A38 Derby Junctions

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Volume 6

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Appendix 8.13a: Terrestrial Invertebrate Survey in 2018

Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

April 2019

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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6.3 Environmental Statement Appendices
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A38 Derby Junctions

Terrestrial Invertebrate Survey 2018

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1 INTRODUCTION

1.1 Background and Scope

1.1.1 AECOM Infrastructure & Environment UK Limited (AECOM) has been commissioned by Highways England to provide design services with regards to the A38 Derby Junctions Scheme (referred to herein as "the Scheme)".

1.1.2 The Scheme concerns the grade separation of three junctions on the A38 in Derby, namely:

- A38/ A61 Little Eaton junction
- A38/ A52 Markeaton junction
- A38/ A5111 Kingsway junction

1.1.3 These three junctions are located along an approximate 5.5km length of the A38 national trunk road, to the west and north of Derby.

1.1.4 In order to assist with the assessment of the Scheme's potential environmental effects, a range of environmental surveys have been undertaken to define prevailing baseline conditions.

1.1.5 The extended Phase 1 Habitat survey of the Scheme in 2015 (AECOM, 2016a) identified potential habitat to support terrestrial invertebrates; therefore, dedicated terrestrial invertebrate surveys were undertaken during the summer of 2015 (AECOM, 2016b). Further terrestrial invertebrate surveys were then carried out in 2018 to take into account amendments to the Scheme boundary and also to provide up to date survey information on those areas previously surveyed in 2015 (where applicable), given the 2015 data were over 2 years old.

1.1.6 The objective of the survey was to evaluate the Scheme in terms of its entomological fauna. A total of three daytime visits were undertaken to meet the minimum requirements for assessing the invertebrate fauna of a site in terms of conservation evaluation (Drake et al 2007).

1.1.7 The aims of the survey were:

- To sample areas of perceived high entomological value using several sampling methods
- To identify collected specimens to species level were possible
- To identify any significant species either in terms of local or national rarity
- To identify any significant groups of species associated with specific habitats or plants
- To identify the most likely areas of the site to have a diverse invertebrate fauna
- To identify the areas with the most potential for invertebrates

1.1.8 This report details the results of the 2018 terrestrial invertebrate surveys.

1.2 Scheme and Study Area

1.2.1 The Scheme under appraisal encompasses Kingsway and Markeaton junctions, west of the City of Derby and Little Eaton junction north of Derby. A plan showing the location of the Scheme is presented in Figure 1, Appendix A. The ecological study

area includes 50m from the Scheme boundary; focusing on those areas identified to have terrestrial invertebrate interest (as detailed in Section 2 Methodology).

1.2.2 The A38 is an existing and busy arterial 'A' road carrying traffic around the west and north of the City of Derby. South of the Kingsway junction, the road enters a cutting and is bordered by semi-improved grassland and scrub covered verges. The central reservation south of Kingsway junction and the junction island in this location support a mosaic of habitat types, including semi-improved neutral grassland and native broadleaved woodland. Bramble Brook flows from the west of the Scheme in this location, through culverts located under the north-bound carriageway and the central reservation before connecting with further culverts located between the junction islands. North of the Kingsway junction there is an area of mixed plantation represented by semi-mature trees on embankment.

1.2.3 Markeaton junction is bordered to the east by residential properties and to the west by parkland. The outfall from Markeaton Lake and Markeaton Brook flows through culverts beneath the existing A38 at the northern extent of the Markeaton junction section of the Scheme.

1.2.4 The western boundary of the Scheme at Little Eaton junction borders the road bridge over the River Derwent. The existing A38 is on embankment in this location, with the embankments themselves covered in areas of scrub and immature broadleaved plantation habitats. A variety of grassland habitats exist at the base of the embankments in this location.

1.3 Relevant Legislation

1.3.1 Whilst a large number of the UK invertebrate species are widespread and common, there are many threatened and/ or vulnerable species that are covered by policy and legislation; these include domestic wildlife legislation, local and national biodiversity policies, and relevant international statutes. Most of these measures aim to protect vulnerable species, but some invasive species are also covered by legislation.

1.3.2 The relevant legislation and policies is as follows:

- UK invertebrate species protected by international statutes
- Invertebrate species listed on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) for England and Wales
- Invertebrate species listed under Section 41 of the Natural Environment and Rural Communities Act for England (referred to as NERC S41)
- Invertebrate species endangered by trade and listed under the EU CITES Regulations
- Invertebrate species listed on Schedule 9 of the Wildlife and Countryside Act 9 (as amended)

1.3.3 Full details of this legislation and policies, and how they relate to UK invertebrate species is available at: https://www.buglife.org.uk/campaigns-and-our-work/policy-legislation

1.3.4 The Lowland Derbyshire Biodiversity Action Plan (LDBAP) seeks to conserve and enhance Lowland Derbyshire's existing wildlife and to redress past losses through habitat conservation, restoration, recreation and targeted action for priority species.

The LDBAP lists 73 species of terrestrial invertebrate comprising 61 species of moth and seven species of butterfly (Lepidoptera), two species of bee and one species of ant (Hymenoptera), one species of beetle (Coleoptera), and one species of spider (Arachnid).

1.3.5 Highways England, through the national Road Investment Strategy (RIS), has set an aspiration that the operation, maintenance, and enhancement of the Strategic Road Network (SRN) should aim to reduce net loss of biodiversity by 2020; and, in the long term, Highways England should deliver a net gain in biodiversity across its broader range of works by 2040. Highways England published a Biodiversity Plan in 2015 to show how it will work with service providers to halt overall biodiversity loss and maintain and enhance habitats and ecological networks. The Government requires Highways England to demonstrate progress against the 2015 Biodiversity Plan, to secure an ongoing annual reduction in the loss of net biodiversity due to its activities. The 2015 Biodiversity Plan provides a general plan to protect and increase biodiversity. The 2015 Biodiversity Plan supersedes the preceding 2002 Highways Agency (now Highways England) Biodiversity Action Plan (Highways BAP 2002), which still however carries some relevance as it lists specific habitats and species of conservation concern.

2 METHODOLOGY

2.1 Desk Study

2.1.1 A desk study was undertaken as part of the scope of works for the Phase 1 Habitat survey and is reported in the Extended Phase 1 Habitat Report (AECOM 2018a). Terrestrial invertebrate records were obtained in 2015 from the relevant local ecological records centres (Derbyshire Wildlife Trust (DWT) and Derbyshire and Nottinghamshire Entomological Society (DaNES)) for a search radius of 1km from the Scheme boundary, referred to in this report. The desk study was updated in 2018, however, no new records were obtained from DWT or DaNES in 2018.

2.1.2 Details of relevant invertebrate desk study records are shown in Figures 2 and 3, Appendix A.

2.2 Field Assessment of Sites Surveyed in 2015

2.2.1 A terrestrial invertebrate survey of sites within the Scheme boundary was conducted in 2015 (AECOM 2016b). These sites were visited again in June 2018 to assess if any major changes to habitat composition had occurred that would warrant repeat survey. The location of these sites is shown in Figures 4 and 5, Appendix A.

2.2.2 Site A – Kingsway Roundabout Local Wildlife Site (LWS) south section. This site was visited once in 2015 before health and safety considerations rendered the site unsafe to access. Changes in vegetation management in this area opened a safe access route and allowed three site visits in 2018.

2.2.3 Site B – Kingsway Roundabout LWS north section. This site was subject to three survey visits in 2015. Management of this site has remained stable since 2015, maintaining a grassland and semi-natural broad-leaved woodland. No repeat survey was conducted in 2018.

2.2.4 Site C – Sturgess Field. This site was subject to three survey visits restricted to the western extent in 2015. A change in the Scheme boundary and associated impacts of the Scheme to include the entire field and bordering woodland strip to the north triggered the requirement to undertake three surveys in 2018.

2.2.5 Site D – Markeaton Park Lakeside. This site was subject to three survey visits in 2015. Management of the habitats in this area has remained stable since 2015 and no survey in 2018 was undertaken.

2.2.6 Site E – Talbot Turf Farm. This site was subject to three survey visits in 2015. Since these surveys, land use has changed considerably to include soil stockpiling and improvements to expand the turf farming area. These changes in land use negated the requirement for further survey in 2018.

2.2.7 Site F – Grassland east of Little Eaton Junction. This site comprised an unmanaged grassland previously used for hay cropping in 2015. A return to regular hay cutting in 2018 negated the requirement for further survey.

2.2.8 Site G – Kingsway Hospital grassland. This site was surveyed twice in 2015 as a substitute site after health and safety concerns prevented access to Kingsway Roundabout LWS. No further survey was conducted in 2018 as a safe access route to the Kingsway Roundabout LWS had been provided.

2.3 2018 Site Surveys

2.3.1 Three sites were selected for survey in 2018, Kingsway Roundabout LWS, Little Eaton Proposed Construction Compound, and Markeaton Proposed Construction Compound. The location of these sites is shown in Figures 6 and 7, Appendix A.

Kingsway Roundabout LWS

2.3.2 Kingsway Roundabout LWS was designated as a wildlife site as a diverse grassland. The site is an unmanaged semi-improved neutral grassland that is undergoing succession to scrub.

Little Eaton Proposed Construction Compound

2.3.3 Little Eaton Proposed Construction Compound is a restored landfill site with a diverse mosaic of habitats including semi-improved neutral grassland, hawthorn dominated scrub, bare ground and tall ruderal.

Markeaton Proposed Construction Compound

2.3.4 Markeaton Proposed Construction Compound is a semi-improved grassland that is regularly managed. The edges of the mown area comprise semi-natural broadleaf woodland with tall ruderal and scrub. A large fishing lake and a brook also border the site.

