



Kent International Gateway Invertebrate Report 2008

Kent International Gateway Limited

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Executive Summary

Invertebrate surveys have been conducted by Colin Plant Associates Ltd on behalf of WSP Environmental in April 2007 and during the summer of 2008, during which an initial site appraisal was undertaken, followed by targeted species sampling in habitats considered to hold potential invertebrate value.

Active sampling of terrestrial invertebrates was undertaken using sweep-netting, beating and suction sampling methodologies and visits were undertaken during May, June and July 2008.

Unseasonably wet and cold weather during 2008 significantly constrained invertebrate surveys. In particular, the weather during July and August was particularly poor and sampling was not undertaken during this time. This atypical weather has severely depressed invertebrate numbers across most of England and Wales and many common species were not in evidence at many sites whilst those that were generally appeared in lower than usual numbers. Additionally, wet vegetation made active sampling by sweep-netting difficult – often impossible. As a result, relatively poor results have been obtained during the course of this project.

The invertebrate value of habitats within the Application Site has been appraised through habitat analysis and targeted species sampling. A total of 277 invertebrate species have been recorded on the site, none of which are Legally Protected, Red Data Book, or UK BAP priority species.

One UK BAP species ‘for Research Only’ was recorded on site (the Cinnabar, a ubiquitous species) and two Nationally Notable species (the wasp spider and the ivy bark beetle). Both of these species are likely to be more widespread than currently recorded. A further 16 Locally Notable species are present on the site.

None of the habitats on site are considered to be of importance at a district scale or higher. Of the habitats sampled, the adjoining woodlands known as The Belt and Chrismill Shaw and the solitary mature tree present on the site are of high local invertebrate value, in particular for the saproxylic species assemblages that they support (species dependent on dead or dying wood). The scheme proposals involve comprehensive mitigation measures relating to the loss of woodland habitat, including some localised retention, translocation and new native woodland planting, resulting in a net increase in woodland coverage across the site of approximately 12ha. The retention of deadwood habitats will be encouraged as part of the management of these areas and as a result it is considered that there will be no net significant negative impact to invertebrates as a result of the loss of woodland habitat on site.

Common wood is also of high local invertebrate value primarily because of the abundance and quality of ‘edge-habitat’ present at the woodland, comprising interfaces between woodland, scrub, grassland and ditch habitats. This habitat will be retained and protected within the final scheme.

The triangular field of ruderal and ephemeral habitat with bare ground that is present north of The Belt and south of the M20 is also of high local value and will be completely lost as a result of the development. It is unlikely that sufficient habitat creation can be incorporated on site to fully off-set the negative impact of this habitat loss since opportunities for ephemeral and ruderal habitat creation within the scheme are restricted to linear habitats along roadsides and retaining walls within the scheme (and these are recommended – see the Breeding Bird Survey (WSPE, 2007) for further detail. A negative impact of local significance is therefore predicted with respect to invertebrates using this ruderal habitat.

The scheme will bring about a positive impact on grassland invertebrate assemblages of likely local significance as a result of the creation of approximately 15ha of grassland across the scheme (a net increase of 6ha) which will be managed specifically for wildlife. These wildflower areas are expected to result in an increase in both species abundance and diversity of the grassland invertebrate assemblage.

In summary, the likely residual impacts to the invertebrate assemblage at the KIG site resulting from the development of the scheme (and taking into account the mitigation measures proposed) are not considered to be significant at a local scale or higher.



1 Introduction

1.1 BACKGROUND

1.1.1 Following the recommendations within the Extended Phase 1 Habitat Report for the proposed Kent International Gateway (KIG) site (WSPE, 2006), invertebrate surveys of the site have been conducted. These have comprised an initial site appraisal to assess the habitats present on the site and identify areas of potential invertebrate interest followed by targeted species sampling surveys to enable the invertebrate value of these habitats to be determined.

1.1.2 The invertebrate surveys were conducted by Colin Plant Associates Ltd on behalf of WSP Environmental in April 2007 and during the summer of 2008.

1.1.3 The findings of the initial site appraisal were presented within a letter report by Colin Plant Associates dated 9th April 2007 and included within Appendix 8A of the Environmental Statement submitted in support of the KIG planning application. These are summarised again within this report, alongside the full results of the subsequent species sampling surveys which were undertaken this year.



2 Methodology

2.1 INITIAL SITE APPRAISAL (2007)

2.1.1 The application site was visited by Colin Plant on 5th April 2007. The entire site was seen and most of it was walked and examined in detail, including all woodland areas, the entire length of the M20 motorway embankment, all accessible lanes and tracks, all ponds and water courses and some pasture land¹.

2.2 TARGETED SPECIES SAMPLING SURVEYS (2008)

2.2.1 The recommended species survey work was commissioned on 14th May 2008 and the first sampling visit was made on 23rd June. Subsequent visits were made during 2008 on 30th June, 7th July and 7th September. Terrestrial sampling was undertaken on every visit, aquatic sampling was undertaken only on 23rd June and 7th September. The number of survey visits was restricted in particular during the latter part of the summer due to bad weather.

2.2.2 Active sampling of terrestrial invertebrates was undertaken using the following methodologies:

2.2.3 **Sweep-netting.** A stout hand-held net is moved vigorously through vegetation to dislodge resting insects. The technique may be used semi-quantitatively by timing the number of sweeps through vegetation of a similar type and counting selected groups of species. This technique is effective for many invertebrates, including several beetle families, most plant bug groups and large number of other insects that live in vegetation of this type. However, it does not sample invertebrates that are confined to lower levels such as the litter layer, which we looked for by hand-searching and sieving litter over a white sheet.

2.2.4 **Beating trees and bushes.** A cloth tray, held on a folding frame, is positioned below branches of trees or bushes and these are sharply tapped with a stick to dislodge insects. Black or white trays are used depending upon which group of invertebrates has been targeted for search. Insects are collected from the tray using a pooter. This technique is effective in obtaining records of most arboreal species, including many beetle groups, bugs, caterpillars of Lepidoptera, spiders and others. It can be undertaken at any site where there are trees or bushes present although is rendered ineffective if the vegetation is wet or if the weather is windy.

2.2.5 **Suction Sampling** consists of using a converted leaf blower to collect samples from grass and other longer ground vegetation. The sample is then everted into a net bag and the invertebrates removed with a pooter. The advantage of suction sampling is that it catches species, which do not fly readily or which live in deep vegetation. It is particularly productive for Coleoptera, some Diptera and Arachnida.

2.2.6 **Aquatic invertebrate sampling** was undertaken using a standard pond net with a mesh diameter of 1.0 millimetres, using this as a sweep-net under the water, ensuring that all microhabitat features, such as submerged vegetation and bare substrate, were included. Samples were sorted on the bankside on a white plastic sheet, and species collected for further identification in the lab were preserved in alcohol.

2.3 SURVEY LIMITATIONS

2.3.1 The year 2008 exhibited one of the wettest and coldest summers for many years. The weather during July and August was particularly poor and sampling was not undertaken during this time. Much of the year from April to September was characterised by rain and occasionally by very strong winds. At the same time, the normal situation of sunny days and warm nights was reversed because of the predominance of rain-bearing clouds during the daytime (which reduced light levels and lowered ambient temperatures) and which dissipated at night to leave clear skies (hence the nights were usually dry, but colder than the seasonal norm).

2.3.2 This atypical pattern severely depressed invertebrate numbers across most of England and Wales (and perhaps elsewhere) and many common species were not in evidence at many sites whilst those that were generally appeared in lower than usual numbers. Numbers of individuals of moths have been shown to have declined by 22 percent at a site in Hertfordshire (Plant, 2008) and anecdotal evidence suggests that this pattern is repeated across

1. The site was dominated considerably by grazed pasture that is unlikely to have a raised potential as an invertebrate habitat. For this reason, only representative pasture land was examined.



southern Britain for most invertebrate groups. This includes casual comments from more than one bat surveyor that several broods of infant bats (which feed on insects) in nest boxes have died during 2008, apparently from starvation.

