricollis</i>	common
<i>Dichetophora obliterata</i>	frequent	<i>Myathropa florea</i>	common
<i>Elgiva cucularia</i>	frequent	<i>Neosasia podagrica</i>	common
<i>Euthycera fumigata</i>	frequent	<i>Neosasia tenur</i>	common
<i>Hydromya dorsalis</i>	common	<i>Parhelophilus frutetorum</i>	frequent
<i>Ilione albiseta</i>	common	<i>Pipizella viduata</i>	common
<i>Limnia unguicornis</i>	common	<i>Platycheirus albimanus</i>	common
<i>Pherbellia albocostata</i>	common	<i>Platycheirus angustatus</i>	common
<i>Pherbellia cinerella</i>	common	<i>Platycheirus clypeatus</i>	common
<i>Pherbellia scutellaris</i>	common	<i>Sphaerophoria scripta</i>	common
<i>Pherbina coryleti</i>	common	<i>Sphegina clunipes</i>	frequent
<i>Tetanocera arrogans</i>	common	<i>Syrirta pipiens</i>	common

Taxon	Status	Taxon	Status
<i>Syrphus ribesii</i>	common	<i>Acompocoris alpinus</i>	common
<i>Syrphus torvus</i>	common	<i>Anthocoris confusus</i>	common
<i>Volucella bombylans</i>	common	<i>Anthocoris nemoralis</i>	common
<i>Volucella pellucens</i>	common	<i>Anthocoris nemorum</i>	common
<i>Volucella zonaria</i>	common	<i>Buchananiella continua</i>	common
<i>Xylota segnis</i>	common	<i>Cardiastethus fasciiventris</i>	common
Tachinidae		<i>Orius majusculus</i>	common
<i>Cistogaster globosa</i>	RDB1	<i>Orius niger</i>	common
<i>Dexiosoma caninum</i>	common	<i>Orius vicinus</i>	common
<i>Eriothrix rufomaculata</i>	common	<i>Temnostethus pusillus</i>	common
<i>Phasia pusilla</i>	common	Aphrophoridae	
<i>Tachina fera</i>	common	<i>Aphrophora alni</i>	common
Tephritidae		<i>Neophilaenus campestris</i>	frequent
<i>Anomoia purmunda</i>	common	<i>Neophilaenus lineatus</i>	common
<i>Terellia tussilaginis</i>	common	<i>Philaenus spumarius</i>	common
<i>Chaetorellia jaceae</i>	common	Aradidae	
<i>Merzomyia westermanni</i>	Nb	<i>Aradus depressus</i>	frequent
<i>Sphenella marginata</i>	common	Berytidae	
<i>Tephritis cometa</i>	common	<i>Berytinus minor</i>	frequent
<i>Tephritis formosa</i>	common	<i>Berytinus signoreti</i>	frequent
<i>Tephritis matricariae</i>	frequent	<i>Metatropis rufescens</i>	frequent
<i>Tephritis neesii</i>	common	Cicadellidae	
<i>Terellia ruficauda</i>	common	<i>Acericerus heydenii</i>	common
<i>Terellia serratulae</i>	common	<i>Acericerus kirschbaumi</i>	common
<i>Urophora cardui</i>	common	<i>Acericerus vittifrons</i>	frequent
<i>Urophora jaceana</i>	common	<i>Agallia consobrina</i>	common
<i>Xyphosia miliaria</i>	common	<i>Alebra albostriella</i>	common
Tipulidae		<i>Alebra wahlbergi</i>	common
<i>Nephrotoma flavescens</i>	common	<i>Alnetoidea alneti</i>	common
<i>Nephrotoma quadrifaria</i>	common	<i>Anaceratagallia ribauti</i>	common
<i>Tipula lateralis</i>	common	<i>Anoscopus flavostriatus</i>	common
<i>Tipula lunata</i>	common	<i>Aphrodes makarovi</i>	common
<i>Tipula obsoleta</i>	common	<i>Arthaldeus pascuellus</i>	common
<i>Tipula pagana</i>	common	<i>Cicadella viridis</i>	common
Trichoceridae		<i>Cicadula frontalis</i>	frequent
<i>Trichocera annulata</i>	common	<i>Cicadula quadrinotata</i>	common
<i>Trichocera hiemalis</i>	common	<i>Deltocephalus pulicaris</i>	common
<i>Trichocera parva</i>	frequent	<i>Edwardsiana avellanae</i>	common
<i>Trichocera regelationis</i>	common	<i>Edwardsiana crataegi</i>	common
<i>Trichocera saltator</i>	common	<i>Empoasca decipiens</i>	common
Ulidiidae		<i>Empoasca vitis</i>	common
<i>Dorycera graminum</i>	NTBAP	<i>Eupteryx aurata</i>	common
<i>Herina frondescentiae</i>	frequent	<i>Eupteryx filicum</i>	frequent
Ephemeroptera		<i>Eupteryx urticae</i>	common
Baetidae		<i>Eupteryx vittata</i>	common
<i>Cloeon dipterum</i>	common	<i>Eurhadina concinna</i>	common
Caenidae		<i>Eurhadina loewii</i>	common
<i>Caenis horaria</i>	common	<i>Eurhadina pulchella</i>	common
<i>Caenis luctuosa</i>	common	<i>Euscelis incisus</i>	common
Hemiptera		<i>Fagocyba cruenta</i>	common
Acanthosomatidae		<i>Grypotes puncticollis</i>	frequent
<i>Acanthosoma haemorrhoidale</i>	common	<i>lassus lanio</i>	common
<i>Elasmostethus interstinctus</i>	common	<i>lassus scutellaris</i>	Na
<i>Elasmucha grisea</i>	common	<i>Idiocerus herrichi</i>	frequent
Anthocoridae		<i>Idiocerus lituratus</i>	common