2.4 Survey Method for the 2018 Sites

2.4.1 Full species lists and habitat descriptions of these sites are presented in the 2018 extended Phase 1 Habitat report (AECOM 2018a) and extended Phase 1 Habitat Survey of the Markeaton (Sturgess Field) Proposed Construction Compound (AECOM 2018b).

2.4.2 The terrestrial invertebrate survey was undertaken following best practice guidelines as detailed in Drake et al (2007) comprising several passive trapping, active trapping, and direct observational survey techniques.

2.4.3 Four entomological sampling methods were used; sweep netting, yellow water traps, beating of scrub and woody vegetation, and direct observation/spot checking. The sampling techniques chosen were in line with recommended sample techniques provided in the “Surveying Terrestrial and Aquatic Invertebrates for Conservation Evaluation” (Drake et al 2007).

2.4.4 The sites were visited on three dates in 2018, 20 June, 23 July and 23 August 2018. These dates were selected as they covered the activity period of most spring and summer diurnal invertebrates; the weather conditions encountered are shown in Table 1.

Table 1: Visit dates and conditions

Visit No.	Date	Temperature °C	Cloud Cover (%)	Wind	Rain
1	20/06/2018	21	0	F2*	0
2	20/07/2018	25	0	0	0
3	23/08/2018	18	0	0	0

*Beaufort Wind Speed Scale: F0 – calm <1mph. F1 – Light air 1-3mph. F2 – Light breeze 4-7mph.

Sweep Netting

2.4.5 Sweep netting was chosen as a technique as insects from a wide range of insect Orders can be collected. A 35cm wide white sweep net with a fixed handle was used to collect insects from vegetation up to a height of three metres.

2.4.6 Due to the small area of each survey site, three ten-minute sweep samples were undertaken with the entire habitat ecotones swept ensuring that survey effort was distributed evenly across the area and less promising areas were surveyed with equal effort as apparently good areas.

2.4.7 Each sample consisted of sweeping for 10 minutes, using back-and-forth sweeps while walking at a moderate pace, and keeping the net as low as practical in the vegetation for the whole length of the sweep. Captured invertebrates were removed frequently from the net, with large specimens that were easily identifiable (e.g. some Syrphidae, Hymenoptera, and Coleoptera) noted and released and smaller specimens removed with a pooter and preserved in 70% isopropyl alcohol for later identification.

Yellow Water Traps

2.4.8 Yellow water traps target those orders of insects that visit flowers such as the Hymenoptera (Bees and wasps), some families of Coleoptera (beetles), and Diptera (true flies).

2.4.9 Ten pairs of identical shallow yellow trays were located throughout the sites and filled with slightly soapy water to half their depth (approximately 0.8l). They were set up upon arrival on site at 08:30 am to allow time for insects to be attracted to them. The traps were left in the field for approximately 6 hours, whereupon the contents of the traps were carefully sieved, and the specimens preserved in 70% isopropyl alcohol for later identification.

2.4.10 The traps were in sheltered, sunny areas across the survey area were located within ecotones where two or more habitat types (e.g. bare ground and short sward grassland) meet and grade into one another (see Figures 2 and 3, Appendix A).

Direct Observation/ Spot-checking

2.4.11 Where nectar sources were present, the sweep net was used to stalk insects visiting flowers. Large insects on the wing that could be easily identified (e.g. Lepidoptera) were recorded during the survey periods. Areas of bare ground and suitable refugia were searched for the presence of ground dwelling taxa.

Beating

2.4.12 Invertebrates living on the foliage and branches (saproxylic and epiphyte assemblages) of bushes and tall herbage are collected by jarring the branches with a stick so the animals fall onto a collecting tray below. This technique is largely un-favoured during optimal weather as any large or active insects escape before capture and/or identification.

Sample Identification

2.4.13 Identification of the invertebrates collected was undertaken with a low powered dissecting microscope. All specimens were retained and individually stored and labelled. The keys used to identify species are listed in the bibliography. The finalised species lists are shown in Appendix C.

2.5 Sample Data Processing

2.5.1 The species list derived from sample identification was processed using the Natural England database resources ISIS (Invertebrate Species-habitat Information System) (Webb and Lott, 2006) and Pantheon (Webb *et al,* 2018).

2.5.2 The ISIS database was originally designed as an application for recognising invertebrate assemblage types in species lists collected at scales ranging from management compartment to landscape character area. The assemblage types were labelled in terms that relate to their favoured habitats to make them accessible to non-specialists. Two levels were recognised in the classification: broad assemblage types (BATs), a comprehensive series of assemblage types that were characterised by more widespread species; and specific assemblage types (SATs), characterised by ecologically restricted species and were generally only expressed in lists from sites with conservation value.

2.5.3 Pantheon is a database tool derived from ISIS and developed by Natural England and the Centre for Ecology & Hydrology (CEH) to analyse invertebrate sample data. The analyses supported by Pantheon are designed to improve understanding of the resources and structures used by invertebrates within the sample locations and aid their conservation.

2.5.4 The number of species recorded at a site are used through ISIS and Pantheon to calculate the rarity value of the species assemblage present, or the Species Quality Index (SQI). It can be expected that a good invertebrate site with a notable or rare assemblage present would have an SQI of 4.0 or above.

2.6 Assessment of Rarity

2.6.1 Invertebrate rarity is based on the following Joint Nature Conservation Committee (JNCC) categories:

- Red Data Book Category 1. RDB 1 – Endangered:

  Taxa in danger of extinction in UK.

- Red Data Book Category 2. RDB 2 – Vulnerable:

  Taxa believed to be moving into endangered status in UK.

- Red Data Book Category 3. RDB 3 – Rare:

  Taxa with small populations in UK.

- Red Data Book Category 4. RDB 4 – Out of danger:

  Taxa thought to be relatively secure.

- Red Data Book Category K. RDB K – Insufficiently known:

  Taxa that are suspected of belonging to the above groups, but lack of knowledge does not permit their classification as such.

- Nationally Scarce (Notable):

  Species which are estimated to occur in 16 to 100 10km squares in the UK.

- Local:

  The term Local is not rigidly defined, but loosely means species confined to a particular habitat, but which are too widespread to be termed Nationally Scarce (Notable).

2.6.2 Further details on Assessment of Rarity is included in Appendix B.

2.7 Overall Ranking of Site Value

2.7.1 The CIEEM Guidelines for Ecological Impact Assessment in the United Kingdom (IEEM, 2006) highlight "*In some EIAs (or other integrated assessments), the ecologist may be required to use other approaches to assigning levels of value (in order to be consistent across different technical subjects). In such cases, it is often helpful for the prescribed terms to be translated into the geographical scale that is set out above, so that the legal and policy consequences of any significant impact can be clearly understood by all ecologists*".

2.7.2 Assessing site value using invertebrates requires such an approach.

2.7.3 Provisional invertebrate assessment criteria were put forward on the CIEEM website several years ago (Plant. Undated). These criteria are used by invertebrate specialists as part of the assessment process when considering the value of a site.

2.7.4 The numbers of rare species and the calculated SQI values are used to assess the site in a geographical context. Further details on these assessment criteria are included in Appendix B.

2.8 Limitations

2.8.1 Due to the limited knowledge of previous land use on some of the sites, especially in the Little Eaton Proposed Construction Compound, which is a capped landfill site, pitfall trapping was not used on any of the sites to provide a consistent level of survey effort. Not using pitfall trapping has the potential to miss many of the ground dwelling taxa that may be present, particularly Carabid beetles and represents a minor constraint on the entomological assessment. Spot checking and refugia checks were utilised to sample ground fauna where possible.

2.8.2 The weather conditions during the summer 2018, being extremely hot and dry, limited the abundance and diversity of invertebrates on the wing, particularly in late summer. However, the surveys conducted in June and August 2018 provided some compensation for the July survey due to reduced temperatures and occasional rainfall.

2.8.3 Identification of the invertebrates collected was undertaken with a low powered dissecting microscope. Whilst this was adequate, some species were not identified to species as certain small features could not be seen. In addition, identification keys for some groups only refer to males leaving the females unidentifiable. Appendix C provides lists of all the invertebrates that were collected during the survey.

2.8.4 Pantheon and ISIS analyses do not include species that are either ubiquitous in the wide landscape, non-native, vagrant or introduced, and do not include some predatory species without stenotopic prey items (e.g. ladybird species preying upon various aphids).

2.8.5 These constraints, whilst limiting the number and range of invertebrates encountered during the survey, did not prevent an accurate assessment of the invertebrate fauna from being undertaken as the number of species recorded was high enough to allow a suitable assessment of the habitat value within the survey sites.

3 RESULTS

3.1 Desk Study

3.1.1 Data provided by DaNES comprised 2,698 records representing 411 species. These records included one species listed on Schedule 5 of the WCA; white letter hairstreak (*Satyrium (Strymonidia) w-album*), 33 species that are listed on NERC Section 41, 36 species that are listed on the LBAP and included one invasive species (see Table 2). Records from within 500m of the Scheme are presented in Figure 2 (Appendix A).