2.3.3 Additionally, the wet vegetation made active sampling by sweep-netting difficult – often impossible. As a result we have obtained relatively poor results during the course of this project.

2.3.4 The aquatic invertebrates were not sufficiently well-sampled to permit any analysis of the inventory



3 Results

3.1 INITIAL SITE APPRAISAL RESULTS (2007)

Overall appraisal of invertebrate interest

3.1.1 Habitat features of particular interest to invertebrate ecology across the scheme are relatively isolated and the lack of hedges in many areas, and the poor quality of those that do exist, might suggest that the landscape does not appear likely to function as a habitat mosaic. Any invertebrate species interest within the application area will, therefore, probably be confined to a few specific places and can be both identified and targeted for appropriate survey so that any losses arising from the proposed development can be adequately mitigated.

3.1.2 In summary, the habitats on the site of potential invertebrate interest are:

- The streams and four of the ponds on site (excluding the two ponds at Glenrowan House) may support a noteworthy assemblage of species, in particular where there is submerged and emergent vegetation present.
- Chrismill Shaw and The Belt woodland due to the mature trees, deep litter layer and aerial and fallen dead timber.
- Common Wood due to dense shrub edge habitats adjacent to grassland.
- The Parkland area due to the maturity of the trees.
- The tall ruderal vegetation in the triangular field north of 'The Belt' and south of the M20, due to the varied habitat including bare ground and sparsely vegetated areas.

3.1.3 The hedgerows, pasture land, arable land and remaining ponds are not considered to be likely to support significantly elevated or important invertebrate populations (see CPA, 2007 for further information).

3.1.4 Overall the site provides several habitats likely to support important invertebrate assemblages although the value of the site for invertebrates cannot be quantified without further survey work.

3.2 TARGETED SPECIES SAMPLING SURVEY RESULTS

General remarks

3.2.1 A total of 269 terrestrial invertebrate species were recorded during the 2008 survey, and these are listed within Appendix 1. The list is annotated with formal national status codes where these are better than “nationally common” and these status codes are explained in Appendix 2.

3.2.2 Aquatic invertebrates recorded are listed in Appendix 2. A total of only ten species were recorded; none are of conservation significance, but the aquatic invertebrates are not sufficiently well-sampled to permit any analysis of the inventory.

Species of conservation interest

3.2.3 Several categories of invertebrates are of raised significance in an ecological assessment. These categories are explained in detail in Appendix 2 and the corresponding species encountered on site are described below.

3.2.4 **Legally protected species:** No invertebrate species that are afforded protection under any UK or European legislation were encountered during the survey.

3.2.5 **Red Data Book species or Nationally rare species:** No species listed in the British Red Data Books (Shirt, 1987; Bratton, 1991) or which has been elevated to the status of Nationally Endangered, Nationally Vulnerable or Nationally Rare by subsequent formal reviews were recorded during the survey.

3.2.6 **UK BAP Priority species:** During 2007/2008 the list of UK Biodiversity Action Plan Priority Species (UK Biodiversity Group, 1999) underwent significant revision. Eleven former Priority invertebrate Species are downgraded and so are no longer included. The new list of 150 Priority invertebrate species is divided into two sections. In the first, a total of 81 species are afforded the status of UK BAP Priority Species; none of these was recorded on the site.

3.2.7 **UK BAP species ‘Research Only:’** The second section of the revised UK BAP invertebrate list comprises 69 species that have declined in population by a significant amount in the past 25 years. These are not yet rare and are flagged as UK BAP species “for research only”.

3.2.8 This is a confusing situation which is viewed by Colin Plant Associates Ltd as undesirable, since these species are not intended to be affected by the requirements of *Planning Policy Statement 9: Biodiversity and Geological Conservation*, published by the Office of the Deputy Prime Minister during 2005, which requires Local Authorities to take measures to protect the habitats of UK BAP species from further decline through policies in local development documents.

3.2.9 One such “Research Only” species was recorded at the Application Site during 2008. This is the moth – the **Cinnabar *Tyria jacobaeae*** – a ubiquitous species whose yellow and black striped caterpillars are a familiar sight on almost every ragwort plant in southern Britain. CPA expect several other ‘Research Only’ species to be present, although no others were recorded during the site visits.

3.2.10 **Nationally Notable species:**

3.2.11 One species that is placed in Nationally Notable category Na (see Appendix 2) was recorded on site. The **Wasp Spider (*Argiope bruennichi*)** was first recorded in Britain in 1922 at Rye, East Sussex and for many years seemed to be restricted to a few areas close to the south coast in Sussex, Kent, Hampshire and Dorset. Since the 1970s, evidence suggests that the spider has been increasing its range, probably due to longer warmer summers and autumns. However, although now widely recorded as far north as Lincolnshire, the species currently still warrants its formal status as it remains very localised. The large orb webs are slung low down in the vegetation and the adult spider is easily hidden by the surrounding herbage. Grasshoppers form the main food item. The large urn shaped egg cocoon is positioned in the higher levels of vegetation and the eggs over-winter, hatching out in the following spring. Both sexes mature in the late summer, the females perhaps living on until October, but the much smaller males living for only a short time.

3.2.12 One species that is placed in Nationally Notable category Nb (see Appendix 2) is recorded. The **Ivy Bark Beetle *Kissophagus hederæ*** is probably more widespread than realised. The larvae tunnel under the bark of mature ivy branches until mature and then the adults emerge leaving a characteristic hole in the bark. Recognition of this hole is the key to recording the species.

3.2.13 **Nationally Local Species:** Sixteen species are listed formally as Nationally Local (see Appendix 2). These are:

Table 1: Nationally Local Species recorded on the Application Site

Scientific Name	English Name where given	Ecological associations and comments
<i>Aspidapion aeneum</i>	a weevil	larva feeds inside the stems of <i>Malva sylvestris</i>
<i>Ceratapion carduorum</i>	a weevil	Thistles
<i>Byrrhus pilula</i>	a pill beetle	associated with moss or rabbit-grazed turf, in open situations.
<i>Amara lunicollis</i>	a ground beetle	grasslands, open woodland, gardens etc
<i>Aphthona euphorbiae</i>	a leaf beetle	widely polyphagous
<i>Hermaeophaga mercurialis</i>	a leaf beetle	Dog's Mercury in older woodlands
<i>Ceutorhynchus pyrrhorhynchus</i>	a weevil	<i>Sisymbrium</i>
<i>Rhamphus oxyacanthae</i>	a weevil	larva mines in leaves of hawthorn
<i>Dorcus parallelepipedus</i>	Lesser Stag Beetle	larvae feed in soft, rotten timber of broad-leaved trees
<i>Oedemera lurida</i>	a beetle	a common grassland species
<i>Chalcosyrphus nemorum</i>		larvae feed under decaying bark, especially of alder trees
<i>Ledra aurita</i>	Hippopotamus froghopper	Oak trees
<i>Centrotus cornutus</i>	a froghopper	oak, aspen and other sapling trees
<i>Andrena flavipes</i>	a solitary bee	nests colonially, tunnelling into in a vertical face, in dry sandy sites
<i>Hylaeus hyalinatus</i>	a yellow-faced bee	nests in hollow plant stems
<i>Vespa crabro</i>	Hornet	woodland species



4 Valuation

4.1 METHODOLOGY FOR ASSIGNING SIGNIFICANCE

4.1.1 Criteria for formal assessment of impact on invertebrate ecology are under development. The most recent revision of the guidelines for this process generated by the Institute for Ecology and Environmental Management (IEEM) in 2006 omits any mention at all of invertebrates apart from comments submitted to that organisation by Colin Plant Associates (UK) and posted on the IEEM web site.