Taxon	Status	Taxon	Status
<i>Idiocerus stigmatalis</i>	common	Delphacidae	
<i>Kybos butleri</i>	common	<i>Anakelisia fasciata</i>	frequent
<i>Kybos populi</i>	common	<i>Conomelus anceps</i>	common
<i>Kybos rufescens</i>	common	<i>Dicranotropis hamata</i>	common
<i>Kybos virgator</i>	common	<i>Ditropis pteridis</i>	common
<i>Ledra aurita</i>	frequent	<i>Eurysa lineata</i>	frequent
<i>Lindbergina aurovittata</i>	common	<i>Hyledelphax elegantulus</i>	common
<i>Linnavuoriana sexmaculata</i>	frequent	<i>Javesella pellucida</i>	frequent
<i>Macropsis cerea</i>	common	<i>Stenocranus minutus</i>	common
<i>Macropsis fuscula</i>	common	Gerridae	
<i>Macropsis graminea</i>	frequent	<i>Aquarius paludum</i>	NS
<i>Macropsis prasina</i>	common	<i>Gerris lacustris</i>	common
<i>Macrosteles laevis</i>	common	Hydrometridae	
<i>Macrosteles sexnotatus</i>	common	<i>Hydrometra stagnorum</i>	common
<i>Macrosteles viridigriseus</i>	common	Lygaeidae	
<i>Notus flavipennis</i>	common	<i>Chilacis typhae</i>	common
<i>Oncopsis alni</i>	common	<i>Cymus glandicolor</i>	common
<i>Oncopsis carpini</i>	frequent	<i>Cymus melanocephalus</i>	common
<i>Oncopsis flavicollis</i>	common	<i>Heterogaster urticae</i>	common
<i>Oncopsis tristis</i>	common	<i>Ischnodemus sabuleti</i>	common
<i>Populicerus albicans</i>	common	<i>Kleidocerys resedae</i>	common
<i>Populicerus confusus</i>	common	<i>Megalonotus chiragra</i>	occasional
<i>Populicerus populi</i>	common	<i>Nysius ericae</i>	common
<i>Populicerus vitreus</i>	common	<i>Nysius huttoni</i>	common
<i>Psammotettix confinis</i>	common	<i>Peritrechus geniculatus</i>	common
<i>Psammotettix nodosus</i>	common	<i>Peritrechus lundii</i>	occasional
<i>Ribautiana scalaris</i>	common	<i>Scolopostethus affinis</i>	common
<i>Ribautiana tenerrima</i>	common	<i>Scolopostethus thomsoni</i>	common
<i>Ribautiana ulmi</i>	common	<i>Stygnocoris fuliginosus</i>	common
<i>Thamnotettix confinis</i>	common	Micropsysidae	
<i>Tremulicerus distinguendus</i>	common	<i>Loricula elegantula</i>	common
<i>Tremulicerus tremulae</i>	common	<i>Loricula pselaphiformis</i>	common
<i>Typhlocyba quercus</i>	common	Miridae	
<i>Viridicerus ustulatus</i>	common	<i>Adelphocoris lineolatus</i>	frequent
<i>Zonocyba bifasciata</i>	frequent	<i>Amblytylus delicatus</i>	RDB3
<i>Zygina flammigera</i>	common	<i>Amblytylus nasutus</i>	common
<i>Zyginidia scutellaris</i>	common	<i>Apolygus lucorum</i>	common
Cixiidae		<i>Apolygus spinolae</i>	common
<i>Cixius nervosus</i>	common	<i>Blepharidopterus angulatus</i>	common
<i>Reptalus quinquecostatus</i>	Nb	<i>Bryocoris pteridis</i>	common
<i>Tachycixius pilosus</i>	common	<i>Campyloneura virgula</i>	common
Coreidae		<i>Capsus ater</i>	common
<i>Coreus marginatus</i>	common	<i>Closterotomus norwegicus</i>	common
<i>Coriomeris denticulatus</i>	frequent	<i>Cylloceria histrionica</i>	common
<i>Syromastus rhombeus</i>	occasional	<i>Deraeocoris flavilinea</i>	common
Corixidae		<i>Deraeocoris lutescens</i>	common
<i>Callicorixa praeusta</i>	common	<i>Deraeocoris ruber</i>	common
<i>Hesperocorixa sahlbergi</i>	common	<i>Dicyphus epilobii</i>	common
<i>Micronecta scholtzi</i>	frequent	<i>Dicyphus errans</i>	common
<i>Sigara dorsalis</i>	common	<i>Dicyphus globulifer</i>	common
<i>Sigara falleni</i>	common	<i>Dicyphus stachydis</i>	common
<i>Sigara nigrolineata</i>	common	<i>Europiella artemisiae</i>	common
Cydnidae		<i>Grypocoris stysi</i>	common
<i>Legnotus limbosus</i>	common	<i>Heterotoma planicornis</i>	common
<i>Tritomegas bicolor</i>	common	<i>Leptopterna dolabrata</i>	common