Table 2: DaNES Desk Study Records for Protected or Notable Invertebrate Species

Terrestrial Invertebrate Desk Study Records from the Last 10 Years				
Type	**Binomial**	**Common name**	**LDBAP**	**Section 41**
Moth	*Acronicta psi/tridens*	Grey/Dark Dagger agg	yes	yes
Moth	*Allophyes oxyacanthae*	Green-brindled Crescent	yes	yes
Moth	*Amphipoea oculea/lucens/etc*	Ear Moth agg	yes	yes
Moth	*Amphipyra tragopoginis*	Mouse Moth	yes	yes
Moth	*Apamea remissa*	Dusky Brocade	yes	yes
Moth	*Aporophyla lutulenta*	Deep-brown Dart	yes	yes
Moth	*Atethmia centrago*	Centre-barred Sallow	yes	yes
Moth	*Brachylomia viminalis*	Minor Shoulder-knot	yes	yes
Moth	*Caradrina morpheus*	Mottled Rustic	yes	yes
Moth	*Diarsia rubi*	Small Square-spot	yes	yes
Moth	*Watsonalla (Drepana) binaria*	Oak Hook-tip	yes	yes
Moth	*Ecliptopera silaceata*	Small Phoenix	yes	yes
Moth	*Ennomos fuscantaria*	Dusky Thorn	yes	yes
Moth	*Eulithis mellinata*	Spinach	yes	yes
Moth	*Euxoa nigricans*	Garden Dart	yes	yes
Beetle	*Harmonia axyridis*	Harlequin Ladybird	Invasive	Invasive
Moth	*Hemistola chrysoprasaria*	Small Emerald	yes	yes
Moth	*Hepialus humuli*	Ghost Moth	yes	yes
Moth	*Hoplodrina blanda*	Rustic	yes	yes
Moth	*Hydraecia micacea*	Rosy Rustic	yes	yes
Moth	*Lomographa bimaculata*	White-pinion Spotted	yes	no
Moth	*Lycia hirtaria*	Brindled Beauty	yes	yes
Moth	*Melanchra persicariae*	Dot Moth	yes	yes
Moth	*Melanchra pisi*	Broom Moth	yes	yes
Moth	*Mesoligia literosa*	Rosy Minor	yes	yes

Terrestrial Invertebrate Desk Study Records from the Last 10 Years				
Type	**Binomial**	**Common name**	**LDBAP**	**Section 41**
Moth	*Mythimna comma*	Shoulder-striped Wainscot	yes	yes
Moth	*Orthosia gracilis*	Powdered Quaker	yes	yes
Moth	*Scotopteryx chenopodiata*	Shaded Broad-bar	yes	yes
Moth	*Spilosoma lubricipeda*	White Ermine	yes	yes
Moth	*Spilosoma luteum*	Buff Ermine	yes	yes
Butterfly	*Satyrium (Strymonidia) w-album*	White letter Hairstreak	yes	yes
Moth	*Tethea ocularis octogesimea*	Figure of Eighty	yes	no
Moth	*Tholera decimalis*	Feathered Gothic	yes	yes
Moth	*Tyria jacobaeae*	Cinnabar	yes	yes
Moth	*Xanthia icteritia*	Sallow	yes	yes
Moth	*Xanthorhoe ferrugata*	Dark-barred Twin-spot Carpet	yes	yes

3.1.2 Desk study records from DWT were sparse comprising 32 records representing nine species, all of which are included in both NERC Section 41 and the LBAP (see Table 3). However, the majority of these records were over ten years old, with only one record of wall brown butterfly *Lasiommata megera* having been made within the last ten years. Records from within 500m of the Scheme are presented in Figure 3 (Appendix A).

3.1.3 No records were found on EnvIS.

Table 3: DWT Desk Study Records for Protected or Notable Invertebrate Species

Terrestrial Invertebrate Desk Study Records within Last 10 Years				
Type	**Binomial**	**Common name**	**LBAP**	**Section 41**
Moth	*Spilosoma luteum*	Buff Ermine	yes	yes
Moth	*Acronicta rumicis*	Knot Grass	yes	yes
Moth	*Chiasmis clathrata*	Latticed Heath	yes	yes
Moth	*Eulthis mellinata*	Spinach	yes	yes
Moth	*Graphiphora augur*	Double Dart	yes	yes
Moth	*Mesoligia literosa*	Rosy Minor	yes	yes
Moth	*Mythimna comma*	Shoulder-striped Wainscot	yes	yes
Butterfly	*Lasiommata megera*	Wall brown	yes	yes
Moth	*Tyria jacobaeae*	Cinnabar	yes	yes

3.2 Terrestrial Invertebrate Survey

3.2.1 The survey identified a total 223 species of invertebrate (Appendix C) from the three sample sites including representatives of the following groups: Diptera, Coleoptera, Hymenoptera, Lepidoptera, Hemiptera, Odonata, Orthoptera, Neuroptera, Mollusca, Mecoptera and, Myriapoda.

3.3 Key Species

3.3.1 Amongst the 223 species recorded by these surveys, five (2.3%) have NERC S41, Red Data Book (RDB), Nationally Scarce, Threatened or Near Threatened conservation status (Table 4); for the purposes of this report, these species will be referred to as "Key Species". Table 5 is ordered by conservation status category with the rarest/ most threatened species listed first. For an explanation of the conservation status categories of invertebrates, see Appendix B.

3.3.2 This total of five Key Species includes two S41 and LBAP species (Cinnabar moth and Small heath).

Table 4: Key Species Recorded

Order	Family	Species (Scientific name)	Common name	Status
Lepidoptera	Erebidae	*Tyria jacobaea*	Cinnabar	NERC S41 research only
Lepidoptera	Nymphalidae	*Coenonympha pamphilus*	Small heath	NERC S41 research only, Near Threatened (NT)
Coleoptera	Oedermeridae	*Ischnomera caerulea*	A flower beetle	Nationally Rare (NR)
Hemiptera	Pentatomidae	*Eurydema (Rubrodorsalium) dominulus*	Scarlet shield bug	Endangered (EN): NR
Diptera	Tachinidae	*Gonia divisa*	A tachinid fly	Red Data Book (RDB)†

† Red Data Book Category 3 Rare – Pre 1994 Category

3.3.3 Further information on these two species, along with other key species recorded is provided below.

3.4 Section 41 Species

3.3.4 Two species, the small heath and cinnabar moth were recorded from the surveys (Table 4) and are listed on NERC S41 as 'research only' species. Conservation action for these "research only" species is focused on further research rather than protection of individual sites. Small heath is also listed as 'Near Threatened'.

3.3.5 For each of the Key Species recorded, a short account is provided, describing the ecology and distribution of the species in Britain, followed by details of its occurrence during the current survey. IUCN categories are included, details of these abbreviations are included in Appendix B.

***Coenonympha pamphilus* (Lepidoptera: Nymphalidae) NT, S41**

3.3.6 Joint Nature Conservation Committee (JNCC) Criteria 3: Marked decline in the past 25 years; this species has shown a 62% decline in numbers over 25 years. A widespread butterfly that can be found in grassland habitats across lowland Britain, this species lives in discrete colonies. This species has undergone a serious decline in abundance since 1976. This species was recorded on the wing in Little Eaton Proposed Construction Compound during the June and July 2018 visits.

***Eurydema (Rubrodorsalium) dominulus* (Hemiptera: Pentatomidae) EN: NR**

3.3.7 A small colourful plant bug, this species is dependent upon Lady's smock *Cardamine pratensis* as the larval foodplant. This species has shown a marked decline across England with very few recent records and this record may represent a first for the County.

3.3.8 This species was recorded from sweep netting in Markeaton Proposed Construction Compound during the June 2018 visit.

***Gonia divisa* (Diptera: Tachinidae) RDB3**

3.3.9 This tachinid fly species is an endoparasite on the larvae of the turnip moth or common cutworm *Agrotis segetum,* a common pest species of several commonly cultivated vegetables. This species has limited records in southern England and may represent a first record for the County, recorded from water traps placed in Markeaton Proposed Construction Compound in June 2018. The Markeaton Proposed Construction Compound site is within 300m of a long-established allotment site.

***Ischnomera caerulea* (Coleoptera: Oedermeridae) NR**

3.3.10 A species of polyphagic false blister beetle, this species has limited data on the ecology of the species available. Records are limited, but widespread across southern England.

3.3.11 This species was recorded from sweep netting within Markeaton Proposed Construction Compound and Little Eaton Proposed Construction Compound.

***Tyria jacobaeae* (Lepidoptera: Erebidae) The Cinnabar, S41**

3.3.12 JNCC Criteria 3: common and widespread, but rapidly declining moths – research needed; Declined by 83% over the last 35 years (JNCC). Resembling no other British species, except perhaps the burnets (Zygaenidae), this is a fairly common moth in much of Britain. It is generally nocturnal, but is quite often disturbed during the day from long grass, low herbage etc. At night, it comes to light. A colour form, *f. flavescens* is found occasionally, with the red markings replaced with a yellowish tint. The distinctive larvae, with their yellow and black hoops, generally feed gregariously on ragwort *Senecio jacobaea* and other related plants. The flight period is May through July (Kimber, 2018). This species was observed regularly on the wing through direct observation across the survey sites.

4 SPECIES ANALYSIS

4.1 Markeaton Proposed Construction Compound

Summary

4.1.1 The survey identified 137 species of invertebrate (Appendix C) within Markeaton Proposed Construction Compound across the three survey visits, including two Nationally Rare species, one Endangered species, and one S41 Priority Species (research only).

ISIS Results

4.1.2 ISIS lists 113 of the 137 species identified by the survey within Markeaton Proposed Construction Compound. Analysis of the 113 species through ISIS, recognised two Broad Assemblage Types (BATs); represented by 15 species or more. Six more BATs were identified; however, these fell below the number of species required to reliably calculate Rarity scores required for favourable condition and are not discussed further. The two BATs represented by 15 or more species are shown in Table 5.

Table 5: BATs Represented at Markeaton Proposed Construction Compound - the ISIS scores and the number of species on which each score is based

BAT Code	BAT Name	No. of Species	ISIS Rarity Score	ISIS Rarity Score 'favourable Condition threshold'	Favourable Condition Reached
F2	Grassland & scrub matrix	31	129	160	No
F1	Unshaded early successional mosaic	14	125	160	No

Pantheon Results

4.1.3 The list of 138 species or aggregates from the three surveys visits was entered into Pantheon. 13 taxa were not matched, so Pantheon processed 125 taxa. Within the species dataset, three broad biotypes were well represented.