4.1.2 Those comments put forward invertebrate assessment criteria that have been in use by invertebrate specialists and at present form the only finite guidelines available. They are presented in Table 1, below. Note that the information in the Table refers to Great Britain, including offshore islands, but excludes all parts of Ireland (including Northern Ireland).

4.1.3 In arriving at an allocation of significance level using these criteria, the site should always be considered in the context of other sites containing similar macro- and micro-habitats at the same geographical category level.

4.1.4 Criteria below those for National and International significance should be regarded as flexible; in particular, geographical variations in the distributions of species should be taken into account as should real and semi-permanent changes in status that have taken place since the publication of status codings. Sites that do not meet these criteria may nevertheless be significant at the level stated for other reasons.

4.1.5 Within each of the geographical categorisations, the significance may be Moderate, High or Very High (there is no "Low Significance" category - such sites are already defined by the Evaluation Table).

4.1.6 The application of Moderate, High or Very High significance at each geographical level is based on a wide number of factors and does not sit well with a table of pre-defined rules. Additionally, within a site of particular geographical significance, different component parts may have differing levels of actual significance. The allocation of the level of significance should always be performed by, or subsequently approved by, a qualified entomologist with adequate field experience and not by a general ecologist for whom entomology is not a primary discipline.

Table 2: Provisional criteria for site assessment based on the invertebrate fauna

Significance	Description	Minimum qualifying criteria
International	European important site	Internationally important invertebrate populations present or containing RDB 1 (Endangered) species or containing any species protected under European legislation or containing habitats that are threatened or rare at the European level (including, but not exclusively so, habitats listed on the EU <i>Habitats Directive</i>).
National	UK important site	Achieving SSSI invertebrate criteria (NCC, 1989) or containing viable populations of RDB2 (Vulnerable) or containing viable populations of RDB 3 (Rare) species or containing viable populations of any species protected under UK legislation or containing habitats that are threatened or rare nationally (Great Britain) or supporting sustainable populations of more than one UK BAP species.
Regional (for border sites, both regions must be taken into account)	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened in the region	Habitat that is scarce or threatened in the region or which has, or is reasonably expected to have, the presence of an assemblage of invertebrates including at least ten Nationally Notable species or at least ten species listed as Regionally Notable for the <i>English Nature</i> region in question in the Recorder database or elsewhere or a combination of these categories amounting to ten species in total or supporting sustainable populations of at least one UK BAP species.
County (for border sites, both counties must be taken into account)	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened in the county in question	Habitat that is scarce or threatened in the county and/or which contains or is reasonably expected to contain an assemblage of invertebrates that includes viable populations of at least five Nationally Notable species or viable populations of at least five species regarded as Regionally Scarce by the county records centres and/or field club.
District	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened in the administrative District	A rather vague definition of habitats falling below county significance level, but which may be of greater significance than merely Local. They include sites for which Nationally Notable species in the range from 1 to 4 examples are reasonably expected but not yet necessarily recorded and where this omission is considered likely to be partly due to under-recording.
Local	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened in the affected and neighbouring Parishes (except Scotland, where the local area may best be defined as being within a radius of 5 kilometres)	Habitats or species unique or of some other significance within the local area.
Low significance	—	Although almost no area is completely without significance these are the areas with nothing more than expected “background” populations of common species and the occasional Nationally Local species.



4.2 APPRAISAL OF INVERTEBRATE INTEREST

4.2.1 The limitations of the survey have restricted the volume of invertebrate species data that it was possible to obtain and as such, less data was obtained than would be the desired optimum for formal assessment of the site. In particular, it has not been possible to gain sufficient useful information on aquatic invertebrates to permit a proper assessment of significance (i.e. a WETSCORE). It is recommended that a minimum of three sampling visits (net sampling in ponds and kick sampling in streams) are made to each water body next year (spring, summer and autumn) in order to obtain a robust species inventory and determine a Biological Monitoring Working Party (BMWP) score for the streams.

4.2.2 Nevertheless, it is the opinion of the specialist invertebrate surveyors (CPA) that the larger part of the Kent International Gateway site is clearly of low or insignificant invertebrate interest and that proposed development has the potential to create opportunities for mitigation that may actually improve the overall value of the area.

4.2.3 However, the few discrete areas examined in detail may have a higher interest and are now appraised as far as practical within the stated constraints.

THE BELT, RAILWAY WOODLAND AND CRISMILL SHAW

4.2.4 These, together, form three continuous sides of a square and should be treated as a single woodland unit, although access to the section that flanks the railway line and joins together the other two compartments was not permitted (as it is inside the railway boundary).

4.2.5 This is a unit of old, established woodland with a good physical structure. The canopy is uneven with mature oaks (*Quercus robur*) and other trees ascending to heights greater than other younger trees. A secondary canopy is evident in places and there is a shrub layer, which includes honeysuckle (*Lonicera periclymenum*), before a diverse herb layer containing wood anemone (*Anemone nemorosa*) and bluebell (*Hyacinthoides non-scripta*), as well as several other plants that form a varied herb layer; this in turn stabilises a relatively deep litter layer. Such well-structured woodlands inevitably support an invertebrate interest that is raised significantly above that exhibited by less established units.

4.2.6 Additionally, the saproxylic resource appears to be relatively high in The Belt and in Crismill Shaw. Saproxylic invertebrates are those that are dependent, during at least some part of their life-cycle, upon dead or dying wood of usually over-mature, damaged or dead trees (standing or fallen), upon wood-inhabiting fungi or upon other species associated with this habitat or upon microhabitats associated with the process of decay of wood, including sap-runs, rot-holes, fungal hyphae and others.

4.2.7 There are over 1,700 species of invertebrate in the UK which depend to a lesser or greater extent on decaying wood habitat for the successful completion of their lifecycle. This number represents 6% of the total UK invertebrate fauna (Alexander, 1999). Coleoptera (beetles) form a major component of this number and it is also of note that 38% of invertebrates associated with decaying wood habitats have a formal conservation status.

4.2.8 Both aerial and fallen dead timber, the former including main boles as well as smaller branches, are evident throughout these woodland units. Several rot-holes are also visible at the bases of the long neglected coppice stools in Crismill Road Wood.

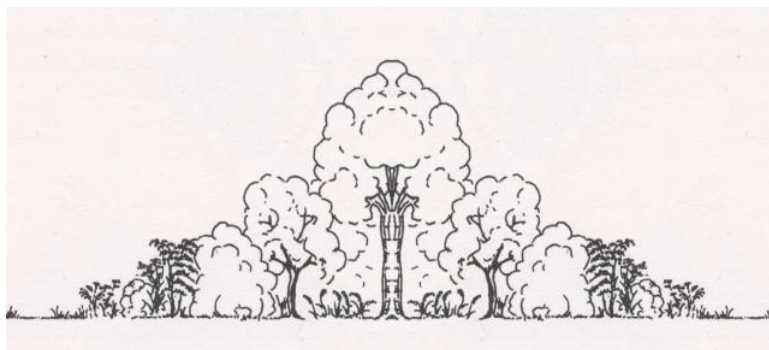
4.2.9 The invertebrate ecology within the woodland unit is of **High Local significance**.

COMMON WOOD

4.2.10 Common Wood is of a different character to the other woodland units. The trees, including a large number of birches, grow close together and are drawn to the light. Though some mature trees are present, the shrub layer dominates this woodland, especially where it slopes downwards to the north-east and opens to grassland.

4.2.11 There is a different invertebrate interest inherent in this area and it is largely associated with edge habitats. These are formed by the intersection of two features –one that is low and level and a second that is tall. A classic example is a hedgerow intersection with a field, but other examples include the woodland/grassland interface, and roadside verge.