Taxon	Status	Taxon	Status
<i>Leptopterna ferrugata</i>	common	<i>Nabis ferus</i>	common
<i>Liocoris tripustulatus</i>	common	<i>Nabis flavomarginatus</i>	common
<i>Lopus decolor</i>	frequent	<i>Nabis limbatus</i>	common
<i>Lygocoris pabulinus</i>	common	<i>Nabis rugosus</i>	common
<i>Lygus pratensis</i>	RDB3	Nepidae	
<i>Lygus rugulipennis</i>	common	<i>Nepa cinerea</i>	common
<i>Malacocoris chlorizans</i>	common	<i>Ranatra linearis</i>	frequent
<i>Megacoelum infusum</i>	common	Notonectidae	
<i>Megaloceroea relicticornis</i>	common	<i>Notonecta glauca</i>	common
<i>Megalocoleus molliculus</i>	common	<i>Notonecta maculata</i>	occasional
<i>Monalocoris filicis</i>	common	<i>Notonecta viridis</i>	frequent
<i>Neolygus contaminatus</i>	common	Pentatomidae	
<i>Neolygus viridis</i>	common	<i>Aelia acuminata</i>	common
<i>Notostira elongata</i>	common	<i>Dolycoris baccarum</i>	frequent
<i>Oncotylus viridiflavus</i>	frequent	<i>Eurydema oleracea</i>	frequent
<i>Orthocephalus saltator</i>	frequent	<i>Palomena prasina</i>	common
<i>Orthonotus rufifrons</i>	frequent	<i>Pentatoma rufipes</i>	common
<i>Orthops campestris</i>	common	<i>Piezodorus lituratus</i>	common
<i>Orthops kalmii</i>	common	<i>Podops inuncta</i>	common
<i>Orthotylus diaphanus</i>	common	Piesmidae	
<i>Orthotylus marginalis</i>	common	<i>Piesma quadratum</i>	common
<i>Orthotylus ochrotrichus</i>	common	Pleidae	
<i>Orthotylus tenellus</i>	common	<i>Plea minutissima</i>	common
<i>Phylus coryli</i>	common	Psyllidae	
<i>Phylus melanocephalus</i>	common	<i>Psylla melanoneura</i>	common
<i>Phytocoris longipennis</i>	common	<i>Psylla peregrina</i>	common
<i>Phytocoris populi</i>	common	<i>Psyllopsis fraxini</i>	common
<i>Phytocoris tiliae</i>	common	Rhopalidae	
<i>Phytocoris ulmi</i>	common	<i>Corizus hyoscyami</i>	frequent
<i>Phytocoris varipes</i>	common	<i>Rhopalus subrufus</i>	common
<i>Pilophorus clavatus</i>	frequent	<i>Stictopleurus punctatonervosus</i>	common
<i>Pilophorus perplexus</i>	frequent	Saldidae	
<i>Pinalitus cervinus</i>	common	<i>Chartoscirta cincta</i>	common
<i>Pithanus markellii</i>	common	<i>Saldula pallipes</i>	NS
<i>Plagiognathus arbustorum</i>	common	<i>Saldula saltatoria</i>	common
<i>Plagiognathus chrysanthemi</i>	common	Thyreocoridae	
<i>Polymerus nigritus</i>	frequent	<i>Thyreocoris scarabaeoides</i>	NS
<i>Psallus ambiguus</i>	common	Tingidae	
<i>Psallus assimilis</i>	common	<i>Acalypta parvula</i>	common
<i>Psallus confusus</i>	common	<i>Kalama tricornis</i>	frequent
<i>Psallus flavellus</i>	common	<i>Physatocheila dumetorum</i>	common
<i>Psallus haematodes</i>	common	<i>Tingis ampliata</i>	common
<i>Psallus lepidus</i>	common	<i>Tingis cardui</i>	common
<i>Psallus perrisi</i>	common	Trioziidae	
<i>Psallus salicis</i>	common	<i>Trioza urticae</i>	common
<i>Psallus varians</i>	common	Veliidae	
<i>Stenodema calcarata</i>	common	<i>Microvelia reticulata</i>	common
<i>Stenodema laevigata</i>	common	<i>Velia caprai</i>	common
<i>Stenotus binotatus</i>	common	Hymenoptera	
<i>Sthenarus rotermundi</i>	common	Andrenidae	
<i>Trigonotylus caelestialium</i>	common	<i>Andrena fulva</i>	common
<i>Trigonotylus ruficornis</i>	common	Apidae	
Nabidae		<i>Apis mellifera</i>	common
<i>Himacerus apterus</i>	common	<i>Bombus hortorum</i>	common
<i>Himacerus mirmicoides</i>	common	<i>Bombus hypnorum</i>	common

