A12 Chelmsford to A120 widening scheme TR010060

6.3 ENVIRONMENTAL STATEMENT

APPENDIX 9.11 TERRESTRIAL INVERTEBRATE SURVEY REPORT

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ENVIRONMENTAL STATEMENT
APPENDIX 9.11 TERRESTRIAL INVERTEBRATE SURVEY REPORT

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1 Executive Summary

1.1.1 This report is an appendix of the A12 Chelmsford to A120 widening scheme Environmental Statement (ES).

1.1.2 This report presents an evaluation of terrestrial invertebrates based on field surveys undertaken in 2020. It presents the policy and legislative context within which the Environmental Impact Assessment (EIA) process is being carried out. The likely significant effects on, and appropriate mitigation strategies for terrestrial invertebrates, are considered in Chapter 9 of the ES.

1.1.3 Terrestrial invertebrates were surveyed using guidance set out in Drake *et al. (*2007) and assemblages were analysed using Pantheon (Webb *et al.* 2018).

1.1.4 Five sites were scoped in for terrestrial invertebrate surveys, including Brockwell Meadows, Little Braxted Fishing Lakes, Prested Hall, West of Hatfield Peverel, and Whetmead Local Nature Reserve (LNR).

1.1.5 Within Brockwell Meadows, 320 terrestrial invertebrate species were identified, 13 of which had conservation importance. Pantheon analysis showed that open habitats broad biotope, short sward, and bare ground habitat had the highest reliable species quality within the survey area. The terrestrial invertebrate population at this site is considered of **County** importance for biodiversity.

1.1.6 Within Little Braxted Fishing Lakes, 144 terrestrial invertebrate species were identified, four of which had conservation importance. Pantheon analysis showed that the tree-associated broad biotope had the highest reliable species quality within the survey area. The terrestrial invertebrate population at this site is considered of **County** importance for biodiversity.

1.1.7 Within Prested Hall, 311 terrestrial invertebrate species were identified, 14 of which had conservation importance. Pantheon analysis showed that the wetland broad biotope, and short sward and bare ground habitat had the highest reliable species quality within the survey area. The terrestrial invertebrate population at this site is considered of **County** importance for biodiversity.

1.1.8 Within the site West of Hatfield Peverel, 358 terrestrial invertebrate species were identified, 23 of which had conservation importance. Pantheon analysis showed that the tree-associated broad biotope and arboreal habitat had the highest reliable species quality within the survey area. The rich flower resource of the site was in favourable condition. The terrestrial invertebrate population at this site is considered of **County** importance for biodiversity.

1.1.9 Within Whetmead LNR, 297 species were identified, 12 of which had conservation importance. Pantheon analysis showed that the wetland broad biotope and decaying wood habitat had the highest reliable species quality within the survey area. The scrub-edge and rich flower resource at this site were in favourable condition. The terrestrial invertebrate population at this site is considered of **County** importance for biodiversity.

2 Introduction

2.1 Background

2.1.1 The A12 Chelmsford to A120 widening scheme (hereon referred to as the 'proposed scheme') comprises improvements to the A12 between junction 19 (Boreham) at TL741094, and junction 25 (Marks Tey) at TL917238, approximately 24km, or 15 miles. The proposed scheme involves widening the A12 to three lanes throughout. It includes safety improvements, including closing of existing at grade accesses, and reducing access to cyclists along the dual carriageway by providing an alternative route for walkers, cyclists and horse riders.

2.1.2 The proposed scheme would require new crossings of watercourses and potential improvements to existing culvert and bridge crossings. There are eight crossings of main rivers, six of which comprise existing crossings and two of which comprise new crossings on proposed offline sections of road. Three of the crossings would require minor realignments at the crossing points.

2.1.3 Land would be required both temporarily and permanently to construct, operate and maintain the proposed scheme. Permanent land-take requirements include the footprint of all the proposed highway infrastructure and associated earthworks, drainage works, and access roads, together with environmental mitigation areas such as landscape planting and biodiversity habitat creation.

2.1.4 The proposed scheme is classed as a Nationally Significant Infrastructure Project (NSIP) under the Planning Act (2008), triggering the need to apply for a Development Consent Order (DCO).

2.1.5 The selection criteria in the Infrastructure Planning Environmental Impact Assessment (EIA) Regulations 2017 have been used to screen the proposed scheme and identified the potential for significant effects. The proposed scheme is therefore required to be accompanied by an Environmental Statement (ES) to provide information on likely significant effects.

2.1.6 The Scoping Report (National Highways, 2020a), informed by an Extended Phase 1 Habitat Survey (National Highways, 2020b), identified several ecological receptors which have the potential to be impacted by construction or operation of the proposed scheme.

2.1.7 Ecological surveys are required to establish an accurate baseline against which the impacts of the proposed scheme could be assessed in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM) guidance for Ecological Impact Assessment (EcIA) (CIEEM, 2019) and DMRB LA 108 – Biodiversity (National Highways, 2020).

2.1.8 Scoping opinions received from statutory and non-statutory consultees during this process were taken into consideration (refer to Chapter 9 of the ES).

2.1.9 The Extended Phase 1 Habitat Survey confirmed the requirement to undertake the following suite of ecological surveys for the proposed scheme as follows:

- Botanical surveys of potential UK Biodiversity Action Plan (BAP) priority habitats

- Hedgerow
- Freshwater macro-invertebrates
- Freshwater fish
- Freshwater macrophytes
- White-clawed crayfish
- River habitat survey
- Pond habitat survey
- Terrestrial invertebrates
- Birds (breeding and wintering)
- Barn owls
- Bats (bat activity, bat roost potential, and roost characterisation surveys)
- Dormice
- Water vole
- Otter
- Badger

2.2 Purpose of the report

2.2.1 This report is an appendix of the A12 Chelmsford to A120 widening scheme ES. It presents the results of the terrestrial invertebrate surveys undertaken by Jacobs in 2020.

2.2.2 An evaluation of the status of terrestrial invertebrates associated with the proposed schemed has been conducted which is based on a desk-based review of records and the field surveys results.

2.2.3 The report presents the policy and legislative context within which the EIA is carried out. Likely significant effects on, and mitigation for terrestrial invertebrates, are considered in Chapter 9 of the ES.

2.3 Survey objectives

2.3.1 The key objectives of this survey were to:

- determine the presence or likely absence of protected/notable terrestrial invertebrates within the study area
- identify protected/notable terrestrial invertebrate distribution and status in the study area

- identify habitats of importance to protected/notable terrestrial invertebrates within the study area
- provide an evaluation for protected/notable terrestrial invertebrate populations in the study area
- inform the assessment of potential impacts on protected/notable terrestrial invertebrates associated with the proposed scheme (as detailed within the ES)
- provide sufficient field data for the development of appropriate mitigation if necessary (as detailed in the ES).

3 Terrestrial invertebrate ecology

3.1.1 There are almost thirty thousand species of invertebrates in Britain, excluding microscopic invertebrate groups (Drake *et al.* 2007).

3.1.2 Invertebrates are useful indicators of the surrounding environmental conditions. As this is becoming more widely recognised, terrestrial invertebrates are increasingly being considered in conservation. As part of this, Pantheon is now a widely used database tool to analyse invertebrate sample data. Pantheon has been developed by Natural England and the Centre for Ecology and Hydrology. The information gained by the analysis can be used to determine site quality by revealing whether a species list is indicative of good quality habitat (Webb *et al.* 2018)

3.1.3 Most British terrestrial invertebrates have annual life cycles with a marked seasonality as adults. Different species are therefore detectable at different times of the year. Many terrestrial invertebrates have two or more generations in a year and, for most terrestrial invertebrates, suitable conditions for breeding must persist each and every year to ensure their survival.

3.1.4 Invertebrate life cycles can be complex with each stage of the life cycle demanding a different habitat requirement. This renders many invertebrates particularly sensitive to ecological change. Such habitats often comprise 'microhabitats' which may be seemingly insignificant within a site such as a log or grass tussock. Sites which can satisfy a range of different habitat requirements, such as open mosaic habitats on previously developed land, can be extremely valuable to some invertebrate populations (Maddock, 2008).

3.1.5 Invertebrates are cold-blooded so depend on external heat sources to survive. Habitat features which support their need for warm, sunny conditions are often essential to some species. Such habitat features can include south-facing slopes and bare ground which can act as important heat sinks.

3.1.6 Many invertebrates, particularly rarer ones, are highly specialised and have precise habitat requirements. Some, for example are monophagic (feeding only on one species of plant) or monolectic (collecting pollen from only one species of plant).

3.1.7 Although invertebrates can often be regarded as quick to colonise, many invertebrates have very limited powers of dispersal and can be flightless. Their small size makes them incapable of travelling long distances and they are often at the mercy of wind currents. Their chances of arriving at new suitable habitat is often slim. If a species has precise habitat requirements it is likely to have evolved to become relatively sedentary (Kirby, 2001).

3.1.8 Notable species in the context of this report are those which do not fall under the Habitats Regulations, and Wildlife & Countryside Act 1981 (as amended). Instead, they fall under the IUCN Red List and GB Rarity Status Categories.

4 Legislation and policy

4.1 Legislation

4.1.1 Certain terrestrial invertebrate species are protected either under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), Schedule 2 of the Conservation of Habitats and Species Regulations 2017, or Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006.

4.1.2 Under the Wildlife and Countryside Act 1981 (as amended), it is an offence to intentionally kill, injure or take certain invertebrate species and/or possess or control them (alive or dead). It is an offence to intentionally or recklessly damage or destroy a structure or place used for shelter or protection, disturb them in a place used for shelter or protection and/or obstruct access to a place used for shelter or protection.

4.1.3 There are three invertebrate species that are considered European Protected Species (EPS). These species include large blue butterflies, Fisher's estuarine moths and little ramshorn whirlpool snail. If these species are found on sites, the site is likely to be designated as a Site of Special Scientific Interest (SSSI) or a Special Area of Conservation (SAC).

4.2 Priority species

4.2.1 The Natural Environment and Rural Communities Act 2006 (NERC) places a responsibility on local authorities and government departments to consider the purposes of conserving biodiversity in a manner consistent with their normal duties, such as policy and decision-making. This Act ties together wildlife legislation and planning policies.

4.2.2 Section 40 of the Act concerns biodiversity and states: "Every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity."

4.2.3 Section 41 of NERC states that "The Secretary of State must, as respects England, publish a list of the living organisms and types of habitat which in the Secretary of State's opinion are of principal importance for the purpose of conserving biodiversity". Many terrestrial invertebrate species are categorised as 'Species of Principal Importance' under the NERC Act. The list of species can be downloaded from the Natural England website at: http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx.

4.2.4 The Act stresses that "it is important that public authorities seek not only to protect important habitats and species, but actively seek opportunities to enhance biodiversity through development proposals, where appropriate. Incorporating enhancement opportunities into projects may help applicants to achieve planning permission."

4.2.5 A full list of UK Invertebrate Species protected by the Habitats Regulations, Wildlife and Countryside Act and NERC can be found at: http://jncc.defra.gov.uk/page-3408.

4.3 IUCN Red List

4.3.1 Established in 1964, the International Union for Conservation of Nature's Red List of Threatened Species is the world's most comprehensive information source on the global extinction risk status of animal, fungus and plant species.

Extinct (EX)

4.3.2 A taxon is Extinct when there is no reasonable doubt that the last individual has died. Extensive surveys in the taxon's known and/or expected habitat have failed to record an individual.

Extinct in the Wild (EW)

4.3.3 A taxon is Extinct in the Wild when it is known to only survive in cultivation, captivity or as a naturalised population/s well outside its past range. A taxon is Extinct in the Wild when extensive surveys in the taxon's known and / or expected habitat have failed to record an individual.

Critically Endangered (CR)

4.3.4 A taxon is Critically Endangered when it is considered to be facing an extremely high risk of Extinction in the Wild. The taxon must meet any of the following criteria:

- Reduction in population size based on any of the following:
  - population size reduction of ≥90% over the last 10 years of three generations, whichever is the longer, where the causes are clearly reversible, understood and ceased.
  - population size reduction ≥80% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may NOT be reversible, understood or ceased.
  - projected population size reduction ≥80% to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years).
  - observed or projected population size reduction ≥80% over any 10 year or three generation period, whichever is the longer (up to a maximum of 100 years in the future). The time period must include the past and future and the reduction or its causes may not be reversible, understood or ceased.
- Extent of occurrence is estimated to be less than 100 km2 or area of occupancy is estimated to be less than 10 km2 and indicates at least two of: severe fragmentation; continuing decline (observed or projected); and/or, extreme fluctuations.
- Population size is estimated to be fewer than 250 mature individuals and either:

- an estimated decline of at least 25% within three years or one generation whichever is the longer (up to a maximum of 100 years in the future).
- a continuing decline observed or projected with no subpopulation estimated to contain more than 50 mature individuals or at least 90% of mature individuals are in one subpopulation.

- Population size estimated to be fewer than 50 mature individuals.
- Probability of Extinction in the Wild is at least 50% within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years).

Endangered (EN)

4.3.5 A taxon is Endangered when it is considered to be facing a very high risk of Extinction in the Wild. The taxon must meet any of the following criteria:

- Reduction in population size based on any of the following:
  - population size reduction of ≥70% over the last 10 years of three generations, whichever is the longer, where the causes are clearly reversible, understood and ceased.
  - population size reduction ≥50% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may NOT be reversible, understood or ceased.
  - projected population size reduction ≥50% to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years).
  - observed or projected population size reduction ≥50% over any 10 year or three generation period, whichever is the longer (up to a maximum of 100 years in the future). The time period must include the past and future and the reduction or its causes may not be reversible, understood or ceased.
- Extent of occurrence is estimated to be less than 5000 km2 or area of occupancy is estimated to be less than 500 km2 and indicates at least two of: severe fragmentation; continuing decline (observed or projected); and/or, extreme fluctuations.
- Population size is estimated to be fewer than 2500 mature individuals and either:
  - an estimated decline of at least 20% within five years or two generations whichever is the longer (up to a maximum of 100 years in the future); or
  - a continuing decline observed or projected with no subpopulation estimated to contain more than 250 mature individuals or at least 95% of mature individuals are in one subpopulation.

- Population size estimated to be fewer than 250 mature individuals.
- Probability of extinction in the wild is at least 20% within the next 20 years or five generations, whichever is the longer (up to a maximum of 100 years).

Vulnerable (VU)

4.3.6 A taxon is Vulnerable when it is considered to be facing a high risk of Extinction in the Wild. The taxon must meet any of the following criteria:

- Reduction in population size based on any of the following:
  - population size reduction of ≥50% over the last 10 years of three generations, whichever is the longer, where the causes are clearly reversible, understood and ceased.
  - population size reduction ≥30% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may NOT be reversible, understood or ceased.
  - projected population size reduction ≥30% to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years).
  - observed or projected population size reduction ≥30% over any 10 year or three generation period, whichever is the longer (up to a maximum of 100 years in the future). The time period must include the past and future and the reduction or its causes may not be reversible, understood or ceased.
- Extent of occurrence is estimated to be less than 20 000 km2 or area of occupancy is estimated to be less than 2000 km2 and indicates at least two of: severe fragmentation; continuing decline (observed or projected); and/or, extreme fluctuations.
- Population size is estimated to be fewer than 10 000 mature individuals and either:
  - an estimated decline of at least 10% within 10 years or three generations whichever is the longer (up to a maximum of 100 years in the future).
  - A continuing decline observed or projected with no subpopulation estimated to contain more than 1000 mature individuals or 100% of mature individuals are in one subpopulation.
- Population size estimated to be fewer than 1000 mature individuals and with a very restricted area of occupancy or number of locations.
- Probability of extinction in the wild is at least 10% within the next 100 years.

Near Threatened (NT)

4.3.7 A taxon is Near Threatened when it has been evaluated against the Red List criteria but does not qualify for any of the above threatened categories but is close to qualifying for or is likely to qualify for a threatened category in the near future.

Least Concern (LC)

4.3.8 A taxon is Least Concern when it does not qualify for the above criteria. Widespread and abundant taxa are included in this category.

Data Deficient (DD)

4.3.9 A taxon is Data Deficient when there is inadequate information to make an assessment of its risk of extinction based on its distribution and/or population status.

Not Evaluated (NE)

4.3.10 A taxon is Not Evaluated having not yet been evaluated against the Red List criteria.

4.3.11 More details of all these criteria can be found in the IUCN Red List Categories and Criteria report (available at https://www.iucnredlist.org).