4.2.12 Edge habitats play a dual role in invertebrate ecology – apart from any intrinsic interest which they may possess they also act as corridors of physical movement between different areas. The best examples are those that are gradual, with the vertical component rising gradually through long grass, tall herbs and larger bushes to mature trees. This is illustrated in the following diagram:



4.2.13 Examination of the invertebrate list shows a dominance of species that are associated with this edge zone and confirms the theorised significance.

4.2.14 The invertebrate ecology within this woodland is also of **High Local significance**.

SOLITARY MATURE TREES

4.2.15 These are most dominant in the “parkland” area of sheep pasture that connects The Belt to Common Wood, though other examples are dotted elsewhere about the landscape. Some of these trees contain saproxylic microhabitats that would withstand further examination, but the various problems encountered during the 2008 survey prevented any such research from being undertaken.

4.2.16 However, it would be unusual in the extreme if the saproxylic microhabitats evident here were *not* occupied by a number of expected invertebrate species. Accordingly, we recommend that rather than introduce an unnecessary delay, the overall project should progress as if the trees have a **High Local** invertebrate significance.

HEDGES

4.2.17 In general the hedges on the site are of poor quality as invertebrate habitats. They are mostly thin, gappy, uniform in structure and low in floral diversity so that their intrinsic interest will be relatively low.

4.2.18 Their value as physical corridors of invertebrate movement may be higher. However, there is a degree of isolation of these hedges and although they undoubtedly allow invertebrate movement about the site there is no evidence of movement into and out of the application site from the wider area of Kent.

4.2.19 Overall, these hedges are only of **Low** significance and specific mitigations are not required to offset any losses to any associated invertebrate interest.

BRIDGE FARM TRIANGLE

4.2.20 The habitat here is varied. There are tall herbs in the central area and on the adjacent motorway embankment, whilst there is a peripheral dirt track (motorcycle circuit?) that exhibits bare ground and sparsely vegetated areas as well as ruderal grassland.

4.2.21 The extremely high value of bare ground and ruderal habitats is well established (see, for example, Harvey, 2000; Key, 2000). The invertebrate samples obtained at Bridge Farm Triangle do not contradict that notion and, although the sample is reduced because of various unavoidable factors, the invertebrate interest in this compartment is judged to be high.

4.2.22 This habitat unit is of **High Local** invertebrate significance

5 Impact Assessment

5.1.1 Table 3 below sets out the Assessment of Impacts to invertebrate communities which would arise as a result of the KIG development scheme. For each habitat type assessed, the likely impact is predicted firstly in the absence of mitigation (column A) and secondly, with the proposed mitigation measures (the 'residual impact', column C).

Table 3: Impact Assessment Table

	Column A: Likely impact in the absence of mitigation	Column B: Discussion of mitigation proposals	Column C: Residual Impact
The Belt, railway woodland and Chrismill Shaw	The complete loss of The Belt and part of the woodland along the Railway (a loss of approximately 80% of this 2.8ha habitat parcel) would result in a negative impact on invertebrates (through habitat loss) of permanent local significance .	Retention of Chrismill Shaw and creation of 1ha indigenous woodland directly adjacent to Chrismill Shaw, and a further 2ha south of the A20, through the translocation of root stock material, soils and dead wood from 'The Belt' will specifically target habitat creation for saproxylic species. Furthermore, new planting of native trees will create connected woodland areas leading to an overall net increase in woodland coverage across the site of approximately 12Ha. The retention of deadwood habitats will be encouraged as part of the management of these areas.	Not significant
Common Wood	The retention and protection of 100% of this habitat parcel will result in no significant impact on invertebrates at any scale.	In addition to the retention of Common Wood, which is valuable to invertebrates because of the edge habitat it provides, the scheme involves the creation of additional edge habitats. These will occur along new stream and pond banks (which will be crenulated and support aquatic and marginal vegetation). Furthermore, the landscape strategy for the scheme is to provide a mosaic of woodland and grassland habitats and good quality edge habitat will be formed at the interfaces between these two habitat types.	No change
Solitary Mature trees	The loss of approximately 50% of the solitary mature trees and potential for isolation of remaining solitary trees could bring about an overall negative impact of permanent local significance .	Trees will be retained in groups and all areas of retained trees will be augmented by new tree planting of appropriate species, providing replacement planting for the future and connecting tree habitat to the wider landscape.	Not significant.
Hedges	The loss of species rich hedges and on site will result in no significant impact on invertebrates at any scale.	No mitigation is required, although it should be noted that the woodland and grassland mosaic created within the landscape proposals will provide a replacement habitat resource that is comparable to the 'edge habitat' provided by hedgerows.	Not significant



	Column A: Likely impact in the absence of mitigation	Column B: Discussion of mitigation proposals	Column C: Residual Impact
Bridge farm triangle	<p>The complete loss of this habitat would result in a negative impact on invertebrates (through habitat loss) of permanent local significance. However, it should be noted that the longevity of this habitat is not secured even in the absence of development, since it is not currently subjected to any land management regime and is therefore turning to birch scrub.</p> <p>Furthermore, ephemeral and ruderal habitats are likely to dominate the site during the 7 year construction phase, following the initial ground-leveling exercises.</p>	<p>This habitat type (ruderal species and disturbed ground) is relatively easy to recreate (developing within 1-2 years over set-aside fields and brownfield sites). It is a transient habitat, occurring as a seral stage within the process of ecological succession from bare ground through to woodland climax communities. Within the available soft-landscaping regions of the development, the habitat creation design has purposely prioritised the creation of permanent native woodland and grassland habitats in the long term. As a result, opportunities for ephemeral and ruderal habitat creation are restricted to linear habitats along roadsides and retaining walls within the scheme (and these are recommended – see the Breeding Bird Survey (WSPE, 2007) for further detail.</p> <p>The proposed 0.5ha of ‘living walls’ (please refer to the Environmental Statement, WSPE, 2007)) form an important part of the mitigation proposals for bats and birds. In addition to the nesting and roosting facilities they will support, invertebrate habitat for burrowing species which utilise bare ground (such as solitary ground nesting bees) should be incorporated into the structures. For example, ‘insect banks’ comprising bundles of hollow straws, sand/concrete mixes and other such structures should all be considered, in consultation with Buglife International and the Wildlife Trust.</p>	Negative impact of Local significance
Semi-improved grassland species	<p>The existing grassland habitat on site is of low value to invertebrates and as such was not targeted for species sampling.</p>	<p>The creation of approximately 15ha of grassland across the scheme will lead to a 6ha increase in this habitat type. More importantly, the grassland will be managed specifically for wildlife (e.g. involving annual or biannual mowing and removal of arisings) with the intention that the value of this habitat to invertebrates will be greatly increased. Whilst it is not possible to predict what resulting invertebrate assemblage will be attracted to the site, it is anticipated that there will be a net increase in both species abundance and diversity as a result of these measures</p>	Positive impact of local significance.



6 Conclusion

6.1.1 The value of invertebrate habitats within the Application site has been appraised through habitat analysis and targeted species sampling. A total of 277 invertebrate species have been recorded on the site, none of which are Legally Protected, Red Data Book, or UK BAP priority species.

6.1.2 Insufficient survey data was obtained in 2008 to enable an adequate assessment of the aquatic habitats on site and recommendations for repeated surveys next year are provided.

6.1.3 One UK BAP species 'for Research Only' was recorded on site (the Cinnabar, a ubiquitous species) and two Nationally Notable species (the wasp spider and the ivy bark beetle). Both of these species are likely to be more widespread than currently recorded. A further 16 Locally Notable species are present on the site.