Taxon	Status	Taxon	Status
<i>Bombus lapidarius</i>	common	<i>Nemophora degeerella</i>	common
<i>Bombus lucorum</i>	common	Argyresthiidae	
<i>Bombus pascuorum</i>	common	<i>Argyresthia bonnetella</i>	common
<i>Bombus pratorum</i>	common	<i>Argyresthia goedartella</i>	common
<i>Bombus terrestris</i>	common	Blastobasidae	
<i>Bombus vestalis</i>	common	<i>Blastobasis lacticolella</i>	common
<i>Nomada flavoguttata</i>	common	Choreutidae	
Argidae		<i>Anthophila fabriciana</i>	common
<i>Arge cyanocrocea</i>	common	<i>Choreutis pariana</i>	frequent
Cephalidae		Crambidae	
<i>Calameuta pallipes</i>	common	<i>Agriphila tristella</i>	common
<i>Cephus cultratus</i>	common	<i>Crambus lathoniellus</i>	common
<i>Cephus pygmaeus</i>	common	<i>Crambus pascuella</i>	common
Colletidae		<i>Udea olivalis</i>	common
<i>Hylaeus communis</i>	common	Erebidae	
<i>Hylaeus confusus</i>	common	<i>Euclidia glyphica</i>	frequent
Crabronidae		<i>Herminia tarsipennalis</i>	common
<i>Crossocerus podagricus</i>	common	<i>Hypena proboscidalis</i>	common
<i>Ectemnius lituratus</i>	common	<i>Orgyia antiqua</i>	common
<i>Lindenius albilabris</i>	common	<i>Tyria jacobaeae</i>	common BAP
<i>Passaloecus singularis</i>	common	Geometridae	
<i>Psenulus pallipes</i>	common	<i>Cabera exanthemata</i>	common
<i>Stigmus solskyi</i>	frequent	<i>Cabera pusaria</i>	common
Formicidae		<i>Campptogramma bilineata</i>	common
<i>Formica fusca</i>	common	<i>Chiasmia clathrata</i>	frequent BAP
<i>Lasius brunneus</i>	Na	Hesperiidae	
<i>Lasius niger</i>	common	<i>Ochlodes sylvanus</i>	common
<i>Temnothorax nylanderii</i>	frequent	<i>Thymelicus sylvestris</i>	common
<i>Myrmica ruginodis</i>	common	Lycaenidae	
<i>Myrmica scabrinodis</i>	common	<i>Lycaena phlaeas</i>	frequent
Halictidae		<i>Polyommatus icarus</i>	frequent
<i>Halictus tumulorum</i>	common	Micropterigidae	
<i>Lasioglossum calceatum</i>	common	<i>Micropterix calthella</i>	common
<i>Lasioglossum morio</i>	common	Noctuidae	
Megachilidae		<i>Amphipyra pyramidea</i>	common
<i>Chelostoma florissomne</i>	frequent	<i>Autographa gamma</i>	common
<i>Heriades truncorum</i>	RDBK	<i>Polyploca ridens</i>	frequent
<i>Hoplitis spinulosa</i>	frequent	Nymphalidae	
<i>Megachile willughbiella</i>	common	<i>Aglais urticae</i>	common
<i>Osmia leaiana</i>	common	<i>Aglais io</i>	common
Pompilidae		<i>Aphantopus hyperantus</i>	common
<i>Anoplius nigerrimus</i>	common	<i>Coenonympha pamphilus</i>	NT BAP
Tenthredinidae		<i>Maniola jurtina</i>	common
<i>Eutomostethus ephippium</i>	common	<i>Pararge aegeria</i>	common
<i>Macrophya montana</i>	frequent	<i>Polygonia c-album</i>	common
<i>Tenthredo livida</i>	common	<i>Pyronia tithonus</i>	common
<i>Tenthredo mesomelas</i>	common	<i>Vanessa atalanta</i>	common
<i>Tenthredopsis nassata</i>	common	<i>Vanessa cardui</i>	common
Tiphiidae		Peleopodidae	
<i>Tiphia minuta</i>	Nb	<i>Carcina quercana</i>	common
Vespidae		Pieridae	
<i>Symmorphus gracilis</i>	frequent	<i>Gonepteryx rhamni</i>	common
<i>Vespula vulgaris</i>	common	<i>Pieris brassicae</i>	common
Lepidoptera			
Adelidae			