4.3.12 GB Rarity Status Categories

4.3.13 At the national level countries are permitted to refine the definitions for non-threatened categories and define categories of their own. Nationally Rare and Nationally Scarce categories are unique to Great Britain.

Nationally Rare

4.3.14 Taxa which occur in 15 or fewer hectads (10km squares) in Great Britain

Nationally Scarce

4.3.15 Taxa which are recorded in 16 – 100 hectads (10km squares) in Great Britain but are not included in one of the Red List Categories

Red Data Book

4.3.16 Taxa occurring in fewer than 16 hectads (10km squares) of the National Grid, divided as:

- endangered (Red Data Book 1), for species known from a single population or in continuous recent decline and now known from five or fewer 10km squares.
- vulnerable (Red Data Book 2), likely to become endangered (Red Data Book 1) if causal factors continue.
- rare (Red Data Book 3), species at risk but not qualifying as vulnerable.

4.3.17 Red Data Book K, species insufficiently known but likely to qualify at least as rare.

4.4 National planning policy framework

4.4.1 The National Networks National Policy Statement (NNNPS) sets out the Government's policies to deliver the development of NSIP on the national road and rail networks in England. The Secretary of State uses the NNNPS as the primary basis for making decisions on DCO applications.

4.4.2 Paragraph 5.22 of the NNNPS states that the applicant's assessment should describe any likely significant effects on internationally, nationally and locally designated sites of ecological conservation importance; protected species; habitats (including irreplaceable habitats such as ancient woodland and veteran trees); and other species identified as being of principal importance for the conservation of biodiversity. The surveys described in this report will inform the assessment of significant effects within the ES.

4.4.3 In addition to the national policy set out in the NNNPS, the proposed scheme has had regard to relevant legislation and local plans and policy.

5 Methodology

5.1 Desk study

5.1.1 A desk study was undertaken to obtain information pertaining to protected and notable terrestrial invertebrates in the study area and surrounding landscape.

5.1.2 Records of protected and notable terrestrial invertebrates were requested within 2km of the study area. The following organisations were contacted to provide desk study records:

- Essex Wildlife Trust Biological Records Centre (EWTR) (2020)
- Essex Field Club (EFC) (2020)

Limitations

5.1.3 Although the data provided by the consultees is the most complete set of species data available, the absence of records should not be taken as an indication of absence of species.

5.1.4 Biological records centre data for terrestrial invertebrates is often lacking and must be used in combination with habitat data when scoping in areas for survey and considering terrestrial invertebrate distributions. Areas with terrestrial invertebrate potential were identified from desk study data, habitat data and scoped in from other survey disciplines if potential habitat/invertebrates of interest were identified during field surveys. The lack of desk study data was not considered to be a limiting factor in the validity of the survey data.

5.2 Field study

5.2.1 The terrestrial invertebrate surveys were carried out in 2020 between 08:00 and 17:00 during the weeks commencing 25 May, 15 June, 13 July, 10 August, and 07 September. All surveys were led by Principal Ecologist, and invertebrate specialist, Catherine Burton. Where identification in the field was not possible, invertebrate samples were collected and sent for identification by experienced entomologists, Tristan Bantock and Marcel Ashby.

5.2.2 The requirement for detailed terrestrial invertebrate surveys was based on an evaluation of habitats within the area to be affected by works and an additional 100m buffer. A greater buffer distance was considered, where appropriate, due to habitat connectivity. Such scoping was based on:

- interpretation of aerial photography to identify potential suitable habitats for breeding, or that may be important for maintenance of at least one part of an invertebrate's life cycle (eg. foraging habitat, overwintering habitat for eggs/larvae etc.)
- screening of sites using expert opinion

5.2.3 Table A.1 in Annex A summarises the locations where surveys for terrestrial invertebrates were undertaken.

5.2.4 The sampling methods for each habitat compartment followed those proposed by Drake *et al.* (2007) and included spot searching, sweep netting, beating, and hand searching. Each survey area was initially subject to a visual appraisal with one or more sampling areas selected for direct survey. The number of sampling areas was decided according to the size of the compartment, variety of habitats, and the likely invertebrate assemblages present.

5.2.5 All samples were timed to ensure that analysis by Natural England's Pantheon system could be undertaken if required, as outlined in Drake *et al.* (2007). The Pantheon system is used to allocate species to habitat types and Specific Assemblage Types (SATs), and to allow a standardised comparison of the habitats of importance at sites.

5.2.6 Spot searching, beating, and hand searching were each undertaken for 30 minutes within each sampling area. Sweep-netting was undertaken for 20 minutes within each sampling area.

5.2.7 Site significance was assessed using provisional criteria for site assessment based on the invertebrate fauna as defined by Colin Plant Associates (2016). This is in line with Natural England's Invertebrate Standard Advice for Essex (2014).

Limitations

5.2.8 Standard survey methodology was followed for all surveys undertaken. Surveys were generally carried out on sunny, clear days with light wind. Two surveys were partially undertaken in sub-optimal conditions. The following two surveys were subject to brief rain showers:

- 18/06/2020: Brockwell Meadows overnight showers prevented sweep netting in exposed grassland areas in the morning. Despite this the second highest count of records for the site was obtained that day.
- 11/08/2020: West of Hatfield Peverel was subject to a brief shower at 08:00. Conditions were humid and so the survey was delayed until rain had stopped. Species record count for the site was the lowest on this day and therefore the shower could have been a limiting factor. However, record counts for the remainder of the surveys at this site were high and this site had the highest total species records of all the sites.

5.2.9 Weather was not considered to be a limiting factor to the overall study results. The data collected during these two surveys was a good representation of the species present. An objective measure of site value could be determined from these results which is deemed sufficient for the purposes of the assessment.

5.2.10 One area could not be accessed due to lack of landowner permission. This was a portion of woodland between Whetmead LNR and Little Braxted Fishing Lakes. A good proportion and representation of this woodland was accessible at both Whetmead LNR and Little Braxted Fishing Lakes. The woodland species found at these sites is deemed to be representative of the larger woodland area due to its similar woodland composition (both in terms of species and age structure).

5.2.11 Spring invertebrate surveys could not be undertaken due to the COVID-19 pandemic. This limitation impacted the recording of invertebrates limited to a spring survey window. All sites were subject to the same limitation and therefore in the context of determining an objective measure of site value, the representation of species that were recorded is deemed sufficient for the purposes of the assessment.

5.2.12 The results within this report reflect the condition of survey areas at the time of survey. Many terrestrial invertebrate species have limited abilities for dispersal (see Section 3: Terrestrial invertebrate ecology), however some invertebrates can disperse large distances overland to colonise new aquatic and terrestrial habitats. Colonisation of new areas is therefore possible within a relatively short timescale.

5.2.13 If the construction of the proposed development is delayed for an extended period, the survey results would be less reliable. The surveys may need to be repeated to provide an up-to-date assessment.

5.2.14 The findings of this report represent the professional opinion of qualified ecologists and do not constitute professional legal advice. The client may wish to seek professional legal interpretation of the relevant wildlife legislation cited in this document.

5.2.15 This report should be read in full, and excerpts may not be representative of the findings.

5.2.16 This report has been prepared exclusively for Jacobs' client and no liability is accepted for any use or reliance on the report by third parties.

6 Results

6.1 Desk study

6.1.1 Protected/notable terrestrial invertebrate data were available from nine locations within 2km of the proposed scheme (see Table 6.1). A full list of the protected/notable terrestrial invertebrate records is included within Table A.2, Annex A.

6.1.2 Most records were received from EFC but not in time to inform the survey scoping. This is not regarded as a limitation as subsequent examination of the records showed that most records received from within the field study area were located within or proximity to sites scoped in for survey.

6.1.3 Wickham Bishops returned the most protected/notable terrestrial invertebrate records and contained an assemblage mainly associated with woodland. The complex of woodlands at this location (Sparkey Wood, Mope Wood, and Chantry Wood) are within 1km of woodland habitat at the nearest survey locations of Whetmead Local Nature Reserve (LNR) and Little Braxted Fishing Lake.

6.1.4 There is some mature woodland connectivity between the record location and survey location, although the connectivity is separated in places by arable fields and young plantation woodlands. A similar assemblage of invertebrates might be expected within the two survey areas.

6.1.5 Terrestrial invertebrate records for Copford and Hatfield Place were made during scoping visits. The areas surveyed were deemed to have limited potential for terrestrial invertebrates and therefore not scoped in for full survey.

Table 6.1 Summary of desk study and incidental protected and notable terrestrial invertebrate records within 2km of the proposed scheme

Location	Grid reference	Distance from scheme (nearest point) km	Protected/notable species	Associated habitats
Boreham	TL760119	1.2	Butterfly (1 species)	Short sward and bare ground
Coggeshall Hamlet	TL863205	1.5	Bees (2 species)	Tall sward and scrub; short sward and bare ground
Copford (see Section 6.1.5)	TL931243	0.2	Beetles (3 species) True fly (1 species) Ant (1 species)	Woodland (including decaying wood); tall sward and scrub
Eight Ash Green	TL951247	1.5	Butterfly (1 species)	Tree-associated

Location	Grid reference	Distance from scheme (nearest point) km	Protected/notable species	Associated habitats
Hatfield Place (see Section 6.1.5)	TL783114	0.1	True bug (1 species) Bee (1 species)	Open habitats; short sward and bare ground
Marks Tey	TL910244	0.8	Bee (1 species)	Tall sward and scrub
Whetmead LNR	TL830138	0.1	True fly (1 species)	Tall sward and scrub
Wickham Bishops	TL8313; TL837120	0.6	Spiders (3 species) Beetle (1 species) True flies (3 species) Ant (1 species) Butterfly (1 species)	Woodland (including decaying wood and shaded woodland floor); tall sward and scrub
Witham	TL823162	0.9	Beetles (2 species)	Decaying wood; tall sward and scrub

6.2 Field study

Brockwell Meadows (TL868187)

6.2.1 Brockwell Meadows is a 4.3ha LNR located at Kelvedon, Essex. It is located approximately 300m from the proposed scheme. The River Blackwater runs along the eastern boundary of the site, extending northwards. A tributary to the river, Domsey Brook, runs adjacent to the wooded extent of the site and extends eastwards crossing the proposed scheme north of Inworth Road (B1023).

6.2.2 The substrate of the site is composed of riverine clay, floodplain sands, and gravel (British Geological Survey, 2021). The site is directly hydrologically connected to Prested Hall (see Prested Hall) through Domsey Brook.

6.2.3 Survey effort was concentrated within the eastern section of the site on a semi-improved grassland meadow within the reserve, and along the margin of Domsey Brook. The remainder of the reserve comprised narrow well-used footpaths adjacent to the river edge.

Habitat

6.2.4 Within Brockwell Meadows LNR, semi-improved grassland meadow lay to the east of an area of improved (amenity) grassland. Oak *Quercus* spp., hazel *Corylus avellana*, willow *Salix* spp. and privet *Ligustrum ovalifolium* surrounded both areas (Photo 6.1).

6.2.5 A plantation of cricket bat willows *Salix alba* var. *caerulea* was present on the eastern side of the River Blackwater, facing Domsey Brook. The plantation was separated by Worlds End Lane further east, and thereafter, the river corridor consisted of cricket bat willows surrounded by abundant comfrey *Symphytum* sp. (Photo 6.2). Dead wood, predominantly from previously harvested willow stumps, was frequent throughout the area.

6.2.6 The woodland surrounding Domsey brook narrowed and transitioned from plantation to heavily shaded semi-natural broadleaved woodland. Dense scrub was present throughout the woodland floor. Arable fields surrounded the brook on both sides, of note was a crop of borage *Borago officinalis* to the north, adjacent to Worlds End Lane. Along the river's edge hairy willowherb *Epilobium hirsutum* and common reed *Phragmites australis* were abundant.

6.2.7 Habitat quality declined further along Domsey Brook with heavily shaded woodland which had been opened intermittently for mountain bike trails. Arable margins were present on both sides of the brook (Photo 6.3).

Photo 6.1 Semi-improved grassland meadow within Brockwell Meadows Local Nature Reserve

Photo 6.2 Habitat corridor along River Blackwater

Photo 6.3 Arable margins along Domsey Brook

Terrestrial invertebrates

6.2.8 In total, 690 samples were recorded/collected consisting of 320 terrestrial invertebrate species.

6.2.9 The technique of sweeping was the most productive method employed with 380 (55%) samples collected composed primarily of beetles (Coleoptera). Spot-searching was the second most effective survey method with 156 (22%) samples recorded comprising true flies (Diptera), butterflies and moths (Lepidoptera), and sawflies, bees, wasps, and ants (Hymenoptera). Beating captured a further 103 samples (15%) composed primarily of Diptera, and ground searching 51 samples (7%) mainly composed of Coleoptera.

6.2.10 Of the 320 species identified by this survey, 13 were considered as species of conservation importance, namely spiders *Ballus chalybeius* and *Rugathodes instabilis*, weevils (Coleoptera) *Protapion filirostre*, *Liparus coronatus*, and *Polydrusus formosus*, leaf beetle *Longitarsus lycopi*, flea beetle *Podagrica fuscicornis*, tumbling flower beetle *Mordellistena neuwaldeggiana*, rove beetle *Sepedophilus bipunctatus*, plant bugs (Hemiptera) *Deraeocoris olivaceus*, *Lygus pratensis* and *Macrosteles sardus*, and the dragonfly (Odonata) ruddy darter *Sympetrum sanguineum*.

Pantheon results

6.2.11 Pantheon covered 293 of the 320 species identified from this survey area, with 27 species not included within the Pantheon conservation status database. Within that subset, three broad biotopes were represented. These broad biotopes could be subdivided into habitat types (Table 6.2). Only habitat types which contained enough species for accurate assessment are included and some species can be present in multiple habitat categories hence the disparity in total species numbers between habitats and biotopes.

6.2.12 The assemblage of ‘open habitat’ species was best represented at Brockwell Meadows, with 180 associated species. Open habitat could be further subdivided in to ‘tall sward and scrub’ (156 species) and ‘short sward and bare ground’ (21 species).

6.2.13 This was followed by ‘tree-associated’ assemblages (65 species), which could be further divided in to ‘arboreal’ (42 species), ‘decaying wood’ (13 species)*, ‘shaded woodland floor’ (10 species)* and ‘wet woodland’ (1 species)* habitat types.

6.2.14 The full list of habitats identified from the survey area species list (in order of representative number of species) is as follows: tall sward and scrub, arboreal, short sward and bare ground, decaying wood, peatland[1], shaded woodland floor, marshland, running water, lake, and wet woodland

6.2.15 Six species were associated with ‘coarse woody debris’ ie. fallen dead trees and large branches lodged in water courses and saturated with water. The species include beetles *Cyphon coarctatus*, *Atrecus affinis*, and *Stenus clavicornis*; craneflies *Limonia phragmtidis* and *Tipula oleracea;* and the banded demoiselle damselfly *Calopteryx splendens*.

[1] In this context, wetlands where disturbance is limited such as mires and seepages

Table 6.2 Broad biotopes and habitats within Brockwell Meadows

Broad biotope (no. of species)	Broad biotope SQI	Species with Conservation Status	Conservation Status	Habitats with a species quality score (no. of species)	Habitat SQI
Open habitats (180)	107	5	4 Nationally scarce 1 Rare (RDB3)	Tall sward and scrub (156)	104
				Short sward and bare ground (21)	130
				Undefined (4)	N/A
Tree-associated (65)	124	5	5 Nationally scarce	Arboreal (42)	122
				Decaying wood (13)	150*
				Shaded woodland floor (10)	100*
				Wet woodland (1)	100*
Wetland (22)	114	3	1 Nationally scarce 1 New to Britain 1 Essex Red List	Peatland (11)[2]	127*
				Marshland (5)	100*
				Running water (4)	100*
				Lake (1)	100*
				Wet woodland (1)	100*

SQI = Species Quality Index

* Calculated from less than 15 species so may not be reliable.

6.2.16 Five species were ‘freshwater species tolerant of mildly brackish water’. These were dragonflies and damselflies (Odonata)*:* the brown hawker dragonfly *Aeshna grandis*, banded demoiselle damselfly, large-red damselfly *Pyrrhosoma nymphula*, emerald damselfly *Lestes sponsa*, and ruddy darter dragonfly.