4.1.4 These Broad biotypes are shown in Table 6 along with, the number of species associated with the biotope, the percentage of the national assemblage for the biotope this represents, and the Species Quality Index (SQI). A good quality invertebrate site is expected to have an SQI of 4.0 or above.

Table 6: Broad Biotopes Represented in the Markeaton Proposed Construction Compound

Broad Biotope	No. of Species	% Representation of UK species	SQI	No. of Key Species
Open Habitats	80	2	1.23	2
Tree-associated	19	<1	1.39	1
Wetland	16	<1	1.00	0

4.1.5 Within these 125 species covered by Pantheon analysis, six Specific Assemblage Types (SATs) were represented. These are species that are stenotopic to a specific habitat type; and these habitats can be considered highly important to invertebrates within the site. However, only one of these SATs was represented by 15 or more species which is a minimum requirement for calculating a reliable Species Quality Index.

4.1.6 The SAT types represented, including the number of stenotopic species, the Species Quality Index (SQI), and an indication of whether Favourable Condition Criteria for the habitat type has been met is shown in Table 7.

Table 7: Specific Assemblage Types for Markeaton Proposed Construction Compound

Broad Biotope	Secondary Habitat	Specific Assemblage Type	Code	No. of Species	SQI	Favourable Condition Met?
Open Habitats	-	Flower rich resource	F002	15	1.20	Favourable
Open Habitats	-	Scrub edge	F001	3	**	Unfavourable
Open habitats	-	Scrub-heath and moorland	F003	1	**	Unfavourable
Tree-associated	Decaying wood	Heartwood decay	A211	2	**	Unfavourable
Tree-associated	Decaying wood	Decaying wood	A212	1	**	Unfavourable

**calculated from <15 species and considered unreliable in site assessment

4.1.7 These results show that that the habitat of highest importance to invertebrates within Markeaton Proposed Construction Compound are flower rich resources, with mature tree and wetland habitats also being represented by the recorded assemblage.

4.2 Kingsway Roundabout LWS

Summary

4.2.1 The survey identified 118 species of invertebrate (Appendix C) within Kingsway Roundabout LWS across the three survey visits, including two Nationally Rare species, one Endangered species, and one S41 Priority Species (research only).

ISIS Results

4.2.2 ISIS lists 99 of the 117 species identified by the survey within Kingsway Roundabout LWS. Analysis of the 99 species through ISIS, recognised two Broad Assemblage Types (BATs); represented by 15 species or more. Four more BATs were identified, however, these fell below the number of species required to reliably calculate Rarity scores required for favourable condition and are not discussed further. The two BATs represented by 15 or more species are shown in Table 8.

Table 8: BATs Represented at Kingsway Roundabout LWS - the ISIS scores and the number of species on which each score is based

BAT Code	BAT Name	No. of Species	ISIS Rarity Score	ISIS Rarity Score 'favourable Condition threshold'	Favourable Condition Reached
F2	Grassland & scrub matrix	28	118	160	No
F1	Unshaded early successional mosaic	15	<100	160	No

Pantheon Results

4.2.3 The list of 117 species or aggregates from the three survey visits was entered into Pantheon. Nine taxa were not matched, so Pantheon processed 108 taxa. Within the species dataset, three broad biotypes were well represented.

4.2.4 These Broad biotypes are shown in Table 9 along with, the number of species associated with the biotope, the percentage of the national assemblage for the biotope this represents, and the Species Quality Index (SQI). A good quality invertebrate site is expected to have an SQI of 4.0 or above.

Table 9: The Broad Biotopes Represented in the Kingsway Roundabout LWS Survey Area

Broad Biotope	No. of Species	% Representation of UK species	SQI	No. of Key Species
Open Habitats	70	2	1.04	1
Tree-associated	19	<1	1.16	1
Wetland	6	<1	1.50	1

4.2.5 Within these 108 species covered by Pantheon analysis, six Specific Assemblage Types (SATs) were represented. These are species that are stenotopic to a specific habitat type; and these habitats can be considered highly important to invertebrates within the site. However, only one of these SATs, open habitat, was represented by 15 or more species which is a minimum requirement for calculating a reliable Species Quality Index.

4.2.6 The SAT types represented in the survey area, including the number of stenotopic species, the Species Quality Index (SQI), and an indication of whether Favourable Condition Criteria for the habitat type has been met is shown in Table 10.

Table 10: Specific Assemblage Types for Kingsway Roundabout LWS

Broad Biotope	Secondary Habitat	Specific Assemblage Type	Code	No. of Species	SQI	Favourable Condition Met?
Open Habitats	-	Flower rich resource	F002	15	1.20	Unfavourable
Tree associated	Decaying wood	Bark & sapwood decay	A212	3	**	Unfavourable
Open habitats	-	Scrub edge	F001	3	**	Unfavourable
Tree-associated	Decaying wood	Heartwood decay	A211	1	**	Unfavourable
Open habitats	Short sward & bare ground	-	F112	1	**	Unfavourable

**calculated from <15 species and considered unreliable in site assessment

4.2.7 These results show that that habitat of highest importance to invertebrates within Kingsway Roundabout LWS is the open mosaic of grassland and scrub, with mature tree and deadwood habitats also being represented by the recorded assemblage.

4.3 Little Eaton Proposed Construction Compound

Summary

4.3.1 The survey identified 164 species of invertebrate (Appendix B) within Little Eaton Proposed Construction Compound across the three survey visits, including two Near Threatened species, one S41 Species of Principal concern, one S41 Priority Species (research only) and one Nationally Rare species.

ISIS Results

4.3.2 ISIS covers 137 of the 164 species identified by the survey within Little Eaton Proposed Construction Compound. Within the 137 species covered by ISIS, two Broad Assemblage Types (BATs) were well represented (i.e. represented by 15 species or more), 5 more BATs were identified, however, these fell below the number of species required to reliably calculate Rarity scores required for favourable condition and are not discussed further. The two BATs represented by 15 or more species are shown in Table 11.

Table 11: BATs Represented at Little Eaton Proposed Construction Compound - the ISIS scores and the number of species on which each score is based

BAT Code	BAT Name	No. of Species	ISIS Rarity Score	ISIS Rarity Score 'favourable Condition threshold'	Favourable Condition Reached
F2	Grassland & scrub matrix	33	127	160	No
F1	Unshaded early successional mosaic	16	123	160	No

Pantheon Results

4.3.3 The list of 164 species or aggregates was entered into Pantheon from the three survey visits to Little Eaton Proposed Construction Compound. 19 taxa were not matched, so Pantheon processed a list of 145 taxa. Within the species dataset, 3 broad biotypes were well represented, with 1 broad biotype represented by a single species.

4.3.4 These Broad biotypes are shown in Table 12. This table includes the Broad biotopes, the number of species associated with the biotope, the percentage of the national assemblage for the biotope this represents, and the Species Quality Index (SQI). A good quality invertebrate site is expected to have an SQI of 4.0 or above.

Table 12: The Broad Biotopes represented in the Little Eaton Proposed Construction Compound Survey Area

Broad Biotope	No. of Species	% Representation of UK species	SQI	No. of Key Species
Open Habitats	90	2	1.03	2
Tree-associated	22	<1	1.32	1
Wetland	20	<1	1.00	0

4.3.5 Within these 145 species covered by Pantheon analysis, 7 Specific Assemblage Types (SATs) were represented. These are species that are stenotopic (ecologically restricted) to a specific habitat type; and these habitats can be considered highly important to invertebrates within the site. However, only one of these SATs was represented by 15 or more species which is a minimum requirement for calculating a reliable Species Quality Index.

4.3.6 The SAT types represented in the survey area, including the number of stenotopic species, the Species Quality Index (SQI), and an indication of whether Favourable Condition Criteria for the habitat type has been met is shown in Table 13.

Table 13: Specific Assemblage Types for Little Eaton Proposed Construction Compound

Broad Biotope	Secondary Habitat	Specific Assemblage Type	Code	No. of Species	SQI	Favourable Condition Met?
Open Habitats	-	Flower rich resource	F002	15	1.20	Favourable
Open habitats	-	Scrub edge	F001	3	**	Unfavourable
Tree-associated	Decaying wood	Heartwood decay	A211	1	**	Unfavourable
Open habitats	Short sward & bare ground	Open short sward	F112	1	**	Unfavourable
Tree associated	Decaying wood	Bark & sapwood decay	A212	3	**	Unfavourable

Broad Biotope	Secondary Habitat	Specific Assemblage Type	Code	No. of Species	SQI	Favourable Condition Met?
Open habitats	-	Scrub heath and moorland	F003	1	**	Unfavourable
Open habitats	Short sward & bare ground	Bare sand and chalk	F111	1	**	Unfavourable

**calculated from <15 species and considered unreliable in site assessment

4.3.7 These results show that habitat of highest importance to invertebrates within Little Eaton Proposed Construction Compound is the open habitat with diverse nectar sources. Deadwood and mature tree specialists are also represented within the recorded assemblage.

5 HABITAT ASSESSMENT

5.1.1 ISIS and Pantheon offer methods of assessing the importance of a site in the national context. The sites surveyed supported a narrow range of invertebrate assemblages with two ISIS Broad Assemblage Types (BATs) being well represented; unshaded early successional mosaic and grassland & scrub matrix. These two BATs yielded high Rarity scores, but low species numbers and low national species pool percentage representation, indicating that the sites where these habitat types are located, whilst being in favourable condition cannot be considered important at the national level (Webb *et al* 2018). The remaining habitats fell below the threshold values for national importance.