Taxon	Status	Taxon	Status
<i>Pieris napi</i>	common	<i>Sympetrum striolatum</i>	common
<i>Pieris rapae</i>	common	Orthoptera	
Psychidae		Acrididae	
<i>Narycia duplicella</i>	common	<i>Chorthippus brunneus</i>	common
Pterophoridae		<i>Chorthippus parallelus</i>	common
<i>Emmelina monodactyla</i>	common	Tetrigidae	
Pyralidae		<i>Tetrix subulata</i>	common
<i>Homoeosoma sinuella</i>	frequent	<i>Tetrix undulata</i>	common
Tineidae		Tettigoniidae	
<i>Nemapogon cloacella</i>	common	<i>Leptophyes punctatissima</i>	common
Tortricidae		<i>Meconema thalassinum</i>	common
<i>Ditula angustiorana</i>	common	<i>Metrioptera roesellii</i>	common
<i>Grapholita tenebrosana</i>	frequent	<i>Pholidoptera griseoptera</i>	common
<i>Gypsonoma dealbana</i>	common	Plecoptera	
<i>Hedya pruniana</i>	common	Nemouridae	
<i>Orthotaenia undulana</i>	common	<i>Nemurella pictetii</i>	common
<i>Pammene aurana</i>	common	Psocoptera	
<i>Strophedra nitidana</i>	occasional	Caeciliusidae	
<i>Tortrix viridana</i>	common	<i>Valenzuela flavidus</i>	common
Zygaenidae		Ectopsocidae	
<i>Zygaena filipendulae</i>	common	<i>Ectopsocus briggsi</i>	common
Mecoptera		Mesopsocidae	
Panorpidae		<i>Mesopsocus unipunctatus</i>	common
<i>Panorpa communis</i>	common	Philotarsidae	
<i>Panorpa germanica</i>	common	<i>Philotarsus parviceps</i>	common
Megaloptera		<i>Philotarsus picicornis</i>	common
Sialidae		Psocidae	
<i>Sialis lutaria</i>	common	<i>Loensia fasciata</i>	frequent
Neuroptera		Stenopsocidae	
Chrysopidae		<i>Graphopsocus cruciatus</i>	common
<i>Chrysopa perla</i>	common	<i>Stenopsocus immaculatus</i>	common
<i>Chrysoperla carnea</i>	common	Raphidioptera	
<i>Nineta vittata</i>	common	Raphidiidae	
Hemerobiidae		<i>Atlantoraphidia maculicollis</i>	frequent
<i>Hemerobius humulinus</i>	common	<i>Phaeostigma notata</i>	frequent
<i>Hemerobius micans</i>	common	Trichoptera	
<i>Hemerobius stigma</i>	common	Leptoceridae	
Odonata		<i>Athripsodes aterrimus</i>	common
Aeshnidae		Limnephilidae	
<i>Aeshna cyanea</i>	common	<i>Glyptotaelius pellucidus</i>	common
<i>Aeshna grandis</i>	common	<i>Limnephilus affinis</i>	common
<i>Aeshna mixta</i>	common	<i>Limnephilus auricula</i>	common
Calopterygidae		<i>Limnephilus flavicornis</i>	common
<i>Calopteryx splendens</i>	common	<i>Limnephilus lunatus</i>	common
Coenagriidae			
<i>Coenagrion puella</i>	common		
<i>Enallagma cyathigerum</i>	common		
<i>Ischnura elegans</i>	common		
<i>Pyrrhosoma nymphula</i>	common		
Libellulidae			
<i>Sympetrum sanguineum</i>	frequent		

**APPENDIX 9.10.2
DISTRIBUTION OF INVERTEBRATE RECORDS AND ASSESSMENT OF RELATIVE INTEREST**

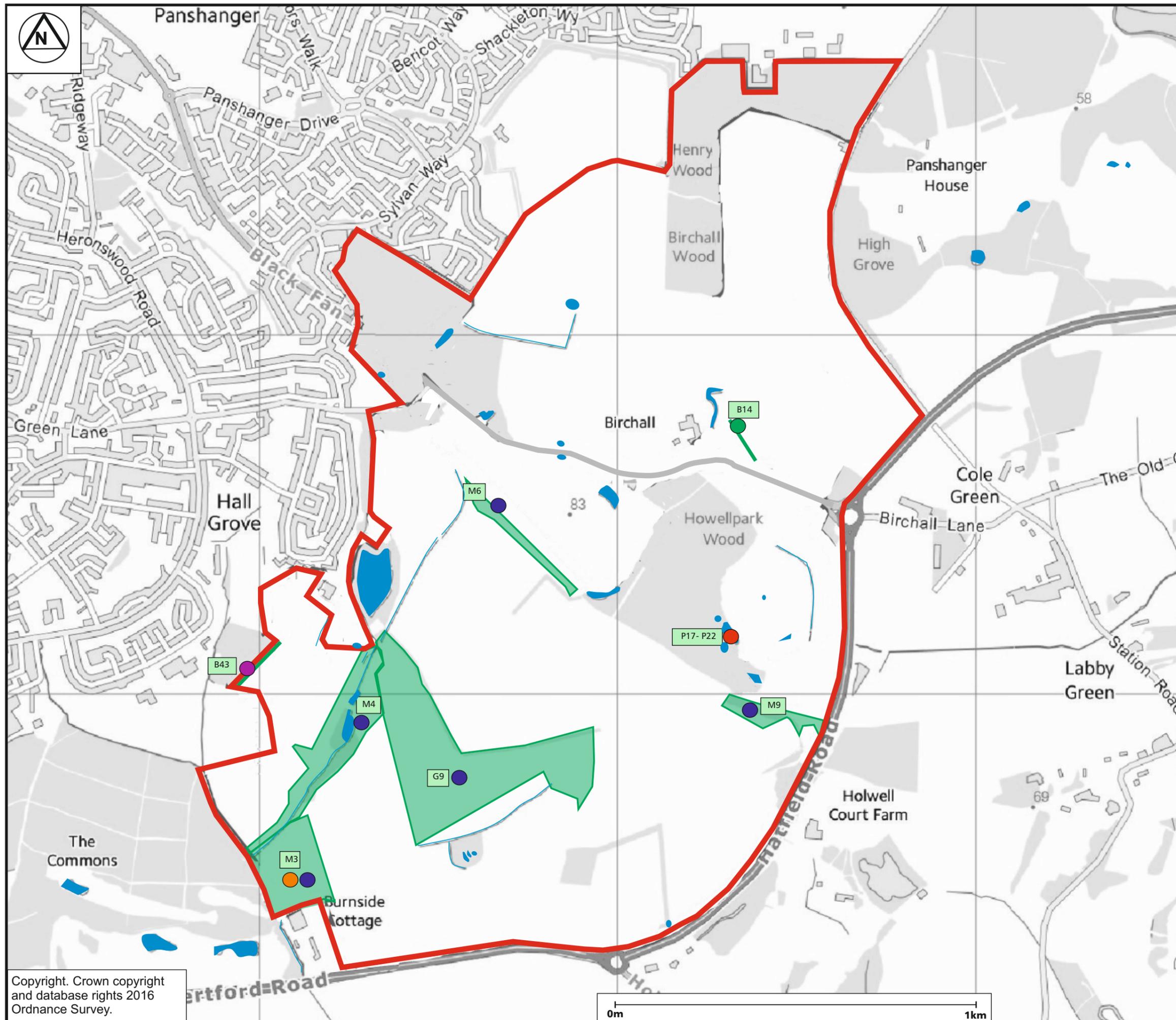
Features are graded on a five-point scale, with 1 being the highest quality and 5 the lowest. These gradings are intended to indicate the relative value of features in a site context, rather than to correspond to particular levels of national or local importance. Gradings in this table are those based on invertebrate potential, or proven interest, alone. Descriptions and overall assessments for features, including the results of botanical survey and assessment, are given separately.