6.1.4 None of the habitats on site are considered to be of importance at a district scale or higher. Of the habitats sampled, the adjoining woodlands known as 'The Belt' and 'Chrismill Shaw' and the solitary mature tree present on the site are of high local invertebrate value, in particular for the saproxylic species assemblages that they support (species dependent on dead or dying wood). The scheme proposals involves comprehensive mitigation measures relating to the loss of woodland habitat, including some localised retention, translocation and new native woodland planting, resulting in a net increase in woodland coverage across the site of approximately 12ha. The retention of deadwood habitats will be encouraged as part of the management of these areas and as a result it is considered that there will be no net significant negative impact to invertebrates as a result of the loss of woodland habitat on site.

6.1.5 Common wood is also of high local invertebrate value primarily because of the abundance and quality of 'edge-habitat' present at the woodland, comprising interfaces between woodland, scrub, grassland and ditch habitats. This habitat will be retained and protected within the final scheme.

6.1.6 The triangular field of ruderal and ephemeral habitat with bare ground that is present north of The Belt and south of the M20 is also of high local value and will be completely lost as a result of the development. It is unlikely that sufficient habitat creation can be incorporated on site to fully off-set the negative impact of this habitat loss since opportunities for ephemeral and ruderal habitat creation within the scheme are restricted to linear habitats along roadsides and retaining walls within the scheme (and these are recommended – see the Breeding Bird Survey (WSPE, 2007) for further detail. A negative impact of local significance is therefore predicted with respect to invertebrates using this ruderal habitat.

6.1.7 The scheme will bring about a positive impact on grassland invertebrate assemblages of likely local significance as a result of the creation of approximately 15ha of grassland across the scheme (a net increase of 6ha) which will be managed specifically for wildlife. These wildflower areas are expected to result in an increase in both species abundance and diversity of the grassland invertebrate assemblage.

6.1.8 In summary, the likely residual impacts to the invertebrate assemblage at the KIG site resulting from the development of the scheme (and taking into account the mitigation measures proposed) are not considered to be significant at a local scale or higher.



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Appendix A Invertebrates Recorded

National status codes are explained in Appendix C.

Group / species	English name if available	National status	Ecological associations and comments
ARACHNIDA:			
ARANEAE			
Agelenidae			
<i>Agelena labyrinthica</i>			spins a sheet-web amongst grasses
Araneidae			
<i>Araneus diadematus</i>	the garden spider		ubiquitous
<i>Araneus quadratus</i>			rough grassland
<i>Araniella cucurbitina</i> <i>s.str.</i>	a spider		trees and bushes
<i>Araniella</i> <i>opisthogographa</i>			trees and bushes
<i>Argiope bruennichi</i>	Wasp Spider	Na	tall grassland - a species that is extending its range
Linyphiidae			
<i>Lepthyphantes tenuis</i>	a spider		ubiquitous - often in grassland, but also a pioneer species
ARACHNIDA:			
OPILIONES			
Leiobunidae			
<i>Leiobunum rotundum</i>			Ubiquitous - under stones, logs etc
Phalangiidae			
<i>Phalangium opilio</i>	a harvestman		under stones or other objects
<i>Rilaena triangularis</i>			
COLEOPTERA			
Anobiidae			
<i>Anobium fulvicorne</i>			dead timber in trees
<i>Anobium punctatum</i>	woodworm beetle		larvae feed in dead timber
<i>Ernobius mollis</i>			larvae feed in dead timber
<i>Ptilinus pectinicornis</i>			larvae feed in dead tree branches and other dead timber

Group / species	English name if available	National status	Ecological associations and comments
Apionidae			
<i>Apion frumentarium</i>	a weevil		broad-leaved docks
<i>Aspidapion aeneum</i>		Local	larva feeds inside the stems of <i>Malva sylvestris</i>
<i>Aspidapion radiolus</i>			various species of Malvaceae
<i>Ceratapion carduorum</i>	a weevil	Local	Thistles
<i>Eutrichapion ervi</i>			<i>Lathyrus pratensis</i> , and also on <i>Vicia vetches</i>
<i>Eutrichapion loti</i>			<i>Lotus corniculatus</i> and <i>L. tenuis</i> in dry grassland and dunes
<i>Malvapion malvae</i>			Malvaceae - especially <i>Malva sylvestris</i>
<i>Oxystoma pomonae</i>			vetches - both <i>Vicia</i> and <i>Lathyrus</i>
<i>Perapion violaceum</i>	a weevil		dock plants, the larvae mining the stems; widespread and common
<i>Protapion assimile</i>	a weevil		clover, especially red clover; widespread and common
<i>Protapion dichroum</i>			<i>Trifolium</i> - widespread and almost ubiquitous
<i>Protapion nigritarse</i>			feeds on a wide variety of low plants and bushes
<i>Protapion trifolii</i>	a weevil		various clovers; widespread and common
Attelabidae			
<i>Rhynchites aequatus</i>			rosaceous shrubs - the larvae feeding in the fruits
Bruchidae			
<i>Bruchus loti</i>			Larvae on seeds of <i>Lotus</i> , <i>Lathyrus</i> & <i>Vicia</i> ; adults at various flowers
<i>Bruchus rufimanus</i>	Broad Bean Weevil		larva on <i>Vicia</i> (vetches); adults at flowers
Byrrhidae			
<i>Byrrhus pilula</i>		Local	Associated with moss or rabbit-grazed turf, in open situations.
Byturidae			
<i>Byturus tomentosus</i>	the raspberry beetle		Brambles and raspberries
Cantharidae			
<i>Cantharis cryptica</i>	a soldier beetle		tall vegetation, especially at the woodland/grassland interface
<i>Cantharis decipiens</i>	a soldier beetle		adults in grassland but larvae associated with woodland
<i>Rhagonycha lignosa</i>			an arboreal species
<i>Rhagonycha limbata</i>	a soldier beetle		dry grasslands (formerly called <i>Rhagonycha femoralis</i>)

Group / species	English name if available	National status	Ecological associations and comments
Carabidae			
<i>Abax parallelepipedus</i>			mainly in woodlands, but also on moorland in the north
<i>Amara communis</i>			phytophagous species of open sites, hiding under leaf rosettes, stones, etc
<i>Amara familiaris</i>			Phytophagous species of gardens and other open, dry and sunny habitats
<i>Amara lunicollis</i>		Local	grasslands, open woodland, gardens etc
<i>Amara ovata</i>			most open and moderately dry ground
<i>Amara plebeja</i>			damp, vegetated soils, especially farmland
<i>Bembidion lampros</i>			open, sunny sites, often amongst tussocks
<i>Bembidion quadrimaculatum</i>			open sunny sites, preferring sparsely-vegetated ground, often near water
<i>Carabus violaceus</i>			fairly widespread in most habitats
<i>Demetrias atricapillus</i>			amongst leaf litter and in grasslands
<i>Dromius quadrimaculatus</i>			arboreal species of deciduous trees and occasionally on conifers
<i>Harpalus rufipes</i>			ubiquitous
<i>Microlestes maurus</i>			Open sand areas or short turf on chalk or sand. Predatory and common
<i>Microlestes minutulus</i>			known from scattered localities in south-east Britain
<i>Nebria brevicollis</i>			ubiquitous late summer and autumn species
<i>Notiophilus biguttatus</i>	a ground beetle		most open ground habitats
<i>Pterostichus madidus</i>	a ground beetle		ubiquitous
<i>Pterostichus melanarius</i>	a ground beetle		ubiquitous
Chrysomelidae			
<i>Aphthona euphorbiae</i>	a leaf beetle	Local	widely polyphagous
<i>Chaetocnema concinna</i>			Feeds on a variety of both Polygonaceae and Chenopodiaceae
<i>Cryptocephalus labiatus</i>			adults are usually found in association with birch
<i>Hermaeophaga mercurialis</i>		Local	Dog's Mercury in older woodlands
<i>Lochmaea crataegi</i>	a leaf beetle		Hawthorn - larvae mine the berries. Occasionally on Blackthorn or Rowan