6.2.17 Two species were associated with ‘seepages’: the cranefly *Tipula lateralis*, and the hoverfly *Chrysogaster solstitialis*.

6.2.18 The number of species representative of each assemblage or habitat is not necessarily an indicator of higher conservation importance. This is instead indicated by the Species Quality Index (SQI).

6.2.19 The ‘tree-associated’ broad biotope for this survey area had the highest reliable SQI, followed by the ‘wetland’ and ‘open habitats’ broad biotopes.

6.2.20 The ‘short sward and bare ground’ habitat for this survey area had the highest reliable SQI, followed by the “arboreal” habitat, and “tall sward and scrub” habitat.

[2] In this context, wetlands where disturbance is limited such as mires and seepages

6.2.21 Pantheon identified eight SATs from the site species list: rich flower resource, bark and sapwood decay, scrub edge, open short sward, scrub-heath and moorland, reed-fen and pools, fungal fruiting bodies, and heartwood decay. None were found to be in favourable condition.

6.2.22 A table of species of conservation importance along with their associated habitat types can be found below (see Table 6.3).

6.2.23 The leafhopper *Macrosteles sardus* is new to Britain so is not yet included within the Pantheon database. The species is known to be associated with wetland habitats.

Protected and notable species recorded

Ballus chalybeius **(Nationally scarce – least concern)**

Pantheon habitat association: tree-associated/arboreal

6.2.24 *Ballus chalybeius* is a locally distributed jumping spider, with most UK records being from the south-east including the Thames Gateway area. It is a distinctively marked spider associated with broadleaved bushes and trees. Oaks are particularly favoured by this species (Roberts, 1996).

Rugathodes instabilis **(Nationally scarce – least concern)**

6.2.25 The spider *Rugathodes instabilis* is widespread in East Anglia and in the south-east of England. It is more locally distributed elsewhere in southern Britain. This species builds its webs on low vegetation in wetland habitats including saltmarsh, reed fen, sedge marsh and carr woodland. Both sexes are mature from early to mid-summer with females recorded into the autumn. There has been no recent decline in this species. Threats to this species include drainage and degradation of wetland habitats (Roberts, 1996).

Table 6.3 Species of conservation importance and their associated habitat within Brockwell Meadows

Habitat	Species of conservation importance	
Open habitats	True bug (Hemiptera)	*Lygus pratensis*[3]
Short sward and bare ground	Beetle (Coleoptera)	*Protapion filirostre*
		Longitarsus lycopi
Tall sward and scrub	Beetle (Coleoptera)	*Podagrica fuscicornis*
		Liparus coronatus
Arboreal	Spider (Araneae)	*Ballus chalybeius*
	Beetle (Coleoptera)	*Polydrusus formosus*
	True bug (Hemiptera)	*Deraeocoris olivaceus*
Decaying wood	Beetle (Coleoptera)	*Mordellistena neuwaldeggiana*
		Sepedophilus bipunctatus
Peatland[4]	Spider (Araneae)	*Rugathodes instabilis*
Wetland	True bug (Hemiptera)	*Macrosteles sardus*
Marshland	Dragonfly (Odonata)	Ruddy darter *Sympetrum striolatum*

[3] *Lygus pratensis* is associated with the 'Open habitats' broad biotope but its habitat association is not further refined within Pantheon.

[4] In this context, wetlands where disturbance is limited such as mires and seepages

***Protapion filirostre* (Nationally scarce; Essex Red List)**

Pantheon habitat association: open habitats/short sward and bare ground

6.2.26 *Protapion filirostre* is a very small weevil often found in dry grassland and brownfield sites. In continental Europe it is found on lucerne and medicks *Medicago* spp. with larvae developing in the flowerheads. This species is local in central and southern England (Duff, 2016).

***Liparus coronatus* (Nationally scarce; Essex Red List)**

Pantheon habitat association: open habitats/tall sward and scrub

6.2.27 *Liparus coronatus* is a large weevil associated with various umbellifers such as cow parsley *Anthriscus sylvestris* and hogweed *Heracleum spp*. The larvae feed in the rhizomes and are generally found around their roots. It is often found on calcareous soils, is very local, and generally scarce (Duff, 2016)

***Polydrusus formosus* (Nationally scarce[5])**

Pantheon habitat association: tree-associated/arboreal

6.2.28 *Polydrusus formosus* is a species of leaf weevil which is typically associated with broadleaved woodland rides, clearings, and woodland edge habitats. Adult beetles are herbivores and are found on a range of broadleaved trees. The larvae develop in the soil and feed on plant roots.

***Longitarsus lycopi* (Nationally scarce – least concern)**

Pantheon habitat association: open habitats/short sward and bare ground

6.2.29 *Longitarsus lycopi* is a small flea beetle. Its larvae develop in the roots of its host plants (various *Lamiaceae*). This species is local in central and southern England (Duff, 2016).

***Podagrica fuscicornis* (Nationally scarce – least concern; Essex Red List)**

Pantheon habitat association: open habitats/tall sward and scrub

6.2.30 *Podagrica fuscicornis* is a flea beetle occurring in southern England and Wales in grassland, scrub, and disturbed ground. It is widespread in the East Thames Corridor and Colchester area. The beetle is associated with mallows *Malva* spp. and feeds on the leaves of the plant. Adults hibernate in leaf-debris or in the stems of the food plant. This species is local in south-east England (Duff, 2016)

***Mordellistena neuwaldeggiana* (Nationally scarce – least concern; Essex Red List)**

Pantheon habitat association: tree-associated/decaying wood

6.2.31 The beetle *Mordellistena neuwaldeggiana* is associated with woodland and pasture woodland habitats. In mainland Europe it is mainly associated with woodland edges. The larvae are thought to be associated with wood decay

[5] Whilst the beetle is still classified as Nationally scarce, a recent increase in records suggests that this is due revision (Duff, 2016).

habitat or plant stems, whilst adults can be found on the flowers of umbellifers such as common hogweed *Heracleum sphondylium*.

***Sepedophilus bipunctatus* (Nationally scarce; Essex Red List)**

Pantheon habitat association: tree-associated/decaying wood

6.2.32 *Sepedophilus bipunctatus* is a rove beetle found in decaying wood (James, 2018), under mildewy bark, and under mouldy leaves (Harde, 1998).

***Deraeocoris olivaceus* (Nationally scarce; Essex Red List)**

Pantheon habitat association: tree-associated/arboreal

6.2.33 *Deraeocoris olivaceus* is a large red plant bug found on hawthorn *Crataegus monogyna*. It was first recorded in 1951, when it was found at a site in Surrey. It is unclear whether it had been overlooked prior to this or was a recent arrival. It has since become more widespread but remains scarce with a patchy distribution across southern England. The bug has a strong preference for mature heavily fruiting hawthorns growing in open situations.

***Lygus pratensis* (Rare – Red Data Book 3 (RDB3)[6])**

Pantheon habitat association: open habitats

6.2.34 *Lygus pratensis* is a plant bug which has recently undergone a dramatic range expansion.

***Macrosteles sardus* (New to Britain)**

Pantheon habitat association: wetland

6.2.35 The leafhopper *Macrosteles sardus* is a very recent addition to the British fauna, unrecorded before 2020. It has been found at several widely separated sites, suggesting it has become quickly established. It is undoubtedly a wetland species and hairy willowherb is a suspected host, (Pers. Comm. Dr Tristan Bantock, entomologist and Hemiptera specialist).

Ruddy darter *Sympetrum sanguineum* (Essex Red List)

Pantheon habitat association: wetland/marshland

6.2.36 The ruddy darter is slightly smaller than the common darter *Sympetrum striolatum* with a 'waisted' abdomen and club-shaped tip. Males are bright red. Females are very similar to female common darters but have all black legs. It favours shallow water with lots of emergent vegetation. Adults are on the wing from July to October. Away from the water both sexes usually perch in a tree or bush facing out over open space where they can scan for prey. They will usually return to the same perch after chasing prey or seeing off a rival (Smallshire and Swash, 2014; Corbet and Brooks, 2008).

[6] It is now widespread throughout much of southern Britain and is much more common than its RDB3 status suggests. It is polyphagous, feeding on a variety of herbaceous plants.

Little Braxted Fishing Lakes (TL831149)

6.2.37 Little Braxted Fishing Lakes includes Coleman's Fishing Lakes to the west of Little Braxted Lane, near Witham. It extends towards the woodland adjoining Whetmead LNR to the south.

6.2.38 The substrate of the site is composed of river terrace sand/gravel (British Geological Survey, 2021).

6.2.39 Survey effort was concentrated within semi-natural and plantation broadleaved woodland and adjacent fishery lake margins within 50m of the proposed scheme. Access to woodland south of the fisheries could not be afforded due to land access and safety restrictions.

Habitat

6.2.40 Plantation woodland of silver birch *Betula pendula* and oak was present within the northern centre of the site, grading to older semi-natural broadleaved woodland in the south (Photo 6.4). The older remnant woodland consisted of silver birch, beech *Fagus sylvatica*, oak, elder *Sambucus nigra*, white willow *Salix alba*, and ash *Fraxinus excelsior*. The marshy understorey was dense with bramble *Rubus fruticosus* agg., ivy *Hedera helix*, common nettle *Urtica dioica*, marsh sow thistle *Sonchus arvensis*, and greater burdock *Arctium lappa* (Photo 6.5). Fishery lakes lay to the east of the site surrounded by cricket bat willow plantations and abundant comfrey *Symphytum* spp. margins. Natural fallen dead wood, as well as felled log piles, were frequent in this area.

6.2.41 To the west of the fishing lakes, and adjacent to the proposed scheme, a terrace of sandy slopes was present. Large areas of bare, sandy ground were present amongst introduced shrubs and buddleia *Buddleia davidsonii* (Photo 6.6).

Terrestrial invertebrates

6.2.42 In total, 207 samples were recorded/collected consisting of 144 species. The technique of spot-searching was the most productive method employed with 83 (40%) samples recorded composed primarily of bees, wasps and ants (Hymenoptera). Beating was the second most effective survey method with 54 (27%) samples collected mainly comprising beetles (Coleoptera). Sweeping captured a further 46 samples (22%) composed primarily of Coleoptera and true bugs (Hemiptera), and ground searching 24 samples (12%) composed mainly of Coleoptera and Hymenoptera.

6.2.43 Of the 144 species identified by this survey, four were considered here as species of conservation importance, namely the false flower beetle, *Anaspis thoracica*, true bug *Lygus pratensis*, and the bees: lobe-spurred furrow bee *Lasioglossum pauxillum*, and dark blood bee *Sphecodes niger*.

Photo 6.4 Plantation oak and silver birch woodland grading into semi-natural broadleaved woodlan

Photo 6.5 Semi-natural broadleaved woodland with dense scrub understory

Photo 6.6 Fishing lake with sandy terraced slopes in the background

Pantheon results

6.2.44 Pantheon covered 130 of the 144 species identified from this survey area, with 14 species not included within the Pantheon conservation status database. Within that subset, four broad biotopes were represented. These broad biotopes could be subdivided into habitat types (Table 6.4). Only habitat types which contained enough species for accurate assessment are included and some species can be present in multiple habitat categories hence the disparity in total species numbers between habitats and biotopes.

6.2.45 The assemblage of 'open habitat' species was best represented at Little Braxted Fishing Lakes, with 73 associated species which could be further subdivided in to 'tall sward and scrub' (53 species) and 'short sward and bare ground' (17 species).

6.2.46 This was followed by 'tree-associated' assemblages (29 species), which could be further divided in to 'arboreal' (17 species), 'decaying wood' (7 species)*, "shaded woodland floor" (4 species)* and 'wet woodland' (1 species)* habitat types.

6.2.47 The full list of habitats identified from the survey area species list (in order of representative number of species) is as follows: tall sward and scrub, short sward and bare ground, arboreal, decaying wood, shaded woodland floor, marshland, peatland[2], wet woodland, running water, and lake.

6.2.48 Four species were 'freshwater species tolerant of only mildly brackish water'. These were dragonflies and damselflies (Odonata): the brown hawker dragonfly *Aeshna grandis*, common blue damselfly *Enallagma cyathigerum*, blue-tailed damselfly *Ischnura elegans*, and common darter.

6.2.49 One species of conservation importance was identified by Pantheon as having a soft rock cliff association namely the dark blood bee. Ivy bee *Colletes hederae* is not a species of conservation concern but is associated with soft rock cliffs and was present with a very large aggregation of nests (800+) at this site.

6.2.50 The number of species representative of each assemblage or habitat is not necessarily an indicator of higher conservation importance. This is instead indicated by the SQI.

6.2.51 The 'tree-associated' broad biotope for this survey area had the highest reliable SQI, followed by the 'open habitat' broad biotope.

6.2.52 The 'tall sward and scrub', 'short sward and bare ground', and 'arboreal' habitats for this survey area had the same reliable SQI score of 100.

6.2.53 Pantheon identified seven SATs from the site species list: rich flower resource, scrub edge, bark and sapwood decay, heartwood decay, bare sand and chalk, scrub-heath and moorland, and open short sward. None were found to be in favourable condition.

6.2.54 A table of species of conservation importance, along with their associated habitat types, can be found in Table 6.5.

Table 6.4 Broad biotopes and habitats within Little Braxted Fishing Lakes

Broad biotope (no. of species)	Broad biotope SQI	Species with Conservation Status	Conservation Status	Habitats with a species quality score (no. of species)	Habitat SQI
Open habitats (73)	100	3	1 Nationally scarce 2 RDB3 (1 also Essex Red List)	Tall sward and scrub (53)	100
				Short sward and bare ground (17)	100
Tree-associated (28)	111	1	1 Nationally scarce (also Essex Red List)	Arboreal (17)	100
				Decaying wood (7)	143*
				Shaded woodland floor (4)	100*
				Wet woodland (1)	100*
Wetland (9)	150*	0		Peatland[2] (4)	100*
				Marshland (4)	100*
				Running water (1)	100*
				Lake (1)	100*
Shaded woodland floor (1)	100*	0		Shaded woodland floor (4)	100*

SQI = Species Quality Index

* Calculated from less than 15 species so may not be reliable.

Table 6.5 Species of conservation importance and their associated habitat within Little Braxted Fishing Lakes

Habitat	Species of conservation importance	
Open habitats	True bug (Hemiptera)	*Lygus pratensis*
Short sward and bare ground	Bee (Hymenoptera)	Lobe-spurred furrow bee *Lasioglossum pauxillum*
		Dark blood bee *Sphecodes niger*
Decaying wood	Beetle (Coleoptera)	False flower beetle *Anaspis thoracica*

Protected and notable species recorded

***Anaspis thoracica* (Nationally scarce – least concern; Essex Red List)**

Pantheon habitat association: decaying wood

6.2.55 A small false flower beetle usually found on foliage but sometimes on blossom, in wooded areas and fens (Duff, 2020). Larvae develop among soft decaying xylem from a range of broadleaved trees. This species is widespread in northern, central, and south-eastern England.

***Lygus pratensis* (Rare – Red Data Book 3 (RDB3) [7])**

Pantheon habitat association: open habitats

6.2.56 See Brockwell Meadows for species account.

Ivy bee Colletes hederae (Not scarce or threatened but a very large aggregation of nests worthy of note, providing extensive pollinator services)

Habitat association: short sward and bare ground

6.2.57 A recent arrival in Britain, with the first confirmed records from Dorset in 2001. By 2016, the bee had spread across southern England and south Wales, northwards, and eastwards to colonise most of East Anglia, the Thames and Severn Valleys.

6.2.58 Nesting sites are found in sparsely vegetated banks and paths, on urban and suburban lawns and grassy areas, roadside verges, golf courses, and on soft rock cliffs and undercliffs. Consisting of one generation (univoltine) on the wing from late August/early September to late October, occasionally the beginning of November. This species was originally believed to be monolectic on ivy. Recent work has shown that bee collects pollen from a variety of plant species

[7] It is now widespread throughout much of southern Britain and is much more common than its RDB3 status suggests. It is polyphagous, feeding on a variety of herbaceous plants.

(polylectic) with strong preference for ivy. Nesting aggregations are often extensive, containing several thousand nests (Falk, 2015; Else and Roberts, 2019).

Lobe-spurred furrow bee *Lasioglossum pauxillum* (Nationally scarce[8])

Pantheon habitat association: short sward and bare ground

6.2.59 The lobe-spurred furrow bee is associated with a range of habitats including chalk grassland and open woodland. It nests in bare ground forming small to large nesting aggregations. The bee is polylectic, and feeds on a range of flowering herbs.