Feature code	Grade	Number of Invertebrate records	Key species recorded
A1	5	0	-
A2	5	0	-
A3	5	0	-
A4	5	0	-
A5	5	0	-
A6	5	0	-
A6	5	0	-
A7	5	0	-
A8	5	0	-
A9	5	0	-
A10	5	0	-
A11	5	3	None
A12	5	0	-
A13	5	0	-
A14	5	0	-
A15	5	0	-
B1	1	80	<i>Agrilus sinuatus</i> occasional (Coleoptera) <i>Anaspis costai</i> NS (Coleoptera) <i>Aradus depressus</i> occasional (Hemiptera) <i>Chrysolina oricalcia</i> occasional (Coleoptera) <i>Lissodema denticolle</i> NS (Coleoptera) <i>Malthinus balteatus</i> occasional (Coleoptera) <i>Mordellochroa abdominalis</i> occasional (Coleoptera) <i>Rhagonycha lutea</i> NS(Coleoptera) <i>Strophedra nitidana</i> occasional (Lepidoptera)
B2	2	0	-
B3	2	28	None
B4	2	60	<i>Choragus sheppardi</i> Na (Coleoptera) <i>Chrysolina oricalcia</i> occasional (Coleoptera) <i>Dorycera graminum</i> RDB3, BAP (Diptera) <i>Lissodema denticolle</i> NS (Coleoptera) <i>Magdalis ruficornis</i> occasional (Coleoptera) <i>Thyreocoris scarabaeoides</i> NS (Hemiptera) <i>Tyria jacobaeae</i> BAP (Lepidoptera)
B5	4	27	None
B6	2	48	<i>Dorycera graminum</i> NT, BAP (Diptera)
B7	1	0	-
B8	4	0	-
B9	2	0	-
B10	3	0	-
B11	4	0	-
B12	4	0	-
B13	4	0	-
B14	4	0	-
B15	5	0	-
B16	2	0	-
B17	2	64	<i>Anthocomus fasciatus</i> NS (Coleoptera) <i>Pseudovadonia livida</i> occasional (Coleoptera)
B18	3	0	-
B19	5	0	-
B20	2	0	-
B21	3	0	-
B22	2	19	None
B23	3	2	<i>Orchesia micans</i> NS (Coleoptera)
B24	4	2	<i>Amblytylus delicatus</i> RDB3 (Hemiptera) <i>Mordellistena parvula</i> NS (Coleoptera).
B25	4	0	-
B26	4	0	-
B27	4	0	-
B28	5	0	-
B29	4	0	-