Group / species	English name if available	National status	Ecological associations and comments
<i>Longitarsus flavicornis</i>			ragworts
<i>Longitarsus luridus</i>	a flea beetle		widely polyphagous
<i>Longitarsus melanocephalus</i>	a flea beetle		feeds on various species of plantain (<i>Plantago</i> species)
<i>Longitarsus parvulus</i>	a flea beetle		feeds on many plant species
<i>Oulema rufocyanea</i>	a leaf beetle		feeds on grasses - very common
<i>Phyllotreta atra</i>	a leaf beetle		various Brassicaceae
Cisidae			
<i>Cis boleti</i>			fungi - in both brackets and caps
Coccinellidae			
<i>Adalia 10-punctata</i>	10-spot ladybird		predatory on other insects
<i>Adalia 2-punctata</i>	2-spot ladybird		predatory on other insects
<i>Anisostica 19-punctata</i>	19-spot ladybird		wetland habitats
<i>Coccinella 7-punctata</i>	7-spot ladybird		predatory on other insects
<i>Exochomus 4-pustulatus</i>	Pine ladybird		aphid predator on both pines and broad-leaved trees
<i>Halyzia 16-guttata</i>	Orange ladybird		predatory on other insects
<i>Harmonia axyridis</i>	Harlequin ladybird		a recent colonist in Britain
<i>Propylea 14-punctata</i>	14-spot ladybird		predatory on other insects
<i>Rhyzobius litura</i>			predatory on other insects
<i>Subcoccinella 24-punctata</i>	24-spot ladybird		predatory on other insects
<i>Thea 22-punctata</i>	22-spot ladybird		feeds on mildews
Curculionidae			
<i>Barypeithes araneiformis</i>			ubiquitous amongst moss, litter, etc.
<i>Barypeithes pellucidus</i>			amongst litter in woodland, occasionally in dry grassland
<i>Ceutorhynchus contractus</i>	the cabbage leaf weevil		various Cruciferae
<i>Ceutorhynchus pallidactylus</i>			ecology unclear
<i>Ceutorhynchus pyrrhorhynchus</i>	a weevil	Local	Sisymbrium
<i>Ceutorhynchus quadridens</i>	now called <i>Pelonomus 4-tuberculatus</i>		various Cruciferae
<i>Euophryum confine</i>			dead timber



Group / species	English name if available	National status	Ecological associations and comments
<i>Hypera postica</i>			Medicago, Melilotus and Trifolium - on the foliage
<i>Nedyus quadrimaculatus</i>	was called <i>Cidnorhinus quadrimaculatus</i>		nettles - feeding on the flowers
<i>Phyllobius pomaceus</i>	a weevil		Nettles
<i>Phyllobius pyri</i>	a weevil		Larvae develop in the ground and adults feed on a variety of herbage and tree leaves
<i>Rhamphus oxyacanthae</i>	a weevil	Local	larva mines in leaves of hawthorn
<i>Rhynchaenus querci</i>			larvae mine the leaves of oak trees
<i>Sitona lineatus</i>	a weevil		various legumes
<i>Trichosirocalus troglodytes</i>	also called <i>Ceutorhynchidius troglodytes</i>		Plantains, usually in grassy places
Dytiscidae			
<i>Agabus bipustulatus</i>			freshwater ponds etc
<i>Colymbetes fuscus</i>			freshwater ponds etc
Elateridae			
<i>Agriotes pallidulus</i>			larvae feed on grass roots
<i>Agriotes sputator</i>	a click beetle		larvae feed on grass roots
<i>Denticollis linearis</i>			larvae feed in decaying wood
<i>Kibunea (Cidnopus) minuta</i>			a species of dry grasslands
Halipilidae			
<i>Haliplus lineatocollis</i>			
<i>Haliplus ruficollis s. str.</i>			
Hydrophilidae			
<i>Anacaena globulus</i>			mud and decaying vegetation at water's edge
<i>Helophorus minutus</i>			
<i>Laccobius minutus</i>			generally ubiquitous
Kateretidae			
<i>Brachypterus glaber</i>			Nettles
<i>Brachypterus urticae</i>			Nettles
Latridiidae			
<i>Aridius bifasciatus</i>			litter, compost, tussocks etc - more or less ubiquitous

Group / species	English name if available	National status	Ecological associations and comments
<i>Aridius nodifer</i>			litter, compost, tussocks etc - more or less ubiquitous
<i>Corticaria impressa</i>			amongst plant litter
<i>Corticaria gibbosa</i>			amongst plant litter
Lucanidae			
<i>Dorcus parallelepipedus</i>	Lesser Stag Beetle	Local	larvae feed in soft, rotten timber of broad-leaved trees
Melyridae			
<i>Malachius bipustulatus</i>	a malachite beetle		grasslands
Nitidulidae			
<i>Glischrochilus hortensis</i>			unknown association; adults usually in woodland
Nitidulidae			
<i>Meligethes aeneus</i>	a pollen beetle		various flowers
<i>Meligethes nigrescens</i>	a pollen beetle		White Clover
Oedemeridae			
<i>Oedemera lurida</i>	a beetle	Local	a common grassland species
<i>Oedemera nobilis</i>			a common grassland species
Phalacridae			
<i>Stilbus testaceus</i>			dry grasses, hay etc
Pyrochroidae			
<i>Pyrochroa serraticornis</i>	Cardinal beetle		Larvae predatory under loose tree bark
Scarabaeidae			
<i>Serica brunnea</i>			sandy and chalky habitats
Scolytidae			
<i>Kissophagus hederæ</i>	a bark beetle	Nb	larva feeds in dead ivy wood
<i>Scolytus scolytus</i>	elm bark beetle		under elm bark
Scaptiidae			
<i>Anaspis costae</i>			ecology unclear - adults usually at spring flowers
<i>Anaspis humeralis</i>			ecology unclear - adults usually at spring flowers
<i>Anaspis maculata</i>			Develops in small girth deciduous branch wood
<i>Anaspis regimbarti</i>			larvae feed inside dead stems of plants
Staphylinidae			
<i>Atheta (Mocyta) fungi</i>			a detritus-feeding rove beetle
<i>Atheta triangulum</i>			unknown ecology
<i>Omalius italicum</i>			unknown ecology
<i>Tachinus signatus</i>			grass litter and tussocks

Group / species	English name if available	National status	Ecological associations and comments
<i>Tachyporus hypnorum</i>			leaf litter, grass tussocks and similar micro-habitats
<i>Tachyporus nitidulus</i>			leaf litter, grass tussocks and similar micro-habitats
CRUSTACEA:			
ISOPODA			
Armadillidiidae			
<i>Armadillidium vulgare</i>	the pill bug		under stones etc
Asellidae			
<i>Asellus aquaticus</i>	freshwater hoglouse		most freshwater habitats
Oniscidae			
<i>Oniscus asellus</i>	a woodlouse		damp, but not wet, habitats everywhere
Philosciidae			
<i>Philoscia muscorum</i>	a woodlouse		under stones etc
Platyarthridae			
<i>Platyarthrus hoffmanseggi</i>	a woodlouse		lives inside the nests of ants, usually <i>Lasius niger</i>
Porcellionidae			
<i>Porcellio scaber</i>	a woodlouse		under stones etc
DERMAPTERA			
Forficulidae			
<i>Forficula auricularia</i>	common earwig		generalist species
DIPTERA			
Agromyzidae			
<i>Agromyza alnibetulae</i>			larva mines the leaves of birch trees
<i>Agromyza potentillae</i>			mines leaves of <i>Potentilla reptans</i> and other rosaceous plants
<i>Amauromyza flavifrons</i>			larva mines leaves of white campion
<i>Amauromyza labiatarum</i>			mines leaves of <i>Lamium album</i> and other labiates
<i>Aulagromyza hendeliana</i>			mines leaves of honeysuckle and snowberry
<i>Chromatomyia horticola</i>			mines the leaves of various plants
<i>Chromatomyia syngenesiae</i>			larva mines leaves of various plant species
<i>Liriomyza amoena</i>			mines leaves of elder
<i>Phytomyza ranunculi</i>			mines leaves of <i>Ranunculus repens</i>