5.1.2 Pantheon has superseded ISIS; however, the results generated by this database are more difficult to put into context. The Species Quality Index (SQI) values for the Broad Biotope of open habitats (12.0) is low as are the ISIS Species Rarity scores. This does support ISIS in identifying the open habitats represented by unshaded early successional mosaic and grassland & scrub matrix as low significance at the local level.

5.1.3 The habitats at the three sites assessed are of significance for invertebrates at the Local level only (Plant undated). This is strongly supported by Species Quality Index analysis and by the numbers of Key Species and Section 41 (research only species). This assessment is also supported by both ISIS and Pantheon analysis.

6 SITE ASSESSMENTS AND CONCLUSIONS

6.1 Key Species

6.1.1 Five Key species were found across the three sites, comprising 2.3% of the 223 species recorded across the surveys. This figure of 2.3% is below to the mean of 5.06% for occurrence of Key Species at important sites in contemporary studies of invertebrates for conservation evaluation (Telfer, 2017).

6.1.2 Two Rare Key Species were found, comprising 0.8% of the 223 species identified. This figure is low compared to occurrence of Rare or Key Species in contemporary studies of invertebrates for conservation evaluation. This low percentage of Rare Key Species supports the assessment of the sites as significant at the Local level in terms of invertebrate assemblage.

6.1.3 The two Rare Key species; small heath butterfly and cinnabar moth, were recorded across the three sites; these species are listed on NERC S41 as Research Only due to documented decline. However, both of these species species should be taken into account when considering site level impacts and mitigation.

6.2 Habitats

6.2.1 The habitats at the three sites assessed are of significance for invertebrates at the Local level only (Plant undated). This is strongly supported by Species Quality Index analysis and by the numbers of Key Species and Section 41 (research only species). This assessment is also supported by both ISIS and Pantheon analysis.

6.3 Markeaton Proposed Construction Compound

6.3.1 The 2018 survey identified 137 species of invertebrate (Appendix C) within Markeaton Proposed Construction Compound across the three survey visits, including two Nationally Rare species, one Endangered species, and one S41 Priority Species (research only).

6.3.2 The low numbers key species indicate that the site is significant at the Local level in terms of invertebrate assemblage.

6.4 Kingsway Roundabout

6.4.1 The survey identified 118 species of invertebrate (Appendix C) within Kingsway Roundabout LWS across the three survey visits, including two Nationally Rare species, one Endangered species, and one S41 Priority Species (research only).

6.4.2 The low numbers key species indicate that the site is significant at the Local level in terms of invertebrate assemblage.

6.5 Little Eaton Proposed Construction Compound

6.5.1 The survey identified 164 species of invertebrate (Appendix C) within Little Eaton Proposed Construction Compound across the three survey visits, including two Near Threatened species, one S41 Species of Principal concern, one S41 Priority Species (research only) and one Nationally Rare species.

6.5.2 The low numbers key species indicate that the site is significant at the Local level in terms of invertebrate assemblage.

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Appendix A Figures

N

M1 JUNCTION 28

A38/A61 LITTLE EATON JUNCTION

A38/A6 PALM COURT JUNCTION

A38/A52 MARKEATON JUNCTION

A38/A5111 KINGSWAY JUNCTION

A50/A38 JUNCTION

2 0 2 4 6 8 Kilometres

Project Title/Drawing Title A38 DERBY JUNCTIONS SCHEME LOCATION PLAN	AECOM Internal Project Number 60533462	Highways England A38 Derby Junctions Project Highways England, Floor 5 2 Colmore Square 38 Colmore Circus Birmingham B4 6BN
	Drawn: GB / Checked: SR / Approved: PB	
	Date: 01/10/2018 / Scale @ A3: 1:100,000 / Purpose of issue: FINAL	AECOM Royal Court Basil Close, Chesterfield Derbyshire. S41 7SL +44 (0) 1246 209221 +44 (0) 1246 209229 www.aecom.com
	Drawing Number: Figure 1 / Rev: 1F	

File Name:\\ch-wip-001\CH_Roads\A38 Derby Jcns - PO1339\12 CAD\12.1 WIP\FIGURE 1.1 - LOCATION PLAN F1.mxd

N

25 different LBAP moth species

200 0 200 400 600 800 1000 Metres

Legend

- Scheme bounday
- 50 m buffer
- 500 m buffer
- 1km buffer

Terrestrial invertebrates records provided by DaNES

- LBAP Beetle
- LBAP Butterfly
- LBAP Moth

Terrestrial invertebrates records provided by DWT

- LBAP Butterfly
- LBAP Moth

File Name:A:\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_A38_2018\project_files\Terrestrial Invert\Fig2_Update_A38_Kingsway_DeskStudy_TerrestInvert_201602024.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS MARKEATON AND KINGSWAY DESK STUDY TERRESTRIAL INVERTEBRATES RECORDS

AECOM Internal Project Number 60533462		
Drawn: GSB	Checked: SR	Approved: PB
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Drawing Number: Figure 2		Rev: 3F

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N

200 0 200 400 600 800 1000 Metres

Legend

- Scheme boundary
- 50 m buffer
- 500 m buffer
- 1km buffer

Terrestrial invertebrates records provided by Derbyshire Wildlife Trust

- NERC Section 41 moth
- NERC Section 41 Butterfly

File Name:A:\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_A38_2018\project_files\Terrestrial Invert\Fig3_Update_A38 LittleEaton_TerrestInvert_Records_20160224.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS
LITTLE EATON
DESK STUDY
TERRESTRIAL INVERTEBRATES RECORDS

Project Number 60533462		
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Drawing Number Figure 3		Rev 3F

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Site C

Site D

Site B

Site A

Site G

N

Legend

- Scheme boundary
- 50 m buffer
- 250 m buffer
- 500 m buffer
- Terrestrial invertebrates survey area

Habitats

- Semi-natural broad-leaved woodland
- Coniferous woodland
- Mixed plantation woodland
- Dense scrub
- Parkland
- Semi-improved grassland
- Tall ruderal
- Open water
- Amenity grassland
- Introduced shrub
- Building
- Bare ground
- Hard standing
- Invasive non-native species
- No access

100 0 100 200 300 400 500 Metres

File Name:A:\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_A38_2018\project_files\Terrestrial Invert\Fig4_Update_A38_Kingsway_Survey_TerrestInvert_20160205.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS MARKEATON AND KINGSWAY 2015 TERRESTRIAL INVERTEBRATES SURVEY

AECOM Internal Project Number
60533462

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Drawing Number		**Rev**
Figure 4		3F

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N

Site E

Site E

Site F

Legend

- Scheme boundary
- 50 m buffer
- 250 m buffer
- 500 m buffer
- Terrestrial invertebrates survey area

Habitats

- Plantation broad-leaved woodland
- Dense scrub
- Semi-improved grassland
- Improved grassland
- Open water
- Boulders
- Arable
- Amenity grassland
- Building
- Bare ground
- Hard standing
- Invasive non-native species

100 0 100 200 300 400 500 Metres

File Name:A:\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_A38_2018\project_files\Terrestrial Invert\Fig5_A38 LittleEaton_TerrestInvert_Survey_20160224.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS
LITTLE EATON
2015 TERRESTRIAL INVERTEBRATES SURVEY

Project Number 60533462		
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Date 29/11/2018	Scale @ A3 1:5,000	Purpose of issue FINAL
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Legend

- Terrestrial invertebrate sampling area
- Scheme Boundary
- 50 m buffer

Habitats

- Broad-leaved woodland
- Broad-leaved plantation
- Coniferous plantation
- Mixed plantation
- Dense scrub
- Scattered scrub
- Parkland
- Mixed parkland
- Semi-improved grassland
- Poor semi-improved grassland
- Tall ruderal
- Swamp
- Water
- Invasive Non-Native Species
- Amenity grassland
- Introduced shrubs
- Building
- Hard standing
- No access
- Private Gardens - Not surveyed
- Species-Poor Hedge
- Species-Poor Hedge With Trees
- Fence
- Wall
- Dry Ditch
- Scrub
- Tree

N

Sturgess Fields

Kingsway Roundabout

100 0 100 200 300 400 500 Metres

File Name:A:\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_A38_2018\project_files\Terrestrial Invert\A38_Terrestrial Invert sv_MK_CA.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS TERRESTRIAL INVERTEBRATES SURVEYS 2018 KINGSWAY MARKEATON

AECOM Internal Project Number 60533462			A38 Derby Junctions Project Highways England, Floor 5 2 Colmore Square 38 Colmore Circus Birmingham B4 6BN
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Date: 29/11/2018	Scale @ A3: 1:8,000	Purpose of issue: FINAL	AECOM Royal Court Basil Close, Chesterfield Derbyshire. S41 7SL +44 (0) 1246 209221 +44 (0) 1246 209229 www.aecom.com
Drawing Number: Figure 6		Rev: 0	

N

Legend

- Terrestrial invertebrates sampling area
- Scheme boundary
- 50 m buffer

Habitats

- Broad-leaved woodland
- Broad-leaved plantation
- Coniferous plantation
- Dense scrub
- Scattered scrub
- Parkland
- Semi-improved grassland
- Improved grassland
- Marshy grassland
- Poor semi-improved grassland
- Tall ruderal
- Water
- Dry pond
- Boulders
- Invasive Non-Native Species
- Arable
- Amenity grassland
- Introduced shrubs
- Building
- Bare ground
- Hard standing
- No access
- Private Gardens - Not surveyed
- Broad-leaf tree
- Species-Poor Hedge
- Species-poor Defunct Hedge
- Species-Poor Hedge With Trees
- Fence
- Scrub
- Tree

Little Eaton Proposed Construction Compound (Site 8)

100 0 100 200 300 400 500 Metres

File Name:A:\Highways Agency\47071390 A38 Derby Jcns - Environment\Technical\Ecology\GIS_A38_2018\project_files\Terrestrial Invert\A38_Terrestrial Invert sv_LE_CA.mxd

Project Title/Drawing Title

A38 DERBY JUNCTIONS TERRESTRIAL INVERTEBRATES SURVEYS 2018 LITTLE EATON

AECOM Internal Project Number
60533462

Drawn	Checked	Approved
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Date	Scale @ A3	Purpose of issue
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Drawing Number		Rev
Figure 7		0

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Appendix B Assessment Criteria

British Conservation Status Categories - Definitions

Status Categories and Criteria Version 1 (Shirt, 1987)

Conservation status categories of invertebrates

A system of conservation statuses has been in use since the British Red Data Book for insects (Shirt, 1987), amended and supplemented by a series of JNCC Nature Conservation reviews. By this system, the rarest and most threatened species are given one of the Red Data Book (RDB) statuses. Species which do not qualify as RDB but are nonetheless uncommon are given one of the Nationally Scarce statuses. For butterflies, dragonflies, water beetles and some other groups, the most up-to- date conservation statuses are based on the International Union for Conservation of Nature (IUCN) Red List categories and criteria (IUCN, 2001). This system places less emphasis on rarity and more on factors which suggest a risk of extinction (such as severe declines in range or population).