Dark blood bee *Sphecodes niger* (Rare – Red Data Book 3 (RDB3); Essex Red List)

Pantheon habitat association: short sward and bare ground

6.2.60 The dark blood bee is distributed from Devon to Kent and north to Buckinghamshire and Lincolnshire. Often found on calcareous grassland but known from soft-rock cliffs, heathland, and other disturbed situations on light and heavy soils. As this is a cleptoparasitic bee, it does not collect pollen. The host of this bee is possibly the brassy mining bee *Lasioglossum morio* (Falk, 2015; Allen, 2012).

Prested Hall (TL881196)

6.2.61 Prested Hall is a historic country house, now hotel, built in the fourteenth century in Feering, Essex, surrounded by 30ha of grounds, some landscaped.

6.2.62 The substrate of the site is composed of colluvium and glacial till which could be locally chalky (British Geological Survey, 2021). The site is directly hydrologically connected to Brockwell Meadows through Domsey Brook which runs along Prested Hall's southern margin (see Brockwell Meadows).

6.2.63 Survey effort was concentrated within the western parkland of the estate, which was not disturbed by the hotel estate or facilities.

Habitat

6.2.64 To the east of the estate, the grounds predominantly composed of hotel buildings, amenity grassland, car parks, and leisure facilities such as tennis courts. The parkland to the west was largely undisturbed semi-improved neutral grassland bordered by young plantation woodland, scattered and dense scrub, as well as a mature broadleaved woodland margin adjacent to surrounding arable fields (Photo 6.7).

6.2.65 Scattered mature parkland trees were present within the site's grassland including horse chestnut *Aesculus hippocastanum*, hazel, and beech.

[8] Formerly a rare species in the UK the lobe-spurred furrow bee has increased its UK range in recent years and has now been recorded over much of southern England. Its conservation status is likely to be revised (Falk, 2015; Else, 2005).

6.2.66 Young plantation oak woodland present in the southern part of the site was interspersed amongst older woodland remnants including mature ash, elder, and hawthorn (Photo 6.8).

6.2.67 Along the western border, the grassland bordered areas of scattered scrub predominantly composed of bramble and intermittent gorse *Ulex europaea* (Photo 6.9).

6.2.68 A boundary of Scots' pine (*Pinus sylvestris*) was present along the western boundary adjacent to a ditch and arable fields.

Photo 6.7 Semi-improved neutral grassland in the north-west of Prested Hall's grounds

Photo 6.8 Young plantation oak woodland

Photo 6.9 Areas of scattered and dense scrub at the interface of the western grassland/woodland margin

6.2.69 The grassland composed of cock's foot *Dactylis glomerata*, false oat grass *Arrhenatherum elatius*, tormentil *Potentilla erecta*, field forget-me-not *Myosotis arvensis*, bird's foot trefoil *Lotus corniculatus*, and common knapweed *Centaurea nigra*.

Terrestrial invertebrates

6.2.70 In total, 674 samples were recorded/collected consisting of 311 species. The technique of sweep netting was the most productive method employed with 289 (45%) samples recorded. Species composed primarily of beetles (Coleoptera) and true bugs (Hemiptera). Spot-searching was the second most effective survey method with 209 (31%) samples collected, mainly comprising beetles and butterflies and moths (Lepidoptera). Beating captured 164 samples (24%) composed primarily of beetles and true bugs. Ground searching captured 12 samples (2%) of spiders (Araneae), beetles, true bugs, beetles, and woodlice (Isopoda).

6.2.71 Of the 311 species identified by this survey, 14 were considered as species of conservation importance, namely the true bug *Lygus pratensis*, beetles: *Meligethes umbrosus*, *Rhinocyllus conicus*, *Involvulus cupreus*, and *Tanymecus palliatus*, spider wasp *Anoplius nigerrimus*, bees: lobe-spurred furrow bee *Lasioglossum pauxillum*, welted lesser mason bee *Hoplitis claviventris* and *Ceratina cyanea*, butterfly small heath *Coenonympha pamphilus*, true flies the hornet mimic hoverfly *Volucella zonaria* and band-eyed brown horsefly *Tabanus bromius*, spider *Phylloneta impressa*, and ant *Lasius brunneus*.

Pantheon results

6.2.72 Pantheon covered 288 of the 311 species identified from this survey area, with 23 species not included within the Pantheon conservation status database. Within that subset, four broad biotopes were represented. These broad biotopes could be subdivided into habitat types (Table 6.6). Only habitat types which contained enough species for accurate assessment are included and some species can be present in multiple habitat categories hence the disparity in total species numbers between habitats and biotopes.

6.2.73 The assemblage of 'open habitat' species was best represented at Prested Hall, with 181 associated species which could be further subdivided in to 'tall sward and scrub' (148 species) and 'short sward and bare ground' (32 species).

6.2.74 This was followed by 'tree-associated' assemblages (58 species), which could be further divided in to 'arboreal' (41 species), 'decaying wood' (12 species) and 'shaded woodland floor' (6 species). The representation of 'decaying wood' and 'shaded woodland floor. was calculated from less than 15 species and so may not be reliable.

Table 6.6 Broad biotopes and habitats within Prested Hall

Broad biotope (no. of species)	Broad biotope SQI	Species with Conservation Status	Conservation Status	Habitats with a species quality score (no. of species)	Habitat SQI
Open habitats (181)	107	11	4 Nationally scarce (2 also Essex Red List) 2 RDB3 (also Essex Red List) 4 Essex Red List (exclusively) 1 IUCN Near Threatened and NERC S41	Tall sward and scrub (148)	104
				Short sward and bare ground (32)	119
				Undefined (5)	N/A
Tree-associated (58)	110	2	2 Nationally scarce (1 also Essex Red List)	Arboreal (41)	107
				Decaying wood (13)	123*
				Shaded woodland floor (6)	100*
Wetland (24)	122	1	1 Essex Red List	Peatland[2] (11)	100*
				Marshland (12)	140*
				Running water (3)	100*
				Lake (1)	100*
Shaded woodland floor (1)	100*	0		Shaded woodland floor (6)	100*

SQI = Species Quality Index

* Calculated from less than 15 species so may not be reliable.

6.2.75 The full list of habitats identified from the survey area species list (in order of representative number of species) is as follows: tall sward and scrub, arboreal, short sward and bare ground, decaying wood, marshland, peatland[2], shaded woodland floor, running water, and lake.

6.2.76 The flower beetle *Phalacrus fimetarius* had a high affiliation with calcareous grassland. Five species had a medium association with calcareous grassland namely, the beetles *Rhinocyllus conicus*, *Meligethes umbrosus,* the true bug *Podops inuncta*, bee *Ceratina cyanea*, and ant *Myrmica sabuleti*.

6.2.77 The cranefly *Tipula oleracea* was associated with 'coarse woody debris' ie. fallen dead trees and large branches lodged in the water course and saturated with water.

6.2.78 Eight species were 'freshwater species tolerant of only mildly brackish water'. These were a mayfly (Ephemeroptera) *Cloen dipterum*, dragonflies and damselflies (Odonata): the brown hawker dragonfly, azure damselfly *Coenagrion puella*, common blue damselfly, blue-tailed damselfly, and common darter, and two caddis flies (Trichoptera) *Mystacides azurea* and mottled sedge *Glyphotaelius pellucidus.*

6.2.79 The number of species representative of each assemblage or habitat is not necessarily an indicator of higher conservation importance. This is instead indicated by the SQI.

6.2.80 The 'wetland' broad biotope for this survey area had the highest reliable SQI, followed by the 'tree-associated' and 'open habitats' broad biotopes.

6.2.81 The 'short sward and bare ground' habitat for this survey area had the highest reliable SQI, followed by the 'arboreal' habitat, and 'tall sward and scrub' habitat.

6.2.82 Pantheon identified eight SATs from the site species list: rich flower resource, scrub edge, bark and sapwood decay, open short sward, scrub-heath and moorland, bare sand and chalk, heartwood decay, and epiphyte fauna. None were found to be in favourable condition.

6.2.83 A table of species of conservation importance along with their associated habitat types can be found below (see Table 6.7).

Table 6.7 Species of conservation importance and their associated habitat within Prested Hall

Habitat	Species of conservation importance	
Open habitats	True bug (Hemiptera)	*Lygus pratensis*
	Beetle (Coleoptera)	*Meligethes umbrosus*[9]
Short sward and bare ground	Beetle (Coleoptera)	*Rhinocyllus conicus*

[9] *Meligethes umbrosus'* habitat not listed in Pantheon but inferred from known foodplant and moderate calcareous grassland affiliation.

Habitat	Species of conservation importance	
	Spider wasp (Hymenoptera)	*Anoplius nigerrimus*
	Bee (Hymenoptera)	Lobe-spurred furrow bee *Lasioglossum pauxillum*
	Butterfly (Lepidoptera)	Small heath *Coenonympha pamphilus*
	Hoverfly (Diptera)	Hornet mimic hoverfly *Volucella zonaria*
Tall sward and scrub	Beetle (Coleoptera)	*Tanymecus palliates*
	Spider (Araneae)	*Phylloneta impressa*
	Bee (Hymenoptera)	Welted lesser mason bee *Hoplitis claviventris*
		Blue carpenter bee *Ceratina cyanea*
Arboreal	Beetle (Coleoptera)	*Involvulus cupreus*
Decaying wood	Ant (Hymenoptera)	*Lasius brunneus*
Peatland[2]	True fly (Diptera)	Band-eyed brown horsefly *Tabanus bromius*

Protected and notable species recorded

Phylloneta impressa (Essex Red List)

Pantheon habitat association: tall sward and scrub

6.2.84 *Phylloneta impressa* is a spider typically found in open ground on gorse bushes and heather. It can be found on oak, blackthorn, nettles, and thistles. Adult males have been recorded between May and August, adult females between June and October. It constructs an inverted cup shaped web, which it covers with plant debris. Below its retreat the spider spins a typical Theridiidae tangle web. The spider is widespread in central southern England but becomes scattered or absent in parts of the west and north. It is very rare in some parts of the east, including Essex.

***Rhinocyllus conicus* (Nationally scarce)**

Pantheon habitat association: short sward and bare ground

6.2.85 A weevil which has been used as a biological pest control in the past, to help stop the spread of invasive thistles in America. This species proved to be so successful, that it is now no longer used as a biological pest control. The species can be found on thistles *Cirsium* spp. and *Carduus* spp. in open places. It is local in central and southern England but rapidly spreading in range (Duff, 2016).

***Tanymecus palliatus* (Nationally scarce; Essex Red List)**

Pantheon habitat association: tall sward and scrub

6.2.86 This beetle is widespread but very local and generally rare through Wales and southern and central England. The species is widely polyphagous and might be found in almost any situation; grassland and meadows, arable land, roadsides, disturbed land, dunes, heaths, allotments, parks, and gardens etc. This species feeds upon plants of a range of families, especially thistles *Carduus* spp. and *Cirsium* spp. and field bindweed *Convolvulus arvensis*.

6.2.87 Adults are present year-round, overwintering between 15cm and 50cm below the soil surface where hosts are abundant. They become active during March and April when the soil temperature increases. Larvae feed on roots and within the lower parts of stems and develop slowly; they feed until the autumn when they burrow down in the soil to overwinter. In the UK adults are active from April until September, they are flightless, and populations generally remain very local. Adults are usually sampled by general sweeping and during the day they usually hide among litter around the base of host plants or under low foliage (Beetles, *Tanymecus palliatus* (Fabricius, 1787)).

***Meligethes umbrosus* (Nationally scarce; Essex Red List)**

Pantheon habitat association: short sward and bare ground

6.2.88 *Meligethes umbrosus* is a pollen beetle which feeds as both larvae and adult on buds and flower. In continental Europe it has been found to be polyphagous, on self-heals *Prunella* spp. (Audisio et al. 2000).

***Involvulus cupreus* (Nationally scarce)**

Pantheon habitat association: arboreal

6.2.89 *Involvulus cupreus* is a small tooth-nosed snout weevil. Its larvae are found in the fruits of its host, rowan *Sorbus aucuparia* or rarely other rosaceous trees and shrubs. Pupation occurs in the soil with adults emerging in late summer or early autumn and either remain in the soil or climb the host plant to feed on the leaves before returning to the soil to hibernate, reappearing the following spring (Duff, 2016).

***Lygus pratensis* (Rare – Red Data Book 3 (RDB3))**

Pantheon habitat association: open habitats

6.2.90 See Brockwell Meadows for species account.

Blue carpenter bee *Ceratina cyanea* (Rare – Red Data Book 3 (RDB3[10]); Essex Red List)

Pantheon habitat association: open habitats

6.2.91 The blue carpenter bee *Ceratina cyanea* is polylectic and collects pollen from species such as buttercup *Ranunculus* spp., bird's-foot-trefoil, bramble, tormentil, and self-heal. Females excavate nesting burrows in dead, dry, broken woody, or herbaceous stems in which the pith has been exposed. Most nests have been found in bramble stems, with a few in rose *Rosa* spp. Many nests seem to be in stems lying on, or close, to open ground with detached stems regularly utilised.

6.2.92 From late summer onwards, adults of both sexes seek out hollow stems in which to pass the winter. The bees enter the burrows often in small aggregations, until the following spring.

Anoplius nigerrimus (Essex Red List)

Pantheon habitat association: short sward and bare ground

6.2.93 The spider wasp is often associated with dry grassland and scrub. They are probably univoltine, appearing between May and September and feed on spiders of various genera. This spider wasp nests in a variety of conditions such as under stones, in hollow plant stems, deserted bee burrows and in snail shells. It is able to construct its own burrow and cell in friable soil.

Welted lesser mason bee *Hoplitis claviventris* (Essex Red List)

Pantheon habitat association: tall sward and scrub

6.2.94 The welted lesser mason bee is widely distributed but usually uncommon throughout much of southern England. The species has been recorded from a wide range of habitats, including broad-leaved woodland, heathland, chalk grassland, and coastland. It has been recorded on common bird's-foot-trefoil and greater bird's-foot-trefoil *Lotus pedunculatus* in the UK but is probably polylectic. Many nests of this bee have been found in dead stems, where the females excavate the pith to form nesting burrows. Such stems include bramble, rose and ragwort *Senecio jacobaeae* (Else, 1998; Falk, 2015).

[10] Listed as Rare (RDB3) in Shirt (1987) and Falk (1991). Recent records suggest that this species may be regarded as Nationally scarce (Else, 2012; Falk, 2015)

Lasius brunneus **(Nationally scarce; Essex Red List)**

Pantheon habitat association: decaying wood

6.2.95 The ant *Lasius brunneus* has only been recorded from central and southern English counties, from Essex to Shropshire. Most activity occurs in bark crevices or tunnels under the bark where the ants tend large tree aphids. The excreta of these aphids forms the majority of their diet, although they may take other small insects found on, or under, the bark such as psocids and beetle larvae. Nests are usually found within mature living trees but have been found in stumps, hedgerows, and timber framed buildings. The ant does not appear to be restricted to any tree species, but nests are more commonly associated with oak (Lebas, 2016).

Lobe-spurred furrow bee *Lasioglossum pauxillum* (Nationally scarce)

Pantheon habitat association: short sward and bare ground

6.2.96 See Little Braxted Fishing Lakes for species account.

Small heath butterfly *Coenonympha pamphilus* (IUCN Near threatened; NERC S41)

Pantheon habitat association: short sward and bare ground

6.2.97 The small heath butterfly is widespread and common throughout the UK but has seen a dramatic decline within recent decades. This has led to the species being included as a species of principal importance. The butterfly can be found in open, sunny habitats including grassland, heaths, meadows, and basking on bare ground. Adults favour areas with a short sward. Larvae feed on various grasses including bent grasses *Agrostis* spp., fescues *Festuca* spp. and meadow grasses *Poa* spp.

Volucella zonaria (Essex Red List)

Pantheon habitat association: short sward and bare ground

6.2.98 *Volucella zonaria* is a hornet mimic and is one of our largest hoverflies which can be recognised by its yellow and black banded abdomen. Adults occur in midsummer and are most easily found at flowers, especially umbellifers, brambles and buddleia. Larvae have been found in wasps' nests, especially those of the common wasps, *Vespula vulgaris*, and German wasp, *V. germanica*. Current evidence shows that this species is expanding into Suffolk, Norfolk, north and west from London into Hertfordshire, and along the Thames valley. Adults are found May to November, peaking in August (Ball *et al.,* 2002).