Group / species	English name if available	National status	Ecological associations and comments
Bombyliidae			
<i>Bombylius major</i>	a bee fly		edge habitats - mostly a southern species
Stratiomyidae			
<i>Beris chalybata</i>			associated with the scrub/grassland interface
<i>Sargus bipunctatus</i>			associated with the scrub/grassland interface
Syrphidae			
<i>Baccha elongata</i>			shaded woodland
<i>Chalcosyrphus nemorum</i>		Local	larvae feed under decaying bark, especially of alder trees
<i>Cheilosia pagana</i>			larvae are thought to feed in the roots of <i>Anthriscus sylvestris</i>
<i>Cheilosia proxima</i>			larvae feed in the roots of <i>Cirsium</i> species of thistle, especially <i>Cirsium palustre</i>
<i>Dasysyrphus albostrigatus</i>			aphid predator at woodland edge habitats
<i>Dasysyrphus tricinctus</i>			aphid predator at woodland edge habitats
<i>Dasysyrphus venustus</i>			aphid predator at woodland edge habitats
<i>Epistrophe eligans</i>			mainly at edge habitats
<i>Episyrphus balteatus</i>			ubiquitous species, partly immigrant, and a predator of aphids
<i>Eristalis arbustorum</i>			Larvae require damp habitats but adults are more or less ubiquitous
<i>Eristalis pertinax</i>			Larvae require damp habitats but adults are more or less ubiquitous
<i>Eupeodes corollae</i>			Grassland
<i>Helophilus pendulus</i>			Larvae require damp habitats but adults are more or less ubiquitous
<i>Leucozona lucorum</i>			larvae feed on ground layer aphids
<i>Melanostoma mellinum</i>			Grassland
<i>Melanostoma scalare</i>			Grassland
<i>Myathropa florea</i>			larvae are semi-aquatic
<i>Neoascia podagrica</i>			edge-habitat species
<i>Platycheirus albimanus</i>			ubiquitous - larvae prey on aphids
<i>Platycheirus scutatus</i> s. str.			an edge-habitat species
<i>Sphaerophoria scripta</i>			Grassland
<i>Syritta pipiens</i>			larvae in decaying vegetation; adults at flowers

Group / species	English name if available	National status	Ecological associations and comments
<i>Syrphus ribesii</i>			larvae are aphid predators on trees and bushes
<i>Syrphus vitripennis</i>			larvae are aphid predators on trees and bushes
<i>Volucella bombylans</i>			inquiline in nests of bumble bees
Tipulidae			
<i>Tipula paludosa</i>	one of two common 'daddy long legs'		ubiquitous
HETEROPTERA			
Anthocoridae			
<i>Anthocoris confusus</i>			trees and shrubs
<i>Anthocoris nemoralis</i>			trees and shrubs
<i>Anthocoris nemorum</i>			low vegetation
Cimicidae			
<i>Orius niger</i>			low vegetation on a variety of dry sites
<i>Orius vicina</i>			predatory amongst low growing vegetation
Coreidae			
<i>Coreus marginatus</i>			Develops on a variety of Polygonaceae in open habitats
<i>Coriomeris denticulatus</i>			various legumes
Lygaeidae			
<i>Drymus brunneus</i>	a plant bug		amongst litter or moss in damp or shaded places
<i>Heterogaster urticae</i>			Nettles
<i>Kleidocerys resedae</i>			trees and shrubs generally
<i>Scolopostethus thomsoni</i>			usually on nettles
Miridae			
<i>Capsus ater</i>			Grassland
<i>Cylloceria trilineata</i>			associated with oak
<i>Deraeocoris ruber</i>			nettles, brambles as similar rough vegetation
<i>Dryophilocoris flavo-4-maculatus</i>			associated with oak
<i>Harpocera thoracica</i>			Oaks -solitary and in woods
<i>Heterotoma meriopterum</i>			edge habitats - especially in association with nettles
<i>Leptoterna dolabrata</i>			found in a wide range of grassland habitats
<i>Leptoterna ferrugata</i>			grassland species
<i>Liocoris tripustulatus</i>			stinging nettle

Group / species	English name if available	National status	Ecological associations and comments
<i>Miris striatus</i>			associated with oak
<i>Notostira elongata</i>			grasslands
<i>Pantilus tunicatus</i>			alder and birch - on the catkins
<i>Plagiognathus albipennis</i>			Mugwort - probably wherever this grows
<i>Plagiognathus arbustorum</i>			polyphagous, but usually associated with stinging nettles
<i>Plagiognathus chrysanthemi</i>			polyphagous
<i>Stenodema laevigatum</i>			grasslands
<i>Stenotus binotatus</i>			grasslands
Pentatomidae			
<i>Dolycoris baccarum</i>			polyphagous species of dry habitats
<i>Eysarcoris fabricii</i>			probably polyphagous
<i>Palomena prasina</i>			trees and shrubs
<i>Pentatoma rufipes</i>	The Forest Bug		tree-dwelling predator that often flies far from woodland
HOMOPTERA			
Cercopidae			
<i>Aphrophora alni</i>	a froghopper		larvae feed under froth on a wide range of trees and shrubs
<i>Cercopis vulnerata</i>			woodland edge, other edge habitats and damp ditches
<i>Philaenus spumarius</i>	spittle-bug/Cuckoo-spit bug		larvae feed under froth on a wide range of herbaceous plants
Issidae			
<i>Issus coleoptratus</i>			various tree species
Ledridae			
<i>Ledra aurita</i>	Hippopotamus froghopper	Local	Oak trees
Membracidae			
<i>Centrotus cornutus</i>	a froghopper	Local	oak, aspen and other sapling trees
HYMENOPTERA: ACULEATA			
Apidae			
<i>Andrena flavipes</i>	a solitary bee	Local	nests colonially, usually tunnelling into in a vertical face, in dry sandy sites
<i>Apis mellifera</i>	honey bee		flowers in general

Group / species	English name if available	National status	Ecological associations and comments
<i>Bombus lapidarius</i>	red-tailed bumble bee		ubiquitous
<i>Bombus lucorum</i>	white-tailed bumble bee		ubiquitous
<i>Bombus pascuorum</i>	common carder bee		ubiquitous
<i>Halictus tumulorum</i>			ground-nesting solitary bee in a range of habitats
<i>Hylaeus hyalinatus</i>	a yellow-faced bee	Local	nests in hollow plant stems
<i>Lasioglossum morio</i>			excavates nest burrows in level ground
<i>Nomada fabriciana</i>	a nomad bee		nest parasite of <i>Andrena</i> bees - especially <i>Andrena bicolor</i>
<i>Nomada flava</i>			nest parasite of <i>Andrena scotica</i>
Formicidae			
<i>Lasius niger</i>	common black ant.		generalist species
Vespidae			
<i>Vespa crabro</i>	Hornet	Local	woodland species
<i>Vespula germanica</i>	a common social wasp		ubiquitous
HYMENOPTERA: PARASITICA			
Cynipidae			
<i>Andricus ostreus</i>			forms a gall on an oak leaf
<i>Andricus quercuscalicis</i>			forms galls in acorns
<i>Biorhiza pallida</i>			forms the oak apple gall
<i>Diplolepis rosae</i>			forms pin cushion gall on wild rose
<i>Neuroterus quercusbaccarum</i>			forms the hairy spangle gall on oak leaves
HYMENOPTERA: SYMPHYTA			
Argidae			
<i>Arge cyanocrocea</i>			larvae feed on <i>Rubus</i> (bramble, raspberry etc)
<i>Arge ochropus</i>			larvae feed on wild rose
Tenthredinidae			
<i>Aglaostigma aucupariae</i>			larvae feed on bedstraws
<i>Claremontia confusa</i>			
LEPIDOPTERA: BUTTERFLIES			
Nymphalidae			