The species of conservation significance for a site assessment such as this (the "Key Species") are the RDB and Nationally Scarce species under the earlier criteria and the Threatened and Near Threatened species under the later criteria.

These status categories and criteria were introduced for British insects by Shirt (1987) and received some modifications by later authors (e.g. Hyman and Parsons (1992)).

Red Data Book Category EXTINCT

Species which were formerly native to Britain but have not been recorded since 1900.

Red Data Book Category 1, Endangered

Species in danger of extinction and whose survival is unlikely if causal factors continue to operate. Endangered species either (a) occur as only a single population within one 10-km square, or (b) only occur in especially vulnerable habitats, or (c) have been declining rapidly or continuously for twenty years or more to the point where they occur in five or fewer 10-km squares, or (d) may already have become extinct.

Red Data Book Category 2, Vulnerable

Species which are likely to move into the Endangered category in the near future if causal factors continue to operate. Vulnerable species are declining throughout their range or occupy vulnerable habitats.

Red Data Book Category 3, Rare

Species which occur in small populations and although not currently either Endangered or Vulnerable are at risk. Rare species exist in 15 or fewer 10-km squares, or are more widespread than this but dependent on small areas of especially vulnerable habitat.

Red Data Book Category I, Indeterminate

Species considered to be either Endangered, Vulnerable or Rare but with insufficient information to say which. NB. Best written as 'RDBi' rather than 'RDBI' as the latter is easily confused with 'RDB1' (Endangered).

Red Data Book Category K, Insufficiently Known

Species suspected to merit either Endangered, Vulnerable, Rare or Indeterminate status but lacking sufficient information. Species included in this category may have only recently been discovered in Britain, or may be very poorly recorded for a variety of reasons.

Nationally Scarce Category A, Na.

Species which do not fall within Red Data Book categories but which are nonetheless uncommon in Great Britain and thought to occur in 30 or fewer (typically between 16 and 30) 10-km squares of the National Grid, or for less well-recorded groups, in seven or fewer vice-counties.

Nationally Scarce Category B, Nb.

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

Nationally Scarce, N.

Species which do not fall within Red Data Book categories but which are nonetheless uncommon in Great Britain. This status category has been used where information has not been sufficient to allocate a species to either Na or Nb. These species are thought to occur in between 16 and 100 10-km squares of the National Grid.

Status Categories and Criteria Version 2 (IUCN, 2001)

These later status categories and criteria are based on IUCN Red List Categories and Criteria version 3.1 (IUCN, 2001) and have been applied to British butterflies, dragonflies and a few other invertebrate groups.

Critically Endangered (CR)

A taxon is Critically Endangered when the best available evidence indicates that it is facing an extremely high risk of extinction in the wild.

Endangered (EN)

A taxon is Endangered when the best available evidence indicates that it is facing a very high risk of extinction in the wild.

Vulnerable (VU)

A taxon is Vulnerable when the best available evidence indicates that it is facing a high risk of extinction in the wild.

N.B.: Species belonging to the above three categories may be collectively referred to as Threatened.

Data Deficient (DD)

A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.

The DD category effectively replaces the Indeterminate (RDBi) and Insufficiently Known (RDBK) categories of the earlier version.

Near Threatened (NT)

A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

Least Concern (LC)

A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

Species List

The species of conservation significance for a site assessment such as this (the “Key Species”) are highlighted in bold red text in the list below.

Geographical Categorisation

The following assessment criteria were published by Colin Plant Associates.

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).

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 alweay be performed by, or subsequently approved by, an approved entomologist.

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 *Habitats Directive*).
National	UK important site	Achieving SSSI invertebrate criteria (NCC, 1989) **or** containing 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).
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 south-east England	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 *English Nature* region in question in the Recorder database or elsewhere **or** a combination of these categories amounting to ten species in total.
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.

Appendix C Species List

Order	Family	Scientific Name	Common Name	20/06/2018			20/07/2018			23/08/2018		
				Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound	Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound	Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound
Coleoptera	Cantharidae	*Rhagonycha fulva*	Common red soldier beetle		x	x	x	x	x	x	x	
Coleoptera	Carabidae	*Amara aenea*	A ground beetle				x					
Coleoptera	Carabidae	*Amara aulica*	A ground beetle				x					
Coleoptera	Carabidae	*Amara communis*	A ground beetle						x			
Coleoptera	Carabidae	*Carabus nemoralis*	A ground beetle			x	x					
Coleoptera	Carabidae	*Carabus problematicus*	A ground beetle			x						
Coleoptera	carabidae	*Carabus violaceus*	A ground beetle			x			x			
Coleoptera	Carabidae	*Leistus rufescens*	A ground beetle							x		
Coleoptera	Carabidae	*Loricera pilicornis*	A ground beetle		x	x						
Coleoptera	Carabidae	*Nebria brevicollis*	A ground beetle					x	x	x		
Coleoptera	Carabidae	*Notiophilus biguttatus*	A ground beetle		x	x	x					
Coleoptera	Carabidae	*Patrobus atrorufus*	A ground beetle	x		x			x			

Order	Family	Scientific Name	Common Name	20/06/2018			20/07/2018			23/08/2018		
				Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound	Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound	Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound
Coleoptera	Carabidae	*Leistus ferrugineus*	A ground beetle			x			x			x
Coleoptera	Carabidae	*Amara apricaria*	A ground beetle						x			
Coleoptera	Carabidae	*Asaphidion stierlini*	A ground beetle			x		x				
Coleoptera	Carabidae	*Calathus (Calathus) melanocephalus*	A ground beetle		x					x		
Coleoptera	Carabidae	*Harpalus affinis*	A ground beetle			x			x			
Coleoptera	Carabidae	*Pterostichus cupreus*	A ground beetle					x	x			
Coleoptera	Carabidae	*Pterostichus madidus*	A ground beetle				x			x		x
Coleoptera	Carabidae	*Pterostichus (Pseudomaseus) nigrita*	A ground beetle			x						
Coleoptera	Carabidae (Pterostichini)	*Abax parallelepipedus*	A ground beetle			x	x			x		
Coleoptera	Cerambycidae	*Agapanthia villosoviridescens*	Golden-plumed grey longhorn beetle			x						
Coleoptera	Chrysomelidae	*Cassida rubiginosa*	Thistle tortoise beetle*						x			
Coleoptera	Coccineldiae	*Adalia 2-punctata*	2 spot ladybird	x				x	x	x	x	
Coleoptera	Coccineldiae	*Chilocorus renipustulatus*	Kidney spot ladybird								x	
Coleoptera	Coccineldiae	*Coccinella septempunctata*	7-spot ladybird		x	x	x	x	x	x	x	x

Order	Family	Scientific Name	Common Name	20/06/2018			20/07/2018			23/08/2018		
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Coleoptera	**Coccineldiae**	***Harmonia axyridis***	**Harlequin ladybird****	**x**	**x**				**x**			**x**
Coleoptera	Coccineldiae	*Propylea quatuordecimpunctata*	22 spot lady bird				x					
Coleoptera	Curculonidae	*Dorytomus melanophthalmus*	Long nosed weevil		x	x						
Coleoptera	Curculonidae	*Phyllobius pomaceus*	Nettle weevil		x	x			x	x		
Coleoptera	Curculonidae	*Rhynchites aequatus*	Apple weevil				x		x			x
Coleoptera	Elatidae	*Athous haemorrhoidalis*	Click beetle		x							
Coleoptera	Malachiidae	*Malachius bipustulatus*	The malachite beetle	x	x	x	x	x	x	x	x	x
Coleoptera	**Oedermeridae**	***Ischnomera caerulea NR***	**A flower beetle**						**x**	**x**		**x**
Coleoptera	Oedermeridae	*Oedemera nobilis*	thick-legged flower beetle	x	x	x	x	x	x			
Coleoptera	Pyrochroidae	*Pyrochroa coccinea*	Black-headed cardinal beetle		x			x				
Coleoptera	Pyrochroidae	*Pyrochroa serraticornis*	Common cardinal beetle					x				
Coleoptera	Staphylinidae	*Ocypus olens*	Devil's coach horse	x		x						
Coleoptera	Tenebrionidae	*Lagria hirta*	a beetle	x		x		x	x		x	x