Band-eyed brown horsefly *Tabanus bromius* (Essex Red List)

Pantheon habitat association: Peatland[2]

6.2.99 The band-eyed brown horsefly is one of the smaller members of the Tabanus genus. Its larvae live in soil under turf in meadows and along uncultivated edges of fields. The larvae are voracious and often cannibalistic but also eat earthworms and fly larvae. This species has a wide habitat tolerance and they used to be plentiful in the UK. Nowadays it is local and seems to have declined substantially. Widespread ploughing and destruction of meadows would have

contributed to the decline. This species is the wing late May to August, mainly June and July (Stubbs and Drake, 2014).

West of Hatfield Peverel (TL782115)

6.2.100 West of Hatfield Peverel site lies adjacent to the proposed scheme, approximately 800m south-west of the centre of Hatfield Peverel. The site is bisected by the River Ter which separates the site from south-east to south-west. The north-eastern half of the site comprises cricket bat willow plantation whilst the south-western half remains unplanted and is accessible via public footpath.

6.2.101 The substrate of the site is primarily riverine clay and floodplain sands and gravel (British Geological Survey, 2021).

6.2.102 Survey effort was concentrated within the south-western, unplanted half of the site. This area composed of semi-improved neutral grassland, tall ruderal and scattered scrub, with a river margin of mixed tall ruderal and mature broadleaved trees.

Habitat

6.2.103 The site had a diverse range of habitats with an area of open mosaic habitat adjacent to the proposed scheme. This habitat composed of semi-improved grassland, bare ground, scattered scrub, and tall ruderal with abundant dead wood and stumps from felling (Photos 6.10 and 6.11). This area was rich in umbellifers such as common hogweed, hemlock *Conium maculatum*, Queen Anne's lace *Daucus carota*, and common mallow *Malva sylvestris*. White clover *Trifolium repens*, black medick *Medicago lupulina*, and lesser stitchwort *Stellaria graminea* were abundant.

6.2.104 An area of marshy habitat lay to the north-west of the open mosaic habitat, mainly composed of abundant areas of St John's wort *Hypericum perforatum* and water mint *Mentha aquatica*. This was surrounded by large stands of common hogweed. To the north, areas of scattered scrub and buddleia were present.

6.2.105 Alongside the river margin, to the north-east of the site, were mature semi-natural broadleaved trees such as oak, ash, elder and blackthorn *Prunus spinosa*. Adjacent to the river, both verges of the footpath possessed umbellifers such as hemlock, and hairy willowherb. Other plants included comfrey, bittersweet *Solanum dulcamara*, sheep's sorrel *Rumex acetosella*, common nettle, meadowsweet *Filipendula ulmaria*, knapweed, bristly ox-tongue *Helminthotheca echioides*, bladder campion *Silene vulgaris* and greater burdock.

Photo 6.10 Open mosaic habitat with abundant dead wood adjacent to the proposed scheme

Photo 6.11 Dead wood amongst tall herbs adjacent to the proposed scheme

Photo 6.12 Dense areas of umbellifers and nettles along the river edge verge overlooking the cricket bat willow plantation to the north

Terrestrial invertebrates

6.2.106 In total, 771 samples were recorded/collected consisting of 358 species. The technique of sweep netting was the most productive method employed with 383 (50%) samples recorded, composed primarily of beetles (Coleoptera) and true bugs (Hemiptera). Spot-searching was the second most effective survey method with 213 (28%) samples collected, mainly comprising beetles, butterflies and moths (Lepidoptera), true flies (Diptera), and bees, ants and wasps (Hymenoptera). Beating captured 122 samples (16%) composed primarily of beetles and true bugs. Ground searching captured 53 samples (7%) of mainly beetles.

6.2.107 Of the 358 species identified by this survey, 23 were considered here as species of conservation importance, namely the spiders *Ballus chalybeius* and *Phylloneta impressa*, true bug *Oxystoma cerdo*, beetles *Rhagonycha lutea*, *Longitarsus lycopi, Rhinocyllus conicus*, bloody cranesbill weevil *Zacladus exiguus*, and *Variimorda villosa*, true flies chocolate tipula *Nigrotipula nigra*, *Pipizella virens*, *Volucella inanis*, *Volucella inflata*, and *Volucella zonaria*, true bugs *Iassus scutellaris*, *Deraeocoris olivaceus*, *Lygus pratensis*, and *Macrosteles sardus*, bees: lobe-spurred furrow bee *Lasioglossum pauxillum* and ridge-cheeked furrow bee *Lasioglossum puncticolle*, a spider wasp *Auplopus carbonarius*, moth *Macrochilo cribrumalis*, small heath butterfly *Coenonympha pamphilus,* and white-legged damselfly *Platycnemis pennipes*.

Pantheon results

6.2.108 Pantheon covered 331 of the 358 species identified from this survey area, with 27 species not included within the Pantheon conservation status database. Within that subset, three broad biotopes were represented. These broad biotopes could be subdivided into habitat types (Table 6.8). Only habitat types which contained enough species for accurate assessment are included and some species can be present in multiple habitat categories hence the disparity in total species numbers between habitats and biotopes.

6.2.109 The assemblage of ‘open habitat’ species was best represented at West of Hatfield Peverel, with 232 associated species which could be further subdivided in to ‘tall sward and scrub’ (187 species), ‘short sward and bare ground’ (46 species) and ‘upland’ (1 species).

6.2.110 This was followed by ‘tree-associated’ assemblages (57 species), which could be further divided in to ‘arboreal’ (28 species),’decaying wood’ (15 species), ‘shaded woodland floor’ (14 species)*, and ‘et woodland’ (1 species)*.

6.2.111 The full list of habitats identified from the survey area species list (in order of representative number of species) is as follows: tall sward and scrub, short sward and bare ground, arboreal, decaying wood, shaded woodland floor, peatland[2], marshland, running water, wet woodland and upland.

Table 6.8 Broad biotopes and habitats within West of Hatfield Peverel

Broad biotope (no. of species)	Broad biotope SQI	Species with Conservation Status	Conservation Status	Habitats with a species quality score (no. of species)	Habitat SQI
Open habitats (232)	110	13	7 Nationally scarce (4 also Essex Red List) 1 RDB3 4 Essex	Tall sward and scrub (187)	105
				Short sward and bare ground (46)	133

Broad biotope (no. of species)	Broad biotope SQI	Species with Conservation Status	Conservation Status	Habitats with a species quality score (no. of species)	Habitat SQI
			Red List (exclusively) 1 Near threatened; S41	Upland (1)	100*
Tree-associated (57)	127	6	4 Nationally scarce (3 also Essex Red List) 2 Essex Red List (exclusively)	Arboreal (28)	144
				Decaying wood (15)	100
				Shaded woodland floor (14)	121*
				Wet woodland (1)	100*
Wetland (19)	116	4	1 New to Britain 3 Essex Red List	Peatland[2] (9)	100*
				Marshland (6)	100*
				Running water (3)	100*
				Wet woodland (1)	100*

SQI = Species Quality Index

* Calculated from less than 15 species so may not be reliable.

6.2.112 The spider Trachyzelotes pedestris had a high affiliation with calcareous grassland and seven species had a medium association with calcareous grassland. Species include the beetles Longitarsus expletus, Longitarsus lycopi and Rhinocyllus conicus, the true bugs Anaceratagallia ribauti, Charagochilus gyllenhalii and Kalama tricornis, and ridge-cheeked furrow bee Lasioglossum puncticolle.

6.2.113 Three species were associated with ‘coarse woody debris’ ie. fallen dead trees and large branches lodged in water courses and saturated with water. These were the beetle Cyphon coarctatus, true flies Chrysopilus cristatus and Tipula oleracea, and damselfly banded demoiselle.

6.2.114 Five species were ‘freshwater species tolerant of only mildly brackish water’. These were dragonflies and damselflies: banded demoiselle Calopteryx splendens, azure damselfly Coenagrion puella, common blue damselfly, emerald damselfly, and black-tailed skimmer Orthetrum cancellatum.

6.2.115 Two species of conservation importance were identified having a soft rock cliff association namely the short-fringed mining bee Andrena dorsata and ridge-cheeked furrow bee.

6.2.116 The number of species representative of each assemblage or habitat is not necessarily an indicator of higher conservation importance. This is instead indicated by the SQI.

6.2.117 The 'tree-associated' broad biotope for this survey area had the highest reliable SQI, followed by the 'wetland', and 'open habitats' broad biotopes.

6.2.118 The 'arboreal' habitat for this survey area had the highest reliable SQI, followed by the 'short sward and bare ground' habitat, 'tall sward and scrub' habitat and the 'decaying wood' habitat.

6.2.119 Pantheon identified eight SATs from the site species list: rich flower resource, bark and sapwood decay, open short sward, scrub edge, scrub-heath and moorland, bare sand and chalk, slow-flowing rivers, and heartwood decay.

6.2.120 The rich flower resource SAT for this site was found to be in favourable condition.

6.2.121 A table of species of conservation importance along with their associated habitat types can be found below (Table 6.9).

Table 6.9 Species of conservation importance and their associated habitat within West of Hatfield Peverel

Habitat	Species of conservation importance	
Open habitats	True bug (Hemiptera)	*Lygus pratensis*
Short sward and bare ground	Beetle (Coleoptera)	*Longitarsus lycopi*
		Rhinocyllus conicus
	Bee (Hymenoptera)	Lobe-spurred furrow bee *Lasioglossum pauxillum*
		Ridge-cheeked furrow bee *Lasioglossum puncticolle*
	Butterfly (Lepidoptera)	Small heath *Coenonympha pamphilus*
	Hoverfly (Diptera)	*Volucella inanis*
		Hornet mimic hoverfly *Volucella zonaria*
Tall sward and scrub	Beetle (Coleoptera)	*Oxystoma cerdo*
		Variimorda villosa[11]
	Spider (Araneae)	*Phylloneta impressa*

[11] *Variimorda villosa* habitat not listed in Pantheon but inferred from known foodplant and habitat associations (see species account under Protected and notable species recorded).

Habitat	Species of conservation importance	
	Hoverfly (Diptera)	*Pipizella virens*
	True Bug (Hemiptera)	Bloody cranesbill weevil *Zacladus exiguus*
Arboreal	Spider (Aranaea)	*Ballus chalybeius*
	Beetle (Coleoptera)	*Rhagonycha lutea*
	True Bug (Hemiptera)	*Iassus scutellaris*
		Deraeocoris olivaceus
Decaying wood	Hoverfly (Diptera)	*Volucella inflata*
Shaded woodland floor	A spider wasp (Hymenoptera)	*Auploplus carbonarius*
Peatland[2]	Cranefly (Diptera)	Chocolate tipula *Nigrotipula nigra*
Wetland	True bug (Hemiptera)	*Macrosteles sardus*
	Moth (Lepidoptera)	Dotted fan-foot *Macrochilo cribrumalis*
	Damselfly (Odonata)	White-legged damselfly *Platycnemis pennipes*

Protected and notable species recorded

***Ballus chalybeius* (Nationally scarce – least concern)**

Pantheon habitat association: arboreal

6.2.122 See Brockwell Meadows for species account.

Phylloneta impressa (Essex Red List)

Pantheon habitat association: open habitats; tall sward and scrub

6.2.123 See Prested Hall for species account.

***Oxystoma cerdo* (Nationally scarce; Essex Red List)**

Pantheon habitat association: tall sward and scrub

6.2.124 A small dark grey weevil recorded from woodland rides, grassland, hedgerows, floodplain fens, and road-side verges. The species is associated with vetches *Vicia* spp., particularly tufted vetch *Vicia cracca*. The larvae occur in the pods where vetches occur. This weevil is widespread but local.

***Rhagonycha lutea* (Nationally scarce – least concern; Essex Red List)**

Pantheon habitat association: arboreal

6.2.125 This soldier beetle is widespread but local in southern England. It is found in woodland, parkland, woodland rides, wood edges, and scrubby calcareous grassland. The larvae and adults are thought to be predatory, and it is probable that the larvae are free-living and active on the ground, and possibly on foliage. Adults are found on trees and shrubs including oak, hazel, and wild rose.

***Longitarsus lycopi* (Nationally scarce – least concern)**

Pantheon habitat association: short sward and bare ground

6.2.126 See Brockwell Meadows for species account.

***Rhinocyllus conicus* (Nationally scarce)**

Pantheon habitat association: short sward and bare ground

6.2.127 See Prested Hall for species account.

Bloody cranesbill weevil *Zacladus exiguus* (Nationally scarce: Essex Red List)

Pantheon habitat association: tall sward and scrub

6.2.128 A small, stocky weevil found on smaller-flowered annual *Geranium* spp., larvae can be found in the roots. This species is local in southern England (Duff, 2016).

***Variimorda villosa* (Nationally scarce – least concern; Essex Red List)**

Pantheon habitat association: tall sward and scrub

6.2.129 This tumbling flower beetle has blackish elytra with very visible paler patches. It is sometimes known as pintail beetle because of the elongated and pointed abdominal tip which aids them with tumbling movements to escape predators. This species can be found on flowers in ancient broad-leaved woodland such as members of the daisy family and on umbellifers from June to August. It is local and mainly confined to the southern half of England (Duff, 2016).

Chocolate tipula cranefly *Nigrotipula nigra* (Essex Red List)

Pantheon habitat association: peatland[2]

6.2.130 A dark brown cranefly of grassland and fen (Boardman, 2016). This species is widespread but in local distribution, it can be seen from June to August.

Pipizella virens (Essex Red List)

Pantheon habitat association: tall sward and scrub

6.2.131 This hoverfly is generally scarce and local. It utilises a variety of habitats, especially coarse grassland, grassy rides, clearings in woodland, and disturbed ground. It has been reported on the continent in association with aphids on the roots of umbellifers. This species can be seen between May and September, peaking in late June and early July (Ball et al. 2002).

***Volucella inanis* (Essex Red List)**

Pantheon habitat association: short sward and bare ground

6.2.132 The outer suburbs of London and adjacent countryside have been the focus of this hoverfly's distribution, but since 1999 records indicate that it is expanding north and contracted eastwards. It has been found in association with the nests of German wasps, and the hornet *Vespa crabro*. This species can be found between June and September, peaking in early August (Stubbs and Drake, 2014).

***Volucella inflata* (Essex Red List)**

Pantheon habitat association: decaying wood

6.2.133 This hoverfly is found in heavily wooded areas and is mainly restricted to ancient semi-natural woodland. It can be found from May to September peaking in June and July. The species, unlike other *Volucella* hoverflies, is associated with the sap runs on trees. Records are largely confined south of a line between the Severn and the Wash.

***Volucella zonaria* (Essex Red List)**

Pantheon habitat association: short sward and bare ground

6.2.134 See Prested Hall for species account.

***Iassus scutellaris* (Nationally scarce – least concern; Essex Red List)**

Pantheon habitat association: arboreal

6.2.135 *Iassus scutellaris* is a large leafhopper recorded from scattered locations in southern England. The only known foodplant of the species is English elm.

Deraeocoris olivaceus (Nationally scarce; Essex Red List)

Pantheon habitat association: arboreal

6.2.136 See Brockwell Meadows for species account.

***Lygus pratensis* (Rare – Red Data Book 3 (RDB3))**

Pantheon habitat association: open habitats

6.2.137 See Brockwell Meadows for species account.

Macrosteles sardus *(New to Britain)*

Habitat association: wetland

6.2.138 See Brockwell Meadows for species account.

Lobe-spurred furrow bee *Lasioglossum pauxillum* (Nationally scarce)

Pantheon habitat association: short sward and bare ground

6.2.139 See Little Braxted Fishing Lakes for species account.

Ridge-cheeked furrow bee *Lasioglossum puncticolle* (Nationally scarce; Essex Red List)

Pantheon habitat association: short sward and bare ground

6.2.140 This bee is a scarce and localised species, with most records in south-east England between Dorset and Essex. The species nests on steep slopes in various habitats including soft rock cliffs, sea walls, vegetated shingle, and saltmarsh. It occurs inland in chalk downland, heathland, open woodland, old quarries and pits, and arable margins. The species is polylectic.