Group / species	English name if available	National status	Ecological associations and comments
<i>Inachis io</i>	Peacock		nettles
Pieridae			
<i>Pieris brassicae</i>	Large white		various Cruciferae
<i>Pieris napi</i>	Green-veined white		ubiquitous
<i>Pieris rapae</i>	Small white		ubiquitous
LEPIDOPTERA: MOTHS			
Arctiidae			
<i>Tyria jacobaeae</i>	Cinnabar	BAP(R)	Ragwort
Bucculatricidae			
<i>Bucculatrix ulmella</i>			oak
Coleophoridae			
<i>Coleophora flavipennella</i>			oak
<i>Coleophora serratella</i>			deciduous tree leaves
<i>Coleophora trifolii</i>			clovers
Eriocraniidae			
<i>Eriocrania sangii</i>			larva mines leaves of birch
<i>Eriocrania subpurpurella</i>			larva mines leaves of oak
Gracillariidae			
<i>Parornix anglicella</i>			mines leaves of hawthorn
<i>Phyllonorycter corylifoliella</i>			mines leaves of hawthorn and other rosaceous shrubs, rarely on birch
<i>Phyllonorycter geniculella</i>			mines leaves of sycamore
Lyonetiidae			
<i>Lyonetia clerkella</i>			mines leaves of rosaceous bushes and trees, birch etc
Momphidae			
<i>Mompha raschkiella</i>			Rosebay Willow-herb - mining the leaves
Nepticulidae			
<i>Stigmella aurella</i> agg.			mines leaves of bramble
<i>Stigmella plagicolella</i>			mines leaves of blackthorn
<i>Stigmella speciosa</i>			mines leaves of sycamore
Tischeriidae			



Group / species	English name if available	National status	Ecological associations and comments
<i>Emmetia marginea</i>			mines leaves of bramble
Tortricidae			
<i>Celypha lacunana</i>			herbaceous plants. Britains most widespread moth
<i>Tortrix viridana</i>	Green Oak Tortrix		oak
MECOPTERA			
Panorpidae			
<i>Panorpa germanica</i>			edge habitats
MYRIAPODA: CHILOPODA			
Cryptopidae			
<i>Cryptops hortensis</i>	a centipede		amongst litter - often synanthropic
<i>Lithobius forficatus</i>	a centipede		many habitats
MYRIAPODA: DIPLOPODA			
Glomeridae			
<i>Glomeris marginata</i>	Pill Millipede		deciduous woodland, bare rock and other habitats, but avoids sand dunes and disturbed ground
Julidae			
<i>Tachypodoiulus niger</i>	a snake millipede		many habitats and often found climbing trees
Polydesmidae			
<i>Polydesmus angustus</i>	a flat-back millipede		many habitats, often synanthropic, also on acid heaths and moorlands
NEUROPTERA			
Chrysopidae			
<i>Chrysopa perla</i>			aphid predator amongst herbage
<i>Chrysoperla carnea</i> s.str.			aphid predator of trees and bushes
<i>Chrysoperla pallida</i>			a recent split from <i>Chrysoperla carnea</i>
<i>Cunctochrysa albolineata</i>			predatory on aphids in tree foliage
<i>Nineta flava</i>			thought to be associated with oak, feeding on aphids on the leaves
Hemerobiidae			
<i>Hemerobius lutescens</i>			trees and bushes, hedges, etc



Group / species	English name if available	National status	Ecological associations and comments
<i>Wesmaelius subnebulosus</i>	a brown lacewing		larvae are aphid predators on trees and bushes
ODONATA			
Coenagriidae			
<i>Ischnura elegans</i>	Blue-tailed damselfly		found in most permanent water bodies, the adults flying from May to August
ORTHOPTERA			
Acrididae			
<i>Chorthippus brunneus</i>	Field grasshopper		grassland
Tettigoniidae			
<i>Leptophyes punctatissima</i>	Speckled Bush-cricket		rough herbage and scrub
<i>Meconema thalassinum</i>	Oak Bush-cricket		oak trees, especially when at the woodland edge
<i>Pholidoptera griseoptera</i>	Dark Bush-cricket		scrub and edge habitats
PSOCOPTERA			
Ectopsocidae			
<i>Ectopsocus petersi</i>			

Appendix B Aquatic Invertebrates Recorded

Group / species	English name if available	National status	Ecological associations and comments
CRUSTACEA:			
AMPHIPODA			
Gammaridae			
<i>Gammarus pulex</i>	freshwater shrimp		found in most permanent water bodies
COLEOPTERA			
CRUSTACEA:			
ISOPODA			
Asellidae			
<i>Asellus aquaticus</i>	Freshwater Hoglouse		found in most permanent water bodies
Dytiscidae	Diving beetles		
<i>Agabus bipustulatus</i>			freshwater ponds etc
<i>Colymbetes fuscus</i>			freshwater ponds etc
Haliplidae	Water beetles		
<i>Haliplus lineatocollis</i>			
<i>Haliplus ruficollis s. str.</i>			
Hydrophilidae	Water beetles		
<i>Anacaena globulus</i>			mud and decaying vegetation at water's edge
<i>Helophorus minutus</i>			
<i>Laccobius minutus</i>			generally ubiquitous
ODONATA			
Coenagriidae			
<i>Ischnura elegans</i>	Blue-tailed damselfly		found in most permanent water bodies, the adults flying from May to August



Appendix C Invertebrate Status Codes

Nationally Rare species are those falling within the Status categories defined in the *British Red Data Books* (Bratton, 1991; Shirt, 1987). These are internationally recognised species listed in the various *Red Data Books* published by, or under the auspices of, the International Union for the Conservation of Nature (IUCN). Species included may not be informally removed or transferred between categories. There are four categories as follows:

RDB 1 Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. These include:

- Species known from only a single locality since 1970;
- species restricted to habitats which are especially vulnerable;
- species which have shown a rapid and continuous decline in the last twenty years and are now estimated to exist in five or fewer localities;
- species believed extinct but which would need protection if re-discovered.

RDB 2 “Vulnerable”. Taxa believed likely to move into the Endangered category in the near future if the causal factors continue operating. These include:

- Species declining throughout their range;
- species in vulnerable habitats;
- species whose populations are low.

RDB 3 “Rare”. Taxa with small populations which are not at present endangered or vulnerable but which are at risk. These include:

- Species which are estimated to occur in fifteen or fewer localities.

RDB K Taxa suspected to fall within the RDB categories but which are at present insufficiently known to enable placement.

Nationally Scarce species are those falling within the Nationally Notable categories introduced by Ball (1986). They are species which are estimated to occur within the range of 16 to 100 ten-kilometre squares of the British National Grid system since 1970. The specific categorisations of species have been revised since their inception for a number of taxa; those revisions are taken into account in the present report.

Notable species are subdivided as follows:

- Na species estimated to occur within the range of 16 to 30 10-kilometre squares of the National Grid System.
- Nb species estimated to occur within the range 31 to 100 10-kilometre squares of the National Grid System.
- N Diptera (flies) not separated, falling into either category Na or Nb.

Nationally Local species are those which, whilst fairly common, are evidently less widespread than truly common species, but also not qualifying as Nationally Notable having been recorded from over one hundred, but less than three hundred, ten-kilometre squares of the UK National Grid. Without exception, “Local” designations have been obtained from the RECORDER software.

The National Status Codes, where these are Local or better, are indicated against species names in Appendices A.