Order	Family	Scientific Name	Common Name	20/06/2018			20/07/2018			23/08/2018		
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Diptera	Asilidae	*Leptogaster cylindrica*	Striped slender robberfly		x	x	x					
Diptera	Calliphoridae	*Calliphora vicina*	Common bluebottle	x	x	x	x	x	x	x	x	x
Diptera	Calliphoridae	*Calliphora vomitoria*	Orange-bearded bluebottle	x	x	x	x	x	x	x	x	x
Diptera	Calliphoridae	*Cynomya mortuorum*	Yellow-faced blowfly	x	x	x	x	x	x	x	x	x
Diptera	Calliphoridae	*Eurychaeta palpalis*	False flesh fly	x	x	x	x	x	x	x	x	x
Diptera	Calliphoridae	*Lucilia caesar*	Common green bottle	x	x	x	x	x	x	x	x	x
Diptera	Calliphoridae	*Protocalliphora azurea*	Bird Blowfly	x	x	x	x	x	x	x	x	x
Diptera	Calliphoridae	*Protophormia terraenovae*	Blackbottle	x	x	x	x	x	x	x	x	x
Diptera	Empididae	*Empis digramma*	A dance fly	x	x			x				
Diptera	Empididae	*Empis stercorea*	A dance fly		x							
Diptera	Empididae	*Sciapus platypterus*	A dance fly	x			x		x			
Diptera	Empiidae	*Empis livida*	A dance fly								x	
Diptera	Empiidae	*Empis tessellata*	A dance fly	x	x	x	x	x	x	x	x	x
Diptera	Sarcophagidae	*Sarcophaga carnaria*	A flesh fly	x	x	x	x	x	x	x	x	x
Diptera	Sarcophagidae	*Sarcophaga haemorrhoa*	A flesh fly	x	x	x	x	x	x	x	x	x

Order	Family	Scientific Name	Common Name	20/06/2018			20/07/2018			23/08/2018		
				Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound	Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound	Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound
Diptera	Sarcophagidae	*Sarcophaga subvicina*	A flesh fly	x	x	x	x	x	x	x	x	x
Diptera	Sarcophagidae	*Sarcophaga variegata*	A flesh fly	x	x	x	x	x	x	x	x	x
Diptera	Sciomyzidae	*Tetanocera ferruginea*	Common buff snail killer									
Diptera	Stratiomyidae	*Beris geniculata*	Long horned black legionnaire							x		x
Diptera	Stratiomyidae	*Chloromyia formosa*	Broad centurion								x	
Diptera	Syrphidae	*Cheilosia bergenstammi*	A hoverfly					x	x	x		
Diptera	Syrphidae	*Cheilosia fraterna*	A hoverfly		x	x			x			
Diptera	Syrphidae	*Cheilosia proxima*	A hoverfly				x	x				x
Diptera	Syrphidae	*Chrysotoxum bicinctum*	A hoverfly	x		x						
Diptera	Syrphidae	*Chrysotoxum festivum*	A hoverfly			x			x			
Diptera	Syrphidae	*Chrysotoxum bicinctum*	A hoverfly	x				x	x			
Diptera	Syrphidae	*Episyrphus balteatus*	Marmalade fly		x				x			
Diptera	Syrphidae	*Eristalinus sepulchralis*	A hoverfly			x	x					x
Diptera	Syrphidae	*Eristalis arbustorum*	A hoverfly				x					
Diptera	Syrphidae	*Eristalis horticola*	A hoverfly		x			x				x

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Diptera	Syrphidae	*Eristalis nemorum*	A hoverfly						x			
Diptera	Syrphidae	*Eristalis pertinax*	A hoverfly				x		x			
Diptera	Syrphidae	*Eristalis tenax*	A hoverfly		x		x			x		
Diptera	Syrphidae	*Eumerus strigatus*	A hoverfly			x						
Diptera	Syrphidae	*Eupeodes latifasciatus*	A hoverfly		x	x		x				
Diptera	Syrphidae	*Helophilus hybridus*	A hoverfly						x			x
Diptera	Syrphidae	*Helophilus pendulus*	A hoverfly						x			
Diptera	Syrphidae	*Helophilus trivittatus*	A hoverfly				x		x			
Diptera	Syrphidae	*Leucozona glaucia*	A hoverfly									x
Diptera	Syrphidae	*Leucozona laternaria*	A hoverfly									x
Diptera	Syrphidae	*Melanostoma scalare*	A hoverfly				x				x	
Diptera	Syrphidae	*Merodon equestris*	A hoverfly						x			
Diptera	Syrphidae	*Myathropa florea*	Batman hoverfly		x	x	x			x	x	
Diptera	Syrphidae	*Pipizella viduata*	A hoverfly					x				
Diptera	Syrphidae	*Scaeva pyrastri*	A hoverfly			x		x			x	
Diptera	Syrphidae	*Sericomyia silentis*	A hoverfly									x
Diptera	Syrphidae	*Sicus ferrugineus*	A hoverfly	x								

Order	Family	Scientific Name	Common Name	20/06/2018			20/07/2018			23/08/2018		
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Diptera	Syrphidae	*Sphaerophoria scripta*	A hoverfly			x	x	x	x	x		
Diptera	Syrphidae	*Syritta pipiens*	A hoverfly		x							
Diptera	Syrphidae	*Syrphus ribesii*	A hoverfly								x	
Diptera	Syrphidae	*Syrphus torvus*	A hoverfly								x	
Diptera	Syrphidae	*Tropidia scita*	A hoverfly			x	x		x			
Diptera	Syrphidae	*Volucella bombylans*	A hoverfly				x		x			
Diptera	Syrphidae	*Volucella inanis*	A hoverfly				x					
Diptera	Syrphidae	*Volucella pellucens*	A hoverfly	x	x				x			
Diptera	Syrphidae	*Volucella zonaria*	A hoverfly				x					
Diptera	Syrphidae	*Xanthogramma pedissequum*	A hoverfly			x			x			
Diptera	Tachinidae	*Dexia rustica*	A tachinid fly		x	x		x	x	x		
Diptera	Tachinidae	*Eriothrix rufomaculata*	A tachinid fly						x			x
Diptera	**Tachinidae**	***Gonia divisa RDB3***	**A tachinid fly**	**x**			**x**					
Diptera	Tachinidae	*Sturmia bella*	A tachinid fly		x				x	x		x
Diptera	Tachinidae	*Tachina fera*	A tachinid fly						x		x	x
Diptera	Tephritidae	*Chaetostomella cylindrica*	A frit fly				x	x			x	x

Order	Family	Scientific Name	Common Name	20/06/2018			20/07/2018			23/08/2018		
				Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound	Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound	Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound
Diptera	Tephritidae	*Sphenella marginata*	Ragwort fly		x	x		x	x			x
Diptera	Tephritidae	*Terellia ruficauda*	Red-tailed thistle fly	x		x			x			x
Diptera	Tephritidae	*Urophora cardui*	A tephritid fly			x			x			x
Hemiptera	Acanthostomatidae	*Acanthosoma haemorrhoidale*	Hawthorn shield bug				x	x		x		x
Hemiptera	Acanthostomatidae	*Elasmucha grisea*	Parent bug			x						
Hemiptera	Berytidae	*Neides tipularius*	A stilt bug					x	x	x		x
Hemiptera	Cicadidae	*Cicadella viridis*	A plant hopper		x	x	x	x	x		x	x
Hemiptera	Cicadidae	*Cixius nervosus*	A plant hopper	x	x	x	x	x	x	x	x	x
Hemiptera	Cicadidae	*Philaenus spumarius*	Common froghopper	x	x	x	x	x	x			
Hemiptera	Coreidae	*Coriomeris denticulatus*	A stilt bug							x		
Hemiptera	Coriedae	*Coreus marginatus*	Dock bug	x			x			x		
Hemiptera	Miridae	*Anthocoris nemorum*	Common flower bug		x	x		x	x			x
Hemiptera	Miridae	*Calocoris norwegicus*	Potato bug				x			x		
Hemiptera	Miridae	*Heterotoma planicornis*	A plant bug									
Hemiptera	Miridae	*Leptopterna dolabrata*	Grass bug		x	x	x	x	x		x	
Hemiptera	Pentatomidae	*Aelia acuminata*	Bishop's mitre							x		

Order	Family	Scientific Name	Common Name	20/06/2018			20/07/2018			23/08/2018		
				Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound	Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound	Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound
Hemiptera	**Pentatomidae**	***Eurydema (Rubrodorsalium) dominulus EN:NT***	**Scarlet shield bug**				**x**					
Hemiptera	Pentatomidae	*Palomena prasina*	Green shield bug				x	x	x	x		
Hemiptera	Pentatomidae	*Pentatoma rufipes*	Forest bug								x	
Hemiptera	Rhopalidae	*Myrmus miriformis*	A plant bug					x	x	x		x
Hemiptera	Tingidae	*Tingis cardui*	Spear thistle lacebug			x		x	x			x
Hymenoptera	Andrenidae	*Andrena flavipes*	Yellow legged mining bee	x	x		x	x	x			
Hymenoptera	Andrenidae	*Andrena minutula*	Common mini-miner		x		x	x	x			
Hymenoptera	Andrenidae	*Andrena wilkella*	Wilke's mining bee	x	x		x					
Hymenoptera	Apidae	*Apis mellifera*	Honeybee	x	x	x	x	x	x	x	x	
Hymenoptera	Apidae	*Bombus campestris*	Field cuckoo bee	x		x	x		x	x		x
Hymenoptera	Apidae	*Bombus hortorum*	Garden bumblebee		x							
Hymenoptera	Apidae	*Bombus hypnorum*	Tree bumblebee	x	x	x	x	x	x	x	x	x
Hymenoptera	Apidae	*Bombus lucorum*	White tailed bumblebee	x			x		x			
Hymenoptera	Apidae	*Bombus (Thoracomubus) pascuorum*	Common carder	x	x	x	x		x	x		