***Auplopus carbonarius* (Nationally scarce; Essex Red List)**

Pantheon habitat association: shaded woodland floor

6.2.141 *Auplopus carbonarius* is a nationally scarce spider wasp which constructs a nest of barrel-shaped cells in which spiders are stored and the larvae develop. The wasps are single-brooded and found from May to September. The wasp needs water and soil to construct cells in a variety of locations such as stone walls, tree stumps, under bark, in empty burrows of earthworms, and old snail shells (Falk, 1997).

Small heath butterfly *Coenonympha pamphilus* (IUCN Near threatened; NERC S41)

Pantheon habitat association: short sward and bare ground

6.2.142 See Prested Hall for species account.

Dotted fan-foot *Macrochilo cribrumalis* (Essex Red List)

Pantheon habitat association: wetland

6.2.143 This localised moth occurs in East Anglia and some parts of southern England. It can be found in wetland habitats on the wing from late June to August. The larvae likely feed on sedges or grasses before overwintering (Manley, 2010; Kimber, 2020).

White-legged damselfly *Platycnemis pennipes* (Essex Red List)

Pantheon habitat association: wetland

6.2.144 The white-legged damselfly is uncommon but locally abundant on rivers and canals in southern England. Its flight period spans from May to September.

Whetmead Local Nature Reserve (TL830138)

6.2.145 Whetmead LNR is located east of Witham and is a 10ha reserve bound by the River Blackwater to the east. It is directly hydrologically linked to the Little Braxted Fishing Lakes site to the north. To the east of the site, on the other side of the river, lies a cricket bat willow plantation and to the north, a semi-natural broadleaved woodland (Photo 6.13).

6.2.146 Access to most of the broadleaved woodland was not possible due to land access and safety restrictions.

6.2.147 The substrate of the site is primarily riverine clay, floodplain sands, gravel, and river terrace sand/gravel (British Geological Survey, 2021). The reserve was formerly a rubbish tip on land that was once a sewage works.

Habitat

6.2.148 Much of the reserve consists of patchy rough grassland with a variety of herbs bordered by dense and scattered scrub, and semi-mature broadleaved woodland (Photo 6.14).

6.2.149 A footpath leading north through the reserve is bordered to the west, adjacent to the A12 and proposed scheme by semi-mature broadleaved woodland and a wide ditch. This stretch of woodland is heavily shaded and possesses a poor ground flora. This is exacerbated by a large amount of littering from the A12.

6.2.150 East of the reserve lies a large area of rough and marshy grassland, with drainage sluices. Areas of bare, sandy ground are frequent along the footpaths, interspersed with ground cover from sedums *Sedum* spp. (Photo 6.15).

Photo 6.13 River Blackwater margin overlooking the cricket bat plantation, to the north-east

Photo 6.14 Meadow within the centre of the reserve

Photo 6.15 Areas of bare ground and sedums along the reserve footpath in the south-east of the reserve

Terrestrial invertebrates

6.2.151 In total, 693 samples were recorded/collected consisting of 297 species. The technique of sweep netting was the most productive method employed with 291 (42%) samples recorded. Samples comprised primarily of beetles (Coleoptera) and true bugs (Hemiptera). Spot-searching was the second most effective

survey method with 249 (36%) samples collected mainly comprising beetles, butterflies and moths (Lepidoptera), true flies (Diptera), and bees, ants and wasps (Hymenoptera). Beating captured 125 samples (18%) comprised primarily of beetles and true bugs. Ground searching captured 28 samples (4%) of mainly beetles.

6.2.152 Of the 297 species identified by this survey, 12 were considered as species of conservation importance, namely beetles, mallow flea beetle *Podagrica fuscipes*, *Larinus planus*, *Rhinocyllus conicus*, *Mordellistena humeralis* and *Anaspis thoracica*, true bugs *Drymus latus* and *Lygus pratensis*, spined hylaeus bee *Hylaeus cornutus*, lobe-spurred furrow bee, swollen-thighed blood bee *Sphecodes crassus* and ridge-saddled carpenter bee *Heriades truncorum*, and small heath butterfly.

Pantheon results

6.2.153 Pantheon covered 280 of the 297 species identified from this survey area, with 17 species not included within the Pantheon conservation status database. Within that subset, three broad biotopes were represented. These broad biotopes could be subdivided into habitat types (Table 6.10). Only habitat types which contained enough species for accurate assessment are included hence the disparity in total species numbers between habitats and biotopes.

Table 6.10 Broad biotopes and habitats within Whetmead Local Nature Reserve

Broad biotope (no. of species)	Broad biotope SQI	Species with Conservation Status	Conservation Status	Habitats with a species quality score (no. of species)	Habitat SQI
Open habitats (188)	109	10	7 Nationally scarce (4 also Essex Red List) 2 RDB3 1 Near threatened; S41	Tall sward and scrub (144)	104
				Short sward and bare ground (34)	118
				Undefined (5)	N/A
Tree-associated (59)	121	2	2 Nationally scarce (2 also Essex Red List)	Arboreal (32)	100
				Decaying wood (16)	175
				Shaded woodland floor (11)	100*

Broad biotope (no. of species)	Broad biotope SQI	Species with Conservation Status	Conservation Status	Habitats with a species quality score (no. of species)	Habitat SQI
Wetland (20)	126	0		Peatland[2] (10)	100*
				Marshland (8)	155*
				Running water (2)	100*
				Lake (1)	100*

SQI = Species Quality Index

* Calculated from less than 15 species so may not be reliable.

6.2.154 The assemblage of 'open habitats' species was best represented at Whetmead LNR, with 188 associated species. These could be subdivided into 'tall sward and scrub' (144 species) and 'short sward and bare ground' (34 species).

6.2.155 This was followed by 'tree-associated' assemblages (59 species), which could be further divided into 'arboreal' (32 species), 'decaying wood' (16 species) and 'shaded woodland floor' (11 species)*.

6.2.156 The full list of habitats identified from the survey area species list (in order of representative number of species) is as follows: tall sward and scrub, short sward and bare ground, arboreal, decaying wood, shaded woodland floor, peatland[2], marshland, running water, and lake.

6.2.157 The beetle *Phalacrus fimetarius* had a high affiliation with calcareous grassland. Four species had a medium association with calcareous grassland namely, the beetle *Rhinocyllus conicus*, spined hylaeus bee *Hylaeus cornutus*, lobe-spurred furrow bee, and ant *Myrmica sabuleti*.

6.2.158 Two species were associated with 'coarse woody debris' ie. fallen dead trees and large branches lodged in water courses and saturated with water. These were the red-headed cardinal beetle *Pyrochroa serraticornis*, and damselfly banded demoiselle.

6.2.159 Eight species were 'freshwater species tolerant of only mildly brackish water'. These were dragonflies and damselflies: brown hawker, migrant hawker *Aeshna mixta*, common darter, broad-bodied chaser *Libellula depressa*, banded demoiselle, common blue damselfly, blue-tailed damselfly, and the caddis fly *Limnephilus lunatus*.

6.2.160 One species of conservation importance was identified as having a soft rock cliff association namely the short-fringed mining bee.

6.2.161 The number of species representative of each assemblage or habitat is not necessarily an indicator of higher conservation importance. This is instead indicated by the SQI.

6.2.162 The 'wetland' broad biotope for this survey area had the highest reliable SQI, followed by the 'tree-associated' and 'open habitats' broad biotopes.

6.2.163 The 'decaying wood' habitat for this survey area had the highest reliable SQI, followed by the 'short sward and bare ground' habitat, the 'tall sward and scrub' habitat and finally the 'arboreal' habitat.

6.2.164 Pantheon identified eight SATs from the site species list: rich flower resource, bark and sapwood decay, scrub edge, open short sward, bare sand and chalk, scrub-heath and moorland, reed-fen and pools, and heartwood decay.

6.2.165 The rich flower resource SAT and scrub edge SAT for this site were found to be in favourable condition.

6.2.166 A table of species of conservation importance along with their associated habitat types is shown in Table 6.11.

Table 6.11 Species of conservation importance and their associated habitat within Whetmead Local Nature Reserve

Habitat	Species of conservation importance	
Open habitats[2]	True bug (Hemiptera)	*Lygus pratensis*
Short sward and bare ground	Beetle (Coleoptera)	*Larinus planus*
		Rhinocyllus conicus
	Bee (Hymenoptera)	Lobe-spurred furrow bee *Lasioglossum pauxillum*
		Swollen-thighed blood bee *Sphecodes crassus*
	Butterfly (Lepidoptera)	Small heath *Coenonympha pamphilus*
Tall sward and scrub	Beetle (Coleoptera)	Mallow flea beetle *Podagrica fuscipes*
	True bug (Hemiptera)	*Drymus latus*
Decaying wood	Beetle (Coleoptera)	*Mordellistena humeralis*
		Anaspis thoracica
	Bee (Hymenoptera)	Spined hylaeus bee *Hylaeus cornutus*
		Ridge-saddled carpenter bee *Heriades truncorum*

Protected and notable species recorded

Mallow flea beetle Podagrica fuscipes (Nationally scarce – least concern; Essex Red List)

Pantheon habitat association: tall sward and scrub

6.2.167 The mallow flea beetle is mainly found in eastern England and is thought to be declining nationally. The species is found in grassland, scrub, wood margins, disturbed ground, and coastal sites. It feeds on mallows including marsh-mallow *Althaea officinalis*. The larvae probably feed on the roots of the foodplant (Parsons, 1992).

Larinus planus (Nationally scarce)

Pantheon habitat association: short sward and bare ground

6.2.168 *Larinus planus* is a large weevil associated with thistles, particularly *Carduus* spp. and *Cirsium* spp., and the larvae feed within the flowerheads. The species is scarce in the UK and mainly found near the coast. Management is considered important to maintain the open, grassland habitats required by this species (Parsons, 1992; Duff, 2016).

Rhinocyllus conicus (Nationally scarce)

Pantheon habitat association: short sward and bare ground

6.2.169 See Prested Hall for species account.

Mordellistena humeralis (Nationally scarce – least concern; Essex Red List)

Pantheon habitat association: decaying wood

6.2.170 This beetle is locally common in England north to The Wash but is generally absent from the west country and most of Wales. Typical habitats for this species include deciduous woodland (with plenty of trees in various stages of decay), hedgerows, old established parkland, and wooded borders.

6.2.171 Adults are active over a short season from the middle of June until the middle of August. The species may occasionally be swept from foliage but will generally occur in warm weather on a variety of flowers, more especially various umbellifers but also on meadowsweet, hawthorn and elder. On the continent larvae have been recorded developing among decaying white wood of oak, hornbeam *Carpinus* spp., alder *Alnus glutinosa*, and hazel (Linnaeus, 1758).

Anaspis thoracica (Nationally scarce – least concern; Essex Red List)

Pantheon habitat association: decaying wood

6.2.172 See Little Braxted Fishing Lakes for species account.

Drymus latus (Nationally scarce; Essex Red List)

Pantheon habitat association: tall sward and scrub

6.2.173 This ground bug is a scarce species mainly confined to the south-east of England with a scatter of records north to Yorkshire. The host plants are unclear. It has been recorded from a variety of habitats on both chalk and acid soils. In the London area it is mainly associated with sparsely vegetated sites.

Lygus pratensis (Rare – Red Data Book 3 (RDB3))

Pantheon habitat association: open habitats

6.2.174 See Brockwell Meadows for species account.

Spined hylaeus bee Hylaeus cornutus (Nationally scarce; Essex Red List)

Pantheon habitat association: decaying wood

6.2.175 The spined hylaeus bee is unique among British bees in carrying at least part of its pollen load in a shallow depression on the lower part of the face. The depression is bounded on each side by a usually prominent ‘spine’. Generally, it is a rare species, although in recent years there has been a noticeable increase of records from various sites within its range.

6.2.176 Its habitat includes open deciduous woodland, fenland, and calcareous grassland. It is univoltine and on the wing from early June to late August. Nests have been rarely found but occur in herbaceous stems. The bee forages on wild mignonette *Reseda lutea*, lesser stitchwort, field scabious *Knautia arvensis*, yarrow *Achillea millefolium*, angelica *Angelica sylvestris*, common hogweed, wild carrot *Daucus carota* and ox-eye daisy *Leucanthemum vulgare* (Falk, 2015).

Lobe-spurred furrow bee Lasioglossum pauxillum (Nationally scarce)

Pantheon habitat association: short sward and bare ground

6.2.177 See Little Braxted Fishing Lakes for species account.

Swollen-thighed blood bee Sphecodes crassus (Nationally scarce; Essex Red List)

Pantheon habitat association: short sward and bare ground

6.2.178 The swollen-thighed blood bee was regarded as a scarce, but widespread species nationally; however, it is now considered frequent at least in southern Britain. This is a cuckoo bee which can be found within nests of *Lasioglossum nitidiusculum* and *L. parvulum*, although other hosts include *L. pauxillum* (found within Whetmead LNR) and *L. punctatissimum* (Falk, 2015).

Ridge-saddled carpenter bee Heriades truncorum (Rare – Red Data Book 3 (RDB3))

Pantheon habitat association: decaying wood

6.2.179 The large-headed resin bee is largely confined to south-east England. Nests are found in decayed wood habitat and uses the exit holes of wood-boring beetles; therefore, a resource of wood decay habitat is required. There have also been found in walls and hollow stems from brambles. The bee favours open habitats with an abundant supply of yellow composite flowers. Common ragwort is considered an important pollen and nectar resource (Falk, 2015).

Small heath butterfly Coenonympha pamphilus (IUCN Near threatened; NERC S41)

Pantheon habitat association: short sward and bare ground

6.2.180 See Prested Hall for species account.

7 Discussion and Evaluation

7.1 Brockwell Meadows

7.1.1 None of the habitats within Brockwell Meadows were found to be in favourable condition in the Pantheon analysis.

7.1.2 The tree-associated broad biotope held the highest species quality within the survey area with notable species associated with arboreal and decaying wood habitats. This includes the nationally scarce (least concern) jumping spider *Ballus chalybeius* nationally scarce (least concern) and Essex red listed rove beetle *Sepedophilus bipunctatus,* respectively.

7.1.3 The wetland broad biotope had the next highest species quality which included notable species such as, the new to Britain, leafhopper *Macrosteles sardus*, nationally scarce (least concern) spider *Rugathodes instabilis*, and Essex Red Listed ruddy darter dragonfly.

7.1.4 Within the highest represented broad biotope of this site, open habitats, the short sward and bare ground habitat had the highest species quality. Two notable beetles, the nationally scarce (least concern) and Essex red listed weevil *Protapion filirostre* and nationally scarce (least concern) flea beetle *Longitarsus lycopi* are associated with plants such as medicks *Medicago* spp. and mints *Lamiaceae* spp. respectively.

7.1.5 Habitat quality degraded along Domsey Brook, away from Brockwell Meadows towards the proposed scheme. The grassland areas of the nature reserve are maintained to retain their floristic richness. The habitat becomes more shaded and uniform further along the Domsey Brook, with comfrey providing the abundant forage along the brook edge until the woodland floor is dominated by dense scrub. The habitat has been cleared for recreational practices further along the brook.

7.1.6 The terrestrial invertebrate population at this site is considered of County importance for biodiversity.

7.2 Little Braxted Fishing Lakes

7.2.1 None of the habitats within Little Braxted Fishing Lakes were found to be in favourable condition in the Pantheon analysis.

7.2.2 The tree-associated broad biotope held the highest species quality within the survey area with the notable nationally scarce (least concern) false flower beetle *Anaspis thoracica* depending on decaying wood in the site. Of note was the presence of lesser stag beetle *Dorcus parallelipipidus* and violet ground beetle *Carabus violaceus* within wood piles found on site stacked next to the woodland area.

7.2.3 Whilst there were remnants of older woodland in the survey area, the majority of the woodland next to the fishing lakes had been replaced with a younger plantation. This plantation had limited terrestrial invertebrate fauna.

7.2.4 The open habitat broad biotope had the highest representation. The highest species quality was both tall sward and scrub and short sward and bare ground which had equal species quality.

7.2.5 The large aggregation of ivy bee nests is worthy of consideration within the sandy banks of this site. Although this species does not have a protected or notable status, such a large population would provide significant pollination services for this site and its surroundings. The sandy banks and 'cliff edges' at this site provide valuable nesting habitat for other ground-nesting invertebrates including two notable bees: the lobe spurred furrow bee and dark blood bee.

7.2.6 The terrestrial invertebrate population at this site is considered of County importance for biodiversity.

7.3 Prested Hall

7.3.1 None of the habitats within Prested Hall were found to be in favourable condition in the Pantheon analysis.

7.3.2 The wetland broad biotope held the highest species quality within the survey area with a freshwater assemblage of mayflies, dragonflies, damselflies, and caddis flies.