Feature code	Grade	Number of Invertebrate records	Key species recorded
B30	4	9	None
B31	4	0	-
B32	4	0	-
B33	2	33	<i>Anaspis costai</i> NS (Coleoptera) <i>Lissodema denticolle</i> NS (Coleoptera) <i>Malthinus balteatus</i> occasional (Coleoptera)
B34	4	19	None
B35	4	0	-
B36	4	0	-
B37	4	0	-
B38	3	1	None
B39	5	0	-
B40	2	44	None
B41	4	0	-
B42	4	0	-
B43	2	16	<i>Heriades truncorum</i> RDBK (Hymenoptera)
B44	4	14	<i>Syntomus truncatellus</i> NS (Coleoptera)
G1	2 (tree only)	0	-
G2	5	0	-
G3	5	0	-
G4	2	140	<i>Anthocomus fasciatus</i> NS (Coleoptera) <i>Coenonympha pamphilus</i> NT, BAP (Lepidoptera) <i>Diplapion stolidum</i> Nb (Coleoptera) <i>Machimus cingulatus</i> occasional (Diptera) <i>Merzomyia westermanni</i> N (Diptera) <i>Reptalus quinquecostatus</i> Nb (Hemiptera)
G5	4	4	None
G6	4	1	<i>Longitarsus strigicollis</i> NS (Coleoptera)
G7	3	6	None
G8	2	70	<i>Berosus signaticollis</i> occasional (Coleoptera) <i>Hippodamia variegata</i> Nb (Coleoptera) <i>Machimus cingulatus</i> occasional (Diptera) <i>Olibrus millefolii</i> Nb (Coleoptera) <i>Reptalus quinquecostatus</i> Nb (Hemiptera) <i>Syromastus rhombeus</i> occasional (Hemiptera) <i>Tiphia minuta</i> Nb (Hymenoptera)
G9	2	43	<i>Hippodamia variegata</i> Nb (Coleoptera) <i>Lygus pratensis</i> RDB3 (Hemiptera) <i>Machimus cingulatus</i> occasional (Diptera) <i>Nemotelus pantherinus</i> occasional (Diptera) <i>Reptalus quinquecostatus</i> Nb (Hemiptera)
G10	3	0	-
M1	4	15	None
M2	3	62	None
M3	2	135	<i>Athous campyloides</i> Nb (Coleoptera) <i>Cistogaster globosa</i> RDB1 (Diptera) <i>Coenonympha pamphilus</i> NT, BAP (Lepidoptera) <i>Hippodamia variegata</i> Nb (Coleoptera) <i>lassus scutellaris</i> Na (Hemiptera) <i>Lygus pratensis</i> RDB3 (Hemiptera) <i>Merzomyia westermanni</i> N (Diptera) <i>Squamapion cineraceum</i> Na (Coleoptera) <i>Zacladus exiguus</i> Nb (Coleoptera)
M4	2	80	<i>Lygus pratensis</i> RDB3 (Hemiptera)
M5	3	64	<i>lassus scutellaris</i> Na (Hemiptera)
M6	2	80	<i>Hippodamia variegata</i> Nb (Coleoptera) <i>Megalonotus chiragra</i> occasional (Hemiptera) <i>Lygus pratensis</i> RDB3 (Hemiptera) <i>Peritrechus lundii</i> occasional (Hemiptera)

Feature code	Grade	Number of Invertebrate records	Key species recorded
			<i>Phyllotreta consobrina</i> NS (Coleoptera) <i>Phyllotreta cruciferae</i> NS (Coleoptera) <i>Reptalus quinquecostatus</i> Nb (Hemiptera) <i>Squamapion cineraceum</i> Na (Coleoptera) <i>Syntomus truncatellus</i> NS (Coleoptera) <i>Zacladus exiguus</i> Nb (Coleoptera)
M7	2	105	<i>Dorycera graminum</i> NT, BAP (Diptera) <i>Longitarsus strigicollis</i> NS (Coleoptera) <i>Magdalis ruficornis</i> occasional Coleoptera <i>Magdalis cerasi</i> Nb (Coleoptera) <i>Marpissa muscosa</i> Nb (Araneae) <i>Nemotelus nigrinus</i> occasional (Diptera) <i>Oxycera nigricornis</i> occasional (Diptera) <i>Rhagonycha lutea</i> NS Coleoptera)
M8	3	58	<i>Chiasmia clathrata</i> BAP (Lepidoptera) <i>Dicranomyia lucida</i> N (Diptera) <i>Ellipteroides lateralis</i> occasional (Diptera) <i>Rhinocyllus conicus</i> Na (Coleoptera) <i>Rivellia syngenesiae</i> occasional (Diptera) <i>Tetratoma fungorum</i> occasional (Coleoptera)
M9	2	151	<i>Hippodamia variegata</i> Nb (Coleoptera) <i>Lygus pratensis</i> RDB3 (Hemiptera) <i>Mordellistena neuwaldeggiana</i> NS (Coleoptera) <i>Reptalus quinquecostatus</i> Nb (Hemiptera) <i>Syntomus truncatellus</i> NS (Coleoptera) <i>Temnocerus coeruleus</i> Nb (Coleoptera) <i>Zacladus exiguus</i> Nb (Coleoptera)
M10	4	17	None
M11	4	0	-
M12	4	0	-
P1	4	0	-
P2	4	0	-
P3	4	16	None
P4	3	43	<i>Notaris scirpi</i> Nb (Coleoptera)
P5	4	53	<i>Odontomyia tigrina</i> occasional (Diptera) <i>Stratiomys potamida</i> occasional (Diptera)
P6	5	0	-
P9	4	0	-
P10	3	25	<i>Aquarius paludum</i> NS (Hemiptera) <i>Bembidion obliquum</i> NS (Coleoptera)
P12-13	3	112	None
P14-16	4	10	<i>Ellipteroides lateralis</i> occasional (Diptera)
P17-22	1	69	<i>Dicranomyia lucida</i> N (Diptera) <i>Ellipteroides lateralis</i> occasional (Diptera) <i>Gonomyia recta</i> occasional (Diptera) <i>Odontomyia tigrina</i> occasional (Diptera) <i>Oxycera nigricornis</i> occasional (Diptera) <i>Suphrodytes figuratus</i> occasional (Coleoptera) <i>Theridiosoma gemmosum</i> Nb (Araneae) <i>Thaumastopectera calceata</i> N (Diptera) <i>Vertigo moulinsiana</i> NS, BAP (Mollusca)
P23	5	0	-
P24	4	0	-
P28	4	0	-
P29	4	0	-
W1	1	135	<i>Biphyllus lunatus</i> occasional (Coleoptera) <i>Chalcosyrphus nemorum</i> occasional (Diptera) <i>Lasius brunneus</i> Na (Hymenoptera) <i>Lithobius macilentus</i> NS (Chilopoda) <i>Mycetophagus atomarius</i> occasional (Coleoptera) <i>Tillus elongatus</i> NS (Coleoptera)
W2	1	139	<i>Biphyllus lunatus</i> occasional (Coleoptera) <i>Choragus sheppardi</i> Na (Coleoptera)