Order	Family	Scientific Name	Common Name	20/06/2018			20/07/2018			23/08/2018		
				Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound	Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound	Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound
Hymenoptera	Apidae	*Bombus pratorum*	Early Bumblebee	x	x	x						
Hymenoptera	Apidae	*Bombus ruderatus*	Large garden bumblebee	x	x	x			x			
Hymenoptera	Apidae	*Bombus terrestris*	Buff tailed bumblebee	x	x	x	x	x	x	x	x	x
Hymenoptera	Apidae	*Bombus vestalis*	Vestal cuckoo bee				x			x		
Hymenoptera	Apidae	*Lasioglossum calceatum*	Common furrow bee		x				x			
Hymenoptera	Apidae	*Nomada flavoguttata*	Little Nomad Bee	x		x						
Hymenoptera	Apidae	*Nomada goodeniana*	Gooden's Nomad bee	x		x						
Hymenoptera	Apidae	*Osmia rufa*	Tawny mining bee	x		x	x	x	x			
Hymenoptera	Chalcidae	*Mesoplobus sericeus*	A chalcid wasp **		x			x				
Hymenoptera	Chrysididae	*Chrysis ignita*	A chrysid wasp									x
Hymenoptera	Crabronidae	*Mellinus arvensis*	Field digger wasp			x			x			x
Hymenoptera	Crambidae	*Crambus lathoniellus*	Hook-streak grass-veneer		x	x	x	x			x	
Hymenoptera	Cynipdae	*Andricus quercuscalicis*	Knopper gall wasp	x			x			x		x
Hymenoptera	Cynipdae	*Diplolepis nervosa*	A parasitic wasp									x
Hymenoptera	Cynipdae	*Neuroterus quercusbaccarum*	spangle gall wasp			x			x			

Order	Family	Scientific Name	Common Name	20/06/2018			20/07/2018			23/08/2018		
				Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound	Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound	Markeaton Proposed Construction Compound	Kingsway RBT	Little Eaton Proposed Construction Compound
Hymenoptera	Formacidae	*Lasius flavus*	Yellow meadow ant		x	x		x	x			
Hymenoptera	Halictidae	*Halictus tumulorum*	Bronze banded furrow bee						x			
Hymenoptera	Halictidae	*Lasioglossum leucozonium*	White zoned furrow bee					x				
Hymenoptera	Halictidae	*Halictus rubicundus*	Orange legged furrow bee				x	x	x			
Hymenoptera	Halictidae	*Sphecodes gibbus*	Dark-winged blood bee						x		x	x
Hymenoptera	Ichnuemonidae	*Amblyteles armatorius*	Parasitic wasp			x	x	x	x			x
Hymenoptera	Ichnuemonidae	*Ichneumon stramentarius*	A parasitic wasp			x	x		x			
Hymenoptera	Ichnuemonidae	*Ichneumon stramentor*	Parasitic wasp	x			x					
Hymenoptera	Ichnuemonidae	*Ichneumon suspiciosus*	A parasitic wasp			x						
Hymenoptera	Ichnuemonidae	*Perithous scurra*	Parasitic wasp				x	x	x		x	x
Hymenoptera	Ichnuemonidae	*Pimpla rufipes*	Black slip wasp				x					
Hymenoptera	Ichnuemonidae	*Priocnemis exaltata*	A parasitic wasp				x	x				
Hymenoptera	Symphyta	*Arge pagana*	Rose sawfly						x			x
Hymenoptera	Symphyta	*Rhogogaster viridis*	Green sawfly							x	x	
Hymenoptera	Tenthredidae	*Tenthredo arcuata*	A sawfly				x		x			

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Hymenoptera	Tenthredidae	*Tenthredo mesomela*	A sawfly					x	x			
Hymenoptera	Tenthredinidae	*Ametastegia glabrata*	Dock sawfly				x	x				
hymenoptera	Tenthredopsis	*Tenthredo atra*	A sawfly	x		x	x			x		
Hymenoptera	Vespidae	*Dolichovespula sylvestris*	Tree wasp	x	x		x	x		x	x	
Hymenoptera	Vespidae	*Vespula germanica*	German wasp	x		x		x	x		x	x
Hymenoptera	Vespidae	*Vespula vulgaris*	common wasp	x	x	x	x	x	x	x	x	x
Lepidoptera	Adelidae	*Nemophora degeerella*	Long horn moth				x					
Lepidoptera	Choreutidae	*Anthophila fabriciana*	Nettle tap		x	x	x		x			
Lepidoptera	**Erebidae**	***Tyria jacobaeae S41***	**Cinnabar**		**x**	**x**	**x**		**x**			
Lepidoptera	Goniopterygini	*Gonepteryx rhamni*	Brimstone	x		x			x			x
Lepidoptera	Hesperiidae	*Ochlodes sylvanus*	large skipper						x			
Lepidoptera	Hesperiidae	*Ochlodes venata*	Large skipper				x		x			
Lepidoptera	Hesperiidae	*Thymelicus lineola*	Essex skipper						x			
Lepidoptera	Hesperiidae	*Thymelicus sylvestris*	Small skipper				x		x			
Lepidoptera	Lasiocampidae	*Eupithecia abbreviata*	Brindled pug		x	x		x		x	x	
Lepidoptera	Lasiocampidae	*Euthrix potatoria*	The drinker	x								
Lepidoptera	Lycaenidae	*Celastrina argiolus*	Holly blue						x			x

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Lepidoptera	Lycaenidae	*Lycaena phlaeas*	Small copper								x	
Lepidoptera	Lygaeidae	*Heterogaster urticae*	Nettle ground bug							x		
Lepidoptera	Nitulidae	*Meligethes aeneus*	Pollen beetle	x	x	x	x	x	x	x	x	x
Lepidoptera	Noctuidae	*Noctua pronuba*	Large yellow underwing				x		x	x		x
Lepidoptera	Noctuidae	*Xestia c-nigrum*	Setaceous hebrew character									x
Lepidoptera	Nymphalidae	*Aglais io*	Peacock	x					x	x		
Lepidoptera	Nymphalidae	*Aglais urticae*	Small tortoiseshell							x		
Lepidoptera	Nymphalidae	*Aphantopus hyperantus*	Ringlet				x		x	x		x
Lepidoptera	**Nymphalidae**	***Coenonympha pamphilus NT, S41***	**Small heath**			**x**			**x**			
Lepidoptera	Nymphalidae	*Maniola jurtina*	Meadow brown		x	x						
Lepidoptera	Nymphalidae	*Pararge aegeria*	Speckled wood					x	x	x	x	x
Lepidoptera	Nymphalidae	*Polygonia c-album*	Comma									x
Lepidoptera	Nymphalidae	*Pyronia tithonus*	Gatekeeper		x		x		x	x		
Lepidoptera	Nymphalidae	*Vanessa atalanta*	Red admiral								x	x
Lepidoptera	Nymphalidae	*Vanessa cardui*	Painted lady			x			x	x		x

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Lepidoptera	Pieridae	*Anthocharis cardamines*	Orange tip				x		x	x		
Lepidoptera	Pieridae	*Colias croceus*	Clouded yellow							x		x
Lepidoptera	Pieridae	*Pieris brassicae*	Large white		x	x	x		x	x		x
Lepidoptera	Pieridae	*Pieris napi*	Green veined white	x	x		x					
Lepidoptera	Pieridae	*Pieris rapae*	Small white	x	x		x					
Lepidoptera	Polyommatinae	*Polyommatus icarus*	Common blue			x			x			
Lepidoptera	Pterophoridae	*Pterophorus pentadactyla*	White Plume				x	x		x		
Lepidoptera	Pyrales	*Pyrausta aurata*	mint moth									x
Lepidoptera	Zygaenidae	*Zygaena filipendulae*	6 spot burnet		x			x				
Mecoptera	Panorpidae	*Panorpa communis*	Scorpion fly				x	x		x	x	x
Mollusca	Helicidae	*Helix aspersa*	Garden snail	x	x	x	x	x	x	x	x	x
Myriapoda	Cryptopsidae	*Cryptops hortensis*	A centipede						x			
Neuroptera	Chrysopidae	*Chrysopa perla*	Green lacewing		x	x	x		x			
Odonata	Aeshnidae	*Aeshna cyanea*	Southern hawker				x			x		
Odonata	Aeshnidae	*Aeshna grandis*	Brown hawker			x			x	x		
Odonata	Aeshnidae	*Anax imperator*	Emperor dragonfly							x		

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Odonata	Calopterygidae	*Calopteryx virgo*	Beautiful demoiselle				x					
Odonata	Coenagrionidae	*Coenagrion puella*	Azure damselfly				x		x			x
Odonata	Coenagrionidae	*Enallagma cyathigerum*	Common blue damsel						x			x
Odonata	Coenagrionidae	*Ischnura elegans*	Blue tailed damslefly				x			x		
Odonata	Lestidae	*Lestes sponsa*	Emerald damselfly			x	x		x			
Odonata	Libuellidae	*Sympetrum sanguineum*	Ruddy darter						x			
Orthoptera	Acrididae	*Metrioptera roeselii*	Roesel's bush-cricket			x						
Orthoptera	Acrididae	*Omocestus viridulus*	Common green grasshopper			x			x	x	x	x
Orthoptera	Acrididae	*Chorthippus brunneus*	Brown grasshopper									x
Orthoptera	Phaneropteridae	*Leptophyes punctatissima*	Speckled bush cricket						x			
Orthoptera	Acrididae	*Chorthippus parallelus*	Meadow grasshopper			x		x	x			
Orthoptera	Acrididae	*Tetrix undulata*	slender groundhopper		x	x	x		x			x