7.3.3 The tree-associated broad biotope had the next highest species quality which included arboreal notable species and species associated with decaying wood.

7.3.4 Within the highest represented broad biotope of this site, open habitats, the short sward and bare ground habitat had the highest species quality including a thistle-associated weevil (Coleoptera) and a number of species which have a high to medium affiliation with calcareous grassland. The underlying geology of the site indicates that some parts of the site may be calcareous in nature, a priority habitat in the UK.

7.3.5 The floristic grassland provided valuable habitat for many pollinators such as a rich assemblage of bees, the Section 41 and near threatened small heath butterfly, and Essex Red Listed hoverfly, the hornet mimic hoverfly.

7.3.6 The bramble rich scrub margins of the grassland provided an important contribution to such pollinator habitats. They provided nesting opportunities for stem-nesting species such as the Rare (RDB3) and Essex Red Listed blue carpenter bee, Essex Red Listed spider wasp *Anoplius nigerrimus,* and welted lesser mason bee.

7.3.7 The terrestrial invertebrate population at this site is considered of County importance for biodiversity.

7.4 West of Hatfield Peverel

7.4.1 One of the species assemblages within the West of Hatfield Peverel site was found to be in favourable condition in the Pantheon analysis. This was the rich flower resource assemblage within the open habitat broad biotope. The remaining assemblages and habitats were found to be in unfavourable condition. Rich flower resource is a resource-based assemblage type that can be present with a large range of habitats but its favourable status shows the importance of the floristic resource at this site.

7.4.2 The tree-associated broad biotope held the highest species quality within the survey area with the arboreal habitat holding the highest species quality within this broad biotope. Species include the Nationally scarce (least concern) jumping spider *Ballus chalybeius* and soldier beetle *Rhagonycha lutea*, Nationally scarce (least concern) and Essex Red List leafhopper *Iassus scutellaris* and Nationally scarce and Essex Red List plant bug *Deraeocoris olivaceus*.

7.4.3 The wetland broad biotope had the next highest species quality with notable species such as, the new to Britain, leafhopper *Macrosteles sardus*, and Essex Red Listed dotted fan-foot moth and white-legged damselfly.

7.4.4 The highest represented broad biotope of open habitats possessed the next highest species quality containing Short sward and bare ground as the highest species quality habitat with notable records such as the Nationally scarce flea beetle *Longitarsus lycopi* and thistle dependent weevil *Rhinocyllus conicus*, Nationally scarce solitary bees lobe-spurred furrow bee and ridge-cheeked furrow bee, Section 41 and Near Threatened small heath butterfly, and Essex red listed hoverflies *Volucella inanis* and hornet-mimic *V. zonaria*.

7.4.5 In addition to the woodland, wetland and grassland elements of the site the area adjacent to the proposed scheme contained a number of tree stumps and remains of felled trees which were observed to provide habitat for the Nationally scarce and Essex red listed spider wasp *Auplopus carbonarius* and an assemblage including numerous lesser stag beetles and many solitary nesting bees with their associated parasites. The proximity of this valuable nesting habitat to a rich floral resource is a valuable feature of the site.

7.4.6 The terrestrial invertebrate population at this site is considered of County level importance for biodiversity.

7.5 Whetmead Local Nature Reserve

7.5.1 Two of the species assemblages within Whetmead LNR were found to be in favourable condition in the Pantheon analysis. These were the scrub edge assemblage and rich flower resource assemblage, both within the open habitat broad biotope. The remaining assemblages and habitats were found to be in unfavourable condition.

7.5.2 The scrub edge assemblage type is found where scrub or woodland grades into, or is interspersed, with open areas of grassland and is linked to scrub management and maintenance of graded edge habitats. Rich flower resource is a resource-based assemblage type that can be present with a large range of habitats but it's favourable status here shows the importance of the floristic resource at this site.

7.5.3 The wetland broad biotope had the highest species quality within the survey area, with a diverse range of dragonfly, damselfly, and caddis flies present.

7.5.4 The tree-associated broad biotope had the next highest species quality with notable species associated with decaying wood. This includes the nationally scarce (least concern) beetles *Mordellistena humeralis* and false flower beetle *Anaspis thoracica*, and solitary bees such as the nationally scarce and Essex red listed spined hylaeus bee and Rare (RDB3) ridge-saddled carpenter bee.

7.5.5 The highest represented broad biotope of open habitats possessed the next highest species quality containing short sward and bare ground as the highest species quality habitat with notable records such as the nationally scarce thistle-associated weevils *Larinus planus* and *Rhinocyllus conicus*. Records for this habitat included the ntionally scarce lobe-spurred furrow bee and its nationally scarce and Essex red listed cleptoparasite the swollen thighed blood bee, which were particularly prevalent in the bare ground and sedum area of the reserve.

7.5.6 The terrestrial invertebrate population at this site is considered to be of County level importance.

8 Summary

8.1.1 Of the five sites where surveys were undertaken, each maintained populations of terrestrial invertebrates that are considered to be of County level importance.

8.1.2 Table 8.1 below summarises the number of species of conservation importance, SATs found to be in favourable conservation status, and the level of importance of each site within the national context.

Table 8.1 Summary of Species records and Conservation Importance for each Site.

Site	Number of Species recorded	Number of Species of Conservation Importance	Number of Pantheon SATs represented	SATs with Favourable Conservation Status	Level of Importance
Brockwell Meadows (TL868187)	320	13	8	None	County
Little Braxted Fishing Lakes (TL831149)	144	4	7	None	County
Prested Hall (TL881196)	311	14	8	None	County
West of Hatfield Peverel (TL782115)	358	23	8	Rich flower resource	County
Whetmead Local Nature Reserve (TL830138)	297	12	8	Rich flower resource Scrub edge	County

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Glossary

Arboreal	Pertaining to moving about or living in, on, or among trees
Biotope	An area of uniform environmental conditions providing a living place for a specific assemblage of plants and animals
Cleptoparasitic	A form of feeding in which one animal takes prey or other food that was caught, collected, or otherwise prepared by another animal, including stored food.
Microhabitats	A habitat which is of small or limited extent and which differs in character from some surrounding more extensive habitat.

Annex A Desktop and Field Survey Results

Table A.1 Summary of terrestrial invertebrate field surveys undertaken

Survey site name	Location	Centroid OS grid reference	Survey date(s)	Location in relation to the proposed scheme
West of Hatfield Peverel	West of Hatfield Peverel	TL 782 115	19 June 16 July 13 August 8 September	Overlapping and to the south of provisional order limits
Whetmead LNR	Witham	TL 830 138	27 May 17 June 17 July 12 August	Overlapping and to the east and west of provisional order limits
Little Braxted Fishing Lakes	Little Braxted	TL 830 149	27 May 17 June 12 August 10 September	Overlapping and to the west of provisional order limits
Brockwell Meadows	Kelvedon	TL 871 188	18 June 14 July 11 August 9 September	Overlapping and to the west of provisional order limits
Prested Hall	Feering	TL 882 196	28 May 13 June 13 July 11 August	Overlapping and to the east of provisional order limits

Table A.2 Protected / notable terrestrial invertebrate desk study and incidental records within the last ten years and within 2km of the proposed scheme

Taxon group	Species name	Vernacular name	Status	Number of records	Closest record from the proposed scheme [distance (m)]	Closest record location and grid reference	Most recent record
Spider (Araneae)	*Ballus chalybeius*	A jumping spider	Nationally scarce (Least concern)	4	2000	Wickham Bishops TL8313	2019
Spider (Araneae)	*Cicurina cicur*	A spider	Nationally scarce (Least concern)	1	2000	Wickham Bishops TL8313	2019
Spider (Araneae)	*Tapinocyba insecta*	A spider	Nationally scarce (Least concern)	1	2000	Wickham Bishops TL8313	2019
Beetle (Coleoptera)	*Lucanus cervus*	Stag beetle	WCA (Sch. 5 Sale only); S41; Nationally scarce	33	70	Witham TL839166	11 July 2019
Beetle (Coleoptera)	*Nicrophorus interruptus*	A burying beetle	Nationally scarce	1	920	Witham TL823162	8 July 2013
Beetle (Coleoptera)	*Platyrhinus resinosus*	Cramp-ball fungus weevil	Nationally scarce; Essex Red List	1	200	Copford TL931243	15 July 2020

Taxon group	Species name	Vernacular name	Status	Number of records	Closest record from the proposed scheme [distance (m)]	Closest record location and grid reference	Most recent record
Beetle (Coleoptera)	*Polydrusus formosus*	A weevil	Nationally scarce	1	200	Copford TL931243	15 July 2020
Beetle (Coleoptera)	*Protapion difforme*	A weevil	Nationally scarce	1	200	Copford TL931243	15 July 2020
Beetle (Coleoptera)	*Rhagonycha lutea*	A soldier beetle	Nationally scarce (Least concern); Essex Red List	1	2000	Wickham Bishops TL8313	2019
True fly (Diptera)	*Cheilosia vulpina*	A hoverfly	Essex vulnerable	2	1700	Whetmead LNR TL830138	2014
True fly (Diptera)	*Ctenophora pectinicornis*	A cranefly	Nationally scarce	1	2000	Wickham Bishops TL8313	2019
True fly (Diptera)	*Lipsothrix nervosa*	Southern yellow splinter	S41	1	2000	Wickham Bishops TL8313	2019
True fly (Diptera)	*Megamerina dolium*	A fly	Nationally scarce	1	2000	Wickham Bishops TL8313	2019
True fly (Diptera)	*Protapion difforme*	A cranefly	Essex Red List	1	200	Copford TL931243	15 July 2020

Taxon group	Species name	Vernacular name	Status	Number of records	Closest record from the proposed scheme [distance (m)]	Closest record location and grid reference	Most recent record
True bug (Hemiptera)	*Lygus pratensis*	A plant bug	RDB3	1	45	Hatfield Place TL783114	11 August 2020
Sawflies, bees, wasps, and ants (Hymenoptera)	*Formica rufa*	Red wood ant	Regionally Important	5	2000	Wickham Bishops TL837120	2019
Sawflies, bees, wasps, and ants (Hymenoptera)	*Lasius brunneus*	Brown tree ant	Nationally scarce; Essex Red List	1	200	Copford TL931243	2020
Sawflies, bees, wasps, and ants (Hymenoptera)	*Bombus rupestris*	Hill cuckoo bee	Nationally scarce	1	1500	Coggeshall Hamlet TL863205	2015
Sawflies, bees, wasps, and ants (Hymenoptera)	*Ceratina cyanea*	Blue carpenter bee	RDB3; Essex Red List	1	850	Marks Tey TL910244	2015
Sawflies, bees, wasps, and ants (Hymenoptera)	*Lasioglossum pauxillum*	Lobe-spurred furrow bee	Nationally scarce	3	45	Hatfield Place TL783114	11 August 2020
Sawflies, bees, wasps, and ants (Hymenoptera)	*Sphecodes niger*	Dark blood bee	RDB3; Essex Red List	1	1500	Coggeshall Hamlet TL863205	2015

Taxon group	Species name	Vernacular name	Status	Number of records	Closest record from the proposed scheme [distance (m)]	Closest record location and grid reference	Most recent record
Butterfly (Lepidoptera)	*Coenonympha pamphilus*	Small heath	IUCN (NT); S41	15	750	Boreham TL760119	4 July 2015
Butterfly (Lepidoptera)	*Limenitis camilla*	White admiral	IUCN (VU); S41	1	1800	Wickham Bishops TL837120	11 August 2013
Butterfly (Lepidoptera)	*Satyrium w-album*	White-letter hairstreak	IUCN (EN); S41; Nationally scarce	1	1800	Eight Ash Green TL951247	20 June 2011

Table A.3 Brockwell Meadows: Protected / notable terrestrial invertebrates identified from field study

Taxon group	Species name	Vernacular name	Status	Habitat	Survey date(s)
Spider (Araneae)	*Ballus chalybeius*	A jumping spider	Nationally scarce (Least concern)	Tree-associated; arboreal	9 September
Spider (Araneae)	*Rugathodes instabilis*	A spider	Nationally scarce (Least concern)	Wetland	14 July
Beetle (Coleoptera)	*Protapion filirostre*	A weevil	Nationally scarce; Essex Red List	Open habitats; short sward and bare ground	14 July
Beetle (Coleoptera)	*Longitarsus lycopi*	A leaf beetle	Nationally scarce (Least concern)	Open habitats; short sward and bare ground	9 September
Beetle (Coleoptera)	*Podagrica fuscicornis*	A flea beetle	Nationally scarce (Least concern); Essex Red List	Open habitats; Tall sward and scrub	14 July
Beetle (Coleoptera)	*Liparus coronatus*	A weevil	Nationally scarce; Essex Red List	Open habitats; Tall sward and scrub	8 June
Beetle (Coleoptera)	*Polydrusus formosus*	A weevil	Nationally scarce	Tree-associated; arboreal	18 June
Beetle (Coleoptera)	*Mordellistena neuwaldeggiana*	A tumbling flower beetle	Nationally scarce (Least concern); Essex Red List	Tree-associated; decaying wood	18 June
Beetle (Coleoptera)	*Sepedophilus bipunctatus*	A rove beetle	Nationally scarce; Essex Red List	Tree-associated; decaying wood	18 June

Taxon group	Species name	Vernacular name	Status	Habitat	Survey date(s)
True Bug (Hemiptera)	*Deraeocoris olivaceus*	A plant bug	Nationally scarce; Essex Red List	Tree-associated; arboreal	18 June
True Bug (Hemiptera)	*Lygus pratensis*	A plant bug	RDB3	Open habitats	14 July 9 September
True Bug (Hemiptera)	*Macrosteles sardus*	A plant bug	New to Britain	Wetland habitats	18 June 9 September
Dragonfly (Odonata)	*Sympetrum sanguineum*	Ruddy darter	Essex Red List	Wetland	11 August

Table A.4 Little Braxted Fishing Lakes: Protected / notable terrestrial invertebrates identified from field study

Taxon group	Species name	Vernacular name	Status	Habitat	Survey date(s)
Beetle (Coleoptera)	*Anaspis thoracica*	A false flower beetle	Nationally scarce (Least concern); Essex Red List	Tree-associated; decaying wood	27 May
True Bug (Hemiptera)	*Lygus pratensis*	A plant bug	RDB3	Open habitats	10 September
Sawflies, bees, wasps, and ants (Hymenoptera)	*Colletes hederae*	Ivy bee	None but large aggregation worthy of note	Open habitats; short sward and bare ground	10 September
Sawflies, bees, wasps, and ants (Hymenoptera)	*Lasioglossum pauxillum*	Lobe-spurred furrow bee	Nationally scarce	Open habitats; short sward and bare ground	12 August
Sawflies, bees, wasps, and ants (Hymenoptera)	*Sphecodes niger*	Dark blood bee	RDB3; Essex Red List	Open habitats; short sward and bare ground	10 September

Table A.5 Prested Hall: Protected / notable terrestrial invertebrates identified from field study

Taxon group	Species name	Vernacular name	Status	Habitat	Survey date(s)
Spider (Araneae)	*Phylloneta impressa*	A spider	Essex Red List	Open habitats; Tall sward and scrub	16 June
Beetle (Coleoptera)	*Rhinocyllus conicus*	A weevil	Nationally scarce	Open habitats; short sward and bare ground	13 August
Beetle (Coleoptera)	*Tanymecus palliatus*	A weevil	Nationally scarce; Essex Red List	Open habitats; Tall sward and scrub	13 July
Beetle (Coleoptera)	*Meligethes umbrosus*	A pollen beetle	Nationally scarce; Essex Red List	Open habitats	13 August
Beetle (Coleoptera)	*Involvulus cupreus*	A weevil	Nationally scarce	Tree-associated; arboreal	13 August
True flies (Diptera)	*Tabanus bromius*	Band-eyed brown horsefly	Essex Red List	Peatland[2]	13 July
True flies (Diptera)	*Volucella zonaria*	Hornet mimic hoverfly	Essex Red List	Shot sward and bare ground	13 July
True Bug (Hemiptera)	*Lygus pratensis*	A plant bug	RDB3	Open habitats	13 July
True Bug (Hemiptera)	*Ceratina cyanea*	Blue carpenter bee	RDB3; Essex Red List	Open habitats; Tall sward and scrub	13 July
Sawflies, bees, wasps, and ants (Hymenoptera)	*Anoplis nigerrimus*	A spider wasp	Essex Red List	Open habitats; short sward and bare ground	13 July
Sawflies, bees, wasps, and ants	*Hoplitis claviventris*	Welted lesser mason bee	Essex Red List	Open habitats; Tall sward and	16 June