Feature code	Grade	Number of Invertebrate records	Key species recorded
			<i>Endomychus coccineus</i> occasional (Coleoptera) <i>Gnophomyia viridipennis</i> N (Diptera) <i>Lasius brunneus</i> Na (Hymenoptera) <i>Lissodema denticolle</i> NS (Coleoptera) <i>Lithobius macilentus</i> NS (Chilopoda) <i>Malthinus balteatus</i> occasional (Coleoptera) <i>Phloiophilus edwardsii</i> NS (Coleoptera) <i>Sphinginus lobatus</i> occasional (Coleoptera)
W3	3	5	None
W4	3	3	None
W5	2	41	None
W6	1	120	<i>Choerades marginatus</i> occasional (Diptera) <i>Lasius brunneus</i> Na (Hymenoptera) <i>Malthinus balteatus</i> occasional (Coleoptera) <i>Malthinus frontalis</i> NS (Coleoptera)
W7	2	0	-
W8	2	43	<i>Dorcatoma chrysomelina</i> occasional (Coleoptera) <i>Lasiorrhynchites cavifrons</i> Nb (Coleoptera) <i>Lasius brunneus</i> Na (Hymenoptera) <i>Malthinus balteatus</i> occasional (Coleoptera) <i>Rhagonycha lutea</i> NS (Coleoptera)
W9	1	87	<i>Lasius brunneus</i> Na (Hymenoptera) <i>Malthinus balteatus</i> occasional (Coleoptera) <i>Platyura marginata</i> occasional (Diptera) <i>Rhagonycha lutea</i> NS (Coleoptera) <i>Sinodendron cylindricum</i> occasional (Coleoptera) <i>Tetratoma fungorum</i> occasional (Coleoptera)
W10	1	95	<i>Lasius brunneus</i> Na (Hymenoptera) <i>Platyrhinus resinosus</i> Nb (Coleoptera)
W11	4	0	-
W12	3	33	<i>Ellipteroides lateralis</i> occasional (Diptera): a wetland species: this is presumably a stray belonging to P14-16, and the record has been repeated there



KEY

- Immediate Study Area
- M - Mosaic, usually containing mix of scrub, trees, open vegetation, grassland + possibly wetland features
- G - Grassland
- B - Boundaries which include hedges, shelter belts, streams and ditches or a combination of these
- P - Pond
- Compartment with rare invertebrates
- Desmoulin's whorl snail
- A bristle fly *Cistogaster globosa*
- Capsid bug *Amblytlylus delicatus*
- Lygus pratensis*
- Heriades truncorum*
- Location of ponds/ditch

PHILIP PARKER ASSOCIATES
 WHITE ROW COTTAGE : 7 LEZIATE DROVE : POTT ROW
 NR KINGS LYNN : NORFOLK : PE32 1DB
 TEL : 01553 630842 FAX : 01553 630843
 E-Mail : philipparkerassociates@btconnect.com

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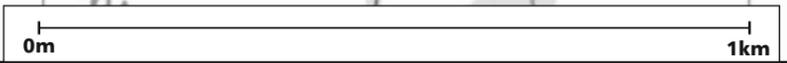
PROJECT
 BIRCHALL GARDEN SUBURB

DRAWING TITLE
 LOCATION OF KEY RARE INVERTEBRATE SPECIES

SCALE	DATE	DWG NO	REV
1:10,000 @ A3	AUG 2016	APPENDIX 9.10.1	

REV	DATE	DETAILS

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**Philip Parker Associates
White Row Cottage
Leziate Drove
Pott Row
King's Lynn
PE32 1DB**

**Tel : 01553 630842 Fax : 01553 630843
Email : admin@philipparkerassociates.co.uk**