Taxon group	Species name	Vernacular name	Status	Habitat	Survey date(s)
(Hymenoptera)				scrub	
Sawflies, bees, wasps, and ants (Hymenoptera)	*Lasius brunneus*	Brown tree ant	Nationally scarce; Essex Red List	Tree-associated; decaying wood	16 June
Sawflies, bees, wasps, and ants (Hymenoptera)	*Lasioglossum pauxillum*	Lobe-spurred furrow bee	Nationally scarce	Open habitats; short sward and bare ground	9 September
Butterfly (Lepidoptera)	*Coenonympha pamphilus*	Small heath	S41; Near threatened	Open habitats; short sward and bare ground	28 May 16 June 13 July

Table A.6 West of Hatfield Peverel: Protected / notable terrestrial invertebrates identified from field study

Taxon group	Species name	Vernacular name	Status	Habitat	Survey date(s)
Spider (Araneae)	*Ballus chalybeius*	A jumping spider	Nationally scarce (Least concern)	Tree-associated; arboreal	19 June 16 July
Spider (Araneae)	*Phylloneta impressa*	A spider	Essex Red List	Open habitats; Tall sward and scrub	19 June
Beetle (Coleoptera)	*Oxystoma cerdo*	A weevil	Nationally scarce; Essex Red List	Open habitats; Tall sward and scrub	16 July
Beetle (Coleoptera)	*Rhagonycha lutea*	A soldier beetle	Nationally scarce (Least concern); Essex Red List	Tree-associated; arboreal	19 June
Beetle (Coleoptera)	*Longitarsus lycopi*	A leaf beetle	Nationally scarce (Least concern)	Open habitats; short sward and bare ground	8 September

Taxon group	Species name	Vernacular name	Status	Habitat	Survey date(s)
Beetle (Coleoptera)	*Rhinocyllus conicus*	A weevil	Nationally scarce	Open habitats; short sward and bare ground	16 July
Beetle (Coleoptera)	*Zacladus exiguus*	Bloody cranesbill weevil	Nationally scarce; Essex Red List	Open habitats; Tall sward and scrub	19 June
Beetle (Coleoptera)	*Variimorda villosa*	A tumbling flower beetle	Nationally scarce (Least concern); Essex Red List	Open habitats; Tall sward and scrub	19 June
True Flies (Diptera)	*Nigrotipula nigra*	Chocolate tipula cranefly	Essex Red List	Wetland; peatland[2]	16 July
True Flies (Diptera)	*Pipizella virens*	A hoverfly	Essex Red List	Open habitats; Tall sward and scrub	19 June
True Flies (Diptera)	*Volucella inanis*	A hoverfly	Essex Red List	Open habitats; short sward and bare ground	11 August
True Flies (Diptera)	*Volucella inflata*	A hoverfly	Essex Red List	Tree-associated; decaying wood	19 June
True Flies (Diptera)	*Volucella zonaria*	Hornet mimic hoverfly	Essex Red List	Open habitats; short sward and bare ground	16 July
True Bug (Hemiptera)	*Iassus scutellaris*	A leafhopper	Nationally scarce; Essex Red List	Tree-associated; arboreal	8 September
True Bug (Hemiptera)	*Deraeocoris olivaceus*	A plant bug	Nationally scarce; Essex Red List	Tree-associated; arboreal	19 June

Taxon group	Species name	Vernacular name	Status	Habitat	Survey date(s)
True Bug (Hemiptera)	*Lygus pratensis*	A plant bug	RDB3	Open habitats	16 July 11 August 8 September
True Bug (Hemiptera)	*Macrosteles sardus*	A plant bug	New to Britain	Wetland habitats	8 September
Sawflies, bees, wasps, and ants (Hymenoptera)	*Lasioglossum pauxillum*	Lobe-spurred furrow bee	Nationally scarce	Open habitats; short sward and bare ground	19 June 16 July 11 August
Sawflies, bees, wasps, and ants (Hymenoptera)	*Lasioglossum puncticolle*	Ridge-cheeked furrow bee	Nationally scarce; Essex Red List	Open habitats; short sward and bare ground	19 June
Sawflies, bees, wasps, and ants (Hymenoptera)	*Auplopus carbonarius*	A spider wasp	Nationally scarce; Essex Red List	Tree-associated; Shaded woodland floor	19 June
Butterfly (Lepidoptera)	*Coenonympha pamphilus*	Small heath	S41; Near threatened	Open habitats; short sward and bare ground	8 September
Moth (Lepidoptera)	*Macrochilo cribrumalis*	Dotted fan-foot	Essex Red List	Wetland	19 June
Damselfly (Odonata)	*Platycnemis pennipes*	White-legged damselfly	Essex Red List	Wetland; running water	19 June

Table A.7 Whetmead Local Nature Reserve: Protected / notable terrestrial invertebrates identified from field study

Taxon group	Species name	Vernacular name	Status	Habitat	Survey date(s)
Beetle (Coleoptera)	*Podagrica fuscipes*	Mallow flea beetle	Nationally scarce (Least concern); Essex Red List	Open habitats; Tall sward and scrub	17 June 17 July
Beetle (Coleoptera)	*Larinus planus*	A weevil	Nationally scarce	Open habitats; short sward and bare ground	12 August
Beetle (Coleoptera)	*Rhinocyllus conicus*	A weevil	Nationally scarce	Open habitats; short sward and bare ground	17 June
Beetle (Coleoptera)	*Mordellistena humeralis*	A tumbling flower beetle	Nationally scarce (Least concern); Essex Red List	Tree-associated; decaying wood	17 July
Beetle (Coleoptera)	*Anaspis thoracica*	A false flower beetle	Nationally scarce (Least concern); Essex Red List	Tree-associated; decaying wood	27 May
True Bug (Hemiptera)	*Drymus latus*	A plant bug	Nationally scarce; Essex Red List	Open habitats; Tall sward and scrub	9 September
True Bug (Hemiptera)	*Lygus pratensis*	A plant bug	RDB3	Open habitats	17 July 9 September
Sawflies, bees, wasps, and ants (Hymenoptera)	*Hylaeus cornutus*	Spined hylaeus	Nationally scarce; Essex Red List	Open habitats; tree-associated; decaying wood	17 July

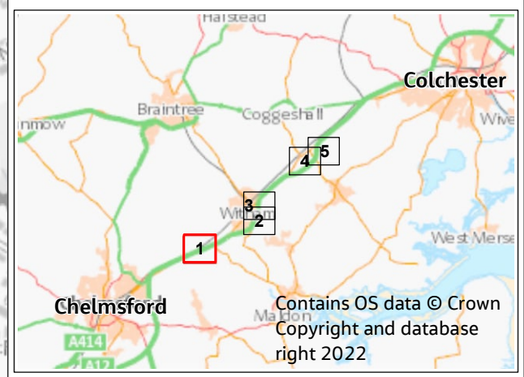
Taxon group	Species name	Vernacular name	Status	Habitat	Survey date(s)
Sawflies, bees, wasps, and ants (Hymenoptera)	*Lasioglossum pauxillum*	Lobe-spurred furrow bee	Nationally scarce	Open habitats; short sward and bare ground	17 June 17 July 12 August
Sawflies, bees, wasps, and ants (Hymenoptera)	*Sphecodes crassus*	Swollen-thighed blood bee	Nationally scarce; Essex Red List	Open habitats; short sward and bare ground	17 July
Sawflies, bees, wasps, and ants (Hymenoptera)	*Heriades truncorum*	Ridge-saddled carpenter bee	RDB3	Open habitats; tree-associated; decaying wood	17 July
Butterfly (Lepidoptera)	*Coenonympha pamphilus*	Small heath	S41; Near threatened	Open habitats; short sward and bare ground	17 June 12 August

Figure

APPENDIX 9.11 - FIGURE 1

Legend

- Provisional Order Limits
- Terrestrial Invertebrate Survey



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Rev.	Rev. Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
P01	31/05/22	For DCO application	ML	LW	NP	SG

Development Consent Order Drawing Number: TR010060/APP/6.3

APFP Regulation: Regulation 5(2)(l)

Client: national highways

Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL STATEMENT
TERRESTRIAL INVERTEBRATE SURVEY
SHEET 1 OF 5

Drawing Status: S4 – SUITABLE FOR STAGE APPROVAL

Scale @ A3	1:8000	DO NOT SCALE	
Jacobs No.	B36601D1	Rev	P01
Client No.	HE551497		

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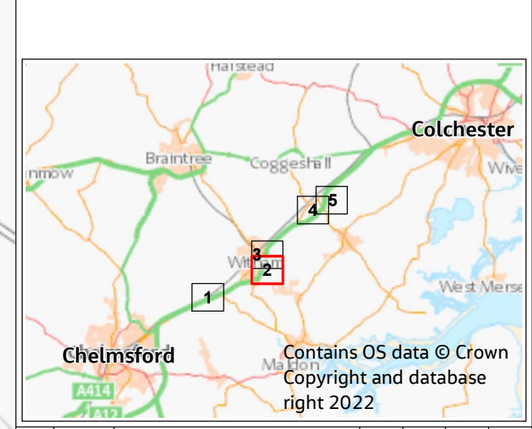
APPENDIX 9.11 - FIGURE 1

Legend

- Provisional Order Limits
- Terrestrial Invertebrate Survey



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Development Consent Order Drawing Number: TR010060/APP/6.3

APFP Regulation: Regulation 5(2)(l)

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Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL STATEMENT
TERRESTRIAL INVERTEBRATE SURVEY
SHEET 2 OF 5

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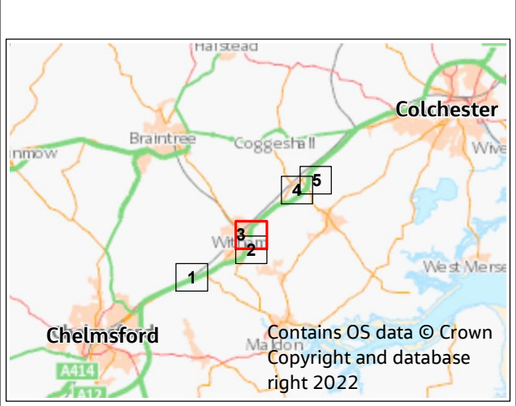
APPENDIX 9.11 - FIGURE 1

Legend

- Provisional Order Limits
- Terrestrial Invertebrate Survey



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APFP Regulation: Regulation 5(2)(l)

Client: national highways

Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL STATEMENT
TERRESTRIAL INVERTEBRATE SURVEY
SHEET 3 OF 5

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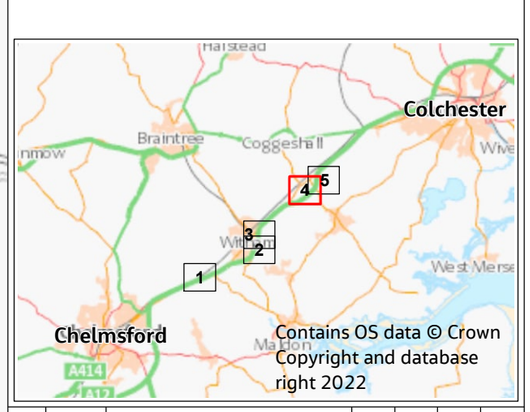
APPENDIX 9.11 - FIGURE 1

Legend

- Provisional Order Limits
- Terrestrial Invertebrate Survey



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Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

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SHEET 4 OF 5

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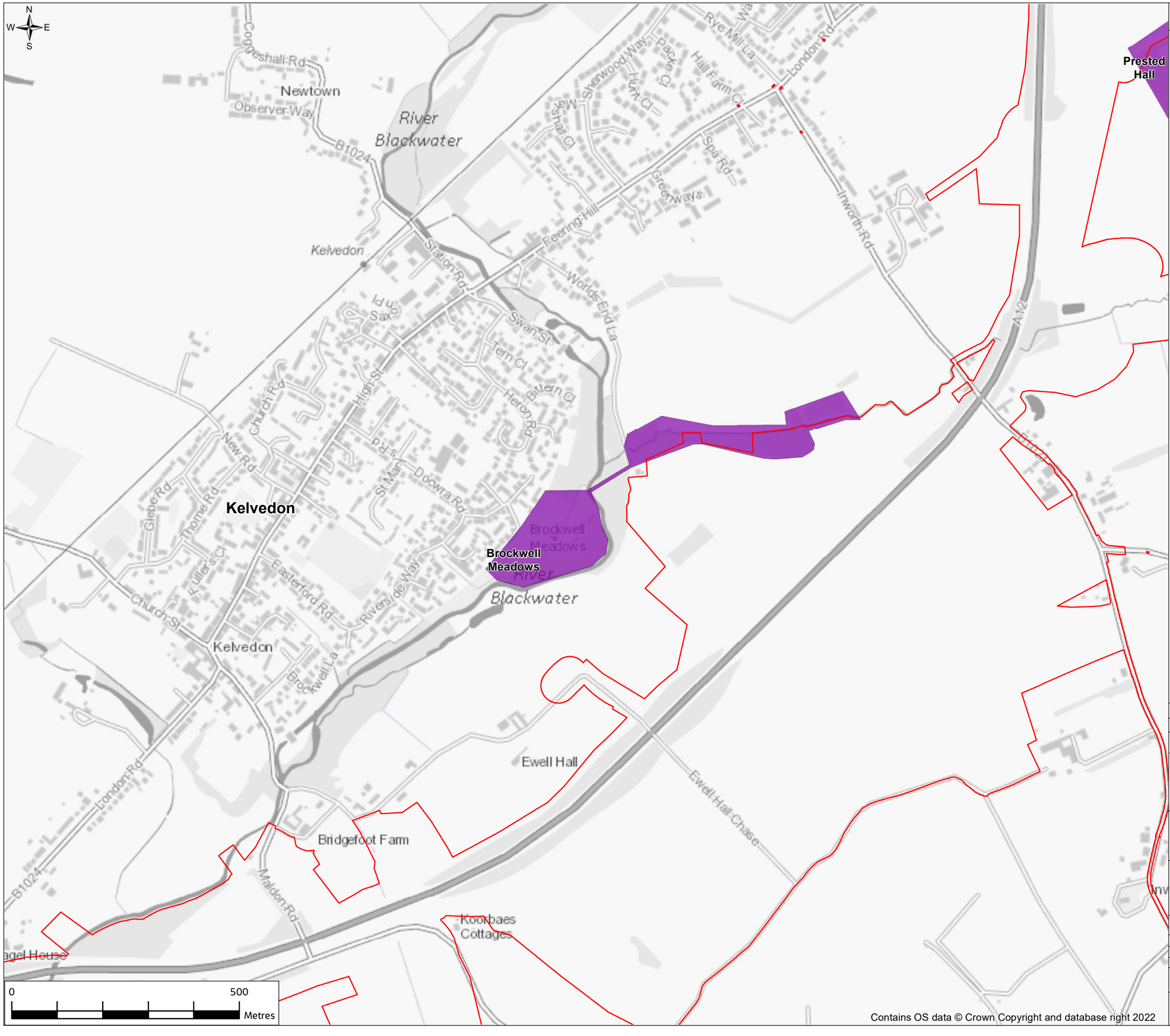
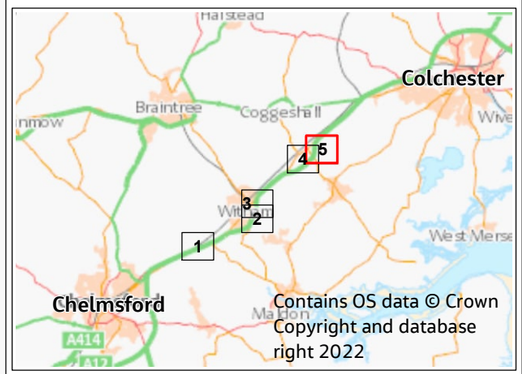


APPENDIX 9.11 - FIGURE 1

Legend

- Provisional Order Limits
- Terrestrial Invertebrate Survey



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Client: national highways

Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing Title: ENVIRONMENTAL STATEMENT
TERRESTRIAL INVERTEBRATE SURVEY
SHEET 5 OF 5

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